



Asia-Pacific Network for Global Change Research

**DIVERSITAS First Open
Science Conference 2005:
Travel Fund for Scientists
from Developing Countries in
the Asia Pacific Region**

Final report for APN project 2005-11-NSY-Bawa

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Other logos may be placed here

**DIVERSITAS Open Science Conference 2005: Travel Fund for
Scientists from Developing Countries in the Asia Pacific Region**

2005-11-NSY-Bawa

Final Report submitted to APN

Overview of project work and outcomes

Non-technical summary

DIVERSITAS, the international programme dedicated to biodiversity science, placed under the auspices of ICSU, IUMS, IUBS, SCOPE and UNESCO, received a grant from APN to provide travel assistance to scientists from developing countries of the Asia Pacific region to attend the DIVERSITAS First Open Science Conference entitled: “Integrating biodiversity science for human well being”, which took place in Oaxaca, Mexico, 9-12 November 2005. Only scientists who actively participated in the conference, with a selected abstract were funded. Part of the funds was used to invite key speakers known to the DIVERSITAS community, and part was used to support scientists new to DIVERSITAS, selected on the quality of their abstract, with the intent to get them interested in the objectives of DIVERSITAS. Eleven participants from the following countries were funded thanks to this grant: China, India, Philippines, Thailand, and Bangladesh.

Overall, the conference succeeded in attracting close to 700 scientists and policy makers from 60 countries, including a large proportion of young scientists, and scientists from developing countries. In addition to the APN objectives stated below, the conference produced a statement representing an important step on the way towards the establishment of a new international mechanism of scientific expertise for biodiversity.

Objectives

The main objectives of the project were:

1. To identify in the APN region, scientists related to DIVERSITAS scientific areas, not yet part of a network, to get them to know the DIVERSITAS programme.
2. To identify possible national representatives in countries where DIVERSITAS needs to be stronger. This includes, in particular, India and China, who are submitting this grant proposal.
3. To generally promote in the APN region the integrated approach of biodiversity science taken within DIVERSITAS to address biodiversity issues of high relevance in the Asia Pacific region (e.g. biodiversity changes and human health; carbon sequestration capacity of diverse tropical forests, etc.).

Amount received and number years supported

<2005-2006: 15,000 USD >; one year

Activity undertaken

Funds were used to fund participation of 11 scientists from the Asia Pacific region to the First DIVERSITAS Open Science Conference. APN funded participants actively contributed to the conference, by presenting one or several talks or organising a symposium. K Ma (China) gave a presentation on main biodiversity scientific programmes in China (National Committees meeting); K Bawa (India/USA) organised a symposium on sustaining partnerships for community-based conservation; A Sridhar (India) gave a talk on community-based approaches to marine conservation in India; B Sinha (India) talked about assessing traditional institutions for conservations in India; Priyadarsanan Dharma Rajan (India) gave a talk related to agrobiodiversity; J Gladwin

(India) was an invited speaker at a symposium on agrobiodiversity; V Amoroso (Philippines) talked about participatory inventory of plants in Natural Parks in the Philippines; E Webb (Thailand) was an invited speaker at a symposium on remote sensing and biodiversity; A Ramana was an invited speaker at a symposium on implementation of multilateral agreements as they apply to plant genetic resources (India). All abstracts are posted on the DIVERSITAS web site.

Results

The objectives were met since: 1) The conference attracted a wider than foreseen audience from 60 countries who signaled their interest to get involved into the activities of the DIVERSITAS cross-cutting networks and core projects, and to take the interdisciplinary approach promoted by DIVERSITAS; 2) Additional contacts were taken in countries which do not have yet a national committee, particularly in Asia (e.g. India, Philippines), Africa (Kenya, Morocco), and Eastern Europe; 3) Following symposiums and round tables, the conference adopted the “Oaxaca declaration” which commits the community to lobby for and get involved in the initial steps towards an International Mechanism of Scientific Expertise on Biodiversity (IMoSEB), similar to an IPCC for biodiversity.

Relevance to APN scientific research framework and objectives

The entire conference was dedicated to the theme of the “change in terrestrial and marine biodiversity”. This included the “human dimension” aspect of biodiversity change, as DIVERSITAS was designed, from the onset, as an integrated programme, with, as a mission, to promote an integrative biodiversity science, linking biological, ecological and social disciplines in an effort to produce socially relevant new knowledge. All core projects of DIVERSITAS include a human dimension. Some sessions, including one symposium, proposed by Paul W. Leadley (University of Paris, Orsay) and Sandra Lavorel (CNRS, Grenoble, France) was dedicated to the impact of climate change on biological diversity, and to the feedback mechanisms of biodiversity changes on climate. Emphasis was placed throughout the programme on input to policy making, at the regional level, and in the context of international conventions.

Self evaluation

The proponents of the proposal (as well as all participants) were very pleased with all aspects of the conference, and feel that they met the objectives of the proposal.

Potential for further work

All the contacts taken in Oaxaca are now being nurtured to firm up the establishment of new national committees, and the involvement of scientists new to DIVERSITAS from the APN region. The DIVERSITAS secretariat is also actively following up on the Oaxaca declaration, and the initiative to create an International Mechanism of Scientific Expertise on Biodiversity, with involvement of all regions of the world.

Publications

Perrings, C, Jackson L, Bawa K, Brussaard L, Brush S, Gavin T, Papa R, Pascual U, and de Ruiter P. 2006. Biodiversity in agricultural landscapes: saving natural capital without losing interest; Editorial. *Conservation Biology* 20: 263

Bawa K, 2006. Globally dispersed local challenges in conservation biology. *Conservation Biology* 20:696-9.

Jackson L, Brussaard L, de Ruiter P, Pascual U, Perrings C, Bawa K. Agrobiodiversity. In review. Encyclopedia of Biodiversity, S Levin, ed.

Acknowledgments

The DIVERSITAS community thanks APN for providing a grant to support the First DIVERSITAS Open Science Conference, and START for managing the APN funds.

Minimum 2pages (maximum 4 pages)

Technical Report

Preface

DIVERSITAS, the international programme dedicated to biodiversity science, received a grant from APN to contribute to its first Open Science Conference. The Conference entitled “Integrating biodiversity science for human well-being” took place in Oaxaca, Mexico, from 9 to 12 November 2005. The conference assembled many perspectives from the natural and social sciences to highlight the causes and consequences of biodiversity loss, following closely the launch of the Millennium Ecosystem Assessment. The grant received from APN was used to support scientists from the Asia Pacific region to attend and present their research.

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1 Conferences/Symposia/Workshops

Agenda/Programme (including title, date and venue)

Participants list (comprising contact details of each participant, including organisation, address, phone number, fax number, and email address)

2 Funding sources outside the APN

A list of agencies, institutions, organisations (governmental, inter-governmental and/or non-governmental), that provided any in-kind support or co-funding and the amount(s) awarded.

3 Glossary of Terms

Include list of acronyms and abbreviations

4 In the Appendix section, the report may also include:

Abstracts, Power Point Slides of conference/symposia/workshop presentations

Conference/symposium/workshop reports

1.0 Introduction

Introduce the project, moving from the broader issues to your specific objectives, finishing the section with the precise aims of the project.

Background

Approximately four years ago, in 2001, International Council for Science (ICSU), the International Union of Biological Sciences (IUBS), the International Union for Microbiological Societies (IUMS), the Scientific Committee on Problems of the Environment (SCOPE), and the United Nations Educational, Scientific and Cultural Organization (UNESCO), asked the scientific community to build a new global change programme dedicated to biodiversity science, *i.e.*, a new DIVERSITAS. DIVERSITAS had been instrumental since its inception in the early 90's in framing biodiversity research questions. There was now a need to take into account a more dynamic and integrated approach to biodiversity science, and to build a new structure to address these questions. In addition to the key field of discovering new species and conserving biodiversity, new questions were emerging, on the causes of biodiversity loss, on its potential consequences for ecosystem functioning and "services", and on how human and social processes interacted to affect biodiversity. Following a series of consultations and meetings DIVERSITAS identified three main priority axes –or "core projects"- and published its science plan in 2002, followed by core projects science plans. During that period (2001-02), DIVERSITAS became a founding member of the Earth System Science Partnership, or ESSP, which includes three other global change programmes: IGBP (International Geosphere-Biosphere Programme), IHDP (International Human Dimensions Programme on Global Environmental Change), and WCRP (World Climate Research Programme).

The Oaxaca conference was the first open science conference of DIVERSITAS, and the first international conference of this kind, entirely dedicated to the many facets of biodiversity science. The conference was organized by the DIVERSITAS Scientific Committee, with a strong lead by the Mexican and US National Committees of DIVERSITAS.

Presentation and objectives of the Conference

The conference assembled many perspectives from the natural and social sciences to highlight the causes and consequences of biodiversity loss. Following closely the Millennium Ecosystem Assessment launch, it examined changes in beneficial ecosystem services and the economic consequences of biodiversity loss. The conference featured a mix of plenary lectures, symposium, oral and poster sessions, presented by invited speakers, as well as scientists selected from a call for abstracts on the three following themes: 1) How is biodiversity changing, and why? 2) What are the consequences of biodiversity changes for ecosystems and for the delivery of ecosystem services? 3) What can we do to promote a more sustainable use of biodiversity and improve human well-being?

The overall objectives of the conference were:

- 1 To convene scientists representing the full DIVERSITAS spectrum, that is, many perspectives from the natural and social sciences to highlight the linkages from biodiversity to ecological functions to ecosystem services, as well as the consequences of damaging economic activities ignoring such linkages;
- 2 Promote scientific exchanges;

- 3 Develop interface between science and policy making for biodiversity;
- 4 Strengthen and expand DIVERSITAS networks;
- 5 Forge new partnerships.

Objectives of APN grant

The main objectives of the APN grant were:

- 1 To identify in the APN region, scientists related to DIVERSITAS scientific areas, not yet part of a network, to get them to know the DIVERSITAS programme.
- 2 To identify possible national representatives in countries where DIVERSITAS needs to be stronger. This includes, in particular, India and China, who are submitting this grant proposal.
- 3 To generally promote in the APN region the integrated approach of biodiversity science taken within DIVERSITAS to address biodiversity issues of high relevance in the Asia Pacific region (e.g. biodiversity changes and human health; carbon sequestration capacity of diverse tropical forests, etc.).

2.0 Conference Outputs

List the outputs here with a description of each. Links can also be included here to the DIVERSITAS websites (outputs may also be placed in the appendix section of CDROMS – see appropriate section).

This was the first international conference of this type entirely dedicated to the many facets of biodiversity science. The conference was a success, attracting close to 700 scientists and policy makers from 60 countries, including a large proportion of young scientists and participants from developing countries. The conference received wide press coverage with more than 100 press articles worldwide, and an editorial in *Science*, on the opening of the conference (*Science*, vol 310, 11 Nov 2005, Dirzo R. and M. Loreau, “Biodiversity science evolves”).

The outputs of the conference as they related to the activities of APN funded participants are listed below in 5 subsections:

a Science/Policy interface

Oaxaca declaration and IMoSEB consultation process

The conference adopted the “Oaxaca declaration” which commits the community to lobby for and get involved in the initial steps towards an International Mechanism of Scientific Expertise on Biodiversity (IMoSEB), to accomplish for biodiversity what IPCC is doing for climate change. The Oaxaca declaration follows up on a call made at an earlier conference held in Paris in January 2005, untitled “Biodiversity: Science and Governance”, which assembled close to 2,000 participants from the biodiversity science and policy environments worldwide, including some heads of states, in which the French President, J Chirac, called for such a new mechanism for biodiversity. The Oaxaca declaration, was approved in plenary, and read by M Loreau, Chair of the Scientific Committee of DIVERSITAS, ends as follows:

“In agreement with the recommendations of the Paris Conference, they urge national governments and United Nations bodies to establish a properly resourced international scientific panel that includes an intergovernmental component and that aims at providing,

on a regular basis, validated and independent scientific information relating to biodiversity to governments, international conventions, non-governmental organisations, policy makers and the wider public". For the full text of the Oaxaca declaration, go to : <http://www.diversitas-international.org/>

As a follow up to the Paris and Oaxaca declaration, a consultation on this new "International Mechanism of Scientific Expertise on Biodiversity (IMoSEB)" has been launched. An International Steering Committee for this consultation met in Paris in February 2006. The initiative is coordinated by a small secretariat funded by the French government, in which DIVERSITAS and the French Biodiversity Institute (IFB) share coordinating responsibilities.

b Scientific publications

The following publications developed as a result of discussions and presentations made in Oaxaca. We list below only those involving APN funded participants:

Perrings, C, Jackson L, Bawa K, Brussaard L, Brush S, Gavin T, Papa R, Pascual U, and de Ruiter P. 2006. Biodiversity in agricultural landscapes: saving natural capital without losing interest; Editorial. *Conservation Biology* 20: 263

Bawa K, 2006. Globally dispersed local challenges in conservation biology. *Conservation Biology* 20:696-9.

Jackson L, Brussaard L, de Ruiter P, Pascual U, Perrings C, Bawa K. Agrobiodiversity. In review. *Encyclopedia of Biodiversity*, S Levin, ed.

Special issue of the journal: *Agriculture, Ecosystems and Environment* (2006)

c New international partnership for agrobiodiversity

A new international partnership is emerging from a symposium on agrobiodiversity which was very well attended in Oaxaca. K Bawa, and his colleagues from ATREE in India have been instrumental in this activity. Subsequent meetings at IPGRI, in Rome, have led to the production of a document, untitled "Platform for agrobiodiversity research", which will involve many nations and organizations (DIVERSITAS, FAO, NEPAD, UNESCO, IPGRI, UN-CBD, etc.). The scoping meeting which took place in Rome on 29-31 May 2006, was attended by about 40 people, including the following representatives from the Asia Pacific region: R Kanok (U of Chiangmai, Thailand), B Ravi (Swaminathan R F, India), R Sackville-Hamilton, SGRP, IRRI, Philippines).

d DIVERSITAS National Committees in APN region

Funding from APN allowed two participants K Ma, and V Amoroso, to also attend the meeting of the National Committees for DIVERSITAS (9 November 2006). 43 countries were represented at this meeting, including the following countries from the Asia Pacific region (China-CAST, China-Taipei, Indonesia, Japan, India, Philippines, Thailand, Vietnam). K Ma made a presentation on the activities of the Chinese DIVERSITAS

National Committee. Following Oaxaca, V Amoroso obtained funding and was able to establish a DIVERSITAS National Committee in the Philippines, which is organizing its first symposium on biodiversity monitoring in October 2006.

Communication (press release in Asia)

More than 100 press releases were published worldwide on the conference. Of interest for the Asia Pacific regions, were articles in Malaya and The Star online, in Malaysia, New Kerala and Reuters, in India, Kyoto News, in Japan, and Daily Times, in Pakistan.

Links to some of these articles can be found at:

<http://www.diversitas-international.org/link5.html>

3.0 APN-Funded Participants

Describe how the funds were used, who was supported, include full contact details of the APN-funded participants and approximately 100-word abstracts from them outlining their fields of interest and how the conference was valuable for their career agendas, specifically for networking and capacity building.

Funds were used to partially support traveling of 11 participants. All participants contributed some of their own funding. All APN funded participants actively contributed to the conference, by presenting one or several talks or organising a symposium. All contributions were peer reviewed by an international committee (subset of SC DIVERSITAS).

K Ma (Prof. of Plant Ecology, Director General Institute of Botany, Chinese Academy of Sciences kpma@ibcas.ac.cn) gave a presentation on main biodiversity scientific programmes in China, such as the Chinese virtual herbarium, and including activities of the Chinese DIVERSITAS committee. K Ma wrote: “It was really a wonderful congress from which I learned a lot. After the congress, I transferred my understanding to the Chinese audience at a number of workshops or symposia such as the International Symposium on Biodiversity and Biogeography in East Asia on 14-15 July, 2006, Kunming with 120 participants, and the 7th national symposium on the conservation and sustainable use of biodiversity in China on 3-5 August, 2006 with 300 participants”. (<http://www.planta.cn/forum/viewforum.php?f=2>) .

K Bawa (India/USA; University of Massachusetts, Boston, USA, kamal.bawa@umb.edu) organised a symposium on sustaining partnerships for community-based conservation, which produced a number of articles (see list of publications); K Bawa is a member of the Scientific Committee of the agroBIODIVERSITY cross-cutting network of DIVERSITAS. As a result of discussions which took place in Oaxaca and elsewhere, K Bawa recently submitted a grant proposal to the Gates Foundation on agrobiodiversity in India. “Community based conservation is assumed to enhance ecological, economic and social benefits of conservation. However, there are very few efforts that have systematically evaluated the success of community-based conservation initiatives. We present the results of a case study from the Biligiri Rangaswamy Hills in Southwest India that was intended to confer ecological and economic benefits to Soligas, the indigenous people of the region”.

P Chaudhary (Institute for Sustainable Development and Research, India, pashupatic@hotmail.com): “Currently a Ph.D. student of Environmental Biology, I am interested in biodiversity conservation and poverty alleviation issues. My major focus of research is to study how social, economic and political factors drive human being to destroy biodiversity and poor peoples’ means of livelihoods and seek policy and practices that curb this negative impact. I am also interested in examining how various conservation strategies such as protected areas fail to meet both conservation and poverty alleviation/sustainable development goal simultaneously and suggesting some useful alternatives. How intensive farming and protected areas induce tradeoffs of various ecosystem services are another areas that I thrive to explore”.

A Sridhar (Ashoka Trust for Research in Ecology and the Environment (ATREE), India, aarathi@atree.org) gave a talk on community-based approaches to marine conservation in India; Sustaining partnerships for community-based conservation
“Marine conservation in India is conspicuously similar in design to terrestrial approaches. While fisheries legislations designed to protect traditional livelihoods may serve conservation objectives if properly implemented, they have not been explicitly designed for the conservation of species or habitats. The protection of endangered marine species and habitats such as turtles and coral reefs has usually meant cutting off human access to a certain habitat and prohibiting the trade and use (sustainable or otherwise) of these species. The paper I presented provided an overview of the approaches in marine conservation in India, highlighting the range of initiatives that can be considered community-based conservation. The paper also critically evaluated the existing space for community-based conservation within the legal framework. The symposium represented an excellent opportunity to compare similar approaches in various regions around the world.”

B Sinha (Ashoka Trust for Research in Ecology and the Environment, India, bhaskarsinha@hotmail.com): “I have been actively involved in research that interfaces with natural sciences and social sciences. For the past three years, my research focus has been on developing sound methodologies for assessing the functioning of informal institutions formed by local communities towards natural resources management and enhancement of livelihoods. The first DIVERSITAS Open Science Conference on ‘Integrating Biodiversity Science for Human Well-being’ was very close to my research interest.

Through my participation to the above conference I was able to share my findings on "Assessing traditional institutions for conservations in India" with other distinguished scientists working on similar issues in different parts of globe and got their feedback. Such platforms/opportunities, which are very crucial for boosting the inspiration of young researchers, are very limiting due to lack of financial support and intellectual capacities, especially in the developing countries. In this regard, I would sincerely acknowledge that my participation has helped me to enhance my knowledge, and as an outcome, I have communicated my research findings to SCIENCE as a report, which is under review”.

Priyadarsanan Dharma Rajan (Ashoka Trust for Research in Ecology and the Environment (ATREE), India, priyan@atree.org): “I am working as a Fellow of Ashoka Trust for Research in Ecology and Environment, Bangalore, India, which is a non-governmental research organisation dedicated to conservation. For the past nine years in the current position, I have worked to understand the synergistic relationships between insects, plants and ecosystems. I am also involved in establishing the "Centre for

Insect Taxonomy and Conservation (CITAC)" with the aim of providing a foundation for the concept of 'insect conservation' in India. I strongly feel that it is necessary to revamp the current conservation approach, which is focusing on the species level to give more emphasis to habitat heterogeneity for an effective conservation of the vast diversity of life forms from which the majority is made of 'less-charismatic' insects and other invertebrates. The major threat to insect diversity is from the large scale land-use changes and overuse of pesticides for agricultural purposes. Meanwhile many studies have shown that diversification of plant components of an agro-ecosystem significantly lowers pest populations. The main goal of my work is then to apply the concepts of landscape ecology for the management of agro-ecosystems to enhance natural enemy populations for a better pest control and sustainable agriculture.

DIVERSITAS meeting was a good opportunity for me to present my research findings on agrobiodiversity to a wide spectrum of conservationists ranging from pure sociologists to pure wildlife biologists. It also gave me opportunities to meet and exchange ideas with many senior colleagues from around the world. I am happy to state that these meetings helped me to establish strong and continuing collaboration with several senior scientists. The financial support I received from APN through DIVERSITAS was crucial for me to attend the DIVERSITAS OSC1. I use this opportunity to thank the Asia Pacific Network for global change research as well as DIVERSITAS for providing me this generous travel grant."

J Gladwin (Ashoka Trust for Research in Ecology and the Environment, India, gladwin@vsnl.com) was an invited speaker at a symposium on agrobiodiversity. He presented a talk on "Scale-dependent approaches and institutions for conserving biodiversity at agriculture-forest margins".

Millions of people in the tropics directly depend on forests for their livelihoods and also live in the forest-agriculture ecotones. This ecotone consists of a mosaic of diverse land cover and land use- forests and grazing lands, marginal dry-land farming or irrigated farming. The agriculture lands in these ecotones are marginal in productivity, predominantly on sloping lands with high risks of soil erosion, and subject to wildlife depredation. The talk discussed an approach to develop and implement workable community-managed models of adaptive natural resource management that cuts across the forestry and agricultural sector in contrasting forest-agriculture ecotones at various spatial scales.

V Amoroso (Central Mindanao University, Philippines, amorosovic@yahoo.com): "My field of specialization is Plant Morphology and Taxonomy, and my current research interest is on plant diversity. The DIVERSITAS conference has broadened my understanding regarding the importance of other fields in conducting biodiversity research.. Although capacity building has not been realized yet, I am optimistic that future collaborations and networking with experts from other countries will strengthen my research in biodiversity. As a follow up to DIVERSITAS, I have taken the initiative to put together a DIVERSITAS National Committee in the Philippines. The first activity of this committee is the organisation of a regional symposium which I am organizing in the Philippines (Symposium on long-term ecological and biodiversity research in the East Asia region, Muuan Bukidnon, Philippines, 25-26 October 2066) as an initial step for future collaborations and networking with other experts, and thereby building our capacities to conduct biodiversity research."

E Webb (Asian Institute of Technology, Thailand, ewebb@ait.ac.th)

E Webb was an invited speaker at a symposium on remote sensing and biodiversity (Symposium 17 - Remote sensing: methods and applications to assess, monitor and

manage biodiversity loss), where he presented a talk untitled “Using RS/GIS to model forest cover change in Thue Thien Hue, Vietnam: implications for biodiversity conservation”

Central Vietnam is recognized as an important repository for biological diversity and endemism, and conservation agencies are placing a high priority on maintaining forest integrity in the region. The forests are particularly important in the province of Thua Thien Hue, where a proposed ‘green corridor’ could connect the Annamite Mountains on the Vietnam – Lao border and Bach Ma National Park. The talk described a project in Nam Dong district, where we are evaluating forest cover and land use changes since 1975 and are attempting to couple those changes with physical, socioeconomic and policy drivers. The talk also outlined what data would be required to fulfill a spatial biodiversity model for Hue Province.

A Ramanna (University of Pune, India, anithar@unipune.ernet.in) was an invited speaker at a symposium on implementation of multilateral agreements as they apply to plant genetic resources (India). She presented a talk untitled “Plant genetic resources for food and agriculture: effects of multilateral agreements in developing countries”.

Biological diversity is usually associated with wild animals and plants, and there is generally less political awareness of the importance of genetic diversity in agriculture for plant breeding and food security. This paper was about the management of plant genetic resources for food and agriculture and how different international agreements have affected this management in developing countries. It focused on the issue of access to these vital resources, since that is particularly important for their future existence and for food security.

Adhikari, Bhim (IUCN, Pakistan, bhim_adhikari@yahoo.com) presented a paper untitled Economic incentives and biodiversity conservation: analysis of management scenarios for conservation.

Biodiversity conservation and poverty reduction strategies remain one of the major discourses in the issue of environment and development in Nepal for the past few years. Among Nepal's unique biodiversity resources, the one-horned Indian rhinoceros (*Rhinoceros unicornis*) is of special interest for its role in the growing eco-tourism industry and local level development. However, rhino populations have come under increasing pressure due to poaching and loss of habitat. The aim of this research was to undertake a stakeholder analysis to obtain important information about use of park resources and to allow statistical analysis of stakeholder groups and random utility modelling of preferences for alternative management approaches involving local communities.

All abstracts are posted on the DIVERSITAS web site.

4.0 Conclusions

The DIVERSITAS community was very pleased with the overall organization and outcome of the conference which reached its set of objectives. Participants expressed their satisfaction at the unique atmosphere of the conference, and many said, leaving the conference, that they were going home with renewed enthusiasm and new insights for their research. The large number of grants that DIVERSITAS was able to secure to help fund young scientists and scientists from developing countries largely contributed to this success, and to the enthusiastic atmosphere. Participants had the opportunity to hear new talks, and meet new people. DIVERSITAS wishes to thank APN for contributing to making this first Open Science Conference a success.

References

No references cited; see publications as output of conference, in section above.

Appendix

1 Conferences/Symposia/Workshops

Agenda/Programme (including title, date and venue)

Participants list (comprising contact details of each participant, including organisation, address, phone number, fax number, and email address)

See separate file untitled Appendix1-Agenda-Programme.

2 Funding sources outside the APN

A list of agencies, institutions, organisations (governmental, inter-governmental and/or non-governmental), that provided any in-kind support or co-funding and the amount(s) awarded.

DIVERSITAS was able, thanks to the following agencies or programmes, to fund the participation of 171 participants, including 95 scientists from developing countries.

First DIVERSITAS Open Science Conference

In Euros

Grants given to DIVERSITAS	Country	Amount (Euros)
CONABIO / CONACYT	Mexico	53 256
IAI	Latin America	26 403
SLOAN Foundation	USA	15 723
Research Council of Norway	Norway	9 982
APN	Asia Pacific	12 390
DFG	Germany	10 000
CIRAD	France	10 000
IFS	Sweden	9 912
MARBEF	European Union	5 000
IPGRI	International (UN)	4 998

Grants given to participants (not administered by DIVERSITAS)

National Science Foundation	USA	32 participants
EU	Europe	15 participants
French Ministry of Foreign Affairs	France	12 participants
GBIF	International	7 participants
UNESCO	UN	3 participants
Instituto Nacional de Ecologia	Mexico	Onsite technical help
UNAM	Mexico	2 participants
		Students help

3 Glossary of Terms

Include list of acronyms and abbreviations

APN	Asia-Pacific Network for global change research
CBD	Convention on Biological Diversity
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CONABIO	National Commission for the Knowledge and Use of Biodiversity, Mexico
CONACYT	Consejo Natiocional de Ciencia y Tecnologia
DFG	Deutsche Forschungsgemeinschaft (German Research Foundation)
ESSP	Earth System Science Partnership
EU	European Union European Commission
FAO	Food and Agriculture Organization of the United Nations
GBIF	Global Biodiversity Information Facility
IAI	Inter-American Institute for global change research
ICSU	International Council for Science
IFB	Institut français de la biodiversité
IFS	International Foundation for Science
IHDP	International Human Dimensions Programme on Global Environmental Change
IMoSEB	International Mechanism of Scientific Expertise on Biodiversity
IPCC	Intergovernmental Panel on Climate Change
IPGRI	International Plant Genetic Resources Institute
IRRI	International Rice Research Institute
IUBS	International Union of Biological Sciences
IUMS	International Union of Microbiological Societies
MA	Millennium Ecosystem Assessment
Marbef	Marine Biodiversity and Ecosystem Functioning Network
NEPAD	Nouveau Partenariat pour le Développement de l'Afrique
SC	Scientific Committee
SCOPE	Scientific Committee on Problems of the Environment
SGRP	Systemwide Genetic Resources Programme
START	Global Change SysTem for Analysis, Research and Training (IGBP, IHDP, WCRP)
UNAM	Universidad Nacional otonoma de Mexico
UNESCO	United National Educational, Scientific and Cultural Organization
WCRP	World Climate Research Programme

4 In the Appendix section, the report may also include:

Abstracts, Power Point Slides of conference/symposia/workshop presentations

Conference/symposium/workshop reports

See separate files untitled

- Appendix2a-Symposium abstracts: this file presents the abstracts of all symposiums
- Appendix2b-Symposium speakers abstracts: this file presents the abstracts of the participants who gave an oral presentation in the symposium sessions.
- Appendix2c-Contributed papers abstracts: this file contains the abstracts of the participants who gave an oral presentation in the contributed papers sessions.
- Appendix2d-Posters abstracts

Table of contents

Programme of the DIVERSITAS Open Science Conference
“Integrating biodiversity science for human well-being”
9-12 November, 2005, Oaxaca, Mexico

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Foreword

Approximately four years ago, in 2001, the institutional sponsors of DIVERSITAS, the International Council for Science (ICSU), the International Union of Biological Sciences (IUBS), the International Union for Microbiological Societies (IUMS), the Scientific Committee on Problems of the Environment (SCOPE), and the United Nations Educational, Scientific and Cultural Organization (UNESCO), asked the scientific community to build a new global change programme dedicated to biodiversity science, i.e., a new DIVERSITAS.

DIVERSITAS had been instrumental since its inception in the early 90's in framing biodiversity research questions, under the leadership of Sir Ghilleen Prance, followed by Prof. José Sarukhan. There was now a need to take into account a more dynamic and integrated approach to biodiversity science, and to build a new structure to address these questions. In addition to the key field of discovering new species and conserving biodiversity, new questions were emerging, on the causes of biodiversity loss, on its potential consequences for ecosystem functioning and "services", and on how human and social processes interacted to affect biodiversity.

We began with a series of consultations and meetings which identified three main priority axes –or "core projects"- for DIVERSITAS, published an operational plan and established an international project office for these core projects, developed a network of national DIVERSITAS committees, devised a mechanism for stable funding of the secretariat and its activities, and engaged in collaboration with an increasing number of international partners. During that period, DIVERSITAS became a founding member of the Earth System Science Partnership, or ESSP, which includes three other global change programmes: IGBP (International Geosphere-Biosphere Programme), IHDP (International Human Dimensions Programme on Global Environmental Change), and WCRP (World Climate Research Programme).

All of this happened thanks to enthusiastic scientists and policy makers who provided their energy and time. We are convinced that DIVERSITAS responds to a very strong need from the scientific community. Together, thanks to programmes like DIVERSITAS, scientists can synthesise knowledge, engage in collaborative experiments or interdisciplinary projects, devise new theories, and contribute, as a community, to international assessments and conventions.

The needs of the community, however, exceed by far our current capacity to address them, and a much larger, better funded effort is still necessary. DIVERSITAS is entirely geared towards addressing the priorities identified in the Millennium Ecosystem Assessment. Funding for international endeavours such as DIVERSITAS remains, however, uncertain and limited.

We hope that the Conference will highlight some of the benefits of having an international platform for biodiversity science. Biodiversity is the key to the provision of a whole range of ecosystem functions, some of which providing invaluable services to human kind. Precisely because these services are difficult to value, the benefits derived from them are often ignored in policy decisions and private activities, which lead to irrevocable environmental damages. DIVERSITAS focuses, in particular, on this

damaging disconnect between economic activities, and their impact on ecological functions and services. A platform to exchange ideas and bring together diverse communities is crucial in order to produce new knowledge to ultimately reduce damage to biodiversity.

The idea of this Conference originated two years ago, when the Scientific Committee (SC) of DIVERSITAS decided to convene scientists representing the full DIVERSITAS spectrum, that is, many perspectives from the natural and social sciences to highlight the linkages from biodiversity to ecological functions to ecosystem services, as well as the consequences of damaging economic activities ignoring such linkages.

The SC DIVERSITAS charged the Mexican and the US Committees for DIVERSITAS to lead the organisation of the conference, and work with the secretariat. The programme you have in your hand shows that the field of biodiversity science is a booming and highly diverse field, full of exciting results and prospects.

The Scientific Committee of DIVERSITAS did not choose Oaxaca by chance. It was important for all of us to choose a symbolic place of high ecological and cultural diversity to inspire participants and nurture biodiversity discussions. We are convinced that you will appreciate the Oaxaca environment, and hope that you will take the time to enjoy the city and the region.

Such a large conference, the first of this size for DIVERSITAS, is not a straightforward undertaking. The Conference has been made possible thanks to

the efforts of many volunteers. Scientists involved in DIVERSITAS have contributed their time and effort to help organise the programme, select abstracts, and plan for symposia.

Quite a few funding agencies, research councils and international organisations have been strong partners and provided funding for the conference, to allow participants from all regions of the world, but particularly from developing countries to attend. Without their contribution, the conference would not have been possible.

Our Mexican colleagues, and particularly Prof. Rodolfo Dirzo, Prof. José Sarukhan, past-Chair of DIVERSITAS, Prof. Gonzalo Halffter, Dr. Susana Magallon and the members of the Mexican DIVERSITAS committee have provided invaluable help and support in all aspects of the conference, and particularly to guide complex in-country arrangements.

Most of the organisational work and fund raising was carried by the DIVERSITAS secretariat in Paris. It has been a long and extraordinary challenging task for such a small team, over these past two years. We want to acknowledge here the dedication and professionalism of Dr. Anne-Hélène Prieur-Richard, Frédérica Kostadinoff, and Kerstin Schmidt-Verkerk, who have worked long hours to make this event happen.

On behalf of the Scientific Committee of DIVERSITAS, and all our colleagues who have contributed to this effort, we hope that you will enjoy a week of biodiversity science in Oaxaca!

Anne Larigauderie, Executive Director
Michel Loreau, Chair,
Scientific Committee DIVERSITAS

Welcome to Oaxaca!

Global biodiversity, the constellation of plants, animals, fungi and micro organisms that inhabit the planet—and that make it lovable—is not homogeneously distributed throughout the earth. Although our understanding of biodiversity is still poor, and in addition terribly biased towards terrestrial ecosystems, we do know that species diversity or richness, the most commonly used descriptor of biodiversity, is disproportionately concentrated in some areas. Other areas show intermediate levels of richness and still others are evident cold spots of diversity. While the biological exuberance of the former makes them an obvious source of attraction and fascination to scientist and the general public alike, the latter is also fascinating, if not for other reasons, because they typically represent extreme ecological settings (e.g., the polar caps and the kilometres-deep sea floor), and the mere capability of some organisms to populate there is also awe-provocative.

Yet, biodiversity includes several facets, in addition to species richness: the concentration of endemisms, the diversity of ecosystems (including the juxtaposition of aquatic and terrestrial ecosystems), the intra-specific diversity (e.g., population differentiation or diversity of populations), the domesticated diversity, and the combination of taxa of different biogeographic origin. Another correlated aspect of biological diversity is cultural diversity. The latter is of additional importance because it reflects legendary involvement of human cultures with nature and translates into traditional knowledge and perception, use and appreciation of biodiversity.

Those areas of the world in which all or many of these biodiversity facets concur, should be of especially evident biodiversity value. This happens to be the case of the Mesoamerican region, and within it, the territory of Mexico. Mesoamerica stands out in

analyses of most of the biodiversity facets I referred to and Mexico is regarded as one of the mega diversity countries elite, given that it embraces 23 major vegetation types, ranging from hyper-wet tropical forests, to hyper-dry deserts and with extensive coral reefs and some 11,500 km of coastline; some 25,000 plant species, about 40% of them endemic to the country; 450 species of mammals and over 1,000 species of birds, as well as a proliferation of domesticated taxa. Furthermore, a significant fraction of the country's biodiversity is accounted for by the biodiversity of the State of Oaxaca, which includes most of the vegetation types of the country and contributes with about a third of Mexico's floristic diversity. In this state, within a short distance one can move from tropical rain forest, to tropical dry forest, to temperate and cloud forest and to spectacularly exuberant deserts. In addition, the probability of finding some remarkable product of organic

elcome!

evolution is high—for example the endemic *Thorius* salamanders, the smallest tetrapod known to earth so far (only 2 cm long and head only 3 mm long, yet capable of accommodating brains, eyes, nose and ears—and almost no muscle or connective tissue!).

As in Mexico in general, cultural diversity is also exuberant, with sixteen ethnic groups that command over 150 tongues—a cultural diversity of ancient and extant traditional knowledge of its associated biodiversity, as reflected in the evidence for initial domestication of calabaza (*Cucurbita*), maize, and the occurrence of about 2800 plant species for which some use is known. Such biological and cultural treasure will be evident to you if you have an opportunity to travel in the state, or even if you visit the Santo Domingo Museum and Botanic Garden, the market, or downtown Oaxaca City, for such human-biodiversity relationship is reflected all around you, particularly in the hyper-diverse cuisine.

This wonderful biological and cultural treasure however, is heavily threatened: consider the case of the 700,000 ha/year deforestation rate of the country, which is mirrored, at the local scale in Oaxaca. Mesoamerica, Mexico and Oaxaca epitomize the central problems of global biodiversity and the challenges that society needs to address: the need to preserve, use and restore biodiversity for human wellbeing; the challenge of making biodiversity

conservation and use socially attractive; the need to make compatible the conservation of biodiversity in the context of human presence, that is, beyond the natural protected areas; and the recognition of and fair compensation to the local inhabitants of the lands where the remaining biodiversity resides. This is for all these reasons that the Scientific Committee of DIVERSITAS chose Oaxaca as the venue for its First Open Science Conference. Oaxaca is a vivid laboratory to address these challenges. I am sure that Oaxaca will be inspirational for your participation and contribution to this conference and for our common goal of understanding, wisely using and caring for the most distinctive feature of our planet: biodiversity.

On behalf of the Mexican National Committee of DIVERSITAS and our national and state sponsors: the National Institute of Ecology (INE), The National University of Mexico (UNAM), the National Council of Science and Technology (CONACYT), and the State's Institute of Ecology and Delegation of the Ministry of the Environment, let me extend my warmest welcome to all of you in Oaxaca! Have a productive and enjoyable conference in this magical venue!

Rodolfo Dirzo
Vice Chair, SC-DIVERSITAS
and DIVERSITAS National Committee-Mexico

Presentation of plenary speakers



Michel Loreau,
McGill University, Canada

Michel Loreau received his PhD from the Free University of Brussels (ULB, Belgium), then worked as a research assistant/senior research assistant of the National Fund for Scientific Research (Belgium), assistant lecturer and lecturer at the Free University of Brussels, and programme manager at the Science Policy Office (Belgium) and Professor at Pierre et Marie Curie University, Paris, France and at the Ecole Normale Supérieure (Paris), where he directed the postgraduate programmes at these institutions and at the National Agricultural Institute of Paris-Grignon.

M. Loreau is the author of more than 170 scientific publications in the fields of theoretical ecology, community ecology, ecosystem ecology, population ecology and evolutionary ecology. His current research aims to synthesise the disparate fields of ecosystem functioning and community organisation and diversity. He develops theory and modelling at the interface between community ecology, evolutionary ecology and ecosystem ecology, in interaction with experimental work on diversified systems, both terrestrial and aquatic, and in both the field and the laboratory. His main research theme is the link between biodiversity and ecosystem functioning (productivity, nutrient cycling, stability, response to perturbations). He also studies the role of material cycles as circular causal pathways that transmit indirect effects to all ecosystem components (ecology and evolution of indirect mutualism generated by nutrient cycling between plants and herbivores or decomposers, effects of the coupling of several biogeochemical cycles on the functioning and stability of ecosystems).

M. Loreau chairs the Scientific Committee of DIVERSITAS and chaired the Scientific Committee of the International Conference on Biodiversity: "Biodiversity Science and Governance", organised in 2005 by the French government, and the Steering Committee of the European Science Foundation programme *Linking community and ecosystem ecology* (LINKECOL). M. Loreau serves on numerous scientific committees and teaches ecology at McGill.

M. Loreau was the winner of the Paul Brien Prize (Belgium), the Competition for Travel Grants (Belgium), the Annual Competition of the Royal Academy of Belgium, the Agathon De Potter Prize of the Royal Academy of Belgium, the Max Poll Prize of the Royal Academy of Belgium, the International Ecology Institute Prize (Germany), and finalist, with the BIODEPTH project, of the Descartes Prize of the European Union.

Michel Loreau will give the introductory plenary lecture of the conference on Thursday, November 10, entitled: «The challenges of biodiversity science».

Jane Lubchenco

Oregon State University, USA

Jane Lubchenco is an environmental scientist and marine ecologist, actively engaged in teaching, research, synthesis and communication of scientific knowledge. She grew up in Colorado, received her PhD. and taught at Harvard University, and 25 years ago, moved to Oregon State University where she became Valley Professor of Marine Biology and Distinguished Professor of Zoology.

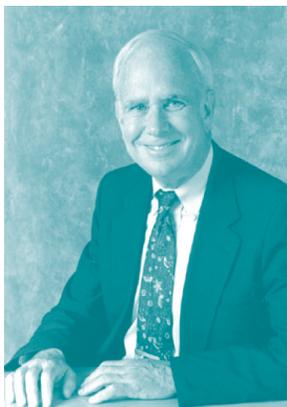


J. Lubchenco's research interests include biodiversity, climate change, sustainability science and the state of the oceans. She is Past-President of the International Council for Science (the first woman to hold that position), a Past-President of the American Association for the Advancement of Science and of the Ecological Society of America, and a member of the National Science Board. She co-founded and leads the Aldo Leopold Leadership Program, which teaches outstanding environmental scientists to be more effective communicators of scientific information.

J. Lubchenco is Principal Investigator of a \$20 million, four-university consortium called the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), which studies the dynamics of the marine ecosystem along the west coast of the US. She is also a Principal of COMPASS, the Communication Partnership for Science and the Sea, and is an elected member of the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Philosophical Society.

J. Lubchenco serves on the Pew Oceans Commission, an independent group of American leaders conducting a national dialogue on the policies needed to restore and protect US marine ecosystems. She is a Director or Trustee of several boards including the David and Lucile Packard Foundation, the Monterey Bay Aquarium, SeaWeb, the Royal Swedish Academy of Sciences' Beijer Institute, and Environmental Defense. She has received numerous awards including a MacArthur Fellowship, a Pew Fellowship, seven honorary degrees (most recently from Princeton University) and the 2002 Heinz Award in the Environment.

Jane Lubchenco will give a plenary lecture on Thursday, November 10, entitled: «Science and society: a disconnect in perceptions of relevance and usefulness».



Peter H Raven,

Director, Missouri Botanical Garden;
Engelmann Professor of Botany at Washington University in St. Louis, USA

Peter H Raven has for the past 34 years directed much of his efforts to the preservation of biodiversity, conservation of natural resources, and protection of the ecosystems of the world. Under his direction the Missouri Botanical Garden has grown to become a world leader in plant systematics and conservation, with about a third of the world's vascular plants under revision in projects associated with the institution. P. Raven is Past-President of the AAAS and of Sigma Xi, as well as a number of other organizations, and has been recognized by many awards and honorary degrees as well as membership in more than 20 national academies of sciences, including that of Mexico. He is the author or coauthor of more than 20 books and about 500 scientific papers, including the globally best-selling *Biology of Plants*. Raven's personal research program focuses on the plant family Onagraceae, which has been analyzed over the course of a half century in great detail, more recently by the methods of macromolecular systematics and phylogenetic analysis. He has also made significant contributions in the areas of biogeography, folk taxonomy, pollination biology, and coevolution.

Peter Raven will give an address during the conference banquet on Thursday, November 10.



Laurence Tubiana

Director, Institute for Sustainable Development and International Relations (IDDRI), France

Laurence Tubiana is the Head of the Institute for Sustainable Development and International Relations (IDDRI) in France. Prior to launching IDDRI, she served as scientific advisor and member of the French Council of Economic Analysis. She was also head of the Prime Ministers' cabinet for international environmental negotiations. Dr. Tubiana was associate professor at the Ecole Nationale Supérieure Agronomique de Montpellier and Inspector-General for Agriculture.

Laurence Tubiana will give a plenary lecture on Friday, November 11, entitled: «Biodiversity and global governance; new issues»

Charles Perrings

Arizona State University, USA

Charles Perrings is currently Professor of Environmental Economics at Arizona State University, USA. Previous appointments include Professor of Environmental Economics and Environmental Management at the University of York; Professor of Economics at the University of California-Riverside; Director of the Biodiversity Programme of the Beijer Institute, Stockholm; Professor of Economics at the University of Botswana; and Associate Professor of Economics at the University of Auckland.



C. Perrings also serves as Vice Chair of the Scientific Committee of DIVERSITAS, an international programme of biodiversity science. He is President of the International Society for Ecological Economics, a society formed to bring together the insights of the ecological and economic sciences to aid understanding and management of environmental problems. He is also on the editorial board of several journals in environmental, resource and ecological economics, and in conservation ecology.

His research interests in environmental, resource and ecological economics include the modelling of dynamical ecological-economic systems, the management of environmental public goods under uncertainty, and the environmental implications of economic development.

Charles Perrings will give a plenary lecture on Friday, November 11, entitled: «Valuing biodiversity and ecosystem services after the Millennium Ecosystem Assessment».



Jeremy Jackson

Scripps Institution of Oceanography, University of California at San Diego and Smithsonian Tropical Research Institute, Republic of Panama

Jeremy Jackson is the William and Mary B. Ritter Professor of Oceanography and a Senior Scientist at the Smithsonian Tropical Research Institute in the Republic of Panama. He was Professor of Ecology at the Johns Hopkins University from 1971 to 1985. J. Jackson is the author of more than 100 scientific publications and five books. His current research includes the long-term impacts of human activities on the oceans and the ecological and evolutionary consequences of the gradual formation of the Isthmus of Panama. He co-founded the Panama Paleontology Project in 1986, an international group of some 30 scientists, to help support his isthmian research. He has also worked extensively on the ecology of coral reef communities and the tempo and mode of speciation in the sea. J. Jackson is a Fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science, and received the Secretary's Gold Medal for Exceptional Service of the Smithsonian Institution in 1997 and the UCSD Chancellor's Award for

Excellence in Science and Engineering in 2002. His work on overfishing was chosen by Discover magazine as the outstanding environmental achievement of 2001. He has served on committees and boards of the World Wildlife Fund US, the National Research Council, the National Center for Ecological Analysis and Synthesis, and the Science Commission of the Smithsonian Institution.

Jeremy Jackson will give a plenary lecture on Friday, November 11, entitled “Brave new ocean”.



David M. Hillis

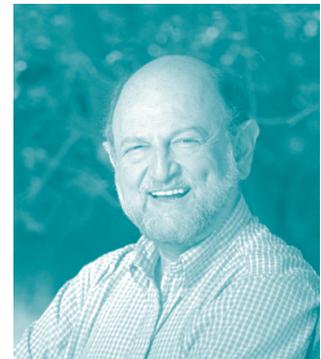
University of Texas, USA

David Hillis' primary interests are in biodiversity, molecular evolution, and the phylogeny of life with his research interests spanning much of evolutionary biology, from development of statistical and computational methods for analyzing DNA sequences, to molecular studies of viral epidemiology, to studies of the diversity and phylogeny of life, to the origin and behavior of unisexual organisms. He has published over 160 scholarly articles and four books, and has served as Editor or Associate Editor of a dozen scientific journals. He is a MacArthur Fellow and a member of the American Academy of Arts and Sciences.

David Hillis will give a plenary lecture on Saturday, November 12, entitled: «Priorities and the future systematic research»

José Sarukhán

National Committee on the Study
and Conservation of Biodiversity (CONABIO), Mexico



José Sarukhán has a master's degree in agricultural botany and a PhD in ecology.

J. Sarukhán was Director of the Instituto de Biología, UNAM (1979-1987), Vice Chancellor for Science (87-88), and Rector of UNAM (the oldest University in the Continent) for two periods (89-93 and 93-97). At the end of his term as Rector, Sarukhán returned to his post as full-Professor in the Institute of Ecology. In 2000, he was invited by President Fox of Mexico to serve as Commissioner for Human and Social Development at the Executive Office of the President, a post he resigned in March 2002.

In 1984-1985, J. Sarukhán was president of the Mexican Academy of Sciences. He has been Coordinator of the Mexican National Committee on the Study and Conservation of Biodiversity (CONABIO) since 1992.

J. Sarukhán's main areas of interest are plant population ecology and systems ecology, biodiversity science, and the role of training and education in science in the development of Third World countries. Currently, he is interested in the roles of science in attaining sustainable development at the global and Mexican scales.

J. Sarukhán is a past Chair of the Scientific Committee of DIVERSITAS and a current member of the DIVERSITAS Advisory Board. He is also a member of the Board of Directors for The World Resources Institute. He currently chairs the special tri-national committee on the effects of transgenic maize in Mexican maize land races, a study group established by the Commission for Environmental Cooperation (CEC) of North American Free Trade Agreement (NAFTA). He is a foreign member of the U.S. National Academies of Science and of the Royal Society.

José Sarukhán will give a plenary lecture on Saturday, November 12, on “Assembling and using data for biodiversity management”.



Robert Scholes

CSIR-Environmentek, South Africa

Robert Scholes is a systems ecologist, employed by the Council for Scientific and Industrial Research, South Africa since 1992. Prior to this, he was manager of the South African Savanna Biome Programme, and worked for his PhD on tree-grass interactions in savannas. He currently studies the effects of human activities on the global ecosystem, and in particular on woodlands and savannas in Africa. He has over twenty years of field experience in many parts of Africa, and has published widely in the fields of savanna ecology and global change, including popular and scientific books. He has been involved in several high-profile environmental assessments and contributes to the formulation of national environmental policy. He is or has been a member of several steering committees of international research programmes, such as the International Geosphere-Biosphere Programme and the Global Climate Observing System, and served as a convening lead author for Intergovernmental Panel on Climate Change. As Fellow, his role is to help the CSIR maintain its technical excellence. He is a Fellow of the Royal Society of South Africa, a member of the South African Institute of Ecologists and several other professional societies, and on the editorial board of several journals.

Robert Scholes will give a plenary lecture on Saturday, November 12, entitled: «Global observing systems for biodiversity»

Harold A. Mooney

Stanford University, USA

Harold A. Mooney holds the Paul S. Achilles Professorship in Environmental Biology at Stanford University.

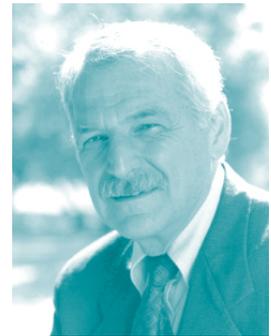
H. Mooney's research on the carbon balance of plants provided a theoretical framework for ecophysiological studies, and was instrumental in incorporating physiological understanding to studies of ecosystem processes. It also led research on interactions between plants and their biotic environment, and provided an objective measure for evaluating theories of plant-animal interaction. H. Mooney demonstrated that convergent evolution takes place in the properties of different ecosystems that are subject to comparable climates, and pioneered the study of plant resources allocation. He has worked in diverse ecosystems: arctic-alpine, Mediterranean-climate scrub and grasslands, tropical wet and dry forests, and deserts. He currently studies the impacts of global change on terrestrial ecosystems, especially on productivity and biodiversity and invasion of non-indigenous plant species.

H. Mooney is involved in many international activities designed to integrate diverse disciplines to advance ecology and ecosystem sustainability. He is one of the founding members of DIVERSITAS and recently co-chaired the Scientific Panel for the Millennium Ecosystem Assessment.

H. Mooney has published more than 450 scientific books, papers, and articles, thereby building bridges between various areas of ecology and exploring how ecologists can contribute to resolving global issues. He has served on many editorial boards and on advisory committees of funding agencies, universities, and national and international agencies.

H. Mooney was elected to the National Academy of Sciences, the American Academy of Arts and Sciences, the American Philosophical Society, and as an Honorary Member of the British Ecological Society. He has received the Eminent Ecologist Award and the Mercer Award of the Ecological Society of America, Humboldt Senior Distinguished U.S. Scientist Award, the Max Planck Research Award, the Ecology Institute Prize for Terrestrial Ecology, the Nevada Medal Award, the Blue Planet Prize and the American Institute of Biological Science Distinguished Scientist Award.

Harold A. Mooney will chair the round table on future directions for biodiversity science and policy on Saturday, November 12.



A. Information

General Conference information

Conference venue

The Conference venue is the Hotel Mision de Los Angeles, located North of the city of Oaxaca, Mexico. Two parallel sessions will also take place at the hotel Holiday Inn, located within 5 minutes walking distance from the Mision de Los Angeles.

For more information, please see section “Going to the Holiday Inn”.

The Hotel Mision de Los Angeles is a four-star resort with extensive grounds and gardens located 10 blocks from the central square of Oaxaca. The hotel offers seven meeting rooms, the largest of which can accommodate 1000 people. A plan of the hotel is available on page 76.

Registration

On site registration will be possible during the meeting at the registration desk located in Tina Laoo at the Mision de Los Angeles. Registration will be opened on 8 November (16h00 – 19h00), 9 November (7h30 – 18h00) and 10, 11 November (7h30 – 19h00).

Lunches and breaks

Lunches are not included in the registration fee. A “lunch package”, including 3 lunch tickets (one for each one of the three days of the conference) can be purchased at the registration desk at the price of 27 Euros – USD 32. Lunches will be served as a Mexican buffet (salads, quesadillas, cold meat, pasta/rice, cold drinks, fresh fruit and dessert) daily in the garden of the Mision de Los Angeles. A limited amount of tickets will be available, as seating in the garden is limited.

Vegetarian dishes will be proposed as part of this buffet.

The buffet will be served between 13h00 and 14h30.

A list of suggestion for restaurants around the Mision de Los Angeles can be found on page 21.

Coffee/tea breaks will be served in the morning (10h30 – 11h00) Thursday to Saturday, and in the afternoon (17h00 – 17h30) Thursday and Saturday.

Name tags

All participants and guests are kindly requested to wear their name badge during all conference events.

Oral presentation guidelines

Thank you for following these rules:

Preparation of oral presentation:

- Plan for a 15 minute-presentation. Your presentation will be followed by five minutes of questions and discussion. These time limitations will be enforced.
- Participants should bring their PowerPoint presentations on a CD or on a USB key. Please do NOT bring your own laptop for your presentation. Laptops and LCD projectors for presentations will be available in every conference room.
- The day prior to your presentation, go from 6:30 to 7:00 p.m. to the secretariat (Salon Yagul) to download your presentation. Technical assistance will be available.
- Go to your assigned meeting room 15-20 minutes prior to the start of the session in which your presentation is scheduled, and identify yourself to the chair of the session.

Oral presentation schedule:

- Consult the conference program to find out in which session and at what time your talk has been scheduled.
- Sessions will take place at the Hotel Mision de los Angeles AND at the Holiday Inn Hotel. Take a look at the conference program to find out in which room your presentation is scheduled.

Additional information:

- All conference equipment is PC compatible. Participants are invited to make sure that presentations prepared on a Mac can be viewed on PC equipment – Macintoshes will not be available at the conference.
- Conference organisers will not be able to make any photocopies of presentations or documents. Participants are invited to bring their own copies for distribution.

Poster protocol

- Posters will be displayed during the whole Conference, with a poster session with drinks-on the afternoon of Friday 11th December starting at 17:30, sponsored by the local Mezcal (Tequila) manufacturer, Matateco, providing authors with time to discuss and describe their work.
- Posters are listed in the Conference Program handed to all participants. Abstracts of posters have been included in the CD Rom of abstracts distributed to all participants.
- All posters will be on display for the whole duration of the Conference. **Posters should be up by Thursday 10 November noon.** Posters should be removed on Saturday 12 November, after 4 p.m.
- Authors are requested to be close to their poster during the poster session on Friday 11 November (17:30-19:00), and encouraged to be close to their poster during morning and afternoon breaks, to enable anyone who wishes to discuss them, to find them and do so!

Press room

The Press Room will offer resource centre for the latest information related to the Conference: announcements, press releases, speaker biographies, etc.
It is located in Tina Laoo, Mision de Los Angeles.

Internet access

A wireless (WIFI) system will be available on the conference premises, as well as several computers with internet access.

Going to the Holiday Inn

Walking from the Misión de Los Angeles to the Holiday Inn takes about 5 minutes. Go down Porfirio Diaz Street and cross the Calzada Niños Héroes de Chapultepec Street, turn right and continue on this side of the street up to Diaz Quintas Street. Take it on your left and walk until the Holiday Inn.



Social events

A welcome cocktail will be offered by DIVERSITAS on Wednesday, November 8, between 18h00 and 20h00 at the Misión de Los Angeles. A number of local artisans will be present to display and sell traditional handicrafts.

The conference banquet will take place at the Santo Domingo Cultural Centre on Thursday 10 November at 20h30.

This 16th-century convent in the heart of Oaxaca is an architectural jewel. In addition to its open courtyard and fountains, the Centre overlooks Oaxaca's ethno-botanical garden, replete with cacti and desert succulents, which is being restored to reflect the period in which it served as the Convent's garden, orchard and herbarium. Participants will have the opportunity to visit the convent and its gardens.

Director Alejandro de Avila will give an introductory talk and Professor Peter Raven will give a keynote address before the dinner. The evening will be chaired by Professor Rodolfo Dirzo.

The event will feature authentic regional foods and end with a traditional Mexican dance performance called Guelaguetza.

Field trips

To enhance participants' experience of the conference location, the DIVERSITAS team has arranged a number of scientific field trips. Find more information on page 15 .

Insurance and liability

The meeting registration fee does not include provisions for insuring participants against injury, sickness, theft, or property damage. Participants are advised to obtain whatever insurance they consider necessary.

Cancellation Policy

Due to space constraints at the conference centre, DIVERSITAS:OSC1 is limited to 600 participants. To ensure that the maximum number of participants can attend, we have initiated a strict cancellation policy, as follows:

	Cut-off Date	Penalty Fee (% of Total Registration Fee)
Early cancellation	Before 21 October 2005	20%
Late cancellation	After 21 October 2005	100%

Field trips

All mini buses for field trips will be leaving from the Hotel Mision de Los Angeles.

An English speaking Mexican scientist will be accompanying each mini bus.

Tour 2, 3 and 4 will make a stop at a local restaurant for lunch, to get participants acquainted with local Mexican specialities. Lunch prices are not included in the field trip price. Refreshments will be offered in each minibus.

Tour 1 **Cultivating agrobiodiversity in the field: human, biological and agricultural dimensions**

Pre-Conference • Tuesday, 8 Nov. 2005 • Full-day trip

Departure 8h30 at the Mision de los Angeles, lunch included, return at 17h30

Visit local villages to interact with researchers, local residents and farmers about the management of endemic and introduced agrobiodiversity that supports their food, ritual and economic needs. This trip will include discussion of results from research completed in Oaxaca and other regions of Mexico.

Tour 2 **Biosphere reserve Valle de Tehuacán-Cuicatlán (Tehuacan Valley)**

Post-Conference • Sunday, 13 Nov. 2005 • Full-day trip

Departure 8h00 at the Mision de los Angeles, no meals included

This reserve protects one of the most exuberant tropical deserts of the New World. The trip includes stopovers in juniper, oak and seasonally dry tropical forest.

Tour 3 **Rural forest management & biodiversity conservation: Sierra Norte de Oaxaca**

Post-Conference • Sunday, 13 Nov. 2005 • Full-day trip

Departure 8h00 at the Mision de los Angeles, no meals included

Visit an outstanding example of local community organization directed to forest management and conservation in the Sierra Norte. This trip includes observation of a spectacular vegetation gradient along Sierra de Juarez, leading to natural and Indian-managed pine-oak forest.

Tour 4 **Plant domestication and indigenous communities of Oaxaca Central Valleys**

Post-Conference • Sunday, 13 Nov. 2005 • Full-day trip
Departure 8h00 at the Mision de los Angeles, no meals included

We will visit a volcanic formation covered with low tropical deciduous forest around the archaeological site of Guilá Naquitz, where 10,000 year old squash seeds have been excavated, the earliest evidence of plant domestication in the American continent. The same site has yielded the earliest evidence of maize. Guilá Naquitz is located east of the city of Oaxaca, a half hour drive away, and is being proposed as a low impact ecotourism development for the benefit of the local communities who own the land as collective property. The tour will focus on local plant resources and the development of cultural diversity in Oaxaca.

Tour 5 **Archaeological sites and Oaxacan handicrafts: Monte Alban, Tlacolula, Teotitlan, San Bartolo Coyotepec**

Post-Conference • Sunday, 13 Nov. 2005 • Full-day trip
Departure 8h00 at the Mision de los Angeles, lunch included

This tour starts by a visit of the spectacular Zapotec ruins at Monte Alban. After a walk over the Indian market in Tlacolula, the next stop is Teotitlan del Valle, where weavers will show their techniques and lunch will be prepared for all participants. The program ends in San Bartolo Coyotepec with a demonstration of the making of black pottery. Participants will get an insight into Zapotec Indian life, traditions and folk art in the east valley of Oaxaca.

Tour 6 **Santo Domingo - Ethnobotanical garden**

Tuesday, 8 Nov. – Sunday 13 Nov.
Visit of the garden only
Information on schedule of visits will provided at the conference

Several trips to this outstanding garden will be organised during the conference. Originally the orchard for the Santo Domingo monastery, the garden is being restored with native medicinal plants. Archaeological explorations have unearthed the old drainage system and parts of the irrigation system.

Bring home
a memory from Oaxaca
and help DIVERSITAS support the cost of this conference!



T-shirts of the conference are on sale in the registration area

We have S, M, L and XL at the price of: USD 15 or 12 Euros.
Payments in cash only, please.

Information on Oaxaca

Oaxaca: a state, a city

Oaxaca State is situated on the southern Pacific coast of Mexico and composed of very different landscapes (coastal, marshy and mountainous) and climates (dry, temperate and tropical) that provide the region with an exceptional biodiversity.

Oaxaca City, the beautiful state's capital, lies at the meeting point of three valleys (Valles centrales) and is the only large city. It has a colonial heart of narrow, straight streets, sprinkled with lovely stone buildings. It is known for its excellent museums and galleries, handicrafts shopping, and a vivacious cultural, restaurants, bar and music scene. It is a capital of the modern Mexican art.

The centre of Oaxaca is called the zócalo (main square). Calle Alcalá, running north from the cathedral to the Iglesia de Santo Domingo is mostly pedestrian.

The commercial area occupies the blocks southwest of the zócalo.

Map of Oaxaca

Casa de Juárez / Juárez House	1
Museo Regional / Regional Museum	2
Iglesia de Santo Domingo / Santo Domingo Church	3
Instituto de Artes Gráficas de Oaxaca / Graphic Arts Institute	4
Museo Rufino Tamayo / Rufino Tamayo Museum	5
Iglesia de la Soledad / Soledad Church	6
Museo Religioso de la Soledad / Soledad Religious Museum	7
Alameda de León / Leon Park	8
Catedral / Cathedral	9
Zócalo / Zócalo (Main Square)	10
Palacio de Gobierno / Town Hall	11
Mercado Benito Juárez / Benito Juárez Market	12
Mercado 20 de Noviembre / 20 de Noviembre Market	13
Mercado de artesanías / Crafts market	14
Mercado de Abastos (sábados) / Wholesale Market (saturdays)	15
Terminal de Autobuses de 1a. Clase / Bus Station (1st class buses)	16

Weather

The conference takes place at the beginning of the dry season. Light clothing will be appropriate during the day but it can get cold at night.

	Mean high temp	Mean low temp	Rainfall
November	26°C	12°C	0 in.

Banks, currency

The most convenient form of money in Mexico is a major international credit card or debit card. Credit cards can be used to obtain cash from ATMs, and are accepted for payment in most tourist places. As a backup, it is wise to take some travellers cheques and some cash.

1 USD = 10.8 MXN ; 1 MXN = 0.093 USD

1 EUR = 13 MXN ; 1 MXN = 0.077 EUR

There are plenty of ATMs (cash machines) around the center, and very close to the venue (see map above).

Tips

In general, waiters do not expect much in the way of tips. In tourist hotspots, tipping is up to 15%; elsewhere 10% is standard.

Taxi drivers do not generally expect tips.

Electricity

The electric current in Mexico is 110 volts CA, like in the United States and Canada. Visitors from other countries might need an adapter.

Tourist information

The Oaxaca state tourism department has three information offices in the city.

- **Independencia:** Independencia 607, 8h00 – 20h00
- **Murguía:** Murguía 206, 8h00 – 20h00
- **Airport:** within the airport, 8h00 – 19h00

You can find some information on the following websites:

- <http://www.visitmexico.com> (many languages)
- <http://www.oaxacity.gob.mx> (Oaxaca City Government Office - Spanish)
- <http://www.aoaxaca.com> (Oaxaca Tourism Office (SEDETUR), heading: alternative tourism - Spanish)
- <http://oaxaca-travel.com> (English and Spanish)
- <http://www.planeta.com/oaxaca.html> (global journal of practical ecotourism - English)

What to do in Oaxaca?

The whole centre of Oaxaca is very nice. Zocaló and Alameda squares are especially pleasant as pedestrian areas with numerous cafes and restaurants.

Alcalá Street, also pedestrian, will bring you to the magnificent Iglesia Santo Domingo, part of the Dominican monastery and to the Ethno-botanic Garden, which presents a fascinating sample of Oaxaca's biodiversity.

Rufino Tamayo's Museum is the perfect place to learn more about the pre-Hispanic art and may be especially interesting before going to the ruins of Monte Albán.

Monte Albán was the ancient Zapotec's capital. Today, this archeologic site can be visited from Oaxaca in half a day, see section "Field trips", page 15.

Teotitlán Del Valle is a famous weaving village home to a nice Mercado de Artesanías. It also boasts a museum, a church, a market, and outdoor guides offering biking, horseback riding, hiking and birding tours.

Tourism agencies propose hiking trips, rock climbing, mountain biking, bird watching, etc.

- **Expediciones Sierra Norte** (Bravo 210)
- **Tierra dentro** (Reforma 528B)
- **Tierraventura** (Abasolo 217)

Where to eat in Oaxaca?

Traditional Mexican food is a delicious mix of influences that must be tasted. Oaxaca is much known for its delicious "moles" (traditional meal using a chocolate based sauce).

Here is a short list of restaurants within a 25min walking distance from the conference venue.

A more complete list is available on the following website: <http://www.oaxaca-restaurants.com>

Doña Elpidia

Miguel Cabrera 413. The phrase "home - style cooking" is often used by restaurants, but Doña Elpidia's really does mean something. **Inexpensive.**

El Gecko

5 de Mayo 512. Coffee drinks are offered along with light food. **Inexpensive.**

El Naranja

Trujano 203. Serving contemporary Oaxaca food, based on old family recipes. One of Oaxaca's seven moles is featured each day and there are many delicious variations of chiles rellenos from mild to hot. **Moderate prices.**

María Bonita

Alcalá 706. This charming little restaurant serves authentic Oaxacan cuisine to mostly local clientele sitting at its six tables. **Moderate prices.**

Catedral

García Vigil and Avenida Morelos. This elegant yet accesible local favorite takes up the entire area of a former colonial house. Favorite dishes include mushroom soup flavored with epazote and chicken in squash blossom sauce. They offer 11 cuts of tenderloin, as well as a variety of regional dishes, such as caldo tlalpe and mole poblano. **Expensive.**

Shopping

Oaxaca has the richest folk art scene in Mexico. Special crafts to look out for include pottery, blankets, rugs, and tapestries, *huipiles* and others indigenous clothing.

They can be found in markets, or in crafts shop. Here are some addresses:

- **Mercado de artesanías** (corner JP García and Zaragoza): pottery, rugs and textiles
- **Mercado Juárez** (between Florés Magón and 20 de Noviembre): food, flowers and crafts
- **MARO** (women artisans' cooperative around Oaxaca) (5 de Mayo, 204): crafts

Internet café

There are plenty of Internet café (0,5-1 USD/1 hour - 0,4-0,8 Euro/1 hour) and some are very close to the venue (see map above).

Getting to the airport

Taxis can be easily ordered from every hotel. To reach the airport, it will take around 30 minutes, and should cost approximately 100 pesos (USD 9 – 8 Euro).

Scientific

B. Scientific Conference day by day

Presenters in bold

Meeting rooms:

Mision de Los Angeles

Oaxaca (divided in Oaxaca 1, 2 and 3 during parallel sessions)

Oaxaca 1

Oaxaca 2

Oaxaca 3

Donaji

Guelaguetza

Holiday Inn

Holiday Inn 1

Holiday Inn 2

Tuesday 8

Wednesday 9

Tuesday, November 8, 2005

Field trip: Cultivating agrobiodiversity in the field: human, biological and agricultural dimensions

8h30 – 17h30, Mision de Los Angeles
Organised by Calvin Qualset

Registration, 16h00 – 19h00, Tina Lao, Mision de Los Angeles

agroBIODIVERSITY Scoping Team meeting (closed session)
13h00 – 18h00, Donaji, Mision de Los Angeles
DIVERSITAS Scientific Committee meeting (closed session)
16h00 – 19h00, Guelaguetza, Mision de Los Angeles

Wednesday, November 9, 2005

Registration, 7h30 – 18h00, Tina Lao, Mision de Los Angeles

Plenary session

Wednesday, November 9, 9h30 – 12h30, Oaxaca, Mision de Los Angeles

DIVERSITAS National Committees and Focal Points meeting

Lunch, 12h30 – 14h00

Plenary session

Wednesday, November 9, 14h00 – 16h00, Oaxaca, Mision de Los Angeles

DIVERSITAS National Committees and Focal Points meeting

Welcome cocktail

Wednesday, November 9, 18h00 – 19h30, Garden of the Mision de Los Angeles

Thursday, November 10, 2005

MORNING

This morning will start with the opening ceremony followed by the opening address given by Prof. Michel Loreau, Chair of the Scientific Committee of DIVERSITAS. Following a break, the morning will end with 7 sessions running in parallel from 11h00 until 13h00.

Registration, 7h30 – 19h00, Tina Laoo, Mision de Los Angeles

Plenary session: Opening ceremony

Chair: Rodolfo Dirzo

Thursday, November 10, 8h45 – 10h30, Oaxaca, Mision de Los Angeles

8h45 – 9h30

Jane Lubchenco, Past-President, International Council for Science (ICSU)

Natarajan Ishwaran, Director Division of Ecological and Earth Sciences, UNESCO

José Luis Luege Tamargo, Secretario, Secretaría de Medio Ambiente y Recursos Naturales (Ministry of Environment and Natural Resources, Mexico)

Adrian Fernandez, Presidente, Instituto Nacional de Ecología (INE, President of the National Institute of Ecology)

Ulises Ortega Ortiz, Gobernador de Oaxaca (Governor of the State of Oaxaca)

Jesus Angel Diaz Ortega, Presidente Municipal de Oaxaca (Mayor of the City of Oaxaca)

9h30 – 10h30

Michel Loreau, Chair, Scientific Committee DIVERSITAS: The challenges of biodiversity science

Coffee break, 10h30 – 11h00

Parallel session: Symposium 1

The insurance value of biodiversity

Chair: Stefan Baumgärtner

Thursday, November 10, 11h00 – 13h00, Oaxaca 3, Mision de Los Angeles

- 11h00** **Stefan Baumgärtner**: Biodiversity as insurance: an ecological-economic perspective
- 11h20** **Michel Loreau**: Biodiversity as insurance: the ecological perspective
- 11h40** **Felix Schläpfer**, Bernhard Schmid: Biodiversity, ecosystem functioning, and ecosystem management: constant vs. changing environments and planted vs. naturally assembling communities
- 12h00** **Michel de Lara**, Luc Doyen: Biodiversity and ecosystem sustainability in uncertain environments
- 12h20** Charles Perrings, Salvatore di Falco: Insuring agricultural productivity: the role of crop biodiversity
- 12h40** **Stephen Polasky**, David Tilman: Diversity and ecosystem services

Parallel session: Symposium 2

Pollination services

Chair: Claire Kremen

Thursday, November 10, 11h00 – 13h00, Oaxaca 1, Mision de Los Angeles

- 11h00** **Alexandra-Maria Klein**, Ingolf Steffan-Dewenter: Pollination services to crops from wild bees: relationship between landscape context, community composition and function
- 11h20** **Peter Kevan**: Monetary and ecological economics of pollination services
- 11h40** **Claire Kremen**, Simon Potts, Diego Vazquez, Neal Williams: Predicting functional consequences of pollinator loss due to habitat alteration
- 12h00** **Carlos Vergara**: Introducing exotic species for crop pollination – pluses and minuses.
- 12h20** **Barbara Gemmill**, Linda Collette, Grace Njoroge: Harvesting the pollination knowledge base: how much information is presently available to guide farmers and land managers on management of pollination services?
- 12h40** **James Regetz**, Claire Kremen: Conservation, restoration and farm management: alternative scenarios for managing pollination services from wild bees on a landscape scale

Parallel session: Symposium 3

Biodiversity informatics: acquisition, analysis, archiving and applications

Chair: James Edwards and Donald Potts

Thursday, November 10, 11h00 – 13h00, Holiday Inn I, Holiday Inn

- 11h00** **Vanderlei Perez Canhos, Dora Ann Lange Canhos, Sidnei De Souza, Rafael Fonseca, Renato Giovanni, Alexandre Marino**: The speciesLink Network: practical solutions for integrating, analyzing, synthesizing and visualizing biodiversity information
- 11h20** **Meredith Lane**: International Biodiversity Information Systems – GBIF
- 11h40** **Silvio Olivieri**: NGO roles in collection, curation and use of biodiversity information
- 12h00** **Jorge Soberón**: Assessment of completeness of primary biodiversity data for inventories and estimation of species distribution areas
- 12h20** Kevin Thiele: Electronic dissemination of biodiversity data
- 12h40** **A. Townsend Peterson**: Biodiversity information and informatics tools permit forecasting complex ecological phenomena

Parallel session: Symposium 4

Theoretical advances in evolutionary conservation biology

Chair: Ulf Dieckmann

Thursday, November 10, 11h00 – 13h00, Donaji, Mision de Los Angeles

- 11h00** **Ulf Dieckmann**, Régis Ferrière: Evolutionary conservation biology: an overview
- 11h30** **Mikko Heino**: Anthropogenic evolution as a driver of rapid biodiversity changes
- 12h00** **Nicolas Loeuille**, Ake Brannstrom, Ulf Dieckmann, Michel Loreau: Emergence of complex size-structured food webs out of repeated adaptive radiation
- 12h30** **Kalle Parvinen**: Biodiversity losses through selection-driven extinctions

Parallel session: Contributed oral session 1

Agriculture and biodiversity I

Chair: Unai Pascual

Thursday, November 10, 11h00 – 13h00, Guelaguetza, Mision de Los Angeles

- 11h00** **Frank Berendse**: Declining biodiversity in agricultural landscapes and the effectiveness of agri-environment schemes
- 11h20** **Josh Dorrrough**, Jim Crosthwaite, Jim Moll: Can agricultural intensification save native biodiversity?
- 11h40** **Luis García-Barrios**: Crop species richness and composition affect productivity and resistance to drought in agroecosystems. Experimental evidence.
- 12h00** **James Kungu**, John Muriuki: The potential of agroforestry in biodiversity conservation and sustainable development: a case of central Kenya Highlands.
- 12h20** **David Kleijn**: Agricultural intensification and biodiversity conservation: can we preserve biodiversity by locally implemented extensification measures?
- 12h40** **Mohammad Rais**, Bohumir Pazderka, Gary W VanLoon: Policy development to support agro-biodiversity in hills of Uttaranchal State in North India

Parallel session: Contributed oral session 2

Biodiversity conservation I

Chair: David Raffaelli

Thursday, November 10, 11h00 – 13h00, Holiday Inn 2, Holiday Inn

- 11h00** **Ruth Beilin**, M.E. Wedderburn: A socio-ecological system approach to incorporating biodiversity in landscape change
- 11h20** **Gary Martin**, Stuart Harrop, Søren Wichmann: Community Ethnofloras: promoting ethnolinguistic and biological diversity in Oaxaca, Mexico
- 11h40** **Gillian A. Maree**, Neels J. Kleynhans, Jeanne Nel, Dirk J. Roux: Testing a systematic planning approach to conserving river biodiversity: how many rivers, which ones, and what level of protection is enough?
- 12h00** **Marta Irving**: National Park Montanhas de Tumucumaque(Amapá-Brazil): a new approach for biodiversity conservation and social inclusion cooperation programs between Brazil and France
- 12h20** **Nicolas Gaidet**, Sébastien Le Bel, Solène Le Doze, George Mapuvire: Wildlife conservation in non-protected lands: spatial configuration for a sustainable coexistence of people and wildlife in African savannas
- 12h40** **Claudia Cerda**, Jan Barkmann, Rainer Marggraf: Participatory assessment of conservation options for Navarino Island (Chile) in the context of the CBD ecosystem approach aided by a choice experiment

Parallel session: Contributed oral session 3

Biodiversity and ecosystem functioning I

Chair: Sandra Lavorel

Thursday, November 10, 11h00 – 13h00, Oaxaca 2, Mision de Los Angeles

- 11h00** **Blandine Descamps-Julien**, Andrew Gonzalez: Biodiversity as insurance in spatially and temporally heterogeneous environments
- 11h20** **Zlatko Petrin**, Björn Malmqvist: Are naturally acid streams as diverse and functional as circumneutral streams?
- 11h40** **Chrystal Healy**, Catherine Potvin: Separating the effects of species diversity, species identity and environmental heterogeneity on the productivity of a tropical tree plantation
- 12h00** **Stephen John Hawkins**, Michael Burrows, Stuart Jenkins, Patricia Masterson, Richard Thompson: Does habitat patch biodiversity matter more than species diversity in the functioning of most marine ecosystems?
- 12h20** **Diego E. Gurvich**, Sandra Díaz, Natalia Pérez Harguindeguy, Carlos Urcelay: Does functional redundancy exist in terrestrial plant communities? Results from a removal experiment in central Argentina
- 12h40** **Elisa Thébault**, Michel Loreau: Food webs and the relationship between biodiversity and ecosystem functioning

Lunch, 13h00 – 14h30

Thursday, November 10, 2005

AFTERNOON

This afternoon will start with 7 sessions running in parallel from 14h30 until 17h00 and end with a keynote address presented by Prof. Jane Lubchenco, from 17:30, until 18:30. The banquet of the conference will take place in the evening.

Parallel session: Symposium 5

Sustaining partnerships for community-based conservation

Chair: Kamaljit Bawa and Ganesan Balachander

Thursday, November 10, 14h30 – 17h00, Oaxaca1, Mision de Los Angeles

- 14h30** **Kamaljit Bawa, Ganesan Balachander:** Community-based conservation: experiences and lessons from case studies in India
- 14h50** **Eduardo García-Frapolli, Bárbara Ayala-Orozco, Martha Bonilla, Gabriel Ramos-Fernández, Víctor Manuel Toledo:** Community conservation in the Otoch Ma'ax Yetel Koooh protected area: linking traditional knowledge and biodiversity conservation policies
- 15h10** **Arturo Gómez-Pompa, Carmen Vergara:** Successful cases of community based management of biodiversity
- 15h30** **Nick Salafsky:** Evaluating success in community based initiatives in conservation
- 15h50** **Sean Southey:** Moving-to-scale: learning from grassroot successes
- 16h10** **Aarthi Sridhar, Kartik Shanker:** Community-based approaches to marine conservation in India
- 16h30** **Victor M. Toledo, Patricia Moguel:** Biodiversity management and indigenous resistance in Mexico: regional case studies

Parallel session: Symposium 6

Oceans of biodiversity - discovering species, habitats and ecologies

Chair: Pedro Martinez, Mark J. Costello and Carlo Heip

Thursday, November 10, 14h30 – 17h00, Holiday Inn I, Holiday Inn I

- 14h30** **Angelika Brandt, Johann-Wolfgang Waegele:** Biodiversity in polar waters: role of the Antarctic and Arctic for speciation
- 14h50** **Mark Costello, Camilo Mora:** Analysis of how many species are described and yet to be discovered in the oceans reveals gaps in biodiversity knowledge
- 15h10** **Charles Griffiths:** The unexplored marine biodiversity of Africa
- 15h30** **Camilo Mora:** Large scale patterns, processes and threats to reef fish biodiversity
- 15h50** **Agnes Muthumbi:** Marine nematodes diversity along a depth transect in the Kenyan Coast (Western Indian Ocean).
- 16h10** **Michael Rex:** Existential deep-sea ecology: is the abyss a black hole sink?
- 16h30** **Craig Smith, Lisa Levin:** From whale falls to oxygen minimum zones: recent discoveries of biodiversity in non-vent chemosynthetic ecosystems

Parallel session: Symposium 7

Ecohealth and conservation medicine: a new agenda for public health and biodiversity

Chair: Peter Daszak

Thursday, November 10, 14h30 – 17h00, Guelaguetza, Mision de Los Angeles

- 14h30** **Peter Daszak:** A new agenda for public health and conservation
- 14h50** **Margarita Lampo:** Ecological factors driving the spread and epidemic outbreaks of chytridiomycosis in the Andean region
- 15h10** **Alonso Aguirre:** The living ocean an evolving oxymoron: emerging diseases in marine ecosystems
- 15h30** **Héctor M. Zepeda López, Alonso Aguirre:** The Mexico-USA border as a region of epizootiologic risk in wildlife
- 15h50** **Graciela García-Guzmán, Luis Alfredo Pérez-Jiménez, Irma Trejo-Vázquez:** Effect of forest fragmentation on plant-pathogen interactions in a seasonally dry tropical forest of Mexico
- 16h10** **A. Marm Kilpatrick, Peter Daszak, Laura Kramer, Peter Marra:** The impact of West Nile virus on bird communities
- 16h30** **Round table discussion**

Parallel session: Symposium 8

Implementing multilateral environmental agreements on biodiversity: balancing equity and effectiveness

Chair: Kristin Rosendal and Klaus Riede

Thursday, November 10, 14h30 – 17h00, Donaji, Mision de Los Angeles

- 14h30** **Peter Johan Schei:** Introduction
- 14h50** **Mariel Aguilar Stoen, Shivcharn Dhillion, Kristin Rosendal:** National jurisdiction – international dilemmas: bioprospecting within national borders
- 15h10** **Regine Andersen, Anitha Ramanna:** Plant genetic resources for food and agriculture: effects of multilateral agreements in developing countries (part I)
- 15h30** **Anitha Ramanna:** Plant genetic resources for food and agriculture: effects of multilateral agreements in developing countries (part II: India's policy on plant genetic resources for food and agriculture)
- 15h50** **Marc Hufty:** Interaction between Multilateral Environmental Agreements (MEA) and aid mechanisms in the case of protected tropical forests
- 16h10** **Klaus Riede:** Efficiency analysis of transboundary conservation strategies for migratory species
- 16h30** **Kristin Rosendal:** International patent law meets access and benefit sharing regulations: prospects for implementation?

Parallel session: Contributed oral session 4

Drivers of biodiversity changes

Chair: Tatjana Good

Thursday, November 10, 14h30 – 17h00, Oaxaca 3, Mision de Los Angeles

- 14h 30** **Vassiliki Kati**, Kostas Poirazidis: Local biodiversity hotspots in a Mediterranean reserve: where and why species concentrate?
- 14h50** **Martin Zobel**, Jaan Liira: Biodiversity drivers and indicators on a European scale
- 15h10** **Mao Angua Amis**, Andrew Balmford, Mathieu Rouget: Land use patterns and the state of our rivers: a case study from South Africa
- 15h30** **Ivan Nijs**: Climatic extremes and biodiversity loss: resistance of individual plants, role of species richness in community resistance, and spatial patterns emerging after extremes
- 15h50** **Pablo Tedesco**, Bernard Hugueny, Thierry Oberdorff: Evidence of history in explaining diversity patterns in tropical riverine fish
- 16h10** **Karl-Heinz Erb**, Helmut Haberl, Christoph Plutzer: New evidence on species-energy hypothesis supports the use of HANPP as indicator of socio-economic pressures on biodiversity
- 16h30** **Trond Larsen**: Consequential coprophages: diversity patterns and interactions between disturbance regimes, dung beetle communities and plant regeneration

Parallel session: Contributed oral session 5

Biodiversity and ecosystem functioning II

Chair: Bernhard Schmid

Thursday, November 10, 14h30 – 17h00, Oaxaca 2, Mision de Los Angeles

- 14h30** **Pedro Flombaum**, Osvaldo E. Sala: Biodiversity and productivity: evidence from a removal experiment in Patagonia, Argentina
- 14h50** **Yau-Lun Kuo**: Response of young seedlings to the naturally enriched CO₂ concentration
- 15h10** **Romain Gallet**: Impact of the interaction of predation and disturbance on prey species diversity
- 15h30** **Patricia Balvanera**, Urani Carrillo, Daniel Herrera, Angelina Martinez-Yrizar, Alvaro Miranda, Jose Alfredo Pérez-Jimenez: Functional structure of primary productivity: the case of conserved and managed tropical dry forest of Western Mexico
- 15h50** **Jake L Snaddon**, Paul Eggleton, William A Foster: Biodiversity and ecosystem function in bird's nest ferns: invertebrate and leaf-litter diversity affecting litter decomposition
- 16h10** **Erika Hiltbrunner**, Christian Koerner, Jens Paulsen: Effects of plant diversity on runoff processes in high elevation grassland
- 16h30** **Momose Kuniyasu**: Biodiversity and sustainability of wild plant and animal use: roles of density dependent resource selection

Parallel session: Contributed oral session 6

Biogeography

Chair: Jorge Soberón

Thursday, November 10, 14h30 – 17h00, Holiday Inn 2, Holiday Inn

- 14h30** **Maarten Kappelle:** Paramo in Costa Rica: natural history of a unique and diverse tropical wet alpine ecosystem under critical threat
- 14h50** **Guadalupe Williams-Linera:** Complementarity and nestedness patterns of tree species in a Mexican cloud forest landscape
- 15h10** **Michael Kessler:** Endemism of five plant and three animal groups in the Bolivian Andes peaks in areas with stable climatic conditions
- 15h30** Yu-Chung Chiang, Barbara A. Schaal, **Chang-Hung Chou**, Tzen-Yuh Chiang: Molecular phylogeography of *Oryza rufipogon* based on cpDNA variation
- 15h50** **Luiz Oliveira**, Ana Rossi: Phylogeography of *Psychotria ipecacuanha* (Rubiaceae), a medicinal species with disjunct geographic ranges in the Amazon and Atlantic forests of Brazil
- 16h10** **Florian Wittmann**, Wolfgang J. Junk, Thomas Motzer, Maria T. F. Piedade, Jochen Schöngart: Species composition and diversity gradients in white-water forests across the Amazon Basin
- 16h30** **Katrin Böhning-Gaese:** Do seed dispersers matter? A biogeographical approach

Coffee break, 17h00 – 17h30

Keynote address (Plenary event)

Chair: Michel Loreau

Thursday, November 10, 17h30 – 18h30, Oaxaca, Mision de Los Angeles

Jane Lubchenco, Oregon State University, USA

Science and society: a disconnect in perceptions of relevance and usefulness

Banquet

Thursday, November 10, 20h30 – 23h00, Centro Cultural Santo Domingo, Ex-Convento Santo Domingo

Alejandro de Avila, Director, Jardín Etnobotánico de Oaxaca, Centro Cultural Santo Domingo, Mexico

Peter Raven, Director, Missouri Botanical Garden, USA

Friday, November 11, 2005

MORNING

This morning will start with 3 plenary addresses given by Laurence Tubiana, Charles Perrings and Jeremy Jackson and will be followed by 7 sessions running in parallel from 11h00 until 13h00. During lunch time, a special symposium round table on the Millennium Ecosystem Assessment will take place.

Registration, 7h30 – 19h00, Tina Laoo, Mision de Los Angeles

Plenary session

Chair: Anne Larigauderie

Friday, November 11, 8h30 – 10h30, Oaxaca, Mision de Los Angeles

8h30

Laurence Tubiana, Institut du développement durable et des relations internationales (IDDRI), France
Biodiversity and global governance: new issues

9h10

Charles Perrings, Arizona State University, USA

Valuing biodiversity and ecosystem services after the Millennium Ecosystem Assessment

9h50

Jeremy Jackson, Scripps Institution of Oceanography, USA

Brave new ocean

Coffee break, 10h30 – 11h00

Parallel session: Symposium 9

Biodiversity in agricultural landscapes: saving natural capital without losing interest (First part)

Chair: Louise Jackson

Friday, November 11, 11h00 – 13h00, Oaxaca 3, Mision de Los Angeles

- 11h00** **Louise Jackson**, Toby Hodgkin, Unai Pascual: Utilizing and conserving agrobiodiversity in agricultural landscapes
- 11h20** **Stephen Brush**, Hugo Perales: A maize landscape: cultural knowledge and agrobiodiversity in Mexico
- 11h40** Vernon Heywood, **Alejandro Casas**: Towards a global plan of action for crop wild relative conservation and use
- 12h00** **Lijbert Brussaard**, Peter de Ruiter: Soil food webs, biodiversity and agricultural sustainability
- 12h20** **Miguel Altieri**, Clara Nicholls: Biodiversity and pest management in agroecosystems
- 12h40** **George Brown**, Mariangela Hungria, Osvaldino Brandão Jr., Júlio César Franchini, Glaciela Kaschuk, Rosinei Souza: Conservation agriculture: making biodiversity work for integrated crop and soil management

Parallel session: Symposium 10

Global environmental change and biodiversity: integrating observations, experiments and models

Chair: Paul Leadley

Friday, November 11, 11h00 – 13h00, Guelaguetza, Mision de Los Angeles

- 11h00** **I. Colin Prentice:** Dynamic Global Vegetation Models predict major shifts in biomes and plant functional types due to climate change
- 11h40** **Wilfried Thuiller, Sandra Lavorel:** Modelling species response to global change: recent advances and future directions
- 12h00** **Jacques Roy:** Can we predict organisms and communities responses to elevated CO₂?
- 12h30** **Paul Leadley:** Global environmental change and terrestrial biodiversity: integrating observations, models and experiments

Parallel session: Symposium 11

Spatial scale, distribution ranges, and large-scale patterns of species diversity

Chair: Jorge Soberón, Héctor T. Arita and José Sarukhân

Friday, November 11, 11h00 – 13h00, Oaxaca 1, Mision de Los Angeles

- 11h00** **Héctor T. Arita:** Species diversity and distribution: mathematical constraints and biological implications
- 11h20** **Gerardo Ceballos:** Global patterns of diversity and extinction in mammals: trends and perspectives
- 11h40** **Enrique Martínez-Meyer, Daniel Díaz-Porras, Luis Zambrano:** Ecological space, geographical space, and the abundance of species
- 12h00** **Carsten Rahbek:** Spatial scale, the perception of large-scale species-richness patterns and the role of geographical range sizes
- 12h20** **Jorge Soberón:** Measuring the beta component of species richness
- 12h40** **Robert Whittaker:** Conservation biogeography, spatial scale and prediction

Parallel session: Contributed oral session 7

Biodiversity conservation II

Chair: Steve Redpath

Friday, November 11, 11h00 – 13h00, Holiday Inn 2, Holiday Inn

- 11h00** **Victor Amoroso:** Participatory inventory and assessment of plants in Malindang Range Natural Park, Mindanao Island, Philippines
- 11h20** **Bhaskar Sinha,** K.D. Singh: Assessing traditional institutions for conservation: a methodological case study on community based forest management in Orissa, India
- 11h40** **Matthew Potts,** Jeffrey Vincent: Managing multi-species forests to minimize the risk of biodiversity loss
- 12h00** **Fernanda Figueroa,** Víctor Sánchez-Cordero: Mexican Biosphere Reserves' efficacy to prevent changes in land use
- 12h20** Augustin Berghöfer, **Susanne Stoll-Kleemann:** Not about money: critical enabling conditions for effective co-management in Protected Areas (PAs)
- 12h40** **Fabian Blanchard,** Jean Boucher, Jean-François Bourillet, Jean-François Guillaud, Pascal Lazure, Frederique Vandermeirsch: Towards a biodiversity management of a large marine ecosystem : the bay of biscay integrated case study

Parallel session: Contributed oral session 8

Biodiversity changes and health

Chair: Peter Daszak

Friday, November 11, 11h00 – 13h00, Holiday Inn 1, Holiday Inn

- 11h00** **Monica Andrade-Morrays,** Carolina Megumi Mizuno: Ecological disequilibria as cause of emerging hantaviruses in Sao Paulo State, Brazil
- 11h20** **Matt Thomas:** Biodiversity and disease
- 11h40** **Njiokou Flobert:** Wild animal reservoir for *Trypanosoma brucei gambiense*
- 12h00** **Charles Nunn,** Sonia Altizer: Global drivers of parasite diversity and host specificity in primates
- 12h20** **Manuel Cesario:** The health benefits of biodiversity conservation
- 12h40** **Asit Mazumder:** Predicting cyanobacterial bloom formation in freshwater ecosystems

Parallel session: Contributed oral session 9

Genetics

Chair: Susana Magallon

Friday, November 11, 11h00 – 13h00, Oaxaca 1, Mision de Los Angeles

- 11h00** **Virginia León-Règagnon**, Daniel Brooks, Deborah McLennan: DNA identification of an introduced amphibian pathogen into Mexico and Costa Rica
- 11h20** **Erika Edwards**: How the cactus lost its leaves: studies of character evolution can reveal the origins of biological diversity
- 11h40** **Sophie Arnaud-Haond**, Claire M. Billot, Carlos M. Duarte, Ester A. Serrao, Sara Teixeira: Genetic structure and mating system at range-edge: low diversity and high inbreeding in SE Asia mangrove (*Avicennia marina*) populations
- 12h00** **Thomas Tully**, Regis Ferriere: Evolution and maintenance of within-species' biodiversity of reproductive traits' flexibility in the springtail *Folsomia candida*
- 12h20** **Nadir Alvarez**, Betty Benrey, Martine Hossaert-McKey: Host plants and organisation of diversity in phytophagous insects, from evolutionary radiations to population processes: the case of the bruchid beetle genus *Acanthoscelides schilsky* (Coleoptera)
- 12h40** **Michael J. Donoghue**: The relative importance of character evolution and geographic movement in the diversification of a flowering plant clade

Parallel session: Contributed oral session 10

Biodiversity and urbanization

Chair: Thomas Elmqvist

Friday, November 11, 11h00 – 13h00, Donaji, Mision de Los Angeles

- 11h00** **Charles L. Redman**: Sustaining ecological values in an urbanizing world
- 11h15** **Daniela Buzo**, Ana Laura Barillas, Jeronimo Garcia, Jose Gonzalez, Lorna Hernandez: Temporal dynamics of avifauna in urban parks of Puebla, Mexico
- 11h25** **Karin Ahrné**: Bumblebee (*Bombus* spp.) diversity and abundance along an urban to rural gradient, from the inner city of Stockholm towards the southern plain of Uppsala
- 11h35** **Emily McClung de Tapia**, Diana Martinez-Yrizar, Cristina Adriano-Moran, Emilio Ibarra-Morales, Elizabeth Solleiro-Rebolledo, Jorge Gama-Castro, Serguey Sedov: Prehispanic
- 11h45** **Ascelin Gordon**, Sarah Bekessy, Josh Dorrrough, Michael McCarthy, Brendan Wintle: Biodiversity viability assessment in the urban fringe of Melbourne
- 11h55** **Ann P. Kinzig**: Towards an international research agenda on biodiversity and urbanization
- 12h10** **Round table discussion**

Lunch, 13h00 – 14h30

Parallel session: Symposium 12

Biodiversity, human-well-being, and the Millennium Ecosystem Assessment

Chair: Harold Mooney and Daniel P. Faith

Friday, November 11, 13h00 – 14h30, Oaxaca 1, Mision de Los Angeles

This symposium will start with short briefings, and will be held as a round table discussion between speakers and the audience. Panelists will include:

Daniel P. Faith (Australia)

Harold Mooney (USA)

David Cooper (Secretariat Convention on Biological Diversity, Canada)

Jon Paul Rodriguez (Venezuela)

Stephen Polasky (USA)

Robert Scholes (S-Africa)

Friday, November 11, 2005

AFTERNOON

This afternoon will start with 7 sessions running in parallel from 14h30 until 17h30 and end with a poster session.

Parallel session: Symposium 9

Biodiversity in agricultural landscapes: saving natural capital without losing interest (Second part)

Chair: Louise Jackson

Friday, November 11, 14h30 – 17h30, Oaxaca 3, Mision de Los Angeles

- 14h30** **Juan Jimenez-Osornio:** Thinking outside of the box: tropical conservation in both protected areas and the surrounding matrix
- 14h50** **Gladwin Joseph, Kamaljit Bawa:** Scale-dependent approaches and institutions for conserving biodiversity at agriculture-forest margins
- 15h10** **Unai Pascual, Charles Perrings:** The economics of biodiversity in agricultural landscapes
- 15h30** **Stuart R. Harrop:** Globally Important traditional agricultural practices and systems- an examination of their context in existing multilateral instruments and policy dealing with biodiversity preservation
- 15h50** **Meine van Noordwijk, Susilo Kuncoro, Endri Martin, Laxman Joshi, Pornwilai Saipothong, Veronika Areskoug, Trudy O'Connor:** Donkeys, carrots, sticks and roads to a market for environmental services: rapid agrobiodiversity appraisal for the PES – ICDP
- 16h10** **Round table discussion.** Panelists will include:
Toby Hodgkin, Luis Garcia-Barrios, Thomas P. Tomich

Parallel session: Symposium 13

Freshwaters: sustaining biodiversity and system integrity

Chair: Robert J. Naiman

Friday, November 11, 14h30 – 17h30, Guelaguetza, Mision de Los Angeles

- 14h30** **Robert J. Naiman:** Introduction
- 14h35** **Mark Gessner, David Dudgeon, Robert J. Naiman, Doris Soto:** Evidence and myths surrounding perceptions about the importance of biodiversity to freshwater ecosystems
- 15h00** **Caroline Sullivan, Jay O'Keeffe:** Confronting the realities of using biodiversity: is Nature a free good? (with apologies to Adam Smith)
- 15h25** **Zen Kawabata:** Does microbial diversity drive the freshwater world?
- 15h45** **Angela Arthington, Stuart E. Bunn, N. LeRoy Poff, Robert J. Naiman, Jay O'Keeffe:** Environmental water allocations to sustain freshwater biodiversity: importance, global developments and challenges
- 16h05** **Duncan Knowler, Jay O'Keeffe:** The economic value of freshwater biodiversity: an experimental simulation
- 16h25** **Jay O'Keeffe, Angela Arthington, Robert J. Naiman, Doris Soto:** The drivers of biodiversity in lakes and rivers at different time scales
- 16h45** **Doris Soto, Angela Arthington, Jay O'Keeffe:** Intensive food production (agriculture/aquaculture) effects on freshwater biodiversity and remediation perspectives
- 17h05** **Round table discussion**

Parallel session: Symposium 14

Phylogeny and biodiversity science

Chair: Mike Donoghue

Friday, November 11, 14h30 – 17h30, Oaxaca 1, Mision de Los Angeles

- 14h30** **Joel Cracraft:** Knowledge of the tree of life: an essential foundation for biodiversity science and a sustainable world
- 14h50** **François Lutzoni,** A. Elizabeth Arnold, Frank Kauff, Jolanta Miadlikowska, Valerie Reeb: Symbioses and their roles in the origin and maintenance of diversity
- 15h10** **Susana Magallón:** The early evolutionary diversification of eudicots (tricolpate angiosperms)
- 15h30** **Isabel Sanmartín:** Phylogenies and the radiation of animals around the Northern and Southern Hemispheres
- 15h50** **Lucia Lohmann,** Richard Winkworth: A phylogenetic approach to understanding contemporary diversity patterns in Bignoniaceae (Bignoniaceae)
- 16h10** **Richard Ree:** A phylogenetic framework for comparing regional species diversities, applied to four floristic hotspots
- 16h30** **Daniel P. Faith:** Phylogenetic diversity (PD) provides biodiversity surrogates information that can enhance the contribution of DNA barcoding programs to conservation planning
- 16h50** **John Wiens:** A phylogenetic perspective on global biodiversity patterns
- 17h10** **Round table discussion**

Parallel session: Contributed oral session 11

Drivers of mountain biodiversity

Chair: Eva Spehn

Friday, November 11, 14h30 – 17h30, Holiday Inn 2, Holiday Inn

- 14h30** **Ørjan Totland,** Kari Klanderud: Simulated climate change altered dominance hierarchies and diversity of a mountain biodiversity-hotspot
- 14h50** **Edersson Cabrera Montenegro,** Gustavo Galindo: Alteration in the distribution of the mountain vegetation types in a sector of the Colombian Andes. Effect of global change, adaptation or loss of biodiversity?
- 15h10** **Wario Adano:** The effects of land-use and climate changes on ecosystem services of a tropical montane forest, Kenya
- 15h30** **Gunilla A. Olsson,** Anna Ekrem, Susanne K. Hanssen, Sølvi Wehn: Rapid forest line changes in Norwegian mountains – in relation to land use and climate change
- 15h50** **Markus Fischer,** Katrin Maurer, Jürg Stöcklin, Anne Weyand: Drivers of grassland biodiversity in the Alps
- 16h10** **Henning Todt,** Helmut Dalitz, Robert Gliniars, Winfred Musila, Dana Uster: Spatial heterogeneity of abiotic parameters in a mountain forest in Kenya: a process that preserves tree diversity?
- 16h30** **Eva Spehn,** Christian Körner, Maximo Liberman: Sustainable use and biodiversity of sub-tropical highlands- a synthesis
- 16h50** **Roger Guevara,** Claudia E. Moreno, Gerardo Sánchez-Rojas, Dianeis Téllez: Pine-oak forest management and the diversity of leaf litter fauna

Parallel session: Contributed oral session 13

Biodiversity and ecosystem services

Chair: Charles Perrings

Friday, November 11, 14h30 – 17h30, Oaxaca 2, Mision de Los Angeles

- 14h30** **Ian Joint**, Nicholas Mann, David Scanlan, Phillip Williamson: Out of the blue - the importance of marine microbes
- 14h50** **Maria Tengö**, Örjan Bodin, Thomas Elmqvist, Kristin Johansson, Jakob Lundberg: Ecosystem services and taboos in dry tropical forests in Southern Madagascar
- 15h10** **Colin Fontaine**, Isabelle Dajoz, Michel Loreau, Jacques Meriguet: Functional diversity of plant-pollinator communities enhances ecosystem sustainability
- 15h30** **David Duncan**: The search for native pollination services in highly modified agricultural landscapes in Victoria, Australia
- 15h50** **Sandra Lavorel**, Ian Davies, Jacqueline de Chazal, Eric Garnier, Fabien Quetier, Mark Rounsevell: Vulnerability to land use change of ecosystem services provided by traditional European agro-pastoral landscapes
- 16h10** **Till Stellmacher**, Franz W. Gatzweiler: Organizing a public ecosystem service economy for the sustainable use of biodiversity
- 16h30** **Taylor Ricketts**, Gretchen Daily, Paul Ehrlich, Charles Michener: Tropical forest fragments enhance pollination and yield in nearby coffee crops
- 16h50** **Round table discussion**

Parallel session: Contributed oral session 14

Monitoring biodiversity changes I

Chair: Norbert Jürgens

Friday, November 11, 14h30 – 17h30, Holiday Inn 1, Holiday Inn

- 14h30** **Karen Hahn-Hadjali**, Pierre Agbani, Didier Agonyissa, Konstantin König, Marco Schmidt, Annika Wieckhorst: Assessment and evaluation of phytodiversity patterns and their dynamics in Northern Benin (West Africa) in regard to conservation and sustainable use
- 14h50** **Estelle Balian**, Christian Lévêque, Koen Martens, Hendrik Segers: An assessment of animal species diversity in continental waters
- 15h10** **Alfonso Alonso**, Patrick Campbell, Francisco Dallmeier, Michelle Lee: Biodiversity conservation in Gabon, Central Africa
- 15h30** **Gregory Insarov**: Monitoring lichen biodiversity alteration under global change stress
- 15h50** **Mónica Morales-R.**, Dolores Armenteras-P., Nelly Rodríguez-E., Sonia Sua-T.: Assessing conservation priorities in Colombian Andes throughout land cover dynamics analysis
- 16h10** **Sarahy Contreras-Martínez**, Eduardo Santana-Castellon: Bird monitoring and plant succession: effects of a crown fire on the hummingbird community of a subtropical montane forest in Western Mexico
- 16h30** **Jesús Ernesto Arias González**, Gilberto Acosta-Gonzalez, José Manuel Castro-Perez, Rodrigo Garza-Perez: Spatial prediction of coral reef fishes biodiversity
- 16h50** **Michio Fukushima**, Satoshi Kameyama: Effects of dams on freshwater fish diversity and distribution in Hokkaido, Japan
- 17h10** **Örjan Bodin**, Jon Norberg: A network approach for analyzing spatially structured populations in fragmented landscape – an example from Southern Madagascar

Parallel session: Contributed oral session 15

Economics of biodiversity

Chair: Edward Barbier

Friday, November 11, 14h30 – 17h30, Donaji, Mision de Los Angeles

- 14h30** **John Tschirhart:** Nature's cournot oligopolists
- 14h50** **Juan Carlos Arias Garcia:** Supply of woody and non timber forest products with economic potential, in Terra firme forest of Colombian Amazonia
- 15h10** **Klaus Glenk, Jan Barkmann, Rainer Marggraf:** Locally perceived values of biological diversity in central Sulawesi (Indonesia): results from a choice experiment approach
- 15h30** **Edward Barbier, Michael Rauscher:** Biodiversity and geography
- 15h50** **Jürgen Meyerhoff, Volkmar Hartje, Ulf Liebe:** The economic value of forest biodiversity: results from two choice experiments
- 16h10** **Theresa Garvin:** Evaluating payments for environmental services in Costa Rica
- 16h30** **Birgit Friedl, Doris Behrens, Michael Getzner:** Managing a Nature Reserve by using the two-edged effect of tourism
- 16h50** **Jan Barkmann, Claudia Cerda, Rainer Marggraf:** Economic preferences for the protection of primary values? Evidence from trading-off ecological insurance by species diversity in an uncertain world
- 17h10** **Robin Naidoo, Taylor Ricketts:** Incorporating economic costs and benefits of conserving natural ecosystems into conservation planning

Poster session

Friday, November 11, 17h30 – 19h30, Patio los Laureles, Mision de Los Angeles

Biodiversity and urbanisation (closed session)

17h30 – 18h30, Guelaguetza, Mision de Los Angeles

Saturday, November, 12, 2005

MORNING

This morning will start with 3 plenary addresses given by Profs. José Sarukhân, Robert Scholes and David Hillis and will be followed by 7 sessions running in parallel from 11h00 until 13h00.
Registration, 7h30 – 19h00, Tina Laoo, Mision de Los Angeles

Plenary session

Chair: Michael Donoghue

Saturday, November 12, 8h30 – 10h30, Oaxaca, Mision de Los Angeles

8h30

José Sarukhân, Universidad Nacional Autonoma de Mexico, Mexico
Assembling and using data for biodiversity management

9h10

Robert Scholes, CSIR-Environmentek, South Africa
Global observing systems for biodiversity

9h50

David Hillis, University of Texas, USA
Priorities and the future of systematics research

Coffee break, 10h30 – 11h00

Parallel session: Symposium 15

Forest biodiversity and carbon sequestration

Chair: Michael Scherer-Lorenzen

Saturday, November 12, 11h00 – 13h00, Oaxaca 2, Mision de Los Angeles

- 11h00** **Kate Kirby**, Catherine Potvin: Opportunities for combining carbon sequestration and biodiversity conservation in an indigenous territory of Eastern Panama
- 11h20** **Kanehiro Kitayama**, Ying Fah Lee, Tohru Nakashizuka: The synergy between carbon sequestration and the conservation of biological diversity in tropical rain forests, Sabah, Malaysia
- 11h40** **Philipson, Christopher**, Andrew Hector, Charles Godfray, Glen Reynolds, Philippe Saner: The Sabah biodiversity experiment: functional ecology of dipterocarps and carbon sequestration in enrichment-planted secondary forests
- 12h00** **Julia Koricheva**, Harri Vehvilainen: Effects of tree stand diversity on insect herbivory
- 12h20** **Michael Scherer-Lorenzen**, Axel Don, Ernst-Detlef Schulze, Jens Schumacher: Examining tree diversity effects on ecosystem functioning: the BIOTREE project
- 12h40** **Round table discussion**

Parallel session: Symposium 16

Wildlife conservation and economic development in East and Southern Africa

Chair: Stephen Polasky and Erwin Bulte

Saturday, November 12, 11h00 – 13h00, Guelaguetza, Mision de Los Angeles

- 11h00** **James Benhin**, Rashid Hassan: The economics of cattle and wildlife ranching in the Transvaal Province of South Africa: implications for biodiversity and living standards
- 11h20** **Erwin Bulte**: Ecoservice payments in the Amboseli system, Kenya
- 11h40** **David Nkedianye**: Biodiversity payment schemes in East African Savannas: problematic half solutions or untapped opportunities?
- 12h00** **Stephen Polasky**, Christopher Costello, Kathleen Galvin: Linking humans and ecosystems: an integrated modeling approach to the Serengeti Ecosystem
- 12h20** **Anders Skonhoft**: Tourism and wildlife in a dynamic model
- 12h40** **Round table discussion**

Parallel session: Symposium 17

Remote sensing: methods and applications to assess, monitor and manage biodiversity loss

Chairs: Harini Nagendra and Donald Potts

Saturday, November 12, 11h00 – 13h00, Oaxaca 3, Mision de Los Angeles

- 11h00** **Brigitte Martini**: Biodiversity applications of hyperspectral and hyperspatial remote imaging
- 11h20** **Stacy Jupiter**, Donald Potts: Effects of agricultural intensification in the pioneer catchment (Queensland, Australia) on adjacent mangroves, nearshore coral reef habitats and biodiversity
- 11h40** **Serge Andrefouet**: Direct and indirect ways to assess biodiversity in coral reef environments using remote sensing
- 12h00** **Harini Nagendra**, Sajid Pareeth: Integrating satellite image analysis with field data for a multi-scale assessment of local institutions and biodiversity distribution in Nepal
- 12h20** **Edward Webb**, Thi Ha: Using RS/GIS to model forest cover change in Thue Thien Hue, Vietnam: implications for biodiversity conservation
- 12h40** **Norbert Juergens**: Towards a global biodiversity observation system: a standardized multi-scale monitoring study of the African continent.

Parallel session: Symposium 18

Capacity building for biodiversity science

Chairs: Jon Paul Rodriguez and Peter Daszak

Saturday, November 12, 11h00 – 13h00, Donaji, Mision de Los Angeles

This session will be dedicated to capacity building for biodiversity science and conservation, with a focus on Latin America. It will feature speakers reflecting on their capacity building experiences both as trainers and trainees, followed by a debate with the audience on capacity building needs and practice:

Jon Paul Rodriguez (Venezuela)

Mary Kalin Arroyo (Chile)

Rodolfo Dirzo (Mexico)

Zoraida Calle (Colombia).

Parallel session: Symposium 19

Marine biodiversity and ecosystem functioning

Chairs: Carlos M. Duarte, Carlo Heip and David M. Paterson

Saturday, November 12, 11h00 – 13h00, Holiday Inn 2, Holiday Inn

- 11h00** **Carlos M. Duarte**, Elvira Alvarez, Elena Diaz-Almela, Nuria Marbá: Seagrass decline in the Mediterranean: impacts on ecosystem services
- 11h20** **Mark Emmerson**, Jose Montoya, Ricard Sole, Guy Woodward: Nature's constraints and the functioning of food webs
- 11h40** **Mercedes Cano**, Beatriz Martinez, Rosa del Valle, Francisco Montalvo, Lidice Clero, Ricardo Sanchez: Health state of seagrass beds in Sabana-Camagüey Archipelago, Cuba
- 12h00** **Adrianna Ianora**: Role of marine natural products in maintaining biodiversity and ecosystem functioning
- 12h20** **Martin Solan**: Marine benthic biodiversity and ecosystem functioning in complex natural systems
- 12h40** **Stephen Hawkins**, P. Moore, M.T. Burrows, E. Poloczanska, N. Mieszkowska, P. Moschella, J. Bishop, S. Nielsen, P. Masterson, A.J. Southward: Global environmental change impacts on marine biodiversity: implications for ecosystem functioning

Parallel session: Contributed oral session 16

Biodiversity conservation III

Chair: Thomas Elmqvist

Saturday, November 12, 11h00 – 13h00, Oaxaca 1, Mision de Los Angeles

- 11h00** **Manfred Denich**, Thomas Borsch, Christine Schmitt, Kassahun Tesfaye, Feyera Senbeta Wakjira: Integrating the conservation of genetic and species diversity: the example of wild *Coffea arabica* in the montane forests of Ethiopia
- 11h20** **Patricia Iloldi-Rangel**, Trevon Fuller, Miguel Angel Linaje, Victor Sánchez-Cordero, Sahotra Sarkar: Selecting areas for biodiversity conservation and ecological restoration in Oaxaca, Mexico: a preliminary analysis
- 11h40** **Free De Koning**, Pablo Benítez, Fabian Muñoz, Roland Olschewski: Modelling the impacts of conservation incentives on land-use change, biodiversity and ecosystem functioning
- 12h00** **Bhim Adhikari**: Economic incentives and biodiversity conservation: analysis of management scenarios for conservation
- 12h20** **Teklu Tesfaye**: Traditional knowledge and natural resources management: the case of wild coffee conservation in the montane rainforests of Southwestern Ethiopia
- 12h40** **Thomas Elmqvist**, Markku Pyykönen, Maria Tengö: Large-scale dry forest regeneration in southern Madagascar: the role of social institutions

Parallel session: Contributed oral session 17

Invasive species

Chair: Mark Lonsdale

Saturday, November 12, 11h00 – 13h00, Holiday Inn 1, Holiday Inn

- 11h00** **Ravindra Joshi**: Crop protection specialist on invasive alien species
- 11h20** **Kari Klanderud**, Ørjan Totland: Invasibility, propagule availability, and diversity of an alpine plant community under simulated climate warming
- 11h40** **William Mark Lonsdale**: Impacts of invasive alien species on biodiversity and human well-being
- 12h00** **Charles Perrings**: Invasive alien species and human poverty
- 12h20** **Ingolf Kühn**, Marlene Brandenburg, Stefan Klotz, Eva Küster: Distribution of invasive plant species' traits in Germany
- 12h40** **Carolina Laura Morales**, Marcelo Adrian Aizen: Impact of invasive species on the structure of plant–pollinator webs in the temperate forests of South Argentina

Lunch, 13h00 – 14h30

Saturday, November, 12, 2005

AFTERNOON

This afternoon will start with 7 sessions running in parallel from 14h30 until 17h00 and end with a round table discussion with members of the DIVERSITAS advisory board chaired by Prof. Harold Mooney.

Parallel session: Symposium 20

Diversity, diversification processes and conservation of high mountain biota

Chairs: Irène Till-Bottraud and Mary Kalin Arroyo

Saturday, November 12, 14h30 – 17h00, Oaxaca 1, Mision de Los Angeles

- 14h30** **Mary Kalin Arroyo:** Diversity and diversification processes in high elevation habitats - using the South American Andes as a model to set the stage
- 14h50** **Lohengrin Cavieres,** Ragan Callaway: Facilitation and its consequences on local species-richness in the alpine: examples from the Andes of Southern-South America
- 15h10** **Jerry Coyne,** Daniel Lachaise, Ana Llopart: Processes of diversification and altitudinal hybrid zone in insular montane biotas : the case of *Drosophila santomea* and *Drosophila yakuba* in Sao Tome Island
- 15h30** **Steven Schmidt,** Liz Costello, Al Meyer: Seasonal dynamics of alpine soil organisms: implications for understanding the functioning of alpine systems
- 15h50** **Juerg Stoecklin:** Intraspecific differentiation, adaptation and gene flow at the landscape level in alpine plants
- 16h10** **Irène Till-Bottraud,** Mary K. Arroyo, Cristian Torres: Genetic variation in the alpine; linking genetic diversity, breeding system and population dynamics.
- 16h30** Richard Winkworth: The evolution of alpine plant diversity

Parallel session: Symposium 21

Biodiversity and litter decomposition: a cross-systems perspective

Chairs: Mark Gessner and Stephan Hättenschwiler

Saturday, November 12, 14h30 – 17h00, Oaxaca 2, Mision de Los Angeles

- 14h30** **Christopher Swan,** Carri LeRoy: Interactive effects of leaf diversity with species composition and detritivore foraging on litter decomposition in streams
- 14h50** **Richard Bardgett:** Linkages between aboveground and belowground communities: the importance of substrate diversity
- 15h10** **Helene Bracht Jorgensen,** Stephan Hättenschwiler: Does soil microbial diversity matter for ecosystem functioning?
- 15h30** **Christian Dang,** Eric Chauvet, Mark Gessner, Antoine Lecerf: Role of fungal diversity in litter decomposition: what do stream microcosms experiments tell?
- 15h50** **Brendan McKie,** Björn Malmqvist: Detritivore diversity and leaf decomposition in streams: placing richness-ecosystem functioning relationships in context
- 16h10** **Diana Wall,** Mark St. John: Faunal diversity in the soil food web and its implications for ecosystem processes
- 16h30** **Stephan Hättenschwiler,** Mark O. Gessner: An attempt to synthesise biodiversity effects on decomposition: how comparable are terrestrial and aquatic systems?

Parallel session: Symposium 22

Understanding and managing biodiversity conflicts

Chairs: Stephen Redpath, Rehema White and Irene Ring

Saturday, November 12, 14h30 – 17h00, Guelaguetza, Mision de Los Angeles

- 14h30** **Rehema White**, Stephen Redpath: A framework to predict, understand and manage biodiversity conflicts
- 14h50** **Irene Ring**, Rui Ferreira dos Santos: Integrated evaluation of policy instruments in biodiversity conflict reconciliation
- 15h10** **Ricardo Rozzi**, Kurt Jax: Linking ecology and ethics in a pro-active conflict management approach in the extreme south of the Americas
- 15h30** **Emmanuel Marfo**: Managing land use and biodiversity conservation conflict in local and national settings: the role of actor-empowerment. Lessons from forest-mining conflicts in Ghana
- 15h50** **Charudutt Mishra**: Understanding and managing human-snow leopard conflicts in the Himalaya
- 16h10** **Suzanne Asha Stone**, Nina Fascione, Christopher Haney, Gina Schrader, Linda Thurston, Amaroq Weiss: Nature of the beast: managing conflict associated with wolf conservation in the USA Northern Rockies
- 16h30** **Timothy V. Snow**: The effects of rural community awareness and conflict resolution programmes on reducing the threats of agro-chemicals on biodiversity

Parallel session: Contributed oral session 18

Agriculture and biodiversity II

Chair: Kamal Bawa

Saturday, November 12, 14h30 – 17h00, Holiday Inn 1, Holiday Inn

- 14h30** **Doreen Gabriel**, Indra Roschewitz, Carsten Thies, Teja Tschardt: Plant communities in organic and conventional agriculture – the relative importance of beta diversity across different spatial scales
- 14h50** **Jens Dauber**, Tobias Purtauf, Volkmar Wolters: Local vs. landscape control of biodiversity in agricultural landscapes
- 15h10** **Carla Catterall**, John Kanowski: How does reforestation affect biodiversity? - Pattern and process in Australian rainforest landscapes
- 15h30** **Jean-Louis Pham**, Gilles Bezançon, Jacques Chantereau, Bruno Gerard, Issoufou Kapran, Yves Vigouroux: How does agrobiodiversity respond to global change? Assessing changes in the diversity of pearl millet and sorghum landraces in Niger between 1976 and 2003
- 15h50** **Priyadarsanan Dharma Rajan**, Sinu Allesh: Impacts of stand simplification of village forests on the natural enemy guilds of paddy agro-ecosystems of Karnataka Western Ghats (India)
- 16h10** **Francisco Espinosa-Garcia**, Heike Vibrans, Jose Luis Villaseñor: Biotic resistance to exotic species: correlations between native and exotic weed species richness in small plots of maize
- 16h30** **Didier Bazile**, Souleymane Dembele, Bhuwon R. Staphit, Anil Subedi: How do communities provide seed system's resilience to maintain on-farm agrobiodiversity through social networks? Mali and Nepal cases studies

Parallel session: Contributed oral session 19

Monitoring biodiversity changes II

Chair: Jon Paul Rodriguez

Saturday, November 12, 14h30 – 17h00, Oaxaca 3, Mision de Los Angeles

- 14h30** **Phillip Williamson**, Michael Heath: Using keystone species for a multidisciplinary analysis of marine ecosystem dynamics in the northern North Atlantic
- 14h50** **Thomas Lewinsohn**, Pedro Jordano: Beyond species lists: interaction inventories for biodiversity assessment and management
- 15h10** **Jesus Ugalde**: National Biodiversity Inventory: the Costa Rica – INBio Project
- 15h30** **Jon Paul Rodríguez**, Andrew Balmford, Andrew Dobson, Georgina M. Mace, John G. Robinson: DIVERSITAS and the establishment of a stronger science basis for the 2010 target of the Convention on Biological Diversity
- 15h50** **David Wingfield Gibbons**, Richard Gregory, Adriaan W. Gmelig Meyling, David Noble, Arco Van Strien, Petr Vorisek: Developing indicators for European birds
- 16h10** **Lidwine Le Mire Pecheux**: LandBioDiv: a new model for the spatial prediction of species richness and composition at the landscape level. A case study within a Mediterranean type region
- 16h30** **Dolors Armenteras**: Modelling the potential distribution of plant species in Colombia using Mahalanobis distances

Parallel session: Contributed oral session 20

Policy for sustainable development

Chair: Peter Johan Schei

Saturday, November 12, 14h30 – 17h00, Donaji, Mision de Los Angeles

- 14h30** **Susanne Menzel**, Susanne Boegeholz: Teaching biodiversity in Chile and Germany: students' subjective theories of threats for biodiversity and their suggestions for sustainable development
- 14h50** **Laura Lopez Hoffman**, David Ackerly, Monroe Ian, Miguel Martinez Ramos: Integrating scientific and local knowledge for sustainable mangrove harvesting
- 15h10** **Susanne Stoll-Kleemann**, Monika Bertzky, Barbara Thierfelder: Integrating biodiversity governance and management approaches with conservation success
- 15h30** **Bernardo Peredo**: Biodiversity, human development and poverty alleviation in Bolivia in a market economy: irreconcilable differences or windows of opportunity?
- 15h50** **Per Stromberg**, Unai Pacual: Bioprospecting contracts: impact of legal and institutional
- 16h10** **Sliman Abu Amara**: Bioprospecting: the role of biotechnology industry toward sustainable development in global biodiversity governance
- 16h30** **Anke Weisheit**: Sustainable harvest training approach for traditional healers: experiences from rukararwe in South Western Uganda

Parallel session: Contributed oral session 21

Systematics

Chair: Michael Donoghue

Saturday, November 12, 14h30 – 17h00, Holiday Inn 2, Holiday Inn

- 14h30** **José Rafael Ferrer-Paris:** About the usefulness of natural history collections for biodiversity inventories: predicting plant species richness in the Neotropics
- 14h50** Mundo Manuel, James G. Baldwin, Paul De Ley, **Axayacatl Rocha-Olivares**, Irma Tandingan De Ley, W. Kelley Thomas: A combined morphological and molecular inventory of the marine nematofauna from the Gulf of California
- 15h10** **Anders M. C. Silfvergrip:** FishBase, survey data, and museum data
- 15h30** **Tom Webb**, Rob Freckleton: Abundance-occupancy dynamics in British breeding birds
- 15h50** **Miguel Fernandez**, Steffen Reichle, Brian Fisher, Healy Hamilton: Integrating Natural History Museum collection data and predictive distribution models to understand diversity patterns in two megadiverse countries: Madagascar and Bolivia
- 16h10** **Mohammed Messouli**, Claude Boutin, Nicole Coineau, Mohammed Yacoubi-Khebiza: A hidden part of the biodiversity of the Maghreb: Importance of groundwater fauna and need for its protection
- 16h30** **Karl-Heinz Lampe:** Repatriation of knowledge about insect type specimens through the DORSA virtual museum (Digital Orthoptera Specimen Access)

Coffee break, 17h00 – 17h30

Closing session (Plenary)

Chair: Harold Mooney

Saturday, November 12, 17h30 – 19h00, Oaxaca, Mision de Los Angeles

Round table: Reflections on new directions and opportunities for biodiversity research

Chair: Harold Mooney, Stanford University, USA

Paul Ehrlich, Stanford University, USA

Mohan Munasinghe, Munasinghe Institute for Development, Sri Lanka

Jane Lubchenco, Oregon State University, USA

Peter Raven, Missouri Botanical Garden, USA

José Sarukhân, Universidad Nacional Autónoma de México, México

Peter-Johan Schei, The Fridtjof Nansen Institute, Norway

Award ceremony for best student presentations

Poster session

Displayed 9-12 November, Patio Los Laureles, Mision de Los Angeles

Poster session 1 and 2 : DIVERSITAS National Committees and focal points and international programmes

1. **Didier Babin:** The French Committee of DIVERSITAS
2. **Norbert Juergens:** The National Committee on global change research and DIVERSITAS Germany
3. **Juan Schnack, Hugo López:** An overview of biodiversity studies in Argentina
4. **Donald Potts:** United States DIVERSITAS National Committee
5. **Sylvia Martinez:** Swiss biodiversity forum – the network of biodiversity experts
6. **Dessislava Dimitrova, Ana Petrova, Vladimir Vladimirov:** Bulgarian biodiversity platform - goals and challenges
7. **Helen Stensrud:** Norwegian DIVERSITAS National Committee
8. **Peter Baas:** DIVERSITAS Committee and biodiversity research in the Netherlands
9. **Jurgen Tack, Aline Van der Werf:** The Belgian biodiversity platform
10. **Isabel Sousa Pinto, Rainer Muessner:** Networking and science-policy interfaces in biodiversity: new ways in improving the impact and relevance of biodiversity research
11. **Eric Craswell:** Biodiversity and the global water system
12. Susana Maldonado, **Mary Kalin Arroyo:** Red Latinoamericano de Botánica: capacity building and partnership for the development of plant sciences and conservation of biodiversity in Latin America

Additional posters may be displayed by countries' representatives.

Poster session 3 : Agriculture and biodiversity

13. **Sonwa Denis J., Weise Stephan:** The need to promote multi-species cocoa based agroforestry system in the humid forest zone of West and Central Africa to meet the market demand
14. **Mohamed Ben Salah:** Agrobiodiversity and population traditional knowledge in the coastal Tunisian oases
15. **Humberto Esquivel, Celia A Harvey, Muhammad Ibrahim, Cristobal Villanueva:** Tree diversity in pastures of cattle farm systems in a Costa Rica dry ecosystem
16. Francisca Acevedo, **Patricia Koleff:** Living modified organisms (LMOs) risk assessment to biodiversity
17. **Eduardo Pineda, Federico Escobar, Gonzalo Halffter, Claudia E. Moreno:** Forest transformation and shade coffee: species diversity of three taxa in a landscape of Mexico
18. **George Dyer, Miguel Martinez-Ramos:** Maize seed networks in Mexico: how open?
19. **Mario Enrique Favila, Lucrecia Arellano, Carmen Huerta:** Diversity of dung and carrion beetles in a disturbed Mexican tropical montane cloud forest and in shade coffee plantations
20. **Toby Hodgkin:** Seed systems and crop genetic diversity in agroecosystems
21. **Luis Arias-Reyes:** Traditional knowledge between Maya farmers from Yucatan, Mexico
22. **Robert Manson, Fabiola López Barrera, César Tejeda Cruz:** Multi-taxon changes along a management intensification gradient in coffee farms located in central Veracruz, Mexico
23. **Feyera Senbeta, Manfred Denich, Paul Velk:** The effects of wild coffee management on the forest biodiversity in the Afromontane rainforests of Ethiopia
24. **Sølvi Wehn:** Predicting influence of different agri-environmental policies on suitable habitats of the endemic mountain herb *Primula scandinavica* – a scenario modelling approach
25. **Kerstin Zander:** Determining the right priorities for conserving farm animal genetic resources – the case of the Borana cattle in East Africa

26. **Admasu Shibru:** Agricultural value of wild coffee genetic resource in Ethiopia: implication for conservation
27. **Richard Pasquis:** Governance in Amazonian agriculture frontier of soybean
28. **Pedro Moreira,** Vitor Carvalho, Silas Pego, Carlota Vaz Patto: Maize landraces collection in maize bread ('broa') Portuguese traditional regions
29. **Hitendra Ram,** Suresh Kumar Billore: Practices of traditional knowledge and culture of Bhil tribe for sustainable development and conservation of biodiversity.
30. **Jörg Hoffmann,** Joachim Kiesel, Gerd Lutze: Action-oriented indicator to maintain biological diversity in the agricultural areas of central Europe
31. **Daniel Grande,** H. Losada, M. Maldonado, J. Nahed, F. Perez-Gil: The silvopastoral systems on the mountain region of Tabasco, Mexico and the epiphyte plant diversity
32. **Waltraud Novak:** Cañihua (*Chenopodium pallidicaule* Aellen) an indigenous Andean food crop, and its contribution to iron supply of rural women in risk of anaemia in Puno (Peru)
33. Tadesse Woldemariam Gole, **Manfred Denich:** Coffee as a flagship species for conservation of mountain forest biodiversity in Ethiopia
34. **Francisco Espinosa-Garcia,** Clara Sánchez-Blanco: Analysis of the distribution of the exotic species of Fabaceae (s.l.) introduced to Mexico
35. **Didier Bazile,** Souleymane Dembele, Bhuwon R. Staphit, Anil Subedi: How do communities provide seed system's resilience to maintain on-farm agrobiodiversity through social networks?

Poster session 4 : Biodiversity conservation

36. **Tzu-Ming Liu:** Tribal Mapping: a bridge between indigenous knowledge and biodiversity conservation
37. **Leonel Torres Hernández,** Eric Isaí Ameca y Juárez: Demographic issues and conservation of *Zamia furfuracea* in coastal dunes of Veracruz.
38. **Francisco Squeo,** Mary T.K. Arroyo, Julio Gutiérrez: Using species – ecosystems approach to build a conservation portfolio
39. **Simona Mihailescu,** Dan Victor Munteanu: Strategies for implementation of Natura 2000 network for protected areas in Romania
40. **Beatriz Fidalgo,** Luis Pinto: Linking landscape functions and preferences – A tool to incorporate biodiversity in land use planning
41. **John Lemons:** Conservation and sustainable use of biodiversity: a portfolio of case studies from Latin America
42. **Natalia Macedo Ivanauskas,** Giselda Durigan, Geraldo Antônio Daher Corrêa Franco, Alexandre Adalardo Oliveira, Ricardo Ribeiro Rodrigues: Diversity, dynamics and conservation in São Paulo state forests: 40ha of permanent plots
43. **John Waithaka:** Conserving biodiversity as an asset of sustainable economic development within human-dominated landscapes – a case study from Southern Kenya, East Africa
44. **Rex Thomas Tandak:** Melsisi community risk assessment
45. **Sarah McCall,** Kathy Milacek, Ricardo Rozzi: Avoiding homogenization of place in the pristine Cape Horn Archipelago: an eco-architecture approach to tourism infrastructure
46. **Ben Dunn,** Kurt Jax, Irene Klaver, Ricardo Rozzi, Pat Sewell: Transcending the anthropo/bio centric dichotomy through the ecosystem approach: insights from the Cape Horn archipelago region
47. **Luc Doyen,** Christophe Bene: Viable management of renewable resources through protected areas: a robust decision approach
48. **Dieter Ramseier:** Can flat roofs be improved as refuges for rare plant species?
49. **Robert Wasno,** Tomma Barnes, Theresa Bert: A community-based approach to biodiversity conservation through fish stock enhancement
50. Irene Garay, Robert Barbault, Catherine Cibien, **Marta Irving,** Rodrigo Medeiros: Biosphere reserves concept and application: the comparative perspective between France and Brazil

Poster session 5 : Drivers of biodiversity changes

51. **Luz Maria Calvo-Irabien**, Lucia de la Torre-Salvador: Ecological and cultural factors affecting diversity of lianas and vines used for handicrafts, in three Mayan communities of Quintana Roo, Mexico.
52. **Hiroshi Tanaka**, Takenari Inoue, Shun'ichi Makino, Isamu Okouchi: Changes in species richness and assemblages of plants and insects due to conversion of deciduous forests to conifer plantation: a comparative study in Japan
53. **Dethardt Goetze**: Consequences of past and recent land use practices on dynamics and diversity of forest-savanna mosaics in Ivory Coast
54. **Juan Carlos Lopez-Acosta**, Rodolfo Dirzo: Anthropogenic changes to the floristic diversity of sabal palmetto woodland: an endemic vegetation type from Mexico
55. **Souleymane Konate**: Effect of logging on the diversity of termites and ants in Côte d'Ivoire
56. **Hamid Reza Akkafi**: Study of species diversity modifications resulting from different managements in the dryland vegetation
57. **Lilly Gama**: Study of the ecological factors in relation with the conservation of the biodiversity of the subgenus *Persea*
58. **Bosco Imbert**, Juan A. Blanco, Federico J. Castillo, Fernando Valladares: Influence of thinning on plant species richness and diversity, and solar radiation indices in two contrasting Iberian *Pinus sylvestris* L. forests during a five year period
59. **Monika Normant**, Anna Szaniawska: Non-native crustaceans in the Polish coastal waters (Baltic Sea) – increased biodiversity or environmental threat?
60. **Ileri Suazo-Ortuño**, Javier Alvarado-Díaz, Miguel Martínez-Ramos: Effect of habitat disturbance on the herpetological community in a Mexican tropical dry forest
61. **Oscar Cardenas Hernandez**, Sarahy Contreras Martinez, Oscar Ponce Martinez: Impacts of land-cover change in the Sierra de Manantlan Biosphere Reserve, Mexico
62. **Winfred Musila**, Helmut Dalitz, Henning Todt, Dana Uster: Effects of human disturbance on soil physico-chemical patterns in deeply weathered tropical soils of Kakamega forest, Kenya
63. **Nirmala Massin**, Andrew Gonzalez: Diversification under disturbance: theoretical and experimental approaches with *Pseudomonas fluorescens*
64. **Armando Aguirre**, Sarita Borges de Faveri, Rodolfo Dirzo, Nashelly Meneses: Effects of habitat fragmentation on floristic composition in Los Tuxtlas, Mexico
65. **Chandan Mahanta**: Potential Impact of C-N-P biogeochemical flux on the declining aquatic biodiversity of the Brahmaputra basin
66. **Natasha Ribeiro**: Interaction between fires and vegetation in miombo woodlands in Mozambique
67. **Ramiro Aguilar**, Marcelo Aizen, Lorena Ashworth, Leonardo Galetto: Determinants of plant reproductive susceptibility to habitat fragmentation: a meta-analysis
68. **Cibele Queiroz**, Inês Gomes, Henrique Miguel Pereira, Luís Vicente: Biodiversity and land-use change in a mountain rural landscape
69. **Timothy Beechie**, Correigh Greene, Robert Naiman, Michael Pollock: A mechanistic approach to predicting biodiversity in river-floodplain ecosystems
70. **Sara Mendes**, Maria Helena Freitas, António Keating, Joaquim Santos, José Paulo Sousa: Effects of understory vegetation management in soil macrofauna from a cork-oak Montado in South Portugal
71. **Wang Wenying**: The effect of land management on plant community composition, species diversity, productivity of alpine Kobersia steppe meadow
72. **Bhupendra Adhikari**, Gopal Rawat: Impact of climate change along altitudinal gradient in Garhwal, west Himalaya, India

73. **Villy Kourafalou**, Claire Paris, Joanna Staneva: Ecosystem response to nutrient fluxes and climate changes
74. **Ada Sánchez**, Kathryn Rodríguez-Clark: The effect of landscape structure on population dynamics: spectacled bear populations (*Tremarctos ornatus*) in Venezuela.
75. **Adriana Gómez**, Laura Barraza, Margarita Cano: Perceptions and environmental knowledge in a rural Mexican community: contributions for biodiversity conservation
76. **Nitin Rai**: The ecological and socio-economic aspects of forest fruit harvest in the Western Ghats of India
77. **Elvira Pereira**, Henrique Pereira, Cibele Queiroz: The impacts of agricultural abandonment on biodiversity: considering local and global values

Poster session 6 : Biodiversity and ecosystem functioning

78. **Stephan Hättenschwiler**, Jacques Roy: A programme on tree diversity and soil biology in French Guyana
79. **Luis A Maldonado**, Erika T Quintana: Exploitable microbial diversity from Mexican soils
80. **Kao Dana**: The acceptable cutting cycle modelling for sustainable wood production in Cambodia
81. **Ndafuda Shiponeni**, Nicky Allsopp, Peter Carrick: Competitive relationships and root partitioning between grass and leaf succulent shrub at the ecotone between Nama karoo and Succulent karoo biomes
82. **Karin Johst**, Andreas Huth: The intermediate disturbance hypothesis: general conclusions from a comparison of different ecosystems
83. **Noé Montaño-Arias**, Felipe García-Oliva, Mayra E. Gavito, John Larsen, Ana Lidia Sandoval-Pérez: Bacterial biodiversity and carbon availability in soils from a tropical dry forest in Mexico
84. **Yareni Perroni**, Carlos Montana: Relationship between plant richness and soil nutrient availability in a semi-arid environment
85. **Tal Levanony**, Vladimir Chikatunov, Tamar Dayan, Yael Mandelik, Sergei Zonstein: Afforestation in Mediterranean ecosystems: the role of semi-natural afforested habitats in supporting native plants and arthropods
86. **James Saunders**, David Paterson: Ecosystem engineering by *Arenicola marina* on intertidal mudflats; influences on biodiversity and sediment erosion rates
87. **Paulina Chacon**: Seed rain and seedling survival on nurse cushions in the high Andes of Central Chile.
88. **Ramón Cecaíra-Ricoy**, Zenón Cano-Santana: Bottom up forces and secondary productivity of *Neoscona oaxacensis* (Araneae: Araneidae) at the pedregal of San Angel Ecological Reserve, (D.F.), México
89. **Kris Hulvey**, Erika Zavaleta: Ecological extinction in California grasslands: the effect of native species declines on ecosystem functioning
90. **Kirstie Dyson**: Biodiversity and ecosystem functioning in heterogeneous environments
91. **Tohru Nakashizuka**, Tomohiko Kamitani: The effects of simplified forest-use on local landscape and wildlife
92. **Yutaka Kobayashi**: Diversity of chemical signals in plants: a theoretical approach
93. **Roly Russell**: Exploring the role and rubric of feedback cycles in socio-ecological systems
94. **Philippe Saner**, Christopher Philipson, Andrew Hector, Reynolds: Does the growth performance of dipterocarp saplings in different light conditions follow an ecological trade-off?

Poster session 7 : Biodiversity and ecosystem services

95. **Mariam Akhtar-Schuster**, Bernadette Bock, Thomas Falk, Claudia Görke, Anke Hoffmann, Andreas Petersen, Katrin Vohland: An interdisciplinary approach to understand biodiversity services in arid rangelands of southern Namibia
96. **Berry Brosi**, Gretchen Daily, Paul Ehrlich: Bee communities and pollination services in human-dominated tropical landscapes
97. **Sarah Greenleaf**, Claire Kremen: Effects of local-scale and foraging-scale habitats on bumble bees (*Bombus vosnesnenski*) in a mosaic of agricultural and wild habitat
98. **Stein Joar Hegland**, Ørjan Totland: Facilitation in pollination interactions
99. **Joanna Nelson**, Erika Zavaleta: Effects of changing fire regime on ecosystem services in the boreal forest, Alaska
100. **Fabien Quétier**, Sandra Lavorel, Pierre Liancourt, Aurélie Thébault: Scenario based projections of ecosystem services in mountain grasslands: comparison of a state and transition model incorporating ecosystem services and a more widely applicable method based on modelling

Poster session 8 : Biodiversity changes and health

101. **Boyzibu Ekhasa**: Survey on epidemics of wildlife as a management tool in protected areas in the Democratic Republic of Congo
102. **Johnson Jato**: Cameroonian plants for life-threatening diseases – the case of cancer and AIDS
103. **Dewaram Nagdeve**: Population change, natural resources and environment

Poster session 9 : Invasive species

104. **Patricia Koleff**, Jesus Alarcon, Elizabeth Moreno, Jorgé Soberon: Prediction of risk areas for biodiversity in Mexico caused by invasive species
105. **Anders Nielsen**, Anne-Line Bjerknæs, Mikael Ohlson, Ørjan Totland: Alien invasion and habitat disturbance: effects on pollination and reproduction in a native boreal forest herb
106. **Francisco Arenas**, Stephen Hawkins, Stuart Jenkins: Susceptibility of marine algal assemblages to invasion: the role of functional diversity.
107. **Anne-Line Bjerknæs**, Stein Joar Hegland, Anders Nielsen, Ørjan Totland: Alien impacts on pollination of natives

Poster session 10 : Monitoring biodiversity changes

108. **Claudia Moreno**, Gonzalo Halffter: Scale and diversity: ant species richness and turnover in micro-environments, communities and a land
109. **Thorsten Kroemer**, Amparo Acebey, S. Robert Gradstein, Michael Kessler: Diversity of vascular epiphytes along an elevational gradient in primary forests and fallows in the Bolivian Andes
110. **Joerg Szarzynski**, Eduard Linsenmair, Michael Schmidt, Paul Vlek: Integrated assessment of biodiversity, climate and land cover changes: scientific networking and capacity building in West Africa
111. **Diego Giberto**: Historical spatial patterns of benthic diversity in the Río de la Plata estuary and its oceanic front, Argentina-Uruguay (35°-36°S)

112. Jens Mutke, Wilhelm Barthlott, Holger Kreft, **Wolfgang Küper**, Jan Henning Sommer: Plant diversity patterns at global, continental, and regional scales – implications for biodiversity conservation
113. **Julius Oszlányi**, Lubos Halada: Species diversity trends in abandoned grasslands in the Carpathians
114. **Claudia Hemp**, Andreas Hemp: Diversity and refuge function for indigenous fauna in anthropogenic influenced habitats in tropical regions: a case study on the Chagga home gardens on Mt. Kilimanjaro, Tanzania
115. **Fabián A. Rodríguez-Zaragoza**, J. Ernesto Arias-González: Coral reef fish biodiversity in the north sector of Mesoamerican barrier reef system
116. **Abisaí Josué García-Mendoza**: Floristic diversity in the state of Oaxaca, Mexico
117. **Oswaldo Tellez**, Patricia Davila, Rafael Lira: The DIVERSITAS project strategy: a study case in the Tehuacán-Cuicatlán biosphere reserve, México
118. **Hoang Van Son**: Biodiversity of Non-Timber forest products
119. **Jean-Luc DesGranges**, Louise Gratton: An innovative approach for drawing out a short list of strategic sites for breeding bird conservation: the case of the St. Lawrence Lowlands avifauna.
120. **Oscar F. Francke**: Arachnid diversity in the Northern Lacandona lowland tropical rain forest, Chiapas, Mexico
121. Sonia Sua, **Monica Morales-R**, Daniel Davila, Ruben Mateus: Biological records georeferencing and digital localities gazetteer
122. **Sara Lucía Camargo-Ricalde**, María Eugenia Fraile-Ortega, Rosaura Grether, Angélica Martínez-Bernal: Diversity of *Mimosa* (Leguminosae-Mimosoideae) in Mexico, its second geographical distribution centre.
123. **Ignacio Doadrio**, Emilio Martínez, Adolfo Sostoa: The historical and ecological processes in the distribution of the freshwater ichthyofauna native from Oaxaca state, Mexico.
124. **José L. Villaseñor**, Pedro Maeda, Enrique Ortiz: The potential use of three plant families as indicators of plant biodiversity in Mexico
125. **Esteban Benitez-Inzunza**, Irma Trejo: Beta diversity, structure, composition in an altitudinal gradient in temperate forests in Santa Maria Yavesia, Oaxaca, Mexico
126. **Cristina Rufino**: Soil macrofauna diversity and habitat indicator taxa in the Doñana national park
127. **Javier Eduardo Mendoza Sabogal**, Fabio Lozano Zambrano, William Gerardo Vargas: Comparison of the alpha, beta and gamma vegetal diversity among three landscapes with different fragmentation levels in the Cental Andes of Colombia
128. **Susana Ocegueda**, Diana Hernandez, Patricia Koleff: A key element in biodiversity information system: nomenclatural catalogues
129. **Judith Becerra**, David Venable: Identifying diversity sources and diversity sinks to conserve tropical trees
130. **Isabelle Barois**, Simoneta Negrete-Yankelevich, J. Alvarez, G. Castillo, C. Fragoso, F. Franco, J. A. García, T. Fuentes, S. Kram, E. Martinez, M. Moron, P. Rodríguez, P. Rojas, V. Sosa, D. Trejo, L. Varela: Below-ground biodiversity in tropical landscapes. Study case: México
131. **Yael Mandelik**, Vladimir Chikatunov, Tamar Dayan, Vassily Kravchenko: Rapid biodiversity assessment at the local scale: is the higher taxa approach a reliable shortcut?
132. **Jung-Tai Chao**, Sing-Chi Chow: An automated system for ecological research on migratory danaid butterflies and their overwintering sites
133. **Raúl Salas**, Beatriz Fidalgo: The use of diversity and structure indices to assess the diversity vegetation in sub-urban forest
134. **Kwang-Tsao Shao**: Integration of Taiwan Biodiversity Information Networks – TaiBNET & TaiBIF
135. Elena Alvarez Buylla, **Oscar Frank**, Alma Delia De los Ríos Massé, Esteban Martínez Salas, Griselda Montiel Parra, Tila María Pérez Ortíz, María Zaharieva: Lacandonia schismatica: a strategic resource for the conservation of the Lacandon rain forest

136. **Santoshkumar Sarkar**, Asokkumar Bhattacharya: Biodiversity of Polychaetous Annelids in Sundarban Mangrove wetland : a useful tool for monitoring environmental change
137. **Geo Coppens d'Eeckenbrugge**: First results from diversity mapping of *Passiflora* (Passifloraceae) and *Vasconcellea* (Caricaceae) in the Colombian coffee growing zone
138. **Pedro L. B Rocha**, Márcio. Z Cardoso, Blandina F Viana: Changes in the animal communities among landscape components in Southern Bahia, Brazil
139. **Axayacatl Rocha-Olivares**, Melania C. Lopez-Castro, Iris H. Segura-Garcia: Assessing biodiversity patterns in the Gulf of California
140. **Miguel Olvera-Vargas**, Blanca Figueroa-Rangel, Martin Vazquez-Lopez: Spatio-temporal analysis of species coexistence in mixed-oak forests in Western Mexico
141. **Susana Ochoa-Gaona**: Application of sustainability indices in rural areas in tropical Mexico
142. **Pilar Rodriguez**, Héctor Arita, Andres Lira-Noriega, Mariana Munguia, Leticia Ochoa-Ochoa, Jorge Soberón: Scale and patterns of vertebrate diversity in Mexico: an integrative approach
143. **Sonia Trujillo Argueta**, Rafael Del Castillo, Adrian Newton: Patterns of genetic diversity and mating systems
144. **Iriana Zuria**: Species richness and abundance of birds in field margins of El Bajío, Mexico: local and landscape-scale effects
145. **Sergio Vitale**: Objective subdivision in study sub-areas of Central Mediterranean Sea by the analysis of bottom trawl discard species

Poster session 11 : Policy for sustainable development

146. **Irma Trejo**, Alejandra Aguilar, Josefina Hernandez-Lozano, Fernando Ramos: Social participation in the conservation of Santa María Yavesía forests, in Sierra de Juárez, Oaxaca, México
147. **Gavan Mathieson**: Linking global issues and local action
146. Rodrigo Medeiros, Irene Garay, **Marta Irving**, Lara Vasco: The Brazilian strategy for biodiversity conservation in protected areas: facing the 2010 goals and the CBD's programme of work
149. **Leticia Ponce de Leon**, Gilberto Hernandez Cardenas, Cecilia Jimenez Sierra, Cecilia Jimenez Sierra, Martha Perez Garcia, Martha Perez Garcia: Biodiversity at risk: a biological critical perspective of the mexican biosecurity law
150. **Thomas Koetz**: The complexity of science-policy interfaces in biodiversity governance on multiple identities of biodiversity and their implications for policy processes based on democratic principles
151. **Dmitry Efremenko**: The theory of biotic regulation of the environment as a framework concept for integrated environmental policy: an analysis of Russian scientific-political discourse
152. **Oliver Coroza**, Daniel Lagunzad, Felino Lansigan, Noela Lasmarias, Connie Morales, Mely Silverio: Policy recommendations for linking biodiversity conservation with human dimensions: the Philippine experience

Poster session 12 : Systematics, phylogeny and evolution

153. **Tam Truong quang**: Biodiversity in the limestone area of Ha Tien and Kien Luong, Kien Giang province
154. **Hernan Laurentin**, Petr Karlovsky: Investigation of genetic relationships in sesame (*Sesamum indicum* L.) germplasm collection using amplified fragments length polymorphisms (aflp)
155. **Jean-François Flot**, Simon Tillier: Biodiversity of the coral genus *Pocillopora* based on molecular markers vs. morphology

156. **Demetria Mondragon**, Remedios Aguilar, Mariel Cruz: Epiphytic diversity of a Mexican's wet oak forest
157. **Rocio Rodiles-Hernandez**, Dean A. Hendrickson, John G. Lundberg: A new Mesoamerican catfish family and the need for its conservation
158. **Tania Escalante**, Miguel Linaje, Juan Jose Morrone, Victor Sánchez-Cordero: Biogeographical regionalization of Mexico using ecological niche modeling of terrestrial mammals
159. **Effa Onomo Pierre**, Nicolas Niemanak: Peroxidase, polyphenol oxidase and amylase isoenzymes activity in Cameroonian Cola germplasm
160. **Maria Wlodarska-Kowalczyk**, Slawomira Gromisz, Michael A. Kendall, Jacek Sicinski: A comparison of diversity of soft-bottom Polychaeta in Arctic and Antarctic
161. **Rodríguez-Guzmán Maria del Pilar**: Diversity of root pathogenic fungi in the Los Tuxtlas Biosphere Reserve, Veracruz, México
162. **Adrian Quijada-Mascareñas**, Wolfgang Wüster: Cryptic biodiversity revealed by DNA markers: the case of the Neotropical rattlesnake *Crotalus durissus*
163. Vivianne Solis-Weiss, Jean-François Flot, Margarita Hermoso Salazar, **Francisco Solis-Marin**: The depauperate benthic invertebrate macrofauna of Clipperton Island
164. **Ana Maria Umaña**, Mauricio Alvarez, Maria Angela Echeverry, Federfco Escobar, Fernando Gast, Humberto Mendoza: Status and diversity patterns of plants, birds and insects in the East side of the East Cordillera, North Andes Colombia
165. **Stuart A. Harris**: Sources of the vascular plants that recolonized the alpine zone of the Canadian Cordillera following the Late Wisconsin glaciation
166. **Simon Tillier**: EDIT: a network to move taxonomy from cottage industry to integrated processes
167. **Diego Tobar**: Diversity, richness, and abundance of the community of diurnal butterflies in a fragmented landscape in northern of Costa Rica
168. **Jonathan Sandoval-Castillo**, Juan Carlos Perez-Jimenez, Axayacatl Rocha-Olivares, Oscar Sosa-Nishizaki, Carlos Villavicencio-Garayzar: Unmasking cryptic diversity in elasmobranch populations of the Gulf of California
169. **Tamara Muenkemuller**: How important are local population dynamics in spatially structured landscapes for species persistence and coexistence?
170. **Pham Huu Tri**: Variation in morphology of *Kappaphycus cottonii* (Weber-van Bosse) Doty in Vietnam
171. **Atahualpa Sosa Lopez**, Domingo Flores Hernandez, David Mouillot, Julia Ramos Miranda: Fish richness decreases with salinity in tropical coastal lagoons
172. **Denise Peccinini Seale**, Marco Aurelio Sena: Genetic diversity in lizards and amphisbaenians from southeastern Atlantic forest of Brazil
173. **Takeuchi Yayoi**, Nakashizuka Tohru: Genetic diversity, genetic structure and inbreeding depression of four dipterocarp species in a tropical rain forest
174. Eduardo de Andrade Bressan, **Elizabeth Ann Veasey**, Roland Vencovsky, Maria Imaculada Zucchi: Allozyme variation in *Dioscorea cayenensis* from swidden agriculture small holdings in Vale do Ribeira, São Paulo, Brazil
175. **José Manuel Barreiro**, Rafael Morales, Alexandra Narváez-Trujillo: Molecular evaluation of the genetic diversity of *Annona cherimola* Mill at one of its proposed centres of origin
176. **Alexandra Narváez-Trujillo**, Carolina Portero: A molecular approximation to determine the genetic relationship of *Manihot leptophylla* to south and central American species of the genus and the evaluation of introgression with cassava
177. **Lorenzo Alvarez-Filip**, Hector Reyes-Bonilla: Functional diversity of reef fishes throughout Gulf of California
178. **Isabel Sousa Pinto**, Rita Araújo: *Grateloupia turuturu* (yamada): a recently introduced species on the Portuguese coast
179. Adeline Barnaud, **Geo Coppens d'Eeckenbrugge**: What is a landrace? The case of sorghum in a Duupa village (northern Cameroon)

Poster session 13 : Biodiversity and urbanization

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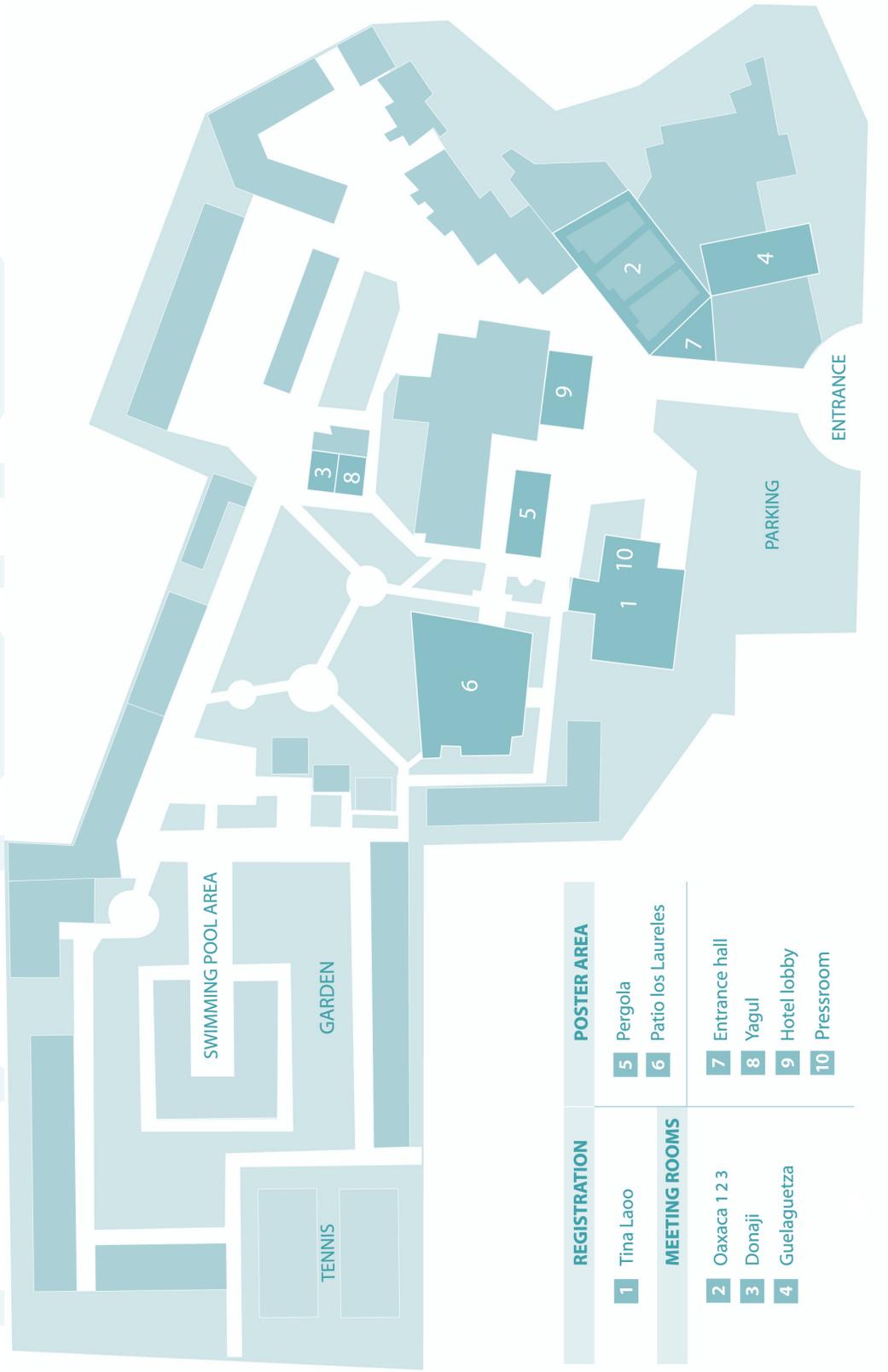
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	6 Patio los Laureles
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2 Oaxaca 1 2 3	7 Entrance hall
3 Donaji	8 Yagul
4 Guelaguetza	9 Hotel lobby
	10 Pressroom

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Symposium 1: The insurance value of biodiversity

Chair

- **Stefan Baumgärtner**, University of Heidelberg, Germany, baumgaertner@uni-hd.de

Humans make use of ecosystem services in a variety of ways. Typically, these ecosystem services are stochastic, such as e.g. the production of green biomass in grasslands, water run-off in a watershed, the level of pollination provided by insects, etc. Economic decision makers, who (i) consider ecosystem services as contributing to their income or, more generally, their well-being, and (ii) are risk-averse, thus, face a risk. This includes orchard farmers, water utility managers or rangeland managers. Biodiversity influences their risk, as it influences the underlying ecosystem processes and functioning. In particular, it influences the statistical distribution at which ecosystem services are being provided. This leads to the hypothesis that, under certain conditions, biodiversity can provide natural insurance for risk-averse users of ecosystem services. This symposium explores this hypothesis from an ecological-economic point of view. Contributions to the symposium will discuss results from ecology about how biodiversity influences ecosystem functioning and services, and integrate these with an economic analysis of decision-making under uncertainty and in different institutional settings. Questions to be discussed include the following:

- How can one define an “insurance value” of biodiversity?
- What ecological and economic factors and relationships determine this insurance value in different ecological-economic settings?
- In what way can biodiversity (as a natural form of insurance) be seen as a substitute for – or as a complement to – commercial (financial) insurance against income risks?
- How is the level of biodiversity, as a natural form of insurance, influenced by different institutional arrangements concerning ecosystem management?
- How does biodiversity’s function and use as an insurance relate to the other functions and uses of biodiversity?

Contributors

- **Baumgärtner, Stefan**

Biodiversity as insurance: an ecological-economic perspective

- **Loreau, Michel**

Biodiversity as insurance: The ecological perspective

- **Schläpfer, Felix; Schmid, Bernhard**

Biodiversity, ecosystem functioning, and ecosystem management: constant vs. changing environments and planted vs. naturally assembling communities

- **Perrings, Charles**

Biodiversity conservation and risk management in agriculture

- **Polasky, Stephen; Tilman David**

Diversity and ecosystem services

- **de Lara, Michel; Doyen, Luc**

Biodiversity and ecosystem sustainability in uncertain environments

Symposium 2: Pollination services

Chair

- **Claire Kremen**, Berkeley University, USA, ckremen@nature.berkeley.edu

Ecosystem services sustain human life, but human domination of the biosphere has led to rapid alterations in the composition, structure and functions of ecosystems, such that the natural capacity to provide services has been increasingly overwhelmed or eroded. Despite their tremendous importance and vulnerability to human activities, we possess little detailed ecological understanding of most ecosystem services. Crop pollination by unmanaged, native bees is one service that is now comparatively well studied and could serve as a model system for the restoration of ecosystem services in degraded, human-dominated landscapes, and is amenable to economic analysis.

Fifteen to 30% of the human food supply depends on animal pollinators, especially bees. Many farmers rely on managed colonies of the honey bee (*Apis mellifera*) to provide pollination during bloom but honey bees are not always the most effective pollinators of a given crop. In addition, the numbers of honey bee colonies, both domesticated and feral, has declined precipitously since the 1950s around the world due to the spread of the mite, *Varroa destructor*, leading to shortages. Recent studies show that native, unmanaged bee populations also provide significant pollination services to various crops, particularly on farms near to natural habitat.

In this symposium, contributors will present new syntheses of existing ecological studies documenting the role and value of wild bees in crop pollination, and detailing how wild bee communities respond to land use change and habitat alteration, both in agricultural and semi-natural landscapes. Contributors will discuss the variety of options available for replacing the natural service and the ecological/economic impacts of such replacements. They will describe novel techniques and incentives for managing pollination services across the landscape.

Contributors

- **Klein, Alexandra-Maria;** Steffan-Dewenter, Ingolf
Pollination services to crops from wild bees: relationship between landscape context, community composition and function
- **Kevan, Peter**
Monetary and ecological economics of pollination services
- **Kremen, Claire;** Potts, Simon; Vazquez, Diego; Williams, Neal
Predicting functional consequences of pollinator loss due to habitat alteration
- **Vergara, Carlos**
Introducing exotic species for crop pollination – pluses and minuses
- **Gemmill, Barbara;** Collette, Linda; Njoroge, Grace
Harvesting the pollination knowledge base: how much information is presently available to guide farmers and land managers on management of pollination services?
- **Regetz, James;** Kremen, Claire
Conservation, restoration and farm management: alternative scenarios for managing pollination services from wild bees on a landscape scale

Symposium 3: Biodiversity informatics: acquisition, analysis, archiving and applications

Co-chairs

- **James Edwards**, Global Biodiversity Information Facility (GBIF), Denmark, jedwards@gbif.org
- **Donald Potts**, US National Committee, DIVERSITAS University of California – Santa Cruz, USA, potts@biology.ucsc.edu

The Convention on Biological Diversity recognizes biodiversity as spanning three broad levels: molecular-genetic, species, and ecosystems. Interactions within and between levels produce synergistic emergent effects intimately involved with the ecological functioning of the natural world and the natural services on which humankind depends. Until recently, gathering and integrating information across levels was not feasible because available tools restricted most biodiversity studies to only one level. However, new informatics tools now make it possible to link information about genes and gene products to information about the relationships among species, to relationships with their habitats, and to biotic and abiotic information about those habitats. The essential component for successful integration across levels is linkage of all data to species-level information, derived mainly from natural history collection specimens and field observations that are incorporated into spatially-arrayed databases (e.g. GIS).

This symposium describes new developments in informatics approaches for exploiting primary biodiversity data for useful purposes within local, regional or global contexts. It also explores the design of systems for extracting and disseminating information in a variety of formats suitable for a great variety of users (from school children to research scientists to managers), and provides examples of the uses to which biodiversity informatics can be put.

Contributors

- **Canhosn, Vanderlei P.;** Lange Canhos, Dora Ann; de Souza, Sidnei; Fonseca, Rafael; Giovanni, Renato, Marino, Alexandre
The speciesLink Network: practical solutions for integrating, analyzing, synthesizing and visualizing biodiversity information

- **Lane, Meredith**
International Biodiversity Information Systems – GBIF

- **Olivieri , Silvio**
NGO roles in collection, curation and use of biodiversity information

- **Soberon M., Jorge**
Assessment of completeness of primary biodiversity data for inventories and estimation of species distribution areas

- **Thiele, Kevin**
Electronic dissemination of biodiversity data

- **Peterson, Alan T.**
Biodiversity information and informatics tools permit forecasting complex ecological phenomena

Symposium 4: Theoretical advances in evolutionary conservation biology

Chair

- **Ulf Dieckmann**, International Institute for Applied Systems Analysis, Austria, dieckmann@iiasa.ac.at

Evolution is the architect and custodian of all biological diversity. Evolutionary insights are thus indispensable for understanding the past, present, and future of diversity patterns and ecosystem properties observed in nature. With direct observation or manipulation of biodiversity evolution rarely being feasible, mathematical models are playing a key role in characterizing the ecological, evolutionary, and environmental factors that foster the formation, maintenance, and loss of species. Recently developed theory facilitates such understanding at three levels:

- Anthropogenic environmental changes have been identified as potent forces of rapid contemporary evolution, both in the lab and in the field. A particularly striking example is provided by evolution in response to heavy exploitation, with documented cases including plants, fish, and mammals. Accordingly, attempts at managing biological diversity and sustainable exploitation must account for such evolution if they are to be successful in the longer run.
- Second are new insights into the evolutionary dynamics of biodiversity formation and loss. While classical speciation theory emphasized the role of geographic isolation in triggering diversification, modern approaches have revealed how selection pressures originating from local ecological interactions may drive surprisingly rapid adaptive radiations. Likewise, current theory has uncovered the active role evolutionary dynamics may play in the loss of biodiversity: far from being a reliable agent of species preservation, natural selection itself may be the driver of species extinctions.
- Thirdly, the evolution and self-assembly of whole ecological communities and food webs is attracting mounting attention. Models have demonstrated how evolutionary change triggered by anthropogenic impacts on a single species can lead to coevolutionary cascades, sending evolutionary ripple effects through entire ecological communities and resulting in species extinctions that are unexpected as long as the underlying coevolutionary dynamics remain unappreciated.

Evolutionary processes as those outlined above are critical for understanding ecosystem composition, function, and stability. This symposium sets out to

review relevant scientific progress at the interface between evolutionary theory and biodiversity science.

Contributors

- **Dieckmann, Ulf; Ferrière, Régis**
Evolutionary conservation biology: an overview
- **Heino, Mikko**
Anthropogenic evolution as a driver of rapid biodiversity changes
- **Loeuille, Nicolas; Brannstrom, Ake; Dieckmann, Ulf; Loreau, Michel**
Emergence of complex size-structured food webs out of repeated adaptive radiation
- **Parvinen, Kalle**
Biodiversity losses through selection-driven extinctions

Symposium 5: Sustaining partnerships for community-based conservation

Co-Chairs

- **Kamal Bawa**, University of Massachusetts, USA, kamal.bawa@umb.edu
- **Ganesan Balachander**, The Ford Foundation, India, g.balachander@fordfound.org

Conservation of biological diversity in this heterogeneous world will eventually require a multiplicity of decentralized approaches combining principles of modern science with indigenous knowledge and practices. In recent years, after the disastrous results from Integrated Conservation and Development Projects (ICDPs), a number of small scale decentralized, community based conservation efforts have been initiated to conserve biodiversity and manage wild biological resources. These efforts invariably involve several organizations with complementary strengths. Such efforts raise several questions: (1) what is the extent to which these projects have been successful, (2) how should the success of small scale, community based projects be evaluated, (3) what are the main requirements for success in these efforts? and (4) how can the partnership be sustained and replicated?

The objective of the symposium is to bring together key participants involved in community based conservation projects to address these questions and discuss general principles emerging from experiences in the field. The symposium would benefit from conservation scientists and conservation practitioners. Speakers will be assembled from different parts of the world.

Contributors

- **Bawa, Kamaljit;** Balachander, Ganesan
Community-based conservation: experiences and lessons from case studies in India
- **García-Frapolli, Eduardo;** Ayala-Orozco, Barbara; Bonilla, Martha; Ramos-Fernandez, Gabriel; Toledo, Victor
Community conservation in the Otoch Ma'ax Yetel Kooh protected area: linking traditional knowledge and biodiversity conservation policies
- **Gómez-Pompa, Arturo;** Vergara, Carmen
Successful cases of community based management of biodiversity
- **Salafsky, Nick**
Evaluating success in community based initiatives in conservation
- **Southey, Sean**
Moving-to-scale: learning from grassroot successes
- **Sridhar, Aarthi;** Shanker, Kartik
Community based approaches to marine conservation in India
- **Toledo, Victor;** Moguel, Patricia
Biodiversity management and indigenous resistance in Mexico: regional case studies

Symposium 6: Oceans of biodiversity – discovering species, habitats and ecologies

Chairs

- **Pedro Martinez**, Deutsches Zentrum für Marine Biodiversitätsforschung, Forschungsinstitut Senckenberg, Germany, pmartinez@senckenberg.de
- **Mark J. Costello**, University of Auckland, New Zealand, m.costello@auckland.ac.nz
- **Carlo Heip**, Netherlands Institute of Ecology, The Netherlands, c.heip@nioo.knaw.nl

Although our Planet's oldest biodiversity and most phyla and classes are unique to the oceans, their habitats remain the least explored on Earth. Astonishing discoveries in the oceans continue to be made, such as new phyla, kingdoms of bacteria, kilometres of deep-sea coral reefs, and major sulphur-based ecosystems. For the past 200 years, marine biologists have tended to work at local and regional scales and within their own communities.

This has changed with the Census of Marine Life (CoML) having organized a global network of marine biologists so they are now thinking globally. Global level changes in top ocean predators, notably whales, sharks and other large fish, have already been demonstrated. Thus ocean ecosystems are changing because of human impacts before we even understand the natural patterns and gradients of biodiversity. These patterns will be best revealed by open access to data at global scales, such as by the CoML Ocean Biogeographic Information System (OBIS). Now marine biologists cannot only think globally but study hotspots and gradients of marine biodiversity at ocean and global scales.

Objectives

This symposium will present the latest findings in relation to the species, habitat and ecology aspects of marine biodiversity, including findings from CoML and OBIS. It will include:

- patterns and gradients of species richness across ocean coasts;
- review of how many species exist in the oceans and how many may exist;
- polar and deep-sea discoveries;
- recently discovered unusual habitats such as cold seeps.

Contributors

- **Brandt, Angelika;** Waegele, Johann-Wolfgang
Biodiversity in polar waters: role of the Antarctic and Arctic for speciation
- **Costello, Mark;** Mora, Camilo
Analysis of how many species are described and yet to be discovered in the oceans reveals gaps in biodiversity knowledge
- **Griffiths, Charles**
The unexplored marine biodiversity of Africa
- **Mora, Camilo**
Large scale patterns, processes and threats to reef fish biodiversity
- **Muthumbi, Agnes**
Marine Nematodes diversity along a depth transect in the Kenyan Coast (Western Indian Ocean)
- **Rex, Michael**
Existential deep-sea ecology: is the abyss a black hole sink?
- **Smith, Craig;** Levin, Lisa
From whale falls to oxygen minimum zones: recent discoveries of biodiversity in non-vent chemosynthetic ecosystems

Symposium 7: Ecohealth and conservation medicine: a new agenda for public health and biodiversity

Chair

- **Peter Daszak**, Executive Director, Consortium for Conservation Medicine, USA (Member SC-DIVERSITAS), daszak@conservationmedicine.org

The last three decades has seen an alarming number of high profile outbreaks of new viruses and other pathogens, many of them emerging from wildlife. The recent outbreaks of SARS, avian influenza and others highlight emerging zoonotic diseases as a key threat to global health. Similar emerging diseases have been reported in wildlife populations, resulting in mass mortalities, population declines and even extinctions. Other infectious diseases have continued to emerge in crop plants, causing widespread economic loss and hardship. These challenges to biodiversity, public health and the global economy demand new policy and research agendas. In this symposium, we present case studies of human, wildlife, plant diseases and novel collaborative strategies to deal with them. These include new international collaborations, the fusion of ecological, medical and socio-economic disciplines, and new outlets for research and policy.

Contributors

- **Daszak, Peter**

A new agenda for public health and conservation

- **Lampo, Margarita**

Ecological factors driving the spread and epidemic outbreaks of chytridiomycosis in the Andean region

- **Aguirre, Alonso**

The living ocean an evolving oxymoron: emerging diseases in marine ecosystems

- **Zepeda López, Héctor M.;** Aguirre, Alonso

The Mexico-USA border as a region of epizootiologic risk in wildlife

- **García-Guzmán, Graciela;** Pérez-Jiménez, Luis Alfredo; Trejo-Vázquez, Irma

Effect of forest fragmentation on plant-pathogen interactions in a seasonally dry tropical forest of Mexico

- **Kilpatrick, Marm A.;** Daszak, Peter; Kramer, Laura; Marra, Peter

The impact of West Nile virus on bird communities

Symposium 8: Implementing multilateral environmental agreements on biodiversity: balancing equity and effectiveness

Co-chairs

- **Kristin Rosendal**, The Fridtjof Nansen Institute, Norway, kristin.rosendal@fni.no
- **Klaus Riede**, Zoological Research Institute and Museum Alexander Koenig, Germany, k.riede.zfmk@uni-bonn.de

This symposium analyses the dynamics between equity and effectiveness in the implementation of multilateral environmental agreements (MEA) on biodiversity. Our aim is to trace conflict potential and examine the scope for synergies between conservation of biological diversity and equitable sharing of its use. Case studies focus on ecosystem management and MEA interaction, as well as MEA interaction in the field of access and benefit sharing relating to genetic resources and biological material. One case deals with the interaction between multilateral environmental agreements and aid mechanisms. Protected areas are still a current and favourite instrument for conservation. However, they often fail to fulfil expectations; many are still "paper parks", others are embedded in social conflicts.

Why is this tool so popular despite its inefficiencies and how can it be made more efficient regarding conservation and social equity? One study deals with transboundary conservation strategies and look into MEA co-operation and interaction in the field of migratory species; their wide distribution range lies mostly outside protected areas. Therefore, their conservation depends on management of agro-ecosystems, forests and fishery. The second set of case studies range from bioprospecting and the strategies of industrial actors to the effects of MEA interaction on domestic implementation of managing plant genetic resources for food and agriculture. A third case analyses how the ongoing international negotiations on harmonisation of patent law might affect access to genetic resources and biological material. In all of these cases from various sectors, implementation faces pressure both along the equity and the effectiveness dimension. We will analyse how this pressure is dealt with, and examine the scope for improved synergies among the relevant international agreements, as they may engender different measures in terms of behaviour change in target groups.

Contributors

- **Schei, Peter Johan**

Introduction

- **Aguilar Stoen, Mariel; Dhillon, Shivcharn; Rosendal, Kristin**

National jurisdiction – international dilemmas: bioprospecting within national borders

- **Andersen, Regine; Ramanna, Anitha**

Plant genetic resources for food and agriculture: effects of multilateral agreements in developing countries (part I)

- **Ramanna, Anitha**

Plant genetic resources for food and agriculture: effects of multilateral agreements in developing countries (part II)

- **Hufty, Marc**

Interaction between multilateral environmental agreements (MEA) and aid mechanisms in the case of protected tropical forests

- **Riede, Klaus**

Efficiency analysis of transboundary conservation strategies for migratory species

- **Rosendal, G. Kristin**

International patent law meets access and benefit sharing regulations: prospects for implementation?

Symposium 9: Biodiversity in agricultural landscapes: saving natural capital without losing interest

Co-chairs

- **Louise Jackson**, UC Davis, USA, lejackson@ucdavis.edu
- **Lijbert Brussaard**, Wageningen University, The Netherlands, lijbert.brussaard@wur.nl

Worldwide, many agricultural systems are in transition as farmers and social institutions strive to meet the demands for increased sustainability (productivity, environmental quality, and human well-being) that are needed to support the growing global human population. Agricultural biodiversity may be able to play a large role in the transition to sustainability. Different levels of biological organization (genes, populations, communities, and ecosystems) in agricultural landscapes perform functions and deliver services that sustain agriculture and the resources upon which agriculture depends. These include, for example, the value of: genetic diversity of traditional varieties and wild species for human adaptation to socioeconomic and environmental change; community assemblages that limit pest damage to crops thereby reducing off-farm inputs of pesticides; ecosystem functions such as nutrient cycling and retention that are derived from spatial and temporal biodiversity via rotations, cover crops, and conservation tillage; and the specific landscape-level interactions between agricultural and non-agricultural ecosystems that enhance resource availability and human well-being.

This symposium will address how agricultural landscapes can be managed to enhance the services provided by agricultural biodiversity within agroecosystems. It will also examine socioeconomic tradeoffs involved in conserving agricultural biodiversity for its ecosystem services and cultural benefits. The expansion of agriculture into shrinking habitats for wild species, thereby promoting their extinction in their constricted natural habitats, will also be considered. The presentations and panel discussion will present research strategies that demonstrate the importance of linkages between biologists and social scientists to monitor biodiversity, analyze ecosystem services provided by biodiversity, and guide decision making and policies regarding biodiversity in agricultural landscapes.

Contributors

First session: Agrobiodiversity and sustainable agriculture

- **Jackson, Louise;** Hodgkin, Toby; Pascual, Unai
Utilizing and conserving biodiversity in agricultural landscapes
- **Brush, Stephen;** Perales Rivera, Hugo
A maize landscape: cultural knowledge and agrobiodiversity in Mexico
- Vernon Heywood, **Alejandro Casas**
Towards a global plan of action for crop wild relative conservation and use
- **Brussaard, Lijbert;** de Ruiter, Peter
Soil food webs, biodiversity and agricultural sustainability
- **Altieri, Miguel**
Biodiversity and pest management in agroecosystems
- **Brown, George G.;** Hungria, Mariangela; Franchini, Julio Cezar; Souza, Rosinei A.; Kaschuk, Glaciela; Brandao Jr., Osvaldino; Periera, Alan A.; Brussaard, Lijbert; de Goede, Ron G.M.; Torres, Eleno
Conservation agriculture: making biodiversity work for integrated crop and soil management

Second session: Biodiversity at the interfaces between agricultural and neighbouring ecosystems

- **Jiménez-Osornio, Juan J.;** Rorive, Veronique; Gómez-Pompa, Arturo; Rodriguez-Luna, Ernesto; Allen, Michael F.; Tiessen, Holm
Thinking outside of the box: tropical conservation in both protected areas and the surrounding matrix
- **Joseph, Gladwin;** Kamal, Bawa
Scale-dependent approaches and institutions for conserving biodiversity at agriculture-forest margins
- **Pascual, Unai;** Perrings, Charles
The economics of biodiversity in agricultural landscapes
- **Stuart R. Harrop**

Globally Important traditional agricultural practices and systems- an examination of their context in existing multilateral instruments and policy dealing with biodiversity preservation

- **Meine van Noordwijk**, Susilo Kuncoro, Endri Martin, Laxman Joshi, Pornwilai Saipothong, Veronika Areskoug, Trudy O'Connor

Donkeys, carrots, sticks and roads to a market for environmental services: rapid agrobiodiversity appraisal for the PES – ICDP continuum

Panel Discussion: Perspectives of conservationists vs. agriculturalists: does agrobiodiversity hurt, help, or matter at all?

- Padulosi, Stefano; Hoeschle-Zeledon, I.; Shtapit, B.; **Hodgkin, Toby**
- **Garcia-Barríos, Luis**
- **Tomich, Tom**

Symposium 10: Global environmental change and biodiversity: integrating observations, experiments and models

Chair

- Paul Leadley, University of Paris at Orsay, France, paul.leadley@ese.u-psud.fr

Population declines and extinctions of plant and animal species due to human activities have been primarily caused by habitat destruction and degradation, overexploitation, and invasive species. Most conservation strategies have been designed to limit the negative effects of these human impacts on biodiversity. In the future, global environmental change - increasing temperature, changes in precipitation patterns, increasing atmospheric CO₂ concentration, N deposition, etc. - is likely to become a major factor influencing species abundance, distribution, and behavior. It is essential that we develop a sound scientific understanding of how global environmental change will modify biodiversity so that decision makers can be appropriately alerted to the possible effects of global change on biodiversity, conservation strategies can be adapted to account for environmental change, and assessments can be made of the potential effects of changes in biodiversity on ecosystem services.

A wide variety of observations, models, and experiments suggest that global environmental change has modified and will continue to modify biodiversity in important ways. All of these approaches - observations, experiments, and models - have strengths, but also have weaknesses that limit our ability to determine the reliability of predictions of the effects of global environmental change on biodiversity in the future.

This symposium is a follow-up to a workshop to be held in Paris in May 2005. The goal is to develop a research agenda that contributes to exchanges of ideas between fields of research, tests of hypotheses underlying models, and reflections on the use of observational and experimental studies. With this goal in mind, this symposium will bring together researchers 1) doing experimental work at the patch scale with elevated CO₂, warming, and N deposition, 2) modeling species response to climate change at regional scales using bioclimatic envelopes, 3) modeling shifts in plant species groups at global scales (DGVM models), and 4) analyzing observational data and developing biodiversity observation networks. We will be discussing the concrete steps that can be made improve our confidence in the ability to predict the effects of global environmental change on biodiversity by combining and comparing a variety approaches.

Contributors

- **Leadley, Paul**

Global environmental change and terrestrial biodiversity: integrating observations, models and experiments

- **Prentice, Collin Iain**

Dynamic Global Vegetation Models predict major shifts in biomes and plant functional types due to climate change

- Thullier, Wilfried; **Lavorel, Sandra**

Modelling species response to global change: recent advances and future directions

- **Roy, Jacques**

Can we predict organisms and communities responses to elevated CO₂?

Symposium 11: Spatial scale, distribution ranges, and large-scale patterns of species diversity

Chairs

- **Jorge Soberón**, Universidad Nacional Autónoma de México, jsoberon@xolo.conabio.gob.mx
- **Héctor T. Arita**, Universidad Nacional Autónoma de México, arita@ecologia.unam.mx
- **José Sarukhan**, Universidad Nacional Autónoma de México, sarukhan@servidor.unam.mx

The way in which local and regional processes interact to produce patterns of species diversity at different scales is currently a hotly debated topic. One way of analyzing such interaction is through the study of the spatial distribution of organisms at different scales. By examining the overlap in the distribution ranges of several species, one can measure the expected species richness of sites at different scales. Of course, several methodological and conceptual shortcomings must be taken into account when applying this procedure to avoid the oversimplification of complex patterns.

Mathematical models and empirical evidence have shown that the analysis of the spatial distribution of biodiversity measured as overlaps of distributional ranges can yield several interesting results both for theoretical and applied ecology. For example, the overlap patterns determine the patterns of species turnover, the shape of the species-area relationship (SAR), the type of curve for the local-regional species richness plots, and the patterns of complementarity among sites.

In this symposium, contributors will show both recent theoretical developments and applications aimed at the conservation of diversity at large scales. Topics covered by talks include conceptual and methodological issues regarding the analysis of the scaling of species diversity, the mathematical relationships between distribution and diversity, and the dynamics of such patterns through time. Additionally, the symposium will consider study cases involving regional, continental, and global species assemblages and applications to the identification and design of priority areas for conservation.

Contributors

- **Arita, Hector**

Species diversity and distribution: mathematical constraints and biological implications

- **Ceballos , Gerardo**

Global patterns of diversity and extinction in mammals: trends and perspectives

- **Martínez-Meyer, Enrique; Díaz-Porras, Daniel; Zambrano, Luis**

Ecological space, geographical space, and the abundance of species

- **Rahbek, Carsten**

Spatial scale, the perception of large-scale species-richness patterns and the role of geographical range sizes

- **Soberon, Jorge**

Measuring the beta component of species richness

- **Whittaker, Robert**

Conservation biogeography, spatial scale and prediction

Symposium 12: Biodiversity, human-well-being, and the Millennium Ecosystem Assessment

This symposium will start with short briefings, and will be held as a round table discussion between speakers and the audience.

Contributors

- **Daniel P. Faith**, The Australian Museum, Australia, dpfaithma@yahoo.com.au
- **Walt Reid**, Millennium Ecosystem Assessment, USA, reid@millenniumassessment.org
- **Harold Mooney**, Stanford University, USA, hmooney@jasper.stanford.edu
- **David Cooper**, Convention on Biological Diversity, Canada, david.cooper@biodiv.org

The Millennium Ecosystem Assessment (MA) was carried out between 2002 and 2005 and has involved more than 800 scientists. It includes an assessment of our current state of knowledge of biodiversity and ecosystem services and its focus corresponds well to the theme of the first OSC, "integrating biodiversity science for human well being". The MA has placed human well-being as the central focus for assessment, while recognizing that biodiversity has intrinsic and option values, and that people take decisions concerning ecosystems based on all these considerations. The MA consequently has addressed the consequences of biodiversity and ecosystem change for human well-being, and has analyzed the options available to enhance the conservation and sustainable use of biodiversity and contribute to human well-being. It is timely that the results of the MA be discussed in the context of the goals of DIVERSITAS and the OSC's focus on the promotion of a more integrative biodiversity science.

The MA biodiversity symposium will present assessment results describing trends and current status of biodiversity, scenarios for future change in biodiversity, and response options for conserving biodiversity. The presentations will address different aspects of biodiversity, including both losses of local populations and global species extinctions.

In addressing the causes and trends relating to of biodiversity loss, the symposium will include presentation of the potential consequences for biodiversity of four scenarios developed by the MA. The symposium also will

examine biodiversity response strategies in the context of their bearing on human well-being in: 1) conserving a source of current and future goods and services; and 2) creating synergies and trade-offs of biodiversity conservation with other needs of society, including sustainable use of biological resources. A final objective of the symposium will be exploration of the links from MA results to strategies for addressing the 2010 biodiversity target, and to the Convention on Biological Diversity.

Symposium 13: Freshwaters: sustaining biodiversity and system integrity

Chair

- **Robert J. Naiman**, School of Aquatic & Fishery Sciences
University of Washington, USA, naiman@u.washington.edu

In December 2003, the United Nations General Assembly adopted a resolution proclaiming 2005 to 2015 as an International Decade for Action – ‘Water for Life’. This resolution calls for a greater focus on water-related issues and development efforts, and recommits countries to achieving the water-related goals of the 2000 Millennium Declaration and of Agenda 21. The ‘Water for Life’ resolution comes at a time when the biodiversity of fresh waters faces unprecedented and growing threats from human activities and, if current trends in habitat change and human demands for water increase, the opportunity to conserve much of the remaining freshwater biota will be lost by 2015 when the ‘Water for Life’ decade ends. In response, the Freshwater Committee within DIVERSITAS has launched a global effort focused on the ecological and social aspects of freshwater biodiversity. This effort is aimed at discovering the breath of biodiversity, quantifying the ecological services provided, and articulating how freshwater biodiversity contributes to human sustainability. This symposium represents an initial effort to provide a synthesis of priority issues related to the world’s freshwater systems.

Symposium speakers examine several highly pressing and broadly applicable issues related to biodiversity by using freshwaters as model systems. Topics addressed include valuing freshwater biodiversity, common myths and perceptions about biodiversity, methodologies for scaling, importance of variability in sustaining biodiversity, determining if biodiversity conservation can be successful at the community level, the effects of agriculture and aquaculture on freshwater systems, and examining the emerging frontier of microbial diversity in regulating system-scale processes. As these issues transcend freshwaters, the presentations will inform discussions about the value and uses of biodiversity in a rapidly changing world. An overarching goal is to elucidate key factors allowing improvements to global freshwater biodiversity.

Contributors:

- **Naiman, Robert J.**
Introduction
- **Gessner, Mark O.;** Naiman, Robert J.; Soto, Doris; Stiasny, Melanie
Evidence and myths surrounding common perceptions about freshwater biodiversity
- **Sullivan, Caroline;** O'Keeffe, Jay
Confronting the realities of using biodiversity: is Nature a free good? (with apologies to Adam Smith)
- **Kawabata, Zen;** Fuhrman, Jed
Does viral diversity drive the freshwater world?
- Arthington, Angela; **O'Keeffe, Jay;** Naiman, Robert J.; Dudgeon, David
Environmental requirements to sustain freshwater biodiversity: importance of flow variability
- **Knowler, Duncan;** O'Keeffe, Jay
Valuing freshwater biodiversity: a conceptual model and simulation
- **O'Keeffe, Jay;** Soto, Doris; Naiman, Robert J.
Drivers of freshwater biodiversity: differences between rivers and lakes
- **Soto, Doris;** Arthington, Angela; O'Keeffe, Jay; Sullivan, Caroline
Intensive food production (agriculture/aquaculture) effects on freshwater biodiversity and remediation perspectives

Symposium 14: Phylogeny and biodiversity science

Chair

- **Michael J. Donoghue**, Yale University, michael.donoghue@yale.edu

This symposium will highlight progress on the Tree of Life and provide examples of the ways in which this new understanding can illuminate studies of biodiversity, including identifying patterns of biodiversity across the landscape (hot/cold spots), patterns of movement in the past/future, changes in diversity through time and community assembly, and the evolution of key functional traits and the conditions surrounding their origins.

Contributors

- **Cracraft, Joel**

Knowledge of the tree of life: an essential foundation for biodiversity science and a sustainable world

- **Lutzoni, Francois;** Arnold, A. Elizabeth; Kauff, Frank; Miadlikowska, Jolanta; Reeb, Valerie

Symbioses and their roles in the origin and maintenance of diversity

- **Magallon, Susanna**

The early evolutionary diversification of eudicots (tricolpate angiosperms)

- **Sanmartín, Isabel**

Phylogenies and the radiation of animals around the northern and southern hemispheres

- **Lohmann, Lucia;** Winkworth, Richard

A phylogenetic approach to understanding contemporary diversity patterns in Bignoniaceae (Bignoniaceae)

- **Ree, Richard**

A phylogenetic framework for comparing regional species diversities, applied to four floristic hotspots

- **Faith, Daniel**

Phylogenetic diversity (PD) provides biodiversity surrogates information that can enhance the contribution of DNA barcoding programs to conservation planning

- **Wiens, John J.;** Donoghue, Michael

A phylogenetic perspective on global biodiversity patterns

Symposium 15: Forest biodiversity and carbon sequestration

Chair

- **Michael Scherer-Lorenzen**, Swiss Federal Institute of Technology, Switzerland, michael.scherer@ipw.agrl.ethz.ch

There is currently a great deal of interest in the value of forests as carbon sinks and in reforestation schemes aimed at carbon sequestration. However, forests are more than just carbon pools: forests cover much of the terrestrial landscape, provide many other important ecosystem services and house much of the world's threatened biodiversity.

Forest management and reforestation projects for carbon sequestration should therefore also take biodiversity considerations into account. However, there is currently little information on the relationship between biodiversity and ecosystem functioning of forests. Do higher levels of local tree diversity increase carbon sequestration, decrease it, or leave it unaffected? Whatever the effect, systems need to be developed that incorporate the consideration of biodiversity into the design of reforestation projects for carbon sequestration and into forest management practices.

This symposium aims to advance the understanding of the functional ecology of forests and tree plantations with a special focus on carbon sequestration. The symposium will:

- Examine evidence from forest inventory data and observations of permanent plots in natural forests.
- Present the first results from a new network of tree plantation biodiversity experiments that encompass four terrestrial biomes (temperate forest, boreal, neo- and paleo-tropical).
- Describe the need for new economic models that assess the costs and benefits of enhancing tree diversity in plantations and of preserving or restoring diversity in managed forests.
- Synthesize the results of the biodiversity and carbon storage workshop held in Malaysian Borneo in September 2005 and highlight needs for future research.

Contributors

- **Kitayama, Kanehiro;** Lee, Ying Fah; Nakashizuka, Tohru
The synergy between carbon sequestration and the conservation of biological diversity in tropical rain forests, Sabah, Malaysia
- **Philipson, Christopher;** Hector, Andrew; Godfray, Charles; Glen, Reynolds; Saner, Philippe
The Sabah biodiversity experiment: functional ecology of dipterocarps and carbon sequestration in enrichment-planted secondary forests
- **Koricheva, Julia;** Vehvilainen, Harri
Effects of tree stand diversity on insect herbivory
- **Scherer-Lorenzen, Michael;** Don, Axel; Schulze, Ernst-Detlef; Schumacher, Jens
Examining tree diversity effects on ecosystem functioning: the BIOTREE project
- **Kirby, Kate;** Potvin, Catherine
Opportunities for combining carbon sequestration and biodiversity conservation in an indigenous territory of Eastern Panama

Symposium 16: Wildlife conservation and economic development in East and Southern Africa

Co-chairs

- **Stephen Polasky**, University of Minnesota, USA, spolasky@appec.umn.edu
- **Erwin Bulte**, Tilburg University, The Netherlands, e.h.bulte@uvt.nl

East and Southern Africa are home to some of the richest concentrations of wildlife and some of the poorest people in the world. A major issue facing these regions is how to simultaneously promote economic development while at the same time conserving its rich heritage of wildlife. Traditionally, wildlife used to roam between protected areas and adjacent lands. While there exist various threats to wildlife conservation, the main threat in many areas is the gradual conversion of grazing grounds into agricultural fields. This development threatens the survival of certain species and the ecosystem at large, compromising the set of eco-services that the system is able to generate. Such ecosystem services create benefits that to a large extent spill over to the international community. Any costs incurred by conservation, however, are borne mainly at the local level. This creates inefficient incentives and may cause opposition to conservation by local people.

There is a need to develop analytical and numerical models of wildlife conservation in rural systems to gain understanding of how humans and wildlife may coexist in a dynamic system. This implies bringing together ecological knowledge about the dynamics of the ecosystem and its interacting components, and socio-economic knowledge about the dynamics of human societies and its interaction with other components of the system. Integrated models will generate predictions on the evolution of the system under various conditions, and allow analysis or simulation of various forms of policy intervention. The symposium will (i) evaluate the prospects of wildlife and human populations in an integrated systems modelling approach; (ii) evaluate the impact of policies on conservation and development; (iii) discuss the sharing of benefits generated by wildlife conservation and ecosystem services; (iv) and establish cooperation between different groups working in this area.

Contributors

- **Benhin, James;** Rashid, Hassan

The economics of cattle and wildlife ranching in the Transvaal Province of South Africa: implications for biodiversity and living standards

- **Bulte, Erwin**

Ecoservice payments in the Amboseli system, Kenya

- **Nkedianye, David**

Biodiversity payment schemes in East African Savannas: problematic half solutions or untapped opportunities?

- **Polasky, Stephen;** Costello, Christopher; Calvin, Cathleen

Linking humans and ecosystems: an integrated modelling approach to the Serengeti Ecosystem

- **Skonhofs, Anders**

Tourism and wildlife in a dynamic model

Symposium 17: Remote sensing: methods and applications to assess, monitor and manage biodiversity loss

Co-chairs

- **Donald Potts**, US National Committee, DIVERSITAS
University of California - Santa Cruz, USA, potts@biology.ucsc.edu
- **Harini Nagendra**, Fellow, Ashoka Trust for Research in Ecology and the Environment (ATREE), India, nagendra@atree.org

Advances in the spatial and spectral resolution of remotely sensed data sensing have made it increasingly feasible for ecologists to map the spatial distribution of individual species, assemblages or communities, and use this information to prioritize conservation strategies. While “appropriateness” of an approach is constrained by costs, available infrastructure, state of development of a region, personnel and training, useful remote sensing techniques are proliferating, their costs and ease of use are declining rapidly, and the internet is increasingly providing global support for local activities that could not be done by relying only on local resources and expertise.

This symposium describes several recent developments and new applications of remote sensing for establishing baselines at individual, population, and community levels; for habitat characterization; for obtaining uniform quality and intensity of data over large areas; and for detecting changes of many kinds. Examples span a variety of spatial scales; cover terrestrial and marine habitats; and include animals and plants from different geographic regions. The variety of approaches will help to define the body of knowledge needed as a basis for environmental policy decisions to manage and conserve biodiversity. Special attention will be given to how remote sensing can best be applied to biodiversity issues in tropical developing countries, where high species diversity, greater human pressures, spatial and temporal dynamics, and complexity of biodiversity distributions make the task of monitoring from space conceptually far more challenging than in temperate regions.

Contributors

- **Martini, Brigitte**

Biodiversity applications of hyperspectral and hyperspatial remote imaging

- **Jupiter, Stacy; Potts, Donald**

Mapping, monitoring and managing biodiversity in tropical coastal zones: a watershed approach evaluating land use impacts on mangroves and nearshore reefs

- **Andrefouet, Serge**

Direct and indirect ways to assess biodiversity in coral reef environments using remote sensing

- **Nagendra, Harini; Pareeth, Sajid**

Integrating satellite image analysis with field data for a multi-scale assessment of local institutions and biodiversity distribution in Nepal

- **Webb, Edward; Ha, Thi**

Using RS/GIS to model forest cover change in Thue Thien Hue, Vietnam: implications for biodiversity conservation

- **Jürgens, Norbert**

Towards a global biodiversity observation system: a standardized multi-scale monitoring study of the African continent

Symposium 19: Marine biodiversity and ecosystem functioning

Co-chairs

- **Carlos M. Duarte**, Spanish Research Council, Spain, carlosduarte@imedea.uib.es
- **Carlo Heip**, The Netherlands Institute of Ecology, The Netherlands, c.heip@nioo.knaw.nl
- **David M. Paterson**, University of St Andrews, UK, d.paterson@st-and.ac.uk

Marine systems have been stable and inhabited for far longer than most terrestrial systems, yet investigations of the biodiversity/functionality relationships have lagged behind their terrestrial counterparts. However, from an evolutionary (origin of life, establishment of the oxygenic atmosphere), spatial (global surface coverage or volume) or functional (carbon fixation, nutrient recycling) standpoint it is arguable that the marine habitat is of greater global significance than terrestrial systems.

The nature of the functionality of aquatic systems is also different from terrestrial systems. Water is a more viscous medium than air and this has important implications for aquatic ecology and dynamics. Transport processes under aquatic conditions support rapid (adjective) exchange rates, and support the development of steep physical and chemical gradients and rapid biological processing.

The ecosystem services provided by marine systems are well-recognized and various indices of functionality are used. In addition, many aquatic systems can and have been used to develop experimental approaches to functionality research, either in the field or through the construction of synthetic laboratory systems. The validity of these approaches is open to debate particularly where scale relationships can be challenged. However, a spate of recent work has led to a rapid advance in this important area of ecology. The European Commission has funded its first network of excellence: to examine Marine Biodiversity and Ecosystem functioning (MARBEF) and it is therefore timely to hold a symposium, to bring together leading experts in this field and to examine the state-of-the-art and provide a platform for future research. The symposium guest speakers will cover aspects varying from chemical ecology, ecosystem processes and the evolutionary theory of niche construction.

The objectives of the symposium are to:

- Provide a benchmark for the status of biodiversity/functionality research
- Identify the strategic progress that is required in the near future
- Establish cooperative links between areas of activity and promote further research
- Help to address the simple question “How much does diversity matter?”

Contributors

- **Duarte, Carlos M.**; Alvarez, Elvira; Diaz-Almela, Elena; Marbá, Nuria
Seagrass decline in the Mediterranean: impacts on ecosystem services
- **Emmerson, Mark**
Nature's constraints and the functioning of food webs
- **Cano, Mercedes**, Beatriz Martinez, Rosa del Valle, Fransisco Montalvo, Lidice Clero, Ricardo Sanchez
Health state of seagrass beds in Sabana-Camagüey Archipelago, Cuba
- **Ianora, Adrianna**
Role of marine natural products in maintaining biodiversity and ecosystem functioning
- **Solan, Martin**
Marine benthic biodiversity and ecosystem functioning in complex natural systems
- **Stephen Hawkins**, P. Moore, M.T. Burrows, E. Poloczanska, N. Mieszkowska, P. Moschella, J. Bishop, S. Nielsen, P. Masterson, A.J. Southward
Global environmental change impacts on marine biodiversity: implications for ecosystem functioning

Symposium 20: Diversity, diversification processes and conservation of high mountain biota

Co-chairs

- **Irene Till-Bottraud**, Laboratoire d'Ecologie Alpine, CNRS, France, irene.till@ujf-grenoble.fr
- **Mary Kalin Arroyo**, Center for Advanced Studies in Ecology and Research on Biodiversity, University of Chile, Chile, southern@uchile.cl

The symposium aims at assessing diversity (specific and intra-specific) and exploring diversification processes on high mountain biota in order to identify emerging research issues across worldwide mountain biota.

Assessment of the extent of mountain biodiversity is the first step in the global understanding of biodiversity. First we will review existing knowledge of diversity in alpine biota, and critically assess the tools available for this assessment. Secondly, we will address the broad and small scale diversification patterns and processes acting at different biological scales (communities, species and populations) considering approaches such as phylogeny, phylogeography, ecology and population biology.

We specifically wish to address these issues on different types of organisms (plants, animals and microorganisms) and to bring together scientists from different countries/continents in order to build bridges across disciplines and countries.

Contributors

- **Kalin Arroyo, Mary**

Diversity and diversification processes in high elevation habitats - using the South American Andes as a model to set the stage

- **Cavieres, Lohengrin; Callaway, Ragan**

Facilitation and its consequences on local species-richness in the alpine: examples from the Andes of Southern-South America

- **Coyne, Jerry; Lachaise, Daniel; Llopart, Ana**

Processes of diversification and altitudinal hybrid zone in insular montane biotas: the case of *Drosophila santomea* and *D. yakuba* in Sao Tome Island

- **Schmidt, Steven; Costello, Liz; Meyer, Al**

Seasonal dynamics of alpine soil organisms: implications for understanding the functioning of alpine systems

- **Stoecklin, Juerg**

Intraspecific differentiation, adaptation and gene flow at the landscape level in alpine plants.

- **Till-Bottraud, Irène; Kalin Arroyo, Mary; Torres, Cristian**

Genetic variation in the alpine; linking genetic diversity, breeding system and population dynamics

- **Winkworth, Richard**

The evolution of alpine plant diversity

Symposium 21: Biodiversity and litter decomposition: a cross-systems perspective

Co-chairs

- **Mark O. Gessner**, Eawag, Swiss Federal Institute of Aquatic Science and Technology, Switzerland, gessner@eawag.ch
- **Stephan Hättenschwiler**, Centre d'Ecologie Fonctionnelle et Evolutive, CNRS, France, hattenschwiler@cefe.cnrs-mop.fr

Plant litter decomposition is an ecosystem process nearly on par in importance with primary production by vascular plants. An array of organisms differing in biological organization and functional capacities mediate the process. They range from small detritivorous invertebrates to bacteria and fungi. This variety suggests a large scope for mutualistic and competitive interactions among decomposers and consequent biodiversity effects on litter decomposition. Such effects may be further reinforced by the diversity of plant litter found under mixed vegetation.

Although exploration of biodiversity effects on litter decomposition has lagged behind assessing effects on primary productivity, several groups are currently investigating diversity-decomposition relationships from different perspectives. The proposed symposium aims at bringing them together to discuss the following questions: Does plant litter decomposition respond to changes in species richness in a similar way as vascular plant production? Which aspects of biodiversity matter most: plant litter, microbial or detritivore diversity? Are response patterns the same across different types of diversity? What are the commonalities and differences between terrestrial and aquatic systems? Thus, the two main objectives of the symposium are to evaluate current evidence on the functional importance of various facets of biodiversity on litter decomposition, and to assess the scope of variation across terrestrial and aquatic ecosystems. The sharing of ideas at the symposium should be an opportunity to start building a common framework for unravelling the significance of biodiversity to litter decomposition as a key component of the global carbon cycle.

Contributors

- **Bardgett, Richard**

Linkages between aboveground and belowground communities: the importance of substrate diversity

- **Bracht Jorgensen, Helene; Hattenschwiler, Stephan**

Does soil microbial diversity matter for ecosystem functioning?

- **Dang, Christian; Lecerf, Antoine; Chauvet, Eric; Gessner, Mark**

Role of fungal diversity in litter decomposition: what do stream microcosms experiments tell?

- **McKie, Brendan; Malmqvist, Björn**

Detritivore diversity and leaf decomposition in streams: placing richness-ecosystem functioning relationships in context

- **Swan, Christopher; LeRoy, Carri**

Interactive effects of leaf diversity with species composition and detritivore foraging on litter decomposition in streams

- **Wall, Diana; Mark St., John**

Faunal diversity in the soil food web and its implications for ecosystem processes

- **Hättenschwiler, Stephan, Mark O. Gessner**

An attempt to synthesise biodiversity effects on decomposition: how comparable are terrestrial and aquatic systems?

Symposium 22: Understanding and managing biodiversity conflicts

Co-chairs

- **Rehema White**, Centre for Ecology and Hydrology, UK, rmwh@ceh.ac.uk
- **Irene Ring**, UFZ Centre for Environmental Research, Germany, irene.ring@ufz.de
- **Steve Redpath**, Centre for Ecology and Hydrology, UK, smre@ceh.ac.uk

Effective environmental management is an important component of sustainable development but is often hampered by conflicts that arise between biodiversity conservation and other goals. A range of economic, social and ecological drivers can initiate conflicts with latent origins or that arise from new developmental pressures. Violent clashes may be seen around some protected areas and in disputes over commercial harvesting of natural resources in regions of high biodiversity.

Some conservation-livelihood conflicts are locally specific and require local solutions.

However, other conflicts are national or international: solutions must be sought at the appropriate scale. Moreover, many of the underlying issues are generic and perspectives from different regions are crucial in building general and applicable solutions. The integration of biodiversity management, economic development and people's livelihoods requires a multi-level governance perspective, considering public as well as private actors. An interdisciplinary and applied approach is required to understand and mitigate existing conflicts and to develop models to predict and mitigate future conflicts. Both the bridging of natural and social sciences in biodiversity research and the involvement of stakeholder groups are prerequisites to build consensus for successful conservation and reconciliation strategies. The science of biodiversity conflict management is now a rapidly developing field that addresses this biologically and socially relevant issue. Only within this holistic framework can environmental management reverse biodiversity decline.

This symposium will address biodiversity conflicts from the perspective of ecologists, economists and social scientists. The experiences of academics, government officials and NGO practitioners will be sought to bridge the gap between theory and practice. The presentations will review the role of an interdisciplinary approach and case studies will focus on integrated approaches

to understanding and managing specific conflicts. Speakers from a broad spectrum of countries will give the symposium an international perspective.

Contributors

- **White, Rehema;** Redpath, Stephen
A framework to predict, understand and manage biodiversity conflicts
- **Ring, Irene;** Ferreira dos Santos, Rui
Integrated evaluation of policy instruments in biodiversity conflict reconciliation
- **Rozzi, Ricardo;** Jax, Kurt
Linking ecology and ethics in a pro-active conflict management approach in the extreme south of the Americas
- **Marfo, Emmanuel**
Managing forest conservation-mining conflicts in Ghana: the role of actor-empowerment
- **Mishra, Charudutt**
Understanding and managing human-snow leopard conflicts in the Himalaya
- **Stone, Suzanne Asha;** Fascione, Nina; Haney, Christopher; Schrader, Gina; Thurston, Linda; Weiss, Amaroq
Nature of the beast: managing conflict associated with wolf conservation in the USA Northern Rockies
- **Snow, Timothy V.**
The effects of rural community awareness and conflict resolution programmes on reducing the threats of agro-chemicals on biodiversity

Aguilar Stoen, Mariel; Dhillon, Shivcham; Rosendal, Kristin

National jurisdiction - international dilemmas: bioprospecting within national borders

University of Oslo, Norway, m.c.a.stoen@sum.uio.no

Symposium 8 - Implementing multilateral environmental agreements on biodiversity: balancing equity and effectiveness

The Convention on Biological Diversity outlines a framework for facilitating access to genetic resources and benefit sharing between users and providers of genetic resources. The CBD is a multilateral agreement aiming at governing relations between countries; hence, search and use of genetic resources by national actors within the borders of their own country are not subject to CBD regulations. Still, national bioprospectors collaborate with foreign industry, universities, or other bioprospectors. This often entails exchange of genetic material, extracts or information about the resources collected by the former in their own country. Here, we explore the challenges that this type of cooperative exchange entails for sharing benefits between CBD parties.

We use a qualitative multi-case approach to address the question.

Our preliminary findings demonstrate that a networked cooperation between public and private actors in developing countries and developed countries and between public and private actors in developed countries has emerged. New strategies for bioprospecting have become increasingly common, such as bioprospecting texts, databases and existing collections of biological material. At the same time the activities have expanded to marine ecosystems, in both tropical and temperate waters. The emergence of these new strategies make very difficult to address the issue of benefit sharing, as it is almost impossible to identify whom to share benefits with. In addition, governments in developing countries are passive in relation to the negotiation of agreements leaving the responsibility resting in the shoulders of the organizations that collect material (often public universities and research institutes). However, it seems that even if governments in developed countries are more active and interested in outlining guidelines, the issue of benefit sharing remains elusive.

Keywords: bioprospecting, benefit sharing, access, CBD, genetic resources

Aguirre, Alonso

The living ocean an evolving oxymoron: Emerging diseases in marine ecosystems

Wildlife Trust, USA, aguirre@wildlifetrust.org

Symposium 7 - Ecohealth and conservation medicine: a new agenda for public health and biodiversity

Emerging infectious diseases, mass mortality events, harmful algal blooms, and anomalous changes in selected marine species abundance and composition -- occurrences which can be defined as major marine ecological disturbances -- may signal a decline in ecosystem health. There is currently an effort by many scientists to examine the systemic health threats to marine vertebrate species, including marine mammals, as they relate to marine environmental health. Unprecedented number of emerging and re-emerging diseases such as brucellosis in dolphins, aspergillosis in coral reefs and morbillivirus infections linked to large-scale marine mammal die-offs have occurred in recent times. Marine turtles are facing a worldwide epidemic of fibropapillomatosis and Florida manatees have been identified harboring skin tumours caused by a papillomavirus with unknown long-term impacts to these

endangered species. One proactive method of trying to get a handle on this large-scale problem of disease emergence and resurgence is by surveying sentinel species. Sentinel species are the proverbial “canaries in the mineshaft”. They serve as indicators of their environment and may reflect the quality of health in marine ecosystems. The single species approach may provide a series of “snap shots” of environmental changes to determine if animal, human or ecosystem health may be affected. Marine vertebrates are good integrators of changes over space and time and represent excellent sentinels of ecosystem health. The sentinel species concept can be useful for providing an “early warning” system of emerging diseases or for monitoring the course of disease related activities requiring prevention, remediation or control. We have identified a number of critical research needs and opportunities for transdisciplinary collaboration that could help advance the use of sentinel species in ecosystem health and monitoring of disease emergence.

Keywords: oceans, ecosystem health, biodiversity, emerging diseases, sentinel species

Altieri, Miguel

Biodiversity and pest management in agroecosystems

University of California, Berkeley, USA

Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

The instability of agroecosystems, which is manifested as the worsening of most insect pest problems, is increasingly linked to the expansion of crop monocultures at the expense of the natural vegetation, thereby decreasing local habitat diversity. The inherent self-regulation characteristics of natural communities are lost when humans modify such communities through the shattering of the fragile thread of community interactions. Agroecologists maintain that restoring the shattered elements of the community homeostasis through the addition or enhancement of biodiversity can repair this breakdown. A key strategy in sustainable agriculture is to reincorporate diversity into the agricultural landscape and manage it more effectively. Emergent ecological properties develop in diversified agroecosystems that allow the system to function in ways that maintain soil fertility, crop production, and pest regulation. The main approach in ecologically based pest management is to use management methods that increase agroecosystem diversity and complexity as a foundation for establishing beneficial interactions that keep pest populations in check. This is particularly important in underdeveloped countries where sophisticated inputs are either not available or may not be economically or environmentally advisable, especially in the case of resource -poor farmers.

Keywords: biodiversity, agroecology, biological control, pest management, agroecosystems

Andersen, Regine; Ramanna, Anitha

Plant genetic resources for food and agriculture: effects of multilateral agreements in developing countries (part I)

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Symposium 8 - Implementing multilateral environmental agreements on biodiversity: balancing equity and effectiveness

Biological diversity is usually associated with wild animals and plants, and there is generally less political awareness of the importance of genetic diversity in agriculture for plant breeding and food security. This paper is about the management of plant genetic resources for food and agriculture and how different international agreements have affected this management in developing countries. It will focus on the issue of access to these vital resources, since that is particularly important for their future existence and for food security. The international agreements affecting such access are the Convention on Biological Diversity (CBD), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), its predecessor, the International Undertaking on Plant Genetic Resources (IU), the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), and the Convention for the Protection of New Varieties of Plants (UPOV).

A key finding is that these international agreements have, as an aggregate effect, restricted access to plant genetic resources for food and agriculture, despite explicit intentions (the CBD and the ITPGRFA/IU) and implicit expectations (TRIPS and UPOV) in the opposite direction. The explanation is to be found in their interaction. Implications and consequences for developing countries will be pointed out and illustrated with examples from the Philippines. The results will be discussed in an equity-effectiveness perspective. An important factor contributing to restricted access to plant genetic resources for food and agriculture in developing countries is the tension between the demands for intellectual property rights and demands for fair and equitable benefit sharing. A discussion of the trade-offs between the equity dimension related to the demands for benefit sharing and the effectiveness dimension related to the norm of facilitating access might uncover viable paths to deal with the problem.

Keywords: plant genetic resources, multilateral agreements, interaction, India, Philippines

Andrefouet, Serge

Direct and indirect ways to assess biodiversity in coral reef environments using remote sensing

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Symposium 17 - Remote sensing: methods and applications to assess, monitor and manage biodiversity loss

Biodiversity is a field of study that includes many folders. Census of diversity and richness is only one aspect. Understanding how biodiversity was created, and how biodiversity force ecological and geological processes make another important field. Finally, the conservation and uses of biodiversity is a crucial societal and environmental topic. Here, we present how a variety of remote sensing products can be used for these applications with a focus on coral reef environments, from the global scale to the scale of microbial mat community pigmentation.

The Millennium coral reef mapping project aims to characterize and map detailed geomorphology attributes worldwide, for every coral reefs on the planet. Nearly 1700 Landsat 7 ETM+ images have been used for this purpose, and the products currently serve biodiversity applications with regional biogeographic perspectives. Down the levels of biological organizations, many reef-scale habitat map products optimized locally for a given reef are also used to assess microflora, macroflora, fish, invertebrates and coral community structures, in conjunction with better understanding of the spectral signatures of each of these taxa. Current optimal data

include commercial multispectral sensors (IKONOS, Quickbird) and a handful of airborne or satellite hyperspectral sensors. Several reef-scale and community-scale examples will be discussed including fish community prediction in New Caledonia, giant clam community structure in Tuamotu atoll lagoons, algal dynamics in Tahiti barrier-reefs, and characterization of microbial population in Tuamotu atolls rims. To conclude, a generic scheme showing multi-scale linkages between remote sensing technology and biodiversity applications will be presented.

Keywords: remote sensing, millennium coral reef mapping, scale, habitat, community structure

Arita, Hector

Species diversity and distribution: mathematical constraints and biological implications

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Symposium 11 - Spatial scale, distribution ranges, and large-scale patterns of species diversity

A current area of research is aimed at understanding the spatial patterns of diversity. At different scales, biogeographers, community ecologists, and macroecologists all look for repetitive patterns in nature to elucidate the factors that promote biological diversity and that determine its distribution. At the crux of the problem lies the analysis of the distribution of organisms. From local communities to continental floras and faunas, the way in which individuals of different species distribute to occupy available space determines the spatial patterns of species diversity.

We have examined mathematical relationships between species diversity and the spatial distribution of species that allow the analysis of patterns at different scales. Such mathematical models provide predictions that can be contrasted with patterns found in real assemblages of species. Our goal is to find biologically relevant patterns in nature that cannot be explained by those constraints.

We used databases on the distribution of North American mammals to examine spatial patterns of diversity and distribution. We built null models based on the predictions of the models and contrasted patterns with real assemblages. We used two new types of plots (species-range plots) to explore patterns among species and among sites.

We confirmed the influence of mathematical constraints on the arrangement of possible values of species diversity and species distribution. However, we also found patterns that deviate from the predictions of null models, allowing the identification of species of concern in terms of their rarity and incidence, and the identification of critical sites in terms of their unusual diversity or presence of restricted species. Species assemblages obey mathematical constraints, but do show patterning caused by macroevolutionary processes.

Keywords: species diversity, range size, null models, North America, mammals

Arthington, Angela H.; **O’Keeffe, Jay**; Naiman, Robert J.; Dudgeon, David

Environmental requirements to sustain freshwater biodiversity: importance of flow variability

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Symposium 13 - Freshwaters: sustaining biodiversity and system integrity

There is growing awareness that the natural variability of river flows and wetland water regimes sustains key features of aquatic ecosystems. This perception has been captured in the 'natural flow-regime paradigm', which identifies six ecologically important components of river flows – their magnitude, frequency, timing, duration, rate of change and predictability. These flow components act as drivers of aquatic biodiversity by shaping the morphology of river channels and floodplains, providing habitat diversity and connectivity in space and time, as well as seasonal stimuli and conditions suitable for migration, reproduction and growth of aquatic species. International efforts to implement the 'natural flows paradigm' in the form of Environmental Water Allocations (EWA) have produced new techniques to describe flow regimes in ecologically meaningful terms, and 'holistic' environmental flow methods to translate hydrological information into ecological responses. This paper traces recent developments and current challenges for scientists, managers and society. The greatest challenge for science is to develop methods and models for predicting the ecological outcomes of flow manipulations. The greatest challenge for managers is to design and operate water infrastructure and abstraction systems in ways that maintain essential flow variability in the short, medium and long-term. The greatest challenge for society is to use water wisely so rivers and their floodplains can continue to supply essential ecological goods and services upon which we all depend for our health, wealth and well-being.

There is growing awareness that maintenance of natural variability in river flows and wetland water levels is essential to underpin the conservation of freshwater biodiversity and ecological goods and services provided by aquatic ecosystems. In the European Water Framework Directive sustainable water management embodies the achievement of 'good ecological status', echoing water management policy and legislation around the world. In the past decade, international effort to implement the 'natural flows paradigm' in the form of EWA that mimic natural flow patterns has led to the development of new techniques to describe flow regimes in ecologically meaningful terms, and 'holistic' environmental flow methods to translate hydrographic information into ecological responses. This paper traces these developments, touching on EWA methods, implementation and outcomes. From this synthesis we address the current challenges, particularly the question: How can we overcome scientific uncertainties associated with predicting the outcomes of flow manipulations? We outline progress with GRSP, designed to quantify the role of the hydrologic regime as a major driver of aquatic biodiversity, ecosystem processes and provision of goods and services. GRSP's objective is to provide scientific foundations for the protection and restoration of river flows to promote conservation of aquatic biodiversity, productivity and ecosystem resilience. An early task is a literature review that identifies quantitative relationships between aspects of the 'natural' hydrologic regime (water quantity, timing, frequency and duration of floods, low or no flows, flow predictability, etc.), biodiversity, ecosystem processes and provision of goods and services. GRSP proposes the establishment of a global program of river restoration studies, monitoring and adaptive management, linked to research on flow-related ecological processes in various bioclimatic regions (tropical, temperate, arid, polar). **Keywords:** environmental water allocations, rivers, floodplains, sustainability, biodiversity

Balian, Estelle; Lévêque, Christian; Martens, Koen; Segers, Hendrik
An assessment of animal species diversity in continental waters

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Symposium 13 - Freshwaters: sustaining biodiversity and system integrity

The status and trends of freshwater biodiversity need to be monitored to quantify human impact on freshwater systems and to improve freshwater biodiversity conservation. Current projects carrying assessment of freshwater biodiversity focus mainly on leading- better-known groups, or identify keystone species and/or endemic freshwater systems for conservation purposes. Our aim is to complete these approaches by providing quantitative estimates of species numbers for all freshwater groups on each continent and/or major eco-regions.

The project consisted in: (1) compiling data from literature, web sites and museum collections; (2) contacting scientific experts of each group to provide an estimate of species numbers 'to the best of their knowledge'. Here, we consider as "true freshwater species", those that complete part or all their life cycle in freshwater, and "water dependant species" those that need freshwater for food or that permanently use freshwater habitats.

The order of magnitude for known freshwater animal species diversity worldwide is 100,000, half of which are insects. Among other groups, there are some 20,000 vertebrate species; 10,000 crustacean species and 5,000 mollusc species that are either true freshwater or water dependant species.

The study highlighted gaps in the basic knowledge of species richness at different scales:

(1) Some groups such as Protozoa, nematodes or annelids have been less studied and data on their diversity and distribution is scarce. Because current richness estimates for these groups are greatly biased by knowledge availability, we can expect that real species numbers might be much higher.

(2) Continents are unequally studied: South America and Asia are especially lacking global estimates of species richness for many groups, even for some usually well-known ones such as molluscs or insects.

Keywords: freshwater, continental waters, animal diversity, species richness, global assessment

Bardgett, Richard

Linkages between aboveground and belowground communities: the importance of substrate diversity

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Symposium 21 - Biodiversity and litter decomposition: a cross-systems perspective

There has been much recent interest in the effects of plant species diversity and composition on ecosystem functioning. To date, most research in this area has focused on predicting the consequences of plant species richness on plant productivity, and the debates surrounding this issue are well rehearsed. There is now a growing body of literature that examines how plant species richness (living and dead plant parts) influences the structure and diversity of soil communities and their functioning. This talk will focus on one particular aspect of this issue, examining how changes in the composition and diversity of substrates entering soil from plants - primarily in the form of litter - influence the structure and dynamics of soil microbial

communities, and how this in turn influences processes of nutrient cycling. I will illustrate this by drawing on data from a range of experiments that show how: (1) resource inputs (litter and exudates) to soil from individual plants can act as important drivers of belowground properties of decomposition and nutrient release, and how these effects vary depending on particular plant traits; and (2) how changes in the diversity and composition of resource inputs to soil can similarly influence belowground properties. Overall, the talk aims to show how changes in the diversity and type of resource that enter soil from plants can act as important drivers of ecosystem properties.

Keywords: plant diversity, soil biota, plant litter, nutrient cycling, exudates

Baumgärtner, Stefan

Biodiversity as insurance: an ecological-economic perspective

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Symposium 1 - The insurance value of biodiversity

Biodiversity provides insurance by stabilizing the provision of ecosystem services which are being used by risk-averse economic agents. I present a conceptual ecological-economic model that combines (i) recent results from ecology about the relationships between biodiversity, ecosystem functioning, and the provision of ecosystem services with (ii) economic methods to study decision-making under uncertainty. In this framework I (1) determine the insurance value of biodiversity, (2) study the optimal allocation of funds in the trade-off between investing into biodiversity protection and the purchase of financial insurance, and (3) analyze the effect of different institutional regimes in the market for financial insurance on biodiversity protection. I conclude that biodiversity acts as a form of insurance for risk-averse ecosystem managers against the over- or under-provision with ecosystem services. Therefore, biodiversity has an insurance value, which is a value component in addition to the usual value arguments, such as direct or indirect use or non-use values. In this respect, biodiversity and financial insurance are substitutes. The availability, and exact institutional design, of financial insurance, thus, influences the level of biodiversity protection.

Keywords: biodiversity-stability-relation, ecosystem services, natural capital, insurance, uncertainty

Bawa, Kamaljit; Balachander, Ganesan

Community-based conservation: experiences and lessons from case studies in India

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Symposium 5 - Sustaining partnerships for community-based conservation

Community based conservation is assumed to enhance ecological, economic and social benefits of conservation. However, there are very few efforts that have systematically evaluated the success of community-based conservation initiatives. We present the results of a case study from the Biligiri Rangaswamy Hills in Southwest India that was intended to confer ecological and economic benefits to Soligas, the indigenous people of the region. Soligas harvest non timber forest products from the region, and the objectives of the project were to assist Soligas develop better harvesting techniques, monitor and manage extraction levels, diversify

plant products for sale, as well as develop micro enterprises based on non timber forest products to enhance their income and foster conservation. The site specific results from the Biligiri Rangaswamy Hills are then compared with a more comprehensive analysis of several community based projects throughout India. The larger study incorporates a framework to measure success along ecological, economic and social dimensions. The efforts in Biligiri Rangaswamy Hills were moderately successful, but overall, very few projects could demonstrate success along three dimensions. The region-wide analysis however revealed important factors that promote or constrain success. More important the analysis showed the importance of developing a rigorous design for natural resource-based projects along the three dimensions mentioned above. We also discuss other lessons learnt from our site specific and regional analyses.

Keywords: community-based conservation, India, Indigenous people, case studies, conservation initiatives

Benhin, James; Rashid, Hassan

The economics of cattle and wildlife ranching in the Transvaal Province of South Africa: implications for biodiversity and living standards

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Symposium 16 - Wildlife conservation and economic development in East and Southern Africa

Cattle ranching in the rangelands of former Transvaal Province of South Africa was the most important economic activity over a long period of time. However, game ranching is replacing cattle. The relative profitability of game ranching is driven by the demand for the relative high quality of the dry wildlife meat and by the high demand for hunting for recreational purposes. This trend has implications for wildlife conservation in the region and also the living standards of the locals.

Cattle ranching and, game ranching may have different implications for biodiversity. Cattle grazing have impacts on individual plants or species, plant communities, soils and watersheds, and wildlife. In addition each of these impacts has secondary or ecosystem-level effects. Heavy grazing may directly alter plant species composition and productivity, as well as animal population. It may also indirectly affect invertebrate species, which often play an important role in the maintenance of the stability in ecosystems.

The shifts in land use over the period are market driven and these same forces may be responsible for changes in biodiversity in this part of South Africa. This paper identifies the specific driving force for these shifts in the use of the land and how these shifts may have influenced wildlife conservation in the region, associated changes in biodiversity, and the living standards of the locals in the Transvaal Province.

The paper uses a cost-benefit approach to assess the relative incentives for the choice of either game or cattle ranching and its trickling effects on the local population. It then extends the discussion using a stylised optimal control model to investigate the role of cattle and game ranching on the Provinces' biodiversity and ecosystem and the extent of the influence of market forces in the shifts in economic activity and its implications.

Keywords: biodiversity, cattle, living standards, rangelands, wildlife

Bracht Jorgensen, Helene; Hattenschwiler, Stephan
Does soil microbial diversity matter for ecosystem functioning?
CNRS, France

Symposium 21 - Biodiversity and litter decomposition: a cross-systems perspective

One gram of soil can contain billions of individuals of microorganisms belonging to thousands of different species. The majority of these species are found within the same trophic level of primary decomposers. Present evidence suggests a high degree of redundancy within the microbial community, which implies that a loss of microbial species has no or only marginal effects on ecosystem functioning.

However, since less than 10% of all soil microorganisms can be cultured, the species-specific functional properties remain unknown, making a comprehensive assessment of the functional role of microbial diversity extremely difficult.

Additionally, substrate availability for microbial decomposers may differ substantially at small spatial scales influencing the diversity of the active part of microbial communities to a great extent. The aims of the presentation are to summarize the current knowledge on the consequences of changing microbial diversity for decomposition processes in terrestrial systems, and to discuss most recent results from an ongoing experiment. This last study focuses on the small-patch scale to quantify the influence of microbial diversity on decomposition. Our hypothesis is that the decomposer community differs with the composition of leaf litter and thereby drives litter decomposition and nutrient dynamics. We manipulate substrate availability by varying leaf litter diversity in microcosms placed in a tropical rain forest in French Guyana. All possible combinations of leaf litter from four different tree species are placed on the soil surface with free access for microorganisms. Fungal- and bacterial biomass is evaluated by PLFA-analysis and differences in fungal communities in response to different litter diversity treatments is assessed by fungal DNA analysis (RFLP).

Keywords: ecosystem functioning, microbial diversity, leaf litter diversity, substrate availability, decomposition rate

Brandt, Angelika; Waegele, Johann-Wolfgang

Biodiversity in polar waters: role of the Antarctic and Arctic for speciation

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Symposium 6 – Oceans of biodiversity: discovering species, habitats and ecologies

We present data on the origin and diversity of the abyssal fauna, exemplified with peracarid isopods of the Atlantic sectors of the polar oceans, faunas that have been studied extensively in the past years, especially in the Southern Ocean. Contrary to the Antarctic shelf which is well isolated and where the zoogeographic distribution of the Isopoda is well documented, knowledge of the Southern Ocean deep-sea species is scarce. However, the recent expeditions ANDEEP I-III (ANTarctic benthic DEEP-sea biodiversity: colonisation history and recent community patterns) have yielded many interesting results. It is shown with phylogenetic methods that the deep-sea fauna has a complex history, some lineages being old, while speciation is still ongoing, also within more recent lineages conquering the deep sea in polar areas. Sampling along transects increased our knowledge of the horizontal distribution of single species and the percentage of hitherto undescribed species. Differences in the diversity between Arctic and Antarctic habitats will be discussed as well as the zoogeography and endemism of the Southern Ocean deep-sea Isopoda.

Keywords: Antarctica, deep sea, benthos, marine, speciation

Brown, George G.; Hungria, Mariangela; Franchini, Julio Cezar; Souza, Rosinei A.; Kaschuk, Glaciela; Brandao Jr., Osvaldino; Periera, Alan A.; Brussaard, Lijbert; de Goede, Ron G.M.; Torres, Eleno

Conservation agriculture: making biodiversity work for integrated crop and soil management

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

Soil microorganisms and animals are an essential part of agrobiodiversity and perform functions vital for agricultural productivity and sustainability. Their activity and biodiversity may be useful indicators of soil quality, ecosystem disturbance and the integrity of ecosystem functioning. Conservation agriculture and the adoption of no-tillage (NT) in the tropics is finally reversing physical, chemical, and biological soil degradation; in Brazil, 19 M ha are now devoted to NT. To evaluate the effect of different management practices on below-ground biodiversity, we monitored several long-term field trials in Southern Brazil, including 2-25 yr NT and crop rotations based on soybean (*Glycine max*) or common bean (*Phaseolus vulgaris*). C- and N-microbial biomass and metabolic microbial efficiency were always higher in NT than in conventional tillage (CT) systems and were enhanced by legumes in the rotation. Bacterial and fungal genetic diversity, evaluated by the DGGE analysis, were also higher under both NT and rotation systems including legumes. Diversity of rhizobial strains (assessed by PCR-RFLP) was also higher under NT, although species diversity was not always higher. The environmental stability offered by the NT system may decrease total species diversity, but simultaneously increase genetic diversity within each species. Soil macrofauna diversity was higher in NT (16-18 orders) than in CT (12-13 orders), while rotations seemed to have a secondary effect. Tillage selected for resistant organisms, and in its absence a more diverse, yet more "fragile" assemblage was able to persist, performing a larger number of functions. The results obtained emphasize the benefits of NT and crop rotation with legumes, but also indicate a poor understanding of the complex relationship between soil biodiversity and sustainability and the challenges to adequately evaluate and monitor soil quality.

Keywords: microbial diversity, soil fauna, tillage, sustainable agriculture, soil quality

Brush, Stephen; Perales Rivera, Hugo

A maize landscape: cultural knowledge and agrobiodiversity in Mexico

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

The ecology of maize in Mexico, its centre of domestication and diversity, has been researched for several decades. While the broad outlines of farmer knowledge, diversity, and dynamics of native maize populations are known at the farm and national levels, these topics are less well known at the landscape level. This paper reviews the background of research on cultural knowledge about maize and recent research on maize diversity and ecology at the landscape level. Case study material from different regions in Mexico is used to evaluate theoretical and methodological approaches and data from Chiapas is presented and used to illustrate the role of

knowledge and other cultural components in understanding the ecology of maize diversity in Mesoamerica.

Keywords: maize, culture, Mexico, traditional knowledge, crop diversity

Brussaard, Lijbert; de Ruiter, Peter

Soil food webs, biodiversity and agricultural sustainability

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

Agricultural production depends on the availability and management of resources, such as labour (man and animal), capital, machinery, fuel, seeds, water, nutrients, crop residues, manure and pesticides. Agricultural sustainability is related to the time frame within which non-declining plant and animal production is strived for; the time frame within which the resources are renewed or remain available at levels to attain such production; and the time frame within which agriculture remains financially sufficiently profitable to support the farmer's livelihood. To achieve sustainability the farmer has to manage the biodiversity at the farm. Obviously, this pertains to the "planned biodiversity", i.e. the crops and/or livestock the farmer wishes to produce, but also to the "unplanned" biodiversity, i.e. all other biota in, and entering the system. That biota may be considered beneficial, such as insects pollinating the crop, or harmful, such as pathogens, pests and weeds.

Most of the biodiversity resides in soil. Food web interactions among the soil biota (including plant roots) have large effects on the quality of crops (affecting human and animal nutrition or other utility) and the incidence of soil-borne plant and animal pests and diseases (affecting production levels). This is because the availability of water, nutrients and certain micro-organisms at the root surface is mediated by such interactions, largely through their effects on soil organic matter and soil structure. In our presentation, we will argue that the dynamics of soil organic matter and soil structure are closely related to the elements of soil biodiversity and that the stability of the soil food web is pertinent to the sustainability of agro-ecosystems.

Keywords: soil, foodweb, biodiversity, agriculture, sustainability

Bulte, Erwin

Ecoservice payments in the Amboseli system, Kenya

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Symposium 16 - Wildlife conservation and economic development in East and Southern Africa

Kenya is home to some of the richest concentrations of wildlife and some of the poorest people in the world. One area with large conservation value is the Amboseli region, and here, as well as in other regions, the issue is how to promote economic development while at the same time conserving the rich heritage of wildlife. While there exist various threats to wildlife conservation, the main threat in Amboseli is the gradual conversion of grazing grounds into agricultural fields – the Maasai sell or lease their lands to farmers from other regions in Kenya, or start cultivating their land themselves. This development threatens the survival of certain species and the ecosystem at large, compromising the set of (international) eco-services that the system is able to generate. The sustainability of the agricultural practices is also subject of debate. In this study we (i) conduct a cost-benefit analysis to evaluate

whether implementation of an eco-services payment scheme based on external funding is welfare increasing, (ii) develop numerical simulation models to explore how different payment schemes affect the incentives of Maasai to use their lands, and how in turn their behaviour affects wildlife abundance, and (iii) draw policy recommendations based on our findings.

Keywords: transfers, ecosystem services, elephants, simulation, pastoralist

Canhos, Vanderlei P.; Lange Canhos, Dora Ann; de Souza, Sidnei; Fonseca, Rafael; Giovanni, Renato, Marino, Alexandre

The speciesLink Network: practical solutions for integrating, analyzing, synthesizing and visualizing biodiversity information

Centro de Referência em Informação Ambiental - CRIA, Brazil, vcanhos@cria.org.br
Symposium 3 - Biodiversity informatics: acquisition, analysis, archiving and applications

Biodiversity information is essential for decision making, but most of it is neither readily available nor accessible. However, recent developments are making possible new capabilities for digitizing, analyzing and visualizing biodiversity information. One formidable challenge that lies ahead is the integration of data from local, regional and global initiatives into a shared information infrastructure that will be useful to all. The speciesLink Network is a distributed information system that is being created to integrate primary specimen data from biological collections in real time, in support of the development of means to conserve and sustainably use the biodiversity of the State of São Paulo, Brazil. The speciesLink Network takes advantage of the most current advances in communication protocols and database management systems. It uses free and open source software, mirroring techniques, and Internet 2 connectivity. The project is developing tools to clean, analyze, synthesize and visualize biodiversity data from associated biological collections in Brazil. These tools include: openModeller, a species distribution modelling framework; spOutlier, an on-line tool to detect outliers in latitude, longitude and altitude; and geoLoc, a geo-referencing tool. The speciesLink Network is being developed by CRIA within the framework of the "Biota FAPESP Virtual Institute of Biodiversity" program that was launched in March 1999. It is integrating data from approximately 60 projects that involve more than 800 scientists and students who are working at local research institutions and abroad. This presentation will describe the information architecture that has been adopted for the speciesLink Network, its system functionalities, and the strategy for integrating this information system with other local, regional and global initiatives.

Keywords: biodiversity, informatics, biological, collections, networks

Cano, Mercedes, Beatriz Martinez, Rosa del Valle, Fransisco Montalvo, Lidice Clero, Ricardo Sanchez

Health state of seagrass beds in Sabana-Camagüey Archipelago, Cuba

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Symposium 19 - Marine biodiversity and ecosystem functioning

Sabana-Camagüey Archipelago, located in the north central zone of Cuba, occupies an approximate area of 8 311 km². It comprises large extensions of seagrass beds, which stand out among the different marine ecosystems because of the high biodiversity they harbour. The GEF/UNDP Project CUB/98/G32 has supported

actions for consolidating biodiversity protection in the Sabana-Camagüey ecosystem. These actions included the assessment of the conservation state of seagrass beds and biodiversity between March 2001 and March 2003. The most important results of the assessment were that seagrass beds are in good state in the zones having larger exchange with the ocean. The most critical areas are the inner parts of the bays; in some of them seagrass beds have disappeared, and their recovery is not significant at present. Hypersalinity, high nutrient levels, decrease in water transparency, and the employment of dangerous fishing arts are among the factors that affect this ecosystem. It was verified that the worsening of these factors affects biodiversity and damages the species of interest for conservation or economic reasons. There is a governmental will to foster the coastal zone integrated management in this region, carried out by a monitoring program for seagrass beds, in order to detect the changes and evaluate the recovery of the affected zones, once these fishing arts are substituted by other less dangerous, and the contaminant load is reduced in the impacted zones.

Keywords: marine biodiversity, ecosystem health, seagrass, corals, Cuba

Cavieres, Lohengrin; Callaway, Ragan

Facilitation and its consequences on local species-richness in the alpine: examples from the Andes of Southern-South America

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Symposium 20 - Diversity, diversification processes and conservation of high mountain biota

Facilitation is a non-trophic interaction between species that increases the average individual fitness of at least one of the species involved, without negatively affecting any of the other species. In alpine habitats, facilitation tends to increase with elevation due to the altitudinal increase in environmental harshness. This suggests that local species richness at a particular elevation is highly dependent on the presence of facilitator species and on the magnitude of the facilitative process. We studied the altitudinal variation of species association to cushion plants at different sites in the Chilean Andes, and assessed how facilitation changes with elevation, the mechanisms involved, and the consequences for species richness at the local scale. Presence/absence of species within and outside cushion plants was registered at two contrasting elevations in the Andes of the Chilean Patagonia (50°S) and central Chile (33°S). For each site and elevation, the amount of positive associations with cushions were estimated through randomization analyses, and the total species richness within and outside cushions estimated with rarefaction procedures. In the Andes of the Chilean Patagonia, facilitation increase with elevation, and the thermal amelioration performed by cushions appears to be the most important mechanism. Cushion species increase species richness at the local scale ca. 50%. In contrast, in the central Chilean Andes which is much more xeric, facilitation by cushion species is more important at lower elevations, where the wetter soils provided by cushions appear to be the most important mechanism. In the central Andes cushion species can increase species richness ca. 30%. Facilitative interactions are crucial for the maintenance of species richness and community structure in alpine habitats, but facilitative mechanisms vary with the abiotic environment.

Keywords: facilitation, alpine habitats, species richness, community structure, Andes

Ceballos, Gerardo

Global patterns of diversity and extinction in mammals: trends and perspectives

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Symposium 11 - Spatial scale, distribution ranges, and large-scale patterns of species diversity

Population and species extinctions shows an accelerating decay of contemporary biodiversity. While impacts of human activities are global in scope, they are not uniformly distributed. The biota of certain countries and regions can be identified as being most at risk, having both exceptionally diversity and exceptionally rapid rates of anthropogenic change. Since resources for conservation are limited, ecologists must provide managers and politicians with solid bases for establishing conservation priorities to minimize extinctions, to reduce conservation conflicts, and to preserve ecosystem services. Here we conduct a global examination of mammal distributions to evaluate conservation priorities based on (i) range size distribution, (ii) global patterns of species richness, (iii) the minimum area required to preserve one population or 10% of the range of each species, and (v) conservation conflicts in priority areas.

We created maps for 4795 land mammal species. To evaluate the minimum area required for preserving a minimum of ten percent of the range of each species. We used the best solution of a MARXAN program to represent our global conservation management network. We used a datasets to estimate the proportion of each cell that is occupied by cropland and human population density.

A combination of rarity, anthropogenic impacts, and political endemism put about a quarter of terrestrial mammal species, and a larger fraction of their populations, at risk of extinction. The complementarity analysis for selecting priority areas for conservation shows that some 11% of Earth's land surface should be managed for conservation to preserve at least 10% of terrestrial mammal geographic ranges. Different approaches, from protection (or establishment) of reserves to countryside biogeographic enhancement of human-dominated landscapes, will be required to approach this minimal goal.

Keywords: biodiversity, conservation, mammals, conflict, reserves

Costello, Mark

**Role of biodiversity informatics in data publication
(with marine examples)**

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Symposium 3 - Biodiversity informatics: acquisition, analysis, archiving and applications

Costello, Mark; Mora, Camilo

Analysis of how many species are described and yet to be discovered in the oceans reveals gaps in biodiversity knowledge

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Symposium 6 - Oceans of biodiversity: discovering species, habitats and ecologies

Most species, especially of smaller sized organisms, have yet to be described; so species are going extinct before man has ever known them. Predictions of how many species exist have included expert opinion, extrapolations from the proportions of species in one habitat or area to another, body-size relationships to species numbers; and from species–area relationships. However, a checklist of the number of known species has not been produced.

The all-taxon European Register of Marine Species (ERMS) was used to analyse species discovery rates, and a novel statistical approach predicted the numbers of species remaining to be discovered with confidence limits. This statistically rigorous method of predicting the numbers of species is based on verifiable data and accounts for variation in discovery rates, and can be applied to other regions and taxa.

Adding the species listed in ERMS to estimates of omitted taxa, and the predicted number yet to be described, indicated there were about 38,400 species in European seas. Although only 6% of the species may remain to be described, discovery rates remain high, especially for worms and smaller crustaceans. Only mammals, reptiles and birds can be considered adequately described. Outside of Europe up to 90% of some marine taxa may remain to be described. Estimates of how many marine species are described range from 200,000 to 300,000, and estimates of how many million exist remain guess-work.

An online catalogue of all marine species will improve communication about what is known, and thus save time wasted in describing already known species and enable more correct usage of species names. New explorations of marine biodiversity will be focused and stimulated by showing taxonomic and geographic areas (gaps) where the highest rates of discovery will occur.

Keywords: discovery rates, taxonomy, marine, gap analysis, biodiversity

Coyne, Jerry; Lachaise, Daniel; Llopart, Ana

Processes of diversification and altitudinal hybrid zone in insular montane biotas: the case of *Drosophila santomea* and *D. yakuba* in Sao Tome Island

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Symposium 20 - Diversity, diversification processes and conservation of high mountain biota

Taking the Cameroon Volcanic Line, an archipelago of oceanic and continental rainforest 'islands' extending 2000km from Guinea Gulf Islands to Cameroon high volcanoes as an example and *Drosophila* as a model we focus on the mechanisms triggering biodiversity in tropical montane biota. Analysing altitudinal hybrid zones allows to understand how much gene flow between sympatric entities can occur while they still remain distinct. Sympatric clusters may differ at only a few loci while showing substantial introgression throughout the rest of the genome, or sister species may exchange genes freely for only few traits while selection maintains distinctness for the majority of genes.

D. yakuba occurs in open lowland habitats on Sao Tomé, while the endemic *D. santomea* is restricted to misty forests at higher elevations up to 2024m. At mid elevations they form a hybrid zone where sterile male and fertile female hybrids have been found. We studied polymorphism and divergence patterns in 29 different regions throughout the genome, including mtDNA and 3 genes on the Y chromosome, to determine the extent of gene flow between these species.

This multilocus approach allowed us to distinguish between forces that should affect

some genes (such as introgression) and forces that should act on all genes (such as common ancestry). Our results show that *D. yakuba* mtDNA has replaced that of *D. santomea*, and there is detectable introgression for only two nuclear genes, yellow and Salr. The majority of genes, however, have remained distinct.

These two species therefore do not conform a « hybrid swarm » in which disruptive selection maintains distinctness for only few traits while the rest of the genome shows substantial introgression. Our data suggest that specific regions of the genome introgress more readily than others and regions linked to genes causing species-specific adaptations –like coping to montane conditions- might be limited in their ability to move between species.

Keywords: tropical mountains, speciation, hybrid zones, introgression, *Drosophila*

Cracraft, Joel

Knowledge of the tree of life: an essential foundation for biodiversity science and a sustainable world

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Symposium 14 - Phylogeny and biodiversity science

Phylogenetic relationships are little appreciated as the underlying framework for a predictive comparative biology and biodiversity informatics, biological inventory and discovery, delineating global patterns of diversity and its history, understanding the historical assembly of ecosystems and biotas, and for numerous contributions to global sustainability. This talk presents an overview of the crucial role of phylogenetics.

The last decade has seen a near exponential increase in papers resolving portions of the Tree of Life (TOL). These results, along with the analytical tools used to discover phylogenetic relationships, have had a profound impact on many sectors of society that support efforts toward global sustainability: human health (vaccine design, drug discovery, identifying and tracking infectious and emerging diseases), agriculture (crop improvement, pest control and identification), ecosystem management (identification and tracking of invasives), and forensics (epidemiology, bioterrorism control).

The inventory and discovery of diversity depend on phylogenetic knowledge because it is the scaffold of hierarchical classification systems. Such classification schemes, moreover, make biology comparative, and thus are the key to creating predictive information systems (phyloinformatics). Phylogenetics is also essential for describing patterns of diversity through space and time.

In order to make sense of the history of taxonomic and ecological diversity, and to support efforts toward sustainability, more TOL research is needed. Only a small portion of Earth's diversity has been placed on phylogenetic trees. Moreover, a major international effort is needed to create a globally supported, phyloinformatics infrastructure that can comparatively integrate biodiversity data sets through node-based data mining.

Keywords: phylogeny, phylogenetics, classification, sustainability, phyloinformatics

Dang, Christian; Lecerf, Antoine; Chauvet, Eric; Gessner, Mark

Role of fungal diversity in litter decomposition: what do stream microcosms experiments tell?

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Symposium 21 - Biodiversity and litter decomposition: a cross-systems perspective
Given the importance of litter decomposition in streams and the central role of fungi in the process, we addressed three aspects of the relationship between fungal diversity and decomposition: (i) the effect of fungal diversity on decomposition rate; (ii) its role in generating high-quality food for fine-particle consumers through the release of spores; and (iii) the consequences for leaf conditioning and thus detritivore feeding. Results of microcosm experiments show that, on average, rates of fungal leaf decomposition and spore production are not affected by reduced fungal diversity, suggesting that functional redundancy among fungal decomposers is high. However, reduced fungal diversity decreased leaf ingestion by a common litter consumer, the amphipod *Gammarus fossarum*, which implies that fungal diversity can indirectly affect decomposition rate. In addition, the variability of fungal process rates consistently increased when species numbers declined; this effect can be explained by a mechanism known as statistical averaging or portfolio effect, which is moderated by the degree of evenness of fungal communities. We conclude that a range of direct and indirect effects needs to be considered when evaluating the significance of microbial diversity on litter decomposition in streams.

Keywords: diversity, decomposition, fungi, detritivores, microcosms

Daszak, Peter

A new agenda for public health and conservation

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Symposium 7 - Ecohealth and conservation medicine: a new agenda for public health and biodiversity

There is a growing awareness of the connections between biodiversity and health and for the need to integrate the disciplines of conservation biology, ecology, microbiology, the human medical and veterinary sciences and others. This follows increasing recognition of the environmental and ecological drivers of emerging diseases such as SARS, avian influenza and others. These emerging zoonotic diseases are paralleled by a series of high impact emerging diseases of wildlife such as amphibian chytridiomycosis: diseases that cause population declines and even extinctions of wildlife. Finally, an often-overlooked threat to conservation and human well-being are a series of diseases emerging in wild and agricultural plants. In this talk, I review common themes among the underlying drivers of these diseases and their impact on human health, well-being and conservation. I will propose that these diseases and our new understanding of their similarities represent a challenge to research and policy. I will propose a new agenda to address the challenge that brings multi-disciplinary teams of investigators to quantify the underlying environmental drivers of emerging diseases, then predict and prevent their emergence.

Keywords: conservation medicine, ecohealth, emerging diseases, economy, disease

Dieckmann, Ulf; Ferrière, Régis

Evolutionary conservation biology: an overview

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Symposium 4 - Theoretical advances in evolutionary conservation biology

As anthropogenic environmental changes spread and intensify across the planet, conservation biologists have to analyze dynamics on increasingly large spatial and temporal scales. Ecological and evolutionary processes are then closely intertwined.

In particular, evolutionary responses to anthropogenic environmental change can be so fast and pronounced that conservation biology can no longer afford to ignore them.

This opening talk of Symposium 4 will provide an overview of recent advances in understanding the evolutionary dimensions of conservation biology. The following perspectives will be discussed:

- (1) the exploitation of living resources is likely to cause rapid contemporary evolution.
- (2) compared with the rapid pace of evolutionary deterioration, evolutionary recovery may be very slow.
- (3) modest amounts of biodiversity might occasionally be recovered through rapid adaptive speciation.
- (4) adaptive evolution may often act as an active driver of population extinctions.
- (5) evolutionary responses to environmental change must be expected to cascade through ecosystems.

Open questions to be addressed by future research in evolutionary conservation biology are as follows. Which characteristics of species and which features of environmental change foster or hinder evolutionary responses in ecological systems? How do such responses affect population viability, sustainable yield, community dynamics, and ecosystem functioning? Under which conditions will evolutionary responses ameliorate, rather than worsen, the impacts of environmental change?

Keywords: evolution, conservation biology, speciation, selection-driven extinction, evolutionary cascades

Duarte, Carlos M.; Alvarez, Elvira; Diaz-Almela, Elena; Marbá, Nuria
Seagrass decline in the Mediterranean: impacts on ecosystem services
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Symposium 19 - Marine biodiversity and ecosystem functioning

Reports of seagrass, *Posidonia oceanica*, decline throughout the Mediterranean suggest the widespread decline of these ecosystems. The rates and patterns of decline are, however, unknown, and projections of the future status of Mediterranean seagrass meadows are, therefore, impossible at present.

Direct census, involving repeated counts of tagged plants in replicated plots, were used to assess the rates of mortality, recruitment and net population growth of 40 *Posidonia oceanica* distributed across the Mediterranean Sea. The results revealed that mortality rates exceeded recruitment rates in most of the meadows, which were, therefore, in decline. Projections of the decline rates suggest that the meadows will lose about 50 % of their density in one decade, involving major losses in key ecosystem services and functions associated to this ecosystem. We conclude that *Posidonia oceanica* experiences widespread decline in the Mediterranean, where these ecosystems are under high pressure. Conservation efforts must be enhanced to reduce and, if possible, revert the decline rates, to maintain these ecosystems and the marine biodiversity they contain, as well as the services they provide to society.

Keywords: seagrass, Mediterranean, marine biodiversity, ecosystem function, forecast

Emmerson, Mark,
Nature's constraints and the functioning of food webs
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Symposium 19 - Marine biodiversity and ecosystem functioning

Predicting the consequences of biodiversity loss at multiple trophic levels will be impossible without an understanding of how species interact. In food webs these interaction strengths describe the effect of one species on the population growth rate of another. We now know that the arrangement of interaction strengths among species populations is crucial for the stability and functioning of whole food webs. Despite this, interaction strengths are almost never measured empirically and assigning strengths to interactions remains an elusive, yet pressing goal. Clearly, our ability to predict ecosystem dynamics, and ultimately the consequences of extinctions and invasions, is restricted by a limited knowledge of species interaction strengths. A method of parameterising food webs, thus enabling an exploration of their dynamics, would therefore be extremely useful. Here we address this need using metabolic theory to derive three simple and general relationships between interaction strength and predator and prey body mass. We use these measures to explore the relative importance of species within food webs for their stability and ecosystem functioning.

Our theoretical predictions are well supported by empirical measurements of interaction strength from one of the most-detailed, quantified food webs to date, the Broadstone Stream, UK. Our results indicate that the metabolism of species yields fundamental clues for an understanding and prediction of ecosystem and food web dynamics.

Faith, Daniel

Phylogenetic diversity (PD) provides biodiversity surrogates information that can enhance the contribution of DNA barcoding programs to conservation planning

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Symposium 14 - Phylogeny and biodiversity science

Because "biodiversity" reflects not only known variation, but also the vast unknown, systematic conservation planning relies on surrogates information, as in the use of one set of species to indicate overall biodiversity. Barcoding programs, such as that based on cytochrome c oxidase I gene, focus on species documentation and discovery, and the expected large increase in species information could overcome some known weaknesses of existing surrogates strategies. However, known sensitivity of conservation planning to species definitions suggests that the most robust surrogates information from barcoding programs might be found in associated phylogenetic patterns, rather than contentious species designations. A phylogenetic diversity measure, PD, (Faith 1992) indicates the amount of branch length or evolutionary history spanned by a set of taxa. PD links to conservation planning through PD-based complementarity and PD-endemism values for localities. PD not only side-steps the species designation problem, but also may boost surrogacy in reflecting historical relationships among areas. Corroboration assessments that move beyond simple support measures may help establish reliable barcoding-derived phylogenetic pattern for PD analyses. Application of PD to geographic data and phylogenetic information for arctic Collembola, from the "Barcode of Life Database" (BoLD), illustrates PD-complementarity and PD-endemism for localities, plus the priority-setting and regional trade-offs analyses necessary for systematic conservation planning. Conservation scenarios for these BoLD data illustrate how large-scale barcoding programs might contribute to a simple approach for assessing

progress towards the 2010 biodiversity target of a significant reduction in the rate of loss of biodiversity.

Keywords: phylogeny, barcode, evolution, conservation, 2010 target

García-Frapolli, Eduardo; Ayala-Orozco, Barbara; Bonilla, Martha; Ramos-Fernandez, Gabriel; Toledo, Victor

Community conservation in the Otoch Ma'ax Yetel Kooh protected area: Linking traditional knowledge and biodiversity conservation policies

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Symposium 5 - Sustaining partnerships for community-based conservation

Studies show that the appropriation of nature by indigenous communities goes beyond shifting cultivation practices to include a multiple use strategy (MUS) combining a diversity of land use activities. Although this strategy may result in biodiversity conservation, national policy makers dismiss it as an inefficient use of resources. Here we analyze the sustainability of the MUS implemented by Mayan indigenous people in three communities in a recently created protected area in Mexico. We evaluate the process by which these practices have been incorporated into a local policy for protecting biodiversity.

Socio-economic data were collected from semi-structured interviews of 44 local households and a series of workshops. Vegetation maps for 1999 and 2003 were performed using satellite images of the protected area (5367 has). Inventories of bird and plant species have been performed using standard census techniques. The viability of the spider monkey population was evaluated using data from a nine-year long study.

Plant and bird species diversity, as well as the presence of a viable spider monkey population, suggests that the area still harbours a large biodiversity. The MUS includes 6 activities: swidden agriculture, homegardens, fishing, cattle raising, extraction of wood and medicinal plants, and ecotourism. The resulting landscape from this MUS includes a mosaic of old-growth and secondary succession forest. From 1999 to 2003 the land cover of all successional stages changed little, despite the continuation of all activities. One factor influencing this is the regulation of land use by local social institutions.

Even though the MUS conserves biodiversity and provides diversified sources of income for local communities, the extent to which government authorities incorporate this local knowledge and practices into the management guidelines for the protected area remains to be seen.

Keywords: multiple use strategy, appropriation of nature, biodiversity conservation, protected areas, Mexico

García-Guzmán, Graciela; Pérez-Jiménez, Luis Alfredo; Trejo-Vázquez, Irma

Effect of forest fragmentation on plant-pathogen interactions in a seasonally dry tropical forest of Mexico

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Symposium 7 - Ecohealth and conservation medicine: a new agenda for public health and biodiversity

This study aimed to determine the effects of forest fragmentation in the establishment of plant-pathogen interactions in the seasonally dry tropical forest (SDTF) of the Chamela-Cuixmala Biosphere Reserve. During the rainy season of 2003 we carried

out vegetation surveys in 2 sites of continuous forest (CF) and in 4 fragments of 15, 24, 26 and 40 ha. All plants with a dbh \geq 1 cm present within an area of 500m² were sampled. To assess pathogenic damage a large number of small branches was collected from different parts of each sampled plant, and a group of ~50 leaves per plant was randomly chosen. Leaves were affected by fungal pathogens that caused leaf spots and rust. The results show that the mean number of plant species and plant density were higher in the CF than in the fragments. The proportions of pathogen affected species ($X^2 = 21.24$; $P < 0.01$), individual plants ($X^2 = 161.54$; $P < 0.01$) and leaves ($X^2 = 736.44$; $P < 0.01$) were higher in CF and in the 40 ha fragment than in the smaller fragments. Similarly, proportions of leaf area damaged per plant were significantly higher in CF and in the 40 ha fragment than in the smaller fragments ($F = 29.65$, $df = 5$, 1554 ; $P < 0.0001$). These results suggest that changes of environmental variables due to forest fragmentation can significantly affect establishment and development of biotic interactions, probably as a consequence of alteration in species abundance and richness, and the interruption of fungal dispersal patterns between the CF and fragments. Our study can be considered as the first one showing that fungal pathogens in the undisturbed SDTF community are very common, attacking a wide variety of plant species. Understanding how diversity of plant pathogens varies, and how pathogens interact with the abiotic and biotic environment is important to determine the roles they play in population dynamics of plants and ecosystem processes

Keywords: biotic interactions, diseases, dry forest, fragmentation, fungal pathogens

Gemmill, Barbara; Collette, Linda; Njoroge, Grace

Harvesting the pollination knowledge base: how much information is presently available to guide farmers and land managers on management of pollination services?

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Symposium 2 - Pollination services

There is an increased recognition of the role of pollination services to agricultural production and quality, but is there a sound knowledge base to guide the decisions of farmers and land managers in the management of pollination services? What sources of information are available to populate a knowledge base on pollination? Using a study of watermelon pollination in Kenya as a test case, the sources, barriers to and possible strengths of integrating different information sources for pollination knowledge are assessed. Barriers are identified. Integration of existing information is recommended, so long as barriers, particularly with respect to identification of taxa, can be overcome.

Keywords: pollination, information, management, agroecosystems, services

Gepts, Paul

Gene flow in agroecosystems, with special emphasis on crops and their wild progenitors

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

The study of gene flow in agroecosystems has taken on added interest in the light of the potential or actual release of transgenic crops. Gene flow can take place between transgenic and non-transgenic cultivars of a crop. Particular topics of interest here are the introduction of pharmaceutical and industrial transgenic crops and the possibility of co-existence between transgenic and organic agricultures. In centres of domestication of crops, there is an added dimension, namely gene flow involving wild, conspecific relatives of crops. Concurrently, the study of gene flow has been facilitated by the availability of new molecular tools, particularly the development of a myriad of marker types and of linkage maps. The parameters influencing the direction and magnitude of gene flow include population factors (relative sizes and levels and types of genetic diversity, phenology), migration factors (level of pollen and seed production, distance, frequency of events, and reproductive isolation), and inheritance (selective effects, dominance, location in the genome, and genetic background). Population genetic theory and empirical studies have identified specific circumstances under which gene flow may affect the survival of genes in recipient populations and the levels of genetic diversity in the latter populations. Specifically, repeated migrations, predominantly in one direction, may lead to the displacement of native genetic diversity and the establishment of genes, even those that do not confer optimum adaptation. These findings will be illustrated with examples from several crops, including my own research on *Phaseolus* beans in Mexico. Consequences for conservation of genetic diversity will also be discussed.

Keywords: gene flow, introgression, genetic diversity, genetic assimilation, transgenic

Geremia, Roberto

Alpine Soil Microbial Communities:seasonal variations of phylogenetic structure and ecosystem function

Université Joseph-Fourier, France

Symposium 20 - Diversity, diversification processes and conservation of high mountain biota

Gessner, Mark O.; Dudgeon, David; Naiman, Robert J.; Soto, Doris; Stiasny, Melanie

Evidence and myths surrounding perceptions about freshwater biodiversity

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Symposium 13 - Freshwaters: sustaining biodiversity and system integrity

Managing biodiversity is ideally grounded in a sound understanding of diversity patterns, the processes that shape them, and the consequences for ecosystems functioning and services to society. It is not uncommon, however, that advice to policy makers is based on poorly substantiated evidence and/or controversial views within the scientific community. We screened the literature to assess the strength of evidence supporting common perceptions that often underlie arguments about the importance of biodiversity in freshwaters. We focused on three tenets: (1) loss of freshwater biodiversity is particularly severe compared to terrestrial biodiversity losses; (2) loss of biodiversity entails impairment of ecosystem functioning and, by extension, of ecosystem services; and (3) exotic species are most likely to invade fresh waters already subject to human disturbance. Although good data on most

freshwater taxa are scarce, our synthesis provides overwhelming evidence that freshwater species are at significantly greater risk of extinction than terrestrial species. This fact is likely related to the particularly strong human pressure on freshwaters, the high level of endemism, and the globally small extent of freshwater habitats, which yet harbour a large portion of global species richness. Evidence supporting the view that biodiversity loss equals loss in ecosystem functioning and services is equivocal. Although small-scale experiments have identified diversity effects and theoretical evidence suggests upscaling may be possible, various studies have reported no effects. Similarly, successful invasions have occurred in both disturbed and largely natural freshwater ecosystems. Thus, while it is clear that freshwater species are particularly vulnerable to extinction, predicting the consequences of species loss and of the 'homogenization' of freshwater communities through the combined effect of extinctions and invasions continues to require careful specific analyses.

Keywords: freshwater, extinction, ecosystem functioning, invasion, review

Gómez-Pompa, Arturo; Vergara, Carmen

Successful cases of community based management of biodiversity

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Symposium 5 - Sustaining partnerships for community-based conservation

In recent times there has been a stronger recognition of the important role played by some rural communities in biodiversity conservation and management of non-protected areas. These activities could be the starting point for a major initiative that could protect most of the biodiversity outside of governmental protected areas. We will review some studies on the role of some ancient tropical cultures in maintaining the biodiversity that we want to protect today. We will present examples of successful cases of biodiversity conservation and resource management by local rural communities of the tropics and we will discuss the factors that may have influenced their success. We will analyze the importance of local, national and international policies that encourage and promote sustainable use and management of resources as the only feasible approach to long-term conservation of the world's biodiversity.

Keywords: community based management, biodiversity, protected areas, non-protected areas, resource management

Griffiths, Charles

The unexplored marine biodiversity of Africa

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Symposium 6 - Oceans of biodiversity: discovering species, habitats and ecologies

To estimate species richness in the coastal marine fauna of East and South Africa; to estimate how known biodiversity relates to 'real' or undescribed biodiversity; to estimate rates of endemism of the fauna and to describe geographic patterns of species richness, endemism and range restriction.

Species counts are based on museum and literature records for marine taxa from this region. Distribution patterns are analysed for 13 major taxa for which sufficient distributional data exist.

A total of 11 257 marine species have been recorded from the Western Indian Ocean and 11 980 from South Africa (of which 32% are endemic). Comparison of these lists by taxonomic group, and with similar lists for Europe, suggest that less than half of

the species actually present have been described. Taxa with smaller body sizes and from deeper waters are particularly poorly known.

Analyses of distributional data (South Africa only) show that some taxa, such as fish, decapod Crustacea and Gastropoda, increase in diversity towards the tropics, whereas others, such as Amphipoda, Isopoda and Polychaeta, are more speciose in the south. When all taxa are summed the Atlantic coast emerges much less species rich than the Indian Ocean coast. Rates of endemism vary greatly between taxa and peak on the south and south-west coasts. There are strong peaks of endemism and in narrow range restriction at the borders of major biogeographic provinces, suggesting that these 'ecotonal' areas may be particularly important for conservation. The marine faunas of this region remains largely undescribed. Distribution patterns vary greatly between taxa (making use of surrogates dangerous). Boundary areas between biogeographically provinces are particularly important for species conservation.

Keywords: marine, biodiversity, Africa, endemism, distribution patterns

Stuart R., Harrop

Globally Important traditional agricultural practices and systems- an examination of their context in existing multilateral instruments and policy dealing with biodiversity preservation

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Symposium 9 - Biodiversity in agricultural landscapes: saving natural capital without losing interest (Second part)

The traditional protected area approach to conservation of habitats and species emphasises a natural world shaped without human influence. Despite the debates relating to community conservation, stakeholder involvement in conservation and equitable benefit sharing, the most progressive approaches to community conservation tend to permit traditional agricultural practises that support biodiversity preservation, to operate only in land outside core conservation areas. Nevertheless, there are many ingenious agricultural systems that have shaped novel agricultural landscapes for centuries and in so doing have also sustained and even increased levels of biodiversity. The traditional practices deployed in these methods also constitute and support a wealth of unique cultural heritage. These systems are of such importance that they merit primary support in protected areas and should not be relegated to operate in buffer zones. Further, some of these systems may be globally important and capable of fulfilling aspects of key global policy statements made at the Earth Summits held in Rio de Janeiro and Johannesburg.

This presentation examines the extent to which the current international regulatory and policy matrix supports or frustrates these systems. The presentation draws on research carried out by the author for the UN FAO in respect of its Globally Important Ingenious Agricultural Heritage Systems (GIAHS) project.

Keywords: tradition, regulation, agro-biodiversity, protected-areas, cultural-heritage

Stephen Hawkins, P. Moore, M.T. Burrows, E. Poloczanska, N. Mieszkowska, P. Moschella, J. Bishop, S. Nielsen, P. Masterson, A.J. Southward

Global environmental change impacts on marine biodiversity: implications for ecosystem functioning

Symposium 19 - Marine biodiversity and ecosystem functioning

The world's environment is rapidly changing physically due to anthropogenically driven warming. There are major consequences for marine biodiversity with predicted poleward shifts in geographic distributions. Another facet is the accelerating introduction of non-native species from one biogeographic province to another, often facilitated by climate change.

The interactions of these two forms of global change are considered by means of case studies. The implications for ecosystem functioning are compared and contrasted to address the question whether non-native species or climate change has the most effect on ecosystem processes.

Keyword: marine biodiversity, global warming, ecosystem functioning, non-native species, climate change

Heino, Mikko

Anthropogenic evolution as a driver of rapid biodiversity changes

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Symposium 4 - Theoretical advances in evolutionary conservation biology

For millennia, humans have used selective breeding to improve the genetic make-up of domesticated plants and animals. It is less recognized that humans are also drivers of large-scale, unintentional selection in the wild, often against our best interests. Such selection operates in two ways. First, harvesting may be intrinsically selective. The most valuable individuals are preferentially harvested and thus removed from the gene pool (selective breeding aims at the opposite!). Second, harvesting inevitably alters the selective environment of the harvested species – if only by increasing overall mortality, a potent driver of evolution. Here I review two of the best-studied cases of unintentional evolution in the wild: trophy hunting and commercial fishing.

Trophy hunting amounts to the removal of the strongest individuals with the best-developed secondary sexual characteristics (e.g. antlers). If hunting pressure is high enough, anthropogenic selection against exaggerated sexual traits may override sexual selection favouring them. At least in one case such genetic deterioration has been documented unambiguously, although anecdotal evidence suggests the phenomenon to be more widespread. Even more so than hunting, commercial fishing results in major increases in mortality. Typically, the largest individuals are most at risk (a correlation opposite to that typically caused by natural size-dependent mortality). Theory predicts this to cause evolution towards earlier maturation. Indeed, such maturation trends are commonly observed in fish stocks. Recent advances in the analysis of field data support the notion that these trends have a significant evolutionary component. These trends are likely to compromise the productivity and stability of fish stocks, and may even lead to selection-driven extinction.

The findings call for new, evolutionarily enlightened measures for managing the genetic diversity of natural populations.

Keywords: evolution, genetic change, fishing, hunting, management

Heywood, Vernon; **Casas, Alejandro**; Lloyd, Brian; Kell, Shelagh; Maxted, Nigel
Towards a global plan of action for crop wild relative conservation and use

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

Conservation of crop wild relatives (CWR) is a complex interdisciplinary process that is being addressed by various national and international initiatives, including the IUCN SSC Crop Wild Relative Specialist Group, two GEF-funded projects ('In situ Conservation of Crop Wild Relatives through Enhanced Information Management and Field Application' and 'Design, Testing and Evaluation of Best Practices for in situ Conservation of Economically Important Wild Species') and the European Community-funded project 'European Crop Wild Relative Diversity Assessment and Conservation Forum (PGR Forum)'. Key issues are: (1) definition of what constitutes a crop wild relative (2) need for a global clearing house and regional and national information systems (inventory of CWR needed for most countries, accessibility through electronic means), (3) how to integrate the conservation of CWR into existing national, regional and international PGR programmes, (4) development and application of priority-determining mechanisms (a means of selection for priority species has to be applied), (5) assessment of the threat facing CWR and the effectiveness of in situ and ex situ conservation actions and evaluation of their cost-effectiveness (including sampling and genetic conservation in special reserves and community management inside/outside protected areas; effectiveness of these options and the costs involved), (6) promoting the use of CWR through in situ characterization of potentially important adaptive traits, (7) developing and enhancing national capacity, (8) raising awareness of the importance of crop wild relatives in agricultural development at local, national and international levels both for scientific and lay communities, (9) policy development and legal framework (including access, IPR and benefit sharing). A proposal is made for a framework action plan for CWR conservation and use. Examples are given from columnar cacti in C. Mexico and European/Mediterranean case studies

Keywords: crop wild relatives, conservation, in situ, action plan, Mexico

Hufy, Marc

Interaction between Multilateral Environmental Agreements (MEA) and aid mechanisms in the case of protected tropical forests

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Symposium 8 - Implementing multilateral environmental agreements on biodiversity: balancing equity and effectiveness

The case study deals with conservation between equity and effectiveness through a fresh look at the interaction between multilateral environment agreements and aid mechanisms in the case of protected tropical forests. The availability of genetic resources depends to a large extent on in situ measures and programmes. One of the conservation and aid organizations' current favourite instruments is protected areas. This instrument, however, often fails to fulfil expectations; many are still "paper parks", others are embedded in social conflicts. Why is this tool so popular despite its inefficiencies and how can it be made more efficient regarding conservation and social equity? This case study looks at local, national and international programmes, institutions and MEAs.

Keywords: interaction, multilateral agreements, aid, ecosystem management, forests

Ianora, Adrianna

Role of marine natural products in maintaining biodiversity and ecosystem functioning

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Symposium 19 - Marine biodiversity and ecosystem functioning

Marine natural products play fundamental roles as defences against predators, competitors and pathogens, and are therefore driving ecosystem functionality and maintaining Marine biodiversity. The aim of this presentation is to focus on the ecological function and pharmacological applications of natural products originating from marine organisms, and in particular those produced by diatoms, a major phytoplankton class with over 1600 recognized species. Diatom blooms are believed to initiate and support the cycle of secondary production and growth of fish larvae that depend predominantly on the eggs and larval stages of planktonic copepods. Evidence has accumulated over the last decade that has progressively challenged the view that diatoms are good and harmless food items for copepod growth and survival. Laboratory and field studies have shown that when these crustaceans are fed certain diatom diets, the eggs produced either fail to develop to hatching or hatch into malformed nauplii. The compounds responsible for these teratogenic effects are short-chain unsaturated aldehydes that arrest embryonic development in copepods and sea urchins, and have antiproliferative and apoptotic effects on human carcinoma cells. Unsaturated aldehydes are cleaved from fatty acid precursors by enzymes activated within seconds after crushing of cells. This mechanism does not deter the herbivore from feeding but impairs its recruitment, thereby restraining cohort size of the next generation. This biological model is new for the marine environment since most of the known negative plant-animal interactions are generally related to poisoning processes, or feeding deterrence, but never to reproductive failure. Understanding the mechanisms of action of these and other natural products can provide new insights into the factors regulating ecological processes at sea and can help scientists find new applications for marine natural products in the future.

Keywords: marine natural products, biodiversity and ecosystem function, plant-animal interactions, diatoms, copepods

Jackson, Louise; Hodgkin, Toby; Pascual, Unai

Utilizing and conserving biodiversity in agricultural landscapes

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

Agricultural landscapes will undergo unprecedented transitions as people confront population growth and increased food demand, climate change, land degradation, and the globalization of agricultural markets during the next few decades. Biodiversity, as natural capital, is a direct source of food, fuels and fibres and raw material for innovation in subsistence and commercial agriculture. It also provides critical agroecosystem services and insurance against risks for an uncertain future. But much of the world's agrobiodiversity has not been described, either in terms of genetic or species composition, or for its capacity to provide a flow of valuable services for humankind, i.e., 'interest' on that capital. To generate public commitment to utilize and conserve agrobiodiversity, its capacity for provisioning services needs particular emphasis due to the welfare implications to current and future generations. More is known about how genetic, population, and species diversity in agriculture

directly supply provisioning services, compared to the effects of whole community or ecosystem diversity, due to the ecological complexity of organism and environment interactions at these levels. Examples that show promising options for sustainable utilization of agrobiodiversity exist, but they usually depend on well-designed economic incentives, beyond market prices, to ensure their adoption.

Agroecosystems that rely on agrobiodiversity for provisioning services tend to enhance landscape-level biodiversity and its regulating and supporting services. This is evident when regions that are dominated by cultivated ecosystems undergo a transition from traditional to intensive modern agriculture. Using agrobiodiversity to support sustainable agriculture, e.g., as specified in the recent report of the Millennium Ecosystem Assessment, requires significant changes in policies and in economic strategies to support research and adoption of new methods.

Keywords: agroecosystems, sustainable agriculture, intensive agriculture, provisioning services, genetic diversity

Jiménez-Osornio, Juan J.; Rorive, Veronique; Gómez-Pompa, Arturo; Rodríguez-Luna, Ernesto; Allen, Michael F.; Tiessen, Holm

Thinking outside of the box: tropical conservation in both protected areas and the surrounding matrix

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

It is widely assumed that the most critical biodiversity in need of protection exists in wilderness areas. This view resulted in the creation of reserves that restrict human activities. Evidence exists to prove that this assumption, based on data from limited groups of organisms, is incomplete, resulting in the loss of valuable biodiversity elements. The greatest amount of biodiversity for many groups of organisms exists outside of protected areas; in regions inhabited, used, and modified by traditional cultures and local inhabitants. These unrecognized collective areas constitute an ecological mosaic that includes a great diversity of ecosystems. Our working hypothesis is that developing a means to integrate these areas into regional biodiversity planning could protect large numbers of species. A new strategy promoted in the Yucatán Peninsula, México by the World Bank and the Mexican Government is the establishment of two corridors: Celestún-Ría Lagartos and Calakmul-Sian Ka'an. While the importance of corridors is not a new concept in theory or practice, the specific management strategies that focus on a mosaic of land uses by the people living in those corridors has rarely been applied. We postulate that incorporating traditional agriculture, agroforestry, and natural reserves into a comprehensive management strategy can result in a drastically improved design for the protection of biodiversity and development. This initiative requires the integration of the social and natural sciences with a cross-sectoral approach that includes public policy and local communities in the study of land use patterns and regulatory processes. This will (1) maintain ecosystem patterns and processes through the management and coordination of both established protected areas and the surrounding matrix, and (2) identify economical and environmentally sustainable livelihoods.

Keywords: agrobiodiversity, network conservation, traditional agriculture, Yucatán, community reserves

Joseph, Gladwin; Kamal Bawa

Scale-dependent approaches and institutions for conserving biodiversity at agriculture-forest margins

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

Millions of people in the tropics directly depend on forests for their livelihoods and also live in the forest-agriculture ecotones. This ecotone consists of a mosaic of diverse land cover and land use- forests and grazing lands, marginal dry-land farming or irrigated farming. The agriculture lands in these ecotones are marginal in productivity, predominantly on sloping lands with high risks of soil erosion, and subject to wildlife depredation. We discuss an approach to develop and implement workable community-managed models of adaptive natural resource management that cuts across the forestry and agricultural sector in contrasting forest-agriculture ecotones at various spatial scales. The ecotonal zones are delimited into socio-ecological systems (SES). The SES includes several villages depending on natural boundaries circumscribed by a common drainage, resource-use regimes and administrative boundaries. In the SES, decentralized models of governance can be linked with rural enterprise generation, providing employment and increasing income while balancing the demands of livelihoods with the concerns of conservation. In each SES, such an integrated management system would work at the scale of households, customary village institutions, microfinance networks, and Government institutions. We emphasize the building of natural capital along with social and human capital. The key parameters for social and human capital would be the community-based institutions in villages and the human and financial resources needed to strengthen such institutions. The key parameters for natural capital would be sustainable utilization of non-timber forest products (NNTF's), fuel wood, and fodder, and conservation-friendly agro forestry. This integrated approach of using the SES in forest-agriculture ecotones with equitable, incentive-based sustainable forest and agriculture management can be adapted to any human-dominated forested landscape in the tropics.

Keywords: scale-dependent approaches, forest agriculture, adaptive management, ecotones, socio-ecological systems

Jürgens, Norbert

Towards a global biodiversity observation system: a standardized multi-scale monitoring study of the African continent

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Symposium 17 - Remote sensing: methods and applications to assess, monitor and manage biodiversity loss

Change of terrestrial biodiversity is mainly driven by land use change and climate change. The related change of species composition, structure and function depends on the intensity of the impact(s) and on the sensitivity or resilience of the impacted system. An integrated understanding of the responses of the ecosystems of the globe to these anthropogenic impacts requires a global observation system, which again requires standardized methodology of documentation and analysis.

Since 2000, within the BIOTA-Africa project network a multi-scale system of standardized documentation of the change of biodiversity has been developed for the

African continent. Embedded into observation at the global scale, using remote sensing and GIS as well as bio-geographical methods, an annual monitoring of several dozens of standardized Biodiversity Observatories have been established in Southern, Western, Eastern and Northern Africa. Special emphasis is given to the impact of different land use strategies, which are analyzed at local scale in an integrated way, involving socio-economic drivers and processes.

A comparison of the changes within Biodiversity Observatories located in different African ecosystems allows identification and discrimination of the most important drivers, controlling change of biodiversity. Recent analysis, including a reconstruction of the history of land use and vegetation over the past century, suggest, that e.g. in Southern Africa a southward shift of the Namib Desert Biome is taking place.

The pilot study proves that a standardized observation system for the change of biodiversity is feasible, in general. The design of an adequate global network requires further discussion within the global scientific community.

Keywords: biodiversity observation, monitoring, Africa, land use, climate change

Jupiter, Stacy; Potts, Donald

Mapping, monitoring and managing biodiversity in tropical coastal zones: a watershed approach evaluating land use impacts on mangroves and nearshore reefs

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Symposium 17 - Remote sensing: methods and applications to assess, monitor and manage biodiversity loss

Rapidly increasing human populations along land-sea margins make these critical places to study anthropogenic effects on biodiversity. Remote sensing, with its ability to image large areas at variable scales in space and time, is especially valuable for assessing important, but often diffuse, natural and anthropogenic processes acting on coastal zones.

To determine the most efficient, cost-effective way for baseline mapping, ecological assessment and change detection in mangrove communities, we evaluated decision-making strategies for choosing sensors and mapping techniques by comparing combinations of three sensor platforms (aerial photography, satellite multispectral ASTER, airborne hyperspectral AVIRIS) and three mapping techniques (visual interpretation, unsupervised and supervised classifications). We then integrated several approaches to explore consequences of watershed-scale land-use changes in the Pioneer River Catchment (QLD, Australia) on coastal mangrove and marine biodiversity. We combined time series analysis of land cover (aerial photography, Landsat) with water quality changes (geochemical proxies in coral skeletons) to assess the nature and magnitude of land-use impacts on geomorphology, biodiversity and ecosystem functions in coastal mangroves and nearshore reefs.

Agriculture increased by 500% and mangroves declined by 26% during 1948-2002, while contemporaneous coral skeletal records correlate well with: rare earth enrichment; declining Y/Ho ratios (related to catchment weathering); and elevated Ba and Y during periods of high discharge. The optimal sensor/mapping technique pair depends on accuracy, cost and processing efficiency, all of which may vary across spatial and temporal scales. Integrating mapped changes in mangrove ecosystems in a GIS with other spatial and thematic layers (e.g. slope, deforestation zones, cultural heritage sites) is an effective way to prioritize sites for management.

Keywords: remote sensing, ecosystem linkages, mangroves, watershed, data integration

Kalin Arroyo, Mary

Diversity and diversification processes in high elevation habitats - using the South American Andes as a model to set the stage

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Symposium 20 - Diversity, diversification processes and conservation of high mountain biota

High elevation habitats provide a global resource for understanding patterns of biodiversity and evolutionary processes involved in diversification. Located above treeline on all continents of the world, and found from tropical to high latitudes, the biota of high elevation habitats has evolved from ancestors found in a diverse sample of lowland ecosystems, with subsequent enrichment through long-distance dispersal and migration along mountain corridors. A conceptual framework for thinking about diversity and diversification processes in high elevation habitats, using the vascular flora of the South American Andes as a model is developed.

I will critically examine how unique the entire high elevation flora of the South America Andes, whether species diversity decreases with latitude, and compare diversification patterns in the páramo, puna and southern temperate alpine zone. I examine the role of certain reproductive biology parameters as drivers of alpine diversity.

Although the South American high elevation flora is of a similar age throughout the entire length of the Andes, species diversity, significantly, is higher at tropical latitudes. The latter trend is strongly influenced by major radiations in some key genera. Limited evidence suggests that a number of monotypic high elevation genera are closely phylogenetically related to larger genera, suggesting rapid morphological differentiation, while other are relictual. A trend for higher species richness in genera exhibiting obligate outcrossing systems may exist.

A full understanding of diversity in high elevation ecosystems requires an integrated approach. The Andes are a useful model for understanding diversity patterns in high elevation habitats, and for testing hypotheses on latitudinal gradients in species richness.

Keywords: species diversity, latitude, Andes, high elevation, breeding systems

Kawabata, Zen; Fuhrman, Jed

Does viral diversity drive the freshwater world?

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Symposium 13 - Freshwaters: sustaining biodiversity and system integrity

We have little knowledge about these viral roles as regulators of freshwater ecosystem's structure and function. The goal of this paper is to evaluate viral diversity as a significant driving factor for change in freshwater ecosystem structure and function. We will address the following issues: 1) we overview the methodology to reveal virus diversity, 2) we describe the viral abundance and diversity, and 3) we show some examples of viral effects which appear to involve drastic changes in freshwater ecosystem structure and function.

We will show the following key examples regarding the third issue above: 1) bottom up effect: cyanobacterial bloom control and its cascading effects, 2) top down effect: virulent effect on fish and its cascading effects, 3) nutrient cycling regulation by infection of bacteria or other host organisms through the microbial loop, 4) virus role as agents promoting horizontal genes transfer among different bacteria species: mechanism responsible for producing genetic diversity, 5) viral dispersion over freshwater ecosystems by vectors such as birds and introduced species.

Regarding cyanobacterial bloom control by viruses, we found recently at least 10 different viruses like agents killing cyanobacteria *Microcystis aeruginosa* in a hyper-eutrophic pond during 2 months and their community structure changed with time.

These data suggest that multiple virus-like agents could potentially involve in regulating the dynamics of *M. aeruginosa* bloom in natural environments.

The key examples indicate that viral diversity is hidden driving force to regulate ecosystems structure and function.

Keywords: virus, freshwater, cyanobacteria, bottom up effect, regulation

Kevan, Peter

Monetary and ecological economics of pollination services

University of Guelph, Canada

Symposium 2 - Pollination services

The economics of pollination services is a complex topic that remains understudied. Numerous studies on the valuation of pollination services to crop production, especially related to honeybees, only provide snap-shot estimates of monetary value. Most such valuations have not taken into account how the vagaries of supply and demand influence commodity prices. In times of crop failure, supply is low and price is high; in times of plenty, supply is high and prices low. Thus, the value of pollination to crop production and commodity prices may change depending on yields, or the value of pollination may remain at a more or less constant proportion of crop value. Producers may or may not suffer financially, the merchant economy is buffered, but the consumer inevitably pays more. To assess the problems of pollinator shortages and how they may affect commodity prices along with human food and fibre security, economic analyses that can translate into policy are needed. The problem of pollinator shortages in the economy of nature is even more complex and difficult to assess. Nevertheless, pollination services are crucial to sustainability and productivity in natural ecosystems. As more is learned about the economics of pollination from the human perspective, analyses in natural ecosystems may become more tractable. One of the important emerging concepts is that pollinator diversity, abundance, and service are tightly interwoven synergistically for productivity through pollination and other ecosystemic functions in agricultural, forested, and wilderness environments.

Keywords: pollination, ecological economics, valuation, sustainability, ecosystem service

Kilpatrick, Marm A.; Daszak, Peter; Kramer, Laura; Marra, Peter

The impact of West Nile Virus on bird communities

Consortium for Conservation Medicine, USA,

Symposium 7 - Ecohealth and conservation medicine: a new agenda for public health and biodiversity

Over the past 6 years West Nile Virus (WNV) has killed millions of birds in its spread North America. However, its impact and ecology in species other than corvids (crows and jays) is almost completely unknown. We have studied patterns of mosquito abundance and WNV infection prevalence and avian WNV antibody prevalence along an urbanization gradient near Washington DC over the past three years. We have found that exposure to WNV differs significantly between species and that this has serious implications for avian ecology and conservation. We have also found that mosquitoes show significant preferences for some species and avoid others. The interplay between mosquito feeding preferences, virus epidemiology, avian susceptibility, and avian demography determine the impact of WNV on avian populations. We identify several species that are likely to be strongly impacted by WNV, and suggest measures to reduce these impacts. Finally, we demonstrate a simple approach to predicting the likely pathways of West Nile Virus spread between countries. We show that the most likely route of entry of WNV into Hawaii and the Galapagos: two island systems with a unique avian fauna, is via airplane-transported mosquitoes. We propose simple measures for reducing this risk.

Keywords: disease, conservation, modelling, species introduction, population

Kirby, Kate; Potvin, Catherine

Opportunities for combining carbon sequestration and biodiversity conservation in an indigenous territory of Eastern Panama

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Symposium 15 - Forest biodiversity and carbon sequestration

New incentives for the development of terrestrial carbon (C) sinks could enable reforestation projects that would provide concurrent benefits for biodiversity and local livelihoods. We report the results of a C sink pilot project that was carried out in cooperation with an indigenous Emberá community in Panama to determine the C stocks and tree-species richness of three common land-use types in the community. Total C stocks (including below-ground carbon to 40 cm depth) were 255 Mg ha⁻¹ for primary forests, 127 Mg ha⁻¹ for traditional agroforests, and 45 Mg ha⁻¹ for pastures. Land uses high in carbon also contained the most tree species, with average species richness of trees ≥ 10 cm DBH per 707 m² varying from 16 (forests) to 9 (agroforest) to 1 (pasture). Of the 61 tree species encountered in agroforests, 47.5% were never encountered in primary forests, and 14.8% were exotics. However, these exotic species are widespread in Panama and are important for local food security.

Agroforests also provided marketable goods to 56% of landowners interviewed. Our data suggest that expanding traditional agroforests into areas currently under pasture might be done in such a way as to provide significant biodiversity benefits, produce marketable goods for landowners, and with the potential to sequester 82 Mg ha⁻¹ in two decades. However, in the short-term, slowing the conversion of forest to pasture would have the greatest impact on carbon and biodiversity stocks, avoiding the release of approximately 210 Mg C ha⁻¹. International agreement on the provisioning of incentives for forest conservation is thus sorely needed.

Keywords: carbon sequestration, biodiversity conservation, payments for ecosystem services, tropical, land use change

Kitayama, Kanehiro; Lee, Ying Fah; Nakashizuka, Tohru

The synergy between carbon sequestration and the conservation of biological diversity in tropical rain forests, Sabah, Malaysia

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Symposium 15 - Forest biodiversity and carbon sequestration

DIWPA (DIVERSITAS in Western Pacific and Asia) is promoting a pilot project, which seeks the synergy between carbon sequestration and the conservation of biological diversity in tropical rain forests of Southeast Asia. In this paper, we report the new algorithm of estimating carbon and tree species diversity on a landscape-level, and how to incorporate carbon and biodiversity to the ecological and economic incentives to reduce logging impacts in forest management.

We jointly collected ground data from 51 plots laid in production forests of varying intensities of logging in Deramakot (FSC certified forest with reduced impact logging) and Tangkulap (heavily logged by conventional methods), Sabah, Malaysia. We applied standard allometric equations to tree diameters to estimate biomass (tons/ha) in each plot. In selected plots, we inventoried tree-species richness. Subsequently, the location of each plot was determined on the LANDSAT ETM data taken in 2002. Among various combinations of LANDSAT reflectance bands, the normalized index of band 4 and 5 (called NDSI) demonstrated the highest correlation with biomass. However, the biomass estimates from this equation saturated at biomass 500 ton/ha or greater. This caused a considerable underestimate of biomass in high-stock forests. To correct, we developed meshes of various sizes ($N \times N$ pixels) from a given focal pixel (30x30m) on the satellite data, and classified the vegetation using an unsupervised method. The number of classes rapidly increased in heavily damaged Tangkulap, but gently increased in reduced-impact Deramakot with increasing N . Coefficient of variation (CV) of the number of classes at $N=9$ adequately indicated the magnitude of canopy heterogeneity caused by logging. We corrected biomass values where NDSI saturated using CV as guidance. Biomass values also correlated with the richness of tree families. The above algorithm can thus estimate carbon and family richness at landscape level.

Keywords: carbon, DIWPA, tropical rain forests, reduced-impact logging, satellite data

Klein, Alexandra-Maria; Steffan-Dewenter, Ingolf

Pollination services to crops from wild bees: relationship between landscape context, community composition and function

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Symposium 2 - Pollination services

Crop pollination is an ecosystem service of direct economic importance, which is threatened by ongoing loss of biodiversity. Bees are the most important animal group providing pollination, and special attention should be given to wild bees and their impact on pollination. Non-domesticated bees are becoming more important to provide crop pollination, because domesticated species, especially honey bees, are declining seriously due to diseases and decreasing bee-keeping. Bee diversity and crop pollination are not only related to the management of the local agro-ecosystem in which the crop is planted, but the surrounding agricultural landscape is also an important variable to provide food and especially nesting resources for non-domesticated bees. Therefore, wild bees particularly suffer from the continuing and accelerating destruction and fragmentation of natural habitats with significant but mainly unknown consequences for pollination.

To adequately conserve and manage pollination services, information on habitat requirements of pollinators and the pollination biology of crop species is needed. In our presentation we review the importance of animal pollination of the most common crop species (which is based on a selected list of approximately 70 species) and assess the potential yield reductions in the absence of pollinators. We identify the gaps in pollination studies and give suggestions on how to collect adequate information on pollination biology, which are the basis for studying the importance of land use and landscape effects for bee pollination. We then summarize what is known about the effects of landscape and land-use changes on native bee communities and the pollination services they provide, and summarize the requirements for managing ecosystems to conserve pollinator diversity and ensure pollination services in agricultural landscapes.

Keywords: agrobiologie, agricultural matrix, diversity, non-domesticated bees, fragmentation

Knowler, Duncan; O’Keeffe, Jay

The economic value of freshwater biodiversity: an experimental simulation

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Symposium 13 - Freshwaters: sustaining biodiversity and system integrity

The valuation of biodiversity is an emerging field with a variety of potential applications to different species, habitats and ecosystem types. Initial efforts have been directed towards valuing components of biodiversity or single species within a relatively small range of ecosystems, e.g. tropical forests, wetlands. This paper first reviews progress in valuing freshwater biodiversity and then develops a conceptual model for integrating economic and ecological/biological components within a single valuation model.

The paper is concerned with the value of biodiversity in supporting economic activity. A key element in the modelling is the linkage between changes in the biodiversity characterizing the freshwater system and stochastically-related economic losses. We begin with a broad definition of biodiversity, as described by Noss, i.e. structures, functions and components, at scales from genetic to landscape. However, for modelling purposes we characterize biodiversity more narrowly, as an appropriate index or as the proportion of native species retained.

Using our conceptual model, we simulate experimental values for a notional freshwater system, employing representative values from a case study of the Great Fish River in South Africa. The paper generates a range of possible values for biodiversity in freshwater ecosystems that support economic activity.

In contrast to many earlier attempts at valuing biodiversity, our values are consistent with economic welfare theory. They also represent ex ante estimates and, therefore, are more appropriate for management planning than ex post estimates, which ignore the key stochastic elements.

Keywords: valuation, stochastic, ecological economics, freshwater, biodiversity

Koricheva, Julia; Vehvilainen, Harri

Effects of tree stand diversity on insect herbivory

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Symposium 15 - Forest biodiversity and carbon sequestration

Herbivory may remove large part of carbon sequestered by trees, and pure forest stands are believed to be more susceptible to attacks by herbivores than mixed stands. We examined the effects of tree stand diversity on insect herbivory in several long-term experiments in Finland, Sweden and England where tree species diversity of stands has been manipulated.

Insect herbivory was quantified in a standard way in all experiments by examining 100 leaves on 2 branches per 10 randomly chosen trees per stand and recording all herbivore feedings marks.

In the Finnish experiments, insect herbivory on silver birch was higher in birch monocultures than in birch mixtures with Scots pine, but only at the beginning of the season and only in mixtures which contained 75% of pine. No effects of stand diversity were found on insect herbivory on silver birch growing in monocultures or in mixtures with Scots pine and Norway spruce in the Swedish experiment. In the Gisburn forest diversity experiment (NW England), insect herbivory on sessile oak and black alder was lowest in monocultures and particularly high in oak-alder mixtures. This could be due to the presence of generalist herbivores able to feed on both oak and alder and thus benefiting from mixed stands.

We conclude that the effects of forest stand species diversity on insect herbivores vary from positive to negative depending on the type of herbivores present, the identity of tree species constituting a mixture, time of the season and geographic locality. In other words, forest diversification does not provide a universal remedy for insect pest problems.

Keywords: herbivory, forest diversity, ecosystem functioning, carbon sequestration, boreal forests

Kremen, Claire; Potts, Simon; Vazquez, Diego; Williams, Neal

Predicting functional consequences of pollinator loss due to habitat alteration

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Symposium 2 - Pollination services

Like other organisms throughout the globe, plant populations face increasing threats from habitat loss and degradation due to human disturbance. Because most plant species rely on animal vectors for pollination (~60% of ca. 235,000 flowering plant species), their persistence in the face of such threats relies not only on their own population characteristics, but also on the stability of services provided by their pollinators. Stability of pollination services will depend on the relative contributions of different pollinators in the community and their sensitivities to disturbance.

Simulations based on empirical studies of pollination networks suggest that pollination systems are quite resilient to species loss for two reasons. First, pollination networks are characterized by high redundancy (multiple pollinator species visit most plant species). Second, the most abundant pollinator species tend to be most important in providing services to individual plant species, and are also most extinction-resistant. Despite these mechanisms for maintaining function, cases also exist in which pollination services rapidly degrade with pollinator loss. For example, in farms located across a gradient of agricultural intensification in California, we find that pollination function to crops declines rapidly with increased disturbance/declining diversity, because the largest, most efficient pollinators are lost first, and because other species do not compensate by increasing in density, particularly in the low diversity communities. Further studies are needed to determine under what circumstances the most important pollinators are lost first.

Keywords: pollination, disturbance, extinction sequence, redundancy, resilience

Lampo, Margarita

Ecological factors driving the spread and epidemic outbreaks of chytridiomycosis in the Andean region

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Symposium 7 - Ecohealth and conservation medicine: a new agenda for public health and biodiversity

In the last two decades, cutaneous chytridiomycosis, a disease caused by the chytrid fungus *Batrachochytrium dendrobatidis*, has been associated with population declines and extinctions in montane amphibian communities across the world. Although, the demonstration of Koch's postulates has incriminated this pathogen as the direct cause of mortality in some amphibian populations, it is less well understood what factors have driven the epidemic outbreaks of this disease. Diseases in animal populations are the product of complex interactions between environmental factors and the parasite-host ecology. In the Venezuelan Andes, epidemics outbreaks of chytridiomycosis during 1988 were associated to the disappearances of three frog species, but *B. dendrobatidis* persists now endemically. What factors drove the epidemic outbreaks of this disease in this region, and why were some species severely impacted while others appeared unaffected are some of the questions we are now addressing. The spatio-temporal patterns of the prevalence of this pathogen in some frog species and the local climatic data suggest that synchronized epidemic outbreaks were probably driven by a severe drought. While this climatic event produced a drastic increase in the *B. dendrobatidis* prevalence in some species, in others this effect was no evident. This indicates that species-specific differences in transmission rates were more likely to contribute to the occurrence of outbreaks in some species but not in others. We need to understand how climatic characteristics, amphibian community assemblages and the habitat spatial structure affect the pathogen prevalence and transmission rates, in order to predict future epidemic outbreaks of this disease.

Keywords: chytridiomycosis, amphibians, climatic changes, epidemics, Andes

Lane, Meredith

International Biodiversity Information Systems – GBIF

Global Biodiversity Information Facility, Denmark, mlane@gbif.org
Symposium 3 - Biodiversity informatics: acquisition, analysis, archiving and applications

As information about species becomes increasingly digital, and the demand for it grows, the need to develop protocols and standards that allow for the interoperable exchange of data also grows. Because biodiversity is of global concern, and much of the data that are needed in, for example, the Amazon basin are held in institutions in Europe and North America, these protocols and standards need to be developed in a global context. While there are certainly national and regional level information systems (e.g. IABIN) that are highly important, some means of coordination among these efforts is also needed, again, in a global context. This coordination serves several purposes, not least of which is avoidance of duplication of effort, which is wasteful both of resources and time. Many developments made by one information system can be adapted for use by others – but not if they are not made known to

those others. This is one of the primary raisons d'être for the Global Biodiversity Information Facility (GBIF) – providing the global, coordinating context for biodiversity informatics developments worldwide.

Keywords: standards, protocols, global, coordination, interoperability

de Lara, Michel; Doyen, Luc

Biodiversity and ecosystem sustainability in uncertain environments

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Symposium 1 - The insurance value of biodiversity

The relation between diversity, stability and viability is a longstanding and largely studied issue in ecology with important implications to biodiversity management. The role played by the uncertainty is a basic dimension of the problem. Diversification is known to be relevant to deal with risk in portfolio management, as well as in ecology through the insurance hypothesis. This means that biodiversity ensures ecosystems against declines because many species provide greater guarantees that some will maintain functioning even if others fail. To our knowledge, theoretical results on such issues are rare and often restricted to specific ecosystem productivity functions and do not generally allow for direct trophic interactions within the population dynamics. Extensions to complex food-webs and interacting species are generally studied on numerical and simulation grounds. The present paper aims at extending the theoretical results in two directions using one period models in a stochastic environment. First, we examine insurance effects for a large class of global productivity functions within a trophic level. This is how we show, under general conditions, that asynchronicity in the responses of individual species productivities reduces the variability of the global productivity of the ecosystem. Second, we examine how diversification mitigates extinction risk and favour viability for more complex trophic web.

Keywords: insurance hypothesis, stochastic environment, productivity, asynchronicity, trophic web

Leadley, Paul

Global environmental change and terrestrial biodiversity: integrating observations, models and experiments

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Symposium 10 - Global environmental change and biodiversity: integrating observations, experiments and models

A wide variety of observations, models, and experiments suggest that global environmental change - increasing temperature, changes in precipitation patterns, increasing atmospheric CO₂ concentration, N deposition, etc. - has modified and will continue to modify terrestrial biodiversity in important ways. All of these approaches - observations, experiments and models - have strengths, but also have weaknesses that limit our ability to determine the reliability of predictions of the effects of global environmental change on biodiversity in the future. Quantitative comparisons between these different approaches could substantially increase the confidence that the scientific community, conservation managers and decision makers have in these predictions. I will show some concrete examples of steps that have been or can be taken to improve our ability to understand and predict the effects of global

environmental change on biodiversity by comparing models with experiments and observations.

Keywords: climate change, rising CO₂, N deposition, biodiversity loss, terrestrial ecosystems

Loeuille, Nicolas; Brannstrom, Ake; Dieckmann, Ulf; Loreau, Michel

Emergence of complex size-structured food webs out of repeated adaptive radiation

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Symposium 4 - Theoretical advances in evolutionary conservation biology

Although recent ecological models of food web structure are able to account for the emergent properties of empirical food webs, they overlook dynamical features and do not consider quantitative features such as densities or interaction strength. In this regard, evolutionary food web models may provide a good alternative. Until now, however, such evolutionary models dealt with a large number of unidentified traits. The model presented here shows how empirically realistic food web features may emerge from repeated adaptive radiation associated with the evolution of a single ecologically meaningful trait: individual body size.

Body size is assumed to affect the physiology of individuals (by constraining their metabolism) as well as their probability to engage in competitive and trophic interactions. Starting with a single ancestor, it is shown how complex food webs emerge through repeated adaptive radiation. The importance of the different components of individual fitness (metabolism, interaction probability) are investigated analytically for the first steps of the adaptive radiation, and by using numerical simulations once food webs become more complex.

Evolved food webs exhibit distinct trophic levels, if interference competition is weak and consumption niches are narrow. Otherwise, trophic structure is blurred and many species are omnivorous. Total biodiversity and number of trophic levels are dependent on the amount of energy available, but are also heavily constrained by how differences in body size affect competition and predation. The emergent properties of the resultant model food webs are similar to empirically observed food web statistics.

The presented evolutionary model provides interesting insights into the role of metabolism and ecological interactions in the emergence of biodiversity and trophic structure. The model accounts for statistical characteristics found in empirical datasets, without neglecting the quantitative and dynamical aspects of food web structure.

Keywords: adaptive dynamics, coevolution, metabolism, food web structure, community assembly

Lohmann, Lucia; Winkworth, Richard

A phylogenetic approach to understanding contemporary diversity patterns in Bignoniaceae (Bignoniaceae)

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Symposium 14 - Phylogeny and biodiversity science

Bignoniaceae is a conspicuous component of the neotropical flora; this large (360 spp.) angiosperm clade contains more species of woody vine than any other neotropical group. Representatives of Bignoniaceae occur in many of the major ecological zones in

the neotropics and exhibit considerable diversity in reproductive and vegetative morphology. The ecological importance of Bignoniaceae, combined with its broad distribution and morphological diversity make this an excellent model for investigating patterns of neotropical biodiversity.

We used a broad-scale molecular phylogeny to investigate patterns of diversity in Bignoniaceae. Specifically, we evaluate geographic range and morphological data in the context of this phylogenetic framework, exploring biodiversity at differing geographical scales and possible evolutionary explanations for these patterns.

The phylogenetic framework provides important new insights into the development of Bignoniaceae diversity. Although the group is currently most diverse in Amazonia, it seems most likely Bignoniaceae arose in the coastal forests of eastern Brazil and that there have since been multiple, independent transitions between ecological zones; these independent events are temporally asynchronous. Similarly, phylogenetic reconstructions indicate key ecological and morphological traits have arisen on multiple occasions that are, in some cases, correlated with a specific habitat or other ecological change. These insights suggest that patterns of modern diversity in Bignoniaceae have complex evolutionary origins that reflect the importance of ecological and environmental influences.

This phylogenetic framework provides important insights into contemporary diversity patterns in Bignoniaceae. These analyses suggest considerable evolutionary complexity underlies contemporary patterns.

Keywords: Bignoniaceae, Bignoniaceae, diversification, phylogeny, neotropical

Loreau, Michel

Biodiversity as insurance: the ecological perspective

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Symposium 1 - The insurance value of biodiversity

Recent ecological theory provides strong support for the idea that biodiversity can act as insurance for ecosystems in the face of environmental changes. Yet, this idea seems to contradict classical theories of community ecology and is still poorly supported by experimental data. Identifying the conditions for the application of the insurance hypothesis and the mechanisms that underlie it allows resolving its apparent contradiction with classical theories and understanding the limitations of recent experiments on this topic. Biodiversity is more especially likely to act as insurance over long time-scales and in complex ecosystems.

Keywords: biodiversity, ecosystem functioning, insurance, environmental changes, community ecology

Lutzoni, Francois; Arnold, A. Elizabeth; Kauff, Frank; Miadlikowska, Jolanta; Reeb, Valerie

Symbioses and their roles in the origin and maintenance of diversity

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Symposium 14 - Phylogeny and biodiversity science

The discovery of an unexpectedly high diversity and abundance of cryptic fungi in healthy leaves of plants and thalli of lichens begs an explanation for their role as putative symbionts with regard to their respective hosts and ecosystems. Did the diversification of lichens and land plants lead to the diversification of endolichenic and endophytic fungi by providing new substrates in new environments for enhanced

rates of fungal speciation? Or were beneficial interactions of these fungi with their hosts conducive to a higher rate of speciation among lichen-forming fungi and plant lineages? Do endophytes and endolichenic fungi serve as a reservoir for the evolution of fungal pathogens? Using a phylogenetic framework for the Ascomycota, the times of origin and diversification of fungal endophytes, endolichenic fungi, lichen-forming fungi, and a selection of fungal pathogens will be estimated and compared to divergence times of main lineages of land plants. Unveiling the evolutionary processes causing diversification is essential for a comprehensive understanding of extant diversity patterns.

Keywords: symbiosis, evolution, phylogenetics, lichens, fungal endophytes

Magallon, Susanna

The early evolutionary diversification of eudicots (tricolpate angiosperms)

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Symposium 14 - Phylogeny and biodiversity science

Angiosperms are the basis of modern terrestrial ecosystems. Nearly 75% of living angiosperm species belong to the eudicot clade, a group characterized by the presence of tricolpate pollen. Thus, the origin of modern terrestrial ecosystems is inextricably linked with the evolution of eudicots. The onset of eudicot diversification originated several lineages that include a substantially different number of living species, and that encompass a vast morphological variation. The goal of this study is to provide insights of the initial phase of eudicot evolution by estimating the age and pace of its phylogenetic diversification, the associated rates of molecular evolution, and the rates of taxonomic diversification of early eudicot lineages.

Ages and molecular rates were estimated by applying Penalized Likelihood, a relaxed molecular clock method, to a phylogenetic hypothesis calibrated with critically evaluated information from the fossil record. Absolute rates of taxonomic diversification were obtained from a time-homogeneous birth-and-death process, conditional on the survival of a clade to the present.

Age estimates indicate that early eudicot lineages differentiated shortly after the origin of the eudicots. Their present-day diversity is also ancient, but in some of these lineages, a substantial time gap separates their origin from their diversification into extant richness. Associated molecular rates are moderate to slow. Early eudicot lineages have moderate to low diversification rates, ranging from rates similar to those of angiosperms as a whole, to the lowest rates among angiosperms.

The early diversification of eudicots was an evolutionary radiation that produced extensive morphological diversity in the context of moderate molecular divergence. Early eudicot lineages are extremely ancient. Whereas some acquired their relatively high living species richness much later after their origin, others are depauperate survivors of extinct diversity.

Keywords: age, diversification rate, fossils, molecular rate, phylogeny

Marfo, Emmanuel

Managing forest conservation-mining conflicts in Ghana: the role of actor-empowerment

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Symposium 22 - Understanding and managing biodiversity conflicts

The growing concern for biodiversity conservation has altered the context within which many land use and development policies are debated. One example is the recent issue of mining in forest reserves in Ghana which has generated conflicts among several national and local actors. Such biodiversity conflicts can impede biodiversity conservation and restoration and have other destructive effects, hence there is a need for the development of innovative mechanisms to manage conflicts. By employing a two-actor empowerment game model, a study on the forest-mining conflict in Ghana was undertaken to explore the chronological pattern of actor power strategies and resources by generating data through narratives, observation, and documentary and media analyses. Building on the increasingly common observation that 'power' is central to all conflicts and conflict management mechanisms, the study attempted to understand the power play among both national and local actors. The paper has three goals. Firstly, to illustrate, from empirical observation, how 'power' plays itself out in biodiversity conservation conflicts in the contexts of policy discourse (national level) and implementation (local level). In particular the paper attempts to show whether there are patterns of actor power strategies and deployment of power resources or whether these are context-bound. Secondly, the paper examines the role of actor empowerment for managing biodiversity conflicts at national (policy) and local (implementation) levels. Finally, the implications of these observations for policy intervention in managing forest and land use conflicts in Ghana are described and lessons learnt are shared for use in other contexts and countries.

Keywords: forest-mining, conflict management, empowerment, biodiversity, Ghana

Martínez-Meyer, Enrique; Díaz-Porrás, Daniel; Zambrano, Luis

Ecological space, geographical space, and the abundance of species

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Symposium 11 - Spatial scale, distribution ranges, and large-scale patterns of species diversity

The ecological niche -understood as the n-dimensional hypervolume composed of biotic and abiotic variables within which populations of species can survive without immigration- is a conceptual framework that permits understanding how proximal factors determine distributional ranges of species. Further theoretical extensions of the niche concept propose that differential population abundance of a species within its range depends on the position of such populations in relation to the centroid of the hypervolume (in ecological rather than geographical space), where optimal conditions are supposed to persist. Despite its importance, no empirical test exists for these ideas in a range-wide scale, in part due to the lack of methodological tools. In this study we tested the hypothesis that the abundance of species is negatively correlated with the distance to the centroid of their niche's hypervolumes. We modelled ecological niches of several vertebrate species via the Genetic Algorithm for Rule-set Prediction (GARP) and estimated their centroids in ecological space individually; then, for each species we calculated the distance of populations to the centroid of its niche and correlated it to their abundance. We found a statistically significant negative relationship between the distance to the centroid of the niche and populations' abundance in all species analyzed, supporting our hypothesis; although the strength of the correlation and shape of the curve of such relationships vary among them. Implementation of these findings in ecological niche modelling may help to improve from the current binary/probabilistic distribution maps to relative abundance outcomes.

Keywords: ecological niche, abundance, geographic range, GARP, bioclimatic envelope

Martin, Gary

Community-based approaches to assessing and monitoring traditional use zones

The Global Diversity Foundation (GDF), Malaysia, GMartinGDF@aol.com
Symposium 5 - Sustaining partnerships for community-based conservation

Martini, Brigette

Biodiversity applications of hyperspectral and hyperspatial remote imaging

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Symposium 17 - Remote sensing: methods and applications to assess, monitor and manage biodiversity loss

Although assessment and monitoring of biodiversity are increasingly being aided by remote-sensing instruments, data sources and analytical procedures, general acceptance and use of these resources has been hesitant and they are often resisted. One common reaction is that remote sensing adds more variables than are needed, and makes a complex problem even more complex. I argue that only now is remote sensing beginning to provide enough variables to address multifaceted biodiversity issues, via the newest high spectral and spatial resolution satellite and airborne systems. General acceptance and use by the biodiversity community of next-generation sensors, including hyperspatial satellites (IKONOS, Quickbird) and hyperspectral and hyperspatial airborne instruments (HyMap, AVIRIS) has been much slower than expected. Slow acceptance reflects: 1) ignorance of available instruments, their characteristics, ease of use, and analytical algorithms; 2) resistance to changing and/or amending standard operating procedures; 3) barriers such as upgrading hardware and software, and learning new analysis procedures and paradigms; 4) many remote sensing applications were developed first for geological studies where characteristics and variables are more consistent and easier to isolate than biological ones, and usually require more sophisticated levels of scientific innovation and understanding. Practical solutions do exist, and they also lead to new levels of insight into biodiversity science. Some solutions will be presented, including evaluations of available sensors and platforms, and strategies to overcome technology barriers. These will be illustrated with examples of successful, on-going biodiversity studies in Costa Rica, the Pacific Northwest of the U.S. and Hawaii that not only use new, especially hyperspectral and hyperspatial technologies, but also emphasize their growth from simpler technologies (e.g. photography, Landsat).

Keywords: remote sensing, hyperspectral, hyperspatial, AVIRIS, HyMap

McKie, Brendan; Malmqvist, Björn

Detritivore diversity and leaf decomposition in streams: placing richness-ecosystem functioning relationships in context

Umeå University, Sweden,

Symposium 21 - Biodiversity and litter decomposition: a cross-systems perspective

Initial research into the effects of shredder (detritivore) diversity on leaf decomposition in streams has shown that species richness of shredders can impact decomposition. This is a significant finding given current high rates of species loss worldwide. However, much of this work is limited in scope, having been conducted largely in the laboratory over short time scales, and utilising boreal species from only one taxonomic group, the stoneflies. We extended this work by conducting experiments aimed at assessing how additional biotic and abiotic factors modulate observed effects of shredder richness on leaf decomposition in streams. We conducted laboratory experiments with a range of shredder species collected at various sites across Europe, and manipulated evenness and phylogenetic relatedness in addition to species richness. We also assessed the influences of diversity on leaf decomposition in anthropogenically impacted streams, and, for the first time, we manipulated richness in field microcosms, explicitly addressing the influences of a varying environment on richness-ecosystem functioning relationships. Effects of shredder diversity on leaf decomposition were detected, but not consistently in all experiments. The contribution of shredder diversity for leaf decomposition appears to depend on both variation in shredder assemblage composition (encompassing not only species composition, but also intraspecific characteristics that can vary spatially and temporally, such as body size) and external environmental factors. We conclude, therefore, that the role of shredder richness in regulating leaf decomposition depends crucially on biotic and abiotic context, and may be highly variable in space and time.

Keywords: shredder, decomposition, diversity, context dependence, evenness

Mishra, Charudutt

Understanding and managing human-snow leopard conflicts in the Himalaya

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Symposium 22 - Understanding and managing biodiversity conflicts

Pastoral communities across the Himalayan high altitudes are in conflict with wild carnivores due to livestock depredation. Underdeveloped economies, high financial losses, and the precarious status of carnivore species involved make these conflicts acute. Carnivore conservation depends on how effectively such conflicts are managed. We review the results of our studies on human-snow leopard *Uncia uncia* conflicts in Western (Spiti) and Eastern Himalaya (Western Arunachal Pradesh), and examine ways of managing them. Our studies in Spiti have established that livestock outnumber wild ungulate prey, leading to high dependence of the snow leopard on livestock (40 % to 58 % of the diet). Depletion of wild ungulates due to competition from livestock in this low-productivity landscape has presumably escalated the levels of livestock depredation (12 % of the livestock holding annually). Nevertheless, the indigenous Buddhist community has high cultural tolerance towards wildlife. In contrast, there is a high level of carnivore persecution in Arunachal, although people here are also predominantly Buddhist. Depletion of wild ungulate populations in this relatively high productivity landscape has been caused by excessive hunting. Conflict resolution programmes need to offset economic losses, and reduce the extent of livestock losses by (i) promoting better herding, and (ii) facilitating wild ungulate recovery (reducing hunting in Arunachal and livestock density in Spiti). Our pilot conflict resolution programme in Spiti has involved creating livestock free areas (c. 20 km²), and setting up community-managed livestock insurance programmes (covering 100 herding families). This has resulted in a significant increase in wild

ungulate density, off-set economic losses, and reduced livestock losses by over 50%. Our results underscore the need and scope for community-based conflict management programmes founded on a good understanding of wildlife ecology and human society.

Keywords: carnivores, livestock, conflicts, Arunachal Pradesh, conservation

Mora, Camilo

Large scale patterns, processes and threats to reef fish biodiversity

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Symposium 6 - Oceans of biodiversity: discovering species, habitats and ecologies

Among vertebrates, coral reef fishes are a spectacularly diverse group being currently threatened by different forms of human activities. Such a situation has added special impetus to the understanding of processes that regulate their diversity. In this presentation I outline large scale patterns in species richness of this group and how such patterns could arise from evolutionary processes involving the origination and dispersal of species and from environmental variables that seem to promote speciation and constraint species geographical expansions. The extent to which climate change will affect species diversity is also discussed.

Keywords: biodiversity, species richness, dispersal, threats, fish

Muthumbi, Agnes

Marine Nematodes diversity along a depth transect in the Kenyan Coast (Western Indian Ocean)

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Symposium 6 - Oceans of biodiversity: discovering species, habitats and ecologies

There is little information on marine productivity and diversity in the offshore zone along the Kenyan Coast both in the pelagic and benthic system. This study is part of a larger study that was aimed at establishing the influence of the monsoon winds and ocean currents on productivity and diversity and other physico-chemical conditions along the Western Indian Ocean.

Marine meiobenthic fauna was investigated in terms of community, density and diversity in relation to depth along the Kenyan Coast (WIO) from 20 m to 2000m deep. Nematodes were the most abundant, and were identified to genus level, and in a few families to the species level; diversities were calculated using standard indices. Nematode densities and community assemblages were comparable to other oligotrophic areas in the world (300 and 900 ind / 10 cm²). Diversity at the genus level was influenced by sediment type at the shelf with more sandy sites supporting higher diversity. At the continental slope on the other hand, diversity increased at mid-depth (500m) coinciding with low oxygen concentration. Diversity at other levels (family and species for few genera) will be investigated and compared with genus trends.

Marine diversity is higher than we have information of at the moment. This diversity is being lost even before it can be documented. Major hindrance to the documentation of diversity and consequently conservation, at least in Kenya, is lack of funds. Worse still is the lack of awareness on the need for taxonomic work which can help document diversity, identify hot spots, threatened species etc.

Keywords: marine, nematodes, diversity, kenyan coast, depth

Nagendra, Harini; Pareeth, Sajid

Integrating satellite image analysis with field data for a multi-scale assessment of local institutions and biodiversity distribution in Nepal

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Symposium 17 - Remote sensing: methods and applications to assess, monitor and manage biodiversity loss

Levels of detail and resolution, spatial, temporal and spectral, are improving to the point where satellite remote sensing has emerged as a powerful tool for ecologists and conservation biologists interested in understanding the spatial and temporal distribution of biodiversity. Hitherto, much of the research examining the use of remote sensing for biodiversity studies has focused on the temperate regions of the world where vegetation cover tends to be dominated by a few species. In the tropics, where human pressures are amongst the highest in the world, the spatial and temporal dynamicity and complexity of biodiversity distributions make the task of monitoring from space conceptually far more challenging. This research will focus on a region of Nepal experimenting with decentralized approaches to community forest management that have given rise to a shifting mosaic of forest cover and biodiversity. We use a combination of Landsat satellite images at 30 m resolution, IKONOS images at 4 m resolution, Geographical Information Systems, institutional surveys and forest plots to evaluate the impact of government initiated efforts towards community involvement in protected area management in the Nepal Terai. We describe the approaches we have developed to integrate IKONOS and Landsat data, and relate this information to biodiversity distributions in the study landscape. Further, social information on forest management institutions is integrated with the satellite information on forest cover and field information on biodiversity, to understand the human dimensions of biodiversity distribution in this heterogeneous, human-impacted tropical landscape. The interdisciplinary approach used provides an illustration of how such complex questions can be addressed by combining approaches from the social and natural sciences, and results underscore the need to locate such research in an explicitly spatio-temporal context.

Keywords: remote sensing, biodiversity assessment, forest cover change, community forestry, Nepal

Nkedianye, David

Biodiversity payment schemes in East African Savannas: problematic half solutions or untapped opportunities?

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Symposium 16 - Wildlife conservation and economic development in East and Southern Africa

East African savannas are fragmenting rapidly because of a range of socio-economic and biophysical forces. These changes are negatively affecting biodiversity, and eroding an important natural resource that could potentially support livelihoods and thereby help reduce poverty, and provide ecosystem goods and services of global importance. Policies at national, regional and global levels are often in conflict, either supporting biodiversity conservation or supporting development of land in ways incompatible with the region's rich biodiversity, with few policies that balance both needs, particularly at the community level.

We provide the regional context by summarising data from long-term studies in East Africa on livestock and wildlife trends, the interaction of land use and wildlife, pastoral household economies, and incentives for conservation. We then highlight the successes and failures of a biodiversity payment scheme in the Kitengela, Kenya. We further share our experiences with an evolving dialogue with policy makers, communities and conservation organisations at local to regional levels.

Case studies from East Africa suggest that payments for biodiversity conservation do not provide an easy solution to balancing human development and biodiversity conservation, but they can provide pastoral people with incentives to manage land in ways that are compatible with wildlife. Payment schemes work well when there is strong collective action to support their establishment, monitoring and transparency. Problems arise when elites take the lion's share of benefits, forces that drive incompatible land use are overwhelming and rapid, and supportive national policies are lacking. Human rights issues also arise from the control of biodiversity on communal and private lands.

We compare the experiences in this study with other similar schemes in savannas elsewhere in the region.

Keywords: biodiversity, payment schemes, collective action, local communities, testing methods

Meine van Noordwijk, Susilo Kuncoro, Endri Martin, Laxman Joshi, Pornwilai Saipothong, Veronika Areskoug, Trudy O'Connor

Donkeys, carrots, sticks and roads to a market for environmental services: rapid agrobiodiversity appraisal for the PES – ICDP continuum

Symposium 9 - Biodiversity in agricultural landscapes: saving natural capital without losing interest (Second part)

Carrots and sticks were two means farmers saw, before the age of self-propelling automobiles that respond to pressing buttons, to keep their donkeys moving on the road to market. In analyzing the relationship between land use decisions in the forest – rural landscapes of the developing world, the carrot and stick analogy has been used for the conservation/development dilemma. In this use of the analogy, the farmer is implicitly and disrespectfully considered to be the donkey. The target is still going to the market, but a market that entails all goods and services. Where the regulatory (stick) approaches to forest protection have failed, the 'pull' approach (carrot) of 'integrated conservation and development' projects (ICDP's) has rarely delivered on the conservation expectations and has often not been cost-effective for development. Much is currently expected of conditional incentives and payments for environmental services (PES) actually delivered. The ICDP and PES approaches are on opposite sides of a continuum of mechanisms that emphasize different types of interactions. We designed a Rapid Agrobiodiversity Appraisal (RABA) method that in a limited time frame and with limited costs will allow 'brokers' to advise both potential partners to proceed or not on the way to negotiated agreements. The issues to be assessed include Value (natural capital), Threat (human capital), Opportunity (bonding forms of social capital) and Trust (bridging forms of social capital). Three RABA applications will be presented. The first considered the case of rubber agroforest as last refuge of lowland forest biota in Sumatra. The second case summarized our current understanding of shade-based coffee agroforestry in the hills of Sumatra and the opportunities for 'bird-friendly coffee' market channels. The third

case looked at opportunities to make a new national park in an agriculture – forest mosaic in northern Thailand.

Keywords: land use, forest protection, agriculture, ICDP, PES

O’Keeffe, Jay; Soto, Doris; Naiman, Robert J.; Arthington, Angela

The drivers of biodiversity in lakes and rivers at different time scales

UNESCO-IHE, The Netherlands

Symposium 13 - Freshwaters: sustaining biodiversity and system integrity

To understand the causes of biodiversity changes resulting from human activities, we should first understand the evolutionary and ecological drivers that have resulted in the natural biodiversity of different fresh water systems. This paper investigates the effects of physical and biological drivers on lakes and rivers, at short and long time scales, so as to test comparative hypotheses:

Physical and biological processes are important in all aquatic ecosystems, but there is a continuum from predominantly physically-driven systems such as river channels in semi-arid regions, in which biological interactions are only important during episodes of relative stability (e.g. between floods and droughts), to systems which are physically stable over long periods (such as the African Great Lakes) in which biological interactions have structured communities. Floodplain rivers are intermediate in this continuum, with biological processes dominating in floodplain wetlands between episodes of drying and wetting. In recently glaciated lakes (e.g. the North American Great Lakes), biodiversity is a result of a colonisation scramble over the past 10 000 years, and a successional sequence over time. In all systems, the observed biodiversity is driven by present day processes that overlie an evolutionary and biogeographic template

If these hypotheses are correct, the consequences of human disturbance in different freshwater systems should be predictable in relation to the ability of communities to resist or recover from different sorts of perturbations. These hypotheses will provide a framework within which to examine questions such as:

- What are the ecological and evolutionary processes that have shaped biodiversity in the past and determine it today?
- What are the main human impacts on biodiversity in different aquatic systems?
- What will be the impact of changes in human resource use on freshwater ecosystem biodiversity?

Keywords: rivers, lakes, drivers, physical, processes

Olivieri, Silvio; **Jorge Soberon**

NGO roles in collection, curation and use of biodiversity information

Conservation International / IUCN, USA

Symposium 3 - Biodiversity informatics: acquisition, analysis, archiving and applications

The emergence of on-line databases of different kinds relevant to conservation and their increased accessibility is changing the way we can improve access to data, develop better analytical capacities and effectively support decision processes. The new paradigms created by on-line access not only can bridge the gap between scientific data and action but also accelerate the knowledge process and the impact of new research on policy making. Non-governmental organizations are playing an increasingly important role both as data providers and as end users. IUCN launched

the Conservation Commons initiative at the end of 2004. This effort defines a framework for facilitating access and data and information sharing within the conservation community. The Conservation Commons Principles support free access to data and information, protection for author's rights and recognition, and for the proper use of the data and information (safeguarding data integrity, etc). This effort, similar to the Science Commons, is already subscribed by more than 50 organizations from the non-governmental, governmental, intergovernmental, academic communities, and the private sector. Under this framework, we hope to develop the standards, methods and tools to leverage open access data and information for the benefit of the conservation of biodiversity. The presentation will focus on the advances of this initiative as well as on specific roles the NGO community is playing in this field.

Keywords: information, conservation commons, databases, collections, NGOs

Padulosi, Stefano; Hoeschle-Zeledon, I.; Shtapit, B.; **Hodgkin, Toby**

Underutilized crops for community development

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Symposium 9 - Biodiversity in agricultural landscapes: saving natural capital without losing interest

Underutilized species are closely linked to local people. Their promotion is synonymous of promoting cultures and traditions of a territory along with an empowerment of its communities. Enhancing the use of underutilized crops happens through the very people who have been safeguarding them. Species are selected through participatory approaches as models to develop methodologies of broader application. Equitable partnership among supply chain actors is sought for long lasting benefits to communities. Conservation of resource base is achieved as a result of increased sustainable use of target crops through added value strategies. The work has underlined that while genetic diversity is to be properly surveyed, collected, selected, improved and cultivated, at the same time such efforts need to converge towards the identification of best varieties for farmers and markets, training of community members to enhance capacities in harvest/post harvest technologies, add value techniques, commercialization and marketing. Stronger linkages between demand and supply are needed along with policies for a more conducive environment supportive of local products. New income generation opportunities for local communities need to be pursued through penetration of products in new markets banking on increasing demand for novelty food, organic agriculture, fair trade, agro/eco-tourism etc. Networking and public awareness continue to be essential for making best use of limited resources available in this field. Conclusions: Promoting underutilized species requires strategic interventions at community level. These could be integrated within countries' poverty reduction strategies, including food based- dietary guidelines and school feeding programs. Enhancing capacities of partners in integrating management and use of material with appreciation of economics and nutritional aspects deserves highest priority.

Keywords: underutilized species, nutrition, income, marketing, policies

Parvinen, Kalle

Biodiversity losses through selection-driven extinctions

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Symposium 4 - Theoretical advances in evolutionary conservation biology

The great majority of species that lived on earth have gone extinct. These extinctions are often explained by invoking changes in the environment, to which a species has been unable to adapt. Selection-driven extinction (also known as "evolutionary suicide") is an alternative explanation of such extinctions. In the course of such an evolutionary process, a viable population gradually adapts its phenotype so that it can no longer persist. This presentation will review the underlying theory and discuss different models of selection-driven extinction.

Keywords: selection-driven extinction, evolutionary suicide, frequency-dependent selection, Allee effect, adaptive dynamics

Pascual, Unai; Perrings, Charles

The economics of biodiversity in agricultural landscapes

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Symposium 9 - Biodiversity in agricultural landscapes: how to save our capital and not lose interest

This paper offers a framework for analysing the economic drivers and effects of agrobiodiversity loss, focusing on in-situ conservation at both farm and landscape levels. We distinguish between the proximate and fundamental causes of biodiversity loss in terms of the decentralised (microeconomic) behaviour of farming households. Special attention is paid to the interplay between micro-economic decisions and the meso-economic factors (i.e., institutional and market conditions) that determine the effects of government policies. We interpret agricultural landscape changes as the product of explicit or implicit decentralised farm-level decisions to (dis)invest in biodiversity as a strategic asset that provides flows of ecological services on- and off-farm. Several case studies are used to illustrate how 'downstream' or 'forward' effects feed back into agricultural production and stability ('backward effect'). We use the framework to assess the effectiveness of policies to address underprovision of agrobiodiversity-supported ecological services that are socially (locally and globally) welfare enhancing. The distributional impacts of such backward-forward linkages are also discussed. The framework requires modelling across scales to aid policy targeting, and to evaluate both uncertainty and risk externalities and property rights.

Keywords: agrobiodiversity, backward-forward linkages, property rights, meso-economy, decentralised behaviour

Perrings, Charles

Biodiversity conservation and risk management in agriculture

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Symposium 1 - The insurance value of biodiversity

Evidence is accumulating on the conditions in which crop genetic diversity changes the variability of yields and incomes in agriculture. This paper reviews the factors that are altering crop genetic diversity, and the implications this has for susceptibility to harmful pests and pathogens. It then considers the linkages between crop genetic diversity and the costs of pest and environmental risk management. A case study uses data from Italian agriculture to analyze the impact of crop genetic diversity on the variability of farm costs, and hence farm incomes. General conclusions are drawn for the conservation of biodiversity in agroecosystems.

Keywords: agriculture, biodiversity conservation, crop genetic diversity, environmental risk management, pests and pathogens, risk management

Peterson, Alan T.

Biodiversity information and informatics tools permit forecasting complex ecological phenomena

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Symposium 3 - Biodiversity informatics: acquisition, analysis, archiving and applications

Biodiversity affects humans in many ways, including as agricultural pests, in the aesthetic appeal of natural landscapes, as agents of spread and transmission of disease, as a storehouse of biological invention through evolution, etc. Research in recent years has begun to explore the potential of biodiversity information in forecasting complex ecological phenomena of interest to humans—one such effort has focused on modelling the ecological requirements of species based on known occurrences to create a predictive understanding of species' geographic potential. These ecological niche models make possible predictions of species' native distributional areas, potential invasive areas, effects of climate change on geographic potential, etc. In this talk, I illustrate the power of biodiversity information and informatics tools in forecasting ecological phenomena with examples of species' invasions, human disease transmission, and biodiversity discovery.

Keywords: biodiversity, informatics, modelling, disease, invasives

Philipson, Christopher; Hector, Andrew; Godfray, Charles; Glen, Reynolds; Saner, Philippe

The Sabah Biodiversity Experiment: functional ecology of dipterocarps and carbon sequestration in enrichment-planted secondary forests

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Symposium 15 - Forest biodiversity and carbon sequestration

Does the diversity of trees in primary and secondary forests affect their ability to sequester carbon? If a single species sequesters the most carbon then diversity will dilute potential carbon storage. On the other hand, complementary niche differences between species could allow diverse mixtures to sequester more carbon than even the best monoculture. In either case there is a need to better understand the ecological factors that influence carbon storage and to develop economic and management methods that consider both biodiversity and carbon sequestration. To test the relationship between biodiversity and carbon sequestration we have recently established the Sabah Biodiversity Experiment in which we manipulate the generic and species diversity of dipterocarp trees in enrichment-planted secondary forest in Malaysian Borneo. We describe the setting, design and methods employed in the experiment and preliminary results from several side-projects conducted to test for hypothesized key life-history trade-offs in dipterocarp tree species. We are using three companion projects to examine the survival and growth of dipterocarp tree seedlings grown under different light conditions in a shade house experiment, in the secondary forest enrichment-plantations and in primary forest. Preliminary results do not appear to support the hypothesized trade-off between growth under high (gap) and low (understory) light conditions or proposed categorisation of some of the study species into shade-tolerant and light-demanding functional groups.

Keywords: biodiversity, ecosystem functioning, functional ecology, carbon sequestration, experimental plantation forests

Polasky, Stephen; Costello, Christopher; Calvin, Cathleen

Linking humans and ecosystems: an integrated modelling approach to the Serengeti ecosystem

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Symposium 16 - Wildlife conservation and economic development in East and Southern Africa

The Greater Serengeti Ecosystem is one of the few remaining places on Earth with large-scale migration of large mammals, including the annual migration of more than 1 million wildebeest. Human population in the ecosystem outside of protected areas is growing, as is the impact of human actions throughout the ecosystem. There is recognition that linkages between human and other components of the Serengeti are pervasive. The impetus for the Serengeti Biocomplexity Project was to incorporate humans into the model of the Serengeti ecosystem and better understand system dynamics and patterns. We model human decisions, which are affected by ecosystem conditions, as well as ecosystem conditions, which are affected by human decisions. We build a simple model capable of simulating system dynamics with feedbacks between human behaviour and ecosystem conditions and use this to understand the likely effects of various policy or environmental changes.

Keywords: integrated models, system dynamics, Serengeti, human behaviour, human wildlife interaction

Polasky, Stephen; Tilman David

Diversity and ecosystem services

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Symposium 1 - The insurance value of biodiversity

Human activity has modified much of the terrestrial surface of the planet resulting in reductions of diversity in many ecosystems. In this paper we analyze some of the potential implications of the loss of diversity within ecosystems on the production of ecosystem services of value to humans. We begin by providing a general formation of the production of ecosystem services as a function of species composition, diversity, and management choices. We then use simple empirical relationships to draw out implications of reductions in diversity to the provision of various ecosystem services. We then apply this analysis to compare provision of both goods and services from monoculture agriculture, pasture, managed forestry, and unmanaged ecosystems.

Keywords: ecosystem services, productivity, stability, management, diversity

Prentice, Collin I

Dynamic Global Vegetation Models predict major shifts in biomes

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Symposium 10 - Global environmental change and biodiversity: integrating observations, experiments and models

Dynamic Global Vegetation Models (DGVMs) simulate the effects of climate change and rising CO₂ on terrestrial vegetation and the feedback of terrestrial vegetation on

the global C cycle. All DGVMs predict that there will be large shifts in the geographic ranges of major plant functional groups by the end of this century. Most plant functional groups are predicted to move poleward, often by many 100's of kilometres. However, some of the simulated responses of vegetation to global environmental change are more alarming. For example, several DGVMs - including the LPJ model - predict the collapse of the Amazonian rain forest by end of the century for some climate scenarios. If true, climate change could become one of the major driving forces of biodiversity loss in the 21st century and these changes could lead to strong feedbacks to atmospheric CO₂ concentrations and climate. DGVMs also predict that climate and CO₂ may strongly interact in their effects on vegetation. For example, rising CO₂ may limit climate change effects on vegetation in some cases, e.g., may dampen climate effects on tropical rain forests, but may accentuate shifts in plant functional groups in others, e.g. promote shifts of some savannas to forests. This suggests that rising atmospheric CO₂ concentrations must be accounted for when simulating the response of terrestrial vegetation to future climates.

Keywords: biome, rising CO₂, climate change, plant functional types, DGVM

Rahbek, Carsten

Spatial scale, the perception of large-scale species-richness patterns and the role of geographical range sizes

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Symposium 11 - Spatial scale, distribution ranges, and large-scale patterns of species diversity

Spatial scale, the perception of large-scale species-richness patterns and the role of geographical range sizes

Despite two centuries of exploration, our understanding of factors determining the distribution of life on Earth is in many ways still in its infancy. Much of the disagreement about governing processes of variation in species richness may be the result of the implicit, but wrong assumption that patterns and mechanisms are scale invariant. Additionally, patterns of species richness and species range size distributions are intertwined and interrelated. Nevertheless, models of species richness in relation to climatic, topographic, or historical factors often assess the statistical relationship between species richness and these variables without modelling the underlying pattern of species' geographical ranges that determine richness.

This talk will first illustrate how scale effects influences our perception of species richness gradients with examples from elevational gradient studies. Then, using results from an analysis of all breeding birds of Africa, it is demonstrated how underlying variations in geographical range size "bias" conclusions based on analysis of overall species richness.

Finally, I present the results of fresh analysis based on all South American landbirds where spatially explicit models simulating the location of species' geographical ranges in an environmental heterogeneous landscape are used to test the main current hypotheses based on contemporary climate. The results illuminate that our understanding of the role of contemporary climate on species richness patterns is perhaps less powerful than anticipated.

Keywords: species richness patterns, scale effects, range sizes, null models, predictive models

Ramanna, Anitha

Plant genetic resources for food and agriculture: effects of multilateral agreements in developing countries (part II)

University of Pune, India

Symposium 8 - Implementing multilateral environmental agreements on biodiversity: balancing equity and effectiveness

Biological diversity is usually associated with wild animals and plants, and there is generally less political awareness of the importance of genetic diversity in agriculture for plant breeding and food security. This paper is about the management of plant genetic resources for food and agriculture and how different international agreements have affected this management in developing countries. It will focus on the issue of access to these vital resources, since that is particularly important for their future existence and for food security. The international agreements affecting such access are the Convention on Biological Diversity (CBD), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), its predecessor, the International Undertaking on Plant Genetic Resources (IU), the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), and the Convention for the Protection of New Varieties of Plants (UPOV).

A key finding is that these international agreements have, as an aggregate effect, restricted access to plant genetic resources for food and agriculture, despite explicit intentions (the CBD and the ITPGRFA/IU) and implicit expectations (TRIPS and UPOV) in the opposite direction. The explanation is to be found in their interaction. Implications and consequences for developing countries will be pointed out and illustrated with examples from the Philippines. The results will be discussed in an equity-effectiveness perspective. An important factor contributing to restricted access to plant genetic resources for food and agriculture in developing countries is the tension between the demands for intellectual property rights and demands for fair and equitable benefit sharing. A discussion of the trade-offs between the equity dimension related to the demands for benefit sharing and the effectiveness dimension related to the norm of facilitating access might uncover viable paths to deal with the problem.

Keywords: plant genetic resources, multilateral agreements, interaction, India, Philippines

Ree, Richard

A phylogenetic framework for comparing regional species diversities, applied to four floristic hotspots

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Symposium 14 - Phylogeny and biodiversity science

Biodiversity hotspots have traditionally been characterized by measures of species richness and endemism, but the phylogenetic distribution of species within and between hotspots has received little attention. Phylogeny has commonly been accounted for in regional diversity comparisons only by proxy, i.e. by treating taxa of the same rank as equivalent units, but this is a fundamentally flawed application of the current nomenclatural system and better methods that avoid rank-based comparisons are needed.

I introduce a new quantitative framework for phylogenetically "profiling" regional species diversity that accommodates phylogenetic uncertainty as well as regional

differences in species richness. The method standardizes comparisons on a set of known clades for which global diversity estimates are available. Within a region, each clade is measured by an index relating its global diversity, regional representation, and proportional contribution to the regional species pool.

Applied to the angiosperm floras of four hotspots in China, South Africa, California, and Ecuador, the method shows species in the Cape region to be the most aggregated within clades and those in the Hengduan Mountains the least. The regions differ markedly with respect to which clades contribute the most species to the flora. The results motivate many further questions about the underlying causes of these patterns and raise the possibility of hypothetico-deductive tests.

Progress in discovering the tree of Life is accelerating and basic methods are needed for incorporating phylogenetic information into studies of regional species pools. The comparative framework outlined here overcomes some limitations of previous rank-based methods, highlights the need for basic inventory data, and helps bring an historical evolutionary perspective to regional biodiversity studies.

Keywords: hotspots, phylogeny, regional diversity, species richness, angiosperms

Regetz, James; Kremen, Claire

Conservation, restoration and farm management: alternative scenarios for managing pollination services from wild bees on a landscape scale

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Symposium 2 - Pollination services

Wild bees can provide valuable pollination services on farms, augmenting or even replacing the services provided by managed bees like the honey bee, *Apis mellifera*. Stocks of managed honey bees have declined steadily in the United States and other regions of the world over the past fifty years, making reliance on this single pollinator risky. Our recent work in Northern California has identified positive relationships between wild bee diversity and abundance on farms and the proximity and proportional area of natural habitat in the surrounding landscape. Using hierarchical statistical models to bring together multiple field studies of bee visitation on different crop and wild plants, we jointly estimated the effects of local farm management, nearby floral resources, and landscape habitat attributes on wild bee pollinators. We then used best-fit models to predict changes in wild bee communities under several alternative management scenarios. In the first scenario, we assumed that farmers would improve availability of floral and nesting resources to bees directly on their farms, with no restoration of natural habitat patches. In the second scenario, we assumed that no farm enhancements would be made, but natural habitat patches would be restored off-farms. In the third, mixed scenario, we assumed that a combination of off-farm restoration and on-farm enhancement would be conducted. In each case, we not only determined the predicted effects of management on overall bee diversity, abundance, and pollination services provided in the region, but also examined the resulting spatial distribution of services provided across the agricultural landscape.

Keywords: pollination, ecosystem services, agriculture, land management, restoration

Rex, Michael

Existential deep-sea ecology: is the abyss a black hole sink?

University of Massachusetts Boston, USA

Symposium 6 - Oceans of biodiversity: discovering species, habitats and ecologies

The deep-sea soft sediment environment is Earth's largest benthic ecosystem.

Extensive sampling during the last 40 years has revealed that the deep sea supports unexpectedly high invertebrate biodiversity at local scales. However, the geographic distributions of individual species, and hence regional-scale diversity, remain poorly known. Here, I present data on the bathymetric ranges of deep-sea molluscs from the eastern and Western North Atlantic. Summing the number of coexisting species ranges across depth increments supports the unimodal diversity-depth pattern detected earlier by using estimates of local (sample) diversity. The depth distributions also show that the abyssal (>4000 m) molluscan fauna is largely composed of deeper range extensions of bathyal (200-4000 m) species. Most abyssal species have larval dispersal and live at extremely low densities. These trends suggest that the bathyal and abyssal zones may constitute a source-sink system in which many abyssal populations represent a balance between chronic extinction from inverse density dependence and immigration from bathyal sources. I present a number of ways that the source-sink hypothesis for abyssal biodiversity can be tested. A new global synthesis of deep-sea standing stock suggests that source-sink phenomena may be widespread at great depths. If source-sink dynamics do prove to be important in maintaining abyssal biodiversity, this would have very significant implications for understanding the ecology and evolution of the deep-sea fauna, and for estimating global biodiversity.

Keywords: deep sea, diversity, source sink, molluscs, abyss

Riede, Klaus

Efficiency analysis of transboundary conservation strategies for migratory species

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Symposium 8 - Implementing multilateral environmental agreements on biodiversity: balancing equity and effectiveness

Migratory species are a challenge for conservation, because their movements across national boundaries require efficient coordination of environmental legislation. Legal frameworks are provided by various Multilateral Environmental Agreements, such as the Convention on Migratory Species. The efficiency of these agreements is investigated by tracking changes in threat status of migratory species. "Hot spots" of migratory species distributions were identified and correlated with major threats to key habitats.

The Global Register of Migratory Species lists 4,400 migratory vertebrate species, together with threat status as given by the IUCN Red List, and their protection status through the Appendices of the Bonn Convention. Using a Geographical Information System, digital distribution maps for 1,100 migratory species were merged and intersected.

Several migratory species were upgraded as "Critically Endangered", which is the highest threat category of the IUCN Red List. Among those are migratory flagship species such as Saiga antelope (*Saiga tatarica*), or the Giant catfish (*Pangasius gigas*). They are threatened by illegal hunting, over-exploitation (e.g. non-sustainable fishing) and habitat destruction (e.g. dam construction). However, only 22 out of 1,886 migratory fish species have hitherto been listed on CMS Appendices. The GIS analysis shows high diversity of migratory species in temperate regions and highly

industrialized countries.

This analysis shows that concentrating conservation efforts on single species or tropical biodiversity hotspots is not sufficient for migratory species. The huge ranges and movements of these species require fundamental changes in agricultural, forestry and fishery practices, which have to be compatible with maintenance of healthy populations of migratory species, many of which are of economical importance.

Keywords: migratory species, CMS, conservation, coordination, GIS analysis

Ring, Irene; Ferreira dos Santos, Rui

Integrated evaluation of policy instruments in biodiversity conflict reconciliation

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Symposium 22 - Understanding and managing biodiversity conflicts

Successful biodiversity policies have been established for some large vertebrates that were close to extinction. However, recovering populations can be accompanied by increasing conflicts with humans especially when species feed on commercially relevant biological resources. What is the role of policy instruments in reconciling such human-wildlife conflicts and how can policies be evaluated with respect to conflict resolution? This paper presents results of the EU project FRAP that aims 1) to develop a generic framework for reconciliation action plans between the conservation of large vertebrates and the use of biological resources by humans and 2) to illustrate this framework using conflicts between the conservation of fish-eating vertebrates and fisheries as models.

Policy instruments relevant in the conflicts between fisheries and protected species were investigated in Portugal and Germany (otters), Finland and Sweden (grey seals) and Denmark and Italy (cormorants). A number of regulation and economic instruments, and others such as communication and information were studied regarding their actual implementation and potential for improvement. They were evaluated based on criteria such as effectiveness in conflict reconciliation, efficiency, perception by and involvement of stakeholders, thereby considering ecological, economic and sociological concerns. Policy analysis in biodiversity conflict reconciliation has to be based on sound economic analysis, but it must also include ecological findings on the abundance and feeding behaviour of species as well as sociological analysis on the perception and attitudes of stakeholders. Only such an integrated approach in the design and evaluation of instruments is able to provide socially relevant and locally acceptable conflict resolutions. Comparative analysis of conflicts and policies in different countries provides a basis for mutual learning and improvement of the policy mix in place.

Keywords: policy instruments, biodiversity conflicts, protected species, economics, integrated evaluation

Rosendal, G. Kristin

International patent law meets access and benefit sharing regulations: Prospects for implementation?

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Symposium 8 - Implementing multilateral environmental agreements on biodiversity: balancing equity and effectiveness

Biodiversity and bioprospecting keep raising issues of conservation, innovation, and access and benefit sharing in international negotiation fora. Agriculture and pharmacy depend on access to seeds and biological material for the production of food and medicines. Innovators and bioprospectors are looking for ways to capture economic returns from investments in biotechnology through exclusive property rights to biological material. Conservation, access & benefit sharing and innovation: These are all worthy objectives, which are potentially but not necessarily compatible – how do international regimes promote synergy or conflict between them and can a balance be approached? The paper examines how strengthened measures within one international arena have in turn led to heavier ‘weapons’ being applied by the other. Examples are ‘TRIPS plus’ trade agreements and increasingly cumbersome access regulations emerging in many developing countries in response to the Convention on Biological Diversity (CBD). International forum shopping, increasing reliance on private sector actors and the skewed strength of stakeholders are central elements for understanding how the environmental concern for conservation may lose out in the implementation of these overlapping multilateral agreements.

Keywords: biotechnology, access and benefit sharing, interacting regimes, genetic resources, international negotiations

Roy, Jacques

Can we predict organisms and communities responses to elevated CO₂?

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Symposium 10 - Global environmental change and biodiversity: integrating observations, experiments and models

In situ experiments have shown a large interspecific variability in the responses of organisms to elevated CO₂. Subsequent changes in community structure have also been documented. Are the accumulated results conducive to solid predictions on how increasing atmospheric CO₂ will contribute to changes in biodiversity in the 21st century?

Literature and unpublished data will be used to discuss the relevance of the functional group approach to predict organisms and community responses.

Physiological knowledge and laboratory experiments on individual plants suggested groups of response to CO₂ could be identified. In situ experiments cast doubt on our ability to make such classifications. The large variability of response still observed in situ within functional groups is species and/or experiment specific. For example, repeating CO₂ enrichment with annual species on several consecutive years showed that the interactions between the species physiology and the environmental biotic and abiotic conditions are the overriding determinant of the response to CO₂.

Developing a strong, resource based approach of community dynamics could seem a prerequisite to predict the outcome of increasing CO₂ on biodiversity. However, these results concern only the response of vegetative biomass. To truly predict biodiversity changes, a larger integration of processes needs to be done. These include the investment in reproduction, trophic interactions as well as the impact of concomitant atmospheric changes on these two aspects. Is it realistic to hope to predict how specific communities will be altered by atmospheric changes?

Alternative approaches, complementary to short-term community experiments, but at larger time and space scales should be developed.

Keywords: atmospheric changes, functional groups, community structure, reproduction, trophic interactions

Rozzi, Ricardo; Jax, Kurt

Linking ecology and ethics in a pro-active conflict management approach in the extreme south of the Americas

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Symposium 22 - Understanding and managing biodiversity conflicts

The Cape Horn region at the extreme south of the Americas includes a unique mosaic of intact natural landscapes, which represent a world cultural and natural heritage. These ecosystems have been free from direct human impact thanks to their geographic isolation and the presence of a Chilean Navy reserve. However, Cape Horn faces today a critical moment because the two "protective barriers" that have preserved its pristine character are disappearing: its remoteness is decreasing due to higher territorial connectivity, and the military reserve is being minimized. These changes in the territorial administration have attracted new economic interests, and although the Cape Horn County might seem well protected by national parks, the new pressures might cause the elimination or reduction of these protected areas. In 2000, an interdisciplinary group of scientists decided to confront these conservation risks by creating the Omora Ethnobotanical Park, defined as a long-term research-education-conservation initiative emphasizing inter-institutional cooperation, participative approach, communication with the media, national and international networking. The long-term presence of researchers in situ and their direct collaboration with regional and national institutions, the local community, and a variety of stakeholders has enhanced awareness about the uniqueness and value of the austral biological and cultural diversity. The growth in ecological and ethical valuation of the austral diversity has helped to overcome tensions between fisheries, tourism business, conservationists, government and other actors who have come to a consensus about the proposal to create the Cape Horn Biosphere Reserve. This proactive approach aims to reduce present and future conflict of interests by establishing a conceptual framework and policies, a territorial ordering and development plan that help reconcile the new economic interests with conservation of the austral biocultural heritage.

Keywords: biosphere reserve, biodiversity conflicts, interdisciplinary, inter-institutional, Chile

Sanmartín, Isabel

Phylogenies and the radiation of animals around the northern and southern hemispheres

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Symposium 14 - Phylogeny and biodiversity science

Historical, phylogeny-based biogeography plays a crucial role in understanding how present-day biodiversity has been generated. Biogeographic reconstructions can be used to identify "relict" biotas, whose long-term survival is threatened, or to predict the response of species to long-term climatic changes.

So far, however, the role of historical biogeography in conservation decisions has been limited by the lack of an appropriate method of biogeographic analysis.

Traditional (cladistic) methods search for general patterns of distribution as evidence of a common biogeographic history, but ignore the evolutionary processes creating

such patterns, or the time of origin and ecology of the organisms studied. Moreover, biogeographic analyses are usually restricted to one or few organisms, making them of limited value for conservation policies.

Recently, new methods of biogeographic analysis have been developed that allow incorporating processes into the analysis (the “event-based approach”). Here, I describe how these methods, together with large data sets of phylogenies and statistical evaluation of results, allow us for the first time to test specific biogeographic hypotheses at a large, intercontinental scale. For example, comparison of a large dated set of Holarctic animal phylogenies reveals that faunal migration over the Bering Bridge was controlled by the prevailing climatic conditions, so its importance as a dispersal route changed considerably over time. Phylogeny-based estimates of species richness among Holarctic infraregions suggest that the higher extant diversity of the Asian fauna was probably the result of higher diversification rates during the Tertiary. Although patterns of diversity in the southern hemisphere are usually attributed to vicariant events associated to Gondwana’s break-up, a recent meta-analysis of plant and animal phylogenies suggests that long-distance dispersal has played a major role in the radiation of southern hemisphere plants.

Keywords: historical biogeography, animal phylogenies, dispersal, vicariance, event-based methods

Salafsky, Nick

Evaluating success in community based initiatives in conservation

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Symposium 5 - Sustaining partnerships for community-based conservation

Over the past decade millions of dollars have been spent on biodiversity conservation. Yet, to-date, an effective, broadly accepted mechanism for measuring success and promoting the adoption of best practices does not exist. As a result, conservation practitioners have no way of assessing the status of the biodiversity that we care about, measuring the impact of and improving the effectiveness of our conservation actions, convincing our managers, donors, and supporters that our results are credible, and learning from one another in a systematic fashion. This problem is particularly acute for conservation and development projects because of their multiple goals and the complex systems that they operate in. The Conservation Measures Partnership (CMP) is a joint venture of conservation NGOs committed to improving the practice of conservation. CMP Core Members include: African Wildlife Foundation, Conservation International, The Nature Conservancy, Wildlife Conservation Society, and WWF. Collaborating Members include: Cambridge Conservation Forum, Enterprise Works Worldwide, Foundations of Success, IUCN-World Commission on Protected Areas, and RARE Centre. Over the past few years, representatives of each of these organizations have come together to use our collective experience to develop common standards and tools for measuring conservation success. In particular, we are working to develop and implement a set of Open Standards for the Practice of Conservation that can be used to measure effectiveness and conduct meaningful programmatic audits and a computer software program that can help practitioners to implement these standards. In this presentation, I provide an overview of this work, highlighting how it can conservation and development projects to measure and document their success.

Keywords: monitoring, M&E, adaptive management, biodiversity, management effectiveness

Scherer-Lorenzen, Michael; Don, Axel; Schulze, Ernst-Detlef; Schumacher, Jens
Examining tree diversity effects on ecosystem functioning: the BIOTREE project

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Symposium 15 - Forest biodiversity and carbon sequestration

During the last five years, several attempts have been made to establish large-scale and long-term experiments designed to examine the effects of enhancing tree diversity in plantation forests on ecosystem functioning and the provision of ecosystem services. Experiments manipulating within-site diversity while keeping environmental conditions constant have the potential to focus on underlying mechanisms of diversity-ecosystem functioning relationships. One proposed mechanism is complementarity in resource use due to niche differentiation: differences among species in their requirements for different resources will cause complementary interactions so that a combination of species could obtain more resources than could any species living by itself. This may result in higher biomass production, carbon sequestration, and lower levels of unconsumed resources, as demonstrated in several grassland and microcosms experiments. We discuss whether this principle is also relevant for slow growing forest communities that fundamentally differ in certain ecological and physiological aspects from small and fast-growing model systems.

To test the relationship between tree diversity and ecosystem functioning, and the associated complementarity hypothesis, we recently established a large-scale experiment with field sites in Germany (BIOTREE: BIOdiversity and ecosystem processes in experimental TREE stands). In that project, 81 plots covering more than 80ha were afforested with trees of varying species richness and functional diversity on three different sites. In total, 200.000 saplings have been planted. Several ecosystem processes will be monitored regularly, with an emphasis on tree growth, carbon sequestration, and nutrient cycling. We present the experimental setup, methods and preliminary results on tree survival and site-level carbon fluxes.

Keywords: biodiversity, ecosystem functioning, experimental design, plantation forests, complementarity

Schläpfer, Felix; Schmid, Bernhard

Biodiversity, ecosystem functioning, and ecosystem management: constant vs. changing environments and planted vs. naturally assembling communities

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Symposium 1 - The insurance value of biodiversity

Until recently, questions about the relationships between biodiversity and ecosystem performance and stability have been posed and examined without a clear conceptual link to ecosystem management. Our study attempts to contribute to this link by proposing and defining measures for the effects of biodiversity in an ecosystem management context. We define measures for the functional effects of biodiversity in 2x2 fundamental ecosystem management contexts: ecosystems with planted or naturally assembling communities and ecosystems under constant or changing environments. We illustrate our approach with data from a specially-designed grassland management experiment. We found that a given rate of species loss due

to management resulted in a production (relative to a 'best mixture') of (i) 0.986 in a planted community/constant environment, (ii) 0.972 in a naturally assembling community/constant environment, (iii) 0.878 in a planted community/changing environment and (iv) 0.771 in a naturally assembling community/changing environment. In (iii), the relationship between the mean and the standard deviation of plant production was very strong and similar for the mixtures and the best monocultures, although the mixtures achieved higher levels of mean production. Our conclusion is that rigorous quantitative concepts for measures of the effects of biodiversity in managed ecosystems are important if results of biodiversity research should be incorporated in ecosystem management frameworks. Our empirical estimates for the functional effects of biodiversity in a grassland management context suggest substantial benefits of biodiversity for mean ecosystem services in changing environments. Variants of the proposed measures for the effects of biodiversity can be implemented in models for a variety of ecosystems and management scenarios. **Keywords:** community assembly, species extinction, ecosystem stability, primary production, risk

Schmidt, Steven; Costello, Liz; Meyer, Al

Seasonal dynamics of alpine soil organisms: implications for understanding the functioning of alpine systems

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Symposium 20 - Diversity, diversification processes and conservation of high mountain biota

We will review our recent efforts to construct a complete library of rRNA sequences for all below-ground life in alpine tundra meadows in Colorado, USA and Peru. To our knowledge this is the most intensive effort to date to catalogue all soil organisms in one site using molecular techniques. In order not to bias our work towards any one group, we used separate primer sets for the three domains of life: Bacteria, Archaea and Eucarya. In addition we sampled during the three most dynamic periods for microbial activity in alpine systems (under snow, snow melt and summer). Our results demonstrate a staggering diversity of microbial life in these soils. Many of our sequences represent deeply-divergent microbial lineages that have not been previously described. For example, we found 3 new fungal groups that are divergent at the subphylum or class level. We also found that the diversity of microbes changed dramatically on a seasonal basis. Most surprising was our discovery of a large and deeply-divergent group of Ascomycetes that is only detected under the snow or during snow melt. The implications of these seasonal shifts in diversity will be discussed.

Keywords: Alpine, soils, fungi, SSUrRNA, clone libraries

Shogren, Jason; David Hennessy

On protecting ecosystem value

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Symposium 1 - The insurance value of biodiversity

The protection of a native ecosystem service against invasive species involves many steps. An ecosystem service may be damaged as a result of an unsuccessful prevention of invasive species, and the task may have to be started over. A purpose of allocating resources to transforming an intermediate product is to protect the

potential value accrued to that point. This paper develops a discrete-time multi-stage model of ecosystem value added that focuses on value protection. In general, stage of development and testing costs increase protection expenditures, whereas markets for flawed product decrease such expenditures. Conditions are identified such that more protection occurs as a task moves closer to completion. Order is also identified for cost sensitivities, and it is shown that vertical integration along the process will likely reduce unit costs. The paper culminates with a study of behaviour patterns across stages when a deadline must be met.

Keywords: protection, economics, value, ecosystem, economics, invasives

Skonhoft, Anders

Tourism and wildlife in a dynamic model

Norwegian University of Science and Technology, Norway

Symposium 16 - Wildlife conservation and economic development in East and Southern Africa

Harvesting of natural resources, like wildlife and fish, often involves many exploiters. Institutions to govern the resource utilisation are often lacking as well. For these, and other reasons, natural resources are frequently economically and ecologically overexploited. In this paper, a time discrete dynamic harvesting model involving more harvesters lacking well defined property rights is formulated. In a first stage, harvesting takes place under myopic conditions with no strategic interaction among the exploiters. In a next stage, various learning mechanism, reflecting different degrees of expectation formation, are introduced. The analysis is carried out without as well as with ecological uncertainty. The models are illustrated by wildlife harvesting within an East-African institutional and economic setting.

Keywords: harvesting, property rights, East-Africa, dynamic, bioeconomic

Smith, Craig; Levin, Lisa

From whale falls to oxygen minimum zones: recent discoveries of biodiversity in non-vent chemosynthetic ecosystems

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Symposium 6 - Oceans of biodiversity: discovering species, habitats and ecologies

Reducing chemical conditions occur in a broad range of deep-sea island habitats, including methane, brine and oil seeps, beneath large whale, wood and kelp falls, within organic-matter accumulations in submarine canyons, and in oxygen minimum zones. The associated sediments hard and soft substrates have distinctive geochemistries that shape the composition, species diversity, and nutritional and metabolic pathways of the resident biota. The sediment pore-waters are often highly sulfidic and/or low in oxygen concentration, but the activities of large biota can yield key oxygen interfaces that support sulfide and methane oxidation. Large, filamentous sulfur bacteria are often prominent within these habitats. While methane seeps and whale falls are broadly recognized as supporting chemosynthesis-based ecosystems, many other habitats in the deep sea do so as well. Evidence for chemosynthesis-based food webs can come from distinctive infaunal isotopic signatures, taxonomic affiliations, and observations of symbioses with oxidizing microbes. Some taxa have radiated under the stressful conditions of hypoxia and high sulfides; For example, dorvilleid polychaetes are speciose and often dominant in the organic and sulfide-rich conditions of seeps and whale falls. In addition, these remarkable seep and whale-fall habitats yield an unexpected diversity of faunal nutritional modes, including novel

microbial symbioses. New research programs are just beginning to explore the biogeographic, ecological, and evolutionary relationships of the biota inhabiting these extraordinary reducing ecosystems in the global deep sea.

Keywords: whale falls, marine, chemosynthetic, microbes, deep sea

Soberon M., Jorge

Assessment of completeness of primary biodiversity data for inventories and estimation of species distribution areas

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Symposium 3 - Biodiversity informatics: acquisition, analysis, archiving and applications

The name, geo-reference and chrono-reference of museum or herbarium specimens constitute one of the key types of primary biodiversity data. Essentially, such data are used for the two related tasks of estimating what species occupy a place, and what is the range of distribution of a species. However, given the highly biased and incomplete nature of even the largest primary databases, preliminary analyses are required to assess the degree of completeness of a particular dataset at a given spatial resolution. Here I present some methods that can be used for such purposes, using data from CONABIO to illustrate the results.

Keywords: informatics, dataset analysis, methodology, inventory, species distribution

Soberon M., Jorge

Measuring the Beta Component of Species Richness

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Symposium 11 - Spatial scale, distribution ranges, and large-scale patterns of species diversity

The beta component of species number in a given area is known to be the inverse of the average occupancy within the region. This important observation allows one to estimate the area of occupancy via the total number of species and estimates of the local species numbers. In this example we show how this can be done, at the scale of Mexico, by obtaining estimates of local and regional numbers and from those estimating beta. The results partition the total number of species in two components, one affected by the local environmental factors, and the other due to area and heterogeneity effects.

Keywords: richness, alpha, beta, scaling, estimation

Solan, Martin

Marine benthic biodiversity and ecosystem functioning in complex natural systems

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Symposium 19 - Marine biodiversity and ecosystem functioning

An extensive body of literature has emerged over the last decade that explicitly focuses on the effects of biodiversity loss on key ecological processes. The consensus of opinion suggests that, on average, an increase in the number of species has a positive and linear effect on a range of ecosystem processes in terrestrial plant and soil communities, and in freshwater and marine aquatic

invertebrate communities. The empirical approach upon which these conclusions are based, however, usually involves the random assembly of simple synthetic communities around a basal resource, followed by an analysis of how various ecosystem processes, such as primary productivity or nutrient flux, alter with changing levels of species diversity. Although this approach allows the identification of the principle mechanistic basis of the biodiversity-function couple, it fails to explore how ecosystem processes are affected as species are progressively lost from more complex natural communities that are subject to non-random extinction events and natural variability. Whether the same mechanistic processes identified from synthetic laboratory experiments are equally valid and transferable to the real world remains an open empirical question that requires the development of new and innovative ways of analysis and assessment. Here I demonstrate how marine science can contribute to the biodiversity-function process through the use of pre-existing and/or routinely collected data generated by benthic environmental monitoring and conservation efforts and offer some examples of how these data can be used strategically to inform the biodiversity-function process.

Keywords: biodiversity, ecosystem function, benthic, invertebrate, marine

Soto, Doris; Arthington, Angela; O'Keeffe, Jay

Intensive food production (agriculture/aquaculture) effects on freshwater biodiversity and remediation perspectives.

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Symposium 13 - Freshwaters: sustaining biodiversity and system integrity
Intensive food production, e.g. agriculture and aquaculture, have changed landscapes and affected freshwater ecosystems by using large amounts of water, by disturbing habitats and/or disposing of wastes to freshwater bodies as final recipients. Threats to freshwater biodiversity frequently arise in association with agriculture (e.g. irrigated production systems and, to some extent, grazing systems) and aquaculture (e.g. extensive and intensive systems such as grow-out enclosures in lakes and rivers). Pollution problems from agriculture are pandemic due to excess nutrients, sediments and toxicants. Likewise aquaculture often produces contamination from farms and/or from floating cages, after intensive feeding and use of chemicals. Biodiversity decline is common in waterways draining agricultural landscapes and aquaculture areas. Impacts on aquatic biodiversity are a function of the degradation/loss of habitat, interruption of migration pathways and the exacerbation of problems with exotic species that typically flourish in regulated rivers and artificial lakes (i.e. impoundments). Aquaculture using exotic species adds an important worldwide risk to this issue. In this paper we analyse some of the major global patterns of biodiversity loss associated with agriculture and aquaculture and propose some strategies that aim to find a balance between freshwater biodiversity conservation, food production and the alleviation of poverty. The recovery of riparian habitats, aquaculture based on native species, policulture systems both for agriculture and aquaculture, and ecosystemic design of land and water use patterns are some potential management tools to achieve the delicate balance between freshwater biodiversity conservation and intensive food production.

Keywords: freshwater, biodiversity, agriculture, aquaculture, conservation

Southey, Sean

Moving-to-scale: learning from grassroots successes

United Nations Development Programme, USA

Symposium 5 - Sustaining partnerships for community-based conservation

Through a study of 25 Equator Prize 2002 [1] finalist cases, this paper determines that, while successful community-led initiatives do have broad interest in scaling-up, the types of scaling-up activities in which they engage are quite varied. The investigation reveals that - of the four commonly accepted types of scaling-up - quantitative and organizational scaling-up were most frequently undertaken in response to an injection of capacity development funds. The chapter finds that scaling-up is a much more differentiated concept than is usually assumed and proposes that, with respect to the MDG effort, political and quantitative scaling-up will likely be most important. Risk aversion and a focus on immediate needs appears, in part, to drive scaling-up decisions. As well, differences in the constituencies served by the community-based initiatives appear to be related to variation in the type of scaling-up activities undertaken. Initiatives that worked indirectly with communities, with multiple communities, or that were led by private sector, government, or NGO interests were most likely to engage in political and quantitative scaling-up. The paper also concludes that, for scaling-up to have a significant effect on achievement of the MDGs, the complexity of the concept will have to be more clearly reflected in the allocation of capacity development funds and resources in the run-up to the 2015 target date. Furthermore, to ensure that the broad interest of communities in scaling-up is translated into real advances towards MDG achievement, a deeper analysis of successful approaches to scaling-up and more careful allocation of resources to relevant community initiatives will be necessary.

Keywords: grassroots successes, scaling-up, community-based Initiatives, capacity development, resource allocation

Sridhar, Aarthi; Shanker, Kartik

Community based approaches to marine conservation in India

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Symposium 5 - Sustaining partnerships for community-based conservation

Marine conservation in India is conspicuously similar in design to terrestrial approaches. While fisheries legislations designed to protect traditional livelihoods may serve conservation objectives if properly implemented, they have not been explicitly designed for the conservation of species or habitats. The protection of endangered marine species and habitats such as turtles and coral reefs has usually meant cutting off human access to a certain habitat and prohibiting the trade and use (sustainable or otherwise) of these species. Another characteristic of the official approach has been the poor involvement of local communities in these conservation programmes. Non-official conservation practices have historically preceded State-run conservation programmes and continue to function irrespective of official recognition or encouragement. The range of these community-based practices include the involvement of entire villages, monitoring programmes for endangered species by students in urban settings, and cultural taboos on the consumption or use of certain marine species. Conservation groups have advocated the need to revise the current exclusionary and protectionist approaches to marine conservation in India, that discourage community involvement in the management of marine resources. Subsequent to these demands, the Indian Ministry of Environment and Forests

introduced certain legal provisions within the Indian Wild Life (Protection) Act, 1972, in recognition of community based conservation initiatives. These legal changes are housed in conservation laws that have a terrestrial bias and need to be examined to see how well they accommodate community based marine conservation. The paper provides an overview of the approaches in marine conservation in India, highlighting the range of initiatives that can be considered community-based conservation. The paper also critically evaluates the existing space for community-based conservation within the legal framework.

Keywords: marine conservation, community, conservation, participatory, livelihoods

Stoecklin, Juerg

Intraspecific differentiation, adaptation and gene flow at the landscape level in alpine plants.

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Symposium 20 - Diversity, diversification processes and conservation of high mountain biota

Background and goals: Steep environmental gradients and patchy habitats characterize alpine environments. Life conditions change dramatically with altitude, exposition, snow cover or succession. As a consequence, shifts in selection pressure may lead to local adaptations. Spatial isolation and limited gene flow are the rule for alpine plants, and differentiation may also result from small population size and genetic drift. Furthermore, most alpine areas include cultural landscapes and agricultural land use has considerably added to the natural diversity of alpine habitats. The characteristics of alpine environments are well known but consequences for evolutionary processes are still poorly understood.

Material and methods: Molecular studies and common garden experiments with plant species from natural and man-made alpine habitats will be summarized. Particularly, I present effects of altitude and succession on genetic diversity, growth and reproductive traits in species with different life histories, seed dispersal and longevity. Furthermore, adaptations and genetic diversity due to land use in an alpine fodder plant are described. Population differentiation is discussed in relation to gene flow from seed and pollen dispersal.

Results and discussion: There is evidence for considerable gene flow among populations of alpine plants. Genetic diversity was found to be generally high, genetic differentiation was not particularly pronounced, but mostly increasing with distance.

Results suggest considerable genetic drift among populations of alpine plants. Adaptive trait differentiation was observed due to altitude and as a consequence of different land use. However, selection pressure in contrasting habitats is not always strong enough for pronounced differentiation.

Conclusion: Genetic variation in growth and reproduction are common among isolated populations of alpine plants and is shaped by adaptive as well as random evolutionary processes.

Keywords: molecular markers, common garden, elevation, succession, land use

Snow, Timothy V.

The effects of rural community awareness and conflict resolution programmes on reducing the threats of agro-chemicals on biodiversity

Endangered Wildlife Trust, South Africa,

Symposium 22 - Understanding and managing biodiversity conflicts

Deliberate poisoning of wildlife has a significant impact on wildlife in Southern Africa. A recent analysis shows that up to 500 000 game-birds are killed annually in South Africa. Abuse of farm chemicals in the conflict between predators and small stock farmers exacerbates this via secondary poisoning events.

The Poison Working Group of the Endangered Wildlife Trust (EWT-PWG) was established in response to a perceived increase in poisoning, to quantify the problem and establish mitigation methods by positive engagement with the chemical industry and others to reach a solution derived by consensus and collaboration. An educational project was undertaken to enhance awareness of the hazard of chemical abuse. Community knowledge and involvement is critical to the success of the project which aims to create awareness amongst rural communities not only of the danger of deliberate poisoning to wildlife and humans, but also of alternatives to reduce agro-chemical abuses. The programme engages positively and pro-actively with rural communities through engagement with role-players at interactive workshops and meetings. The EWT-PWG has to date considered four integrated projects to be necessary to mitigate the conflict. Firstly, a process of agriculture development focuses on Wildlife Conflict Resolution and Responsible Use of Chemicals; secondly there is regional expansion of activities, nationally and internationally; thirdly an advisory programme on responsible and integrated pest management is run and finally systems to improve understanding of wildlife toxicology with a focus on poisoning investigation, site clearance of toxins, sampling, analysis and reporting have been established.

These themes have been refined in a participatory manner to enhance relevance to farmers and others and to create "project ownership". A database of wildlife poisoning events has been maintained since 1995. Despite some process inadequacies, there is a decline in cases of wildlife poisoning. Refinement of systems and an analysis of outcomes in relation to input efforts will improve the results of this integrated programme.

Keywords: wildlife, poisoning, chemicals, education, conflict resolution

Stone, Suzanne Asha; Fascione, Nina; Haney, Christopher; Schrader, Gina; Thurston, Linda; Weiss, Amaroq

Nature of the beast: managing conflict associated with wolf conservation in the USA Northern Rockies

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Symposium 22 - Understanding and managing biodiversity conflicts

Once eradicated due to conflicts over livestock losses, wolf populations are reaching sustainable levels in the USA Northern Rockies just a decade after their reintroduction and despite the continuance of age-old conflicts that led to their initial demise. Managing conflicts has been a central part of wolf restoration efforts including the killing of wolves associated with livestock losses. However, lethal control efforts are expensive, can endanger human life through aerial gunning actions, and unresolved, result in a relentless cycle of livestock and wolf losses. In 1987, Defenders of Wildlife initiated The Bailey Wildlife Wolf Compensation Trust programme to address conflicts by compensating for confirmed livestock losses. The programme's goals were building local tolerance toward wolves while lessening economic impacts on local residents. To evaluate the programme's effectiveness, from 2002 – 2004 compensation recipients were given comprehensive surveys and

asked for their help to evaluate the programme. While most respondents still strongly objected to the restoration of wolves, they generally reported satisfaction with the compensation they had received. They also stated that their tolerance toward wolves would be lower if the compensation programme ended. While compensation alone does not address all concerns, our findings indicate that it can fill an important role in controversial species restoration. Perhaps even more importantly, most respondents also expressed their interest in non-lethal methods to prevent or reduce depredations, including use of multiple livestock guarding dogs, fladry, predator deterrent fencing, increased human presence, automated guard systems, targeted aerial monitoring, and proactive livestock husbandry practices. The use of these methods demonstrates a willingness to adapt to the presence of wolves, which is a key element in the long-term achievement of co-existence.

Keywords: wolves, humans, conflict, resolution, compensation

Sullivan, Caroline; O’Keeffe, Jay

Confronting the realities of using biodiversity: is Nature a free good? (with apologies to Adam Smith)

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Symposium 13 - Freshwaters: sustaining biodiversity and system integrity

For human societies, formal recognition of the importance of biodiversity involves the creation of effective ways of recognising and capturing its value. While such values may be well understood by indigenous peoples, modern resource management tools which allow for their inclusion are rare. In order to move forward towards more effective policies to promote sustainable use of biodiversity, novel approaches need to be developed, drawing on a wide range of disciplines and different types of knowledge.

The knowledge underpinning effective use of biodiversity is held in many forms by many people, and is, to a very large degree, incomplete. People have been using insects, fish, birds, plants and animals for thousands of years, and as human population pressure has increased, the impact of this use has increased exponentially. Throughout the world, this has resulted in habitat destruction and species loss, particularly in freshwater systems.

Freshwater is recognised as being the key to life on earth. We are now currently at the start of the UN decade of freshwater, and in spite of this, there is widespread agreement that by the end of that decade, in 2015, pressure on freshwater resources is unlikely to be much reduced. Relentless urbanisation and industrialisation, coupled with their inevitable pollution loads, will continue to weaken ecological integrity in many parts of the world. These quality impacts will have the effect of reducing the quantity of freshwater available for human uses. At the same time, lack of institutional capacity and incomplete understanding of the nature and scale of feedbacks within ground and surface water systems have resulted in multiple policy failures, and consequent degradation in rivers, lakes and wetlands. What is needed now to address these problems are mechanisms by which these losses can be reduced. In this paper, we investigate reasons why freshwater biodiversity continues to be threatened, in spite of the fact that conservation issues have now become part of the mainstream agenda. We identify selected policy failure hotspots, and examine some of the options which are available to address them. We illustrate novel approaches that are being used to strengthen biodiversity conservation in various countries, and

suggest ways in which biodiversity can be more formally recognised as natural capital within economic tools for sustainable development.

Keywords: freshwater, resource management, policy, traditional knowledge, economic valuation

Swan, Christopher; LeRoy, Carri

Interactive effects of leaf diversity with species composition and detritivore foraging on litter decomposition in streams

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Symposium 21 - Biodiversity and litter decomposition: a cross-systems perspective

How variation in leaf quality, in the form of leaf diversity, influences litter

decomposition in stream ecosystems is not well known. We present results from field, laboratory and simulation studies to test whether decomposition changes as a result of increasing leaf species richness. Decomposition was estimated in 3 Arizona and 1 Maryland stream (USA) using litter bags containing 1-5 leaf species. Replicate bags from each stream were collected over 80 d. In Arizona, 5 single-species, 3 three-species, and a single 5-species treatment were used. In Maryland, 6 single-species treatments and 4 mixtures of 2-5-species combinations were used. Mass of litter remaining was regressed on time to estimate decomposition rates as a function of the diversity treatment. A laboratory study quantified feeding by an isopod detritivore on 4 single-species and 4 three-species mixtures. Finally, a simulation study of shredder feeding on 1-4 species litter was run to determine if shredder feeding preference/intensity altered decomposition in multi-species mixtures. Decomposition of speciose litter mixtures either did not change or increased in the Arizona streams relative to decomposition estimates of single-species, while mixtures in the Maryland stream decayed more slowly than predicted. This result was driven by both the presence of refractory leaf species in the mixtures and shredder foraging; the isopod, when given no choice, increased its feeding rate on refractory leaves, i.e., it showed compensatory feeding. The simulation supported this empirical finding by revealing slower decomposition of speciose litter mixtures when shredders contributed >40% to overall mass loss. In conclusion, diverse leaf litter mixtures decompose differently compared to expected values estimated from individual species. This is explained by site effects, species composition, and shredder feeding.

Keywords: leaf diversity, decomposition, detritivory, stream, species composition, emergent properties

Thiele, Kevin

Electronic dissemination of biodiversity data

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Symposium 3 - Biodiversity informatics: acquisition, analysis, archiving and applications

One important role for biodiversity data is in identification, in the broadest sense. Identification is an enabling process – it provides a name for an unknown specimen, the name then acting as a keyword to access the (sometimes vast) amount of information available on that taxon. However, biodiversity data for identification are usually used in very traditional formats, using processes and structures developed for traditional methods.

Recent proposals to develop identification methods based on specific DNA

sequences (DNA barcodes), with the promise of highly efficient methods of data acquisition and identification, may significantly extend identification capacity. These methods provide a challenge – to integrate the different types of identification data (from sequence, to whole organism, to ecosystem) into a seamless identification suite for different needs, aims and capacities.

There is a strong need for highly effective and efficient methods for handling biodiversity identification data, particularly in the electronic realm, with high throughput of all data types both for data users and data providers. This paper will describe some recent and planned approaches towards achieving the goal of a globally federated, flexible and effective biodiversity identification web service, as one underpinning for a broader biodiversity information web service.

Keywords: electronic, biodiversity, identification, keys, informatics

Thullier, Wilfried; Lavorel Sandra; **Paul Leadley**

Modelling species response to global change: recent advances and future directions

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Symposium 10 - Global environmental change and biodiversity: integrating observations, experiments and models

Recent anthropogenically-caused climate and land use changes have triggered observable changes in the distribution and functioning of a substantial number of species throughout the world. Assessing current impacts and projecting future possible scenarios of biodiversity change is therefore a scientific and political priority. Species distribution models have been used extensively to assess the likely impacts of future climate and land use changes on plants and animals. Because assessments will lead to policy and management decisions, it is essential to consider the main uncertainties associated with this approach, and to develop ways to reduce them. We will present the different steps required to build reliable models, the key assumptions behind them, as well new advances recently made to reduce modelling uncertainties. As an illustration of recent assessment exercises, we will present results from two studies, one on plants in Europe, and one on mammals in Africa. Although they should not be taken as exact forecasts, both assessments highlighted the considerable sensitivities of these species to climate change and land-use (when accounted for).

We will then finish by proposing new research avenues to improve our capacity to model the current and potential future distributions of species in a changing world. These should improve our ability to account explicitly for three major processes: mortality, fecundity and recruitment.

Keywords: global change, species diversity, biogeography, modelling, scenarios

Till-Bottraud, Irène; Arroyo, Mary; Torres, Cristian

Genetic variation in the alpine; linking genetic diversity, breeding system and population dynamics

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Symposium 20 - Diversity, diversification processes and conservation of high mountain biota

Do alpine species exhibit different genetic variability patterns than lowland species, and if yes, to what extent? What are the driving forces behind genetic variation in

alpine species?

The breeding system of species partly determines the level and distribution of genetic diversity by mixing genes through pollen transport and fecundation. However, in plants, the breeding system is in turn conditioned by environmental conditions such as pollinator availability (very low pollinator activity selects for either higher selfing or increased flower attractivity) or flight distance but also by plant longevity: annuals tend to be selfed, while perennials are mostly outcrossed. As elevation increases, pollinator availability decreases, but longevity increases, leading to conflicting hypotheses about selfing rates and thus genetic diversity.

We review literature data addressing these questions and present current research on estimation of genetic variability and outcrossing rates using molecular markers, population dynamics analysis to estimate life history parameters, measure of pollinator activity and floral attractivity.

Literature data show that obligate outbreeding systems increase in frequency with elevation on some mountains, but the reverse trend has also been found. Similarly, very few annual species are found in the alpine belt of some mountains, but annuals are much more frequent in others. Additionally, perennial plants can exhibit very different longevities and the pattern is complicated because the level of selfing itself determines some of the life history parameters.

The general pattern of level and structure of genetic diversity is thus very complex and varies from massif to massif depending on historical (at the level of flora installation) or climatic factors.

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Keywords: molecular markers, selfing, outcrossing, annual, perennial

Toledo, Victor; Moguel, Patricia

Biodiversity management and indigenous resistance in Mexico: regional case studies

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Symposium 5 - Sustaining partnerships for community-based conservation

Indigenous peoples overlap with the main areas of world's biodiversity ("hotspots").

Today, Mexico is one of the main laboratories of community management of biodiversity in the world, and the nation leader in the production of certified organic coffee and community forestry. The above is the result of over two decades of a grass-root movement initiated by rural communities of practically each one of the main ecological regions of the nation. In our presentation, we offer a brief review of this social process with emphasis in the central and southern portions of Mexico, focusing in two regional case studies: the Sierra Norte of Puebla (Nahua communities) and the Yucatan Peninsula (Yucatec Maya communities). The presentation finishes stressing the importance of indigenous communities in the design and application of a landscape oriented strategy of biodiversity conservation worldwide.

Keywords: biodiversity management, Indigenous peoples, rural communities, Mexico, Yucatec Maya

Vergara, Carlos

Introducing exotic species for crop pollination – pluses and minuses

Universidad de las Américas, Puebla, Mexico

Symposium 2 - Pollination services

Bees are the main pollinators of many wild and cultivated plants, and are the most important insect pollinators. Bees are regarded as beneficial insects for their role in pollination and, as a result, exotic species of bees have been introduced to different countries as crop pollinators or to improve honey production. Well known examples are the alfalfa leafcutting bee (*Megachile rotundata*) and several species of bumblebees (*Bombus* spp., in particular *B. terrestris*), which have been introduced to countries all over the world to pollinate greenhouse crops, especially tomatoes. In most cases, these introductions have been done without prior assessment of possible negative impacts of the pollinators on native ecosystems. Other species have been accidentally introduced, or introduced for purposes other than pollination of crops. The best known of such introductions is the African honey bee, imported to Brazil in the 1950's. African honey bees (*Apis mellifera scutellata*) have become important pollinators of crops like coffee or avocado in tropical and subtropical regions of the Americas, and are floral visitors of many other plants, both native and introduced. Most introduced pollinators can be considered as invasive species and may have detrimental effects on both native pollinators and native plants. Genetic introgression of introduced bumblebee species has been shown to be a potential threat to native species in Asia and Mesoamerica. Introduced bee species also seem to be causatively related to the spread of introduced weeds. This presentation offers currently available information on the success of introduced pollinators, their effects on native ecosystems and examines the viability of using native pollinators to prevent unnecessary introduction of exotic species.

Keywords: introduced crop pollinators, *Apis mellifera*, *Bombus terrestris*, sleeper, weeds, invasive species

Wall, Diana; Mark St., John

Faunal diversity in the soil food web and its implications for ecosystem processes

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Symposium 21 - Biodiversity and litter decomposition: a cross-systems perspective
Decomposition as a regulating ecosystem service is critical for human well-being and provides a fertile framework to analyze the relationship between faunal diversity and nutrient cycling and energy flux across terrestrial landscapes. Theoretical models and manipulative experiments in laboratory and field have addressed the question of whether species diversity (richness) and abundance has an effect on decomposition, and conversely how the variation in organic matter and biogeochemical dynamics affects faunal soil communities. Most of these studies have suggested a high degree of species redundancy and no subsequent effect on decomposition, although in some cases diversity effects have been demonstrated. Recent experiments conducted at local to global scales are producing an array of information relating faunal species diversity to regulation of ecosystem functioning in natural systems. Data include results from 1) the Antarctic Dry Valleys where species richness was low yet soil animals had a disproportionate effect on the carbon budget; 2) the tall grass prairie where the abundance, rather than diversity, of soil mites was related to rates of decomposition; and 3) a global decomposition experiment indicating higher soil animal diversity promotes mineralization of organic matter. Differences in characteristics of these natural systems indicate the relationships between soil faunal diversity and ecosystem processes vary with ecosystem type; and the inherent high

faunal diversity in some systems present difficulties for validating theory and model results. Identifying general patterns and testing theory on the relationship between faunal biodiversity and ecosystem processes must consider real-world diversity levels found in soils.

Keywords: soil, belowground, invertebrates, decomposition, biodiversity

Webb, Edward; Ha, Thi

Using RS/GIS to model forest cover change in Thue Thien Hue, Vietnam: implications for biodiversity conservation

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Symposium 17 - Remote sensing: methods and applications to assess, monitor and manage biodiversity loss

Background: Central Vietnam is recognized as an important repository for biological diversity and endemism, and conservation agencies are placing a high priority on maintaining forest integrity in the region. The forests are particularly important in the province of Thua Thien Hue, where a proposed 'green corridor' could connect the Annamite Mountains on the Vietnam – Lao border and Bach Ma National Park. Initial steps to conserving biodiversity are to assess both forest cover and changes over time in this area, and to try and understand the mechanisms underlying forest and land use change. Objective: We will describe a project in Nam Dong district, where we are evaluating forest cover and land use changes since 1975 and are attempting to couple those changes with physical, socioeconomic and policy drivers. We will model land use changes both backwards and forwards in an attempt to understand how contextual factors may shape future forest conditions and, therefore, biodiversity in our study area. Results and discussion: Our results will include land use change parameters, along with our understanding of the underlying drivers to that change. This project is ongoing, so we will present up-to-date results. We will also outline what data would be required to fulfill a spatial biodiversity model for Hue Province.

Keywords: Vietnam, land use, Asia, modelling, drivers

White, Rehema; **Redpath, Stephen**

A framework to predict, understand and manage biodiversity conflicts

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Symposium 22 - Understanding and managing biodiversity conflicts

Sustainable development is often hampered by biodiversity conflicts that arise between conservation and other goals. We conducted a systematic review to describe the characteristics of biodiversity conflicts and develop a framework to enhance conflict prediction and management. Case studies of biodiversity conflicts were sought and characteristics including country, spatial and temporal scale, protected area involvement, topic (wildlife or natural resource) and species of concern were analysed. Drivers were categorised where possible. It was found that biodiversity conflicts were widely reported from developing countries, reflecting rapid social changes and cultural divisions. Many conflicts were around protected areas and derived from previous "fences and fines" approaches. The spatial and temporal scale varied considerably between conflicts. Many national level biodiversity conflicts originated in response to latent issues such as development, land ownership or power imbalance, with long conflict histories of over a century not uncommon. Some conflicts were replicated at multiple local sites within a region. Drivers were

sometimes ecological (resource limitations) but were mostly socio-economic (cultural values, latent issues, non-sustainable subsistence use, commercial development). Stakeholder combinations ranged from local community and government department to a complex suite of local and global players. Stakeholder identification and participation were recognised to be critical. A conceptual framework for an approach to the management of conflicts was developed using reference to example case studies and including mechanisms to promote interdisciplinary science, stakeholder engagement and knowledge transfer. We conclude that an interdisciplinary approach is vital to understanding biodiversity conflict origins and increases the probability of deriving sustainable management strategies.

Keywords: biodiversity conflicts, stakeholder, interdisciplinary, spatial scale, framework

Whittaker, Robert

Conservation biogeography, spatial scale and prediction

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Symposium 11 - Spatial scale, distribution ranges, and large-scale patterns of species diversity

There is a need for the greater engagement of the biogeographical community in a programme of evaluation and refinement of scientific planning frameworks for conservation. Conservation Biogeography denotes the application of biogeographical principles, theories, and analyses, being those concerned with the distributional dynamics of taxa individually and collectively, to problems concerning the conservation of biodiversity. Conservation biogeography thus encompasses both a substantial body of theory and analysis, and some of the most prominent planning frameworks used in conservation (e.g. Hotspot analyses, biogeographic representation frameworks). In this contribution I will provide a brief comparative overview of large-scale protected area planning frameworks, and how biogeographical research can contribute to improved guidelines for conservation planning at the large scale. In particular I will consider: (i) scale dependency, (ii) the Linnean and Wallacean shortfalls, (iii) effects of model structure and parameterisation, and (iv) inadequacies of theory. I will discuss recent developments in developing both empirical and predictive models of geographic patterns in diversity, and whether such models can be used to develop conservation guidelines for areas where systematic species range data are lacking. There is a great deal of uncertainty inherent in predictive analyses in conservation biogeography and this area in particular presents considerable and exciting challenges. The final part of my presentation therefore discusses recent approaches to quantifying uncertainty and validating models that aim to forecast species range shifts in response to environmental change.

Keywords: conservation biogeography, spatial scale, diversity models, bioclimatic envelope models, strategic conservation planning

Wiens, John J.; Donoghue, Michael

A phylogenetic perspective on global biodiversity patterns

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Symposium 14 - Phylogeny and biodiversity science

Geographic patterns in species richness are often "explained" by reference to correlations with the distribution of current environmental variables. But, even if there is a perfect correlation between environmental variables and diversity patterns, these patterns still depend on the geographical history of diversification in the component lineages: where and when lineages started to diversify, where and when they moved to other regions, etc. In turn, such histories are related to the interplay of ecological and evolutionary factors, such as niche conservatism, the evolution of new ecological capabilities, and the influence of environmental variables on rates of speciation. Historical explanations make unique, testable predictions about the relative ages and diversities of clades in different regions. We apply this thinking to the classic latitudinal gradient in species richness, and describe the results of some recent empirical tests.

Keywords: phylogeny, biogeography, evolution, species richness, methodology

Winkworth, Richard

The evolution of alpine plant diversity

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Symposium 20 - Diversity, diversification processes and conservation of high mountain biota

In general alpine life zones contain considerable biological diversity; indeed, many biodiversity hotspots are associated with mountainous regions. The evolution of plant diversity in alpine habitats has fascinated botanists for many years and various hypotheses have been suggested to explain contemporary alpine plant diversity. In conjunction with palynological and distributional data, molecular phylogenetic and phylogeographic approaches permit hypotheses about the origins, diversification, and distribution of alpine plant lineages to be tested. Here I review recent studies, using these to explore patterns and processes of evolution in the alpine zone.

The floras of different mountain systems appear to have evolved in comparative isolation, with relative diversity reflecting specific differences in the physical and biotic environment. However, taken together molecular, palynological, and distributional data indicate that contemporary patterns of diversity and distribution have arisen recently. Specifically such studies indicate the importance of: (i) migration and/or dispersal during the late Tertiary and Quaternary, and (ii) recent morphological and ecological diversification, perhaps reflecting alpine habitat diversity and/or environmental instability during the Pliocene and Pleistocene. Further, polyploidy and hybridization appear to have been important for alpine plant diversification.

Recent studies provide new insights into the evolution of alpine plants; most often suggesting that contemporary patterns have originated recently. Despite advances we are still far from a detailed understanding of evolutionary patterns and processes, however many of the remaining questions also have wider implications.

Keywords: alpine plants, biogeography, diversification, evolution, phylogenies

Zepeda López, Héctor M.; Aguirre, Alonso

The Mexico-USA Border as a region of epizootiologic risk in wildlife

Escuela Superior de Medicina IPN, Mexico

Symposium 7 - Ecohealth and conservation medicine: a new agenda for public health and biodiversity

The epizootiologic situation of wildlife diseases across the Mexico-USA border is poorly documented. Movements of animal pathogens across borders, even during in between catastrophic outbreaks periods, represent a great risk to agriculture, wildlife conservation and public health. Increasing data on diseases in a higher number of species and scattered locations raise questions on disease introduction and exchange between countries. It will be difficult to stem the wildlife flow and their pathogens carried in and out Mexico and USA while we witness one infectious emerging disease after another. Bovine tuberculosis and brucellosis are two old diseases linked to the Mexican cattle importation into USA. Their eradication is almost completed thanks to a binational committee. However, the status of both diseases in white-tailed deer across borders is unknown. Recently, wild deer has been found infected in some US states. The wildlife trade is a USD2 billion industry, half of it illegal, only surpassed by drug and guns traffic. Potentially life-threatening diseases in all likelihood have crossed borders being undetected in wildlife reservoirs. Exotic Newcastle disease was discovered in pet birds and backyard poultry in Southern California in autumn 2002. By December the disease was confirmed in commercial flocks and over 1.2 million birds were euthanized. The last time VVND broke out in California was in 1971, 12 million birds had to be destroyed at a cost of USD239 million. Applying public health measures to control SARS in USA cost about USD1.5 billion. Strong international collaborations represent the only way to address efforts to diagnose and control disease in wildlife populations, domestic animals and humans across borders. Proactive surveillance for currently known diseases and isolation of new etiologic agents by binational research teams can be the initial attempt to establish the epizootiologic status of wildlife diseases in the Mexico-USA border.

Keywords: wildlife, diseases, biogeography, monitoring, management

Abu Amara, Sliman

Bioprospecting: the role of biotechnology industry toward sustainable development in global biodiversity governance

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Contributed oral session 20, Policy for sustainable development

The role of the non-state actor in global environmental governance, in particular of Multinational corporations (MNCs), is fundamentally growing. Nowadays, it is impossible to talk about global biodiversity governance without the consideration of private actors involvement. MNCs are increasingly involved and control many areas of biodiversity governance. This trend can be described as shift in governance. Of particular importance is involvement of the biotechnology industry. Currently, the biotechnology industry is involved in the screening of flora and fauna for new products, such as drugs and cosmetics by means of bioprospecting. Bioprospecting is embodied in third objective of the Convention on Biological Diversity (CBD), namely, access to genetic resources and benefit sharing (ABS). ABS touches many of the central core concepts of the CBD, namely sovereignty over genetic resources, technology transfer, intellectual property rights, traditional knowledge, rights of indigenous people, local communities and farmers and sustainable development. Furthermore, the World Summit on Sustainable Development recognized ABS as an important mean toward sustainable development. Due to many reasons, bioprospecting arrangements are concluded within the framework of (confidential) private law arrangements. Since the private contracts includes provisions that touch the core concepts of the CBD, private bioprospecting initiative might develop into a new competing private regime to the public biodiversity regime with different consequences for the achievement of the CBDs objectives. Accordingly, the confidentiality of these arrangements raises many question concerning transparency and accountability in global biodiversity governance. This paper aims to give an insight into this problematic based on the results of three multidisciplinary case studies conducted recently on bioprospecting and biodiversity governance in Brazil, India and Tanzania.

Keywords: Bioprospecting, Biodiversity, Convention on Biological Diversity, Access and benefit sharing, Governance

Adano, Wario

The effects of land-use and climate changes on ecosystem services of a tropical montane forest, Kenya

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Contributed oral session 11, Agriculture and biodiversity

Forests provide a number of products and serve a range of functions, including maintenance of ecosystem services and providing habitat for biodiversity. However, many of the environmental services that forests provide are hardly quantifiable in monetary terms. This paper assesses the impacts of harvests of forest products by households and models the indirect function of watershed protection of a tropical montane-forest ecosystem in Northern Kenya. Evidence shows that the annual forest use by the local population is one-fifth higher than the potential wood yields and the natural regeneration rates for tropical mountain forests. The paper also presents a model of the effects of farmland expansion and climate change on

production of water supplies from within the forest ecosystem using time-series data. The model captures the public goods benefits of forest conservation efforts which are jointly delivered. This model learns that an ecosystem approach to environmental conservation is needed in order to promote conservation and sustainable use of natural resources in an equitable way. The finding sharply contrasts with presently weak collaboration between conservation agencies and local communities. The results suggest that the forest ecosystem services are severely threatened by land-use change and household production activities as a result of poverty and rapid population increase. The impacts of land cover change and use of forest resources matter for local and global biodiversity. The results have major policy implications for forests conservation in developing countries and for protected tropical montane forests. An explicit policy implication of the model results is that a small increase in forests conversion to cropland might result in a more proportionate decrease in forest-supported water supply. The paper also discusses some of the potential biodiversity impacts of land use, climate change and local forest uses.

Keywords: land-use, tropical montane forest, water yields, model, Kenya

Adhikari, Bhim

Economic incentives and biodiversity conservation: analysis of management scenarios for conservation

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Contributed oral session 16, Biodiversity conservation III

Biodiversity conservation and poverty reduction strategies remain one of the major discourses in the issue of environment and development in Nepal for the past few years. Among Nepal's unique biodiversity resources, the one-horned Indian rhinoceros (*Rhinoceros unicornis*) is of special interest for its role in the growing eco-tourism industry and local level development. However, rhino populations have come under increasing pressure due to poaching and loss of habitat. The aim of this research was to undertake a stakeholder analysis to obtain important information about use of park resources and to allow statistical analysis of stakeholder groups and random utility modelling of preferences for alternative management approaches involving local communities. A total of 444 interviews were conducted in December 2003 and early January 2004 in six different villages in Royal Chitwan National Park (RCNP) buffer zone which was the vehicle for administering the choice experiment. Stakeholder analysis in the buffer zone of RCNP revealed that there are five major stakeholders- landless/marginalized households, farmers, tourism and related sectors, visitors and non-users and government/NGO- who represent different interests with regard to park management and rhino conservation. The discrete choice experiment confirms that all stakeholder groups find the management scenarios more attractive than the status quo or neither of these options. The various stakeholder groups behaved as to be expected; the highest income farmers regard the compensatory measures as less important, while the landless marginalised group considers more opportunities for park access as very important, as well as the income generation through micro-credit program, tourism employment opportunities and opportunities to use park resources. Most importantly, when these compensatory measures are in place, then the majority of respondents have a clear linear preference for more rhinos.

Keywords: Biodiversity, Poverty, Economic incentives, Rhino, Nepal

Ahmed, Md. Kawser; Islam, Md. Monirul

Conservation of small indigenous fish Species (SIS) through community participation in floodplain river ecosystem, Bangladesh

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Bangladesh is very rich in fish and shrimp species biodiversity. 54 species out of a total 266 species of freshwater and estuarine fishes are threatened. Many of the indigenous freshwater fish species in Bangladesh are already under great threat including a variety of small indigenous species. Presently, their abundance in the nature is at severely stake as more and more floodplain river ecosystem are being destroyed for various reasons. So, conservation of small indigenous fish species through natural breeding under community management has been conducted for a period of 12 months with a view to increase fish (SIS) population density in floodplain beel, find out the community based conservation strategies and management of indigenous species, and meet nutritional deficiency accompanied with raising income for ameliorating poor peoples livelihood.

A number of fish habitats are renovated and were stocked with SIS in May-June 2003. *A. tetudeneus*, *Mystus* spp, *H. fossilis*, and *C. batrachus* are the major representative of stock. Case studies, FGD and semi-structured interviews were used during social studies.

Total production was 518 kg/ha in 10 months culture period and income was calculated Tk. 131,875 (the cost benefit ratio stands 1: 4.6). Family fish consumption has been increased ranges 200 to 500g. The project has proved in yielding SIS population than other commercial fish in terms of income from the fish production of beel fisheries in Bangladesh. The project was successful in designing an equitable profit sharing method among the stakeholders.

Present study recommends more initiatives to delineate and establish a beel fisheries management model through which a large poor community people whose livelihood more or less depend on it are benefited and the threatened native fish diversity will be sustained.

Keywords: Conservation, Small Indigenous Fish Species (SIS), Community Participation, Floodplain River Ecosystem, Biodiversity

Ahrné, Karin

Bumblebee (*Bombus* spp.) diversity and abundance along an urban to rural gradient, from the inner city of Stockholm towards the southern plain of Uppsala

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Contributed oral session 10, Biodiversity and urbanization

As urban areas keep growing rapidly the importance of and interest in studying the impact of urbanization on ecological systems is also increasing. The process of urbanization implies extensive modifications of the environment such as increasing amounts of buildings, roads and industrial areas (hard laid ground). This in turn results in decreasing amounts of green areas together with increasing fragmentation. Habitat fragmentation and destruction are recognized as major threats to biodiversity. The aim of this study is to examine the importance of landscape structure and different habitats of varying quality for the diversity and abundance of pollinators;

chiefly bumblebees, in an urban to rural gradient.

The diversity and abundance of bumblebees were studied in 16 allotments, flower rich green areas, from the inner city of Stockholm towards more rural environments during 2003. These studies are being related to the structure of the surrounding landscape i. e. the amount of hard laid ground within different radii from the study site as well as to site-specific variables such as flower abundance.

Preliminary results indicate a negative relationship between number of bumblebee species observed and amount of hard laid ground both within 500m and 1000m radii. A total number of 13 species of bumblebees were observed during the study, of which seven species occur in 14 or more of the study sites and 6 species occur in 8 or less of the study sites. When looking only at these six uncommon species there is a strong negative relationship between numbers of species observed and amount of hard laid ground in the surrounding landscape. However the surrounding landscape as well as site-specific variables are currently being analysed in more detail.

The structure of the surrounding landscape at different spatial scales seems to have an effect on bumblebee species richness.

Keywords: Bombus, urban-rural gradient, pollinators, habitat fragmentation, landscape structure

Alonso, Alfonso; Campbell, Patrick; Dallmeier, Francisco; Lee, Michelle

Biodiversity conservation in Gabon, Central Africa

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Contributed oral session 14, Monitoring biodiversity changes I

Oil exploration and production as well as logging operations in a landscape matrix of national parks, critical conservation areas and industrial operations in southwest Gabon continue to threaten high biodiversity areas. The Smithsonian Institution and its partner organizations have as one of the objectives of the Gabon Biodiversity Program to increase biodiversity knowledge of the Gamba Complex of protected areas. Multi-taxa biological assessments were conducted at five sites, three oil concessions and two national parks. Nearly 3,000 species have been catalogued in eight taxonomic groups, with new species for science recorded for fish, amphibians, reptiles, insects, trees, and new distribution records for all taxa. Key applied research questions for monitoring have been asked. Data are currently in analysis, and suggest that the industrial corridor is an important wildlife habitat connector between the two national parks, controlled roads are better for biodiversity than open roads, but even controlled roads have measurable negative impacts on biodiversity, and secondary impacts like logging multiply primary impacts and lead to forest fragmentation and habitat loss in oil concession zones. In addition, border areas between the industrial corridor and the national parks show especially high abundance of elephants, highlighting the importance of the corridor in landscape conservation. Overall, these studies made it clear that oil operations do not affect just an isolated concession, but rather are integrated into the larger landscape in ecologically-important ways. The Gamba Complex is a continuum of habitat types and biodiversity gradients from coast to inland, laced by two major watersheds leading into the ocean, and the industrial corridor playing an important ecological role in the effectiveness of protection measures in the two national parks.

Keywords: Assessment, Monitoring, Africa, Corridors, Industry

Alvarez, Nadir; Benrey, Betty; Hossaert-McKey, Martine

Host plants and organisation of diversity in phytophagous insects, from evolutionary radiations to population processes: the case of the bruchid beetle genus *Acanthoscelides* Schilsky (Coleoptera)

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Contributed oral session 9, Genetics

For 400 million years, host-plants have influenced the evolution of phytophagous insects at different levels, from population processes to the generation of species diversity. Understanding how diversity is moulded in phytophagous insects is of first importance in the light of the Global Change that threatens biodiversity.

Among the numerous groups of phytophagous insects are bruchid beetles (Coleoptera: Bruchidae), which include 1700 species whose larvae consume the seeds of certain groups of angiosperms. The great ecological diversity of bruchids (and their host plants), and the tight relationship between each bruchid species and its host-plant(s), makes them an appropriate biological model for testing hypotheses about evolutionary interactions between phytophagous insects and host plants. This study focuses on a group of neotropical bruchids of the genus *Acanthoscelides* Schilsky.

Based on the reconstruction of phylogeny of this bruchid group, we show that processes of adaptive radiation usually exhibit taxonomic conservatism in host-plant association, i.e., related bruchid species usually occur on related (and chemically similar) host plants. At the level of population processes, the dispersal of the host-plants is a key factor in influencing the spatial genetic structure of the associated bruchids, as we show for the species of the *A. obtectus* group (which includes species associated with *Phaseolus* beans), using an approach combining ecology, phylogeography, and population genetics. In the case of bruchids specifically associated with domesticated plants, dispersal is also tied, during the few thousand years since the beginning of domestication, to human history and the human-mediated movements of seeds.

Our study shows that the organisation of diversity of these phytophagous insects is tied to the secondary compounds of host plants, but also to the dispersal capacity of their host plants.

Keywords: *Acanthoscelides*, phytophagy, host-plant secondary compounds, dispersal, anthropogenic factors

Amis, Mao Angua; Balmford, Andrew; Rouget, Mathieu

Land use patterns and the state of our rivers: a case study from South Africa

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Contributed oral session 4, Drivers of biodiversity changes

Freshwater ecosystems are highly imperilled the world over, yet conservation planning is mainly focused on terrestrial and marine ecosystems. One of the reasons is that, few criteria exist to assess the ecological integrity of rivers for conservation planning. Another cause for the disparity between terrestrial and freshwater conservation planning is that, data for assessing ecological integrity of rivers generally have limited geographical coverage. Here, I use a fine-scale dataset from South Africa to explore how well measures of ecological integrity can be predicted

from readily available remotely sensed data. I built a spatial statistical model that uses broad land use variables for predicting the ecological integrity of rivers (subdivided into riparian and in stream integrity). I also tested the importance of the spatial scale of land use variables in predicting ecological integrity in order to identify what scale such predictive models should be built. Results showed that riparian and in stream integrity of river systems could be reasonably predicted, although riparian integrity was more accurately predicted than in stream integrity. The total area under natural cover is the most significant variable for assessing riparian integrity. Riparian integrity is best predicted by land use activities at the catchments level rather than more locally. This GIS-based model provides a fine-filter approach to supplement landscape-level conservation plans of river systems. The model represents a significant contribution towards the monitoring component of the River Health Program (RHP), which reports on the state of rivers in South Africa.

Keywords: Freshwater Ecosystems, ecological integrity, Conservation planning, Predictive Modelling, South Africa

Amoroso, Victor

Participatory inventory and assessment of plants in Malindang Range Natural Park, Mindanao Island, Philippines

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Contributed oral session 7, Biodiversity conservation II

Despite the recognized value of Malindang Natural Park as a major biodiversity refuge, little has been done to conserve and protect its flora. The commercial and social demand for floral resources has resulted in biodiversity loss. Thus, Malindang Natural Park is one of the hotspots in the Philippines needing high priority for protection and conservation. Thus, it is important that plants be inventoried and assessed so that strategies for their sustainable use can be effectively implemented. Site selection, establishment of sampling plots and inventory were done with the local researchers. Using the TWINSPLAN analysis, floristic classification, vegetation types and maps were produced and assessed to determine the status of biodiversity. Participatory inventory and assessment of the forest ecosystems delineated eight types viz., mossy forest, montane forest, dipterocarp forest, almaciga forest, 2 types of mixed-dipterocarp forest, lowland dipterocarp forest and plantation forest. Each forest type is characterized by a specific combination of plant species. The forest ecosystems showed a total of 1,286 species: 873 angiosperms, 20 gymnosperms, 281 pteridophytes, 84 bryophytes, and 28 lichen species. It also revealed 56 endangered and locally threatened species.

Among the forest types, the Almaciga forest appeared with the most number of endemic species, followed by the montane and the mossy forests. The lowest species richness and endemism were found in the plantation forest. In general, the forest types scored high on the species diversity index. It is expected that this species diversity index may increase when the forest will be protected and properly managed by the local people inhabiting the park.

The forests in Malindang Natural Park are still rich in biodiversity and endemic species. However, threatened species were likewise high due to land conversion and resource utilization.

Keywords: diversity, status, forest types, Mindanao, Philippines

Andrade-Morrays, Monica; Mizuno, Carolina Megumi
Ecological disequilibria as cause of emerging hantaviruses in Sao Paulo State, Brazil

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Contributed oral session 8, Biodiversity changes and health

Hantavirus pulmonary syndrome (HPS) is a deadly or a high mortality (50%) disease transmitted by infected rodents through urine, droppings, or saliva. Humans can contract the disease when they breathe in aerosolized virus. It was first recognized in 1993 and has since been identified throughout Brazil. Hantaviruses are carried by numerous rodent species throughout the world and is apparently not deleterious to its rodent reservoir host. A striking male predilection for hantavirus infection is observed in some rodent species such as harvest mice and deer mice, but not in urban rats (*Rattus norvegicus*). In Brazil, studies on the rodents have shown that *Akodon* sp, *Oligoryzomys* sp and mainly *Bolomys lasiurus* have been found with virus or antibodies for Hantavirus. The aim of the present work is correlate the probable local of the Hantavirus infection with the vegetation Sao Paulo State, using geographic maps and satellite images. The results shows that the north-eastern region of the state concentrates the highest number of cases (red indicates multiple events; yellow indicates 2-3 cases and green only one case), roughly 44 locations. Coincidentally, the deforestation of the region stated back in the 1880s, for coffee cultivation, in the 1970s and 1990s for sugarcane and other cultures. We believe that intensive agricultural activity and lack of major areas of preservation promoted the ecological disequilibria. The present forested areas are not big enough to keep the natural food chain, where major populations of mice predators have been collapsing, due losses of habitats during the last decades. Lack of mice predators has led to an increasing of its populations, which migrate to places where food is available: the rural or urban areas. The proximity with human population has led to a major contact with rodents excretes and increased the possibility of virus transmission.

Keywords: Deforestation, Ecological disequilibria, emerging disease, hantaviruses, food chain

Arias Garcia, Juan Carlos
Supply of woody and non timber forest products with economic potential, in Terra firme forest of Colombian Amazonia

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Contributed oral session 15, Economics of biodiversity

The tropical forests have been valued traditionally by the commercial volume of wood that they have. This vision assigns value to the forest like product, but not like alive ecosystem, and has taken to underestimate its potential like source of resources.

This work evaluates the natural abundance of six woody species and seven Non Timber Forest Products (NTFP), and compares their sales price in local markets to calculate the economic value that the alive forest represents for indigenous communities.

The work was developed in an indigenous territory 15 km away from Leticia city. Was used the methodology of analysis of Distances to evaluate density and natural supply

of woody species and NTFP. It was registered the process of harvest, transformation and final sale of products in the local market of Leticia. It was obtained the financial yield, Net Annual Value (NAV) and Net Present Value (NPV) for timber and PFNM. In the medium term (6 years), the NPV obtained with NTFP surpasses the profits acquired with the timber exploitation, with additional benefits in ecosystem conservation like source of foods, fauna, and seeds. The NAV obtained for NTFP fluctuates between US\$47 and US\$301/Ha, depending on species harvested. The total economic profits obtained by Hectare per year, is slightly inferior to effective Legal Minimum Salary for Colombia.

NTFPs are not a marginal line in the local economy. They offer job alternatives and comparable monetary income than other labour activities. It is necessary to advance in studies of ecology, reproductive biology and species regeneration to determine the carrying capacity of populations, and to validate these results with local settlers with the aim of driving sustainable development based in the use and managing of their natural resources. Also, necessary studies become of supply and demand for NTFP in local markets.

Keywords: NTFP, Colombian Amazonia, natural supply species, economic value of forest, economic botany

Arias González, Jesús Ernesto; Acosta-Gonzalez, Gilberto; Castro-Perez, José Manuel; Garza-Perez, Rodrigo

Spatial Prediction of Coral Reef Fishes Biodiversity

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Contributed oral session 14, Monitoring biodiversity changes I

Biodiversity is defined as a synonym of richness species and the relative abundance of species. We used different variables as useful correlates of, and potential proxies for, coral reef fish biodiversity. This work was developed in Chinchorro Bank Biosphere Reserve (CBBR, a plain/atoll type reef that is part of the Mesoamerican Barrier Reef System (MBRS) and one of the most important in the Caribbean by its size (40.7 km long and 18 km wide) and diversity. Fish species assemblages were characterized from 119 sampling stations (visual censuses-transect method -50m long x 1m wide). We estimated geomorphologic characteristics and different biotic variables from point identification (520 along the transect) of benthic organisms, grouped into Morph-Structural Groups (MSGs) and Broad-Functional Groups (BFGs). All the information was integrated in a GIS, along with satellite images (LANSAT 7 ETM+) and a Digital Bathymetric Model (DBM). From the recorded data, a hierarchical classification procedure was performed and we obtained 9 different classes (habitats). Generalized Regression Analysis and Spatial Prediction (GRASP) methodology was used to create predicted distribution maps (GIS layers) of the different features and components of the reef, and a second modelling run produced a map of the predicted spatial distribution of coral reef fish biodiversity. This is a valuable tool for the definition of priority areas for conservation and marine protected areas (MPAs) creation.

Keywords: Coral reefs, Spatial prediction, Biodiversity, Fish, Caribbean

Armenteras, Dolors, Morales-R., Mónica

Modelling the potential distribution of plant species in Colombia using Mahalanobis distances

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Poster session 10, Monitoring biodiversity changes

This work introduces a multivariate methodology for modelling the distribution of plant species in Colombia by means of integrating GIS with multivariate statistics.

Predictive models represent an important tool to better understand the factors that control species distributions. Many of these have been developed in temperate areas, however poorly sampled tropical regions, where the highest biodiversity areas remain and models might be of major value, have hardly ever been considered.

Primary inventory data exist in the best of cases as georeferenced coordinates from localities where specimens have been collected. There is rarely data which indicates absence or abundance of species. However, most of the current modelling approaches need the existence of both presence and absence data, and many of them are based only on biological tolerance to climate. The methodology here illustrated represents a step towards the achievement of an efficient use of the data already available in Colombia by providing a technique for modelling potential species distribution that utilizes only presence data based on Mahalanobis distances applied to two species of Palicourea.

Keywords: modelling, species, Mahalanobis, Colombia, plants

Arnaud-Haond, Sophie; Billot, Claire M.; Duarte, Carlos M.; Serrao, Ester A.; Teixeira, Sara

Genetic structure and mating system at range-edge: low diversity and high inbreeding in SE Asia mangrove (*Avicennia marina*) populations.

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Contributed oral session 9, Genetics

Understanding the genetic composition and mating systems of edge populations provides important insights into the environmental and demographic factors shaping species distribution ranges. We analyzed samples of the mangrove tree *Avicennia marina* from Vietnam and Northern Philippines with microsatellite markers, and compared the genetic diversity and structure with previously published results obtained on core populations and those from the Southern distribution limit. The results obtained highlighted a significantly reduced level of gene diversity and a higher level of genetic structure in both margins compared to core populations, which can be attributed to very low effective population size, pollinator scarcity and high environmental pressure at distribution margins. The estimated level of inbreeding was significantly higher in North Eastern populations compared to core and Southern populations, indicating a much higher level of selfing. This suggests that despite the high genetic load usually associated with inbreeding, selfing may be advantageous in margin habitats due to the possible advantages of reproductive assurance, or local adaptation. The very high level of genetic structure and inbreeding show that populations of *Avicennia marina* are functioning as independent evolutionary units more than as components of metapopulation system connected by gene flow. The combinations of those characteristics make these peripheral populations likely to develop local adaptations and therefore to be of particular interest for conservation strategies as well as for adaptation to possible future environmental changes.

Keywords: biogeographic limits, species distribution margins, genetic diversity, mangrove, mating system

Balvanera, Patricia; Carrillo, Urani; Herrera, Daniel; Martinez-Yrizar, Angelina; Miranda, Alvaro; Pérez-Jimenez, Jose Alfredo

Functional structure of primary productivity: the case of conserved and managed tropical dry forest of Western Mexico

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Contributed oral session 5, Biodiversity and ecosystem functioning II

Studies of the relationship between ecosystem function and species diversity have seldom analyzed the relative contribution of species to an aggregate ecosystem function and how it relates to species' relative abundance and how these relationships are affected by management. We present a conceptual framework to address such functional structure and apply it to primary productivity in a highly diverse tropical dry forest of Western Mexico. We contrast two habitats (low and high water availability) and two management conditions (conserved and 12 years old secondary forest).

Three 30 X 20 m quadrats for each treatment were censused including all woody individuals with diameter at breast height > 5cm. We estimated primary productivity through above-ground fine litterfall with five 0.5 m litter traps that were monthly sampled for one year and processed separating leaves into 75 different species. In the conserved forest the contribution of different species to the function is quite even, dominant species with respect to function contributes to the 10% of all litterfall, relative contribution to litterfall is independent of relative abundance, and contribution of different species changes among habitats. In contrast, in the secondary forest contribution to the function is highly dominated by one species that contributes to 80% of all litterfall, which is also the dominant species in terms of relative abundance and is not found in the conserved forest. Our results suggest that primary productivity in the conserved forest may be quite stable due to the high diversity associated to it while it might be very vulnerable in the depauperate and highly dominated secondary forest.

Evenness in species' contribution to primary productivity was contrasting and related in contrasting ways to relative abundance in two different management conditions of the tropical dry forest.

Keywords: tropical dry forest, primary productivity, functional structure, evenness, management

Barbier, Edward; Rauscher, Michael

Biodiversity and Geography

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Contributed oral session 15, Economics of biodiversity

This paper uses recent advances in economic geography models of international trade and factor mobility to assess the incentives for countries to agglomerate economic activity versus preserve biodiversity. We consider a world consisting of two regions, home and foreign. Both regions contain an economic system governed by monopolistic competition as well as an ecological system containing biodiversity

(species richness), which is a global public good. Increased economic activity will result in both loss of species richness and in the total biomass of each species population. We examine the scenario in which factors of production employed in the world economy are immobile. Factor owners, however, can move. Ownership is equally distributed across the population. Thus, all households have the same factor income, which is independent of their location. We distinguish two cases: 1) high endemism of species and 2) low endemism of species. In case one, high endemism requires that biodiversity be conserved in both regions, and this outcome also leads to maximization of economic welfare. The outcome where population, and thus economic activity, is evenly distributed between both regions is therefore also optimal. However, in case two the objectives of maximizing consumer surplus and the biodiversity index are conflicting. Thus, biodiversity is maximized if all the species of one country are fully protected as a reserve and that the other country is fully devoted to human settlement and economic activity. This is due to the fact that only few species are endemic and a larger degree of global biodiversity can be attained if the whole population is concentrated in one of the two countries than in the case of equal population density in both countries.

Keywords: agglomeration, species richness, economic geography, biodiversity, international trade

Barkmann, Jan; Cerda, Claudia; Marggraf, Rainer

Economic preferences for the protection of primary values? Evidence from trading-off ecological insurance by species diversity in an uncertain world

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Contributed oral session 15, Economics of biodiversity

Primary values are regularly excluded from Total Economic Value (TEV). We argue for an inclusion of at least one aspect: The insurance benefits species diversity provides by enhancing ecosystem resilience (cf. ecological insurance hypothesis). An empirically documented willingness to exchange income (WTP/WTA) for ensuring resilient ecosystem functioning would indicate a legitimate a priori preference for protecting primary values. A choice experiment with aesthetic, existence, ethno-symbolic and insurance benefits was conducted on Navarino Island (Chile) (orthogonal main-effects design; n=220). The resilience attribute was introduced as an insurance benefit regarding the “vigour, health, and resistance of nature”. It was operationalised via a loss of 0, 1/2 and 3/4 of the about 1600 species of the island, and assigned labels of “high”, “medium” and “low”. As most development options for Navarino include a loss of biodiversity, we offered decreases as well as increases in income for the monetary attribute. We assumed linear utility functions, and used LIMDEP’s MNL function. With the exception of the aesthetic attribute on the opportunity to observe native species, all attributes are significant with P

Keywords: primary value, TEV, insurance hypothesis, WTP, environmental valuation

Bazile, Didier; Dembele, Souleymane; Staphit, Bhuwon R.; Subedi, Anil

“How communities provide seed system’s resilience to maintain on-farm agrobiodiversity through social networks?” Mali and Nepal cases studies

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Contributed oral session 18, Agriculture and biodiversity II

Agrobiodiversity management is a key for coping with climate uncertainties in low-input agricultural systems for people from the developing countries. Many landraces continue to disappear and it is crucial to identify if farmer is the adapted scale for agro-biodiversity management. Considering the high cost of ex situ conservation and, the importance to develop in situ conservation, we ask the dependence on the natural resource knowledge and agro-biodiversity loss at the farm level. This research deals with the structure of society, the way the farmers act, where and how decisions are made to manage genetic resources. Demonstration is based on results from 4 years studies conducted in 11 communities in Mali and Nepal. We analyze the knowledge and use of cereals (sorghum and rice). According to a scaling-up methodology and a systemic approach, data was gathered in a suitable spatial framework. A network analysis approach using a snowball-sampling technique was adopted to map seed flows. Ecological indices were used to explain significant differences between communities. 75% of the farms cultivate only 1 variety/cereal/year. So the diversity is not managed at the peasant's level but through social networks that determine an exchanging group of seeds and provide a high level of diversity at the agro-ecosystem level (more than 10 varieties/cereal in a village). Farmers' informal system gives very important resilience of the flow of genetic materials. There is certain degree of stability of network links and in this process nodal farmers do play significant role. The CBD has given a clear mandate for on-farm conservation. The key question is how to increase the diversity available to farmers and enhance farmers' capacity to manage this diversity dynamically. The result of farmer experimentation is a dynamic, open, system of on-farm management of genetic resources with both recruitment and loss of varieties.

Keywords: Agro-biodiversity, seed system, social networks, in situ conservation, developing countries

Becerra, Judith

Identifying diversity sources and diversity sinks to conserve tropical trees

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Contributed oral session 21, Systematics

Macroevolution examines the temporal patterns of biological diversity in deep time. When combined with biogeography, it can provide unique information about the historical changes in diversification in space that can be important to identify areas of conservation. The goal of this study was to identify areas in the Mexican tropical dry forest that have been important centers of diversification of the genus *Bursera* through time (diversification sources) and areas where species are maintained but where speciation is less likely to occur (diversity sinks). *Bursera* is very old, highly adapted to warm dry conditions, and a dominant member of the Mexican tropical dry forest. These characteristics make it a useful indicator of the history of diversification for this biome.

We used a time-calibrated phylogeny to estimate *Bursera*'s diversification rate at different times over the last 20 million years. We also reconstructed the geographic center and time of origin of all species and nodes from information on current distributions.

Only some areas of the tropical dry forest have been favorable for *Bursera*'s speciation since 20 Million years ago. Results show that the south of the state of Jalisco, Colima, and west of Michoacan have functioned as major engines of

speciation. Areas in the states of Nayarit, Sinaloa, Sonora, and the Atlantic and Pacific coasts have historically functioned as diversity sinks, where speciation is very low.

Results of our studies suggest that it is important that conservation efforts are based not only on information on current diversity, but also on future diversity. Areas in Jalisco, Colima, and Michoacan are likely to continue producing more new species if left undisturbed, while other areas will not, regardless of their state of preservation.

Keywords: Mexican tropical dry forest, diversification rates, center of origin, speciation, *Bursera*

Beilin, Ruth; Wedderburn, M.E.

A socio-ecological system approach to incorporating biodiversity in landscape change

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Contributed oral session 2, Biodiversity conservation I

This paper explores the role of agriculture policy in the decline of indigenous biodiversity by tracking the socio-ecological transformation that occurred with white settlement in New Zealand and Gippsland South Eastern Australia over the last century. This transformation has resulted in a predominantly production dominated landscape. Our analysis highlights the social, technological and economic mechanisms and looks to the future policy instruments that attempt to redress the balance within production dominated landscapes.

A historical time line is used to map the activities that drove change and a review of the resulting impacts on land use and biodiversity was undertaken. In the formation of various land stewardship groups there is a perceived opportunity to assess the ecosystem services and to build socio-ecological resilience to a new and imagined landscape.

The major drivers identified related to the pursuit of national and local economic and social well being. The transformation process created cultural and ecological values not widely questioned until the early 1990s. Progress in achieving biodiversity goals on agriculture land may be linked in the shorter term not to international trade issues but to local communities and urban dwellers through regional planning.

Conclusions: We make the case that building awareness of ecosystem dynamics through understanding historical processes enables contemporary players to locate desired outcomes—in this case the creation of a landscape mosaic that incorporates diverse production, conservation and tourist values—as part of an ecosystem management approach that will contribute to the resilience of the new social-ecological system. The capacity to manage multiple drivers as part of interlinked or complex ecosystems highlights the need for strong communities able to imagine and sustain the desired socio-ecological state and contribute to evolving resilience.

Keywords: agroecosystem management, landscape change, resilience, socio-ecological systems, transformability

Berendse, Frank

Declining biodiversity in agricultural landscapes and the effectiveness of agri-

environment schemes

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Contributed oral session 1, Agriculture and biodiversity I

Agricultural intensification, greatly accelerated as a result of the EU Common Agricultural Policy (CAP), has led to drastic reductions in the populations of many wild plant and animal species that used to be characteristic of farmland. In 1992 the EU provided the member states with its Agri-environment Regulation 2078/92 to help member states reverse these developments by means of agri-environment schemes. The question is: will the implementation of these schemes be sufficient to restore the biological diversity on farmland? Studies on habitat selection, reproductive output and large scale population dynamics of meadow birds in the Netherlands show that current agri-environment schemes are not effective to recover the former bird species diversity in Dutch agricultural landscapes. Continuous evaluation and adaptation of these schemes is needed to enable the biodiversity on farmland to recover from the EU's former policy.

Keywords: agricultural landscapes, meadow birds, agri-environment schemes, reproduction, habitat selection

Berghöfer, Augustin

Not About Money: Critical Enabling Conditions for Effective Co-Management in Protected Areas (PAs)

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Contributed oral session 7, Biodiversity conservation II

More than 100.000 protected areas (PA) today cover about 10% of the Earth's terrestrial surface, but many exist as „paper parks“ only. The WPC in Durban 2003 confirmed the general twin goal for PAs: to reconcile in situ conservation of biodiversity with sustainable livelihoods.

While PA management literature and tools exist for the goal of biodiversity conservation, writings are scarce about the functioning and appropriate structure of the management of PAs pursuing the twin goal. The purpose of this study is to explore these management requirements and in particular to examine the conditions for effective collaborative arrangements.

Biosphere reserves pursue the twin goal since 1995; 30 are examined about their institutional set-up and performance (written questionnaire). The findings are analysed in the light of 86 expert interviews on success and failure factors for PAs. Qualitative empirical research methods and software are employed. Statistical testing is also conducted.

The findings suggest that

- 1) Conventional PA management approaches are counter productive for the implementation of twin goal PAs.
- 2) co-management arrangements are, in theory, particularly apt for the twin goal PAs, but in practice they are prone to paralysis.
- 4) Apart from contextual aspects, the quality of co-management as an effective management structure is a function of at least (a) the distribution of official authority, (b) the nature/style of the collaboration, (c) the degree of coupling with other political issues, (d) the personal alliance between key persons. The effects of money remain ambivalent.

Implementing the twin goal requires some money, but more than that, a review of the

management structures and conservation project procedures. Conflict theory, critical participatory development research and joint forest management need to inform and improve the prevailing current practice.

Keywords: protected areas, co-management, local governance, protected area implementation, conservation effectiveness

Blanchard, Fabian; Boucher, Jean; Bourillet, Jean-François; Guillaud, Jean-François; Lazure, Pascal; Vandermeirsch, Frederique

Towards a biodiversity management of a large marine ecosystem : the bay of biscay integrated case study

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Contributed oral session 7, Biodiversity conservation II

Biodiversity conservation in the large marine ecosystems (LME) requires changing the fisheries management from a sectoral perspective to an integrated approach. The objective was to identify the drivers of the biodiversity changes during the last 3 decades in the Bay of Biscay (a LME).

Several disciplines were associated to describe the ecosystem components (climate change and hydrological patterns, nutrients and primary production, fisheries and its economic conditions) and the changes in biodiversity resources impacted by human activities. Temporal data sets from thematic survey networks and enquiries on commercial and recreational fishing activities were used.

Temperature of the water column increased in relation to global warming. Nitrates increased because of agriculture and phosphates decreased because of regulations on treatment of water. Trawling disturbances on the fishing grounds was 30% of the storm effects. 3/4 of the fishing stocks were overexploited. This led to a shift in primary producers, a loss of fragile benthic invertebrate species, while opportunistic species increased; subtropical fish species (commercial or not) abundance of low trophic level increased and large commercial boreal species of high trophic level decreased.

Fisheries economical patterns have evolved. Public incentives for decreasing the fishing boats numbers were invested in the technological catch efficiency.

Concentration of the production and capitalisation of the fishing rights in the boat value were also observed. Despite biodiversity changes affected the fisheries production, the economical value of the fisheries was driven by market fluctuations and investment individual strategy.

The risk of an increase of anthropogenic impacts on biodiversity can be assessed, allowing building alternate scenarios of management based on an ecosystem approach.

Keywords: Bay of Biscay, fisheries management, human impacts, climate change, economic conditions of fisheries

Bodin, Örjan; Norberg, Jon

A network approach for analyzing spatially structured populations in fragmented landscape – an example from southern Madagascar

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Contributed oral session 14, Monitoring biodiversity changes I

It is becoming increasingly necessary to understand the consequences of the destruction and fragmentation of natural habitats for the viability of plant and animal populations and for the generation of ecosystem services. Herein we propose methods that can be applied to (1) identify individual habitat patches that have a disproportionately high importance in maintaining the ability of organisms to traverse the fragmented landscape, and (2) find detached groups of habitat patches that contribute to a spatial compartmentalization of species populations.

We extend the graph-theoretical landscape perspective, wherein a landscape with scattered habitat patches is represented as network, by applying several network-centric methods mainly developed in the social sciences. We apply and compare our suggested methods with previous approaches utilizing a real landscape in southern Madagascar.

In our study area, distinct forest patches, surrounded by cultivated land, serve as islands of habitats for forest-dwelling species, e.g. the ring-tailed lemur (*Lemur catta*). *L. catta* is an important seed disperser and is able of traversing the cultivated land, thus being able to disperse spread seeds between nearby patches. We show how our proposed methods can identify compartments of, as experienced by *L. catta*, internally well-connected habitat patches. In addition, individual patches that significantly contribute to uphold the landscape's traversability for *L. catta* are identified.

We suggest that our methods are particularly suitable in landscapes with distinct habitat patches where species' traversability is not fully inhibited by fragmentation, but merely limited. The framework presented here could be particularly useful for studying spatial aspects of resilience and in the design of dynamic reserves. We also present a publicly available software tool for doing many of the analyses presented here.

Keywords: landscape ecology, landscape fragmentation, networks, connectivity, network analysis

Buzo, Daniela; Barillas, Ana Laura; Garcia, Jeronimo; Gonzalez, Jose; Hernadez, Lorna

Temporal dynamics of avifauna in urban parks of Puebla, Mexico

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Contributed oral session 10, Biodiversity and urbanization

Urbanization provokes local extinctions along a gradient of increasing habitat perturbation and stress, leading to homogenization. Since urbanization affects avifauna at different levels, birds may be considered as indicators of the prevailing environmental conditions. During 8 months, from February to September (2004), we surveyed a study of the avifauna at urban parks of Puebla and its surroundings, using the "qualitative point count" method. We analyzed 3 large parks, 3 small parks and a negative reference with a total of 1378 census points, in order to acquire knowledge on the temporal dynamics of birds.

We obtained the values of species richness both observed and calculated by each non-parametric estimator (ICE, Chao 2, Jack 1, Jack 2, and Bootstrap) for each of the 6 parks and the negative reference. Avifauna richness was always higher in large parks than in small parks; in all cases the negative reference had the lowest richness values. When we analyzed the percentage of presence for each species throughout the 8 months, we found a series of patterns, coherent with the phenology consulted.

For habitat preference, we found that while some species prefer large parks, others prefer small parks; there were species that showed no preference at all. For the winter-migrant species, we were able to complete the cycle for every case, except one (*Dendroica coronata*). We were also able to distinguish a group of species which we called “rare”, because their percentage of presence values were lower than 15%, in general, these species showed preference for large parks.

In order to develop an action plan in favour of biodiversity’s conservation inside the cities, it is necessary to understand the temporal behaviour of species in urban environments. It is important to know the characteristics and needs of birds in order to determine the most vulnerable ones and protect them, preventing homogenization of urban areas.

Keywords: species richness, temporal dynamics, urban, avifauna, birds

Böhning-Gaese, Katrin

Do seed dispersers matter? A biogeographical approach

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Contributed oral session 6, Biogeography

Does the diversity of seed dispersers have consequences for the seed dispersal rate, spatial distribution, genetic structure and reproductive success of trees? Does it influence the composition of tree communities?

To answer these questions we took a biogeographical approach. We compared two tree species in the genus *Commiphora* between Madagascar, that has only few frugivorous bird species, with South Africa, that is rich in frugivorous birds. During 600 hours of tree observations, we studied seed dispersers and seed dispersal rates of the two tree species. We quantified the spatial distribution of seedlings and trees. We used AFLP to investigate the population genetic structure. Finally, we compared the floristic composition of a Malagasy and a South African tree community.

While seeds of the Malagasy species were dispersed by basically one bird species with a total dispersal rate of only 8%, seeds of the South Africa tree were dispersed by 12 species with a total dispersal rate of 71%. Correspondingly, seedlings and trees had a clumped spatial distribution in Madagascar, and a random distribution in South Africa. Gene flow in the Malagasy species was limited to distances up to 3 km with high genetic differentiation between local populations. In the South African species, gene flow covered up to 30 km with little genetic differentiation at a local scale. Recruitment into the older seedling stages was lower in the Malagasy than in the South African species. Finally, the tree community in Madagascar, where lemurs are important seed dispersers, is dominated by tree species with typical “primate fruits”, in South Africa by trees with “bird fruits”.

These results demonstrate that the diversity of seed dispersers can have far-reaching consequences for the spatial distribution, genetic structure and reproductive success of trees, including the composition of tree communities.

Keywords: bird diversity, seed dispersal, tropical trees, genetic structure, Africa - Madagascar

Cabrera Montenegro, Edersson; Galindo, Gustavo

Alteration in the distribution of the mountain vegetation types in a sector of the

Colombian Andes. Effect of the global change, adaptation or loss of biodiversity?

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Contributed oral session 11, Drivers of mountain biodiversity

Some areas can act as bioindicators of global change, especially those located in the tops of the principal mountainous systems (Ames and Francou, 1995). The Colombian Andes are part of the Hotspot Tropical Andes considered as the richest and most diverse region on earth (CI, 2005) and during the last decades this region has experienced climatic changes that might be related to the disappearance of eight of its glaciers (Florez, 1992). The present study analyzed the possible effect of global change in the alteration of the distribution of the mountain vegetation types by means of the use of GIS analysis tools in a zone of the department of Nariño, specifically in the zone of influence of the Volcanoes Cumbal and Chiles, which until 1985 were covered with snow peaks. Methods: The base information of the analysis was the multispectral information and the coverage classifications obtained from Landsat images and air photos taken at four time moments, information of meteorological stations available for the area during the last 40 years and a digital elevation model to determine the behaviour of the limits of the vegetation types. Results: The natural mountain vegetation (Andean Forest and Paramo) experiences transformation processes that are reflected in reduction of his area (15 %), besides the limits of the natural coverages have moved and are related to small increase in the region's temperature. It would be suitable to continue the analyses with images of satellite with better spatial resolution. The zone presents transformation (> 15 %), processes of fragmentation and connectivity losses. Relations exist between the increases of temperature with the displacement of the limits of the mountain vegetation. There is also an increase of human pressure on natural resources not related with the gradual change caused by global change.

Keywords: Colombian Andes Mountain vegetation, Global change, GIS, Andean forest, Paramo

Catterall, Carla; Kanowski, John

How does reforestation affect biodiversity? - pattern and process in Australian rainforest landscapes

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Contributed oral session 18, Agriculture and biodiversity II

Widespread biodiversity losses have followed clearing of rainforest, and there are increasing efforts to restore forest cover. However, changes in biodiversity following different forms of reforestation are poorly understood. We researched the following questions: 1. What effects do different forms of reforestation have on site-specific biodiversity value? 2. How concordant are responses of different biodiversity components? A network of 104 sites was established across two Australian rainforest regions: tropical uplands, and subtropical lowlands. Within each region, sites were stratified across unassisted regrowth, mono- and mixed-species timber plantations, diverse restoration plantings, and reference sites of pasture and rainforest. At each site we quantitatively sampled a range of biodiversity attributes, encompassing physical vegetation structure, taxonomic diversity (plants, vertebrates and invertebrates), and ecological process.

There was reasonable concordance among the biodiversity indicators, and between regions. Reforested sites typically had values intermediate between pasture and rainforest. We devised an index of site development, based on the percent of re-acquired "rainforest" attributes (defined either through known function or by comparison between values in rainforest and pasture). This showed that ecological restoration sites had acquired around 50% of rainforest characteristics (varying among attributes) within 10 years after establishment, whereas timber plantations had lower values, which were broadly similar to those of weedy regrowth. Physical vegetation structure was correlated with many attributes, and canopy closure was a critical factor in early biodiversity development.

Quantification and comparison of site-specific "biodiversity value" is feasible. The forms of reforestation also differ in both cost and likely economic value, and various trade-offs are possible when planning restoration at site and landscape scales.

Keywords: restoration, biodiversity, monitoring, plantation, regrowth

Cerda, Claudia; Barkmann, Jan; Marggraf, Rainer

Participatory assessment of conservation options for Navarino Island (Chile) in the context of the CBD ecosystem approach aided by a choice experiment

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Contributed oral session 2, Biodiversity conservation I

Establishment of a biosphere reserve for the entire Chilean Cape Horn region including widely pristine but inhabited Navarino Island is proposed. Biosphere reserves shall account for the CBD Ecosystem Approach (EA) stressing the economic as well as participative aspects of conservation management. Our contribution describes the potential of a stated preference technique to account for both demands. Ideas of the local population on human-nature relationship were analysed in within the BIODIVERSITY project. We used this input of local values to define biodiversity attributes to be analysed with a choice experiment (n = 220, main-effects design; face-to-face interviews). As most development options for Navarino include some loss of biodiversity, we offered decreases and increases in income as levels of the monetary attribute (WTP/WTA). With LIMDEP's MNL function, we obtain (CHP/month): landscape aesthetics threatened by progressing levels of tourist infrastructure (~20,000; P

Keywords: CBD, Ecosystem Approach, participatory decision-making, scenario analysis, local values

Cesario, Manuel

The health benefits of biodiversity conservation

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Contributed oral session 8, Biodiversity changes and health

The main challenge facing biodiversity conservation professionals is to find ways of demonstrating that the in-situ conservation of biodiversity and its sustainable use have a fundamental relevance to the daily lives of people, emphasizing the purposes of protected areas as contributing to the human well-being.

This work identifies eight ways in which in-situ biodiversity conservation can improve human health. Four of these health benefits of biodiversity are briefly described and

remain as anecdotal evidence, while the other four are better explored through fieldwork in Brazil, Costa Rica, Poland and Kazakhstan.

These health benefits of biodiversity constitute a contribution to academics, decision-makers and protected-area managers interested in improving the relation between local communities and in-situ biodiversity conservation, world-wide.

Keywords: Human health, Biodiversity conservation, Human well-being, Benefits of biodiversity, Parks and people

Chiang, Yu-Chung; Schaal, Barbara A.; **Chou, Chang-Hung**

Molecular phylogeography of *Oryza rufipogon* based on cpDNA variation

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Contributed oral session 6, Biogeography

We investigated the genetic diversity and phylogeography within and among natural populations of common wild rice, *Oryza rufipogon*, of Asia based on genetic variation of chloroplast genomes. *Oryza rufipogon*, known as the ancestor of Asian cultivated rice (*O. sativa*), is a perennial aquatic plant with high morphological diversity.

Populations are widely distributed in the tropics and subtropics of monsoon Asia, including China, Indochina, India, Taiwan, Philippines, Malaya, Indonesia, and Papua New Guinea, where the geological history is largely affected by plate tectonics, island formation, and Pleistocene glaciations. These geological factors make Asian common wild rice, *O. rufipogon*, an ideal model for estimating population diversity and phylogeographical reconstruction. Using sequences of highly diverse regions in chloroplast DNA, the phylogeographical pattern, dispersing pathway and diversity center of Asian common wild rice were investigated. Nucleotide diversity varied from 0.0013 to 0.0041 within populations, showing low levels of genetic variation. Forty one haplotypes of cpDNA identified from 704 individuals were used to reconstruct a minimum spanning network and a neighbour-joining tree. The gene genealogy demonstrated that current populations of *O. rufipogon* existing in the tropics and subtropics of monsoon Asia shared two major haplotypes, while rare haplotypes were subdivided into different geographical groups. The haplotype distributions among geographical groups display genetic differentiation between biodiversity centers and effects of bottleneck events.

Keywords: Asian common wild rice, phylogeography, genetic diversity, chloroplast DNA intergenic spacer, *Oryza rufipogon*

Contreras-Martínez, Sarahy; Santana-Castellon, Eduardo

Bird monitoring and plant succession: effects of a crown fire on the hummingbird community of a subtropical montane forest in Western Mexico

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Contributed oral session 14, Monitoring biodiversity changes I

Forest fires are one of the principal causes of ecological disturbance in montane forests of Western Mexico. However, there are few evaluations of their effects on the bird communities of these subtropical ecosystems. We document the impact on the hummingbird community of a crown fire in a pine-oak forest in the Sierra de Manantlán Biosphere Reserve, based on the longest-running hummingbird

mistnetting and banding program in the Neotropics. The response was measured over 15 years (1991-2005) of continuous monitoring which generated over 15,000 hrs/net of sampling effort, and over 12,000 hummingbird captures. Although all hummingbird species feed on common resources (nectar and insects) and form part of the same foraging guild, population responses to vegetation succession varied among species in magnitude and direction. For example, some species like the long-distance migrant *Selasphorus rufus* decreased significantly, while others like *Lampornis amethystinus* increased in abundance or remained static. Overall species richness and population densities of hummingbirds decreased over time. The conservation of hummingbird diversity in montane habitats is directly dependent on the maintenance of a mosaic of different succession stages over space and time. A fire management strategy that emulates natural fire regimes and includes fire exclusion as well as prescribed burns is necessary to maintain the natural dynamics of these poorly studied ecosystems.

Keywords: Hummingbirds, monitoring, Fire, conservation, succession

Dauber, Jens; Purtauf, Tobias; Wolters, Volkmar

Local vs. landscape control of biodiversity in agricultural landscapes

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Contributed oral session 18, Agriculture and biodiversity II

Processes operating simultaneously at various spatial scales determine the ability of species to colonize and persist in a habitat. Taking full account of the joint impact of both landscape context and local habitat characteristics is now considered to be a key for restoring and maintaining biodiversity in cultural landscapes. The goal of our study was to identify drivers controlling local species richness and to single out the relevant spatio-temporal scales at which these drivers operate.

We studied epigeic arthropods and pollinators in agricultural landscapes of Germany. Sites were selected to represent different trends of land-use change, in particular intensification of agricultural production vs. marginalization. We calculated statistical models including habitat and landscape variables for predicting species richness. Habitat and landscape variables together explained a large amount of the local variation in species richness. The explanatory strength of these effects significantly differed among taxa. Depending on both mobility and resource requirements, local occurrence of species was differentially controlled by habitat as well as by landscape characteristics. Trophic rank and multi-habitat use also determined the susceptibility of a species to land-use change. Both intensification and marginalization lead to landscape simplification that resulted in reduced biodiversity.

Our study proves the need for including both habitat quality and landscape pattern into strategies aiming at biodiversity conservation. We were able to identify the drivers of species richness of single taxa, but no general rules for relating diversity to habitat and landscape features could be established. Our results cast doubt on the suitability of single taxa as biodiversity indicators. The opposite response of some taxa shows that no universal rules for landscape management are available.

Keywords: agriculture, landscape simplification, conservation strategies, spatial scales, biodiversity indicators

David, Choquenot; Burns, Bruce

Biodiversity restoration: theory, concept and practice

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While reservation and protection of largely intact ecosystems will remain a key focus of biodiversity conservation, restoring elements of biodiversity to locations from which they have been lost is increasingly viewed as an important parallel activity. In addition to biodiversity outcomes, restoration yields other significant benefits through community engagement in biodiversity conservation, realisation of cultural aspirations for biodiversity, and enhanced regional economic activity. Despite the rapid elevation of interest in restoration, the field lacks a unifying conceptual basis and alignment with theory linking the structural integrity of ecosystems to their resilience, and the longer-term viability of key local elements of biodiversity. We propose a conceptual framework that encompasses various types of biodiversity restoration (from recovery of highly degraded sites to species reintroduction into largely intact habitat), and links these activities to key areas of theoretical and empirical ecological research. By providing a conceptual and theoretical context for biodiversity restoration, we hope to promote more systematic approaches to this critical conservation activity. Some examples of how current biodiversity restoration initiatives in New Zealand map against our proposed framework will be given.

Keywords: biodiversity, restoration, pests, reintroduction, ecosystems

de Koning, Free; Benítez, Pablo; Muñoz, Fabian; Olschewski, Roland

Modelling the impacts of conservation incentives on land-use change, biodiversity and ecosystem functioning

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Contributed oral session 16, Biodiversity conservation III

Changing land use can have important impacts on biodiversity and ecosystem functioning at the landscape scale. We present a land-use change model that evaluates conservation policies and strategies. The model is being implemented for a study area in western Ecuador, which is part of the Chocó biogeographical region, one of the world's hotspots for biodiversity.

The model is based on locally recorded information on ecological, economic and social aspects of different land-use systems: forests, agroforestry systems with coffee, pastures and crops. In an optimisation procedure, land use is allocated over the region with a resolution of 30 by 30m grid cells, taking into account farm size, risk behaviour, and heterogeneity and variability of land productivity and production costs. Through scenario studies, regional-scale model forecasts of land-use changes as result of conservation strategies are generated. The generated land use patterns are evaluated for their ecological impacts, such as habitat loss and fragmentation, loss or changing composition of plant, bird and insect species, effects on ecosystems functions like pollination, carbon sequestration and seed dispersal, and effects on soil quality.

We show the effectiveness of financial incentives for providing ecosystem services like biodiversity conservation and carbon sequestration. The trade-offs between farm income and biodiversity conservation are demonstrated. We will show how the model can be used to estimate how and where conservation measures with a determined ecological impact can be implemented at the lowest opportunity costs, for example

when designing bio-corridors or buffer-zones.

The presented land use model can be used to evaluate conservation strategies for their impact on welfare, biodiversity and ecosystem functioning and visualize them at the landscape scale.

Keywords: land-use, biodiversity, conservation, ecosystem services, Ecuador

de Lara, Michel; Doyen, Luc

Biodiversity and ecosystem sustainability in uncertain environments

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The relation between diversity, stability and viability is a longstanding and largely studied issue in ecology with important implications to biodiversity management. The role played by the uncertainty is a basic dimension of the problem. Diversification is known to be relevant to deal with risk in portfolio management, as well as in ecology through the insurance hypothesis. This means that biodiversity ensures ecosystems against declines because many species provide greater guarantees that some will maintain functioning even if others fail. To our knowledge, theoretical results on such issues are rare and often restricted to specific ecosystem productivity functions and do not generally allow for direct trophic interactions within the population dynamics. Extensions to complex food-webs and interacting species are generally studied on numerical and simulation grounds. The present paper aims at extending the theoretical results in two directions using one period models in a stochastic environment. First, we examine insurance effects for a large class of global productivity functions within a trophic level. This is how we show, under general conditions, that asynchronicity in the responses of individual species productivities reduces the variability of the global productivity of the ecosystem. Second, we examine how diversification mitigates extinction risk and favour viability for more complex trophic web.

Keywords: insurance hypothesis, stochastic environment, productivity, asynchronicity, trophic web

Deacon, Robert; Murdoch, William

Political Economy Determinants of Conservation Performance in Protected Areas

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New evidence on conservation outcomes now makes it possible to assess the factors associated with the success or failure of conservation in protected areas. Ecological factor play a role and traditional economic factor are also undoubtedly important. Our emphasis is on 'political economy' determinants of success, factors that arise from the economic motivations of political agents. For example, in some institutional settings public officials have little incentive to pursue the public interest, e.g., by enforcing park boundaries and deterring poaching, but may be motivated to enhance their own incomes by taking bribes and diverting conservation funds. Further, when government institutions are unstable, the incentive to pursue long-term conservation goals is undermined.

We examine differences in conservation outcomes for individual protected area in a range of countries with differing political systems, controlling statistically for other

factors that logically should influence success. Data on performance are drawn from satellite imagery showing forest conversion over time and from survey responses on land clearing, logging, poaching, grazing, and similar activities in reserves. The institutional measures examined include indicators of political stability/instability, adherence to democracy versus autocracy in a country's national government and the prevalence of corruption and bribe-taking. Economic and ecological controls are taken from standard sources.

We identify the political economy factors associated with successful conservation outcomes. With this information, we discuss protocols for directing conservation resources toward countries where success is most likely.

The political systems of countries, particularly in the developing world where biodiversity is both abundant and at risk, are important factors determining the success or failure of conservation efforts.

Keywords: conservation, performance, political economy, ecology, protected areas

Denich, Manfred; Borsch, Thomas; Schmitt, Christine; Tesfaye, Kassahun; Wakjira, Feyera Senbeta

Integrating the conservation of genetic and species diversity: the example of wild *Coffea arabica* in the montane forests of Ethiopia

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Contributed oral session 16, Biodiversity conservation III

Coffea arabica has its centre of origin in Ethiopia. Wild Arabica coffee grows in the understory of montane forests and is traditionally used by local people.

Internationally, it represents a gene pool for breeding. Deforestation, however, threatens the forests and the wild coffee populations. Aims are to develop concepts for the conservation of the genetic diversity of wild coffee together with the species diversity of its forest habitat.

Vegetation surveys of montane forest areas and analyses of the genetic diversity of wild *C. arabica* using molecular markers were conducted in 4 geographically separated regions of SW-Ethiopia.

Vegetation surveys yielded >700 plant species (10% of the Ethiopian flora). Although the montane forests of the 4 study regions differ floristically, forest areas with wild coffee are similar in species composition across regions. Human interventions due to the use of wild coffee affect its distribution and abundance as well as forest structure. Genetic diversity in wild coffee populations is high within geographical regions but the amounts of diversity vary from region to region. Most forests have their unique *Coffea* genotypes. This genetic diversity may largely be explained by dispersal and reproduction features. Most strikingly, patterns of genetic diversity are similar to patterns of floristic diversity.

Concepts integrating in-situ conservation of wild *C. arabica* with the conservation of montane forests should consider a multi-site approach, due to geographical differences in genetic and species diversity. *C. arabica* as a flagship species helps to define conservation areas and simultaneously represents a genetic resource to be conserved. The flagship concept broadened by a genetic dimension and including a use aspect may be a perspective to develop conservation measures and to use synergies through participation of local people.

Keywords: *Coffea arabica*, afro-montane forest, deforestation, in-situ conservation, flagship species

Descamps-Julien, Blandine; Gonzalez, Andrew

Biodiversity as insurance in spatially and temporally heterogeneous environments

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Contributed oral session 3, Biodiversity and ecosystem functioning I

Recent theory of metacommunity stability suggests that biodiversity provides spatial insurance for ecosystem functioning by virtue of spatial exchanges among local ecosystems in heterogeneous landscapes. Although this has important implications for conservation and management experimental tests are lacking. Here, using aquatic microcosms we investigate the spatial insurance hypothesis and the effect of varying dispersal rate upon community structure and function.

Experimental communities were assembled from a species pool consisting of six algal species made up of three functional groups (diatom, green and blue-green algae). Metacommunities were assigned to 9 dispersal treatments (from 0 to 50%). They were exposed to one of two temperature treatments: a constant temperature with a mean equivalent to the sinusoidal variation used in the fluctuating treatment. Densities and biomass were estimated twice a week over the 60 days of the experiment.

Dispersal generated more diverse communities both in constant and fluctuating environment, and affected the stability and the productivity of the metacommunity in a fluctuating environment. This insurance effect was greatest at intermediate dispersal rates that maximise both local and regional diversity. The community dynamics in the isolated communities differed markedly to those in the metacommunities. At high dispersal rates the metacommunity acted as a single large community and a single species dominated.

We have demonstrated the feasibility of the spatial insurance hypothesis. In particular diversity may have a strong insurance effect in spatially and temporally heterogeneous environments. The important role played by dispersal suggests that better understanding of spatial processes across ecosystems will be essential if we are to predict the effects of changes in land use on ecosystem functioning and services.

Keywords: dispersal, environmental fluctuations, metacommunity, phytoplankton, spatial heterogeneity

Dharma Rajan, Priyadarsanan; Allesh, Sinu

Impacts of stand simplification of village forests on the natural enemy guilds of paddy agro-ecosystems of Karnataka Western Ghats (India)

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Contributed oral session 18, Agriculture and biodiversity II

Complex habitats proximal to agro-ecosystems provide a diversity of niches for the development of the natural biocontrol agents and pollinators. In many parts of India there is a traditional practice of leaving uncultivated land adjacent to the farm fields. These 'village forests' enhance colonization of arthropods and act as a source natural enemies of agricultural pests.

Growing human population is under constant pressure to convert more and more

available land to satisfy his socio economic needs. In this spree these village forests are also being converted into farmlands or monoculture plantations or are simplified by replacing the natural vegetation with other economically important plants. A study was conducted to determine the impacts of stand level simplification of village forests on the pest-natural enemy guilds of paddy fields in Western Ghats region (India).

Four predominant land-use pattern of adjacent landscapes were identified at the a paddy agroecosystems of Sringeri Taluk (Karnataka) viz. village forests, Degraded Scrub, Acacia plantations and Arecanut plantations. Three sampling plots were marked in a linear transect: one in the adjacent landscape, the second in the paddy fields adjacent to the Corridor and the third 250 m away from the edge. Insects were sampled by a set up number pitfall traps and malaise traps.

Paddy fields in the proximity of village forests showed high abundance of major predators (i.e. ground beetles and ants) and parasitoids (Hymenoptera:

Chalcidoidea), compared to the paddy fields in the proximity of less diverse corridors like Acacia plantations and Areca gardens. Insect abundance as well as the species richness decreased as the distance in the paddy fields increased from the adjacent corridor.

Insect pests of rice paddy can be managed by enhancing the natural enemy populations through habitat management.

Keywords: stand simplification, village forest, agro-ecosystems, natural enemy, land use

Dorrough, Josh; Crosthwaite, Jim; Moll, Jim

Can agricultural intensification save native biodiversity?

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Contributed oral session 1, Agriculture and biodiversity I

Land use change associated with agriculture is a key threat to biodiversity. As such, land use strategies that attempt to meet conservation and production objectives have gained support. An approach argued to have merit is intensification within parts of the landscape to allow “land-saving” for conservation, although there are few empirical tests of this hypothesis. We address this issue in livestock grazing systems of southern Australia, where intensification is typically achieved via application of phosphate fertilisers.

We examined relationships between native vegetation and past and current management in southern Australia. We combined this with data on current production and potential for intensification using either fertilisers or changes in grazing management.

Our research demonstrates that fertilisers result in dramatic and long-term declines in native vegetation cover and diversity. Furthermore options for intensification, via fertiliser application, rarely coincide with those areas where biodiversity values are low. These areas are typically being managed close to optimal production. We demonstrate that at both the paddock and farm scale, increasing productivity via fertilisers will require intensification on more land and will come at a cost to biodiversity. In contrast, improving grazing management across broad scales is likely to result in both enhanced profitability and native vegetation outcomes.

Intensification to enable the setting aside of land for conservation requires that opportunities exist to increase productivity in areas where biodiversity values are low.

Furthermore, lost biodiversity must be compensated for by gains obtained by setting aside land. We argue that increasing agricultural production without biodiversity loss requires a low-input, extensive strategy.

Keywords: Australia, conservation, livestock grazing, economics, farm management

Duncan, David

The search for native pollination services in highly modified agricultural landscapes in Victoria, Australia

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Contributed oral session 13, Biodiversity and ecosystem services

Researchers in many parts of the world have demonstrated the ecosystem service of pollination by native insects and feral bees to native plants and crops. In Australia, however, there remains a large question mark regarding the importance of native bees in providing pollination services, both to horticulture and to maintenance of remnant vegetation. The Australian situation is unique. The native bee fauna is ancient, and dominated by solitary species. *Apis* was introduced with great success and feral colonies are now widespread. It is widely held that they contribute a great deal of pollination services both in agriculture and remnant vegetation. We explore the implications of this reliance on *Apis* for pollination services and ask if native bees may provide valuable service in the event of an anticipated honeybee decline.

We present the results of a comprehensive review of literature from ecology and horticulture to develop hypotheses regarding the resilience of pollinator systems in agricultural landscapes of Australia.

The horticultural literature has a distinct pro-*Apis* bias while the ecological literature reflects antipathy to this invasive species. Current data supports the view that feral honeybees are the dominant pollinator of many crop species in Australia, typically >80% of visitors. Native pollinators are commonly observed visiting flowers of economic species but are far fewer in number than *Apis*. Feral honeybees are also common visitors to flowers of many native plant species and in highly modified sites they often dominate.

The apparent reliance of horticulture and fragmented native plant populations on *Apis* is of great concern. We have yet to encounter threats such as *Varroa* that have decimated *Apis* elsewhere and are spread by feral swarms. The lack of data about the current and potential value of native bees for pollination services must also be addressed and ambitious new project to address this need is described

Keywords: pollination, agriculture, ecosystem services, risk management, remnant vegetation

Edwards, Erika

How the cactus lost its leaves: studies of character evolution can reveal the origins of biological diversity?

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Contributed oral session 9, Genetics

At one level, biodiversity is governed by the origin of traits that promote the diversification of a lineage. A prime example of a “key innovation” trait is the leafless,

stem- succulent cactus life-form, which may have allowed the initial occupation and the subsequent radiation of the cacti into the deserts of the New World. But how did this life-form evolve? The increasing resolution of phylogenetic hypotheses is changing how we study key innovations, as the repeated discovery of paraphyletic basal grades of taxa allow us to more closely examine the order of events leading up to a major radiation. In the case of the cactus life-form, we have used a combination of new phylogenetic and eco-physiological data to establish the series of events that culminated in the transfer of primary photosynthetic function from the leaves to the stems in this lineage.

Pereskia (Cactaceae), a traditionally recognized group of leafy trees and shrubs that generally lack most anatomical specializations found in the core cacti, actually comprise a paraphyletic grade of taxa at the base of the cacti. We measured several important eco-physiological parameters from 7 *Pereskia* species representing each of the main *Pereskia* clades, and analyzed these and several anatomical characters within this new phylogenetic framework.

Many aspects of the cactus ecological water use strategy were present very early in the evolutionary history of the cacti, certainly prior to the evolutionary loss of leaves and the development of stem photosynthesis. We interpret several conserved water-use traits as potentially important drivers of the anatomical evolution that eventually resulted in the successful radiation of the core cacti. We urge that more studies of this type include ecological and physiological traits in their analyses.

Keywords: Cactaceae, ecological trait, key innovation, adaptive evolution, character evolution

Elmqvist, Thomas; Pyykönen, Markku; Tengö, Maria

Large-scale dry forest regeneration in southern Madagascar: the role of social institutions

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Contributed oral session 16, Biodiversity conservation III

In Madagascar, deforestation rates have been estimated to be very high and primarily being a result of a rapidly growing population. Recent research has challenged both the dramatic deforestation rates and proposed a more complex set of drivers of land-cover change. Here we tested the hypotheses that population density and road density are the primary factors driving deforestation in dry forests in southern Madagascar.

We used two Landsat images from 1986 and 2000 respectively, and based on ecological and institutional field analyses we made a time-series analysis of changes in forest cover.

Our hypotheses were rejected; population density and road proximity did not correlate with forest cover change. An area of 19 400 ha had been degraded by 2000, but an area of 18 300 ha, not classified as forest in 1986, had spontaneously regenerated. The net result was a marginal decrease of 2% of total forest cover during the period 1986-2000. An analysis of institutions revealed that degradation of forests occurred in areas characterized by insecure property rights, while areas with well-defined property rights had either regenerating or stable forest cover. The large-scale regeneration appears to be a result of a combination of climatic changes, migration and decreased human population and livestock grazing pressure, but under conditions of well-defined property rights.

This study points to the importance of local, place-based studies with simultaneous analyses of local drivers and institutional characteristics for understanding land-cover change. Our study also emphasizes the large capacity of a semi-arid system to spontaneously regenerate given a window triggered by a changing climate and decreased grazing pressure, but where social institutions mitigate drivers of deforestation.

Keywords: tropical dry forest, drivers, social institutions, regeneration, property rights

Erb, Karl-Heinz; Haberl, Helmut; Plutzer, Christoph

New evidence on species-energy hypothesis supports the use of HANPP as indicator of socio-economic pressures on biodiversity

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Contributed oral session 4, Drivers of biodiversity changes

The identification of policy options to mitigate biodiversity loss requires a comprehensive understanding of the relation between socio-economic activities, their dynamics, and biodiversity change. Pressure indicators are useful tools with this regard because they systematically link socio-economic drivers with impacts on natural systems. Unfortunately, current state of scientific knowledge does not provide robust knowledge on determinants of biodiversity that would permit the development of such indicators. Therefore we focused our research on the interrelationships between species diversity and human impacts on ecosystem energetics. Starting point of our research is the species-energy hypothesis which claims that the availability of trophic energy in ecosystems is a key determinant of species diversity. The indicator “human appropriation of net primary production” (HANPP) assesses changes in the availability of trophic energy in ecosystems due to human activities; it assesses the degree to which land use (land-use induced changes in land cover, land-use practices and harvest) alters the availability of energy in ecosystems each year. Assessing HANPP seems effective because it is an aggregate indicator which can be unambiguously attributed to specific societal activities and is directly related to the species energy hypothesis. We present results from two studies: (1) regressions between HANPP components and the species richness of seven taxa (vascular plants, bryophytes, orthopterans, gastropods, spiders, ants, and ground beetles) on a transect of 38 study plots (600x600m) in East Austria. (2) Correlations between bird species richness and HANPP on Austria’s total area (83.000 km²) on four spatial scales from 0.25x0.25 to 16x16 km. Results strongly support the species energy hypothesis and underline the potential usefulness of HANPP as a pressure indicator. In the second case study, HANPP components worked even better than land-cover heterogeneity indicators.

Keywords: pressure indicators, land use, socio-economic drivers of biodiversity change, HANPP, species-energy hypothesis

Espinosa-Garcia, Francisco; Vibrans, Heike; Villaseñor, Jose Luis

Biotic resistance to exotic species: correlations between native and exotic weed species richness in small plots of maize

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Contributed oral session 18, Agriculture and biodiversity II

The biotic resistance hypothesis postulates that species-rich communities resist alien species invasions better than species-poor communities, thus predicting a negative relationship between native and exotic species richness. Negative correlations have been found mainly in small plots and positive at large scales. High native species richness is thought to reflect high niche heterogeneity and therefore, high niche availability also for exotic species, leading to positive correlations. We examine the correlation of native and exotic weed species richness in small plots.

We analyzed 40m² transects of 379 maize fields in the Mexican states of Puebla and Tlaxcala. The data included number of native and exotic weed species, and edaphic, climatic and geographic position variables.

We obtained a positive partial correlation ($r = 0.39$, $p < 0.00001$) between native and exotic species in a multiple regression model (MRM) with the number of exotic species per plot as dependent variable. The resulting MRM is robust ($R^2 = .361$ Adjusted $R^2 = .339$; $p < 0.00001$) but explained less variability in richness (23%) than the model for exotic species. The variables that contributed significantly to the native weed species model were soil pH and texture, longitude, altitude, and precipitation. This positive correlation between native and exotic weed species richness obtained from small scale plots agrees with the correlations obtained in large scale studies, suggesting that the niche availability hypothesis may work in a wide range of scales.

Keywords: biotic resistance, invasive plants, native weeds, exotic weeds, niche availability hypothesis

Fernandez, Miguel; Reichle, Steffen; Fisher, Brian; Hamilton, Healy
Integrating Natural History Museum **collection data and predictive distribution models to understand diversity patterns in two megadiverse countries: Madagascar and Bolivia**

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Contributed oral session 21, Systematics

Practical methods to rapidly assess biodiversity patterns at appropriate spatial scales in tropical regions are urgently needed to support conservation planning. With access to high resolution environmental spatial data, predictive distribution modelling is a promising new approach. By integrating geographic and biological data, critical information for evaluating biodiversity conservation potential at the landscape level is quickly produced. Natural history museum collections represent an underutilized resource of biodiversity data. Georeferenced museum data can be integrated with layers of environmental information to produce predictive species distributions models, to identify unrecognized regions of endemism, and to generate multitaxon biogeographic analyses.

We integrate biological collection localities with environmental and geospatial data in a GIS to examine the biodiversity distribution patterns of two megadiverse countries: Madagascar and Bolivia. We demonstrate the utility of this approach using the Leptodactylid frogs and Formicid ants. We obtained biodiversity data from multiple sources, including systematic collections, GBIF, and HerpNet, integrated with remotely sensed and environmental data layers. We used two different mathematical algorithms, GARP and BIOCLIM, to extrapolate species niches based on altitude, temperature and precipitation, to produce predictive models of species distributions. In Bolivia, distribution modelling identified outlier populations in some Leptodactylid

species complexes, indicating groups requiring further taxonomic attention. In Madagascar, predictive distribution models of formicid ants suggest regions of potential conservation priority. Modelling invertebrate species distributions provides finer scale geographic resolution than the more commonly applied analyses of vertebrate taxa. This work demonstrates the utility of this integrative approach to conservation.

Keywords: niche modelling, predictive distributions, biodiversity patterns, conservation biogeography, integrated spatial analysis

Ferrer-Paris, José Rafael

About the usefulness of natural history collections for biodiversity inventories: Predicting plant species richness in the Neotropics

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Contributed oral session 21, Systematics

Natural history collections (NHC) are the main source for data on species distribution and species richness. However, records from NHC are unevenly distributed in space and, therefore, are seldom used in conservation planning. In the case study presented here, I use generalised linear models and geostatistics to overcome this geographical bias and make predictions about species richness patterns in the Neotropical region.

I downloaded more than 600,000 georeferenced herbarium's records from a free-access database and generated raster maps of record density and number of species counted. Then I applied kriging based on a Poisson model to obtain unbiased estimates of species richness. I first generated a map of plant species richness for the whole Neotropical Region. Then I selected three countries within the region and generated individual species richness maps for each of the 10 most important families.

At a continental scale, the results confirm the existence of areas of high species richness in Panamá, Costa Rica, West Colombia, Northern Ecuador, the Guyana Shield and the Peruvian Amazon. Due to lack of data, the existence of such an area cannot be confirmed for the Atlantic forest of Brazil. At a national scale, the location of predicted areas of high species richness differs between families within each country. The results obtained are validated using results of coarser predictions based on expert knowledge and literature reviews.

With this case study, I demonstrate that model-based geostatistics can be used to overcome some of the main problems of an uneven distribution of records. Furthermore, the presented approach allows a comparison of the results between the areas and to calculate significant differences among the families of interest. Hence, it enhances the value of NHC records as a data source for biodiversity surveys and makes possible its use in conservation planning.

Keywords: geographical bias, species richness, biodiversity informatics, prediction uncertainty, spatial statistics

Figueroa, Fernanda; Sánchez-Cordero, Víctor

Mexican Biosphere Reserves efficacy to prevent changes in land use

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Contributed oral session 7, Biodiversity conservation II

Conservation of biodiversity requires the systematic evaluation of natural protected areas. The goal of this study is to evaluate Mexican Biosphere Reserves (MBR) efficacy to prevent changes in land use.

We evaluated the efficacy of MBR by comparing annual rates of change in land use between each reserve, a buffer zone of similar size surrounding it, and the Mexican state of location. We selected a total of 14 MBR (out of 31) decreed before 1995, that did not include sea and islands. Using the 2003 Natural Protected Areas Map for Mexico, we constructed a buffer zone for each MBR, as a ring of land of equal size surrounding it. We calculated the total surface of transformed areas (i.e. agriculture, induced and cultivated pastures, human settlements, forestry plantations) and their change rates for each reserve, buffer zone and Mexican state, using land use and vegetation maps from 1976, 1993 and 2000. We constructed an efficacy index as the sum of two parameters: the comparison of land use change rates between (a) the reserve and its buffer zone, and (b) the reserve and its state of location. MBR with lower change rates than their respective buffers and states were regarded as effective.

Ten MBR were effective, and four (La Michilía, La Sepultura, Pantanos de Centla and Sierra de Manantlán) non effective. Preliminary results showed that reserve size have an influence in efficacy, whereas geographic location, vegetation type and date of decree have not. Other factors –presumably socioeconomic- may have a larger influence in MBR efficacy.

This is the first study to address systematically how effective are MBR to conserve biodiversity, based on rates of change of untransformed to transformed areas.

Further analyses will involve a larger set on natural protected areas countrywide.

Keywords: Biosphere Reserves, land use change, conservation, efficacy, Mexico

Fischer, Markus; Maurer, Katrin; Stöcklin, Jürg; Weyand, Anne

Drivers of grassland biodiversity in the Alps

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Contributed oral session 11, Drivers of mountain biodiversity

Alpine grasslands are ecosystems with very high plant diversity. Little is known about other levels of biodiversity, including plant parasite diversity, and phenotypic and molecular intraspecific diversity. It is not clear whether conservation of biodiversity at some levels would compromise the conservation of others, and whether conservation of parasites would conflict with agricultural goals. To address these questions, we studied several intra- and interspecific levels of biodiversity, their interrelations, and their relations to standing plant crop, elevation, and land use for >200 grasslands across the Swiss Alps.

We took vegetation records in >200 grasslands, recorded damage by different categories of herbivores and fungal pathogens for >12000 leaves, and studied molecular and phenotypic diversity of an important grass. The grasslands represented different ancient cultural traditions, different current land uses, and elevations between 1000 and 2500 m.

Across regions, plant species diversity increased with land use diversity. Moreover, plant species diversity was higher in unfertilized mown grasslands, than in fertilized or grazed ones. Herbivore diversity was highest for mown grasslands, especially at

lower elevation. Genetic diversity of an important grass was higher in grazed grasslands. Herbivore diversity was highest on legumes, pathogen diversity on grasses. Together, herbivores and fungal pathogens affected only 4 % of leaf area. Diversity of herbivory was positively related to, and pathogen diversity was unrelated to plant species diversity.

Grassland biodiversity in the Alps is best conserved by diverse land use with a high proportion of unfertilised mown and grazed grassland. Conservation of biodiversity at several levels does not severely conflict with each other, and conservation of biological interactions of plants does hardly compromise agricultural goals.

Keywords: plant species diversity, parasite diversity, intraspecific diversity, conservation conflicts, land use

Flombaum, Pedro; Sala, Osvaldo E.

Biodiversity and productivity: evidence from a removal experiment in Patagonia, Argentina

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Contributed oral session 5, Biodiversity and ecosystem functioning II

We know that biodiversity would be drastically reduced in the following years, but we are uncertain about the effects of losing these species on ecosystem functioning. We tested the biodiversity-productivity hypothesis that states that increasing species richness results in increasing ecosystem functioning. We created a richness gradient by removing species in Patagonia. The Patagonian steppe is an ideal model ecosystem because of the low natural diversity with 6 dominant species that account for 96% of aboveground net primary production (ANPP). In 84 plots that initially all contained the 6 dominant species, we removed target individuals and left 1, 2, 4 and 6 species with all possible assemblages replicated. We ensured at the starting point, that all plots had the same vegetation cover but different species number by removing portions of each individual.

We found that ANPP and biodiversity effect increased linearly with species diversity ($R^2=0.49$; p

The slope of the biodiversity-productivity relationship in our experiment was much steeper than previously reported. Previous experiments used artificial ecosystems, which started from seeds, and consequently had short period of time to develop positive interactions among individuals. Our removal approach used individuals that had been established in the same location for long periods of time, and therefore had a chance to develop positive interactions. Our results indicate that the biodiversity effect in natural ecosystems may be stronger than previously thought based on studies with artificial ecosystems.

Keywords: Species richness, aboveground primary production, Net biodiversity effect, Patagonian steppe, Natural ecosystem

Fontaine, Colin; Dajoz, Isabelle; Loreau, Michel; Meriguet, Jacques

Functional diversity of plant-pollinator communities enhances ecosystem sustainability

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Contributed oral session 13, Biodiversity and ecosystem services

Animal-mediated pollination is one of the essential ecosystem services provided to humankind. The negative impact of pollinator decline on the reproductive success of flowering plants has been studied at the species level but little information is available at the community level. Increasing the study scale to the community level is primordial to take into account potential competitive or facilitative effects among species that belong to the plant-pollinator web. Such effects which are linked to diversity, are known to have huge influences on ecological processes such as productivity or stability. A better understanding of the diversity effects on plant-pollinator communities is thus critical for ecosystem sustainability

We defined functional groups of plants and pollinators based on morphological traits. For plants, 2 functional groups were defined according to accessibility of floral rewards (open or tubular flowers). For pollinators, 2 functional groups were defined according to mouthpart length.

In a meadow, we set up 36 caged experimental plant communities belonging to 3 plant treatments: 2 of them contained one of the 2 plant groups alone and the third contained both together. We performed 3 pollination regimes on each plant treatment, by introducing each pollinator group alone, or both groups together. Our results show that increasing the functional diversity of both plants and pollinators leads to a higher plant reproductive success and a better natural recruitment. Moreover, the positive effect of functional diversity is explained by a complementarity between groups.

Since most of natural plant communities contain both open and tubular flowers, pollinator diversity should enhance the persistence of these communities.

The diversity of plant-pollinator communities is critical for the sustainability and functioning of ecosystems, and should be carefully monitored and protected.

Keywords: mutualism, interaction web, pollination, ecosystem services, functional diversity

Friedl, Birgit; Behrens, Doris; Getzner, Michael

Managing a nature reserve by using the two-edged effect of tourism

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Contributed oral session 15, Economics of biodiversity

Protected Areas (PA) have to contribute to biodiversity preservation and to public values derived from nature (e.g. recreation and education, and non-use values such as existence, bequest and option values). Only if society approves to public expenditures on conservation, an ecologically valuable ecosystem will be preserved for economic reasons. Which measures are most suitable when visitors respond to the state of the protected area, and how is the state of the PA influenced by visitors? This paper compares, from the viewpoint of managing a protected area, the dynamic cost effectiveness of different PA management activities, e.g. visitor steering or habitat protection.

The ecological system is described by a predator prey system, augmented by the intertemporal influence of human activities, i.e. damage by visitors to the PA and conservation measures. The conservation budget is endogenously determined by the overall willingness to pay for biodiversity conservation (as stated by society) and depends on the state of the ecosystem and the number of visitors, acknowledging that visitors are more likely to contribute to conservation than non-visitors. The investigation focuses therefore on the two-edged effect of visitors (stimulating

donations to the conservation budget and on the other hand harming the ecosystem). By means of e.g. static comparative analysis we determine the effectiveness of different static conservation activities for a finite planning horizon. The implications of the endogenous budget and its allocation towards endangered species or their habitat are discussed and underlined by two case studies, for the ibex and the rock partridge populations in the Austrian Alps.

The paper shows that conservation measures should be evaluated not only from an ecological viewpoint but from a broader perspective, taking account of reactions by visitors and of public valuation of protected areas.

Keywords: predator-prey systems, charismatic species, tourism, conservation, economic valuation

Fukushima, Michio; Kameyama, Satoshi
effects of dams on freshwater fish diversity and distribution in Hokkaido, Japan

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Contributed oral session 14, Monitoring biodiversity changes I

Dams pose serious threats to biodiversity by fragmenting streams and rivers and acting as barriers to passage between isolated habitats. In Japan, there are ~2700 large dams (>15 m) and ~55 000 smaller ones. The goal of this study is to assess quantitatively the effects of dams on the species richness, individual species occurrence, and distributions of freshwater fishes in Hokkaido (78 461 km²), the northernmost island of Japan.

A series of predictive models were fitted to fish data collected over the last 50 years during 6674 fish surveys conducted throughout Hokkaido. A nationwide map of watershed fragmentation by damming was created using the geographical information system (GIS). With the fish data superimposed on the map, we could determine whether each survey was conducted under the influence of dams simply by comparing years of dam construction and habitat fragmentation, which became the key predictor variable for the models.

Fish species richness was significantly influenced by dams after the effects of other environmental factors were accounted for. The predicted loss of species richness increased with decreasing altitude, reaching a maximum of nine species at river mouths. Areas throughout Hokkaido where fish species richness had potentially decreased were predicted and mapped using GIS; the loss of species richness was predicted to be on average 13%. We also found that the occurrence probability of four migratory fish species was significantly and adversely affected by the dams. Predictive models fitted to the freshwater fish data collected at broader spatial and temporal scales than previous studies revealed that dams have decreased aquatic biodiversity in a boreal ecosystem. Current fish distributions are therefore most likely under the strong influence of dams, especially in areas where migratory species dominate.

Keywords: dams, freshwater fishes, habitat fragmentation, predictive models, GIS

Gabriel, Doreen; Roschewitz, Indra; Thies, Carsten; Tschardtke, Teja
Plant communities in organic and conventional agriculture – the relative

importance of beta diversity across different spatial scales

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Contributed oral session 18, Agriculture and biodiversity II

Most biodiversity studies comparing organic and conventional farming have focused on a single spatial scale – the field, but diversity patterns vary across spatial scales.

Materials and methods We examined the effects of farming system (organic vs. conventional) and position in the field (edge vs. centre) on plant species richness in wheat fields at three spatial scales. We quantified α -, β -, and γ -diversity at the micro scale in 800 plots, at the meso scale in 40 fields, and at the macro scale in three regions using the additive partitioning approach. Furthermore, we evaluated the relative contribution of β -diversity at each spatial scale to total observed species richness according to the farming system and the position in the field.

α -, β -, and γ -diversity was higher in organic than conventional fields and higher at the field edge than in the field centre at all spatial scales. β -diversity at the meso and macro scale explained most of overall species richness, indicating considerable differences in community composition among fields and regions due to environmental heterogeneity. Total richness of rare species (present in less than 5% of total samples) was mainly explained by β -diversity at the meso and macro scale, but only in organic fields. Total richness of common species (present in more than 25% of total samples) was explained by β -diversity at the micro and meso scale independent of farming system.

Our results support the idea that organic farming and a high density of field edges in agricultural landscapes enhance plant diversity in arable fields. The great importance of differences in community composition among fields and regions for overall biodiversity emphasises the need to expand the perspective of conservation management, especially in arable ecosystems, from the classical local field scale to regional settings.

Keywords: additive partitioning, arable weeds, diversity, organic farming, spatial scale

Gaidet, Nicolas; Le Bel, Sébastien; Le Doze, Solène; Mapuvire, George Wildlife conservation in non-protected lands: spatial configuration for a sustainable coexistence of people and wildlife in African savannas

CIRAD EMVT, France, nicolas.gaidet@cirad.fr

Contributed oral session 2, Biodiversity conservation I

From the area they cover and their role in the connectivity of the ecological network, non-protected lands are of prime concern for wildlife conservation policies. In this type of land, people and wildlife coexist within a landscape mosaic of natural and transformed areas. However, in many tropical contexts, rural areas experience a rapid and massive transformation of the wildlife habitat into crop land. The sustainable management and conservation of these areas require to be built on the understanding of the relationship between wildlife and human abundance, and of the resilience process of animal populations to the expansion of agriculture encroachment.

We here report on a study case of a communal land of Zimbabwe. Following the eradication of tsetse fly, this area experienced a rapid expansion of human settlement and cultivation (2 to 20% over the last 20 years). We set up a GIS database integrating information on land use, human demography, and wildlife

abundance, to explore the land transformation process.

Our results illustrate the temporal and spatial relationships between human density and the proportion of land transformed. We found a threshold level in the human occupation gradient for the economic profitability of wildlife exploitation. We however underline the impact of some specific spatial arrangement of human settlement in the landscape mosaic. We found that large (> 1000 km²) but isolated natural areas can have a low level of wildlife abundance compare to neighbouring areas.

Our study confirms that the relationship between the abundance of wildlife and human populations is a matter of both numeric balance and spatial organisation.

Given the current dynamic of land clearing in most tropical areas, such results suggest that rural planners and conservation agencies should paid a particular attention to the spatial configuration of human settlement expansion.

Keywords: man-wildlife coexistence, non-protected lands, agriculture, ungulates, afrfrican savannas

Galetti, Mauro

Avian extinction and introduced mesopredators in a land-bridge island in the Atlantic forest of Brazil

UNESP, Brasil

Islands can serve as model systems for understanding how biological invasions affect native species. Here we show the impact of the introduction of mesopredator mammals at Anchieta Island, a 828 ha land-bridge island in south-east Brazil. We estimated the density of mammals through 213 km of line transect census. Anchieta Island has the highest density of mammals of the whole Atlantic forest (480.21 ind/km²), especially nest predators (204.91 ind/km²) and herbivores (231.83 ind/km²). The introduction of mammals affected directly the bird's community, nowadays represented by 88 species, being only 67 forest-dwelling species comprised mainly by water-crossing species. Atlantic forests with similar size of Anchieta Island would hold about 168 species. A small part of these remnant bird species nests at tree's holes or at the forest ground. Large frugivores, such as toucans, guans and trogons do not occur in the island and several guilds became extinct or are severely impoverished. The only bird guild that increased in proportion at Anchieta was "insectivorous from edge". Experiments on nest predation showed that about 72% of all nest on the ground are preyed upon by mammals or reptiles. The restoration of vegetation and the bird community is constrained by the high density of mesopredators.

Keywords: Island, Genetic contamnation, nest predation, herbivory, Atlantic forest

Gallet, Romain

Impact of the interaction of predation and disturbance on prey species diversity

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Contributed oral session 5, Biodiversity and ecosystem functioning II

Several factors like predation, nutrient richness, spatial heterogeneity or disturbance regimes have already been identified as influencing species diversity. However, the interactions between these factors remain mostly unknown. Predation has been

shown to interact with nutrient richness and with spatial heterogeneity but to our knowledge no experimental study has focused on the impact of the interaction between predation and disturbance on prey diversity in a long term. We empirically investigated how these factors influence *P. fluorescens* diversity by manipulating both predation (presence or absence of *Bdellovibrio bacteriovorus*) and disturbance parameters (frequency and intensity).

Populations were grown in a poor homogenous medium, and were diluted every 2, 3 or 4 days, by a 100 or a 1000-fold into fresh medium. This protocol was performed during 40 to 80 days (150 – 250 generations) in order to observe evolutionary dynamics of diversity.

Prey diversity was observed only in presence of predators. Three different strategies of resistance (*r*, *K* and refuge strategies) were used by the prey, but only two (*r*, *K*) were selected at the end of the experiment. Different diversity dynamics were obtained under the six transfer regimes. The more cultures were disturbed, the lower was diversity. Maintenance of sympatric diversity was observed under only one of the six disturbance regimes. Different strategies of resistance were selected under different disturbance regimes.

We showed that in a poor medium, predation is essential to the apparition of prey species diversity. However, in most treatments this diversity was transitory, showing that the effect of predation on diversity is strongly influenced by disturbance patterns. Because different strategies of resistance were selected under specific disturbance regimes we concluded that predation and disturbance interact through apparent competition.

Keywords: predation, disturbance, diversity, apparent competition, *Bdellovibrio bacteriovorus*

García-Barrios, Luis

Crop species richness and composition affect productivity and resistance to drought in agroecosystems - experimental evidence.

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Contributed oral session 1, Agriculture and biodiversity I

Plant diversity is being lost in tropical agroecosystems under current constraints on peasant agriculture. We are challenged to better understand under what ecological conditions polycultures actually out-perform monocrops in terms of sustainability attributes (e.g. productivity, resistance to unfavourable conditions and resilience). Recently, plant ecologists have explored how plant species richness and composition relate to productivity and stability in multi-species natural plant communities. At ECOSUR, we are extending these studies to agroecosystem research.

A set of split-plot experiments with five replicates were established in the greenhouse to explore species richness and composition effects on crop productivity and on the stability of overyielding in the face of reduced soil moisture. A total of 160 small-scale plots comprised two levels of watering, 8 monospecific stands of small-sized annual crops (with a four-fold size range), and 8 substitutive multispecies stands comprising all possible seven-species combinations of such crops. The 8 polycultures were ranked by composition, from the “heaviest-weight ensemble” (with the smallest species missing) to the “lightest- weight ensemble” (with the largest species missing). Species and stand biomass were measured at harvest and compared a) among

mono and poly-specific stands, b) among the latter, and c) among moist and dry soil treatments. Over-yielding was dissected into complementarity and selection effects, following Loreau and Hector 2001.

Results: a) The sum of polycultures was more productive than the corresponding sum of monocrops only in moist soil. b) Heavier ensembles were more productive but less drought resistant than lighter ensembles c) Higher over-yielding in the heavier Conclusion Productivity and resistance were clearly sensitive to species richness and composition.

Keywords: Agrodiversity, productivity, stability, experiment, Chiapas

Garvin, Theresa

Evaluating Payments for Environmental Services in Costa Rica

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Contributed oral session 15, Economics of biodiversity

Between 1950 and the late 1980s Costa Rica experienced one of the highest deforestation rates in the world. This deforestation rate was first concentrated in the Guanacaste Peninsula, a tropical dry forest region in the northwest portion of the country. By the end of the 1980s, about 77% of Guanacaste's forest was logged and the remaining forest cover was highly fragmented. To address this extensive land cover change process, in the 1970s the Costa Rican government implemented a nationwide initiative to protect the remaining forest cover through the creation of a network of national parks, biological reserves, and through the development and implementation of a comprehensive forestry law. These initial conservation initiatives were later revised to include changes to the forestry law, the development of new institutions to support the law, and – most importantly – the creation of the Costa Rica Ministry of the Environment (MINAE) and the Costa Rica National Forest Financing Fund (FONAFIFO), who, among other programs, began to pay farmers to allow forest regeneration. These payments for environmental services are suggested to be one of the main reasons for the high levels of forest regrowth in the Guanacaste region over the past decade. In this work we re-evaluate the effectiveness of these policies based on fieldwork conducted using standardized interviews with policymakers and cattle ranchers in the Guanacaste region. In general, respondents indicated the governmental payments have had little to do with day-to-day decisions to clear or regenerate forests. Rather, the world market for beef, governmental financing structures, and micro-environmental effects (such as ensuring good water quality) were the primary influences. This left the question: how effective are payments for environmental services in the Guanacaste region of Costa Rica?

Keywords: Conservation Policy, Deforestation, Lay knowledge, Payments for Environmental Services, Costa Rica

Gibbons, David Wingfield; Gregory, Richard; Meyling, Adriaan W. Gmelig; Noble, David; van Strien, Arco; Vorisek, Petr; Foppen, Ruud

Developing indicators for European birds

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Contributed oral session 19, Monitoring biodiversity changes II

While the 2010 target, to deliver a significant reduction in the current rate of biodiversity loss, is gaining political credence, we lack systems to measure progress towards it. Much recent work has focussed on developing indicators to help such measurements. Here we have developed a range of simple indicators, using population trends of UK and European breeding birds. We have developed statistical methods to allow us to calculate national (UK) and supranational (near pan-European), multi species indices using data from national annual breeding bird surveys.

Skilled volunteers undertook field surveys following methods standardised within each country, even though methods sometimes differed between countries. For UK, population trend indices were calculated for each species, and a multi-species indicator produced by averaging (geometric mean) these indices. To produce a pan-European indicator, we first calculated indices for each species in each country, then produced a pan-European index for each species by combining national indices, weighted by national population sizes. Finally, a pan-European multi-species indicator was generated by averaging the pan-European indices for each species. These indicators show that birds of farmland in both UK and Europe declined substantially in recent decades. Importantly, they show how a large amount of information on European bird trends can be summarised into statistically robust, policy relevant indicators.

The methods adopted here could be used to generate indicators elsewhere and for other taxa. The UK Government has adopted the UK indicator as one of its 15 headline 'quality of life' indicators, and has set itself a binding target, based on the indicator, to improve the fortunes of farmland birds. The European indicator has been adopted as a European Union structural indicator.

Keywords: 2010 target, Indicators, European birds, Population trends, Farmland

Glenk, Klaus; Barkmann, Jan; Marggraf, Rainer

Locally perceived values of biological diversity in Central Sulawesi (Indonesia): results from a choice experiment approach

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Contributed oral session 15, Economics of biodiversity

Central Sulawesi is part of the Wallacea biodiversity hotspot. Because of their exceptional contribution to global biodiversity, conservation of local rainforests is an important case of the application of the requirement to CBD Ecosystem Approach to account for the economic context of conservation.

A choice experiment study was conducted to assess locally perceived values of biodiversity around Lore Lindu National Park. We assessed biodiversity in different categories of the Total Economic Value approach: (1) population sizes of the protected, endemic dwarf buffalo *Bubalus depressicornis* ("anoa"), (2) availability of rattan (*Calamus* spp.), (3) preponderance of cocoa plantations differing along a shade tree gradient, (4) availability of irrigation water for wet rice. A cost attribute was split-sampled (tax rise/donation to village fund). For rattan and water availability, we use an ecosystem services approach to translate biodiversity/ecosystem structures and functions into benefits relevant to respondents.

Economic preferences were calculated by LIMDEP's MNL procedure. All coefficients of the attributes were significant.

We documented a positive WTP for improved ecosystem services (water, rattan),

and claim that the ecosystem services approach contributed essentially to this result. For cocoa shade, we explain the negative sign with the lack of a convincing separation of the advantages of more shade for cocoa harvest (ecosystem service) from the financial benefits often obtained from “full-sun” cocoa plantations. Surprisingly, even for maintaining viable population sizes of anoa only having minimal direct use value, there is a WTP.

Keywords: Ecosystem services, Environmental valuation, Choice Experiment, Rainforest, Indonesia

Gordon, Ascelin; Bekessy, Sarah; Dorrough, Josh; McCarthy, Michael; Wintle, Brendan

Biodiversity viability assessment in the urban fringe of Melbourne

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Contributed oral session 10, Biodiversity and urbanization

Accelerating urbanisation in Australia is considered one of the greatest threats to biodiversity. There is potential to use ecological knowledge and conservation planning tools to develop a strategic approach to retaining biodiversity in urban environments. Conservation planning aims to address the issues of representativeness and persistence. This study focuses on the progress towards quantifying the persistence of communities of species, with the goal of assessing different scenarios of urban development in terms of the persistence of the biodiversity in the region.

Current approaches to quantifying the probability of persistence for multiple species are reviewed and evaluated for case study areas in the Northern edges of Melbourne, where significant urban development is planned. The approaches examined include: aggregating single species assessments using population viability analysis and concepts such as focal or indicator species; threshold responses of habitat area and fragmentation; the metapopulation capacity of fragmented landscapes; and surrogate methods such as habitat availability.

A framework is developed that can best deal with the uncertainties inherent in the data requirements of each approach. A set of minimum requirements necessary for communities to persist is developed. An important result of this study is that the framework must incorporate methods that can explicitly deal with social and economic trade offs in land-use allocation, if it is to be effective.

This study presents an integrated approach to quantify the persistence of communities of species under different urban development scenarios. Methods for incorporating land use trade-offs are explored. These results feed into an umbrella project "Re-imagining the Australian Suburb" which examines key elements of sustainability in urban development.

Keywords: population viability, multiple species, urban fringe, land-use trade offs, conservation planning

Guevara, Roger; Moreno, Claudia E.; Sánchez-Rojas, Gerardo; Téllez, Dianeis

Pine-oak forest management and the diversity of leaf litter fauna

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Session 11, Drivers of mountain biodiversity

We assessed the impact of forest management on the diversity of leaf litter fauna (LLF) in a pine-oak forest in Hidalgo, Mexico. The management strategy is that of selective logging of non-desired trees leaving vigorous trees for in-site reproduction. We used a managed site and a non-managed site to compare the abundance, richness, evenness and diversity of the LLF. Also, we analyzed the influence of litter attributes on the LLF that was collected with three methods: direct search, Winkler funnels and pitfall traps. Abundance was higher in the rainy season than in the dry season but some collembolans and spiders were more abundant in the dry season than in the wet season. Pitfall traps were the more effective sampling method followed by Winkler funnels and direct search. For that fraction of LLF recorded with the direct search method there were significant differences in species richness between sites as was shown by species accumulation curves with 95% confidence intervals. Also, with the direct search method and Winkler funnels we gathered a more diverse LLF in the managed-site than in the conserved site whereas with pitfall traps the diversity of LLF was similar in both sites. Using tree models we observed that litter composition and soil moisture content had a larger effect on the abundance and richness of LLF than that of seasonality and management, except for that fraction of LLF in pitfall traps. Some taxa seem to be do well under management (collembolans (Sminthuridae), ants, centipeds (Geophilomorpha) and pseudoscorpions) whereas others are affected by management (wasps Ichneumonidae and Eurytomidae), crickets (Gryllacrididae) and Opilions). These results seem to indicate that forest management has a positive effect on LLF. However, an in-depth examination reveals that the observed increments in diversity are mainly caused by the reduction of a dominant group (Oligochaeta) under management and not due to an overall positive effect on the community.

Keywords: forest management, soil fauna, sustainable practices, supraspecific richness, Mexico

Gurvich, Diego E.; Díaz, Sandra; Pérez Harguindeguy, Natalia; Urcelay, Carlos
Does functional redundancy exist in terrestrial plant communities? Results from a removal experiment in central Argentina

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Contributed oral session 3, Biodiversity and ecosystem functioning I

According to the hypotheses of functional redundancy and compensation, diversity provides an insurance against local species extinctions. We tested this hypothesis in a mountain shrubland ecosystem in central Argentina. We removed either the dominant species of dominant plant functional type (PFT) or the whole PFT. We predicted that when removing the dominant species, subordinate species of the same PFT should compensate for this loss. The removal of whole PFTs, should not lead to functional compensation, because different PFTs should have different effects on ecosystem processes. The experiment consisted in: a) 4 removal treatments where whole PFTs were removed (deciduous shrubs, graminoids, perennial, and annual forbs), 2) 4 treatments where the dominant species of each PFT were removed (*Acacia caven*, *Stipa eriostachya*, *Hyptis mutabilis* y *Bidens pilosa*, respectively), and 3) an intact control and a disturbed control. We measured the number and abundance of each species and: Leaf Area Index, soil available ammonium, nitrate and phosphate, decomposition of standard materials and litter mixtures, and soil

temperature. After 3 years from the beginning of the experiment we found evidences of compensation in abundance. Only when Acacia and Stipa were removed, species of the corresponding PFTs increased their abundance, suggesting abundance compensation. However, there was no sign of abundance compensation in the case of perennial or annual forbs. Although the removal treatments affected the indicators of ecosystem processes (soil temperature increased when the deciduous shrubs or Acacia were removed, and soil nitrate decreased when the deciduous shrubs, Acacia or the perennial forbs were removed), we did not find evidence of functional compensation. Our 3-year results challenge the relevance of the redundancy and functional compensation hypotheses in ecosystems dominated by terrestrial vascular plants.

Keywords: plant functional types, ecosystem functioning, ecosystem redundancy, functional diversity, Argentina

Hahn-Hadjali, Karen; Agbani, Pierre; Agonyissa, Didier; König, Konstantin; Schmidt, Marco; Wieckhorst, Annika

Assessment and evaluation of phytodiversity patterns and their dynamics in Northern Benin (West Africa) in regard to conservation and sustainable use

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Contributed oral session 14, Monitoring biodiversity changes I

In many West African regions knowledge about phytodiversity is very limited. Even in long-term protected areas no detailed knowledge about vegetation composition and their dynamics exist. However, these data are crucial for improving conservation measures and sustainable use as well as for evaluating phytodiversity changes under increasing human impact and climatic variability.

In this regard spatial and temporal phytodiversity patterns of protected and used areas are documented and analysed on different scales by an interdisciplinary approach. Botanical field data are combined with satellite data to provide vegetation and land use maps. In a second step species distributions are modelled using the GARP system, high resolution satellite images and georeferenced species occurrence points. On this basis species distribution patterns are analysed and evaluated using measures of human impact. For a deeper insight in changes of species composition and diversity, interviews with local communities are carried out, focussing also on the consequences of diversity decline for the local population as an important starting point for developing local approaches of sustainable use.

Additional ethnobotanical data on the utilization and use value of plant species serve to compile priority lists of decreasing, socio-economically interesting species. These data are combined with the results of the modelling approach for analysing species distribution patterns with regard to valuating phytodiversity resources of protected areas. This approach combining remote sensing and botanical data with the local perception enables a more detailed assessment of phytodiversity dynamics as well as the evaluation of changes in regard to needs of the local population.

Recommendations for protection measures can be derived.

The investigations are part of the BIOTA research network on biodiversity, sustainable use and conservation in Africa.

Keywords: Phytodiversity assessment, species distribution models, remote sensing, ethnobotany, West Africa

Hawkins, Stephen John; Jenkins, Stuart; Thompson, Richard; Masterson, Patricia; Burrows, Michael

Does habitat patch biodiversity matter more than species diversity in the functioning of most marine ecosystems?

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Contributed oral session 3, Biodiversity and ecosystem functioning I

Concern with species extinction has focussed scientific attention on the consequences of loss of species for ecosystems functioning. This has prompted much research showing how the number of species affects ecological processes. Most experiments have been in terrestrial grassland systems where communities of different diversities have been synthetically assembled and accumulation of biomass used as a surrogate for productivity. Experimental plots represent largely unconnected habitat patches linked only by the water table.

Experiments in marine ecosystems have emphasised identity or qualitative effects i.e. individual species matter more than the quantity of species. Most marine and coastal systems are strongly connected by water movement enabling exchange of matter and propagules over various spatial scales. Concentrating on benthic habitats in shelf and coastal ecosystems we examine the evidence for the relative importance of species diversity versus habitat patch (biotope diversity) in ecosystem functioning. Some tests are proposed to explore a new approach where the level of biodiversity can be manipulated at the same scale as ecosystem processes. A simple model for a two-phase mosaic is proposed and tested with published data from intertidal systems. In marine systems only local species extinctions have been recorded, caused by habitat loss, over harvesting or point source pollution. The need for monitoring "seascape" diversity is emphasised, especially the relative proportions of producing and consuming communities.

Keywords: Marine, Coastal, Habitat diversity, Ecosystem functioning, Modelling

Healy, Chrystal; Potvin, Catherine

Separating the effects of species diversity, species identity and environmental heterogeneity on the productivity of a tropical tree plantation

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Contributed oral session 3, Biodiversity and ecosystem functioning I

Primary productivity and carbon cycling are essential functions of ecosystems and both have been altered considerably by human action (Silver et al, 1996). The Sardinilla project is a large scale tropical tree plantation located in Panama, whose aim is to improve our understanding of the complex relationship between carbon (C) cycling, land use and biodiversity. It will provide us with estimates of carbon sequestration in tropical plantation; as well as providing a framework needed to explore other ecologically relevant questions. The plantation was established in July 2001, whereupon over 5000 trees were planted. The trees are made up of six native species representing a range of different growth rates. The plantation is divided into 24 plots: 12 monocultures, six species plots and six 3-species plots. This paper attempts to separate the effects of environmental heterogeneity on productivity, from those of species identity and species richness. The productivity of each plot was

assessed by measuring its above and below ground biomass. As indicators of growth, the diameter and height of all individuals are measured annually. The biomass of saplings (2m) were determined using specific-wood density corrected allometric equations derived from the literature. Lateral expansion and leaf area index were also measured. The environmental heterogeneity of each plot was assessed by collecting data from four subplots in each of the twenty four plots. A number of different measurements were collected: soil colour, bulk density, topographical position, soil moisture and depth to water table. Partial Redundancy Analysis as well as Analysis of Covariance was used in order to determine the relative importance of species diversity, and environmental heterogeneity in determining productivity at the plot levels.

Keywords: carbon sequestration, ecosystem function, functional groups, allometric equations, tree biomass

Hillis, David

Priorities and the future of systematic research

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Plenary session

Over the past 250 years, systematists have described about 1.7 million of the Earth's species. Estimates of the total number of species on Earth vary widely, from 5 million to hundreds of millions of species. Regardless of which of these estimates is correct, it is clear that the current rate of species discovery and description is not sufficient to provide a thorough picture of the Earth's biodiversity for purposes of ecological assessment and conservation purposes. Systematists must embrace new technologies and approaches to make systematics more relevant and useful for other biological disciplines, including conservation biology. I will discuss some of the recent technological and analytical advances are being applied (or could be applied) to the problem of biodiversity discovery, assessment, and description.

Keywords: systematics, biodiversity discovery, biodiversity assessment, biodiversity description,

Hiltbrunner, Erika; Koerner, Christian; Paulsen, Jens

Effects of plant diversity on runoff processes in high elevation grassland

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Contributed oral session 5, Biodiversity and ecosystem functioning II

Presently, sustainable use of high elevation grassland is endangered due to reduced management, abandonment, or over-exploitation. Changes in land use have complex ecological effects and may alter vegetation composition (diversity), productivity, and water relations. Steep and not easily accessible slopes are commonly abandoned first. Vegetation changes in steep slopes are critical, since plant roots are the only forces that counteract the strong gravitational forces on slopes. The present study focuses on the functional significance of plant diversity in the high elevation grassland on water runoff and sediment loss in steep slopes.

We simulated 182 single rain events by means of a portable rain simulator in high elevation grassland (2500 m, Swiss central Alps). Prior to irrigation, half of the plots (0.0625 m²) were trampled by hooved shoes. Runoff water and sediment were

collected. Ground cover was estimated visually and divided into 4 categories: bare soil, mosses, lichens and vascular plants. Vascular plant diversity was assessed at the species and functional level.

Increasing degree of cover by vascular plants reduced runoff and sediment loss significantly. Plant diversity did not affect runoff directly, indicating that the presence of particular species and not the species number per se matters. With respect to different functional groups, increasing cover of dwarf shrubs reduced runoff substantially and water infiltration was almost up to 100 % in shrub-dominated plots. Trampling had no apparent effect on runoff nor on sediment loss, illustrating that alpine vegetation is adapted to moderate, mechanical impacts.

Sustainable land use has evolved species rich plant communities. Here we are able to show that a dense vegetation cover and the presence of certain species are of functional relevance to water relations and soil erodibility in high elevation grassland.

Keywords: alpine biodiversity, alpine grassland, land use , rainfall simulation, trampling

Illoldi-Rangel, Patricia; Fuller, Trevon; Linaje, Miguel Angel; Sánchez-Cordero, Victor; Sarkar, Sahotra

Selecting areas for biodiversity conservation and ecological restoration in Oaxaca, Mexico: A preliminary analysis

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Contributed oral session 16, Biodiversity conservation III

The problem being addressed, and if relevant, the hypothesis to be tested.

Oaxaca, located in south-western Mexico, holds an exceptional mammalian diversity, but rampant deforestation threatens its conservation. It contains only 4 decreed natural protected areas (16.38% of the state's total area). Applying new techniques for prioritizing conservation places will allow new conservation strategies to be implemented.

GARP software package was used to produce two models each for the distribution of 183 mammal species used as surrogates for biodiversity. The more restrictive model included a known occurrence record of a species and was used to identify sites for conservation; the less restrictive model did not impose this requirement. Sites were selected using the ResNet software package which incorporates a rarity-complementarity algorithm. The process was initialized using the existing conservation areas and 5, 10, 15, 20, 25, and 30% of Oaxaca were selected in successive runs. The less restrictive model was used to assess the restoration potential or "quality" of sites in the landscape matrix.

New potential conservation areas were selected using ResNet, complementing and adding new areas to the Natural Protected Areas of Oaxaca. Restoration areas were selected using a graph-theoretic protocol (the LQGraph software package) to establish minimum connectivity between conservation areas while maximizing landscape quality.

The methods we develop show how niche modeling can be used along with place prioritization and graph-theoretic algorithms to identify areas for integrated conservation and restoration planning.

Keywords: Oaxaca, conservation, mammals, GARP, ResNet

Insarov, Gregory

Monitoring lichen biodiversity alteration under global change stress

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Contributed oral session 14, Monitoring biodiversity changes I

As a result of anthropogenic emissions of N-, S- and C-compounds to the atmosphere in the 20th and 21st century, the surface layer of the atmosphere is polluted and anthropogenic climate change takes place. The ultimate consequence of global change for lichen biodiversity is efficaciously used for biological monitoring of air quality and climate change. The first goal of the study is to define how an alteration in lichen biodiversity caused by climate change and/or background composition of the ground-level atmosphere can be detected. The second one is to provide baselines against which these changes can be measured.

(1) Initial field study of lichens are carried out at monitoring sites protected from management activities and located away from air pollution emission sources. (2) Estimation of lichen species sensitivity to atmospheric pollution was retrieved from literature. To estimate lichen species sensitivity to climate change, studies of lichen communities along altitude gradient were undertaken. (3) Developing the Trend Detection Index (TDI). Data obtained in phase (1) and (2) are assembled in TDI. TDI is constructed so as to ensure the highest resolution of the index in relation to detecting anticipated man induced temporal trends in atmospheric composition and climate.

Since latest 70th of the past century surveys of epiphytic and epilithic lichen communities have been conducted in more than thirty nature reserves located in Russia, most of other ex-USSR States, Sweden, Portugal, Israel and Greece. Special computer database and software for data handling and processing have also been developed.

Ability of such a system to detect for instance climate-driven change in a state of epilithic lichen community appears sufficient in view of global warming by 1.4-5.8oC considered by the IPCC experts as a realistic projection for the end of the 21st century.

Keywords: Biodiversity Monitoring, Lichens, Global change, Trend detection, Biodiversity indicators

Irving, Marta

National Park Montanhas de Tumucumaque(Amapá-Brazil): A new approach for biodiversity conservation and social inclusion cooperation programs between Brazil and France

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Contributed oral session 2, Biodiversity conservation I

The National Park Montanhas de Tumucumaque (NPMT), created by the Brazilian government in 2002, is the biggest protected area of tropical forest in the world (3.867.000 ha) and was chosen by the government as an "inspiration model" for other frontier conservation units in the Amazon, in the context of the National Plan of Protected Areas, under discussion by the Brazilian society. The greatest park area reaches the Brazilian border with the French Guiana, in which the French government also discusses the creation of a national park, up to 2006, to strengthen its biodiversity policy strategies. In this future perspective, the challenge will be the construction of a new approach of transfrontier biodiversity conservation and social

inclusion strategy, in a continuous territory, with a completely different social, cultural and political background..

The present work aims to discuss these challenges, in terms of conceptual adjustments, legal framework, enforcement, management strategies and joint research and development programs, in short and long terms.

The work was carried out between 2004 and 2005, based on bibliographical research, interviews, questionnaires and field evaluation, as part of a research cooperation program between the Federal University of Rio de Janeiro and the Natural History National Museum of Paris.

The main challenges for a transfrontier cooperation program in biodiversity conservation seems to be connected with the different approaches between France and Brazil, concerned with park concept, implementation and management strategies, the legal, institutional, antropological, cultural and political background and the economic context and development needs. In this complex system, a new approach for research and development cooperation needs to be envisaged. This model will also require a new ethical dialogue for biodiversity conservation and regional development between Latin America and the European Unit.

Keywords: biodiversity conservation, social inclusion, tranfrontier planning, France, Brazil

Jackson, Jeremy

Brave new ocean

Scripps Institution of Oceanography, USA and Smithsonian Tropical Research Institute, Republic of Panama

Plenary session

The oceans are no longer wild and no place is pristine. Six major changes harbinger the future of the oceans: 1) loss of big animals, 2) denuding of the ocean floor, 3) globalization of biota due to extinctions and introductions, 4) ocean warming, 5) increased pollution of all kinds, and 6) microbial dominance of entire ocean ecosystems that comprise the so-called “dead zones” proliferating in coastal seas around the world. Moreover, fisheries are everywhere collapsing and excess biological production is increasingly concentrated in toxic blooms of microbes and jellyfish that are unfit for human consumption. We need to address all of these problems simultaneously to halt and potentially reverse the further degradation of the oceans. Some actions are scientifically straightforward. We must stop fishing entirely in large areas of the oceans and stop destructive fishing practices elsewhere. We also need to improve agricultural practices that waste soils and fertilizer to stop the flow of excess nutrients that nourish the dead zones, and to stop the industrial practices that release the toxins that make fish unfit to eat. But these actions may not be sufficient to restore the ecosystem services of keystone predators and suspension feeders without active intervention. Restoration will require new attitudes about aquaculture, exploitation, and marine equivalents to the “gardenification of nature” proposed by Daniel Janzen for terrestrial ecosystems. The future of marine biodiversity depends upon it.

Keywords: ocean, global change, sustainable, fishery, ecosystem services

Joint, Ian; Mann, Nicholas; Scanlan, David; Williamson, Phillip

Out of the blue - the importance of marine microbes

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Contributed oral session 13, Biodiversity and ecosystem services

Until the development of molecular tools, marine microbes were ignored for biodiversity research but their abundance means they cannot be ignored: the combined biomass of bacteria, archaea, viruses, and single-celled animals and plants in the ocean is estimated to be at least as great as the total for life on land. Because of our ignorance of the ecological role of such organisms, the UK Natural Environment Research Council invested \$12 million over the period 2000-05 in a multi-institute, multidisciplinary programme based on four linked themes: community composition; cultivability and cell-signalling; virus ecology; and biogeochemistry. The programme used a range of methods to characterise microbial diversity at the molecular level, including real time PCR (polymerase chain reaction), DGGE (denaturing gradient gel electrophoresis), FISH (fluorescent in situ hybridisation) and AFLP (amplified fragment length polymorphism). Fieldwork included mesocosm studies, sampling in UK coastal waters and a four-week research cruise in the NW Indian Ocean.

Highlights of results will be presented for each theme, comprising

- The first complete molecular analysis of a marine photosynthetic community, including prokaryotes (cyanobacteria), pico-eukaryotes and nanoeukaryotes
- Evidence for macro-algae 'eavesdropping' on the chemical signalling of bacteria
- Unexpected presence of photosynthesis genes in a virus that infects the marine cyanobacterium *Synechococcus*
- Role of viruses in the oceanic release of dimethyl sulphide, with climatic implications.

The NERC-funded studies confirmed the immense genetic diversity of marine microbes. Molecular and experimental studies helped improve understanding of how their metabolic activities drive the global cycles of elements (such as oxygen, carbon, nitrogen and sulphur) necessary for all other organisms on Earth. But many gaps in our knowledge remain.

Keywords: marine, bacteria, viruses, phytoplankton, biogeochemistry

Joshi, Ravindra

Case study of an invasive alien pest species: the golden apple snail, *Pomacea canaliculata* (Lamarck)

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Contributed oral session 17, Invasive species

The golden apple snail (GAS), *Pomacea canaliculata* (Lamarck) is listed in the 100 worst world's invasive introduced alien pest species of the Global Invasive Species Specialist Group Database. GAS is native to South America. It poses serious ecological risks such as biodiversity loss and alters ecosystem processes and community structure. The other environmental impacts are elimination of native non-pest molluscs; threaten human health as being a vector for at least three parasites; and control measures lead to misuse/abuse of pesticides causing pesticide-related problems in aquatic, soil and air environments.

This presentation will focus on the impacts of the introduction and spread of GAS in several Asian countries and in North America. It will also highlight the importance of

pest-risk analysis and the role of pest alert monitoring and information exchange systems to put in place effective management/mitigation measures that are environmentally benign, economically viable, socially acceptable and yet sustainable.

Keywords: invasive alien species, golden apple snail, *Pomacea canaliculata*, impacts on biodiversity loss, information and networking

Kappelle, Maarten

Paramo in Costa Rica: natural history of a unique and diverse tropical wet alpine ecosystem under critical threat

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Contributed oral session 6, Biogeography

The few remaining natural islands of tropical treeless wet alpine paramo on the highest peaks of Costa Rica and Panama represent the smallest biome and tiniest ecoregion on the Central American landbridge. It represents a biogeographical relict that tells us the living story of dramatic Quaternary ecosystem dynamics as expressed in recurrent past glacial-interglacial cycles. Repetitive stages of isolation and union of species populations over evolutionary time scales have led to its current high level of species endemism in a diverse array of taxonomic groups.

In today's society isthmian paramo plays a vital role in providing ecosystem services to the >2,500,000 people living in Costa Rica's Central Valley. For their water supply and hydroenergy this urban community depends almost completely on the water sources of upslope paramo and adjacent montane cloud forest.

Over the last decades paramo has been considered the most endangered biome in Central America due to increasing frequencies and intensities of human-set fires and accelerated climate changes as expressed in e.g., current lake temperature rises. Climate modelling suggests that the Central American paramo biome may totally disappear under business-as-usual scenarios.

The only available overview of Costa Rican paramos ever dated back from almost fifty years ago. We present a new survey of the geophysical, taxonomic, biogeographical, ecological and socioeconomic aspects of the past and modern paramo environment in Costa Rica based on ample research and a thorough review of recently published literature.

We also identify a series of priorities to guide future research and address biodiversity conservation, urgently needed to guarantee the persistence of this highly unique, diverse and economically invaluable tropic alpine system currently at the brink of extinction on America's landbridge.

Keywords: paramo, alpine, tropical, grassland, biogeography

Kati, Vassiliki; Poirazidis, Kostas

Local biodiversity hotspots in a Mediterranean reserve: where and why species concentrate?

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Contributed oral session 4, Drivers of biodiversity changes

In the present paper we investigate the degree of hotspot overlap at local scale and we attempt to explain species richness concentration with habitat heterogeneity at both horizontal and vertical level. Six taxonomic groups were chosen to quantify

biological diversity: woody plants, orchids, Orthoptera, aquatic and terrestrial herpetofauna and small terrestrial birds. We sampled each of the above groups with adequate techniques in 30 sites of 20ha each, representative of the habitat types existing in Dadia reserve, in Greece. We assessed horizontal site heterogeneity with the help of satellite images, as well as vertical site heterogeneity of each site with direct sampling of vegetation structure. We calculated Simpson's diversity index, taking as values patch size and vegetation layer cover respectively. Local biodiversity hotspots were the sites of coincidence of the most species-rich sites (hotspots) defined after each biological group. There was in general low overlap of hotspots, but when coinciding, they did it in sites of mosaic character. These were two human-originated forest openings and two sites in the rural zone, alternating small cultivated plots with hedges and tree lines. On the other hand, very homogeneous sites such as plantations or intensively cultivated land were very species poor. From all studied groups, woody plants and birds were the best correlated with both horizontal patchiness and vertical complexity. The effect of human disturbance on landscape heterogeneity and biodiversity distribution is discussed.

Keywords: biodiversity, hotspots, heterogeneity, species concentration, Greece

Kessler, Michael

Endemism of five plant and three animal groups in the Bolivian Andes peaks in areas with stable climatic conditions

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Contributed oral session 6, Biogeography

Whereas regional patterns of species richness are usually readily interpretable in light of favourable climatic conditions and habitat heterogeneity, patterns of endemism, i.e., accumulations of species with restricted ranges, are not well understood. We mapped the distribution of all species of non-volant mammals, birds, reptiles, Acanthaceae, Baccharis (Compositae), Bromeliaceae, Pteridophyta, and Solanaceae (>3000 species in total) in a 0.25 x 0.25-degree grid on the eastern Andean versant of Bolivia based on over 100.000 individual species records, and compared the resulting patterns to GIS- and station-generated climatic and topographic variables. Species richness patterns of the eight study groups were more similar to each other than they were to the respective patterns of endemism, and vice versa, indicating that across all taxa richness and endemism are determined by different combinations of environmental factors. As expected, species richness was highest in regions with high temperatures, high precipitation, and high topographical variability. Endemism, in contrast, tended to be highest in areas with high relative interannual temperature and precipitation stability, suggesting that endemic species originate and survive best in ecoclimatically stable areas. Such areas are determined by special topographic situations that ameliorate the effect of ENSO events and subpolar cold air influxes. Human rural population density also peaked in areas with high ecoclimatic stability, but usually spatially slightly removed by about 25 km from the peaks of endemism. Our study has important implications for understanding the evolution of the extraordinary diversity of the Andean biota, and for conservation, watershed management, and land-use planning.

Keywords: Andes, Endemism, Climatic Stability, Species richness, Conservation

Kinzig, Ann P.

Towards an international research agenda on biodiversity and urbanization

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Contributed oral session 10, Biodiversity and urbanization

This presentation will summarize the highlights of the research presented in the Contributed oral session on "Biodiversity and urbanization", discuss it within the broader context of research required to understand the impacts of urbanization on biodiversity, and introduce the preliminary efforts within DIVERSITAS to develop an international research agenda in this area.

The remainder of this Contributed oral session will be devoted to an open discussion of the compelling research challenges in urbanization and biodiversity.

Keywords: urbanization, biodiversity, research agenda, DIVERSITAS, ecosystem services

Klanderud, Kari; Totland, Ørjan

Invasibility, propagule availability, and diversity of an alpine plant community under simulated climate warming

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Contributed oral session 17, Invasive species

There is a debate about the relative importance of regional versus local control on diversity. Climate warming is predicted to decrease alpine species diversity. We know, however, little about which factors that determine the invasibility and diversity of alpine plant communities, and to what extent warming may affect the outcome of these factors on diversity. We aim to examine (1) the relative role of propagule availability and community-level interactions for the invasibility and diversity of an alpine plant community, and (2) if the relative importance of these factors on invasibility and diversity will change under climate warming.

We added propagules from 0 to 27 species from the regional species pool into control plots and plots exposed to experimental warming (open top chambers) in a high-diversity *Dryas* heath in alpine Norway.

Propagule availability and competitive exclusion determined alpine community invasibility and diversity, with an increased role of competition from established species on emerging seedlings under experimental warming. Invasibility increased with the number of species added as propagules and with the soil moisture, and decreased with the resident vascular species richness, the cover of a high abundant species (*Dryas octopetala*), and the soil nutrient content. The amount of bare soil increased invasibility only under experimental warming.

This study integrates the hypotheses of regional versus local control on diversity by showing that both propagule availability and community-level interactions may determine small-scale diversity of alpine plant communities. Climate warming effects on species interactions may increase the role of competition in alpine plant communities. Their limited dispersal abilities may constrain alpine species from escaping competitors, which may result in decreased alpine plant community diversity in the long-term.

Keywords: dispersal limitations, colonization processes, alpine , competition, species diversity

Kleijn, David

Agricultural intensification and biodiversity conservation: can we preserve biodiversity by locally implemented extensification measures?

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Contributed oral session 1, Agriculture and biodiversity I

Farmland biodiversity is under severe threat of agricultural intensification. Agri-environment schemes are an increasingly important tool to counteract effects of modern agriculture on biodiversity. Agri-environment schemes stimulate farmers to take measures that benefit biodiversity or the environment. In return farmers are financially compensated for any loss of income associated with these measures. Throughout Europe most agri-environment schemes prescribe extensification of farm management: fertilizer and pesticide applications are restricted or prohibited and first agricultural activities are delayed. We examined whether a straight-forward extensification of farm management is sufficient to conserve or promote biodiversity. In five contrasting European countries we compared species richness of plants, birds, bees, grasshoppers and crickets, and spiders on in total 202 paired fields, one with an agri-environment scheme, the other conventionally managed.

The results show higher species richness of plants and one arthropod group on scheme fields compared to control fields in all but the most intensively farmed country, the Netherlands. Endangered species were not affected by agri-environment schemes except in the most extensively farmed country, Spain, where the abundance of endangered bird species was significantly higher on fields with agri-environment schemes.

Schemes aimed at the species most threatened by modern agriculture need to be better tailored and address environmental constraints outside the control of farmers (e.g. dispersal barriers, groundwater levels) to make them more effective.

Keywords: Farmland wildlife, Nature Conservation, Farming intensity, Policy evaluation, Red List species

Kungu, James; Muriuki, John

The Potential of agroforestry in biodiversity conservation and sustainable development: a case of Central Kenya highlands.

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Contributed oral session 1, Agriculture and biodiversity I

Agriculture as currently practised in many parts of the world has been a major cause of the destruction of valuable habitats, pushing species towards extinction.

Agroforestry has the potential in solving the problems related to biodiversity. In central Kenya highlands high rural poverty, agricultural intensification, and fast growing population has affected species diversity, especially the indigenous tree species which have been gradually cleared within the farms. This has impacted negatively on other indigenous flora and fauna. The study was undertaken to document the impact of agroforestry on maintaining and conserving farmland biodiversity. Semi-structured interviews with key informants were used to gather socio-economic data while, observational walks and transect diagrams were used in identifying important aspects of the local environment and verifying the information gathered by other means. Large mammals and trees accountings was done while point counts was done for birds. Reptiles and amphibians were sampled using tracking methods. Invertebrates were sampled using nets. Different agroforestry

technologies were identified. Data were analysed using qualitative and quantitative methods. Correlation and regression analysis was done to predict and explain the variation of biodiversity. ANOVA was used to test significant relationship between different categories of agroforestry tree species and diversity. Shannon diversity index was used to calculate tree species diversity. The study reviewed that land sizes, age and education level plays an important role with regard to farming system and the choice of tree species to plant in a given area. Tea zones had a higher diversity of indigenous trees than coffee zones. Tea zones had more woodlots than coffee zones which also led to higher flora and fauna biodiversity. Reptiles and amphibians were very low in coffee zones mainly due to extensive use of agrochemicals.

Keywords: Agroforestry, Biodiversity, Highlands, Indigenous, Species

Kuniyasu, Momose

Biodiversity and sustainability of wild plant and animal use: roles of density dependent resource selection

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Contributed oral session 9, Genetics

If people have sufficient knowledge about plants and animals, biodiversity tends to promote sustainability of wild plant and animal use without any contradictions with short-term benefits of individual persons.

To demonstrate it, I examined effects of resource selection by people in logistic models without inter-species competitions and lottery models with competitions. In both cases, density dependent resource selection (DDRS) plays an important role. DDRS works when species-specific skills are required, qualities of materials should be uniformed, and resources are weakly habit-forming for people.

In non-competitive models, overuse causes extinction. Even without overuse, if population becomes smaller than the threshold by accident, resource use must be stopped to avoid extinction. DDRS enables automatic choice of species of which overuse hardly occurs and resource switch when the resource species accidentally decreases. In competitive models, if DDRS works, resource use becomes more often sustainable than when a single species is used or all species are used evenly, and DDRS reduces the probabilities of extinction of rare species than natural conditions. Resource privatizing is one of the solutions to avoid tragedy of commons. However, under competitive models, if the land is fragmented as the result of resource privatizing, conditions of sustainable use become severer.

Density dependent resource selection (DDRS) promotes sustainability of wild plant and animal use without any contradictions with short-term benefits of individual persons. Biodiversity and rich knowledge about wild organisms by residents are required for DDRS.

Keywords: logistic model, lottery model, tragedy of commons, resource privatizing, resource commercialization

Kuo, Yau-Lun

Response of young seedlings to the naturally enriched CO₂ concentration

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Contributed oral session 5, Agriculture and biodiversity

Seedlings under the forest canopy are constrained by a lack of solar radiation. However, young seedlings near the forest floor experience a high CO₂ environment caused by the efflux of CO₂ from the soil. We hypothesized that in situ high CO₂ levels near the forest floor may compensate the light-limited rates of net photosynthesis for understory shade-tolerant seedlings. This hypothesis was tested first by monitoring the CO₂ profile under a lowland forest at Nanjenshan. We found that CO₂ concentrations at seedling height of 2 to 10 cm were 390 to 425 ppm during the day, as compared to 360 ppm in the ambient air above the forest canopy. This finding indicated that young seedlings did encounter natural CO₂ enrichment during daytime. Second, the responses of net photosynthetic rate in 40 species of differing shade tolerance to the in situ CO₂ conditions were monitored by drawing air from 0.06 m and 1m above the ground to create CO₂ gradient. Net photosynthetic rate in 24 out of 27 shade-tolerant species increased positively and significantly as the CO₂ concentrations increased at natural light conditions under the forest. On the other hand, net photosynthetic rates in 13 shade-intolerant species did not respond significantly to the CO₂ gradient. These results confirmed our hypothesis that assimilation in shade-tolerant young seedlings benefit from the naturally enriched CO₂ environment near the forest floor.

Keywords: CO₂ profile, lowland rain forest, photosynthetic CO₂-response, shade-tolerant species, net photosynthesis

Kühn, Ingolf; Brandenburg, Marlene; Klotz, Stefan; Küster, Eva

Distribution of invasive plant species' traits in Germany

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Contributed oral session 17, Invasive species

Biological invasions are among the most important threats to biodiversity. Thus it is crucial to predict biological invasions. Usually species are in the focus of such analyses. Typical questions are e.g. which species may become invasive or what are their characteristic traits? Another important issue is the spatial prediction: where will invaders be found geographically? Here we analyse traits of successful alien plant invaders in Germany by comparing them to less successful invaders. Thus we could provide a distribution map as a prerequisite for identifying areas with a high abundance of traits that make a species invasive. A prediction on spatial invisibility will thus be independent from species identity but is based on plant functional traits. We compared successful alien plant invaders in Germany with less successful by focussing on two aspects of the invasion process: (i) spread, i.e. the occupancy of a species in Germany and (ii) naturalisation, i.e. whether a species is naturalised in semi-natural or in human-made habitats, using different types generalised linear models (GLMs) – including information on phylogeny. The distribution and abundance of these traits is then modelled into a respective distribution map. Again, the use of (spatial) linear models enables us to calculate environmental correlates of traits that are characteristic for successful invaders.

We found that morphological traits are less important for the success of plant invaders while ecological traits such as niche breadth, habitat, and range are more important. The distribution will be explained by environmental correlates in a spatial context

Our results will be a pre-requisite for a risk assessment scheme for alien plant invaders in Germany. Subsequently, information on spatial distribution and environmental relationships are necessary to elaborate a sophisticated management and prevention framework.

Keywords: plant traits, trait distribution patterns, environmental correlates, spatial analysis, Germany

Lampe, Karl-Heinz

Repatriation of knowledge about Insect type specimens through the DORSA Virtual Museum (Digital Orthoptera Specimen Access)

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Poster session 12, Systematics, phylogeny and evolution

Much of the type material documenting tropical insect diversity is deposited in European or North American museums. During a 3-year project we documented, using high-resolution photographs of different views/specimen, nearly 9,000 Orthoptera type specimens from 9 collections in Germany. The resulting collection of 30,000 images is linked with the data-based original label information and available as a "Virtual Museum" through the SYSTAX database (connected both to the GBIF- and the BIOCASE-portals). Reciprocal links to the 'Orthoptera Species File' (OSF) connect DORSA to a validated taxonomic name register. OSF authority files allow comparisons between published type data (OSF) and our DORSA specimen data. We discovered discrepancies between published type data and museum specimens, such as missing type material (650 primary types) and undocumented types (39 primary types). Exact data about missing type specimens allow initiation of effective searches to fill these gaps (e.g. by designating neotypes). The DORSA web-based repository provides sufficient detailed information, including diagnostic features (e.g. genitalia), to allow taxonomists to narrow down loan requests. Most type specimens in German collections were collected in tropical countries reflecting Germany's scientific expeditions and colonial history. Publishing type specimen data and images through a Virtual Museum signifies repatriation of knowledge for countries of type origin. In addition DORSA includes voucher specimens linked to respective sound records. Many of these specimens are hitherto undescribed species and can be considered as "types of tomorrow". We hope that our information platform will facilitate taxonomic research, especially in tropical countries. To this end we plan to provide access to original taxonomic descriptions, and increase the usability of DORSA with improved query and visualisation tools. DORSA was supported by the German Federal Ministry of Education and Research (BMBF).

Keywords: Virtual Museum, Biodiversity Informatics, Type Specimens, specimen databases, Orthoptera

Larsen, Trond

Consequential coprophages: diversity patterns and interactions between disturbance regimes, dung beetle communities and plant regeneration

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Contributed oral session 4, Drivers of biodiversity changes

Various anthropogenic disturbances are rapidly altering biological communities and

further destabilizing ecosystem integrity by disrupting species-driven functional processes. To understand some of these changes, I examined tropical dung beetles, a diverse and abundant group that performs several ecosystem functions including secondary seed dispersal, parasite regulation, and soil conditioning.

I sampled beetles in various forests in Peru, Venezuela and Costa Rica using dung-baited pitfall traps to assess baseline diversity patterns and beetles' responses to different kinds of land-use, fragmentation and hunting. I then measured the consequences of altered beetle communities for dung burial and seed dispersal. Beetle communities changed distinctly across habitat types. Within one Amazonian habitat type, species composition turned over rapidly with only a few hundred kilometres. Beetle communities were negatively impacted by fragmentation, hunting, logging history, plantations, cattle-ranching, agriculture and other kinds of land-use. Most disturbed habitats showed reduced beetle species richness, abundance and biomass compared to primary habitat. Habitat degradation also altered composition and shifted species' range distributions. In forest fragments, the largest beetles were most extinction-prone and most functionally important for burying dung, leading to loss of dung burial. Large beetle species were important for burying large seeds, but can also bury seeds too deeply. The optimal burial depth of seeds varied among plant species.

Dung beetles increase seedling establishment, and beetle diversity may be important for plant diversity. Many disturbances appear to be disrupting plant regeneration by negatively influencing dung beetles. Understanding functional consequences of how disturbances affect biodiversity is essential for protecting ecological processes sustaining healthy ecosystems.

Keywords: Biodiversity, Disturbance, Ecosystem Function, Dung Beetle, Seed Dispersal

Lavorel, Sandra; Davies, Ian; de Chazal, Jacqueline; Garnier, Eric; **Quetier, Fabien**; Rounsevell, Mark

Vulnerability to land use change of ecosystem services provided by traditional European agro-pastoral landscapes

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Contributed oral session 13, Biodiversity and ecosystem services

Traditional agro-pastoral landscapes of the less productive regions of Europe (e.g. Mediterranean, mountains, cold, poor soils) have been exposed to considerable land use changes over the last century, with an overall trend towards decrease in the intensity of use of grasslands, reaching wholesale abandonment in the most unproductive or economically challenged regions. Future land use changes under global change scenarios are expected to range from an exertion of these trends (in a globalized, economically-driven world) to intensification of agriculture and forestry (in a regionalised, environmentally-driven world).

Changes in the delivery of ecosystem services resulting from these scenarios were projected for five regions with contrasting biophysical and human conditions by combining: field data characterising changes in the functional composition of grasslands along gradients; empirically-derived relationships between these changes and ecosystem properties as well as agronomic characteristics; simulation models of landscape vegetation dynamics; and relationships between these ecological data and ecosystem services identified and valued directly by a diversity of stakeholders.

Vulnerability of different regions and of different groups of stakeholders was assessed by comparing the acceptability of the projected changes in provided ecosystem services to different stakeholders for each site.

We show: 1) Europe-wide trends in response of the diversity and functional composition of grasslands to decreasing intensity of grassland use; 2) Europe-wide trends in associated changes in ecosystem properties and grassland agronomic characteristics; 3) Differing impacts across regions on the delivery of ecosystem services that are valued by local stakeholders; 4) Different levels of vulnerability of the study regions to scenarios of land use change by 2050, as well as contrasting levels of vulnerability across stakeholder groups such as farmers vs. conservation managers.

Keywords: ecosystem services, plant functional traits, plant diversity, ecosystem function, land use change

Le Mire Pecheux, Lidwine

LandBioDiv : a new model for the spatial prediction of species richness and composition at the landscape level. A case study within a Mediterranean type region.

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Contributed oral session 19, Monitoring biodiversity changes II

Mediterranean landscapes are known to be complex with long-term perturbations. In such a context, species richness or floristic composition modelling for a given surface area has never been attempted. This study offers a new method in order to fill this gap and the creation of a software program: LandBiodiv. Species richness maps and floristic databases, the main output of the model, are designed to elucidate the relationship between vegetation and landscape structure.

LandBiodiv is based on concepts drawn from island biogeography (i.e. the influence of surface and community number on species richness) and also from ecological continuum theory. LandBiodiv's framework uses species-area relationships to predict species richness, and Bayesian rules to model species occurrence within landscapes. The model is calibrated using a vegetation map, eleven environmental maps and 313 plots of 0.04 ha each representing 885 species. The model is evaluated using 24 independent and larger plots (0.84 ha) as to include more than one community and to be more realistic at the landscape scale.

In term of composition diversity, the model evaluation demonstrates that the observed and well predicted species represent on average (i) 46% of the species at the community level (alpha composition), (ii) 54% of the species at the landscape level (gamma composition) and (iii) 35% of species occurring at least within two communities (between-community composition). Evaluation also shows that species-area curves are not suitable to predict the species richness of highly variable communities.

LandBiodiv permits good predictions of the species composition both at the landscape and community levels (resp. gamma and alpha composition). Diversity patterns also can be assessed at several spatial scales according to landscape structure. The model will be further improved by the integration of species-richness prediction methods accounting for within-community floristic variability.

Keywords: modelling, species diversity, floristic composition, fragmentation, landscape

León-Règagnon, Virginia; Brooks, Daniel; McLennan, Deborah

DNA identification of an introduced amphibian pathogen into Mexico and Costa Rica

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Contributed oral session 9, Genetics

Pathogens with complex transmission patterns are considered less of a threat for introduction outside their native ranges – vs species with simple life cycles as fungi – because of their highly specialized life cycles. Haematoloechus, the frogs lung flukes, are distributed worldwide. Their life cycles include three hosts (snail, dragonfly, frog). As part of ongoing biodiversity inventories of vertebrate parasites, we collected specimens of Haematoloechus in native frogs in Yucatan, Mexico, (*Rana brownorum*, *R. vaillanti*) and in Guanacaste, Costa Rica (*R. taylori*, *R. cf. forreri*, *R. vaillanti*). Morphological variability of the worms precluded identification of species; it was based on the comparison of COI sequences of the mtDNA (361 bp) and 28S sequences of the rDNA (885 bp). Populations of Haematoloechus spp. collected in Mexico and the US served as reference. Parsimony analysis of sequences showed that populations of Haematoloechus collected in Yucatán and Guanacaste constitute a strongly supported monophyletic clade with 3 populations of *H. floedae* from Arizona, California and Georgia. Sequence divergence is very low among populations of *H. floedae* (28S, 0.57%; COI, 1.1%), compared with populations of other species (28S, 0.8-4.2%; COI, 6.1-12-2%). Haematoloechus floedae is native to the south-eastern US, where it lives in the lungs of the bullfrog, *Rana catesbeiana*. Sequence homogeneity among populations of the US, Mexico and Costa Rica suggests recent spread of the parasite following introductions of the original host species, colonization of native species of frogs, and permanence although original host was removed. Rapid establishment and spread of introduced pathogens can occur even if their transmission dynamics are highly specialized, so long as those specialized conditions are phylogenetically conservative enough to be geographically widespread (ecological fitting).

Keywords: DNA barcoding, Haematoloechus, amphibia, Mexico, Costa Rica

Lewinsohn, Thomas; Jordano, Pedro

Beyond species lists: interaction inventories for biodiversity assessment and management

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Contributed oral session 19, Monitoring biodiversity changes II

Current biodiversity inventories accumulate large amounts of data, but are not easily linked to functional properties of ecosystems. Biotic interactions are acknowledged as essential features of ecological systems, but are virtually excluded from biodiversity assessment and conservation decisions, due to difficulties of incorporating them into widely applicable procedures. We present examples of surveys of interactions in natural communities, and propose that such interaction inventories be added to the current practice of inventorying and monitoring species of given taxa.

We focus on biological interactions (mutualistic or antagonistic) within well-defined assemblages, sampled at the local and/or regional scale. Sample sets can be analyzed as collectors' curves, with established tools for estimating species richness or diversity; and as bipartite webs, to which procedures for network analysis are applicable. Two field studies illustrate the procedure. First, plants and frugivorous birds surveyed in a Mediterranean scrubland in Spain; interactions were scored from seeds identified in bird faecal samples. Second, flowerhead-feeding insects reared from Asteraceae in cerrado areas in Southeast Brazil.

Both studies show that interaction surveys require more extensive sampling than either plant or animal species on their own. Thus, to estimate the total number of interactions in a local community requires additional sampling effort. However, structural properties, such as connectance or link distributions, can be ascertained in partial samples.

Surveys of interaction diversity add crucial information and understanding to biodiversity assessment and monitoring. Interaction structures may signal environmental changes more clearly than measures of species diversity or composition. A network of focused, intensive interaction surveys would be a valuable complement to more extensive taxonomic surveys.

Keywords: interaction diversity, community structure, frugivory, plant-animal interactions, herbivory

Lonsdale, Mark William

Impacts of invasive alien species on biodiversity and human well-being

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Contributed oral session 17, Invasive species

Ecosystem services - the benefits people obtain from ecosystems and from biodiversity - are under threat from invasive alien species. Ecosystem services, as defined in the Millennium Ecosystem Assessment, include:

- provisioning services such as food and water;
- regulating services such as flood and disease control;
- cultural services such as spiritual, recreational, and cultural benefits; and
- supporting services such as nutrient cycling.

All these maintain the conditions for life on Earth. I will provide an overview of the way invasive alien species impact on biodiversity and thus on these services, as an introduction to the symposium.

Keywords: Biological Invasions, Biodiversity, Ecosystem Services, Global Change, Risk

Lopez Hoffman, Laura; Ackerly, David; Ian, Monroe; Martinez Ramos, Miguel

Integrating scientific and local knowledge for sustainable mangrove harvesting

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Contributed oral session 20, Policy for sustainable development

Integrating local and scientific knowledge is critical for biodiversity conservation.

Selective harvesting is a major driver of changes in forest biodiversity. We use matrix models and sociological surveys to assess the harvesting of a Venezuelan mangrove. Our goal is to use science to support local knowledge and sustainable

harvesting.

Sociological surveys were used to assess local knowledge and the opinions of old/young and rural/urban harvesters about sustainability. Matrix models were used to assess the effect of harvesting on the mangroves. Elasticity analysis was used to detect the mangroves' most vulnerable element, where harvesting most impacts population growth. This was compared with local peoples' perceptions of sustainability and opinions of what makes mangroves susceptible/resilient to harvesting.

According to elasticity analysis, the population was most vulnerable to changes in the survivorship 2-15 cm trees, the most harvested size of trees. The matrix models indicated that much of the harvesting was unsustainable.

According to the surveys, young people harvested more intensively than older harvesters, and young urban harvesters were less likely than others to perceive scarcity. All thought that mangrove harvesting was sustainable. Half identified mangroves' high reproductive potential as a reason for their presumed resilience to harvesting. This contrasted with the elasticity analysis which indicated that harvesting of 2-15 cm trees, not reproduction had the most effect on population growth.

Local knowledge of sustainable harvesting did not concur with demographic assessments. In particular, harvesters' perceptions of what made the mangroves resilient/vulnerable to harvesting did not coincide with the demographic analyses. This scientific knowledge must be integrated with local knowledge to support sustainable harvesting, with particular attention to informing young harvesters.

Keywords: local knowledge, sustainable harvesting, matrix models, elasticity analysis, mangroves

Loreau, Michel

Challenges of biodiversity science

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Plenary session

The Earth is home to a tremendous biological diversity, which is under serious threat today because of the extension of human activities. Humankind depends on biodiversity in many ways. Biodiversity has been the source of nearly all our food supplies and medicines, and hence the advent of modern civilisations. It is a natural heritage, which is the source of multiple aesthetic, spiritual, cultural, and recreational values. It supports a wide array of ecosystem services on which human societies depend often indirectly, and for which technological substitutes will be increasingly difficult and costly. The scientific challenges of biodiversity are enormous.

Biodiversity science has traditionally been dispersed and undervalued. In order to make it progress, there is an obvious need for integration of the various approaches and disciplines: we need unity in diversity. We also need a major research effort of the size of the space exploration programmes for the exploration of the Earth's biodiversity, the causes and consequences of its loss, and the best means to conserve and use it. Lastly, the scientific community should learn to speak with a single voice, and promote the establishment of an international mechanism with a view to providing scientifically validated information on biodiversity to policy makers, governments and international conventions.

Keywords: biodiversity, threats, ecosystem services, valuation, policy

Maass, Brigitte; Frank, Ulrika; Kehlenbeck, Katja; Keller, Gudrun
Are on farm conservation of genetic resources and development mutually exclusive?

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On farm conservation of genetic resources for food and agriculture (GRFA) appears to take place de facto in many regions, where farmers have to cope with unfavourable economic and/or environmental conditions.

In three cases from Peru, Tanzania and Indonesia differences in plant diversity composition at genetic and species levels were evident. When comparing two valleys, more remote farmers with no access to irrigation and a higher proportion of fields that lie at relatively high altitude cultivated a higher number of traditional potato land races. In the two out of four districts surveyed in Tanzania that were more remote from urban centres and/or drought-prone, not only a higher number of traditional vegetables were used but also a higher proportion of them were not cultivated but collected from the wild. In fifty Indonesian homegardens from five villages studied on the island of Sulawesi higher plant diversity was recorded when the villages were more distant from commercial opportunities.

The challenge for development ahead is to assist poor farmers under marginal conditions to improve their livelihoods together with maintaining a certain level of useful genetic and species diversity. If this integration of development and conservation of genetic resources for food and agriculture cannot be realized, the rural population will not only lose part of their traditions but also become more vulnerable as their main risk aversion strategy would not function anymore. It is suggested to use diverse strategies to both improve farmers' livelihoods and conserve GRFA through utilization. Participatory plant breeding, the creation of new products from 'old' crops, and raising awareness for the treasures maintained by farmers by presenting them with awards should be among the measures applied.

Keywords: On farm conservation, Genetic resources, Agrobiodiversity, Homegardens, African vegetables

Manuel, Mundo; Baldwin, James G.; De Ley, Paul; **Rocha-Olivares, Axayacatl;**
Tandingan De Ley, Irma; Thomas, W. Kelley

A combined morphological and molecular inventory of the marine nematofauna from the Gulf of California

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Contributed oral session 21, Systematics

The marine meiofauna represents one of the least known and more diverse components of the intertidal infauna in most of the world. This ecologically important community is dominated numerically and in biomass by free living nematodes. Our research focuses in assessing the biodiversity of the free living intertidal nematofauna of the Northern region of the Gulf of California, a strategic and threatened region harbouring an important fraction of the Mexican marine biodiversity.

We describe the strategy adopted involving traditional and novel morphological and molecular analyses: nematodes are subjected to multifocal imaging by Video Capture and Editing followed by Polymerase Chain Reaction (VCE+PCR) of the D2D3 region

of large subunit rDNA (resulting video clips and sequence data are made available online in the database NematOL <http://nematol.unh.edu/>).

We have catalogued over 250 slides with over 1,300 mounted specimens representing 62 genera, 250 scanning electron micrographs, 397 photo microscopy images and 420 video microscopy images. Sequence analyses suggest the existence of at least 38 species among 44 individuals, none of which matches available D2D3 sequences in public databases. The recorded multifocal vouchers have allowed us to provisionally identify specimens to genus, and are currently being used to match specimens with ongoing identifications and descriptions of preserved material. We have also successfully applied our methods to other meiofaunal phyla such as gastrotrichs and tardigrades.

Combining molecular barcodes with multifocal voucher archives through VCE+PCR and NematOL is part of a wider effort at structuring and changing the process of taxonomic discovery. We argue that data-rich surveys and phylogenetic tools for analysis of barcode sequences are an essential component of the exploration of micro- and meiofaunal biodiversity.

Keywords: Gulf of California, marine nematodes, bioinventory, phylogeny, rDNA

Maree, Gillian A.; Kleynhans, Neels J.; Nel, Jeanne; Roux, Dirk J.

Testing a systematic planning approach to conserving river biodiversity: how many rivers, which ones, and what level of protection is enough?

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Contributed oral session 2, Biodiversity conservation I

The South African National Water Policy states explicitly that aquatic ecosystems must be protected to ensure that society derives sustainable benefits from these systems. However, no guidance is provided as to how this should be achieved. Recent South African developments in river conservation include: a freshwater planning tool with a hierarchy of descriptors to derive “signatures of river heterogeneity”, a framework to identify and spatially represent aquatic ecosystem processes, and a step-wise planning process. In parallel, a set of policy principles and options have been drafted to facilitate cross-sector coordination in managing freshwater biodiversity.

The approach is based on principles of systematic conservation planning, which requires setting an explicit goal and quantitative targets. A pilot study of one Water Management Area in South Africa, backed by a wider national analysis, provided the basis for evaluating quantitative conservation targets at 10%, 20% and 40% of total river length.

The pilot study demonstrated that a target of 10% did not achieve adequate representation and failed to cater for biodiversity persistence. In contrast, a target of 40% of a river’s length was difficult to achieve in terms of available systems that are still of high conservation potential. However, a panel of riverine ecologists agreed that a 20% target could be selected with minimal conflict to existing land uses.

This study indicates that the quantitative goal for aquatic biodiversity planning in South Africa should be to maintain (and restore where necessary) at least 20% of the country’s water resources in a so-called “Natural” class. It is important that national coarse-filter targets can be cascaded down to a regional level, a process that implies setting differential targets for each river signature type. These need to correlate closely with areas of administrative responsibility.

Keywords: Systematic Conservation Planning, target setting, design options, freshwater ecosystems, freshwater biodiversity management

Martin, Gary; Harrop, Stuart; Wichmann, Søren

Community Ethnofloras: promoting ethnolinguistic and biological diversity in Oaxaca, Mexico

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Contributed oral session 2, Biodiversity conservation I

The Global Diversity Foundation is proposing a programme of community ethnofloras in Oaxaca that will assist local people to document their botanical knowledge and practices in a way that protects their traditional resource rights. This approach will enhance scientific understanding of the link between ethnolinguistic and biocultural diversity and contribute to efforts to conserve and sustainably use biological diversity, and to guarantee the fair and equitable sharing of the benefits arising from the utilisation of genetic resources.

To explore the potential of this programme, we analyze widespread plant life-form and generic names of Mixean, a group of closely related languages within the Mixe-Zoquean language family of southern Mexico. In Mixe-Zoque - as in other language families around the world - there are key botanical terms that are widespread among speakers from various communities and dialects. Studies of the distribution and variation of these terms allow linguists to reconstruct "proto-terms" that were putatively part of the mother languages spoken thousands of years ago from which current languages and dialects have derived.

Using linguistic reconstruction of plant terms and results of ethnobotanical and ethnographic research, we identified cohorts of species that have played an important role in the cultural history of these indigenous peoples. We argue that plants whose names can be reconstructed for early stages of a language family and which are reflected at later stages without significant changes in meaning correspond to species that are central to the way of life of the speakers.

Based on indications that similar patterns of lexical stability exist elsewhere in Oaxaca, we suggest that this approach can be applied more widely to historical ethnobotanical studies. Our research on long term changes in plant nomenclature contributes to an emerging longitudinal perspective on transmission of traditional ecological knowledge.

Keywords: Ethnobotany, ethnofloras, traditional knowledge, biodiversity inventory, Mesoamerica

Mazumder, Asit

Predicting cyanobacterial bloom formation in freshwater ecosystems

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Contributed oral session 8, Biodiversity changes and health

Cyanobacteria (blue-green algae) are known to cause water quality problems with significant consequences for environmental and human health. Many of the blue-green species are toxic to fish and humans and cause frequent taste and odor and toxin problems in drinking water. More recent research show links between algal toxins and neuro-degenerative diseases in humans. In addition, when blue-green

algae decompose, hypolimnetic oxygen depletion can lead to fish kills. The impact of blue-green algae on water quality and toxicity are frequently dependent upon the specific taxa. Moreover, blue-green algal blooms are often caused by the excessive growth of one or two specific taxa. The type and intensity of specific bloom-forming blue-green algae vary substantially among aquatic ecosystems, and our existing knowledge does not allow us to predict the environmental conditions that support specific types of bloom forming blue-green algae. The objective of this research was to develop models to predict the physical, chemical and biological variables that most significantly relate to the dominance of some of the major bloom forming blue-green algae in freshwater ecosystems. Specifically, I present results on the distribution of *Aphanizomenon*, *Anabaena*, *Microcystis* and *Oscillatoria*, and their association with specific environmental characteristics. Results demonstrate how different types of anthropogenic and natural forces cause significant shifts in algal diversity and support the formation of specific type of bloom-forming blue-green algae.

Keywords: blue-green algae, environmental regulators, algal toxins, water quality, freshwater

McClung de Tapia, Emily

Prehispanic human impact on biodiversity in temperate ecosystems: agriculture and urbanization in the Teotihuacan valley, Mexico

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Contributed oral session 10, Biodiversity and urbanization

The analysis of plant micro- and macrofossils recovered from soils and archaeological contexts in the Teotihuacan Valley, Central Mexico, indicates that prehispanic inhabitants developed intensive/extensive agrosystems to support large pre-industrial populations at the expense of natural vegetation and fauna, the hydrological system and the soils. Two major periods are considered: ca. A.D. 100-650 (Teotihuacan occupation) and ca. A.D. 1300-1520 (Aztec occupation). This research purports to evaluate the extent of prehispanic human impact on regional biodiversity through time.

Pollen, phytoliths, seeds and charcoal, recovered from controlled archaeological excavations and stratigraphic soil profiles undertaken in the region provide important complementary evidence for deforestation, agricultural expansion, urbanization, and hydrological modifications. Examined qualitatively in temporal and spatial frameworks, these data suggest changes in the distributions of key genera. Regional biodiversity is considerably reduced during major occupations. Some regeneration appears to take place during a period of relative landscape stability following the decline of the urban center of Teotihuacan (>A.D. 650). However, as a consequence of the Spanish Conquest (>A.D. 1500), Aztec landuse practices were gradually replaced by European agricultural techniques, animal husbandry and major deforestation of the surrounding slopes, leading to considerably greater landscape instability and further reduction of biodiversity.

To a certain extent similar events affected other sectors of the Central Highlands of Mexico. A historical perspective thus allows us to gain insight about the effects of human activities at different temporal scales.

Keywords: Biodiversity, Human Impact, Prehispanic agriculture, Teotihuacan, Deforestation

Menzel, Susanne; Boegeholz, Susanne

Teaching biodiversity in Chile and Germany: students' subjective theories of threats for biodiversity and their suggestions for sustainable development

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Contributed oral session 20, Policy for sustainable development

The Convention on Biological Diversity expresses in Art.13 the obligation to promote public awareness. Schools play a central role as they should impart key competencies for citizens (Goody 2001). Effective teaching should take into account subjective theories of learners (Posner et al. 1982) which our study seeks to explore. A central focus lies on the recognition of resource-dilemmas (Hardin 1968) threatening biological resources.

The explorative, qualitative study was carried out in Chile and Germany. The sample consists of 11th grade students (n = 24). The instruments were problem-centred interviews (Witzel 2000). Resource dilemmas concerning the trade with endemic medical plant species were presented: The South African "Devil's Claw" (*Harpagophytum procumbens*) and the Chilean "Boldo" (*Peumus boldus*) in order to measure the students' ability to identify economic, ecological and social interactions of a commons dilemma. The interviews were transcribed and analysed computer supported.

Qualitative studies permit the identification of individual strains in argumentation and thought. We found that Chilean students are familiar with the term biodiversity and draw connections to local species under threat. Contrastingly, economic dilemmas of plant collectors are usually not taken into account. To German students the term biodiversity is unknown and local examples are not implied. However, social compounds of a dilemma seem to be more approachable. Few cases could be found where the inclusion of social, economic and ecological aspects lead to an appropriate reconstruction of threats for biodiversity.

The results show the importance of an integration of social, economic, and scientific information to develop an adequate understanding of reasons for and global coherences of threats for biodiversity. A quantitative, representative study on students' conceptions of biodiversity will follow.

Keywords: Biodiversity Education, Learning Prerequisites, Subjective Theories, Chile, Germany

Messouli, Mohammed; Boutin, Claude; Coineau, Nicole; Yacoubi-Khebiza, Mohammed

A hidden part of the biodiversity of the Maghreb: Importance, of groundwater fauna and need for its protection

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Contributed oral session 21, Systematics

The groundwater fauna is generally ignored in the evaluation of global biodiversity. It is important from four points of views we aimed to demonstrate. It includes a part of regional biodiversity and natural patrimony; its local variations may indicate changes in water quality and biodiversity can be used for groundwater monitoring; stygobionts of marine origin may be used for groundwater like living fossils as evidence of marine transgressions, or as a tool for dating the last transgression or emergence of an

oceanic island: comparisons of related species resulting from different colonizations may allow to appreciate evolutionary rates.

Sampling in various subterranean habitats using the cvetkov net and the Bou Rouch system and measurements of the main environmental variables were performed.

About 320 stygobionts were reported from Morocco, Algeria and Tunisia during the last twenty years and hundreds of species are waiting for description, especially crustaceans and gastropods. Many species exhibit a high endemism. Evolution, origin and historical biogeography were considered. Well fauna from different parts of North Africa showed clear relationships between reduced biodiversity and level of water quality. Industries, mining, cattle farms and ranches are potential pollution sources, and fertilizer and pesticide use threatens the local water supply in many areas. Though poorly considered by public agencies, groundwater animal species have a potential scientific, practical and educational value. They may have good potential value to humans as « indicator species » since the decline of sensitive species number due to pests or pollution may be a natural alarm for regulators and public health agencies. These contaminants can also affect people.

Finally, we emphasized the necessity of protecting the biodiversity of groundwaters

Keywords: stygobiont, groundwater, biodiversity, North Africa, management

Meyerhoff, Jürgen; Hartje, Volkmar; Liebe, Ulf

The economic value of forest biodiversity: results from two choice experiments

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Contributed oral session 15, Economics of biodiversity

Forests are multi-functional and provide, in addition to timber, a broad array of goods and services. These non-timber forest products include, for example, watershed protection, recreation, and biodiversity. As markets fail to reveal the economic value of many of these goods, supplementary measurement instruments are needed in order to get this information. So far little is known about the economic value of forest biodiversity. Therefore, the objective of our study is to determine the benefits people would derive from altered levels of forest biodiversity in two different regions of Lower Saxony, Germany. Choice experiments were used as a stated preference method. They do not require respondents to place a direct economic value on the environmental change of interest. Rather, respondents are asked to make comparisons among alternatives characterized by a variety of forest attributes and the levels these are taking. An experimental design was used to structure choice sets with two forest management alternatives and a do-nothing alternative. In addition to the price attribute the following four attributes, elicited in focus groups, were used to describe the management alternatives: Habitat for endangered species, species diversity, forest age class, and landscape diversity. Two random samples were drawn in the study regions. Each time 300 face-to-face interviews were conducted. The statistical analyses (e.g. nested logit models) show that forty respectively fifty percent of the respondents prefer an increase of forest biodiversity over the present situation and are willing to pay for alternative forest management strategies. Furthermore, the results indicate that habitat for endangered species and species diversity are the most important attributes for respondents choices. All in all, the results confirm the importance of protecting and enhancing forest biodiversity as an objective of forest policy.

Keywords: forest biodiversity, willingness-to-pay, stated preferences, choice experiment, forest management

Mitra, Amitava; Mitra, Debarati

Mountain biodiversity in the Eastern Himalayas--conservation through ecotourism

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Contributed oral session 2, Biodiversity conservation I

India is recognised as one of the twelve-mega biodiversity centres in the world comprising two ' Hot spots' regions i.e. Western Ghats and Eastern Himalayas. Arunachal Pradesh, located in the Eastern Himalayas is representative of all the biodiversity characteristics of the region. However, the State suffers from deforestation due to biotic and abiotic factors. This paper deals with how the promotion of ecotourism can act as an economic incentive for preservation of rich forest biodiversity of the State.

The purpose of the present paper is to estimate the recreational value of selected tourist spots of Arunachal Pradesh by using Travel Cost Methodology. This study also aims to identify and assess the possible negative impacts of tourism on environment by applying the Delphi Technique.

The travel cost results showed that the consumer surplus per visit of Indian and foreign tourists was quite substantial. A large part of it could be taxed or visitor charges could be increased to yield additional benefits for tourist spots. The results also showed that this would not result in reduction of the tourist traffic, as the demand for services of tourism turned out to be inelastic. In both the rounds of Delphi Technique, solid waste accumulation and deforestation have been identified as the most significant potential negative impacts followed by loss of wildlife and sewage problems.

From the present study we find that there are some basic linkages between travel cost results and Delphi results. The travel cost results identified the enormous potential economic gain of tourism and the Delphi results showed how the enormous potential benefits could be sustained by identifying the potential negative impacts of tourism on environment.

Keywords: Mountain Biodiversity, Eastern Himalayas, Ecotourism, Travel Cost, India

Morales, Carolina Laura; Aizen, Marcelo Adrian

Impact of invasive species on the structure of plant–pollinator webs in the temperate forests of South Argentina

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Contributed oral session 17, Invasive species

Invasive species affect many ecosystem services, including pollination. The identification of key factors which influence the structure of plant–pollinator webs in communities invaded by alien species permits an assessment of the impact of biological invasions on this key process. We asked i. whether mutualist richness varies with the origin of the mutualists, and ii. whether the plant species origin (i.e., alien or native) influences the composition of pollinator assemblages.

We compared mutualist richness between alien and native plants and pollinators

using rarefaction. Using canonical correspondence analysis, we examined the structure of a plant–pollinator web; we also evaluated the influence of plant origin and other potential covariates, including habitat disturbance, in the composition of pollinator assemblages.

Species origin did not affect mutualist richness. Alien pollinators accounted for >20% of all individuals recorded on flowers. Thus, due to their high abundance, they could have a significant impact in terms of pollination. Alien and native plant species did not differ in the proportion of visits by insects from different orders. Plant species origin influenced the composition of pollinator assemblages at the level of species, independently of the significant influence of habitat disturbance. This influence was determined by a preferential association between alien pollinators and alien plants. The main native pollinators were, on average, as closely associated with native as they were with alien plant species. Thus, alien plants and pollinators may be viewed as a sub-web embedded in the overall plant–pollinator web.

The preferential association between alien plants and pollinators suggests the existence of “invasive mutualisms” which may potentially favour, through pollination, a synergistic facilitation of the invasion process.

Keywords: alien species, biological invasions, ecosystem service, mutualist richness, pollinator composition

Morales-R., Mónica; Armenteras-P., Dolors; Rodríguez-E., Nelly; Sua-T., Sonia
Assessing conservation priorities in Colombian Andes throughout land cover dynamics analysis

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Contributed oral session 14, Monitoring biodiversity changes I

Biodiversity conservation and sustainable use of biodiversity has become increasingly important in the Colombian Andes, one of the richest regions in this megadiverse country. We present the results of a remote sensing based multi-temporal ecosystem mapping study to monitor changes and determine causes of biodiversity loss. We assessed land cover dynamics of the Natural National Parks System (NNPS) in the Colombian Andes, in order to formulate recommendations to design a more representative protected areas system. We carried out a spatial analysis with satellite images of the 1985 and 2000's. We identified 72 land cover types in the Andes: 14 naturals, 10 semi-naturals and 48 transformed. Tropical, subandean and andean forests and tropical xeric vegetation are the most affected by habitat loss in the 1985-2000 period; highland covers (cloud forests, paramo and ice-covered) have the highest representativeness values (above 35%). Our findings suggest that this might be due to the fact that conservation efforts have focused on highland ecosystems and that expansion of the national park system should include more xeric habitats and subandean forests, in order to guarantee their long term persistence.

Keywords: Colombian Andes, Biodiversity, land cover monitoring, conservation priorities, protected areas

Naidoo, Robin; Ricketts, Taylor

Incorporating economic costs and benefits of conserving natural ecosystems

into conservation planning

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Contributed oral session 15, Economics of biodiversity

Economic valuation of ecosystem services and opportunity costs of conservation are rarely integrated into conservation planning. Considering both can allow planners to evaluate whether the value of goods and services from natural habitats outweighs the costs of conserving habitat. Our goal was to develop maps of conservation costs and benefits that could be added to other spatial GIS layers for planning purposes.

Our study area was the Mbaracayu Biosphere Reserve in eastern Paraguay. We estimated opportunity costs using a published model that calculates economic values of still-forested land parcels using trends in forest conversion and local agricultural revenues. Economic benefits were assessed at two scales (local and national/international), and included valuation of non-timber forest products, timber, carbon sequestration, bio-prospecting, and existence values.

Opportunity costs of conservation were heterogeneous and positively associated with areas close to roads and in favourable locations for high-value land-uses such as soybean farming. Nature reserves and indigenous lands had low opportunity costs, as these zones have been effective in preventing forest conversion. Conversely, local economic benefits of natural habitat were greatest in reserves and indigenous lands, and were high enough to justify forest preservation on an economic basis. Ecosystem goods and services of forests on private lands were less valuable at the local scale, and only by including national/international values (which are difficult to “capture” locally) would these forested areas pass a spatial cost-benefit test.

The interaction of spatial features and scale of valuation determined where conservation of remaining forests is economically competitive. While not a panacea, spatial cost-benefit analyses can provide important information to those involved in conservation planning.

Keywords: cost-benefit analysis, reserve design, ecological economics, valuation, land values

Nijs, Ivan

Climatic extremes and biodiversity loss: resistance of individual plants, role of species richness in community resistance, and spatial patterns emerging after extremes

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Contributed oral session 4, Drivers of biodiversity changes

Future changes in extreme climatic events are a largely unknown threat to biodiversity. At least three types of information are needed to assess the risks involved: (1) which plant attributes determine the resistance to extremes in individual plants? (2) does high plant diversity in a community itself protect against extremes? (3) which gap spatial patterns emerge for colonizers after an extreme event?

We present data on each of these issues, either from ecophysiological studies on single species (question 1), from studies on synthesized ecosystems in which species richness is experimentally varied (question 2), and from spatially explicit computer simulations of plant mortality at community level (question 3). In the experiments we exposed grassland patches to heat waves through controlled infrared irradiation.

In single species, the morphological and ecophysiological indicators that best

explained plant resistance to extreme temperatures and drought were different from known indicators of resistance to moderate stress. The best surviving species had stomata that were least sensitive to daily fluctuations in plant microclimate. In the experiments with synthesized ecosystems, we found that a higher complementarity in resource use for biomass production, observed at high species richness prior to a heat wave, had a cost in terms of reduced survival. In the modelling studies, pre-disturbance species richness did not influence the gap spatial patterns emerging after perturbation when community assembly was random. In spatially aggregated communities, however, species loss enhanced the variety of emerging colonization opportunities, but only if interspecific differences in sensitivity were high. These findings suggest that interactions between plant diversity and climatic extremes occur at various levels of biological organization and scale.

Keywords: species richness, extreme climatic events, resistance, complementarity, survival

Njiokou, Flobert

Wild animal reservoir for *Trypanosoma brucei gambiense*

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Contributed oral session 8, Biodiversity changes and health

Some foci of the Human African Trypanosomiasis (HAT) are maintained at low endemicity level for many decades while in others, there are periodical epidemic outbreaks. Between two successive epidemics phases, there is uncertainty about the host in which the parasite (*Trypanosoma brucei gambiense*) evolves. The possible existence of a wild animal reservoir for this parasite was evoked and had to be investigated. This study was carried to find out if wild animals act to as reservoir for *Trypanosoma brucei gambiense* in Cameroon.

Blood was collected from 1142 wild animals in 3 HAT foci and from a non-endemic area as control. In the field, trypanosomes were detected on animal bloods by parasitological tests (Quantitative Buffy Coat: QBC and kit for in vitro isolation : KIVI). In the laboratory DNAs were extracted from bloods and *T. b. gambiense* were identified on wild animal bloods by amplification with two specific primers.

Wild vertebrates sampled were very diversified and belonged to 36 different species grouped in 8 orders. QBC and KIVI tests detected trypanosomes respectively on 1.7% (13/762) and 18.4% (43/234) of animals examined.

T. brucei non gambiense DNA was detected on 56 animals (4.9%). This infection rate was 5.3% in the endemic zone and 3.8% in the control zone. Of the 832 animals of the endemic zone, PCR revealed *T. b. gambiense* DNA in 18 (2.2%). These hosts included 2 rodents, 2 artiodactyls, 2 carnivores and 2 primates. *T. b. gambiense* was absent from animals of the non endemic zone.

Many wild vertebrate species are infected by *T. b. gambiense* and could act as reservoir of this parasite. As the animals are found infected only in the HAT foci, the parasite may be transmitted from human to animals and from the animals to human by the tsetse flies that take blood meals from these two hosts.

Keywords: *T. b. gambiense*, sleeping sickness resurgence, wild animal reservoir, KIVI and QBC, PCR

Nunn, Charles; Altizer, Sonia

Global Drivers of Parasite Diversity and Host Specificity in Primates

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Contributed oral session 8, Biodiversity changes and health

Most emerging diseases arise from pathogens capable of crossing between humans, domesticated animals and wildlife, yet we lack an understanding of the factors that trigger pathogen emergence at the human-wildlife interface. In this talk, we present results from phylogenetic and GIS analyses of factors that maintain parasite diversity in nonhuman primates and lead to sharing of parasites among primate hosts, including humans.

We developed a bioinformatics database on infectious diseases in wild mammals that covers 475 host species and >1400 parasites and pathogens. Unprecedented in size and taxonomic scope, this geo-referenced dataset captures >18,000 host-parasite records spanning macroparasites (helminths and arthropods) and microparasites (protozoa, viruses, bacteria and fungi). The database also includes information on parasite characteristics, prevalence, and sample size. We use phylogenetic methods and GIS to investigate patterns of parasitism in nonhuman primates.

Our comparative analyses reveal that more rapidly radiating primate lineages harbor a larger number of parasites. Further comparative tests indicate that greater primate host diversity supports more parasite species, possibly through mechanisms related to host sharing by generalist parasites or host shifting by specialists. To investigate mechanisms underlying this global pattern, we test whether geographic proximity or phylogenetic distance better accounts for patterns of prevalence in a sample of generalist parasites, including parasites that also infect humans.

Collectively, these results underscore the fundamental links between disease ecology and global patterns of host and parasite diversity. This integrated approach also has implications for human health, including understanding the origin of infectious diseases, their emergence in human populations, and the maintenance of zoonotic pathogens in wildlife.

Keywords: Emerging infectious disease, Biodiversity, Parasite species richness, Phylogeny, nonhuman primates

Oliveira, Luiz; Rossi, Ana

Phylogeography of *Psychotria ipecacuanha* (Rubiaceae), a medicinal species with disjunct geographic ranges in the Amazon and Atlantic forests of Brazil

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Contributed oral session 6, Biogeography

Native Brazilians employed the drug Ipecac or Ipecacuanha extensively and taught the medicinal properties to early European settlers. The usefulness of Ipecac resides in its expectorant, amebicide, and vomitive properties. The pharmacological activities have been confirmed and isoquinoline alkaloids identified as the major bioactive compounds of Ipecac. The botanical source of Ipecac is defined as the dried roots and rhizomes of *Psychotria ipecacuanha* (Brot.) Stokes (Rubiaceae). *P. ipecacuanha* is a perennial herb, which is restricted to the understory of humid, shady areas of tropical forests. The species still occurs in three well-defined geographic regions: 1- Central America and northern parts of South America; 2- Southeastern part of the Brazilian Amazon; and 3- Atlantic Rain Forest along the Brazilian coast.

Overharvesting of wild plants and negligence in replanting ipecac plants after

uprooting has led to a severe decline of native plant populations in Brazil. Here we report a molecular phylogeographic analysis of *P. ipecacuanha*, using data from the trnT-trnL region of the chloroplast genome, for populations located in two Brazilian Biomes, the Amazon and the Atlantic Rain Forests. Currently, eight haplotypes were distinguished among 50 individuals investigated. Haplotype distribution is clearly related to geography. Haplotype diversity is very low in the Amazon, in which a single haplotype was observed. Seven haplotypes were found exclusively in the populations located within the Atlantic Rain Forest. None of the eight haplotypes are shared across biomes. A single haplotype network was obtained, which contains two clades connect via six missing intermediates, corresponding each clade to one of the two biomes. The null hypothesis of no association between network structure and geographic distribution was rejected and nested clade analysis suggested allopatric fragmentation as the most plausible cause in shaping genetic diversity of *P. ipecacuanha* in Brazil.

Keywords: Ipecac, Psychotria, phylogeography, medicinal plant, trnT-trnL

Olsson, Gunilla A.; Ekrem, Anna; Hanssen, Susanne K.; Wehn, Sølvi
Rapid forest line changes in Norwegian mountains – in relation to land use and climate change

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Contributed oral session 11, Drivers of mountain biodiversity

Norwegian mountain landscapes have been shaped by the grazing of domestic livestock and semi-domestic reindeer for more than 500 years but during the past 40 years there have been significant changes both in grazing pressure and human resource use. Today there is an ongoing forest succession on former open habitats and a rise of the forest line of mountain birch. This paper aims to: i) illustrate changes of forest line in mountains in Mid-Norway over the period 1963-2003; ii) illustrate land use changes in the same area and time period, and analyse its possible impact on the advanced forest line; iii) discuss the impact of climate change and the previous factors; iv) give predictions of future landscape development in Norwegian mountains. By means of digitised aerial photos from mountains in Mid-Norway changes in forest line were calculated within a GIS-based system by use of spatial statistics. Land use data (livestock data, grazing regimes, other resource uses) were compiled from interviews and official documents. Climate data from the region for 20th century was collected from official statistics. By use of different statistical methods land use data were related to the recorded changes in forest line.

The range of forest line changes was 200 m and correlated to changes in land use and grazing regimes over a 40 year period. Results from experimental studies on climate warming on forest line in this region were confounded with changes in grazing impact.

The ongoing rise of forest line is positively correlated with decreased livestock grazing pressure and changed human resource use. The ongoing trend predicts a large-scale forestation of the mountains involving decreasing landscape diversity and thus further implying biodiversity changes at the scales of communities and species.

Keywords: forest line, mountain birch, biodiversity, land use changes, climate change

Peredo, Bernardo

Biodiversity, human development and poverty alleviation in Bolivia in a market economy: Irreconcilable Differences or Windows of Opportunity?

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Contributed oral session 20, Policy for sustainable development

Biodiversity conservation is a biological and social process. It is also an economic, political and cultural process in developing nations, characterized by being the richest regions in biodiversity but also the poorest economically. Paradoxically, whilst biodiversity provides substantial socioeconomic benefits, local people have not received benefits resulting from conservation and biodiversity loss has increased.

This would be the case of Bolivia, considered amongst the richest countries in biodiversity, especially within the Tropical Andes Hotspot, recognised as the global epicentre of biodiversity. However, the country is one of the poorest nations in Latin America with indigenous communities amongst the most vulnerable groups.

Biodiversity provides irreplaceable opportunities to these indigenous populations for their well-being both as sustaining livelihoods and providing ecosystem services.

To provide evidence from the field to analyse and test if there are opportunities to integrate biodiversity into poverty alleviation discourses and the significance of biodiversity for human well-being and local agendas under a market economy, or to the contrary, if threats to biodiversity loss and sustainability may increase due to influential driving forces within social, economic and political constraints.

Biodiversity could play a role in alleviating poverty in Bolivia under a market economy context. The study analyses if there is any scale and actors in which biodiversity and poverty alleviation are best integrated, and which market mechanisms could work under current institutions and frameworks.

The study is focused at the conservation corridor in Bolivia, which is one of the regions with greater participation of indigenous communities in biodiversity-based initiatives and politics. It identifies micro and macroeconomic relationships and experiences engaged with markets and decision-making processes.

Keywords: biodiversity, market economy, development, well-being, poverty

Perrings, Charles

Invasive Alien Species and Human Poverty

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Contributed oral session 17, Invasive species

This paper considers the linkage between poverty and invasive alien species (IAS) – the introduction, establishment and spread of species outside of their original range.

There are two main dimensions to the problem. One is the connection between poverty and the likelihood of the introduction, establishment or spread of invasive species. It includes the relation between poverty and strategies for the management of invasive species, investment in invasive species detection and control, and collaboration in international control measures. The second is the connection between poverty and the costs or benefits of invasions. This includes the links between invasive species, the structure of the economy, and poverty. It covers the relation between poverty and dependence on agriculture, wildlife utilisation, forestry

and fisheries, and the importance of the common property.

Keywords: Invasive species, Poverty, Trade, Agriculture, Development

Petrin, Zlatko; Malmqvist, Björn

Are naturally acid streams as diverse and functional as circumneutral streams?

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Contributed oral session 3, Biodiversity and ecosystem functioning I

Numerous studies have addressed the negative impacts of acidification of surface waters on taxa richness, species assemblages, and functionality. However, comparatively little attention has been paid to these parameters in naturally acid freshwater systems in contrast to anthropogenically acidified waterbodies. Recent paleolimnological and hydrochemical research as well as ecological studies suggest widespread tolerance and possibly adaptation to high acidity levels in stream macroinvertebrates. Thus, acid freshwater systems need not necessarily be less diverse and functional compared to circumneutral environments. The goal of this study was to test for the existence of tolerance and adaptation to acidity in stream macroinvertebrate communities.

To this end, six acid and six circumneutral independent stream sites were selected in an orthogonal design. Based on quantitative benthic samples, we estimated taxonomic richness using sample-based rarefaction and studied species assemblages in ordination analyses. Leaf litter decomposition was studied in fine and coarse mesh litter bags.

Leaf litter breakdown rates, macroinvertebrate taxonomic richness, and species assemblages in naturally acid streams did not significantly differ from those in circumneutral streams. The results suggest that macroinvertebrates in naturally acid streams in northern Sweden, possibly even whole communities, are acid-tolerant if not adapted. Exposure to acid conditions over evolutionary time scales implicitly suggests that stream biota may have evolved mechanisms aiding them to cope with potential trade-offs associated with living in acid environments.

Consequently, communities in naturally acid streams should be considered “healthy”, i.e. remediation measures such as liming to “restore” naturally acid streams should be abandoned.

Keywords: natural acidity, streams, shredders, leaf litter decomposition, ecosystem functioning

Pham, Jean-Louis; Bezançon, Gilles; Chantereau, Jacques; Gerard, Bruno; Kapran, Issoufou; Vigouroux, Yves

How does agrobiodiversity respond to global change? Assessing changes in the diversity of pearl millet and sorghum landraces in Niger between 1976 and 2003

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Contributed oral session 18, Agriculture and biodiversity II

In Niger, cultivated area and human population have doubled in 25 years. The 400 mm isohyete has moved southward by 200 km in the west of Niger and by 100km in the east. What was the impact of these dramatic human and climatic changes on genetic diversity and adaptation of crop landraces?

Pearl millet and sorghum are two traditional cereals of major importance in the Sahelian region. This study aimed to assess, at the country scale, temporal and spatial changes that possibly occurred over the past 25 years in the diversity of these crop landraces in Niger.

A comprehensive collection of pearl millet and sorghum landraces was made in 2003 in 79 villages already sampled in 1976. Geographical distribution of landraces was analyzed. Their genetic and agromorphological diversity were evaluated using DNA SSR markers (pearl millet: 609 accessions, 25 loci ; sorghum : 734 accessions, 30 loci) and field trials.

More landraces were collected in 2003 than in 1976. Changes were observed in the geographical distribution of landraces that could be explained by changes in climatic and agronomical constraints. Likewise, field surveys and trials showed a trend to grow in 2003 more early-flowering landraces in regions prone to climatic risk. Overall, slight genetic differences were observed between 1976 and 2003 samples. Genetic diversity of pearl millet landraces shows a strong resilience, despite important climatic and social changes over the last 25 years.

Climatic events over the last 25 years have likely affected the distribution of sorghum and pearl millet landraces in Niger. In contrast, few changes were observed in the molecular diversity of pearl millet. This might be related to the outbreeding status of pearl millet and seed exchanges. The on-going genetic analysis on sorghum will permit to assess if similar results are observed for a predominantly-selfing crop.

Keywords: Agrobiodiversity, Global change, West Africa, Pearl millet, Sorghum

Potts, Matthew; Vincent, Jeffrey

Managing Multi-Species Forests **To Minimize The Risk Of** Biodiversity Loss

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Contributed oral session 7, Biodiversity conservation II

Shrinking habitat and logging threaten biodiversity in the world's forests. We develop a model to analyze forest-related extinction risks by adding harvesting to a metapopulation model of competing species. We use this model to elucidate the dependence of optimal forest harvesting strategies on the competition-colonization characteristics of species, with the minimization of biodiversity loss an important objective in addition to net harvest revenue.

We use a well-known spatially implicit competition-colonization metapopulation model to represent a community of n competing species. A linear hierarchy of competitive abilities exists with individuals of higher-ranking species displacing individuals of lower-ranking species. Coexistence of species occurs because there is a tradeoff between species' colonization and competitive abilities: less competitive species are better colonizers.

We incorporated harvesting of species into the model in two ways, to investigate the differential risks of biodiversity loss under the two major approaches to forest management: uniform and specialized. We used a community similarity index to form a summary measure of biodiversity loss. In addition to solving the model analytically, we parameterized it to simulate the optimal management of a highly diverse Malaysian tropical rainforest.

We found ecological and economic factors played strong roles in determining which strategy minimized biodiversity loss for a given a timber harvest objective. For example, when we considered a tropical forest, we found that uniform management

was superior at low discount rates and specialized management superior at high discount rates.

The ecological nonlinearity of asymmetric competition has important implications for decisions about harvest strategies in multi-species forests where minimizing the risk of biodiversity loss is a management objective.

Keywords: Biodiversity, Forest Management, Tropical Ecology, Control Theory, Metapopulation Model

Rais, Mohammad; Pazderka, Bohumir; vanLoon, Gary W

Policy development to support agro-biodiversity in hills of Uttaranchal state in North India

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Contributed oral session 1, Agriculture and biodiversity I

In the absence of a comprehensive agro-biodiversity policy, the erosion of agro-biodiversity in the hilly regions of Uttaranchal is continuing unabated. Consequently, there is significant ecological degradation and furthermore, food security of poor farmers is threatened. The objectives of the project are: (i) exploration of the variety of agroecosystem practices, (ii) the development of appropriate policy instruments that will promote the conservation of agro-biodiversity and achieve food security in the region.

Two case studies covering various aspects of agro-biodiversity policy issues have been conducted in Uttaranchal state. Using defined criteria 344 households in 28 villages of Almora district and 243 households in 15 villages of Rudrapur district have been surveyed during 2004-2005. In data analysis we compared income generated and energy status (surplus or deficits) associated with (i) traditional coarse grains, (ii) local landraces, (iii) and high yielding crops in the region. Further analysis was carried out using standard agro-biodiversity indicators such as Shannon and Berger-Parker diversity indicators, as well as other indicators developed for the project.

A central feature of the degradation of multiple ecological functions is a loss of natural and crop biodiversity in this fragile Himalayan ecosystem. The area under traditional crops has been declining and these have been replaced by cash crops. However, the popular notion that access to roads in the hills reduces agro-biodiversity is not supported by initial analysis of data for some villages.

The thrust of government policy instruments, like credit, subsidy, and the public distribution system, has been directed towards promoting high productivity monocultures. This study suggests various new policy instruments, like eco-services compensation, etc. to promote agrobiodiversity in the region.

Keywords: Agro-biodiversity , Policy, Hills, Ecological services, Monoculture

Redman, Charles L.

Sustaining ecological values in an urbanizing world

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Contributed oral session 10, Biodiversity and urbanization

It is estimated that virtually all of the net global population increase over the next

thirty years will be in and around urban centres, doubling their current population. Urban dwellers today consume 70% of the world's energy and natural resources, generating an equivalent proportion of its waste. As urban populations grow and raise their standard of living these quantities will increase as well as the demand for food. All of these factors suggest that there will be an unprecedented and ever-increasing pressure placed on the ecosystems of the world to provide these services. Can this be achieved without undermining the integrity and function of the environment? Numerous international groups are organizing to investigate how to best address this challenge. It is suggested that DIVERSITAS consider what role it wants to play and how to coordinate its efforts with those of sister organizations. Current initiatives by three organizations seeking international involvement will be outlined: The US National Academies, the Scientific Committee on Problems in the Environment, and the Resilience Alliance.

Keywords: Urbanization, population, ecosystem services, food security, urban footprint

Ricketts, Taylor; Daily, Gretchen; Ehrlich, Paul; Michener, Charles
Tropical forest fragments enhance pollination and yield in nearby coffee crops
World Wildlife Fund, USA

Contributed oral session 13, Biodiversity and ecosystem services

Crop pollination by wild bees is an ecosystem service of enormous value, but it is under increasing threat from agricultural intensification. Although cultivars of two-thirds of the world's crop species require animal pollination, this vital ecosystem service remains poorly understood. Severe declines in managed honeybees (*Apis mellifera*) are heightening interest in wild bees, which can pollinate many crops effectively but require habitat within agricultural landscapes. Our goal in this study was to evaluate the economic value of forest fragments as sources of pollinators to surrounding coffee, one of the most valuable agricultural exports from developing nations.

We measured bee activity and pollen deposition rates at coffee flowers (*Coffea arabica*) along replicated distance gradients (0.1 - 1.6km) from forest fragments in Valle Del General, Costa Rica. We also conducted pollen limitation experiments along the same gradients to evaluate yield effects. Eleven eusocial species were the most common visitors: 10 species of native meliponines and the introduced honeybee.

Coffee plants near forest experienced higher bee diversity, visitation rates, and pollen deposition than plants further away. The higher bee diversity near forest also stabilized visitation rates over time, through asynchronous dynamics of pollinator populations. As a result, yields were augmented by 20% within ~1km of forest. Over 2000-2003, the pollination services from two forest fragments (46 and 111 ha) translated into ca. US\$60,000/yr for one farm. This is a lower bound value and shows investment in forest conservation can be profitable for agriculture.

Policies that allow landowners to capture the value of pollination and other services could provide powerful incentives for forest conservation in some of the most biodiverse and threatened regions on Earth

Keywords: pollination, biodiversity, ecosystem, services, bees

Roche, Philip; Le Mire-Pecheux, Lidwine

Species richness characterisation at landscape level - a study in Southern France

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Landscape is considered as a complex mosaic of patches defined both by land-uses and environmental variations in space. While landscape diversity is frequently cited as having positive effects on biodiversity, the role of landscape may vary according to the patch mosaic patterns and the scales considered. It could be pointed out that spatial landscape patterns are not simple predictors of biodiversity patterns. We consider that this could be due to an inadequate definition of landscape elements with regards to the ecological process considered. After reviewing current approaches of species richness characterisation at landscape level, we will expose the results obtained using a landscape heterogeneity index that takes into account the ecological contrast between patches at a given scale as well as the spatial abundances and arrangements of these patches. We named this index: "the Landscape Disparity Index (LDI)". On a landscape test area, the LDI values have been regressed against species richness sampling points allowing to explain >70% of species variance. Then we discuss the relationships between landscape heterogeneity and species richness at landscape level.

Keywords: biodiversity, landscape heterogeneity, modelling, plant, Mediterranean

Rodríguez, Jon Paul; Balmford, Andrew; Dobson, Andrew; Mace, Georgina M.; Robinson, John G.

DIVERSITAS and the establishment of a stronger science basis for the 2010 target of the Convention on Biological Diversity

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Contributed oral session 19, Monitoring biodiversity changes II

In 2002, 190 parties to the Convention on Biological Diversity (CBD) committed to achieve, by 2010, a significant reduction of the current rate of biodiversity loss. The Millennium Ecosystem Assessment concluded in 2005 that unprecedented action will be needed, and recognized that most necessary activities were not even in place. In fact, monitoring progress towards this target in itself presents a major challenge. A number of steps have been taken to establish a stronger science basis for the 2010 target, including a discussion and workshop hosted by the Royal Society of London in 2004, a workshop at the 2005 Paris Biodiversity Science and Governance meeting, and a symposium at the 2005 meeting of the Society for Conservation Biology held in Brasília. In addition, continuing efforts by the advisory groups to the CBD's SBSTTA have resulted in continuing changes and additions to the set of indicators being developed by CBD. The draft report on these is now open for comment. Nevertheless progress is very slow. In recognition of the difficulties in mobilizing the scientific community's input for 2010, and to developing a robust but realistic biodiversity goal for 2020, a Scientific Forum for the 2010 Biodiversity Target has been established. DIVERSITAS is uniquely positioned to contribute through its global network of biological and social scientists, and its National Committees, which translate science into policy. In the near future, DIVERSITAS could focus on: 1) disseminating information on the 2010 target and the challenges that it poses, 2) formalizing contacts between its scientific networks, the CBD, and national CBD focal points, to ensure the best available information, 3) identifying how best the global scientific

community can help deliver the measures and data required by the 2010 indicators, 4) promoting peer review of both methods and data, and 5) helping convene scientific gatherings for periodic assessment of progress towards meeting the 2010 target.

Keywords: Convention on Biological Diversity, assessment, monitoring, indicators, methodological standards

Sarmiento, Fausto

Andean Treeline Dynamics in Tropandean Landscapes

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Treeline dynamics of Andean Tropical mountains (tropandean) have been studied under the traditional paradigm of natural treeline formation. I present a complementary view that incorporates the human dimension and how the anthropogenic driver of landscape change has either compress or extend the extent of forest cover in the upper reaches of tropical mountains. I include both direct and indirect evidences of human drivers on treeline location and formation, mainly on the extensification of grassland for grazing (paramization) in the upper limit, and the intensification of the agricultural frontier, fuelwood gathering and timber extraction in the lower limits, making this two treelines act with a sandwich-like effect in detriment of relict Andean forests. Management plans for the conservation of cloud forest ecosystems, and the evaluation of practices that keep paramos as biodiversity focal points are analyzed in view of the new narratives of neotropical montology for increasing landscape diversity in tropandean ecoregions.

Keywords: Treeline, human drivers, landscape change, tropandean, Ecuador

Scholes, Robert

Global Observing Systems for Biodiversity

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Plenary session

The Millennium Ecosystem Assessment has further documented the precarious and declining state of biodiversity throughout the world, and the impact this has on human wellbeing. It also showed that at this late stage, and after several centuries of investigation and billions of dollars invested, we still have a fragmentary and partial view of the status of global biodiversity. Partly this is due to the immensity of the task; but to a very large degree it is due to our failure to mobilise the huge amount that is known about biodiversity in a useful and accessible way. Several initiatives are beginning to change this situation. They will require support from governments, institutions and biodiversity professionals if they are to influence the outcomes of current efforts to protect biodiversity.

Biodiversity observations begin with a systematic knowledge of the variety of life that exists on earth, but do not end there. It is crucial to know where those organisms exist, in what abundance, and how those distributions and abundances are changing (especially if they are in imminent danger of extinction). Particularly for domesticated species, it is important to know the within-species genetic diversity of populations and their wild relatives. It is further necessary to know the location, parcel sizes, and rates of change of habitats and biotic communities. Finally, it is important to observe trends in the functional properties of ecosystems, in particular in relation to the services that

they deliver to people.

Three issues are central to improved biodiversity observation systems: the conversion of historical records into digital information; inter-operability, right down to the level of the final user, of formerly separate information systems; and the filling of information gaps with targeted new information.

The paper discusses recent trends in biodiversity observing systems at the global scale and makes some suggestions regarding the way forward.

Keywords: observing systems, policy, MA

Shaanker, R. Uma

Livelihood gains and ecological costs of forest dependence

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Contributed oral session 16, Biodiversity conservation III

Silfvergrip, A.M.C.

FishBase, survey data, and museum data

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Contributed oral session 21, Systematics

FishBase is the world's largest encyclopedia about fish, available for free on the Internet at www.fishbase.org. The information has been assembled from more than 600 institutions in about 120 countries and continues to grow. FishBase is also among the ten largest suppliers of occurrence data to the Global Biodiversity Information Facility ('GBIF'). All data is freely accessible over the Internet.

Current FishBase database content includes data on 28,800 fish species with more than 2 million occurrence records based on museum records, survey monitoring data and scattered literature records. FishBase recently acquired, but have not yet published, geocoordinated occurrence data from Swedish waters provided by the Swedish National Board of Fisheries. This data has been compared with the already published, and geocoordinated museum data provided by the Swedish Museum of Natural History.

The combined data set has given invaluable insights into the fish distribution within Sweden. However, one of the more interesting characteristics is how the two data sets represent rare species. Data on rare species have been rarely or never collected by the survey efforts, whereas the museums seem to have favoured these kinds of data. Surveys on the other hand provide a much more complete picture of the economically important fish species like salmon, trout, cod and others as well as providing time series.

The two kinds of efforts complement each other rather than compete and this simple comparison demonstrates the need for multiple efforts collecting data. It also emphasises the need for standardisation efforts, like DarwinCore, ABCD, and TAPIR for combining different data sets.

Keywords: FishBase, database, Survey data, museum collection, occurrence data

Sinha, Bhaskar; Singh, K.D.

Assessing traditional institutions for conservation: a methodological case study on community based forest management in Orissa, India

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Contributed oral session 7, Biodiversity conservation II

There are three different types of institutions available for forest management in India, viz., State Forest Management, Joint Forest Management (JFM) and Community Forest Management (CFM) that operate in different political, economic and social realms. The former two institutions have the state as the sole/dominant partners, whereas, the last is born out a self-realization of local communities towards forest protection rather than from external financial/technical aid. All these institutions have varying impact on biodiversity conservation and its sustainable use.

There have been periodic review in the forest policy of the country based on the assessment of the functioning of formal institutions, however, community based institutions often get unnoticed by the policy- makers due to the lack of a scientific methodology to assess the ongoing human-nature complex interaction. This precludes incorporation of the societal preferences among alternative approaches and institutional frameworks available/possible at grass-root level to achieve the conservation objectives.

The study at hand uses a new integrated approach involving remote sensing, GIS and field inventory for monitoring changes in forest cover and to assess the impact of CFM on livelihoods at the village level in the state of Orissa, India. Because of the statistical soundness followed in the integrated approach, the results provide strong empirical evidence in favour of CFM institutions as a viable institutional alternative for forest protection and management. A comparative analysis of livelihood patterns in the three districts of the state reveals that CFM institutions has contributed towards forest protection and regeneration; however, its potential towards livelihood enhancement based on forest resources has not been fully realized. The study concludes by recommending CFM institutions as forest based model for sustainable development in the forest-rich regions of India.

Keywords: Biodiversity, Institution, Assessment, forest management, remote sensing

Snaddon, Jake L; Eggleton, Paul; Foster, William A

Biodiversity and ecosystem function in bird's nest ferns: invertebrate and leaf-litter diversity affecting litter decomposition

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Contributed oral session 5, Biodiversity and ecosystem functioning II

Epiphytes that house diverse invertebrate communities are excellent natural microcosms in which to carry out ecological experiments on the relationships between diversity and ecosystem function. These epiphytes, in particular litter-trapping species such as the Bird's Nest Ferns, are a major focus of litter decomposition within forest canopies. Here we present data from a study – carried out in Sabah, Malaysia – on how invertebrate and litter diversity affects litter decomposition within Bird's Nest Ferns. Initially, the natural diversity levels and decomposition rates in the ferns were examined across three main habitats – primary and selectively logged dipterocarp forest and oil palm plantation. Litter diversity was

then investigated further by experimentally manipulating the litter diversity within the ferns. This study is part of a larger project, in which we are developing the Bird's Nest Ferns as a model microcosm in which to investigate how biodiversity affects a range of ecosystem functions within the rainforest canopy.

Keywords: Biodiversity, Ecosystem Function, Litter Decomposition, Litter Diversity, Athropod Communities

Spehn, Eva; Körner, Christian; Liberman, Maximo

Sustainable use and biodiversity of sub-tropical highlands- a synthesis

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Contributed oral session 11, Drivers of mountain biodiversity

The Global Mountain Biodiversity Assessment (GMBA) of DIVERSITAS is a worldwide network of mountain biodiversity researchers, with a focus on the documentation and explanation of the biological richness of mountain biota and synthesizing knowledge about the influence of land use on biodiversity. The sustainable land use of alpine grassland is endangered in many areas by over-exploitation or abandonment, reducing productivity, biodiversity and catchment value. A GMBA project with workshops in Tanzania (2002) and the Bolivian Andes (2003) tackled the effects of changes in land use traditions on mountain biodiversity, with a focus on worldwide experiences with management of high elevation biota. More than 50 researchers actively participated, sharing knowledge from all major mountain regions, with a particular focus on the Andes and African mountains.

A synthesis of these workshops provides examples on how mountain land use enhances or reduces biological richness. For the treeless tropical and subtropical highlands, moderate burning regimes can foster high biological diversity while also supporting sustainable yield and ensuring ecosystem integrity (with some exceptions). A combination of fire and grazing caused more pronounced reductions of high mountain pasture biodiversity than grazing alone. Traditional camelide grazing systems in the Andean region developed strategies with low impact on Puna or Paramo ecosystems, but recent changes in the socioeconomic conditions have forced High Andean farmers to increase livestock densities, often above the carrying capacity of these rangelands.

Land use of high elevation grasslands is not necessarily in conflict with biological richness, but depends on grazing or fire intensity, post-fire management and the pace of land use changes.

Keywords: Mountain biodiversity network , mountain grassland, , land use changes, fire, grazing,

Stellmacher, Till; Gatzweiler, Franz W.

Organizing a public ecosystem service economy for the sustainable use of biodiversity

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Contributed oral session 13, Biodiversity and ecosystem services

The core question this paper attempts to address is how social organization needs to respond to biodiversity features and functions in order to achieve its sustainable use. Scholars have suggested that governance of complex systems should be dispersed

across multiple centres of authority and that complex systems can successfully be maintained by polycentric governance with a variety of response mechanisms. But how should polycentric governance of biodiversity be organized? We will suggest directions of institutional change and design principles for organizing a public ecosystem service economy.

Case studies from Ethiopia and literature review.

Borrowing from the organization of public economies in metropolitan areas we distinguish between production and provision of public ecosystem services and suggest the direction of institutional change for the organization of a public ecosystem service economy. We provide empirical evidence of the emergence of polycentric governance for biodiversity conservation in the Ethiopian coffee forests.

The Ethiopian Coffee Forest Forum has been established to pool different stakeholders, namely government, forest user communities, coffee industry, non governmental organizations and Public Private Partnerships. If the market alone cannot solve the allocation of public ecosystem services, economic efficiency criteria based on hypothetical markets are not sufficient.

The need to combine “top-down” with “bottom-up” approaches is not new and has been suggested for developed countries. This paper provides a better understanding of the broader context and directions of institutional change and thereby can serve as orientation for the organization of public ecosystem economies in different political and development contexts.

Keywords: Use of biodiversity, Governance, Institutional change, Ethiopia, Coffee forest

Stoll-Kleemann, Susanne; Bertzky, Monika; Thierfelder, Barbara

Integrating biodiversity governance and management approaches with conservation success

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Contributed oral session 20, Policy for sustainable development

Biodiversity faces many types of threats to its ecological integrity and cultural significance. Harmful practices originate from the failure of policies, laws and decision-making processes to provide effective guidance and conservation incentives to managers and others involved who confirm that problems at the operational level are closely linked with broader governance issues. This paper presents results from the interdisciplinary research project GoBi (Governance of Biodiversity), which evaluates the success or failure of current management and governance approaches used in protected areas. Its main hypothesis is that the ecological outcome of protected areas depends on the appropriateness of their governance and management systems with regard to the local context, and on broader economic and political issues.

The study is based on a large set of expert interviews (~100) and a global survey conducted during the 3rd World Conservation Congress in Bangkok 2004 as well as case studies from Thailand, South Africa and Cuba. The research project GoBi connects different kinds of data by means of an integrative model to be used as a decision support tool in biodiversity conservation and sustainable resource use.

The results show that typical imperfections of governance and management institutions such as enforcement and monitoring problems, insufficient political support, lack of stakeholder involvement, corruption, lack of capacity and leadership

play an important role in determining success or failure of protected areas. The empirical material raised shows correlations between singular success and failure factors and allows deriving reasons for the continuance of governance and management failures.

Adaptable institutional arrangements including responsive leadership and capacity building are necessary to manage biodiversity and ecosystems that have complex social, political, cultural and ecological dimensions.

Keywords: Governance, Protected Areas, Biodiversity Management, Assessing Conservation Measures, Interdisciplinarity

Stromberg, Per; Pascual, Unai

Bioprospecting Contracts: Impact of Legal

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Contributed oral session 20, Policy for sustainable development

International transfers of genetic biodiversity resources (GR) and associated traditional knowledge (TK) provide strategic inputs for northern R & D activities. At the same time, they constitute an important potential source of income for southern economies. However, to the extent that they exist, markets for GR and TK are incipient, thin and subject to a series of imperfections. While a large body of literature deals with the role of associated valuation and property rights, we aim to explain the factors that influence access agreements as such, especially legal and institutional uncertainty.

This paper is the first attempt to apply a cross-sectional econometric analysis to explain contractual performance of GR and TK access agreements. There is now a significant stock of worldwide access agreement to learn from. Based on information from case studies, we apply investment theory and economics of information to throw light on the role of uncertainty.

A preliminary finding is that uncertainty concerning institutional and legal factors distorts GR and TK access agreements in the pharmaceutical industry, worldwide. Country level institutional uncertainty impacts the degree with which agreements proceed or not, as does ratification of the Convention on Biological Diversity. The paper will also deal with the impact of general institutional framework in the source country; type of intermediaries; and market preparedness of the provider.

Unclear and unpredictable laws and procedures distort information flows and induce transaction costs. The problem grows as other information imperfections are added, such as discrepancies in market preparedness between a local provider community and a foreign partner.

Keywords: bioprospecting, contract economics, investment uncertainty, traditional knowledge, genetic resources

Tedesco, Pablo; Hugueny, Bernard; Oberdorff, Thierry

Evidence of history in explaining diversity patterns in tropical riverine fish

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Contributed oral session 4, Drivers of biodiversity changes

It has been hypothesized that past climatic events should have limited impact because species are able to rapidly track environmental changes through range

shifts. However when considering organisms with physically constrained dispersal such as freshwater fish, past events should have left a perceptible imprint on present species diversity. Under this assumption, we expect a higher species richness in regions protected from the dry conditions of the Last Glacial Maximum (i.e. rainforest refuges) compared to regions that were isolated from the rainforest refuges (higher extinction rates due to reduced drainage area and discharge).

To evaluate this issue we considered rivers of the tropical regions of West Africa, South America and Central America that have comparable climatic and environmental characteristics (i.e. net primary productivity) but which have undergone different histories during the Last Glacial Maximum. Multiple regression analyses were applied to assess differences on species richness between drainages that were connected and disconnected to rainforest refuges. We added an intercontinental comparison to our analyses to see if a historical signal would persist even when a regional historical effect (climate at Last Glacial Maximum) had already been accounted for.

Both drainage area and climate at Last Glacial Maximum explained the greatest proportions of variance in the geographical pattern of riverine species richness. Intercontinental differences in species richness were also found after controlling for area, productivity and connectedness to rainforest refuge. This results clearly document the ongoing effect of past climatic conditions on patterns of current tropical freshwater fish diversity, and provides a rather singular assessment of historical effects on species richness at two geographic scales (i.e. within and between regions).

Keywords: species richness, freshwater fish, rainforest refuge, last glacial maximum, net primary productivity

Teklu, Teklu Tesfaye

Traditional knowledge and natural resources management: the case of wild coffee conservation in the montane rainforests of South-western Ethiopia

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Contributed oral session 16, Biodiversity conservation III

The wild populations of *Coffea arabica* are important genetic resources for multitudes of Ethiopian farmers. However, they are disappearing rapidly mainly because of deforestation. One of the factors contributing to the problem is failure to understand and incorporate farmers' perception and knowledge in the development of conservation and use concepts. The goal of this paper is to understand farmers' perception and knowledge of the wild coffee conservation and use and to contribute towards the development of sustainable conservation and use concept.

The study was conducted in two districts of South-western Ethiopia. Data were collected using selected PRA (Participant Observation, Focus Group Discussions, and Key Informant Interviews). A formal survey was conducted on a total of 240 randomly selected households. Data were analyzed using SPSS.

The study documented a considerable wealth of traditional knowledge. This knowledge varied among and between farmers. Such variations are related to differences in social factors and resource endowments. Understanding these variations helps create platforms that enhance negotiations between farmers and outsiders and enables policy makers understand the plurality of views that prevail. Farmers rely on their current perception, knowledge and understanding to cognitively

frame a specific NRM. It is precisely when this is taken in to account that policy debates can be more productive. Understanding farmers' traditional knowledge does not guarantee that policy negotiations will always result in a win-win scenario. However, it may smoothen the path toward consensus building and constructing optimal trade-offs.

Keywords: perception, wild coffee, conflict, conservation, sustainable

Tengö, Maria; Bodin, Örjan; Elmqvist, Thomas; Johansson, Kristin; Lundberg, Jakob
Ecosystem services and taboos in dry tropical forests in Southern Madagascar
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Contributed oral session 13, Biodiversity and ecosystem services

In many developing countries human wellbeing is associated with biodiversity and functioning ecosystems in human-dominated landscapes, however studies of ecosystem processes has mainly been focused on pristine areas and reserves. To strengthen the capacity of an ecosystem, where human pressure is strong, to generate services, social aspects as well as ecological ones need to be addressed. We investigate preconditions for the generation of ecosystem services in an agricultural landscape with patches of forest habitat in Southern Madagascar and the role of local informal institutions, taboos, for protecting the forest patches. Two spatial modelling tools, zone analysis and graph theory, based on Landsat images were used to assess generation of two ecosystem services related to the presence of forest patches: crop pollination and seed dispersal using bees (Apoideae) and Ring-Tailed Lemur (*Lemur catta*) as model organisms. Rules and sanctions associated with forest patches were mapped using semi-structured interviews in the field.

Conditions for pollination and seed dispersal services were found to be adequate in spite of the fragmented forest habitat. The models predict both services to be vulnerable to even small changes in landscape forest cover. Of > 100 forest patches, all larger than 5 ha and many smaller were found to be sacred forests, with strong use restrictions locally enforced with considerable sanctions, self-imposed as well as and physical.

Spatial distribution of forest patches was essential for maintaining ecosystem function, as well as a multitude of small habitats that often are overlooked in conservation schemes. Local informal institutions, although not explicitly directed towards conservation of biodiversity or ecosystem services, can nonetheless contribute to maintaining important habitats in the landscape. Thus, local conservation schemes needs to build on existing institutions.

Keywords: pollination, seed dispersal, sacred forests, Androy, enforcement

Thébault, Elisa; Loreau, Michel

Food webs and the relationship between biodiversity and ecosystem functioning

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Session 3, Biodiversity and ecosystem functioning I

Recent theoretical and experimental work provides clear evidence that biodiversity loss can have profound impacts on functioning of natural and managed ecosystems

and their ability to deliver ecological services to human societies. Work on simplified ecosystems in which the diversity of a single trophic level is manipulated shows that diversity can enhance ecosystem processes such as primary productivity and nutrient retention. Theory also strongly suggests that biodiversity can act as biological insurance against environmental changes. One of the major current challenges, however, is to extend this knowledge to multitrophic systems which are common to ecosystems.

Here we present a theoretical model for a nutrient-limited ecosystem containing an arbitrary number of plants and herbivores in a heterogeneous environment. We examine how changes in species richness influence both average values and variability of ecosystem properties for different food-web configurations and for different scenarios of biodiversity changes.

Our theoretical work shows clearly that trophic interactions have a strong impact on the relationships between diversity and ecosystem functioning, whether the ecosystem property considered be total biomass or temporal variability of biomass at the various trophic levels. In both cases, food-web structure and trade-offs that affect interaction strength have major effects on these relationships. The insurance effect of diversity can still be generated by temporal complementarity among species.

Multitrophic interactions are expected to make biodiversity–ecosystem functioning relationships more complex and nonlinear, in contrast to the monotonic changes predicted for simplified systems with a single trophic level. Merging food-web and biodiversity–ecosystem functioning approaches is an exciting challenge which offers promising perspectives.

Keywords: diversity, food web, stability, ecosystem processes, model

Thomas, Matt

Biodiversity and disease

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Contributed oral session 8, Biodiversity changes and health

Most studies of host-parasite systems (and here parasite is used to mean both pathogens and parasites) consider the interaction between one host and one parasite species or genotype. However, interactions between species rarely occur in isolation and it is likely that the presence of other species within a system will commonly influence the outcome of coupled host-parasite interactions. The aim of this paper is to explore some of the mechanisms by which changes in biodiversity (i.e. increases or decreases in species richness and species composition) can affect the dynamics of infectious disease.

Drawing on some empirical and theoretical examples from terrestrial ecosystems, the paper reviews examples of multi-species interactions in host-parasite systems considering three broad types of assemblages: (i) one parasite and multiple shared hosts; (ii) one host and multiple shared parasites; (iii) one host and shared natural enemies which include parasites and other enemy types such as predators.

Biodiversity affects disease in complex ways. Increased parasite or host diversity can increase or decrease the impact of individual disease agents. The presence of other interacting species or larger scale changes in habitat and ecosystem diversity can also affect disease risk and spread. These results reveal that the environmental context in which the interactions are played out, can strongly influence the ecology and evolution of host-parasite interactions.

Keywords: Environmental context, Disease dynamics, Co-evolution, Multi-species interactions, Host-parasite

Todt, Henning; Dalitz, Helmut; Gliniars, Robert; Musila, Winfred; Uster, Dana
Spatial heterogeneity of abiotic parameters in a mountain forest in Kenya: a process that preserves tree diversity?

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Contributed oral session 11, Drivers of mountain biodiversity

Canopy structure defines abiotic parameters such as light, water, and nutrient distribution in the understorey. These parameters characterize the niches for the seedling survival and establishment. If a highly diverse forest specifies more different niches than a less diverse forest, more species should be able to establish in the highly diverse forest and thus the diversity preserves itself.

Amount and variability of throughfall and its chemical properties were measured in the Kakamega Forest in Western Kenya. The sampling is carried out continuously since September 2001 on a grid based design in 9 plots with 9 rain collectors each. Tree species composition was evaluated. Hemispherical images were taken to describe the canopy structure with parameters such as canopy openness, LAI, and radiation.

Spatial heterogeneity of rainfall exists on and between all plots with different values of heterogeneity in the plots triplets and different amounts of through fall precipitation. This heterogeneity is also present in different levels: within a plot, among a plot triplet, between the plot triplets.

The variance of the precipitation and its chemical properties of the plots are compared with the total variance of precipitation, its chemical properties and with vegetation structure characteristics such as light values and tree diversity.

According to literature, heterogeneous conditions can increase the growth (yield) and can lower the total mortality of plant populations. Thus, heterogeneity of abiotic factors might preserve plant diversity of mountain forests.

Keywords: spatial heterogeneity, mountain forest, Kakamega Forest, Kenya, nutrient distribution, rainfall

Totland, Ørjan; Klanderud, Kari

Simulated climate change altered dominance hierarchies and diversity of a mountain biodiversity-hotspot

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Contributed oral session 11, Drivers of mountain biodiversity

Mountain ecosystems may be particularly vulnerable to climate change because individual species are highly affected by abiotic environmental conditions, such as temperature and nutrient availability. However, we know little about responses of mountain plant communities to the predicted abiotic changes. Moreover, because individual species likely do not respond similarly to environmental changes, the biotic environment they experience may also change.

We conducted a four-year combined warming (open top chambers) and nutrient addition experiment in a biodiversity hotspot of mountain areas of Scandinavia; Dryas heaths, and measured plant community responses in terms of the diversity of lichens,

bryophytes, and functional groups of vascular plant species.

Four years of experimental environmental change altered dominance hierarchies, community structure and diversity of the Dryas heath. The previously dominant dwarf shrub *Dryas octopetala* was replaced by graminoids and forbs under nutrient addition and warming combined with nutrient addition. Total community species diversity declined due to decreased bryophyte and lichen richness and abundances, and dwarf shrub abundances. The shift in dominance hierarchies among individual species resulted in a changed community structure and dynamics primarily caused by an increased biomass and height of graminoids that resulted in an intensified competition for light experienced by lower-stature species.

Our results suggests that community diversity was reduced primarily because changes in the abiotic environment modified biotic interactions, and not primarily due to direct effects of the abiotic environment on individual species performance. Our results highlight the need to consider interactions among species in climate change experiments and in models predicting climate change effects.

Keywords: plant community diversity, climate change, Norway, tundra, interspecific competition

Tschirhart, John

Nature's Cournot Oligopolists

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Contributed oral session 15, Economics of biodiversity

Plant competition helps explain community structure; that is, which plant species will coexist, and which will die off. Similarly, economists study firm competition to explain market structure wherein some firms remain in the market and others exit. We borrow from economic market structures to describe plant competition and show how alternative forms of competition yield very different coexistence results. By doing this we gain a better understanding of plant biodiversity and how it is impacted by human activities.

Plants behave as if they are profit maximizers within a competitive setting similar to economic firms. We model individual plants as maximizers of net energy (photosynthetic minus respiration energy). The model is dynamic as plants devote their net energy to fitness. Each plant chooses its green biomass and the sum of all green biomass yields the community leaf area index (LAI). The LAI plays the role of an economic price, and the plants are assumed to behave as either perfect competitors that take the price as given, or as oligopolists that account for how their biomass will impact the price. Ecologists recognize that plants account for neighbors, so oligopoly behavior is a reasonable assumption.

The model is used to address Tilman's resource-ratio hypothesis and its prediction that the number of species cannot exceed the number of resources. This prediction often is inconsistent with observations, and reasons for this inconsistency have been offered. We offer another reason by showing that the prediction holds up if plants behave as perfect competitors, but does not hold up if plants behave as oligopolists. If plants prove to be better described as oligopolists than as perfect competitors, then this would have important implications for how we model human impacts on plant biodiversity.

Keywords: plant competition, plant coexistence, resource ratio hypothesis, oligopolists, market structure

Tully, Thomas; Ferrière, Regis

Evolution and maintenance of within-species' biodiversity of reproductive traits' flexibility in the springtail *Folsomia candida*

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Contributed oral session 9, Genetics

In a variable yet predictable world, organisms may use environmental cues to adjust their life-history traits. Whereas the fitness benefits of such phenotypic flexibility are well documented, little is known about the within-species' biodiversity of the life history traits' flexibilities or about the genetic constraints that drive their evolution and maintenance.

Here we report that in the parthenogenetic (all-female) springtail *Folsomia candida* Willem (Collembola, Isotomidae), genetic variation exists in the mean and flexibility of reproductive traits. We have proved experimentally that individuals are capable of remarkably fast adaptive adjustments of these traits in response to sudden environmental change. The comparative analysis of eleven genetically distinct clones shows that, due to flexibility, the classical genetic tradeoffs expected between reproductive traits are not expressed. The genetic correlations between reproductive traits revert dramatically between consecutive reproductive cycles started under different environmental conditions. We show that two biodemographic strategies have diverged early in the evolutionary history of the species; a reproductively 'super' strategy appears to cumulate the benefit of high reproductive flexibility and consistently large offspring, but pays the cost of shorter adult lifespan. This macroevolutionary tradeoff between lifespan and reproductive flexibility is not reflected among clones belonging to either strategy, whose genetic variation seems organized by tradeoffs nested among reproductive traits. Thus, genetic correlations depend on the phylogenetic scale at which they are observed, and the macroevolutionary and microevolutionary dynamics of life-history reaction norms can follow different trajectories, suggesting that distinct or at least different gene networks are involved in the short-term versus long-term evolution and maintenance of life-history traits biodiversity.

Keywords: evolution, life-history, bio-demographic strategy, flexibility, tradeoff

Ugalde, Jesus

National biodiversity inventory: The Costa Rica – INBio project

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Contributed oral session 19, Monitoring biodiversity changes II

The National Institute of Biodiversity (INBio) was established in 1989 as a non-profit scientific institution, with a social orientation and for the public welfare. His mission is to promote a new awareness of the value of biodiversity, and thereby achieve its conservation and use to improve the quality of life. Its main goal is based on the concept of biodiversity conservation, which integrates the elements of save-know-use. This concept of knowing the diversity is based on the Biodiversity Inventory Program that is focused on species and ecosystems.

The species inventory is carried out through work teams composed by parataxonomists, technicians, curators and the collaboration of taxonomists from different places of the world, who define and develop the appropriate research

strategies. The ecosystems inventory is based on a work team and the ecosystem classification system from the UNESCO. Both of these processes are developed in close cooperation with the National System of Conservation Areas (SINAC). The use of the barcode, georeferencing specimens, the digitalization of the information and the development of databases, are all key elements to update and make available the generated information to users through internet (<http://www.inbio.ac.cr>)

A biologic collection of over 3 million of specimens, 23.000 species catalogued, and also more than 4.000 electronic pages related to species and ecosystems are the result of this investigation work. This information, as well as scientific articles, field guides and educational materials are being produced in order to support decision making, actions implementation and the development of values in conservation and sustainable development.

Keywords: Inventory, Biodiversity, Conservation, INBio, Costa Rica

Venevsky, Sergey; Venevskaia, Irina

Large scale conservation plan for Russian biodiversity hotspots

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We show on example of Russia that:

Large-scale vegetation diversity can be predicted to a major extent by the climatically determined latent heat required for evaporation and the geometrical structure of landscape, described as an altitudinal difference (Venevsky and Venevskaia, 2003)

National biodiversity hotspots can be mapped from biotic or abiotic data using the quantitative criteria for plant endemism and land use (corrected for the respective country) from the “global hotspots” approach (Venevsky and Venevskaia, 2005)

Quantitative conservation targets, accounting for the difference in environmental conditions and human threats between national biodiversity hotspots, can be set using the national data for Red Data book species

A large-scale national conservation plan reflecting the hierarchical nature of biodiversity can be designed by a combination of the abiotic method at the national scale (identification of large-scale hotspots) and the biotic method at the regional scale (analysis of species data from Red Data book).

During the study:

The three biodiversity hotspots North Caucasus, South Siberia and the Far East are mapped from abiotic data. Despite the relatively small total area of the three Russian hotspots (they occupy only 3% of the entire Russian territory), these areas are inhabited by 68% of the Russian RDB species belonging to the five taxa (vascular plants, amphibian, reptiles, birds and mammals)

A large-scale national conservation plan for Russia reflecting regional differences in biodiversity patterns and human threats is elaborated. The largest ratio of prospective conservation area (82%) is required for North Caucasus, South Siberia follows with 49% and less than a third of the hotspot area is suggested for the large-scale conservation plan for the Far East.

Venevsky and Veneskaia (2003) *EcolLet* 6, 1004-1016

Venevsky and Venevskaia (2005) *BiolCons*, 124, 235-251

Keywords: biodiversity hotspots, RDB species, species-energy relationship, protected areas, Russia

Webb, Tom; Freckleton, Rob

Abundance-occupancy dynamics in British breeding birds

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Contributed oral session 19, Monitoring biodiversity changes II

The long-term monitoring of British bird populations has brought to general attention the severe declines in some species, such as farmland specialists. It has also provided data which enable broader ecological questions to be addressed. For instance, human activity clearly affects both the abundance and the distribution of species, but can it also affect the relationship between these two measures? We investigate this possibility by considering the evolution of a macroecological pattern in British breeding birds over a period of agricultural intensification.

We use data from the British Trust for Ornithology's Common Birds Census to examine changes in the interspecific abundance-occupancy distribution over 3 decades. We relate this to changes in the characteristics of the species–abundance distribution over time, to link local with regional-scale processes.

We show that the correlation between local abundance and regional distribution across British bird species has declined markedly over three decades, coinciding with profound anthropogenic environmental change. Human activity appears to have affected rare and common species differently. This has implications for biodiversity monitoring: measures of, for instance, population size may reveal different patterns and priorities than measures of distributional extent, and these differences may be particularly pronounced in rare species. On the other hand, considering both measures together can provide additional insights into patterns of biodiversity change.

We suggest that human activity can disrupt macroecological patterns, with implications for biodiversity monitoring. Consideration of anthropogenic effects will benefit macroecology; additionally, monitoring macroecological relationships may provide important information on biodiversity change, which would not be available if variables were considered in isolation.

Keywords: abundance, distribution, British birds, macroecology, temporal trends

Weisheit, Anke

Sustainable Harvest Training Approach for Traditional Healers: Experiences from Rukararwe in South Western Uganda

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Contributed oral session 20, Policy for sustainable development

The World Health Organization estimates that 80% of the population especially women in sub-Saharan Africa rely on herbal remedies for all or part of their medicinal requirements. The plant material used in herbal remedies is harvested mainly from wild sources. Over-harvesting has led to local extinctions and threatens the conservation of these key species. Medicinal trees are most at risk, as two thirds of all medicinal plants are trees. Their growth traits and habitat leave them particularly vulnerable through over harvesting and increasing demand. Harvesting is done in Uganda mainly inappropriate with often fatal results on the trees where the medicine is harvested. Indigenous knowledge about sustainable harvest is present but the practices differ due to lack of awareness or future planning. Ring barking lead to

totally dry up of trees The participatory way starting on the existing knowledge and skills and is building on existing knowledge and practice on harvesting is an integrated part of the training discussed in this paper. The Traditional healers come from a wide cultural background, ages and education levels which is addressed in the training by practical example of bark and leaf harvesting integrated as the main components in the training for sustainable harvesting.

Keywords: Indigenous knowledge, medicinal plants, Over-harvesting, extinctions, sustainable harvesting

Williams-Linera, Guadalupe; Lopez-Gomez, Ana; Muñiz, Miguel Angel
Complementarity and nestedness patterns of tree species in a Mexican cloud forest landscape

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Contributed oral session 6, Biogeography

Tropical montane cloud forest in central Veracruz, Mexico, exhibits great natural heterogeneity in plant species composition. The landscape consists of forest fragments intermingled and connected through different land uses. The objective was to evaluate richness and diversity patterns in dominant land uses to determine their contribution to the regional floristic biodiversity.

Sites representing the landscape were selected: forest fragments (10) connected by active (4) and abandoned (4) shade coffee plantations, and old fields derived from pastures abandoned 0-80 years ago (13). We determined richness and density of tree species > 5 cm diameter, and analyzed data using EstimateS. Nestedness patterns were analyzed using the T metric with NestCalc.

A total of 156 species were recorded: 125 were natives (71 primary, 54 secondary) and 28 non-natives. Forest and old-field had the lowest number of non-native species (2-3) and active coffee plantations had the highest number (25). Non-parametric estimators of species richness indicated that more sampling effort is necessary to complete inventories (12 to 36 additional species). Sites in each land use category were highly complementary at the landscape level (50 to 100%). Species in all sites and land uses were distributed in nestedness subsets ($T = 20.2$, $P < 0.001$).

Likewise, coffee plantations had nested native species assemblages ($T = 28.4$, $P < 0.001$). In contrast, species assemblages of forest fragments are not nested ($T = 45.3$, $P = 0.41$); cloud forest species composition changes over short geographical distances.

In conclusion, different land uses influence species composition in a distinctive way at the landscape level acting as repositories of part of the regional diversity, therefore, a regional conservation approach will require focusing on the integrity of the landscape.

Keywords: coffee plantations, cloud forest fragments, conservation, old fields, diversity patterns

Williamson, Phillip; Heath, Michael

Using keystone species for a multidisciplinary analysis of marine ecosystem dynamics in the northern North Atlantic

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Contributed oral session 19, Monitoring biodiversity changes II

'Ecosystem-based management' is now widely stated as the policy goal for sustainable exploitation of marine fisheries. The aim is to minimise damage to non-target species whilst using environmental information (such as diet quality and quantity) to help define safe catch limits, based on ecologically-realistic relationships. But marine food webs contain too many species, and their interactions are too complex, for all components to be measured and modelled. The Marine Productivity programme (funded by the UK Natural Environment Research Council, at \$10m over 5 yr) therefore used a keystone species approach to investigate trophic dynamics in the northern North Atlantic. The programme focussed on factors affecting the abundance of the copepod *Calanus finmarchicus* since this species has high biomass, is an important prey for many fish, and there is evidence from Continuous Plankton Recorder (CPR) data that it is highly sensitive to climate change. The programme carried out full-depth zooplankton sampling in the Irminger Sea (SE of Greenland) on four research cruises in 2001-02. Longterm CPR records were also analysed, and 3D population models developed, to include life history, mortality and physical transport.

An overview of programme results will be presented, to include:

- Comparisons of the different long-term trends in *C. finmarchicus* abundance in the NE, NW and central North Atlantic
- Development of a stage-resolved population model covering the species' full geographic range, driven by ocean physics and satellite-based ocean colour data
- An assessment of the role of *C. finmarchicus* in the pelagic foodweb, including its own diet and its links to euphausiids and higher predators.

Extensive datasets have made it possible to test hypotheses regarding the factors affecting the abundance, year-to-year survival and population connectivity of *Calanus finmarchicus* in the northern North Atlantic.

Keywords: marine, ecosystem, plankton, keystone, sustainability

Wittmann, Florian; Junk, Wolfgang J.; Motzer, Thomas; Piedade, Maria T. F.; Schöngart, Jochen

Species composition and diversity gradients in white-water forests across the Amazon Basin

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Contributed oral session 6, Biogeography

Amazonian white-water (várzea) forests are considered as low-diversity forests in literature, because species richness is low compared to non-flooded terra firme forests. In the present study, we investigated floristic composition, richness and alpha-diversity at the species level on a set of 52 tree inventories from 16 regions across the Amazon Basin. More than 1000 flood tolerant tree species were recorded, indicating that Amazonian várzea forests are the most species rich floodplain forests worldwide. Species distribution and diversity varied 1) on the stage of natural forest succession; 2) along the flood level gradient, with a distinct separation between low várzea forests and high várzea forests and 3) geographic distance. Although the most important families recorded in our study also dominate most Neotropical upland forests, only about 33 % of the tree species listed also has been described to occur in the uplands. In contrast to high várzea forests, where floristic dissimilarity increases significantly with increasing distance between the sites, low várzea forests can exhibit

high floristic similarity over large geographic distance. The high várzea may be an important transitional zone for the immigration of terra firme species to the floodplains. On the other hand, we assume that speciation in the low várzea was less challenged by climatic variations during the past than it was in the uplands, thus may contributing to the comparatively low diversity variations in low várzea forests across the Amazon Basin.

Keywords: alpha-diversity, Amazon, floodplains, similarity, várzea

Zavaleta, Erika

Traits associated with endangerment in the California flora

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Plant species are declining and disappearing at an alarming rate around the world, particularly from megadiverse regions such as the California Floristic Province. Still, we have little understanding of the nature and ecological consequences of these declines. The goals of this study were to (1) increase understanding of factors contributing to plant species vulnerability to human and other disturbance, and (2) infer possible functional consequences of actual, ongoing plant diversity declines from a globally important flora. I address the hypothesis that declining species differ from non-threatened congeners in traits such as size, allocation and life history that could correspond to effects on ecological processes.

To more clearly isolate the relationship between species traits and vulnerability, I performed phylogenetically controlled comparisons with ~500 species pairs, each consisting of one endangered species and one non-threatened species in the same genus and with overlapping distribution in the central coast region of California, U.S.A. I assembled available data about species traits and used logistic regression and regression trees to evaluate relationships between trait values and threatened status.

The clearest differences between threatened and non-threatened congeners involved characteristics related to rarity and restriction. For example, threatened taxa had much narrower elevation ranges and more restricted distributions than non-threatened relatives. However, certain individual-scale trait value differences also emerged. The latter differences indicate that (1) species vulnerability across a range of drivers can be consistently associated with certain traits at the regional scale, and (2) species declines within a single trophic and taxonomic group could affect ecosystem processes associated with the losses of particular traits.

Keywords: vulnerability, plants, phylogenetic controls, rarity, ecosystem functioning

Zobel, Martin; Liira, Jaan

Biodiversity drivers and indicators on a European scale

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Contributed oral session 4, Drivers of biodiversity changes

Human alteration of the global environment has become one of the most important drivers shaping the regional and local patterns of biodiversity. Despite of numerous studies of the effects of local-scale changes in land use on biodiversity, broader continental analyses are still largely absent. Currently we attempt to identify large-scale biodiversity drivers and indicators in Europe.

We studied the effect of natural and anthropogenic drivers on the richness of vascular plants, mammals, birds, and reptiles in 33 European countries. Mixed model regression analysis with spatial autocorrelation settings was applied to elaborate good prediction models for biodiversity. First, geographical latitude and longitude and log-transformed area of the country were included in the model. Next, variables related to habitat loss, land use intensity, human population density, and the share of protected areas were added stepwise. Similar model set up was used also used for the indicator predictability test.

The effect of natural drivers overwhelmed that of anthropogenic ones – biodiversity increased towards the south and the east. Habitat loss was the main anthropogenic driver – richness of birds and reptiles increased with an increasing share of forested land, and richness of plants and mammals decreased with an increasing share of rotational agricultural areas. A higher percentage of protected areas resulted in higher biodiversity. Plant richness was the best predictor of mammal and reptile diversity, but this relationship was region-specific.

Our study shows, based on existing data, that natural drivers and habitat loss are responsible for large-scale biodiversity variation, while the effect of land-use intensity may become evident on a smaller scale. Protected areas have resulted in higher biodiversity. The richness of plants is the most efficient biodiversity indicator on a European scale

Keywords: biodiversity, drivers, indicators, Europe, land use

Acevedo, Francisca; **Koleff, Patricia**

Living modified organisms (LMOs) risk assessment to biodiversity

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Poster session 3, Agriculture and biodiversity

Confronted with the necessity of learning and giving out information to different government entities about the risks involved due to the entrance of LMOs into Mexico, Goal of study: the National Commission for the Knowledge and Use of Biodiversity has developed a "Risk Assessment" methodology so as to be able to analyze the risk that LMO proximity could pertain on wild populations of related species. From 1998 to today, CONABIO has dedicated efforts in developing what is known as the "Living Modified Organisms Information System" (SIOVM in Spanish) which contains the scientific and technical bases necessary for the analysis. Given that Mexico is a megadiverse country, centre of origin and domestication of several important crops, the main objective of the analysis is that of detecting the feasibility of gene flow taking place between the LMO and the wild relative populations in existence. The methodology consists of: 1) Identifying the wild relatives of the LMO that wants to be liberated. 2) Determining, based on published literature, the wild relative and LMO characteristics needed for hybridization to take place. 3) Infer, based on published literature, possible offspring fitness. 4) Detecting if the liberation area falls inside the potential distribution of the wild relative. This methodology has been designed so as to make use of information already in existence without necessarily collecting new data out in the field, and thought for the existing situation of countries like Mexico. Once the analysis is done, a recommendation is issued. Results and discussion: This technical opinion helps the Ministry of Agriculture (SAGARPA) in its function of attending requests of LMO liberations to the environment in mexican territory. Between January 2000 and April 2005, CONABIO has emitted 845 recommendations (case by case). This risk assessment methodology helps decision makers with respect to environmental releases of LMOs. **Keywords:** LMOs, wild relatives, database, risk, assessment

Adhikari Bhupendra Rawat, Gopal

Impact of Climate change along altitudinal gradient in Garhwal, west Himalaya, India

Wildlife Institute of India, India Wildlife Institute of India, India

Poster session 5, Drivers of biodiversity changes

In forestry sector carbon sequestration and carbon sinks of forests are considered to be the most important functions. The present paper deals with the impact of climate change on the structural and functional attributes (biomass and productivity) of the vegetation along an altitudinal gradient (1600-3700 m) in Garhwal, West Himalaya, India. Simple well documented ecological methods were followed in the study. The species richness was maximum in mid-altitudinal zone (1800-2600 m). The density peaks at 2100 m and total basal area at 2800 m altitude and density values were lowest for timberline forest. Along altitudinal gradient maximum total biomass was at 2700 and 2800m. In most of the forest types at mid altitude zone the productivity values were high, while in lower and higher altitudinal range it was low, except at 1600m. The litter fall values were high at 2700 and 2800m. The relationship of ecological parameters with altitude shows that the density and total basal area declines at 3200m and at 9.1°C MAT, while the biomass, productivity and litter fall

declines at 3400m and at 8.2°C MAT. The preponderance of Kharsu oak in Garhwal Himalaya governs the density and total basal area in those sites where the timberline is away from the glacial valleys. However, it is evident from the data that the glacial valleys support the distribution of deciduous species, which may be due to their light seed weight and germination capabilities in the nutrient poor soils. Garhwal, West Himalaya has relatively a mixture of dry and moist temperate climate, which influences the growth and vitality of the forests through the water balance in the watersheds. Therefore, along altitudinal gradient the projected changes in the climate are most likely to have distinct impact on the forest ecosystems.

Keywords: Climate change, West Himalaya, carbon sequestration, structural and functional attributes, India

Aguilar, Ramiro; Aizen, Marcelo; Ashworth, Lorena; Galetto, Leonardo
Determinants of plant reproductive susceptibility to habitat fragmentation: a meta-analysis

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Poster session 5, Drivers of biodiversity changes

Habitat fragmentation is one of the most pervasive changes in terrestrial ecosystems across the Earth and probably the main cause of current biodiversity loss.

Fragmentation often reduces local population abundance, increases isolation between populations, and changes the surrounding environment, thus affecting many ecological processes. Sexual reproduction of animal-pollinated plants (~90% of extant Angiosperms) appears to be differentially susceptible to habitat fragmentation as evidenced from the great disparity of reproductive outcomes observed in the literature. Such responses may depend on certain ecological traits that typify the relationship with and the degree of dependence on their pollinators. Theory predicts that reproduction of self-incompatible (SI) plants will be more negatively affected than self-compatible (SC) ones. Similarly, pollination-specialist plants (S) should be more vulnerable than pollination-generalist (G). However, no study has yet formally tested these predictions. Here, we ask whether there is any ecological trait that may help to predict the reproductive response of plants to habitat fragmentation and therefore, their local extinction risk probability. By means of a meta-analysis we quantitatively reviewed the results from independent fragmentation studies throughout the world and from our own, and evaluated the reproductive output of 71 plant species with different compatibility and pollination systems and life forms. The overall magnitude of the effect size was strong and negative for all the species. Significant differences were found between SI and SC species. SI species were significantly more negatively affected than SC. Surprisingly, no differences were observed between S and G species; neither among different life forms. Our results only partially support theoretical concepts. We discuss possible explanations and stress the importance of these results for the conservation of both, pollination mutualisms and plant diversity.

Keywords: Habitat fragmentation, plant reproduction, conservation, pollination, extinction risk

Aguirre, Armando; Borges de Faveri, Sarita; Dirzo, Rodolfo; Meneses, Nashelly
Effects of habitat fragmentation on floristic composition in Los Tuxtlas, Mexico
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Poster session 5, Drivers of biodiversity changes

We report changes in several plant diversity metrics associated to fragmentation in a Mexican rainforest. We examined richness; floristic composition and similarity; and richness/abundance of mature-forest and light-demanding plants, considering individuals of different size-categories, across a range of fragment sizes and continuous forest. When we included small, recently recruited plants in the sample, we detected a linear decline in species richness, with a decrease of about 22% from continuous forest to the smallest fragment after 20 years from excision. We found a significant shift in species composition: small fragments had distinguishable assemblages compared to continuous forest. There was a shift in the relative representation of mature-forest and light-demanding species: the former decreased and the latter became overrepresented in small fragments. All these effects disappeared when considering the largest plants, which were present prior to fragmentation. Our findings confirm that fragmentation threatens tropical biodiversity and that the effect is differential.

Keywords: Fragmentation-related changes in floristic diversity metrics in a Mexican tropical rain forest

Ahrné, Karin

Bumblebee (*Bombus* spp.) diversity and abundance along an urban to rural gradient, from the inner city of Stockholm towards the southern plain of Uppsala

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Poster session 13, Biodiversity and urbanization

As urban areas keep growing rapidly the importance of and interest in studying the impact of urbanization on ecological systems is also increasing. The process of urbanization implies extensive modifications of the environment such as increasing amounts of buildings, roads and industrial areas (hard laid ground). This in turn results in decreasing amounts of green areas together with increasing fragmentation. Habitat fragmentation and destruction are recognized as major threats to biodiversity. The aim of this study is to examine the importance of landscape structure and different habitats of varying quality for the diversity and abundance of pollinators; chiefly bumblebees, in an urban to rural gradient.

The diversity and abundance of bumblebees were studied in 16 allotments, flower rich green areas, from the inner city of Stockholm towards more rural environments during 2003. These studies are being related to the structure of the surrounding landscape i. e. the amount of hard laid ground within different radii from the study site as well as to site-specific variables such as flower abundance.

Preliminary results indicate a negative relationship between number of bumblebee species observed and amount of hard laid ground both within 500m and 1000m radii. A total number of 13 species of bumblebees were observed during the study, of which seven species occur in 14 or more of the study sites and 6 species occur in 8 or less of the study sites. When looking only at these six uncommon species there is a strong negative relationship between numbers of species observed and amount of hard laid ground in the surrounding landscape. However the surrounding landscape

as well as site-specific variables are currently being analysed in more detail. The structure of the surrounding landscape at different spatial scales seems to have an effect on bumblebee species richness.

Keywords: Bombus, urban-rural gradient, pollinators, habitat fragmentation, landscape structure

Akhtar-Schuster, Mariam; Bock, Bernadette; Falk, Thomas; Görke, Claudia; Hoffmann, Anke; Petersen, Andreas; Vohland, Katrin

An interdisciplinary approach to understand biodiversity services in arid rangelands of southern Namibia

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Poster session 7, Biodiversity and ecosystem services

The interdisciplinary BIOTA Southern Africa project (www.biota-africa.org) has the objective of strengthening the interface between science and policy by supplying information on drivers for biodiversity changes.

Comparative botanical, mycological, zoological, soil and socio-economic assessments were carried out on standardised research sites representing two different management systems (Tiervlei & Gellap Ost). The sites are situated adjacent to each other in the dry rangelands of southern Namibia.

Tiervlei is marked by poverty, strong competition over resources and inappropriate governance structures resulting in poor range management and high stocking rates. Due to missing economic incentives for profit maximisation, the rangelands of Gellap Ost are underutilised. As a result, phytodiversity, especially within perennial species, is higher on Gellap Ost. Arbuscular mycorrhizal fungi (increases water and nutrient uptake of plants) and zygomycetes (decomposes fresh organic debris) are reduced in Tiervlei. The dominance of annual plants makes Tiervlei farmers vulnerable to droughts. Low plant cover increases the risk of soil erosion. The small mammal population in Tiervlei is dominated by one species preferring sandy surfaces. Species common on Gellap Ost favour the savannah environment. Soil fauna activity is higher on Gellap Ost, thereby improving water infiltration and water holding capacity. Despite the very low grass cover, Tiervlei farmers maintained high stocking rates over the past 40 years because of the occurrence of an appreciated browsing source, the *Tetragonia schenckii* bush.

Interdisciplinary research impressively showed the complex interaction between natural resource use, ecosystems' reactions and livelihoods. Based on a participatory approach, subsequent steps include the development of tools for improving ecological states and overall human well-being.

Keywords: biodiversity monitoring, ecosystem functions, interdisciplinary, land use, governance

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Poster session 1: DIVERSITAS National Committee

Akkafi, Hamid Reza

Study of Species Diversity Modifications Drived from Different Management In The Dryland Vegetation

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Poster session 5, Drivers of biodiversity changes

Decreased local species diversity is a widespread impact of human activity and may result in decreased primary production . The major reasons for this effect are: population explosion, industrial development and environmental pressure. So, it is important in species diversity recognize in order to, species diversity is one of the basic subjects in conservation management. The main purpose is to conserve and to keep the most number of species in a region. This aim could only be obtained by understanding the concept of diversity and the measurement methods.

This study was carried out in two different grazed and ungrazed sites of rangeland vegetation of Torogh Basin, South of Mashhad, Khorasan province of Iran with the area of 16500 ha. The area is located in the latitudes 36^o 6' 36" , 13 and longitudes 59^o 17' 59" , 34 with the altitude of 1300 m.a.s.l.

Methods Considering cumulative diversity curve of Brillouin and the minimal area , about 228 and 233 1m² quadrats were taken in grazed and ungrazed sites , respectively . Floristic composition along with percentage cover and abundance of each species were recorded. The data were subject to Diver and Nucosa program packages for analysis.

In total number of 190 plant species were found, 93 species in ungrazed and 70 in grazed site, belonging to 38 families were recorded. Data analysis on the basis of all the numerical indices revealed the more diversity in ungrazed site than in grazed site. In addition, the diversity ordering demonstrated a higher diversity profile in the whole range of scale parameter in the ungrazed site.

Keywords: Species diversity, diversity profile, numerical indices, Torogh basin, Iran

Alvarez Buylla, Ma. Elena; **Francke, Oscar**; De los Ríos Massé, Alma Delia; Martínez Salas, Esteban; Montiel Parra, Griselda; Pérez Ortiz, Tila María; Zaharieva, María

Lacandonia schismatica: a strategic resource for the conservation of the Lacandon Rain Forest.

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Poster session 10, Monitoring biodiversity changes

We focus in the North of the Lacandon Rain Forest of Chiapas, Mexico managed by the Ch'ol community of Frontera Corozal, where *Lacandonia schismatica*, the only angiosperm with central stamens, was discovered. Using this species as umbrella, we established a collaborative effort with The Ch'oles to: evaluate the local biodiversity, create a system of communal reserves and a Communal Information Center and Biological Station, implement productive alternatives for sustainable management, and undertake basic research on evolution and molecular genetics of *Lacandonia*. Flora and fauna documentation, Geographic Information System (GIS) data base, organization of workshops for local capacity building, evaluation of productive alternatives, construction of infrastructure to house local biological collections, a Biodiversity exhibit, a Botanical Garden and a Restaurant-handcraft shop, that will generate resources for local conservation and environmental education programs, are under way. Eleven new species for Science and several species never recorded in Chiapas have been found, species registered as rare in Mexico are abundant in the area, we discovered new populations of *L. schismatica* and its sister

species *Triuris brevistylis*. The territorial GIS and proposal of communal reserves including a newly established 30 ha. one to protect *L. schismatica*, as well as the infrastructure development associated with the project and the productive alternatives being explored will be presented. The biological richness of the Lacandon area is greater than expected. Coordinated conservation efforts are urgent in the region: their success will depend on involvement of local communities, joint efforts of Academic and other non profit Institutions, fare trade programs of products generated in the Region and to improve the living conditions of local communities as well as to increase cooperative organization.

Keywords: rainforest, biodiversity, conservation, *schismatica*, ch'oles

Alvarez-Filip, Lorenzo; Reyes-Bonilla, Hector

Functional diversity of reef fishes throughout Gulf of California

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Poster session 12, Systematics, phylogeny and evolution

The interest on functional characteristics of species is growing, but as most studies about marine species have focused on feeding groups the results can be unrepresentative of the situation of the ecosystems. The objectives of our study were: to construct a functional classification of reef fishes from the Gulf of California combining morphological and ecological traits; and to look for latitudinal patterns of functional groups (FG) along the region. We surveyed 5 localities: Bahia de los Angeles (29°N), Santa Rosalía (27°N), Loreto (25°N), La Paz (24°N) and Cabo Pulmo (23°N). Fish abundance was estimated by counting individuals during 15-minutes in observation cylinders of 5m radius (N=118). To define FG we used information on: trophic level, egg type, length, ratio between length of the maxilla and head, shape of the caudal fin, relationship between length and body height, residence, and position in water column. From the data matrix we plotted a dendrogram in which the terminal branches were considered as functional groups. For each census and FG we estimated abundance, richness diversity (H') and evenness (J'). From the 81 species registered, 11 FG were assembled. Seven FG show no latitudinal trend, four had an inverse relationship with latitude, and one increased its abundance in the north. No census had less than 4 FG and 6 species. Total fish abundance and FG evenness remained constant; however richness of FG increases towards the south, possibly indicating an increase of functional niche space. Last, we noticed a significant and positive relationship between species richness and number of FG, but the slope was 0.16, indicating a certain degree of functional redundancy in the communities. The reef fishes of the Gulf of California were classified into eleven FG. Latitudinal patterns in abundance of FG were not consistent; although there is a trend of decreasing FG richness with latitude.

Keywords: Reef fishes, Gulf of California, Functional groups, Latitudinal patterns, Redundancy

Ameca y Juárez, Eric Isaí; Torres Hernández, Leonel

Ethnobotanical exploration in rural areas: an alternative for biodiversity conservation.

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Poster session 13, Biodiversity and urbanization

México is a privileged country, from a biological as well as a cultural point of view. This has originated studies of the interaction between nature and people that every

day is more susceptible to disappear by acculturation processes. Hence, the concept of biodiversity conservation must be linked with the sustainable development and environment education of people. In such strategy, traditional knowledge must be an important basis for a lasting conservation. My main goal is to strengthen capacity in the protection and sustainable utilization of biodiversity, in this case, of medicinal plants in Xico Viejo, municipality of Xico, Veracruz. My specific objectives are divided in two phases.

1) •Identify the plant species used as medicine by the local people.

•Elaborate a taxonomic inventory.

2) -Document the knowledge about uses.

-Establishment of an ethnobotanical garden.

-Generate learning and social co-responsibility around conservation of medicinal plants.

I use field ethnobotanical explorations; interviews, collect vouchers and morphological data, herbarium documentation, taxonomic identification, and database building. Some results are: 56 Interviews with local people, 43 species of medicinal plants, list of medicinal plants by common name, scientific name and a data base about its uses in specific diseases. However, as conclusion there's a fast input of external cultural elements that isolate the interest about traditional practices. Also, it was founded differences about the knowledge between people into the community, so...it is essential to recognize the necessity of empowering communities. I discuss that, with the ethnoecological approach besides to rescue the traditional knowledge about medicinal plants; it's possible to contribute to enhance new alternatives of use, management and conservation of natural resources.

Keywords: ethnobotanical approach, traditional-knowledge, empowerment, social co-responsibility, conservation

Amoroso, Victor; Amoroso, Cecilia; Mohagan, Alma; Escarlos, Jose
Biodiversity conservation status in Mindanao insland, Philippines
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Poster session 1, DIVERSITAS National Committee

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A new perspective on urban gradients

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Poster session 13, Biodiversity and urbanization

Urbanisation is something that changes gradually. To allow for this extended transition, gradient analyses have been suggested as a suitable tool for studies of urban environments. The gradient paradigm takes the view that environmental variation is ordered in space, and that spatial environmental patterns govern the corresponding structure and function of ecological systems. As the number of gradient-based studies of the urban environment increase, the need for an unambiguous, quantitative and ecologically relevant definition of urban becomes more apparent. The actual measures of urbanization vary, from purely geographical relationship to the city centre to complex gradients where urbanization is measured as an index based on several variables. However, some urban-related effects and

processes do not decrease in intensity in a simple linear or concentric pattern from a single centre. In such situations there is no linear decrease in urbanization with distance from the city centre, nor do all variables related to urbanisation covariate. Moreover, the increasing dominance of humans calls for more information than just landscape features; human activities both transcend habitat boundaries and differ between patches of the same habitat. We hypothesise that management diversity over time will lead to increased biological diversity and that human alterations of natural processes will have profound implications for ecosystems and ecological functions. Our description of urbanisation thus includes the history and diversity of land-use and management, structural factors such as road density, and human alterations of natural processes.

Keywords: land-use history, management, ecological processes, urban gradients, ecological functions

Arango, Ximena; Rozzi, Ricardo

The Magellanic woodpecker (*Campephilus magellanicus*): a charismatic species at the southern tip of the Americas

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Poster session 14, Economics of biodiversity

Conservation of species depends as much on their biological characteristics as on the perceptions and attitudes that humans have towards them. Cape Horn is one of the most remote and pristine areas on the planet with a small multicultural population of 2,300 people living in the town of Puerto Williams. In this setting, we asked the research question, what bird species are valued and preferred by residents? We applied a questionnaire to 120 persons, 20 of each of the main socio-cultural groups, including: 1) the indigenous Yahgan community; 2) personnel of Chilean Navy; 3) long-time residents; 4) authorities and public services personnel; 5) teachers; and 6) school children. The Magellanic woodpecker (*Campephilus magellanicus*) was the favored bird (20% of the total), especially by Yaghans and long-time residents. The other birds frequently mentioned (approximately 10% each) were the kingfisher (*Ceryle torquata*), Andean condor (*Vultur gryphus*), upland goose (*Chloephaga picta*) and sea gull (*Larus dominicanus*). This study demonstrates quantitatively the charismatic character of *Campephilus magellanicus*. It is interesting that this species is also: a) a keystone species, producing cavities in tree trunks that serve as nesting sites for multiple species, b) an ecological indicator for old growth forests, and c) an umbrella species due to its extensive home range. Consequently, the Magellanic woodpecker fills a key ecological and social role for conservation of the world's southernmost forests.

Keywords: Cape Horn, Conservation, Charismatic species, Chile, Magellanic woodpecker

Arenas, Francisco; Hawkins, Stephen; Jenkins, Stuart

Susceptibility of marine algal assemblages to invasion: the role of functional diversity.

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Poster session 9, Invasive species

The emergence of the biodiversity-ecosystem functioning debate in the last decade has renewed interest in understanding why some communities are more easily invaded than others and how the impact of invasion on recipient communities and ecosystems varies. To date most research done on invasibility has focused on

taxonomic diversity, i.e. species richness. However functional diversity of the communities should be more relevant for the resistance of the community to invasions, as the extent of functional differences among the species in an assemblage is a major determinant of ecosystem processes. Although coastal marine habitats are among the most heavily invaded ecosystems, studies on community invasibility and vulnerability in these habitats are scarce. We carried out a manipulative field experiment in tide-pools of the rocky intertidal to test the hypothesis that increasing functional richness reduces the susceptibility of macroalgal communities to invasion. We selected a priori four functional groups on the basis of previous knowledge of local species characteristics: a) Crustose species, b) Turf species, c) Secondary space-holder species and d) Canopy-species. Synthetic assemblages containing one, two, three or four different functional groups of seaweeds were created and invasion by native species was monitored over an 8 month period. Analysis of resource availability in the assemblages with only one functional group showed different patterns in the use of resources, confirming true functional differences among our groups. Experimental results showed that the identity of functional groups was more important than functional richness in determining the ability of macroalgal communities to resist invasion and that resistance to invasion was resource-mediated. Results also showed that diversity reduced variability in invasibility, but this reduction was a consequence of the higher degree of similarity between plots of higher diversity treatments.

Keywords: invasibility, marine, macroalgae, functional diversity, experimental

Arias-Reyes, Luis

Traditional knowledge between Maya farmers from Yucatan, Mexico

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Poster session 3, Agriculture and biodiversity

Milperos are the present Maya corn farmers who maintain a richness of traditional knowledge and biodiversity related with agricultural activities, especially maize in milpa fields. Agro ecological restrictions combined with farmer selection and management have influenced the evolution and in situ conservation of maize diversity cultivated in the slash-and-burn milpa system of the Yucatan Peninsula. For understand the reasons of in situ conservation process we develop: 1) An agronomic comparative analysis of half century maize collections showed a predominance of long cycle landraces, reduction of early varieties and recent introduction of improved varieties. 2) A comparative Ethnobotanical analysis between Maya farmer identification and classification of fifteen maize varieties from Yaxcaba, Yucatan, and standard scientific agro morphological characterization. A high correlation was found between farmer variety names and classical agronomic descriptors using Cluster Analysis UPGMA and Principal Component Analysis PCA. Results indicate that farmer selection and management of maize in the milpa system is an on-going process that conserves a broad range of locally adapted maize genotypes. That should be included in regional breeding and in situ conservation programs of genetic resources against the introduction of transgenic seeds and the consequences in replacing, erosion of landraces, biodiversity loss, ecosystem impact and human diseases. In situ conservation process is the best options to conserve Maya maize landraces and traditional knowledge between present Maya farmers from Yucatan.

Keywords: Traditional Knowledge, In situ conservation, Maize, Biodiversity, Maya

Baas, Peter

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Poster session 1, DIVERSITAS National Committee

Barnaud, Adeline; **Coppens d' Eeckenbrugge, Geo**

What is a landrace? The case of sorghum in a Duupa village (northern Cameroon)

CIRAD Gestion des ressources génétiques et dynamiques sociales, France

Poster session 3: Agriculture and biodiversity

Conserving agricultural diversity is fundamental to yield stability and improvement. But what diversity underlines landraces? Farmers, ethnologists and geneticists give various definitions of "landrace", the extent and nature of level genetic diversity within and among landraces are not always clear. In this study, we focus on types of sorghum managed by Duupa farmers, in the village of Wanté, in northern Cameroon. Sorghum is the principal component of the diet. Sorghum is also an important element of the social system: people drink sorghum beer during collective work especially during threshing. Each participant in collective threshing of one farmer's harvest can freely take seed from that harvest for his own use. Ninety eight named taxa are distinguished by farmers in Wanté; morphological traits allowed the identification of forty six types among these taxa. Seeds are sown as a mixture of types in a field (12 types per field in average), giving the potential for extensive gene flow. Several questions are examined. What level of genetic diversity is behind the great morphological diversity observed among types? How well defined genetically is each type, in a context of potentially extensive gene flow? What is a landrace? We genotyped numerous individuals of each 21 types with 13 SSR markers, and analysed pattern of diversity using multivariate procedures and F-statistics. A high level of diversity was revealed within the village. The global Fis value was 0.61 and large values of Fis were found within types. The value of Fst among types was 0.38. Our results suggest a large heterozygote deficit and underline the genetic structure among types. One group of types seemed to form a single undifferentiated entity comprising several named taxa. In this case, the landrace may be considered to be the entity that groups the terminal taxa. Based on our results, we discuss the role played by farmer in maintaining the characteristics of many landraces.

Keywords: Sorghum bicolor, microsatellites, genetic diversity, landrace, farmer management

Barois, Isabelle; Negrete-Yankelevich, Simoneta; Castillo, G.; Alvarez, J.; Fragoso, C.; Franco, F.; García, J.A.; Fuentes, T.; Kram, S.; Martinez, E.; Moron, M.; Rodríguez, P.; Rojas, P.; Sosa, V.; Trejo, D.; Varela, L.

Below-Ground BioDiversity in Tropical Landscapes. Study case: México

Instituto de Ecología A. C., Mexico

Poster session 10, Monitoring biodiversity changes

Below-Ground Bio-Diversity (BGBD) inventories in tropical landscapes of seven countries (Brazil, Mexico, Cote d'Ivoire, Uganda, Kenya, India and Indonesia) are being studied in the first phase of the project "Conservation and Sustainable Management of Below-Ground Biodiversity". The project is funded by GEF,

implemented by UNEP and administered by the Tropical Soil Biology and Fertility Institute of CIAT (TSBF). The objective is to enhance awareness, knowledge and understanding of BGBD's importance to sustainable agricultural production in tropical landscapes by inventorying, analyzing, evaluating BGBD and implementing methods for conservation and sustainable management. Thus we are investigating the biodiversity of some soil functional groups in mosaics of land-uses at differing intensities of management. In Mexico the bench mark site is in the Biosphere Reserve of Los Tuxtlas around Santa Martha volcano. We sampled BGBD and socio-economic indicators in three localities and in four land uses (forest, agroforestry, pasture and maize). The BGBD is identified and analyzed in function of soil parameters, land history and management. The inventories gave in the different groups identified as morphotypes or species: 27 Rhizobium, 44 Mycorrhiza, 20 Phytopathogen Fungi, 165 Nematods and Macrofauna (> 61 Ants, 9 Termites, 164 Beetles and 13 Earthworms). The data analysis determined that there was no difference in the diversity of groups between the 4 land uses but there was a significant difference between the sites. Multivariate analysis will be done to integrate response and explanatory variables to try to define patterns of BGBD and bioindicators of the soil.

Keywords: Belowground, Biodiversity, Mexico, Tropical, Land use

Barreiro, José Manuel; Morales, Rafael; Narváez-Trujillo, Alexandra
Molecular evaluation of the genetic diversity of *Annona cherimola* Mill at one of its proposed centers of origin

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Poster session 12, Systematics, phylogeny and evolution

Annona cherimola is a tropical fruit that is widely appreciated World-wide due to its particular flavor and nutritious value. Commercial production of this fruit has reached important level in Chile, United States and Australia; with Spain as the leader in productivity.

It is originally from the inter-andean valleys of Ecuador and Perú, but its precise center of origin has yet to be determined.

Due to its potential economic importance and the need to evaluate genetic resources that can be incorporated into breeding programs, IPGRI, in the year 2000 mandated the establishment of a germplasm collection in Perú. A second germplasm bank was established by the Universidad Nacional de Loja (UNL) with wild materials from southern Ecuador. To date this collection has approximately 600 cultivars which have been partially characterized for various agronomic traits.

Our research is centered on evaluating a subset of the accessions of the germplasm bank of the UNL using six AFLP primer combinations to determine the genetic diversity existing in this putative center of origin. Additionally, we select the best cost effective combinations that will be used to screen the germplasm collection in correlation with selected agronomic traits.

Keywords: custard apple, *Annona*, AFLP, domestication, Ecuador

Bazile, Didier; Dembele, Souleymane; Staphit, Bhuwon R.; Subedi, Anil
“How communities provide seed system’s resilience to maintain on-farm

agrobiodiversity through social networks?" Mali and Nepal cases studies

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Poster session 3, Agriculture and biodiversity

Agrobiodiversity management is a key for coping with climate uncertainties in low-input agricultural systems for people from the developing countries. Many landraces continue to disappear and it is crucial to identify if farmer is the adapted scale for agrobiodiversity management. Considering the high cost of ex situ conservation and, the importance to develop in situ conservation, we ask the dependence on the natural resource knowledge and agrobiodiversity loss at the farm level. This research deals with the structure of society, the way the farmers act, where and how decisions are made to manage genetic resources. Demonstration is based on results from 4 years studies conducted in 11 communities in Mali and Nepal. We analyze the knowledge and use of cereals (sorghum and rice). According to a scaling-up methodology and a systemic approach, data was gathered in a suitable spatial framework. A network analysis approach using a snowball-sampling technique was adopted to map seed flows. Ecological indices were used to explain significant differences between communities. 75% of the farms cultivate only 1 variety/cereal/year. So the diversity is not managed at the peasant's level but through social networks that determine an exchanging group of seeds and provide a high level of diversity at the agroecosystem level (more than 10 varieties/cereal in a village). Farmers' informal system gives very important resilience of the flow of genetic materials. There is certain degree of stability of network links and in this process nodal farmers do play significant role. The CBD has given a clear mandate for on-farm conservation. The key question is how to increase the diversity available to farmers and enhance farmers' capacity to manage this diversity dynamically. The result of farmer experimentation is a dynamic, open, system of on-farm management of genetic resources with both recruitment and loss of varieties.

Keywords: Agrobiodiversity, Seed system, Social Networks, In situ conservation, Developing countries

Ben Salah, Mohamed

Agrobiodiversity and population traditional knowledge in the coastal tunisian oases

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Poster session 3, Agriculture and biodiversity

The Tunisian coastal oases constitute a unique model of very rich plant biodiversity where cohabits more than 40 species plant in different floors of culture.

The date palm constitutes the highest floor. The second is the fruit floor. The lowest floor is constituted by various cultures: vegetables, fodder, industrial, condiments, ornamental and tincture plants.

The present paper constitutes the result of a MARP diagnosis having for objective to raise the plant diversity and traditions and uses of the products in those oases.

The diagnosis showed a rich date palm diversity, and knowledge of population. It revealed the existence among others of nearly 35 local varieties of date palm and of nearly 40 other cultivated plant species.

Under a high palm tree, grows an olive and fig trees, pomegranate and vine grapes. Under grown cereals (wheat, Barley, corn, but, sorghum) vegetables (onion, carrots, tomatoes, melons ...), pastures and many other plants: rose trees, jasmines, thyme,

rosemary, sage, lavender.

Some aromatic plants: Cumin, caraway, coriander are cultivated. And we can see also co-planted pepper, fenugreek, rubia and henne (*Lawsonia inermis* L.).

This survey as nearly raises 20 uses of dates and by products of the date palm under different shapes: fresh consumed, kept or transformed.

It showed also that the habitants of these oases possess, for a long time, a knowledge to make ingenious concerning use and conservation of the products and by products of the date palm and make some uses: culinary, medicinal and utilitarian (construction of their houses, fences, bridges and borders).

This survey has all as much demonstrated the factors that risk weakening this balance for a long time maintained in these oases. Urbanisation, lack of water, and losses of good agricultural practices are some of those factors.

Some recommendations are also presented in this paper for this system maintain and conservation.

Keywords: Agro biodiversity, oasis, Traditional knowledge, Tunisia, conservation

Benitez-Inzunza, Esteban; Trejo, Irma

Beta diversity, structure, composition in an altitudinal gradient in temperate forests in Santa Maria Yavesia, Oaxaca, Mexico

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Poster session 10, Monitoring biodiversity changes

Santa Maria Yavesia is located in the river head of the Papaloapan basin, in the Juarez Mountains, Oaxaca. The community has an approximate territory of 9000 ha, which extends in altitudinal gradient that goes from the 2000 to the 3280 m a.s.l. most of which is part of the protected communal area. This work objective is to analyze the structure, composition and floristic diversity along the gradient. To do so, ten sample sites were established in a 1000 m² area, in which all individuals were censused with a DBH \geq 1 cm. The diversity value obtained according to the Shannon index goes from a 1.02 to 2.91. With respect to the similarity indexes, Sorensen showed that 82.2% of the sites share less than the 30% of the species, while according to Moristas only the 73% of the sites are 30% similar; a high beta diversity is observed, something rarely seen in temperate forests. A change from conifer communities to mixed forests exits with a change in the dominant species. Above the 3100 m a forest dominated by *Pinus hartwegii* is established with the lowest diversity, at the 3000 m an *Abies hickelii* forest and mixed communities of *P. ayacahuite*, *A. hickelii* and *Quercus ocoteaefolia* exits, which are replaced with *P. lawsonii* and *P. patula* in the middle zone, while in the lowest the mixed forest are made of *P. oaxacana*, *P. herrerae* and *P. leiophylla*, accompanied by *Quercus laeta*, *Q. rugosa* and *Q. crassifolia*. A total of 10 different species of pines and 13 of oak were recognized, representing in both cases, near the 10% of the world diversity. The data obtained confirms the importance of the zone for its protection.

Keywords: beta diversity, conservation, structure, communal reserve, temperate forests

Bjerknes, Anne-Line; Hegland, Stein Joar; Nielsen, Anders; Totland, Ørjan

Alien impacts on pollination of natives

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Poster session 9, Invasive species

Introduction of alien species is today considered as one of the largest threats to biodiversity. Most of the research considering alien plants is concentrated on how they compete with native plants for resources such as nutrients and space and how this leads to displacement of native species, reduced crop yields and water supply. Recently, different reviews have tried to summarize the reasons to alien success. These reasons are developed as seven hypothesis regarding lack natural enemies, evolution of invasiveness, empty niche, novel weapons, disturbance, species richness and propagule pressure. However, such direct vegetative interactions between alien and native species are not the only way aliens may affect natives. Surprisingly, no reviews have considered the effect aliens may have on the reproduction of native plants, one of the most important components in plant fitness. Several alien plants can attract pollinators (an important resource), and may therefore reduce pollination success in natives. For most flowering plants, animal pollination, thus pollen availability is an essential process for the long-term survival of populations of most species because it affects seed production and genetic variability. Thus, any reduction in pollinator visitation (or change in pollinator type or behaviour) caused by alien invasion conceivably have negative impacts on seed production of natives and potentially on their population dynamics.

Although enormous attention has been given to alien plants, very few studies have focused on how aliens may affect the pollination and subsequent reproduction of natives. We here review recent experimental studies of alien/native effects on pollination success in natives, and based on general pollination ecology we propose different pollinator-native plant interactions and consequences that may be changed in the presence of alien plants, such as biodiversity and ecosystem functioning.

Keywords: alien plants, native plants, competition, pollination, pollinator behaviour

Borgström, Sara

Management of urban green areas - an evaluation in Greater Stockholm.

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Poster session 13, Biodiversity and urbanization

Urban green areas are critical sources for generation of many ecosystem services of value for urban inhabitants. Knowledge about management of urban green areas is rapidly developing, but the condition for preservation in an urban social-ecological complexity is still relatively unknown. One emerging strategy to handle this complexity is to develop an ecosystem management, where management is based on ecological scales and incorporates humans as an ecological component. The goal of this study was to analyze the current management practices of urban green areas compared to published criteria of ecosystem management.

The study was conducted in five different urban green areas; a national urban park, a national park, a nature reserve, a cemetery and a watershed. Two main data sources were used: written management documentation and interviews with key informants. Open-ended key questions were formulated based on the ecosystem management criteria and more case-specific questions were created during the analysis. The details in the dataset were classified as supportive or non-supportive to each

ecosystem management criterion.

The analysis revealed three general deficits: limited recognition of ecological cross-scale interactions, limited or no monitoring and evaluation and limited or no recognition of humans as part of the managed system. The general occurrence of these three deficits implies that these five green areas are seen as static and isolated and not interacting with other urban structures.

Sustainable cities need a more conscious, integrated and dynamic management of the whole urban landscape. More participation, awareness of cross-scale interactions and adaptive co-management is needed to reconnect the urban structures. In landscapes of intensive use like cities, future land management is about combining usage of nature resources with nature conservation.

Keywords: urban green areas, ecosystem management, ecosystem services, resilience, dynamic landscape

Bressan, Eduardo de Andrade; **Veasey, Elizabeth Ann**; Vencovsky, Roland; Zucchi, Maria Imaculada

Allozyme variation in *Dioscorea cayenensis* from swidden agriculture small holdings in vale do Ribeira, São Paulo, Brazil

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Poster session 12, Systematics, phylogeny and evolution

In the southern region of the State of São Paulo (Vale do Ribeira) semi-intact corridors of the Atlantic Forest are found co-existing with swidden agriculture. Small holding farmers are responsible for maintaining and reproducing genetic diversity of plant crops such as yams (*Dioscorea* spp.). *D. cayenensis*, of African origin, was introduced into this region through the slave trade. Genetic diversity was evaluated by means of isozyme markers, examining its distribution throughout different organizational levels. Of the 91 subsistence farmers visited, characterized by low energy input and intense family labor, only 17 still cultivate this species. Twenty-one *D. cayenensis* ethnovarieties were assessed by isozyme analysis using polyacrylamide and starch gels. Eighteen enzymatic systems were tested for the polyacrylamide gels of which six were selected for their high resolution bands, such as phosphoglucosomutase (PGM), glucose-6-phosphate dehydrogenase (G6PDH), phosphoglucosomerase (GPI), superoxide dismutase (SOD), shikimate dehydrogenase (KDH) and aspartate aminotransferase (AAT). For the starch gels, however, only the malate dehydrogenase (MDH) system was selected. Due to the polyploid nature of yams, isozyme bands were scored as binary data and the Jaccard similarity index calculated between pairs of individuals. A dendrogram was made through the UPGMA clustering criteria. Correlation between the genetic and geographic distance matrices and molecular variance analysis (AMOVA), to partition the variance components into different hierarchical levels, were performed. Results indicate that there is high genetic variability in the region for *D. cayenensis* ethnovarieties, but this is not genetically correlated with the geographic distance. The majority of the variation was partitioned among small holdings within settlements. Therefore, it is recommended that future collection expeditions give priority to sampling various small holdings within settlements.

Keywords: Genetic diversity, isozymes, landraces, traditional agriculture, yams

Brosi, Berry; Daily, Gretchen; Ehrlich, Paul

Bee communities and pollination services in human-dominated tropical landscapes

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Poster session 7, Biodiversity and ecosystem services

Conservation science needs a much better understanding of the degree to which human-dominated landscapes support biological diversity and ecological services, and how this support can be efficiently sustained and augmented. Bees (Hymenoptera: Apoidea) are an ideal study taxon for this effort because they reflect both biodiversity and the ecosystem service of pollination. We investigated bee diversity, abundance, and foraging patterns in pastures in southern Costa Rica countryside varying across four factors: distance to forest, forest fragment size, pasture tree management, and flowering plant resources.

We sampled bee communities over three seasons with pan traps, Van Someren traps, and aerial netting; we measured flowering plant resources with line transects. To study foraging patterns, we analyzed stable isotopes of C and N in bee specimens.

Preliminary results from nearly 4,000 individual bee records show: 1) surprisingly high bee species richness overall, but 2) similar richness, diversity, and abundance across all study factors; 3) important changes in bee tribal composition among distance and pasture classes; 4) differences in the proportion of bees carrying pollen among forest distance classes and pasture types; and 5) differences in spatial foraging patterns among landscape factors, as shown with stable isotope analysis. iv. Conclusions: Our work indicates that bee communities as a whole can be relatively resilient to landuse change, though our results suggest management interventions at several scales for conserving and augmenting bee biodiversity and pollination activities in tropical working landscapes. In particular, even very small forest fragments play an important role in maintaining a diverse and abundant bee community, making their conservation in agricultural landscapes critical.

Keywords: conservation in working landscapes, bees (Hymenoptera: Apoidea), pollination, biodiversity and ecosystem services, landscape ecology

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Temporal dynamics of avifauna in urban parks of Puebla, Mexico

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Poster session 13, Biodiversity and urbanization

Urbanization provokes local extinctions along a gradient of increasing habitat perturbation and stress, leading to homogenization. Since urbanization affects avifauna at different levels, birds may be considered as indicators of the prevailing environmental conditions. During 8 months, from February to September (2004), we surveyed a study of the avifauna at urban parks of Puebla and its surroundings, using the “qualitative point count” method. We analyzed 3 large parks, 3 small parks and a negative reference with a total of 1378 census points, in order to acquire knowledge on the temporal dynamics of birds.

We obtained the values of species richness both observed and calculated by each non-parametric estimator (ICE, Chao 2, Jack 1, Jack 2, and Bootstrap) for each of the 6 parks and the negative reference. Avifauna’s richness was always higher in

large parks than in small parks; in all cases the negative reference had the lowest richness values. When we analyzed the percentage of presence for each species throughout the 8 months, we found a series of patterns, coherent with the phenology consulted. For habitat preference, we found that while some species prefer large parks, others prefer small parks; there were species that showed no preference at all. For the winter-migrant species, we were able to complete the cycle for every case, except one (*Dendroica coronata*). We were also able to distinguish a group of species which we called “rare”, because their percentage of presence values were lower than 15%, in general, these species showed preference for large parks. In order to develop an action plan in favour of biodiversity’s conservation inside the cities, it is necessary to understand the temporal behaviour of species in urban environments. It is important to know the characteristics and needs of birds in order to determine the most vulnerable ones and protect them, preventing homogenization of urban areas.

Keywords: species richness, temporal dynamics, urban, avifauna, birds

Calvo-Irabién, Luz María; De la Torre-Salvador, Lucía

Ecological and cultural factors affecting diversity of lianas and vines used for handcrafts, in three Mayan communities of Quintana Roo, Mexico

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Poster session 5, Drivers of biodiversity changes

Mayan people have historically used lianas and vines for handcrafts generating an important traditional knowledge. The analysis of links among environment and handcraft production is relevant for biodiversity conservation and management. We documented the use of lianas and vines using 500 semi-structured interviews in three communities of NW Quintana Roo. Harvesting, management, manufacturing and commercialization practices were documented using participant observation during related activities. Distribution and abundance of four selected species was evaluated using 21 transects, in different vegetation types, where environmental variables (age, disturbance, understory light, soil type, distance to town) were quantified. Based on this data and using multivariate analysis, we describe the relationships found between abundance, distribution and ecological and cultural variables. Resource availability and harvest impact were also evaluated. Eleven liana species were reported with a total of 17 different uses. Five of these species have not been reported before for this area. The principal use is construction and basket weaving for corn harvest. The four more frequently reported species are of extended use in the Yucatan Peninsula. Disturbance and vegetation type were the ecological factors that most closely explained abundance. Density was higher in secondary vegetation, reflecting lianas preferences for regenerating in disturbed habitats, but harvestable densities were higher in the mature forest. Cultural factors affecting density were increasing open areas for livestock and agriculture. Distance to towns had no influence in lianas abundance. Our results suggest that sustainable harvest is possible for *Cydista potosina* and *C. aequinoctialis*, both abundant species favoured by disturbance. On the contrary, due to their low abundance and non-disturbed habitat, for *Philodendron radiatum* and *Macfadyena unguis-cati* cultivation is a more appropriate management.

Keywords: handcrafts, lianas & vines, sustainable harvest, disturbance, deforestation

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Diversity of Mimosa (Leguminosae-Mimosoideae) in Mexico, its second geographical distribution center.

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Poster session 10, Monitoring biodiversity change

In subfamily Mimosoideae, *Mimosa* is the second largest genus with ca. 510 species; 90% of them are American and the other 10% occur in Africa, Madagascar, and Asia; three species are introduced in Australia. After field and herbarium work, comparative morphological and palynological studies, and a phylogenetic analysis, our results confirm that Mexico, with ca. 110 species, is the second geographical distribution center of the genus after Brazil. American species have been classified by Barneby (1991) in five sections: *Mimadenia*, *Batocaulon*, *Habbasia*, *Mimosa*, and *Calothamnus*, all of them well represented in Mexico, excepting the latter. Mexico is a unique centre of diversity of *Mimosa*, a genus with noticeable relationships with species from other parts of the world; however, 57% of the 110 species are endemic to the country, 14% are found in Mexico and southern United States, other 6% extend to Central America, 5% have a disjoint distribution: Mexico-West Indies and Mexico-Argentina, and the remnant 18% are widely distributed from Mexico to Argentina. Diversity of the genus is evident, as well, by a wide range of life forms: herbaceous (annuals and biannuals), shrubs (predominant form in Mexico), trees, and lianes; occurring in different vegetation types: tropical rain forests, tropical deciduous forests, and arid tropical scrubs (where major species diversity is found), few species are found in dunes and in temperate forests. Furthermore, Old World species of the genus have not been formally assigned to any section or series, except those species known since Bentham (1875). Based on a comparative study of 40 Madagascan, African, and Asian species, we have placed most species in Section *Batocaulon* and only two in Section *Habbasia*. We consider that most Mexican *Mimosa* species are more closely related to the Old World taxa, than they are to the South American ones.

Keywords: *Mimosa*, diversity, geographical distribution, Mexico, Old World

Cano, Mercedes

Actions on biodiversity in Cuba

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Poster session 1, DIVERSITAS National Committees

Cardenas Hernandez, Oscar; Contreras Martinez, Sarahy; Ponce Martinez, Oscar
Impacts of land-cover change in the Sierra de Manantlan Biosphere Reserve, Mexico

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Poster session 5, Drivers of biodiversity changes

Deforestation and land-cover change are transforming the ecosystems at a global scale, particularly in the tropics. Nonetheless, quantitative data on where, when and

why such changes take place at global, regional and national level are still incomplete and, more often, inaccurate. Deforestation and land-cover/use change have been insufficiently studied in Mexico and quantitative data on these issues is scarce. This study analyzes the extent of land-cover changes in the Sierra de Manantlan Biosphere Reserve from 1970 to 2000 and its effects on the potential spatial distribution of the avian community of this protected area. To assess the changes in land-cover and land-use in the Sierra de Manantlan, we utilized satellite images obtained in 1970, 1980, 1990 and 2000. These images were classified using a supervised classification technique called MAXSET. The satellite images scenes were classified utilizing the spectral signatures obtained from well-known categories and training sites. To detect changes in land-cover we carried out a change detection analysis, a procedure that involves the use of multi-temporal data sets to differentiate areas of land-cover change between dates of imaging. Our results show a decrease in forested areas and an increase in areas destined to agriculture and grazing. The loss of forests in the Sierra de Manantlan has impacted negatively the potential number of bird species found in the area. Our results from the species-area analysis show that there has been a potential decrease in the number of species of birds during the last 30 years, using both conservative and moderate z-values. Since the shape of the species-area curve is determined by this factor, our model predicts that more than 50% of the land can be deforested before the slope of extinction curve rises rapidly with deforestation when values are low (< 0.20). Conversely, at high values (>0.60), extinction rates are almost proportional to deforestation rates.

Keywords: land-cover, deforestation, biodiversity, reserve, Mexico

Cecaira-Ricoy, Ramón; Cano-Santana, Zenón

Bottom up forces and secondary productivity of *Neoscona oxacensis* (araneae: araneidae) at the pedregal of San Angel Ecological Reserve, (d.f.), México

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Poster session 6, Biodiversity and ecosystem functioning

Secondary productivity of *Neoscona oxacensis* was quantified on two types of sites within the Reserve. The hypothesis was that the secondary productivity would be affected by bottom up forces, because perturbed (I will be referring them as P) sites has low vegetal diversity and are dominated by a highly nutrient grass, existing a positive effect over the herbivore and predator insect productivity. A low productivity is predicted in conserved (C) sites, with higher diversity and dominancy of a poor edible grass.

In 2001, weekly samples were done on 6 sites (3C and 3P), registering density and corporal size on spiders. Body caloric content and secondary productivity was measured. Vegetation structure was analyzed.

Nine plant spp. were recorded on P. and 20 spp. on C. Values of the Sørensen similarity index (SI) varied from 0.31 to 0.49 in C, and from 0.09 to 0.50 in P. The SI between different type sites ranged from 0 to 0.11.

P. clandestinum had a relative cover of 83.6% in P, and *M. robusta* 49.6% in C.

Density, weight and weight per unit of area, were significantly greater in the P in relation to the C. Spider energetic content in C was 28.92 kJ g⁻¹, in P it was of 28.42 kJ g⁻¹. Secondary productivity in C was of 0.84 kJ m⁻² year⁻¹, in P of 2.22 kJ m⁻² year⁻¹.

Results suggest that the differential secondary productivity between sites is mainly driven by a bottom up effect. Other factors can be acting in determining this force: substrate type that affects directly the spatial heterogeneity, vegetation diversity, nutritional differences between dominant grasses, quantity and quality of herbivores and the differences in the attack facilities of herbivores over plants.

Keywords: energetics ecology, bottom up forces, secondary productivity, food webs, ecosystem functioning

Chacon, Paulina

Seed rain and seedling survival on nurse cushions in the high Andes of central Chile

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Poster session 6, Biodiversity and ecosystem functioning

It has been reported that nurse plant species are important for the maintenance of diversity in stressful environments such as high mountains. We have observed many alpine plant species growing on high elevation cushion plants in the Andes of central Chile (33° S). Nevertheless, it is not clear if this pattern is determined by differential seed rain or higher seedlings survival. We predict that seed rain, measured as seed abundance, will be similar on and outside cushions of *Laretia acaulis* (Apiaceae), whereas seedling survival will be higher on *L. acaulis* cushions, due to the favourable microhabitat conditions provided by this species.

At two elevations (2800 and 3200 m.a.s.l.) in the Andes of central Chile, we measured the seed rain using seed traps placed on *L. acaulis* cushions and in open areas adjacent to the cushions (microhabitats). Additionally, we registered the survival of experimentally planted seedlings on and outside cushions.

Seeds of 7 and 6 species were found in the seed traps at 2800 and 3200 m, respectively, with five of them shared between both altitudes. Only microhabitat had a significant effect on the number of seeds deposited in seed traps after 51 days; while altitude had no effect. A greater number of seeds was recorded for the open microhabitat at 2800 m. Survival of experimentally planted seedlings was higher within cushions than outside, particularly at the lower elevation. Thus, we conclude that the greater relative abundance of some alpine species on *L. acaulis* cushions is due to higher survival of their seedlings.

Cushion nurse species provide a favourable habitat for seedling survival in the physiologically stressful environments of the semi-arid Mediterranean-type climate Andes of central Chile through facilitation during the first phases of the plant life cycle.

Keywords: Andes of central Chile, cushion plants, seed rain, seedling survival, *Laretia acaulis*

Chao, Jung-Tai; Chow, Sing-Chi

An automated system for ecological research on migratory danaid butterflies and their overwintering sites

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Poster session 10, Monitoring biodiversity changes

Four species of *Euploea* and 8 species of danaid butterflies less in number migrate from north, as far as from Osaka of Japan (ca. 34°, 32' N), to dozens of groves in southern Taiwan (ca. 23° 03' N), for overwintering. Due to past commercial harvest, ended around 1980, and subsequent habitat destruction, the population of overwintering butterflies and the number of overwintering sites has been decreasing. The habitat requirement of the overwintering danaids needs to be identified in order to conserve this diverse array of butterflies, prevent habitat from further encroachment and to restore degraded habitats. The overwintering sites of the migratory danaids, however, are generally remote and in some cases difficult to access. Frequent scientific study in accessible sites may disturb butterflies and increase their mortality. Current information technology such as automatic monitoring system, ADSL broadband network, and image and multimedia database, when applicable, can increase our accessibility, avoid human disturbance, improve data quality, not to mention broaden research opportunities in the future. A total of 6 instrumented towers were set up to provide numerical data on temperature and relative humidity, wind speed and direction, and solar radiation every 10 minutes. Eight remote controlled video cameras were mounted to provide image data of the danaids and their surrounding environment. Numerical data were stored in data loggers and later downloaded to a computer server. Image data had been transmitted, via ADSL broadband, to a server before it was observed, monitored, computed, analyzed or shared through Internet. Web page layout allowed real time observation of butterflies through Internet. Real time meteorological information and query of historical data are also available on the Internet. We will demonstrate this "cross-boundary" research tool in our oral presentation and discuss more about its benefits.

Keywords: Migratory butterflies, overwintering sites, Danaid, automated system, information technology

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First results from diversity mapping of *Passiflora* (Passifloraceae) and *Vasconcellea* (Caricaceae) in the Colombian coffee growing zone

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Poster session 10, Monitoring biodiversity changes

The Colombian coffee-growing zone is one of the eco-climatic areas undergoing major impact of human activities in Colombia. It roughly corresponds to the 1000-2000 m altitudinal range along the Cordilleras, where agriculture is principally based on growing of coffee, plantain and fruits (mainly citrics), and raising cattle. Large and middle-sized towns have grown steadily in the last decades, imposing new pressures on rural lands (e.g. river basin management for water supply, recreational activities), with negative but also potentially positive effects, such as the new conservation demand and the concomitant development of agro-ecotourism. With the general objective of providing scientific bases for environmental managers at the local and national levels, a study of the distribution of biodiversity was undertaken using as indicators two genera that show particular richness at medium to high altitudes: *Passiflora* (passion fruits) and *Vasconcellea* (mountain papayas).

Geographical records were gathered for 3780 samples from herbaria, genebanks or the field, for 154 *Passiflora* and 10 *Vasconcellea* species. The DIVA-GIS and

FloraMap software packages were used to produce maps of observed diversity and potential range of each species.

Both genera show an altitudinal variation of their diversity, with a peak at intermediate elevations. Potential diversity is highest along the Cordillera Central, in the central coffee zone, and between the Cauca and Huila departments. Other hotspots appear in Antioquia, Tolima, Nariño, and the center of Cauca and Cundinamarca departments. With the exceptions of the central coffee zone, these hotspots have been poorly explored by botanists.

The overlap between Passiflora and Vasconcellea hotspots underlines the consistency of these first results and constitutes a first validation of our choice of these two important taxa.

Keywords: Passiflora, Vasconcellea, Colombia, species distribution, biodiversity

Coroza, Oliver; Lagunzad, Daniel; Lansigan, Felino; Lasmarias, Noela; Morales, Connie; Silverio, Mely

Policy recommendations for linking biodiversity conservation with human dimensions: the Philippine experience

Conservation International, Philippines

Poster session 11, Policy for sustainable development

Although population-environment linkages have been established in studies in some countries in Asia, Latin America and Africa, very few researches have actually dealt with measurements of the influence exerted by population variables on the environment in the Philippines. The core messages that need to be conveyed: people do affect biodiversity; the biodiversity status determines the quality of human life; and everyone has a stake in biodiversity and, therefore, must share the burden of safeguarding the quality of biodiversity. This paper reports on an empirical study that sought to demonstrate these messages, to determine the link of the environment, specifically, using a biodiversity indicator with population variables in the Philippine setting, and suggests recommendations for policy-making.

Correlation analysis was used to determine the association between 75 independent population variables and a dependent biodiversity variable. The 75 variables were initially selected through a final consensus of 38 workshop participants coming from various fields. The percent forest cover was chosen as a biodiversity indicator representing wildlife habitat condition within the a local government unit level called the province.

Analyses imply that policies and interventions that focus on biodiversity conservation alone are insufficient in abating biodiversity losses like forest degradation unless population and development concerns are adequately addressed. The results showed that there are intervening factors affecting population-biodiversity links that need to be addressed.

There is a need for a population management policy integrated in the government's development framework. Cooperative efforts among conservation-oriented, development-oriented and population-oriented institutions are warranted so that integration of population-biodiversity concerns in development policies and programs are addressed.

Keywords: population, socioeconomic, policy, biodiversity, habitat

Craswell, Eric

Biodiversity and the Global Water System

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Poster session 2, International Programmes

The Global Water System Project (GWSP) is a new project under the Earth System Science Partnership, comprised of DIVERSITAS, the International Human Dimensions Programme on Global Change, the World Climate Research Programme, and the International Geosphere-Biosphere Programme. The global water system is defined as the global suite of water-related human, physical, biological, and biogeochemical components and their interactions. The GWSP addresses the overarching questions — how are human actions changing the global water system and what are the environmental and socio-economic feedbacks arising from anthropogenic changes in the global water system? Major drivers of change that affect the system include climate change, population growth, land cover change, the construction of dams and diversions, economic development, and governance. Changes wrought in any component of the system will cascade throughout the whole system.

The scientific plan for the GWSP focuses the project on freshwater systems. The research is organized into three themes: 1) What are the magnitudes and mechanisms of anthropogenic and environmental changes in the global water system? 2) What are the main linkages and feedbacks within the earth system arising from changes in the global water system? 3) How resilient and adaptable is the global water system to change, and what are the sustainable water management strategies?

The GWSP is developing close links to the freshwater biodiversity crosscutting network of DIVERSITAS, and has initiated several fast track activities that concern biodiversity issues. The activities include a baseline global study on environmental flows; the compilation of a digital world-water atlas (including the identification of indicators and an improved estimation of the world water balance); the development of a Global Water System Lexicon; and a workshop on the global governance of water. The GWSP is actively seeking collaborators from the biodiversity community.

Keywords: water, global change, earth system, human dimensions, climate

Dana, Kao

The acceptable cutting cycle modeling for sustainable wood production in Cambodia

Kyushu University, Japan

Poster session 6, Biodiversity and ecosystem functioning

The importance of sustainable concepts and nature-oriented forest management has become increasingly recognized in recent years. Cutting cycle needs to ensure that the commercial timber stands have a sustainable view point with annual allowable cut and the remaining resource at the end of the forest harvesting. The important of cutting cycle is to balance the resource and the annual allowable cut whether it can grow to enter to replace stand structure at the end of the cutting cycle or not. It would be decisive that cutting cycle analysis credit can be linked to, or given for future resource measure, because unknown cycle and neglect predictable yield will have the large impact on sustainable forest management. The long-term estimation of yields and stocks by cutting cycles and forest type was determined and investigated

in this work. The data were obtained from a two-year forest inventory in Cambodia. The estimated annual allowable yield approach subtracted the harvestable rate, the wood waste rate and the damaged rate by forest type. The stocked approach was used in a study that compared the tree growth volume with the current tree volume by dbh range, forest type and cutting cycle. The tree growth volume was tested until it could grow to replace the damaged and harvested trees by dbh range, forest type and cutting cycle. Each of these approaches was evaluated for cutting cycle lengths of 10 to 120 years. Conserved evergreen forest (CSFE), deciduous forest (UNFD), evergreen forest (UNFE) and mix evergreen forest (UNFM) annual yield 37.3, 8.5, 32.4 and 19.7 m³/ha decreased when the cutting cycle was prolonged. We recommend harvesting tree within the extended period of the sustained cutting cycle from 35 years for CSFE, UNFE and UNFM but not for UNFD, unless the cutting cycle extended until 120 years. Cutting cycle may certainly be the best option for sustainable forest management planning, which regeneration is likely to be successful in stock by forest type.

Keywords: selective cut, cutting cycle, yield, forest growth, sustainable forest management

Denis J., Sonwa; Stephan, Weise

The need to promote multi-species cocoa based agroforestry system in the Humid Forest Zone of West and Central Africa to meet the market demand

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Poster session 3, Agriculture and biodiversity

The market demand of products coming from the humid forest zone of West and Central Africa, despite the diversity of goods and services of this ecosystem, have been based mainly on timber and perennial crops (such as cocoa). Gradually the local and international markets request those products in certified forms and are diversifying the need by demanding more NWFP (Non Wood Forest Products) and more ecosystem services (such as carbon sequestration, biodiversity protection and watershed protection). Unfortunately and contrary to Cameroon (Central Africa), where cocoa are grown under the forest shade, promotion of un-shaded cocoa orchard on forest land in West Africa (i.e. Côte d'Ivoire and Ghana) have reduced the offer of such products and services. Because of the price fluctuations of cocoa (the main cash income product in rural area of the region), farmers need to adapt to the new situation by targeting new opportunities offers by the market demand of forest products and services. Promoting agroforestry system with structures and functions similar to the forest, by growing cocoa with associated plants (i.e. Timber, NWFP, exotic fruits), is becoming a good way to fulfil properly this market demand and sustain the cocoa production. This paper presents some results of our study in Cameroon and review of the situation in West Africa on (1) the plants species present in the cocoa plantations and (2) the need on the market of products susceptible to be grown in association with cocoa. One of the main findings is that products needed by the market are not necessarily those that are more frequent in the cocoa field. The study concluded by making recommendations to better use multispecies cocoa based agroforestry system to combat poverty and protect environment in the Humid Forest Zone of West and Central Africa.

Keywords: humid forest zone, West and Central Africa, cocoa agroforest, forest products and services, rural poverty

DesGranges, Jean-Luc; Gratton, Louise

An innovative approach for drawing out a short list of strategic sites for breeding bird conservation: the case of the St. Lawrence Lowlands avifauna.

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Poster session 10, Monitoring biodiversity change

The Nature Conservancy of Canada is implementing conservation blueprints as a core strategy for its site-securement efforts. Conservation blueprints or ecoregion plans are projects that are based on natural eco-geography, such as the St. Lawrence Valley and Lake Champlain Ecoregion, and that invite partners from various agencies and jurisdictions to assemble and analyse the available data on species, sites and landscapes.

Some of the innovations of this approach are as follows:

- ♣ Invites and strongly levers individual and group efforts to identify particular portfolio sites as action sites, and invites consensus on action strategies based on a commonly conceived portfolio of sites.

- ♣ Adds new dimensions to site identification for conservation, specifically 1) the emphasis on occurrences of globally vulnerable species and communities, 2) the identification of landscape-scale action sites where coincident conservation values are particularly high, and 3) takes advantage of new technology and methods not previously been applied in Canada for identifying conservation sites.

- ♣ An assessment of threats and opportunities is part of these action strategies, and participants will be invited to consider how direct securement, leverage and creative land management can achieve site conservation.

This presentation will go over the methodological steps we followed to draw out what appears to be the most desirable network of protected areas to conserve biodiversity and present the results of its validation for the long-term viability of all priority breeding bird species (NABCI candidates) in the St. Lawrence Lowlands in Québec.

Keywords: birds, conservation, protected areas, St. Lawrence, NABCI

Dimitrova, Dessislava; Petrova, Ana; Vladimirov, Vladimir

Bulgarian Biodiversity Platform - goals and challenges

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Poster session 1, DIVERSITAS National Committees

Bulgarian Biodiversity Platform (BBP) was launched in 2003 as part of a European network in support of the European Platform for Biodiversity Research Strategy (EPBRS). The main goal of this network is to create effective science-policy interface in support of the implementation of the Convention on Biological Diversity and the EU Commitments.

At international level the most important achievement of the team of BBP is the preparation of a document in support of taxonomic research in Europe based on the opinions of leading European taxonomists. This document was proposed for discussion to the Programme Committee of the 6th Framework Programme and resulted in the recognition of taxonomy as one of the research priorities in Europe.

At national level the following activities have been performed: 1. Launching meeting with main stakeholders in the field of biodiversity; 2. National meeting of biodiversity stakeholders for discussion of the implementation of the Bulgarian Strategy for Biodiversity Conservation and the related Action plan. The achievements in research, conservation and sustainable use of biodiversity in the last decade were presented in 29 plenary lectures. The team of BBP was appointed to be the coordinator of the elaboration of the new Biodiversity Action Plan (2005-2010). 4. Coordination of the elaboration of the national BAP. 5. Impact on the elaboration of the National Biodiversity Monitoring System through implementation of the CBD, EU and EPBRS documents and achievements.

The key role of the BBP is to build effective science-policy interface in Bulgaria through: 1. building trustful communication between scientists and policy makers; 2. support for more effective management of the research institutions; 3. establishment of effective links between science and business; 4. effective dissemination of documents, achievements and lessons learned from the EPBRS meetings and the other national platforms.

Keywords: biodiversity, science-policy interface, Bulgaria, biodiversity platform, European network

Doadrio, Ignacio; Martínez, Emilio; Sostoa, Adolfo

The historical and ecological processes in the distribution of the freshwater ichthyofauna native from Oaxaca state, Mexico.

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Poster session 10, Monitoring biodiversity changes

The focus of this work was to know the ecological and historic factors explained the distribution patterns of freshwater fishes from Oaxaca. 9 samplings with electric fishing in Oaxaca rivers of November 1995 to April of 1997 were carried out. A first exploratory analysis was made with the Canonical Correspondence Analysis of the program CANOCO version 3.12 to relate the presence and absence of 83 species, 20 environmental variables and 175 locations. In a second exploratory analysis 62 species, 14 environmental parameters and 174 locations were used. The distribution of 62 species with regard to the slope was: 28 species in the Gulf of Mexico versant, 20 in the Pacific and 14 in both slopes, which suggest the existence of a discontinuous space variation in the structure of fish communities (discontinuous distribution pattern), this is resulted of the geologic history of Oaxaca. In the species distribution in relation to altitude gradient the biological diversity is inversely proportional with the altitude, finding 4 species categories according to its half height and its limits of altitude where live; this indicates the existence of a continuous space variation in the structure of this ichthyofauna (continuous distribution pattern), what is partially according to the river continuum concept; the increment of biological diversity was originated by the exchange of species between the ichthyofauna of freshwater ecosystems and coastal (estuaries and marine).

Keywords: freshwater fishes, Oaxaca, biogeography, ecology, conservation

Doyen, Luc; BENE, Christophe

Viable management of renewable resources through protected areas: a robust

decision approach

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Poster session 4, Biodiversity conservation

Many works advocate for the use of reserves as a central element of ecosystems and biodiversity management. The present paper studies the contribution of protected areas on renewable resources sustainability through a dynamic model integrating non-stochastic exploitation uncertainty and constraints related to both conservation and harvesting effectiveness. The approach is based on the mathematical concept of invariance kernel. The model allows to assessing the "reserve effect" of a protected area and reveals critical levels of protected areas that guaranty viable exploitation of ecosystems. In particular the analysis shows how the conditions for conservation are not necessarily conflicting with the optimization of catches in a "maximin" perspective. Numerical simulations are provided to illustrate the main formal results of the study.

Keywords: protected area, viability, decision, uncertainty, maximin

Dunn, Ben; Jax, Kurt; Klaver, Irene; Rozzi, Ricardo; Sewell, Pat Transcending the anthrop/bio centric dichotomy through the ecosystem approach: insights from the Cape Horn Archipelago region

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Poster session 4, Biodiversity conservation

The Conference of the Parties at the Convention on Biological Diversity has adopted the Ecosystem Approach (EA) as the primary framework for action. It is widely recognized that this adoption is relevant for applied reasons. However, this approach also has critical philosophical implications, which have received little consideration. Among these implications is the EA's ability to overcome the dichotomy between anthropocentric and biocentric positions, which represents one of the central difficulties facing environmental philosophy today. This dichotomy has been problematic because extreme biocentrism has caused human exclusion from natural areas and strong anthropocentrism fails to consider significant components and processes of ecosystems. The EA can overcome problems inherent in the bio/anthropocentric dichotomy by considering humans as components of ecosystems. We look at this inclusion by focusing on one of the most pristine and remote regions on the planet: the Archipelago Region of Cape Horn at the southern tip of the Americas. We identify two levels of relationships between humans and the environment as exemplified by the EA, which help to overcome this bio/anthropocentric dichotomy. First, the influence that humans have on ecosystem functions and compositions at different spatial and temporal scales. Today, receding glaciers in Cape Horn are affected by global warming as much as by rapid regional development for tourism. Second is the understanding that the well-being of humans is in a dialectical relationship with the well-being of all ecosystem components. Preserving the pristine character of Cape Horn protects biodiversity, allows for regional development and ecotourism in a sustainable manner, and provides a monitoring "lighthouse" for understanding the global implications of human processes. By helping to overcome the bio/anthropocentric dichotomy, the EA offers a framework for understanding environmental values, and stimulating cultural change.

Keywords: ecosystem approach, environmental ethics, global change, social well-being, Chile

Dyer, George; Martinez-Ramos, Miguel

Maize seed networks in Mexico: How open?

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Poster session 3, Agriculture and biodiversity

News of maize transgene escape late in 2001 confirmed five year old predictions based on unique estimates of seed lot replacement in indigenous Mexican communities. At 47 percent, yearly rate estimates exceeded all prior expectations. Foreign seed introductions contributed 11 of those points. It is clear why the seminal work of D. Louette on maize seed in Cuzalapa, Mexico, is the source of a widely held hypothesis on Mexican seed networks. In a previously unopened system under random turnover, given these rates, a stable proportion of one-fourth-foreign would be reached almost within 5 years of opening. It is thus believed that traditional maize seed networks are exceedingly open systems. A recent and apparently widely held corollary is that transgenes have dispersed extensively in Mexico. In effect, to leading experts, reports in 2001 of transgene presence in a nondescript community in Oaxaca, Mexico, were confirmation that genes flow extensively through informal maize seed networks. We use a demographic approach with data from the Mexican Rural Household Survey (MRHS) to show that i) abundance of foreign maize seed in Mexican Mesoamerica is at least an order of magnitude smaller than expected from previously available data; yet ii) maize seed networks are highly vulnerable to the spread of maize transgenes. We describe possible routes of transgene diffusion and estimate the probability of diffusion across Mexico. Recent data, if corroborated, will confirm our estimates. Finally, we describe policies that could curtail unintended transgene spread in Mexico.

Keywords: maize, seed networks, transgenes, policy, Mexico

Dyson, Kirstie

Biodiversity and Ecosystem Functioning in Heterogeneous Environments

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Poster session 6, Biodiversity and ecosystem functioning

Conceptual models of the relationship between biodiversity and ecosystem processes have been explored through a variety of manipulative experiments in terrestrial systems. In these experiments, species richness treatments are assembled and some measure of 'functioning' estimated. Ecosystem processes may be substantially affected by heterogeneity, but these effects are not well understood. The importance of environmental heterogeneity in determining species interactions in marine and freshwater environments has been demonstrated only relatively recently. Habitat heterogeneity may also reflect fragmentation, a main cause of biodiversity loss, so understanding the relationship between heterogeneity and ecosystem processes is of critical importance to biodiversity conservation.

A mesocosm-based approach was used. The sediment was manipulated to obtain a heterogeneous environment by increasing the organic content of the base sediment with powdered *Enteromorpha*. Three species of macrofauna were added to the

system, the ecosystem processes under study were ammonium, phosphate, nitrate production and primary production as a proxy of ecosystem function. Primary production was assessed using non-invasive FMS technique, this device can be used in-situ to assess the algal biomass, health and a levels of photosynthetic efficiency. The movement of individuals from one habitat type across a boundary to a second habitat type was measured.

Initial results show greater diatom biomass where both halves were enriched, and one half enriched and one normal compared to both halves being normal. High diatom levels matched with greater concentrations of Ammonia and Phosphate. Movement across boundaries was found to be insignificant, this was due to experimental problems rather than no movement. The experiment is being repeated and results will be available for this conference.

Keywords: estuaries, macrofauna, diatoms, sediment enrichment, mesocosm

Effa Onomo, Pierre; Nicolas, NIEMANAK

Peroxidase, polyphenol oxidase and amylase isoenzymes activity in Cameroonian cola germplasm

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Poster session 12, Systematics, phylogeny and evolution

Cola sp. is an important crop in many countries of tropical Africa. It is a non-timber forest crop, that the genetic diversity and intra and interspecific-relationships among accessions are quite poor. Our goal was to add information on the genetic structure of Cola sp. and to verify the possibility of classifying Cola sp. entries based on isoenzyme traits. Polyacrylamide gel electrophoresis was employed to study the isoenzyme variation of peroxidase, polyphenoloxidase and amylase in fifty accessions of three Cameroonian Cola species (Cola acuminata, Cola nitida, Cola anomala). Band frequencies were calculated for each entry and for each isoenzyme system. The intrapopulation variation was estimated by Shannon-Weaver (H) diversity index. Based on the matrix of band frequencies and standardised data, the interpopulation variation was examined by cluster analysis. A total of 14 bands with frequency values ranging from 0 to 1 was observed including 12 and 2 monomorphics. The average value of H estimated for each entry range from 0.54 to 0.85 suggesting that Cola sp. entries showed a wide polymorphism for all the enzyme systems being tested. A cluster analysis revealed three distinct groups in which entries revealed a greater similarity. None of the three enzyme systems observed was exclusive to define one or more groups and all enzyme systems showed a similar trend of variation in the group obtained.

Keywords: Cola sp. , cluster analysis, genetic diversity, isoenzyme variation, accessions

Efremenko, Dmitry

The theory of biotic regulation of the environment as a framework concept for integrated environmental policy. An analysis of Russian scientific-political discourse on biodiversity, climate change and

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Poster session 11, Policy for sustainable development

The paper highlights the relevant aspects of Russian scientific-political discourse on biodiversity, climate change and environmental services during the last decade. The core of the discourse is the Theory of biotic regulation of the environment which may be formulated with the following propositions:

- Natural ecosystems that are undisturbed by humans create and control their environment. They maintain it in a state optimal for the whole environmental community and, up to a certain threshold, compensate for all deviations from that optimum.
- Biotic regulation is performed by the complex co-ordinated functioning of all species in the natural ecological community. Evolution proceeds in the direction of enhancing the regulatory potential of the community.
- The biotic mechanism of environmental stabilisation is unique and cannot be replaced by a technological one.
- Anthropogenic transformation of natural ecosystems completely destroys the regulatory potential of the ecological communities on a local scale and continually weakens the global power of biotic regulation. Anthropogenically disturbed ecosystems are not only merely deprived of regulatory abilities but themselves act as powerful destabilisers of the environment.
- Environmental parameters that are favourable for life on Earth are physically unstable. Without the stabilising impact of natural biota the environment and climate of Earth would rapidly degrade to a state prohibiting human existence.

According to protagonists this theory must be used as a framework concept for integrated environmental policy on both national and international levels. In particular this theory offers additional opportunities to overcome conflicts between major multilateral environmental agreements such as Convention on Biodiversity, UNFCCC etc. If biotic regulation will be internationally corroborated, it needs to formulate new international political-economic and legal agenda for environmental services.

Keywords: science-policy interface, biotic regulation of the environment, ecosystems (environmental) services, governance, interlinkages between multinational environmental agreements

Ekhasa, Boyzibu

Survey on epidemics of wildlife as a management tool in protected areas in the Democratic Repu

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Poster session 8, Biodiversity changes and health

Wildlife constitutes a sentinel in the monitoring of many diseases. The diseases of wildlife were strongly established in many countries, in particular by the transborder propagation. Some of them are likely to have low registers reflected on the health of the livestock or on the public health. They are also likely to have a negative effect on the conservation of the forest ecosystems and wildlife in its habitats of origin. It is consequently essential to have a good knowledge and control of the pathogenic agents present and to know their effects on wildlife, the domestic animals and the man in order to prevent the epidemics and to fight against poverty by the production of animal proteins.

The epidemio-surveillance of many diseases such as the rinderpest is a case among

so many others. We must keep in mind that the virus of the rinderpest and even of others can benefit from the wars, the civil disorders and the natural disasters.

All these disorders of which we live unfortunately in Democratic Republic of Congo involve migrations will intra or inter-official cattle, which are often used of spoils or provisions. It is why; we supervise wild fauna on the same basis as the domestic cattle to eradicate more diseases in sight of a durable management of the biodiversity in Democratic Republic of Congo.

The capture of the buffaloes to the National park of Garamba in DRC permit to know the evolution of the epidemiologic situation of the disease in this zone according to the procedure OIE, and permit the DRC to obtain the statute of temporarily unharmed of the rinderpest.

That is the reason for which, it was created a national network of epidemio-surveillance (RENES) in order to supervise and of vigiler on the diseases which cause economic losses on the development of the DRC.

Today; the epidemio-surveillance of wildlife became an important tool in the durable management of the biodiversity in DRC.

Keywords: epidemio-surveillance, tools, eradicate, diseases, DR Congo

El-Hani, Charbel; Almeida, Ana Maria; **Viana, Blandina Felipe**

Is the « Biodiversity - Ecosystem functioning » paradigm a weak scientific enterprise?

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Poster session 6 : Biodiversity and ecosystems functioning

In the last decades Ecology as a science has been extensively criticized. The main problems identified concern its weak prediction ability, its incapacity to test hypothesis and its inability to make generalizations. In recent years a new ecological `paradigm` has emerged, the `Biodiversity-Ecosystem functioning` paradigm, which represents an important part of the ecological literature nowadays. Taking into account the criticisms about Ecology as a `weak` scientific enterprise we investigated whether the `Biodiversity-Ecosystem Functioning` Paradigm shows signs of the problems identified by critiques of Ecology or not. Based on an extensive literature review we analyzed the prediction ability, the theory-practice dialogue, and the generalization status of the recent research about the functional role of biodiversity in ecosystems. Even though this paradigm seems to avoid some of the problems mentioned above, we still cannot reach a generalization degree about the ecosystem functions of biodiversity. We then discuss some possible explanations for these findings, pointing to some historical considerations about the emergence of this paradigm and the nature of the ecological research.

Keywords: ecosystem functioning, biodiversity, ecological research, paradigm, scientific criticism

Escalante, Tania; Linaje, Miguel; Morrone, Juan Jose; Sánchez-Cordero, Victor
Biogeographical regionalization of Mexico using ecological niche modeling of terrestrial mammals

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Poster session 12, Systematics, phylogeny and evolution

A potential shortcoming for biogeographic regionalization involves taxonomic and geographic biases of information solely derived from museum specimens. Here, we propose a biogeographic regionalization based on ecological niche modelling projected as species' potential distributions, using Mexican terrestrial mammals as a case study. This approach provides a robust theoretical framework of species distributions essential for biogeographic regionalization.

We used a database composed of museum specimen records of mammal species, to generate models of ecological niche using the Genetic Algorithm for Rule set Prediction (GARP), including seven digitized maps of abiotic environmental variables, and (1) a map with natural vegetation producing species' potential distributions (t1), and (2) a map with the natural vegetation and landuse (transformed areas), producing species' actual distributions (t2), assuming that transformed areas provide unsuitable niches for species. We further refined these distribution models by delimiting presumed distributional over-predictions with the physiographic provinces. Final distributional models were overlapped to a grid of 1° latitude x 1° longitude. Two matrices (t1 and t2) for Parsimony Analysis of Endemicity were performed for 248 quadrats.

The matrix of t1 had 40 uninformative species, and resulted in 36 cladograms of 4,069 steps (CI = 0.10 and RI = 0.81). The strict consensus had 4,078 steps (CI = 0.11 and RI = 0.82). The matrix of t2 contained five additional informative species, and resulted in 587 cladograms of 3,700 steps (CI= 0.10 and RI= 0.83). The strict consensus had 6,656 steps (CI= 0.05 and RI= 0.68). There were important differences between both cladograms:

of 23 synapomorphies in t1, only 12 were present in t2, some endemicity areas changed, and resolution on t2 was poorest.

Keywords: regionalization, biogeographic provinces, Mexico, terrestrial mammals, Mexican transition zone

Espinosa-Garcia, Francisco; Sánchez-Blanco, Clara

Analysis of the distribution of the exotic species of Fabaceae (s.l.) introduced to Mexico

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Poster session 3, Agriculture and biodiversity

The analysis of the identity and distribution of exotic plant species is the first step to assess the potential effects of these species on the native flora. Additionally, this analysis can be used to test some of the ideas on plant invasion ecology. In this work we analyze the distribution and characteristics of the Fabaceae (s.l.) species naturalized in Mexico to a) assign a category of potential risk of becoming problematic to each species and b) to test the taxonomic hypothesis, that the introduced species without close relatives have higher probability of naturalization than the introduced species with close relatives.

The identity of herbarium specimens from 13 of the most important Mexican herbaria for the 46 most common introduced Fabaceae species was verified and their label information gathered. Additional information on the species origin and behaviour as weeds in other countries was obtained in publications and the internet. The number of native Fabaceae genera and species was obtained from Villaseñor (2003).

Most species were introduced intentionally as ornamental or fodder species. 87% of the species originated in the old world and the rest come from America and Oceania.

67% were herbs, 4% shrubs and 28% trees. The number of herbarium records for each species correlates positively with the number of years since its first record ($r=0.44$). Most species (ca. 60%) have been recorded in one to six states (out of 32), 26% in 7 to 13 and 14% in 14 to 24. We assigned a low risk potential to become problematic to 27 species, a medium risk to 15 and high risk to 7 according to the recorded behaviour of the species on other parts of the world. Out of 94 genera of Fabaceae (s.l.) 56.4% had only native species, 30.8% only exotic species and 12.8% native and exotic. This distribution is significantly heterogeneous ($\chi^2 = 30.26$ d.f. 1, $p < 0.001$) and supports the taxonomic hypothesis.

Keywords: Cesalpiniaceae, Fabaceae, Mimosaceae, exotic species, weeds

Esquivel, Humberto; Harvey, Celia A; Ibrahim, Muhammad; Villanueva, Cristobal
Tree diversity in pastures of cattle farm systems in a Costa Rica dry ecosystem
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Poster session 3, Agriculture and biodiversity

Maintaining or increasing trees on pastures of cattle farms represents an option to minimizing habitat fragmentation while at the same time enhancing farm productivity. However little is known about tree species diversity occurring on cattle farms. The objective of this study was to know the tree species diversity occurring in pastures of cattle farms.

A complete census of all dispersed trees > 10 cm ddb in pastures of 16 cattle farms randomly selected was conducted from June to December 2002 in Guanacaste; a dry ecosystem of Costa Rica. Riparian trees, live fences and forest patches were excluded from the census because they were not considered as trees dispersed in pastures. Trees were identified to species and classified in timber, forage and fruit. Trees were also categorized as individuals or as clusters (trees forming groups where their crowns overlapped).

A total of 5896 dispersed trees belonging to 36 families and 99 species were found in 836 ha of pastures. The most abundant and frequent tree species were *Tabebuia rosea*, *Guazuma ulmifolia*, *Cordia alliodora*, *Acrocomia aculeata*, *Byrsonima crassifolia* and *Tabebuia ochracea*, which together accounted for 60% of the total trees inventoried. Twenty species were found to be represented only by one individual and seven species were represented by two individuals. 50% of total trees were categorized as timber trees, 27% as forage and 27% as fruit bearing trees. Individual trees accounted for 54% and the remaining as trees in clusters. Tree species diversity found dispersed in cattle-dominated landscapes can be related to farmer strategies of combining the commercial value of timber trees, the provision of fodder sources for cattle from forage trees, and the provision of food to humans and wildlife from fruit trees. The low abundance of some particular species found leads to a risk of genetic erosion of some valuable tree species.

Keywords: abundance, census, dispersed trees, pasture, species richness

Favila, Mario Enrique; Arellano, Lucrecia; Huerta, Carmen

Diversity of dung and carrion beetles in a disturbed Mexican tropical montane cloud forest and on shade coffee plantations

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Poster session 3, Agriculture and biodiversity

We analyze changes in species richness, species composition, relative abundance, and niche structure of a dung and carrion beetle assemblage in four human-induced habitats of a disturbed tropical montane cloud forest in Veracruz, Mexico.

Dung and carrion beetles were collected using baited pitfall traps. Beetle sampling was carried out in: TMCF fragments, polyspecific shade coffee plantations, monospecific shade coffee plantations, and clear cuts.

The four habitats had similar richness, species composition, and assemblage structure of dung and carrion beetles. Differences were found at abundance and biomass levels for the four dominant species in the landscape. Dung beetles were more abundant than carrion beetles, but the biomass was higher for the latter. Carrion beetles were seasonal, while dung beetles were not clearly so. When forest fragments and shade coffee plantations were compared to other similar habitats in the region, the same general pattern was observed. However, forests with high disturbance and monospecific shade coffee plantations had lower species richness than forests with low and medium disturbance and polyspecific shade coffee plantations.

Polyspecific shade coffee plantations must also be considered a confluence zone for species with different ecological tolerances, increasing the region's biodiversity. It is therefore clear that these agrosystems must be maintained if we want to protect areas with TMCF fragments.

Keywords: dung and carrion beetles, landscapes, shade coffee plantations, tropical montane cloud forest, Veracruz

Fidalgo, Beatriz; Pinto, Luis

Linking landscape functions and preferences – a tool to incorporate biodiversity in land use planning

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Poster session 4, Biodiversity conservation

Concerns with biodiversity and sustainable development brought the need for more holistic approaches to planning, asking for new methodologies and tools enabling it to enlarge the scale of analysis, considering multiple objectives, and involving people in the planning processes. In Portugal, as well as other European countries, where forest lands are owned by small non-industrial private owners enlarging the area of analysis means to work with owners with multiple objectives, not necessarily consistent with objectives such as conservation of biodiversity. This work describes an attempt to link landscape function, such as conservation, production and recreation, with preferences in a cultural forested landscape, dominated by small non-industrial owners.

We combine multi-criteria decision analysis with prospective scenarios, to build a tool that provides the facility to explore, throughout an interactive and self-learning process, the trade-off between biodiversity conservation and other landscape function such as wood production and recreation.

Starting from an hierarchical structure of objectives and criteria we can find a set of extreme scenarios that represents the boundary of the space of possible alternatives, according with the each main landscape function. The user defines an initial solution to start an iterative process that is repeated until the point that a compromise solution is reached.

At this stage, the model allows for the simulation and visualisation of scenarios of development according to a Multi-Criteria Development Analysis process. A graphical user interface is being developed to allow for the end users themselves to use the tool.

We conclude that decision analysis, scenarios and cognitive mapping combined could be used together in local land use planning allowing to create a participatory decision process.

Keywords: decision, analysis, biodiversity, planning, landscape

Flot, Jean-François; Tillier, Simon

Biodiversity of the coral genus Pocillopora based on molecular markers vs. morphology

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Poster session 12, Systematics, phylogeny and evolution

Corals of the genus Pocillopora are present on most of the world's coral reefs where they play a key role in the building and maintenance of coral reef ecosystems. These colonial organisms have been severely impacted by pollution and coral bleaching to the point that some species once abundant have become locally extinct. Pocillopora display a multitude of recognizable but intergrading morphotypes, which is why the number of species in this genus varies from 4 to 40 according to different authors. It is not clear whether such variations in morphology are due to high inter- or intraspecific genetic diversity or to phenotypic plasticity in response to local environmental conditions. The present study aims to investigate this puzzling situation by using molecular markers; it is expected to shed light on the relationships between coral morphological diversity and coral biodiversity, and to provide tools for recognizing species in the field.

700 DNA samples of coral colonies of the genus Pocillopora were collected while scuba diving in Hawaii (USA), Okinawa (Japan), New Caledonia (France) and Clipperton Island (France), from sea surface down to 52 meters deep. To avoid sampling bias due to conventional taxonomy, samples were collected along transects with no attempt to identify them. The morphology of each colony sampled was recorded using a digital camera, and a voucher skeletal sample of each colony was kept in the collection of the Paris Museum of Natural History.

Preliminary results suggest that the number of species of Pocillopora is far less than what was thought based on morphology. As a result, biodiversity at species-rich locations such as Hawaii, Japan and New Caledonia appears less than previously thought.

This study shows the usefulness of molecular markers to assess the biodiversity of phenotypically plastic organisms such as corals.

Keywords: coral reefs, coral, marine biodiversity, genetics, molecular biology

Francke, Oscar F.

Arachnid diversity in the Northern Lacandona lowland tropical rain forest, Chiapas, Mexico

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Poster session 10, Monitoring biodiversity changes

This work is part of a collaborative project with the Chól Community, one of the three main ethnias of the lowland Lacandon rain forest, in order to document local biodiversity and plan long-term conservation and sustainable management. Our specific objectives are to document Arachnid diversity.

Five week-long field trips were undertaken in 2004. Between 4 and 8 collectors sampled different locations and habitats day and night, exploring all microhabitats available to arachnids (vegetation, under bark, in cracks and crevices, under rocks and logs), searching manually, with sweep and drop-nets, light-traps and ultraviolet lamps. Parasitic and phoretic mites were collected off of insects, amphibians and reptiles. The specimens are deposited in the Instituto de Biología, UNAM; and a reference collection will be given to Comunidad Corozal, A. C. to enrich their biological knowledge and backup a Community Museum.

We collected 5,556 arachnids belonging to 9 of the 11 extant orders, including the extremely rare Schizomida and Palpigradi. The taxa represent 59 different families, 144 genera and 206 species. Mites (Acari) accounted for 87% of the specimens, and spiders (Araneae) had 66% of the diversity of species. Thus far we have identified: (a) one new genus of Uropygi, (b) 13 new species in several orders, (c) 16 new distribution records for Mexico, and (d) 37 new records for Chiapas. Although our results are only preliminary, as we have six more field trips planned for 2005, they have exceeded our expectations and arachnid diversity in a lowland rainforest in Mexico is being documented for the first time. We know of no similar effort in any other tropical part of the world against which our global results can be compared. The Lacandon rain forest is extremely rich in arachnids and conservation strategies must take them into consideration to preserve mankind's legacy.

Keywords: Arachnida, 9 orders, 206 species, biodiversity, lowland-rainforest

Gama, Lilly

Study of the ecological factors in relation with the conservation of the biodiversity of the subgenus *Persea*

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Poster session 5, Drivers of biodiversity changes

The genus *Persea* of the Lauraceae family has two subgenera: *Persea* and *Eriodaphne*. The geographic distribution of the subgenus goes from the north of South America to North-East of Mexico with its highest diversity in the Mesoamerican area. The variability in the number of species of the subgenus reflects its complexity, due mainly to the fact that some of these species have been used, cultivated or semi-cultivated, by different ethnic groups since ancestral times. Their genetic diversity helps explain the wide range they have to adjustment to different ecological factors. The objective was to locate the geographic information of the species in different maps to analyze the ecological factors that limit their distribution and to find out the state of conservation. The material from 14 herbariums was checked to obtain the geographical distribution and ecological information, collections were done in the Mesoamerican area to construct a data base with 294 records. Landscape and landscape modification maps were constructed of the areas to be handled in a geographical system of information to find out the ecological factors that might influence the distribution of the species and to analyze the state of conservation of these areas. The taxa were divided in three categories: wild, semi-domesticated and domesticated. The results show that the wild ones are restrict to the mountains of

Centre America, the Eje Neovolcánico and the Sierra of Guatemala and Chiapas. The semi-domesticated and domesticated varieties are less strict and they are adapted to a major range of ecosystems. *Persea americana* var. *americana* (considered domesticated), is the only one that adapts itself to the conditions of the Yucatan Peninsula. The wild or semi-cultivated species can be found on: cloud forests, subtropical and tropical forests which are threatened in Mexico due to deforestation.

Keywords: Persea, Lauraceae, landscape, domestication, conservation

Garay, Irene; Barbault, Robert; Cibien, Catherine; **Irving, Marta**; Medeiros, Rodrigo
Biosphere reserves concept and application: the comparative perspective between France and Brazil

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Poster session 4, Biodiversity conservation

Biosphere Reserve (BR) represent an original concept in order to make compatible strategies for sustainable development through promoting conservation and wise use of biodiversity. They were proposed in the context of the UNESCO's MAB Program in 1970 and reach 459 areas worldwide. One of the MAB objectives is to develop the basis for the sustainable use and conservation of biodiversity and for the improvement of the relationship between people and their environment, according to the three basic BR functions: conservation, development and research. It is clear that concept interpretation and implementation in the field varies widely according to different country policies and development needs. In order to discuss this subject, this study aims to compare the BR strategies in Brazil and France, in the scope of a research cooperation program, focusing on the strategies that could reinforce the biodiversity management and benefits sharing for both sides. The work was based upon the research of official documents, institutional contacts and interviews with key actors. There's a clear gap in the way BRs are interpreted and implemented in Brazil and France as a result of political priorities and the structure of management capacities. In France ten BRs were established since 1977 and the implementation strategies dynamized by the local MAB Committee have already stressed important lessons: an applied methodology to the elaboration of a Guide for BR Management; the implementation of a transboundary BR; the cooperation with other european BRs based on common issues. In Brazil the first BR was created in 1993, and the implementation strategy is still being discussed. Among the five BRs created at least two don't have a management committee and the majority of them have not yet defined the management strategy. There are many reasons to explain why the contexts are different and they are analysed in the present work in order to inspire a bilateral research cooperation program.

Keywords: biosphere reserve, protected areas, biodiversity, Brazil, France

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Floristic diversity in the state of Oaxaca, Mexico

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Poster session 10, Monitoring biodiversity changes

Background and goal of the study; Oaxaca is one of the Mexican states with the

highest biological diversity, and, although its flora has been collected for more than 200 years, no complete inventory has ever been made. This paper presents updated information of the vascular flora, and describes its richness and endemism, with the purpose of suggesting areas for biological conservation. Materials and methods; The analyzed information is based on bibliographical sources, herbarium samples and fieldwork done in the 20th century by several collectors. Results and discussion; The information analysis sums up a total of 251 families of vascular plants, 1824 genera, 8431 species and 8600 taxa, all of which constitute approximately 40% of the Mexican vascular flora; nevertheless, the floristic richness could approach 10000 species. The highest numbers correspond to angiosperms. In the case of the monocotyledons, 41 families, 398 genera and 1959 species have been discovered, and, 176 families, 1302 genera and 5793 species of dicotyledons have been found. The flora of the state includes 18 families with more than 100 species, the richest being the Asteraceae, Leguminosae and Orchidaceae. The regions with the highest floristic diversity are La Sierra Madre de Oaxaca, north of the state, the dry region of the Istmo de Tehuantepec, the Papaloapan river basin and several spots on the Sierra Madre del Sur. In regards to endemism, 9 endemic monospecific genera, 702 species (8.3% of the state's flora and 21% of the national flora), and 743 taxa, can be found in Oaxaca. Most of the endemism is concentrated in the mountains, mainly in mountain mesophilous forests and pine-oak forests. Conclusions; based on data about richness and endemism regarding the flora, we propose conservation strategies such as new protected natural areas which today, in Oaxaca, are scarce. **Keywords:** floristic diversity, Oaxaca, Mexico, angiosperms, conservation

Giberto, Diego

Historical spatial patterns of benthic diversity in the Río de la Plata estuary and its oceanic front, Argentina-Uruguay (35°-36°S)

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Poster session 10, Monitoring biodiversity changes

The Río de la Plata system is subjected to increasing anthropogenic impact, i.e. commercial fisheries. Many demersal fishes feed on benthic invertebrates, however the spatial and structural patterns of subtidal benthos are scarcely known. The main goal of this study is to identify major richness patterns of benthic assemblages from a large unknown system including freshwater, estuarine and marine environments (~50.000km²).

Spatial patterns were analyzed using multivariate analysis (CLUSTER, MDS and SIMPER analysis) applied to 200 sampling stations collected between 1984 and 2002. Species richness was utilized as a measure of diversity.

A total of 428 species and 18 taxa were found, with a dominance of mollusks (121 species), polychaetes (99), and crustaceans (91). Four main assemblages(A) were defined: A1 (freshwater and mixohaline sites, 44 species), A2 (mixohaline and marine sites

As a general rule, the faunal pattern observed in the study area follows the gradual difference in salinity and bottom type, with areas of high richness corresponding to marine waters with heterogeneous bottoms. This must be interpreted with caution, since most of the studies analyzed cover marine areas between 50-100m, while mixohaline and freshwater areas are under represented. Proper monitoring plans are

needed to obtain basic information that could be used in future conservation plans.

Keywords: benthos, diversity, estuarine, marine, SW Atlantic

**Goetze, Dethardt; Koulibaly, Annick; Gurlin, Daniela; Porembski, Stefan
Consequences of past and recent land use practices on dynamics and
diversity of forest-savanna mosaics in Ivory Coast**

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Poster session 5, Drivers of biodiversity changes

The Guineo-Sudanian transition zone of West Africa is characterized by a mosaic of forest islands and savanna. Its high biodiversity is an important natural resource that is underlying increasing land-use pressure and climate shifts. Their effects on dynamics and diversity of the vegetation mosaic were studied by direct comparison of protected areas with adjacent agriculturally used land (BIOTA Africa program of the German BMBF).

Botanic assessments, soil and GIS analyses in the Comoé National Park and Lamto Reserve.

In both study regions, forest-dwelling Rubiaceae dominate on young fallows also in savanna areas, indicating a high regeneration potential of forest species at first. However, the cash crops cashew in the Comoé region and cocoa and coffee in the Lamto region are nowadays commonly planted with the field crops, leading to an inhibition of fallow regeneration and a decline of arable land.

Aerial photographs revealed that the outlines of 95% of 653 forest islands in the Comoé region remained stable also in extensively utilized areas between 1954 and 1996. A digital elevation model shows the forest islands to be located mainly on hilltops. Soil properties do not directly account for this forest-savanna distribution but reflect their long-term formation under the prevailing vegetation cover instead. Today, however, agriculture and selective logging cause an increasing fragmentation of forest areas and dominance of successional thickets thereon, as many species of intact forests can only be found in a few separated stands, in particular in the protection areas.

The forest-island pattern has been stabilized by annual savanna fires also under extensive land use, which might apply to many other tropical regions. However, future land use must strictly allow for the high potential of forest regeneration and an enforced protection and connectivity of intact forests.

Keywords: West Africa, forest-savanna mosaic, forest fragmentation, landscape dynamics, agriculture

Gole, Tadesse Woldemariam, **Denich, Manfred**

**Coffee as a flagship species for conservation of mountain forest biodiversity in
Ethiopia**

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Poster session 3, Agriculture and biodiversity

Ethiopia is the centre of origin for coffee (*Coffea arabica*), where wild coffee populations are part of the understorey in the montane rainforests. The wild coffee is an important gene pool for future selection and breeding of improved cultivars worldwide. Coffee is also an important source of income for the government of

Ethiopia and the local communities. More than 50% of the national income from export is attributed to coffee. In the forest areas with wild coffee populations, about 60% of the local population earns its income primarily from coffee harvested from forest and semi-forest coffee systems. Deforestation and land-use change, however, are threatening the mountain forest biodiversity and the wild coffee populations. Due to its local, national and international importance, coffee can be used as flagship species to conserve the mountain rainforests of Ethiopia. Hence, to prevent the forest and coffee populations from further loss, conservation as well as sustainable use concepts have to be developed. This paper presents the results of a study carried out in the southwestern Ethiopia, aiming at the identification of areas for conservation and sustainable use; using coffee as a flagship species. Based on multi-criteria evaluation method, the study area was subdivided into different management zones, i.e. core, buffer and transition zones. The classification criteria were coffee occurrence, biodiversity, topographic features and land-use rights of the local communities. Ecological and economic implications of the decision-making and management recommendations on rural livelihood as well as future research strategies are discussed.

Keywords: Conservation, flagship species, coffee, reserve design, Ethiopia

Gómez, Adriana; Barraza, Laura; Cano, Margarita

Perceptions and environmental knowledge in a rural Mexican community: contributions for biodiversity conservation

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Poster session 5, Drivers of biodiversity changes

Many of the factors that lead to the world environmental crisis have their origins in human perceptions and attitudes. In order to understand perceptions and knowledge of local communities about ecosystem functions, it is fundamental to carry out a successful strategy of biodiversity conservation.

The present work was developed in a coastal community surrounded by tropical dry forest in the region of Chamela-Cuixmala Biosphere Reserve, Mexico.

The main environmental problem is the deforestation due to the change in land-use to cattle, rising and agricultures as well as the pressure on the coastline by tourism.

The beliefs and knowledge in women and 5 year old children about the benefits were identified from coastal and marine ecosystems (ME) and tropical dry forest (TDF)

The results indicated that both sectors perceive as the main benefits derived from both ecosystems the food supplies, medicines and wooden resources. People recognize the cultural component of the marine ecosystem.

40% of the 5 year old children establish a direct link between water availability and vegetation of the TDF.

As for women, 92% of the elders (> 45) could mention more benefits from the TDF, in contrast with only 43% of the younger.

In general people know less about TDF than about ME. In addition, people's perceptions rather than helping to reduce ecosystem degradation, seem to have a negative effect.

Conservation strategies require considering perceptions and knowledge that social actors have of their community through programs of environmental education participatory workshops, it is essential to find joint actions towards the conservation of these ecosystems.

Keywords: local knowledge, perceptions, ecosystem services, woman, children

Gordon, Ascelin; Bekessy, Sarah; Dorrrough, Josh; McCarthy, Michael; Wintle, Brendan

Biodiversity viability assessment in the urban fringe of Melbourne

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Poster session 13, Biodiversity and urbanization

Accelerating urbanisation in Australia is considered one of the greatest threats to biodiversity. There is potential to use ecological knowledge and conservation planning tools to develop a strategic approach to retaining biodiversity in urban environments. Conservation planning aims to address the issues of representativeness and persistence. This study focuses on the progress towards quantifying the persistence of communities of species, with the goal of assessing different scenarios of urban development in terms of the persistence of the biodiversity in the region.

Current approaches to quantifying the probability of persistence for multiple species are reviewed and evaluated for case study areas in the northern edges of Melbourne, where significant urban development is planned. The approaches examined include: aggregating single species assessments using population viability analysis and concepts such as focal or indicator species; threshold responses of habitat area and fragmentation; the metapopulation capacity of fragmented landscapes; and surrogate methods such as habitat availability.

A framework is developed that can best deal with the uncertainties inherent in the data requirements of each approach. A set of minimum requirements necessary for communities to persist is developed. An important result of this study is that the framework must incorporate methods that can explicitly deal with social and economic trade offs in land-use allocation, if it is to be effective.

This study presents an integrated approach to quantify the persistence of communities of species under different urban development scenarios. Methods for incorporating land use trade-offs are explored. These results feed into an umbrella project "Re-imagining the Australian Suburb" which examines key elements of sustainability in urban development.

Keywords: population viability, multiple species, urban fringe, land-use trade offs, conservation planning

Grande, Daniel; Losada, H.; Maldonado, M.; Nahed, J.; Perez-Gil, F.

The silvopastoral systems on the mountain region of Tabasco, Mexico and the epiphyte plant diversity

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Poster session 3, Agriculture and biodiversity

In the tropical silvopastoral systems, is common that trees host numerous epiphyte plants in their branches and trunks, although it is known a little about the diversity, importance and characteristics of these species. The objective of this research was to know the most common epiphyte plants on the trees of the main tropical silvopastoral systems on the mountain region of Tabasco.

This study was carried out on the mountain region of Tabasco, at the southeast of Mexico, which has a tropical humid warm climate, and where the original vegetation was evergreen rainforest. The investigation was realized in trees of the two main

regional silvopastoral systems: live fences and isolated trees in pastures, and was focused exclusively in the more common epiphyte plants present on the trees of the two mentioned systems.

Epiphytes were found on diverse individuals and tree species, principally in the highest and old trees and with big fronds of both live fences and isolated trees in pastures. In the trees of the regional silvopastoral systems, the most common epiphyte plants belong to the botanical families Araceae, (genus Anthurium, Philodendron and Syngonium), Bromeliaceae (genus Aechmea, Catopsis and Tillandsia) and Orchidaceae (genus Encyclia, Epidendrum, Maxillaria, Nidema, Notylia, Oncidium and Stelis). Some epiphyte plants (particularly orchids) have potential for ornamental use, which would bring additional economic benefits for the regional producers.

Based on the presence and characteristics of the found species, it is concluded that the epiphyte plants contribute to increase the plant diversity in the regional silvopastoral systems, and by means of an appropriate selection and use, can increase the possibilities of exploitation and the obtaining of economic benefits for the producers, which justifies the realization of more detailed later evaluations.

Keywords: epiphyte diversity, silvopastoral systems, tropical agroforestry, mountain region, Tabasco Mexico

Greenleaf, Sarah; Kremen, Claire

Effects of local-scale and foraging-scale habitats on bumble bees (*Bombus vosnesnenskii*) in a mosaic of agricultural and wild habitat

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Poster session 7, Biodiversity and ecosystem services

Bumble bees, important for crop and wild plant pollination, are declining. Causes for decline may include agricultural intensification, chemicals, introduced diseases, and loss of natural habitat. We have previously identified bumble bees as an important crop pollinator species in North California. Our previous research found that bumble bees are found only on farms that are located within a few hundred meters of natural habitat. However, in that descriptive study we were unable to separate the effects of wild habitat at different scales (nest-site scale vs. foraging distance scale). Here, we report the results from an experimental study. We raised 76 *Bombus vosnesnenskii* colonies from field-collected queens and placed them in the field with 2 colonies per site, including locations where they were locally extirpated. To assess differences in local-scale habitat at the nest site, we placed 13 colonies on organic farms, 13 on conventional farms, and 12 in wild riparian habitat. To assess the effect of wild habitat at the foraging scale, for each type of local habitat, we included sites with varying wild habitat within the colony's foraging range (0 to 99%). All colonies survived > 6 weeks and produced workers in the field. Most colonies produced queens. Foraging-scale habitat affected production of workers but not queens. Local-scale habitat did not affect worker or queen production but did affect the maximum weight obtained by the colony, which was positively correlated with worker and queen production. The results suggest that bumble bee populations can be enhanced by restoration, and that farms closer to more wild habitat host colonies with more workers.

Keywords: pollination, restoration, landscape, Apoidea, ecosystem services

Harris, Stuart A.

Sources of the vascular plants that recolonized the alpine zone of the Canadian Cordillera following the Late Wisconsin Glaciation

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Poster session 12, Systematics, phylogeny and evolution

This paper examines the sources of the vascular plants that recolonized the alpine areas of the Canadian Cordillera and adjacent USA following the Late Wisconsin deglaciation. The glaciated area included 1600 km of longitude and 800-1200 km of latitude, and the recolonization had to be accomplished in under 3 ka. The alpine sites currently consist of isolated mountain peaks and ranges separated by boreal forest. Detailed published records of alpine plants at 29 alpine sites located between Alaska and Colorado were used. The vascular plant species were separated into groups by present-day geographic distribution. Of the 629 taxa, over 70% only occur in North America. The percentages of each geographic group were computed for each site and plotted on maps.

Considerable speciation had occurred in the refugia, probably aided by the changing climates and the migrations of species. The new species from the eastern Middle Cordilleran refugium only spread a short distance along the eastern Cordillera. Those of the Queen Charlotte Island refugium spread along the coast of British Columbia. Species from Beringia and the eastern part of the Beringian refugium (North Cordilleran species) spread south along the east side of the Cordillera, some reaching Wyoming. North American species and Circum-subarctic species migrated in from all the refugia. However, the actual distribution of individual species is patchy, and clearly the species did not have adequate time to colonize the area properly. As a result, many species are on the lists of rare plants.

It would seem that repeated cold periods with attendant speciation and mixing of the taxa, together with periodic migrations across the Bering Strait could explain the development of the Cordilleran group, the North American species, and the Circum-subarctic floras. The latter would also undergo mixing during each cold period.

Keywords: biogeography, evolution, vascular plants, speciation, North America

Hättenschwiler, Stephan; Roy, Jacques

A programme on tree diversity and soil biology in French Guyana

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Poster session 6, Biodiversity and ecosystem functioning

There is a feedback between soil fertility and primary producers characteristic for most ecosystems. Plants from infertile habitats are slow-growing and bear low quality leaves (high C/N and phenol content) of slow turn-over rates during decomposition reinforcing the low fertility of soils. The opposite occurs in fertile habitats. In such a comparison along fertility gradients, the impacts of soil characteristics and species traits are confounded. In the context of biodiversity changes as well as of forestry and agriculture practices, we need to identify, for a given initial substrate, the impact of species identity and diversity on soil biology and ecosystem physiology. The experimental design is a collection of 16 species of local trees established as monocultures 20 years ago in the humid tropical forest of French Guyana (20 x 20 m² plots on a uniform ploughed soil after removal of the natural forest). Adding transition

zones between the contiguous plots allows studying the impact of mixture of litter from 1 to 4 species. We are analysing i) the ecological and physiological determinants of litter quality, ii) the impact of tree species identity on decomposition and soil functioning, and iii) the responses in the structure and activity of the faunal and microbial communities. Using experimental and modelling approaches we will attempt to link trophic interactions, species diversity and biogeochemical cycles. Working with 16 species will allow deriving functional types of primary producers independently of species identity. Preliminary results on some of these aspects will be presented. Most experimental designs for the study of the impact of plant diversity on ecosystem functioning lack longevity to allow feedback processes to develop. Being 20 year old, this experimental site will provide very valuable results.

Keywords: tree diversity, soil biology, nutrient resorption, litter decomposition, recycling pathways

Hegland, Stein joar; Totland, Ørjan

Facilitation in pollination interactions

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Poster session 7, Biodiversity and ecosystem services

Plant-pollinator interactions are crucial for the functioning of ecosystems. Pollinators distribute ecosystem services to plants that depend on sufficient pollen supply for high-quality reproduction, hence influencing plant population dynamics, plant community structure and evolutionary processes. Plants are thus very reliant on the pollinator activity and abundance. In northern ecosystems insects are the prime pollinators and flowering season is limited to summer. Plants are therefore vulnerable to bad weather conditions or short supply of pollinators during flowering. Our aim was to investigate if biodiversity were decisive for insect choice to visit a patch, and if biodiversity could predict insect activity in a patch. Furthermore, we ask how plant species experience the company of other species, in other words are neighbour species competitors or facilitators of each other's pollination?

We observed visitation of pollinator groups to all insect pollinated plant species in a plant community during a whole pollination season, to derive general ecological patterns. We combined observational and experimental studies.

Our results show a crucial importance of biodiversity for insect's choice to visit a patch and for the insect activity in a patch, through the importance of floral density and diversity. Very interesting is the facilitative effects plant species generally have on each other's pollinator visitation. Plant diversity and floral density increase insect activity and diversity, and therefore the diversity of both organism groups depend on the total biodiversity of an area.

Trophic interactions are important when monitoring biodiversity and investigating the influence of biodiversity on ecosystem functioning since most organism groups do not live isolated from other groups. Biodiversity function as a positive driver of pollination and coexistence among plants.

Keywords: pollination, facilitation, competition, coexistence, trophic-interactions

Hemp, Claudia; Hemp, Andreas

Diversity and refuge function for indigenous fauna in anthropogenic

influenced habitats in tropical regions: A case study on the Chagga Home Gardens on Mt. Kilimanjaro, Tanzania

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Poster session 10, Monitoring biodiversity changes

The former sub-montane forests of the southern and eastern slopes of Kilimanjaro are today substituted by small coffee-banana plantations, the so-called Chagga home gardens. Since these cultivated fields still have the structure of a forest, they are a potential refuge for forest plants but also for animals, which is investigated in this study for grasshoppers, locusts and katydids (Saltatoria).

Sixty-two permanent plots (usually 0.1 ha) were established between 1996 and 2004 in the Chagga home gardens along transects from 800-1800 m and compared with the other vegetation formations on this volcano on basis of over 1400 plots following the method of Braun-Blanquet. Saltatoria were recorded by sight, netsweeping, and shaking of trees.

Saltatoria: due to the forest structure of the Chagga home gardens with a tree, shrub and herb layer, more than half of the 52 recorded species are forest species, whilst the remainder originate from open habitats. Moreover, the Chagga home gardens harbour >70 per cent of all forest species and >50% of the endemic species of Mount Kilimanjaro. Most endemics in the plantations originate from sub-montane habitats, and contribute 72% of the total number of sub-montane endemics found in the region. More than half of all endemics from the montane zone are also found in the Chagga home gardens. Flora: The Chagga home gardens maintain a high biodiversity with about 520 vascular plant species including over 400 non-cultivated plants. Most species (194) are forest species, followed by 128 ruderal species, including 41 neophytes. Beside relicts of the former forest cover, which lost most of their former habitats, there are on the other hand (apophytic) forest species, which were directly or indirectly favoured by the land use of the Chagga people.

Therefore, the Chagga home gardens act as an important refuge for both generalist forest species and endemic fauna. In recent years new coffee varieties have been introduced to the gardens that are less shade demanding, and tree removal may impinge on the indigenous Saltatoria fauna and endanger this effective and sustainable system.

Keywords: agroforestry, Orthoptera, East Africa, biodiversity, endemism, conservation

Hodgkin, Toby; Rana, R; Tuxill, J; Didier, B; Subedi, A; Mar, I; Karamura, D; Valdivia, R, Colledo, L; Latournerie, L; Sadiki, M; Sawadogo, M; Brown, AHD; Jarvis, D

Seed systems and crop genetic diversity in agroecosystems

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Poster session 3, Agriculture and biodiversity

Most rural farming communities in developing countries continue to use traditional or informal sources of seed and vegetative planting materials to meet their seed needs. Either they save their own seed or they obtain seed from sources such as relatives, neighbours and local markets independently of the formal certified seed sector. The operation of informal seed systems is clearly important to the maintenance of crop genetic diversity on farm. The numbers and proportions of different varieties, their availability, interrelationships and movement depend on the patterns of exchange

within an area and the forms that it takes. Variation in production, market fluctuations and events such as floods or hurricanes will also have a substantial effect on the availability of seed locally and the diversity of the materials maintained in production. In this paper the operation of different components of the seed system (such as seed source, seed flow, seed production, farmer selection and seed storage) are explored in relation to the evolutionary forces that shape the genetic structure of crop variety populations on farm. The ways in which different features of seed systems contribute to gene flow, migration, selection, mutation and recombination are examined in the context of exploring how adaptive capacity might be maintained in production systems undergoing intensification.

Keywords: seeds, agroecosystems, biodiversity, crop, on farm

Hoffmann, Jörg; Kiesel, Joachim; Lutze, Gerd

Action-oriented indicator to maintain biological diversity in the agricultural areas of central Europe

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Poster session 3, Agriculture and biodiversity

Agriculture is one of the main causes of the reduction in biological diversity in central Europe. The main causes can be identified on the one hand as the production-maximizing farming on agricultural landscapes, the financing for agricultural products oriented on this production-maximization, and the lack of integration of adequate regional natural protection measures in agricultural production systems linked to the natural space type of landscapes.

Against this background, the goal of the indicator is to illustrate the current status of biological diversity (species, habitats, landscapes) under consideration of the different natural space type conditions. With the help of the indicators, regionally adapted measures to maintain bio-logical diversity in agricultural productions systems should be integrated.

On the basis of digital data of the natural space type conditions including the current biotopes, a GIS supported analysis of the agriculturally used landscapes was carried out. Hierarchically classified landscapes, dominated by agricultural use, are the result. Here, the agriculturally used habitats (arable land, grassland, orchard areas, heaths) and the close-to-nature biotope structures were systematized and classified with regard to their differentiated biological significance.

The indicator comprises the given biotope structures as well as the species of birds found there (species diversity, abundance). It is designed according to the hierarchical landscape classification, and has a different conclusive value depending to the type of landscape, which is oriented to the natural space characteristics of the individual areas. The indicator are currently being tested in the German federal state of Brandenburg (ca. 30,000 km²) and shall be implemented throughout Germany in the next few years in order to draw regionally adapted methods/measures in to promote biological diversity in farming.

Keywords: Indicator, biological diversity, agricultural areas, biotopes, species

Hulvey, Kris; Zavaleta, Erika

Ecological extinction in California grasslands: the effect of native species

declines on ecosystem functioning

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Poster session 6, Biodiversity and ecosystem functioning

Biodiversity loss in the form of species abundance declines can result in ecological extinction, where a species no longer contributes to key ecosystem processes. Examples of ecological extinction effects include altered food web dynamics through declines of top predators, loss of mutualisms, and changes in successional patterns due to altered abundances of seed and pollen dispersers. An ecosystem function of current conservation interest that may be reduced by ecological extinction is invasion resistance. Recent studies indicate that rare native species may play a role in invasion resistance. For example, native *Hemizonia congesta* subsp. *luzulifolia*, has been shown to decrease the biomass of invading yellow starthistle, *Centaurea solstitialis*. In the current study, I examined the effect of *Hemizonia* abundance declines on invasion resistance of California grasslands to starthistle.

Experiments were conducted in outdoor ~.07m² microcosms at Jasper Ridge Biological Reserve, California. In the first experiment, plant assemblages varied in species richness, with each treatment representative of assemblages found at the Reserve. In the second experiment, microcosms varied in *Hemizonia* abundance and a functionally contrasting, dominant grass species, *Bromus diandrus*. In all experiments, half of the microcosms were invaded with starthistle. Plant cover, biomass, soil moisture, nutrient, and light availability, and reproductive output were recorded.

In the 1st experiment even very low abundances of *Hemizonia* appeared to suppress starthistle productivity. This trend is being further investigated in the 2nd experiment, which will conclude in August 2005.

Results from this work may highlight non-linear responses of invasion resistance to native species abundance declines.

Keywords: ecological extinction, *Hemizonia congesta*, *Centaurea solstitialis*, invasion resistance, ecosystem functioning

Huu Tri, Pham

Variation in morphology of *Kappaphycus cottonii*(Weber-van Bosse)Doty in Vietnam

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Poster session 12, Systematics, phylogeny and evolution

Kappaphycus cottonii have been studied in Vietnam since 1990. Nguyen (1993) described 3 species collected from central Vietnam. Nguyen and Huynh (1995) reported 4 species of *Kappaphycus* and *Eucheuma* collected from Ninh Thuan, Ly Son and Truong Sa islands. Pham and Nguyen (1997) described some species of *Eucheuma* and *Kappaphycus* found in Vietnam for the first time. Pham (1998, 1999) reported on the situated resources of *Kappaphycus* and *Eucheuma* in the Spratly archipelago.

This chapter give information on some forms of *K. cottonii* distributed in the Spratly archipelago, along the coast of Ninh Thuan and at Ly Son Island.

Materials were collected at Ly Son island and along the coast of Ninh Thuan in April and May 1990- 2000 and in the Spratly archipelago in April and May 1993 – 2002.

Photomicrographs were obtained with a SC-35 camera attached to an Olympus CH-30 compound microscope.

Five forms of *Kappaphycus cottonii* are described: The form 1 (figs. 2a-2d) resembles the species of *Eucheuma cottonii* described by W.V.Bosse (1913-1928, pp.409, 417, 418 figs. 167). The form 2 (figs. 3a-3h) resembles the species of *Eucheuma striatum* described by W.V.Bosse(1928, pp.423 - 424, fig.171, pl. XVI, fig.4) and also resembles the species of *Eucheuma muricatum* that Yamada(1936, pp.122-125, figs.3-5, pl. 23, figs. 1-2) described as one of the species of *Eucheuma* from Ryukyu and Formosa. The form 3(figs. 4a-4d) and form 4(figs.5a-5c) are ecological variants. The form 5 (figs. 6a-6b) resembles the species of *Eucheuma okamurai* described by Yamada (1936, pp.125-126, 128-130, figs. 8-9, pls. 26-27).

Based on the observation of the cross section of materials and compare the specimens at the Bishop museum, Hawaii. We conclude that the 5 forms described in this chapter, which could have been recognized as different species, are ecological variants of *Kappaphycus cottonii*.

Keywords: Forms, Anatomical studies, Photomicrographs, Cross section, Ecological variants

Imbert, Bosco; Blanco, Juan A.; Valladares, Fernando; Castillo, Federico J. Influence of thinning on plant species richness and diversity, and solar radiation indices in two contrasting Iberian *Pinus sylvestris* L. forests during a five year period

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Poster session 5, Drivers of biodiversity changes

Effects of thinning on plant species richness and diversity (Shannon-Wiener (H'), evenness (E) and Simpson (D')), and solar radiation indices (indirect site factor (ISF), direct site factor (DSF), global site factor (GSF), LAI and ground-cover factor (GCF) were studied in two contrasting *Pinus sylvestris* L. stands in the western Pyrenees (Spain): Aspurz (625 m, 7% slope, high productivity) and Garde (1335 m, 40% slope, low productivity). The study was carried out on nine plots (30 x 40 m) per location during a five year period (2000-2004) following thinning in 1999. There were three types of plots in both sites, with three replicates of each: P0, reference with no thinning; P20, 20 % of basal area removal; P30, 30 % removal. Percentage plant cover was estimated each year in June on 10 fixed quadrants (2 x 2 m) per plot. Solar radiation indices were determined using hemispherical photographs. As for species richness and diversity indices significant differences between treatments were only detected in Aspurz for D' and E ($(P0=P20)>P30$), being this pattern constant over the study period. Thinning significantly affected ISF ($P0<(P20=P30)$) and GCF ($(P0=P20)>P30$) in Aspurz, and GSF ($P0<(P20=P30)$) in Garde. Based on reference plots and solar radiation indices it appears that canopy closure in thinned plots was reached in 2004 (Aspurz) and 2003 (Garde). However, in spite of this relative closure, crowns in all types of plots in both locations opened up in 2003 and 2004 apparently due to the action of meteorological factors. Thus, temporal changes in ISF, DSF and GSF were only significantly correlated with D' (Aspurz). Our results imply that management of plant diversity in our research sites should be site specific, and that dominance diversity indices such as D' and evenness indices are more useful to detect these types of disturbances than indices weighted towards species richness.

Keywords: understory plant diversity, solar radiation indices, Pyrenees mountains, thinning, *Pinus sylvestris*

Ivanauskas, Natalia Macedo; Rodrigues, Ricardo Ribeiro; Durigan, Giselda; Franco, Geraldo Antônio Daher Corrêa; Oliveira, Alexandre Adalardo

Diversity, dynamics and conservation in São Paulo State Forests: 40ha of permanent plots

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Poster session 4, Biodiversity conservation

This work presents a multidisciplinary approach for long-term studies on Brazilian forest dynamics. The aim is accumulate knowledge about the processes which determine forestry dynamics and promote the understanding about mechanisms involved in diversity maintenance. Permanent plots with ten ha each were located in the four most representative types of forests occurring in São Paulo State: Restinga Forest (Ilha do Cardoso State Park), Slope Atlantic Forest (Carlos Botelho State Park), Semideciduous Seasonal Forest (Caetetus Ecological Station) and Savanna Forest (Assis Ecological Station). In each plot, all the trees with circumference at breast height (CBH) ≥ 15 cm were sampled, georeferenced and identified (63559 individuals). Soil (samples in three depths in each subplot) and topography were characterized in detail (1:500 scale) and measures of climate, ground water and light have been under continuous monitoring. The tree flora was illustrated in field guides for species recognition and epiphytes and herbaceous vegetation have been collected for the same purposes. The forest structure was described through phytosociological, physiognomic and sylvigenic surveys and the spatial distribution was estimated by K-Ripley function. Vegetation data were correlated with edaphic and climatic features in order to understand the differences between each forest type. Generation and maintenance of biodiversity concepts have been tested at community and species level and compared among areas. The results will help the development of methods for the goal-directed manipulation of ecological processes, in order to increase the resilience in plant communities under different disturbance regimes as well as for forestry restoration of degraded areas. This work was supported by the State of São Paulo Research Foundation (FAPESP) within the BIOTA/FAPESP - The Biodiversity Virtual Institute Program (www.biota.org.br) (Process 1999/09635-0).

Keywords: Tropical forest, Permanent plots, biodiversity, dynamics, phytosociology

Izakovicová, Zita

The socio-economic research on the field of biodiversity – results of the SoBio project in the Slovak Republic

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Poster session 14, Economics of biodiversity

Jato, Johnson

Cameroonian plants for life-threatening diseases – the case of cancer and AIDS

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Poster session 8, Biodiversity changes and health

Studies of medication show that some of the earliest medicines were of plant origin.

During graduate studies we saw life-threatening diseases as a great challenge. Doctoral research addressed chemotherapy of cancer. Even though the product studied in this connection was an analog rather than a plain substance. We kept thinking of how much easier things would be for mankind if some products of abundance in nature could treat life-threatening diseases such as cancer then recently AIDS. In the early 1990s when alkaloids from a liana in Cameroon forest showed activity against HIV-1 and HIV-2 and National Cancer Institute (N.C.I) of the United States patented these michellamines for us, we rushed to cultivate the liana in the hope that it could provide a cure for the deadly disease.

For some of our research involving plants that are rare, we have envisaged sustainability by domesticating the plant in question as in the case of *Ancistrokladus korupensis*, the anti-HIV vine. We used a high humidity vegetative propagation method. Collection, extraction, analysis and screening have followed standard protocols used by the Natural Product Support Group of the N.C.I.

Research on cancer treatment using plant-based medicine continues. The results we have got so far show interesting activities against cancer in certain species of the Euphorbiaceae family from which we expected nothing good for mankind. This applies mainly to the genus *Macaranga*, details of which appear in the full-fledged presentation. Some techniques that we have used can help other researchers in the area.

It is obvious that Cameroonian flora has great potential of remedies for cancer and AIDS as indicated by the *Macaranga* and *Ancistrokladus* species studied; five products so far identified as active against cancer and six against HIV.

Keywords: AIDS, cancer, analyses, domestication, screening

Johst, Karin; Huth, Andreas

The intermediate disturbance hypothesis: general conclusions from a comparison of different ecosystems

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Poster session 6, Biodiversity and ecosystem functioning

Succession after disturbances generates a mosaic of patches in different successional stages. Too infrequent and small disturbances reduce the abundance of the pioneer stages, while too often and too large disturbances reduce the abundance of the late stages. Therefore, the intermediate disturbance hypothesis predicts that high diversity is promoted by intermediate disturbances ensuring a mixture of pioneer, intermediate and late successional stages. In many cases this general concept has been illustrated by a hump-shaped diversity-disturbance curve with the peak diversity qualitatively shown at intermediate disturbances.

We tested this prediction using field data of forest and benthos succession, and hypothetical succession scenarios in combination with analytical and simulation models. We compared two indices measuring the regional diversity of successional stages: the Shannon index including both number and relative proportion of stages and the richness (number) of stages.

Although many scenarios confirmed the intermediate disturbance hypothesis in general, highly asymmetric curves were common and deviations in the form of two diversity maximums could occur. The models revealed the mechanisms behind these patterns. According to our study the main factors shaping the diversity-disturbance curve were the transition times between the successional stages, the transition type,

neighbourhood effects and the choice of diversity measure.

The impact of disturbances on biodiversity can be complex and deviate considerably from a simple hump-shaped curve. The biologically meaningful, reliable identification of the successional pattern is indispensable for predicting the maintenance of diversity at changing disturbances in real data sets.

Keywords: intermediate disturbance hypothesis, diversity, succession, forest, benthos

Kobayashi, Yutaka

Diversity of chemical signals in plants: a theoretical approach

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Poster session 6, Biodiversity and ecosystem functioning

In some tritrophic systems, it is known that plants infested by herbivorous insects emit volatiles to attract natural enemies of the herbivores. These volatiles are sometimes called “SOS” signals. Interestingly, bodyguards (the natural enemies) can discriminate between the signals from their prey species and those from non-prey species. In fact, chemical composition (blend ratios of chemicals) of a signal depends on the combination of plant and herbivore species. Thus, many kinds of signals should exist in a complex community. In this study, I propose a way of understanding how such diversity of signal types is maintained.

A simulation model of a tritrophic system, in which there are multiple species in each trophic level, is constructed and analyzed. The model is essentially a network model, in which vertices are species and directed links denote predation. Each plant-herbivore interaction (link) has a certain signal type, and each predator species has preference to a certain signal type. I assume that signal preference of predators evolutionarily changes to fit the signal from their prey species, while signal types of plants change to fit the preference of their bodyguards.

The number of prey species per predator species has to be small in order for signal diversity to be maintained. Even very slow temporal fluctuation in the food-web structure can completely ruin signal diversity. However, if it is assumed that predators disfavour signals from non-prey species, signal diversity can be maintained even in a varying food web.

Diversity of signal types is explained by structural features of the food web and how bodyguards use information. Through this study, general ways of understanding diffusion of coevolution and diversity of strategies or traits are proposed.

Keywords: SOS signal of plants, tritrophic system, food web, network, diffusion of coevolution

Koetz, Thomas

The Complexity of Science-Policy Interfaces in Biodiversity Governance on multiple identities of biodiversity and their implications for policy processes based on democratic principles

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Poster session 11, Policy for sustainable development

Biodiversity as a concept is not only dual in nature, being (in parts) a concrete and measurable biological phenomena, as well as a human construction, a model

representing nature shaping comprehension, perception, and valuation of the environment. The complex nature of biodiversity confronts the observer also with a multiplicity of non-equivalent but legitimate views of the same object. Organised over different hierarchical levels biodiversity shows different identities when observed and represented on different levels, which, in turn, rules out one of the basic principles of science, its inter-subjectivity.

In the context of multiple identities of biodiversity traditional analytic decision-making, based on objective science, results to be inadequate and illegitimate in the case of biodiversity governance. As opposed to such a linear model of policy processes we follow a structuration approach to understand knowledge-policy interrelationships. According to this approach scientific knowledge is integrated into policies as a combination of structure and agency which continuously and recursively interact, driven by political interest, actor networks, and discourses. Policy-making, then, is complex, political and power-laden and science-policy interfaces need to be treated critically in terms of quality and legitimacy.

Critical issues of science-policy interfaces are made explicit on base of experiences made in biodiversity governance presented in literature. Conflicts arise upon different ways of acquiring information on the environment, and upon different views upon what kind of nature is worth saving and who has the right to make that decision. Focusing on procedural aspects of science-policy interfaces we outline an approach drawing on complex systems theory and deliberative democracy. This is to ensure that scientific knowledge that informs policy is of adequate quality and that decisions made on behalf of this knowledge are in line with democratic principles.

Keywords: Biodiversity, Science-Policy Interfaces, Complexity, Deliberative Democracy, Governance

Koleff, Patricia; Alarcon, Jesus; Moreno, Elizabeth; Soberon, Jorge

Prediction of risk areas for biodiversity in Mexico caused by invasive species

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Poster session 9, Invasive species

Mexico is considered a megadiverse country since it holds about 10 to 12 % of the total biodiversity of the world. The importance of the Mexican biodiversity is not only because of its species richness and the variety of landscapes and ecosystems present in the country, but the high number of endemic species that inhabit on it. This biodiversity is seriously threatened by one of the major causes acknowledged worldwide that causes the extinction of species, the alien invasive species.

However, detailed information about their geographical distribution is not available to date, especially for some groups of organisms. Geographic distribution of many of those species is determined by complex interactions among climatic, historical, ecological and anthropogenic factors. Therefore, accurate geographic distribution of invasive species might be extremely dynamic and might be stressed by actual and future rates of ecological changes in Mexico.

We have been developing the National Biodiversity Information System on Invasive Species since 2000 and started using computerised and geo-referenced data to use predictive models in analysing risk to biodiversity caused by invasive species. Maps and information about a given area of interest are generated by using large databases of species occurrence and predictive algorithms of artificial intelligence such as the Genetic Algorithm for Rule-set Production (Stockwell & Peterson, 1999)

to predict species geographic distribution. Some examples of risk analysis using the method describe above have been made for species such as *Tamarix ramossissima* (saltcedar), *Cenchrus ciliaris* (buffel grass), *Cynara cardunculus* (cardoon) y *Cactoblastis cactorum* (cactus moth).

Keywords: inventories, bioinformatics, risk analysis, invasive species, Mexico

Konate, Souleymane

Effect of logging on the diversity of termites and ants in Côte d'Ivoire

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Poster session 5, Drivers of biodiversity changes

Tropical forests that contain more than half of the global species diversity are subject to increasing human pressure leading to fragmentation and permanent destruction. Facing this threat, an assessment and monitoring of the biological diversity of the remaining tropical forest patches is needed for sustainable management. Therefore a rapid assessment program was organized by the NGO "Conservation International" in the Haute Dodo and Cavally rain forests in Côte d'Ivoire. These two forests, belonging to the important West African rain forest remnants, are subject to private timber exploitation. The aim of our study was to evaluate insect diversity and the impact of timber exploitation on the biodiversity. Because of their ecological importance and relatively well-known taxonomy, we focussed on two groups of insects, termites and ants. We used rapid assessment methods (e.g. semi-quantitative standardized transects) during this program. Our results showed a high entomological diversity in the two forests. We identified 30 species of termites and 39 species of ants. The study demonstrated a high sensitivity of termites and ants to logging and a negative impact on their diversity. Furthermore we noticed a shift in the taxonomic and functional composition of termite communities along with deforestation. These results indicated that termites and ants can be used as biological indicators in the context of forest exploitation. This study underlined the importance of rapid assessment methods as a tool for sustainable forest management. The simplicity of this method makes it a useful tool for natural reserve managers and biodiversity researchers.

Keywords: ants, termites, biodiversity, forest, bioindicator

Koopman, Jerzy

Conservation of biological and cultural diversity: a reconceptualization of patent law

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Poster session 11, Policy for sustainable development

Globalization is characterized by close interconnections between states, corporations, communities and individuals. The global village so built is criticized. Many contend that the regulatory framework that steers globalization is excessively determined by economic parameters: Trade has become an end in itself whilst issues about equity and the common good are neglected. These include cultural and biodiversity. The Convention on Biodiversity (CBD) reflects this perspective. Biodiversity should be conserved through measures that interlink seemingly opposing interests and different types of governance and law. This should result in alignment of

the perils and opportunities of globalization and re-balance the manner in which one could enjoy the benefits or bear the burdens of exploitation of biodiversity and associated knowledge. The concept of access and benefit sharing (ABS, art. 8(j), 15 and 16) is illustrative. Interests of traditional knowledge holders, biodiversity-rich countries and bio-industries are to be aligned through access to each others' valuable objects (knowledge, biological materials, monetary rewards etc.). Long-term interests such as the world's need for cultural and biological diversity and biotechnological progress should so be safeguarded in an integrative fashion. ABS touches on intellectual property and particularly patent law. Questions addressed: Is patent law suited to open up for the cultural and ecological interests safeguarded by the CBD? If not, how could patent law be changed? Are those changes feasible and appropriate and will they truly align said interests? Particular attention is given to proposals for amendment of the disclosure requirement of patent law and for the establishment of sui generis intellectual property for traditional knowledge holders. Legal comparison (Europe – US – Brazil - Peru) will be provided. Suggestions on how to proceed will be provided.

Keywords: Biodiversity, Traditional knowledge (TK), Access and Benefit Sharing (ABS), Sui generis IP for TK, Patent law

Kourafalou, Villy; Paris, Claire; Staneva, Joanna

Ecosystem response to nutrient fluxes and climate changes

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Poster session 5, Drivers of biodiversity changes

The study examines the functioning of coastal marine ecosystems under varying conditions of nutrient supply and for changing climatic influence. Two different coastal ecosystems are studied: the Danube delta area in the Black Sea that receives nutrients through river discharge and the Florida Keys Reef Tract that receives nutrients from the adjacent shallow Florida Bay (subject to anthropogenic changes) and from the deep Florida Straits (through upwelling, internal tides and Florida Current eddies). Both areas have exhibited strong climatic variability.

Comprehensive, three-dimensional physical and biochemical models have been employed to integrate all related processes that control circulation, nutrient loading and transport, as well as larval behaviour, under different conditions of nutrient supply and for different climatic conditions. The impact of future scenarios that reflect management changes is examined.

The fluxes of nutrients, the fish life history traits and the changes in climatic conditions have a pronounced effect on the functioning of marine ecosystems.

Numerical models are essential in the understanding of the related scientific processes and in providing predictions that can be employed by policy makers and managers to ensure sustainability of resources and protection of biodiversity.

Model predictions indicate that coastal ecosystems are very sensitive to changes in nutrient concentrations, as well as to C:N:P:Si ratios. The coupling of physical and biogeochemical models is an important tool in addressing scientific and socioeconomic issues in sustainable ecosystem management.

Keywords: biocomplexity, modelling, nutrient transport, climate change, larval transport

Kroemer, Thorsten; Acebey, Amparo; Gradstein, S. Robbert; Kessler, Michael
Diversity of vascular epiphytes along an elevational gradient in primary forests and fallows in the Bolivian Andes

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Poster session 10, Monitoring biodiversity changes

Vascular epiphytes are an important component of tropical montane forests. However, the rapid destruction of these forests poses a major threat to the epiphytic vegetation. We wanted to determine the diversity patterns of vascular epiphytes in montane forests of Bolivia and to study the impact of deforestation on epiphyte communities.

We studied total vascular epiphyte diversity based on inventories of 90 plots of 400 m² each, sampled at 350-4000 m at 14 elevations in the eastern Andean slopes, Bolivia. Additionally, vascular epiphyte diversity in 24 neighbouring 15-year-old fallow plots was compared.

About 800 species of epiphytes in 30 families and 131 genera were recorded. Orchids were the most species rich family, followed by ferns. All other groups usually contributed less than 10% each per plot, except for the aroids at lower elevations. Species numbers showed a hump-shaped diversity pattern with maximum species numbers recorded at 1300 m.

A comparison of epiphyte diversity in primary and secondary vegetation indicated major losses of epiphytic diversity after deforestation. Species numbers of orchids, Hymenophyllaceae, and Grammitidaceae were much lower in fallows than in primary forest, but numbers were not reduced for hemiepiphytic aroids, Polypodiaceae, and Aspleniaceae.

Our study confirms the mid-elevation bulge of epiphyte richness in the Andes. We hypothesize that the decline of richness at high elevations is due to low temperatures, while epiphyte diversity in the lowlands is probably limited by air humidity. Reduction of epiphytic species diversity in fallows may be explained by structural characteristics of the fallow trees, the lack of a dense moss cover, and the drier microclimate in the fallows. Secondary forests have only reduced value as epiphyte habitats and conservation of epiphyte communities depends on the preservation of natural forests.

Keywords: vascular epiphytes, elevational gradient, tropical montane forest, secondary vegetation, Andes

Laurentin, Hernan; Karlovsky, Petr

**Investigation of genetic relationships in sesame (*Sesamum indicum* L.)
germplasm collection using amplified fragments length polymorphisms (aflp)**

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Poster session 12, Systematics, phylogeny and evolution

Sesame (*Sesamum indicum* L.) is one of the most ancient crops. It is grown in tropical and subtropical areas on 6.5 million of hectares worldwide. Despite its nutritional value and historic and cultural importance, the research on this crop has been scarce, particularly concerning its genetic diversity. The aim of this study was to clarify genetic relationships among 32 sesame accessions from the Venezuelan Germplasm Collection, which represents genotypes from 5 diversity centres, as a measure of its intraspecific variation.

Amplified fragments length polymorphism markers were analyzed on 32 sesame

accessions, using 8 primer combinations. Jaccard's similarity coefficients and Unweighted Pair Group Method with Arithmetic Mean were used in cluster analysis. Three statistical tools tested the dendrogram robustness. Principal coordinates analysis was also performed.

A high level of polymorphism was obtained. Of the 457 bands recorded, 93 % were polymorphic. Cluster analysis grouped 25 accessions in two robust clusters, one of which included all Central Asian accessions, whereas the other one included predominantly Indian accessions. However, Indian, African and Chinese-Korean-Japanese accessions were spread along the whole dendrogram. Principal coordinates analysis showed a continuous variation along the biplot with a similar pattern concerning Indian, African and Chinese-Korean-Japanese accessions, which were spread all over the biplot. Both analysis failed to display grouping by geographical origin, which suggests a strong gene flow across the diversity centres sampled.

Future sesame germplasm management strategies must sample as many populations as possible within each recognizable diversity centre instead of assuming populations coming from the same geographical region are similar among each other and different with respect to population from other geographical regions.

Keywords: sesame, genetic, intraspecific, variation, AFLP

Lemons, John

Conservation and sustainable use of biodiversity: a portfolio of case studies from Latin America

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Poster session 4, Biodiversity conservation

Between 1999–2004, in conjunction with the United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF), the Third World Network of Scientific Organizations (TWNISO) undertook the project “Promoting Best Practices for Conservation and Sustainable Use of Biodiversity of Global Significance in Arid and Semi-Arid Zones.”

The project focused on Africa, Asia, North Africa and the Middle East, and Latin America. Results were: identification and dissemination of best practices for protecting and sustainably using biodiversity; increased collaboration between centres of excellence facilitating exchange of information, research cooperation and coordination of lessons and best practices; and assistance for efforts of local populations to sustainably manage fragile ecosystems.

The project was unique in its collection and dissemination of case studies on best practices to conserve and sustainably use biodiversity in dry land regions of the South. The case studies focused on understudied lessons learnt for science, public policy and management, increasing the participation of local people in decision making, increasing partnerships and capacity building. Over 50 selected case studies have been published and widely disseminated.

This paper discusses examples of case studies from Latin America to provide a concrete “sense” of the diversity of the region's case studies and how they apply science to social and economic problems posed by conserving and sustainably using biodiversity. The paper concludes with a discussion of the relevance of the case studies to recent initiatives of the Convention on Biodiversity and GEF.

Keywords: biodiversity, sustainable use, Latin America, case studies, arid and semiarid lands

León-tejera, Hilda; Candelaria-Silva, Carlos; Madrid, Rafael

Advances of the project "use of algae-coral cover values in the evaluation of coralline communities of Huatulco National Park, Oaxaca, México"

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Poster session 14, Economics of biodiversity

We present the advances of the project "Use of algae-coral cover values in the evaluation of coralline communities of Huatulco National Park, Oaxaca, México". This protected area contains several coralline communities formed mainly by several species of Pocillopora and subject to anthropogenic impact in variable degrees. The project originates from increasing reports and personal observations on the changes in algae-coral cover of several coralline communities both, around the world and also in the Huatulco area.

We are using random quadrates of 250 cm² on several 25 m long transects perpendicular to the coast. We have obtained composition, richness and cover values from both photoquadrats and field data. For this study we have chosen coralline communities from San Agustín, Cacaluta, El Violín, El Maguey and La India located within the protected area and La Entrega that is located next to the national Park and represent one of the bays with more anthropogenic influence.

We present a preliminar evaluation of the state of the communities based on algae-coral cover values as well as information obtained on factors such as depth, temperature, light values as well as several nutrients obtained during several field trips. We discuss the validity of the use of algae-coral cover values obtained from photoquadrates and field data for the evaluation of coralline communities.

Keywords: coral-algae, cover values, evaluation, Oaxaca, Huatulco

Levanony, Tal; Chikatunov, Vladimir; Dayan, Tamar; Mandelik, Yael; Zonstein, Sergei

Afforestation in Mediterranean ecosystems: the role of semi-natural afforested habitats in supporting native plants and arthropods

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Poster session 6, Biodiversity and ecosystem functioning

Afforested habitats are a major component of the landscape in many Mediterranean ecosystems. Pine species are dominantly used in afforestation, generally replacing natural shrublands. In light of growing development pressure in most Mediterranean ecosystems, afforested landscapes may be an important component of the remaining open landscape. Little is known about the role of pine plantations as habitats for native fauna and flora in Mediterranean ecosystems and the effect of afforestation regimes on native species. We compared diversity and composition of arthropods and vascular plants in natural maquis and afforested pine habitats.

The research was conducted in the Judean foothills, 30 km south-west from Jerusalem. We established twenty-four 0.1 hectare plots in afforested habitats with dense (>40%) and sparse (<20%) understory cover, and in maquis habitats - eight plots in each habitat. Understory cover corresponds with plantation density; low

density is associated with high cover and vice versa. All afforested plots consisted of mature forests with dominance of *Pinus halepensis*. We carried out a seasonal study of spiders, beetles and vascular plants, commonly used as indicators for habitat quality.

Species richness and abundance of beetles and spiders was significantly higher in the maquis compared to the afforested habitats. A similar pattern was found for plant species richness. Similarity indices showed significant differences in species composition between the two habitats. We found no significant difference in any of the parameters between the dense and sparse understory habitats.

We conclude that afforested habitats support a different, impoverished fauna and flora compared to the natural habitats they replace, and that this pattern obtains even with reduced pine densities.

Keywords: afforestation, Mediterranean ecosystems, *Pinus halepensis*, Arthropods, vascular plants

Liu, Tzu-Ming

Tribal Mapping: a bridge between indigenous knowledge and biodiversity conservation

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Poster session 4, Biodiversity conservation

Indigenous communities are important part of biodiversity conservation. In Taiwan, however, there is no evident to support this point and indigenous people are excluded from the conservation policy making process. We want to show that indigenous Taiwanese can contribute biodiversity as well.

Materials and methods:

We used tribal mapping to collect, record, and show indigenous knowledge of Da-Wu preserve, the largest protected area in Taiwan. We interviewed the elders and hunters for “stories” of the land and used GIS for data-handling.

We got a list of medicinal plants, most of which are unknown to the public. It suggested potential option value of the protected area. We also got more than hundred historical place names across the area compared to only one official name. These names were all accompanied with stories about ecological change or showed some geographic characteristics. That information is important for managing Da-Wu preserve but also is unavailable in the official database. We also identified the distribution of Formosa black bear (*Selenarctos thibetanus formosanus*), an endangered species, and the distribution of bear's food sources. These two results were also not in official record.

Indigenous knowledge can be complement of official survey. It is important for the policy makers to work with indigenous Taiwanese to conserve biodiversity, especially under the case that we have limited data about Taiwan ecosystem. Besides, with the help of GIS technology, we can show indigenous knowledge in a more reliable and scientific way which helps other stockholders to acknowledge the important role of indigenous Taiwanese on conservation.

Keywords: Tribal mapping, traditional knowledge, Rukai, biodiversity conservation, Da-Wu preserve

Lopez-Acosta, Juan Carlos; Dirzo, Rodolfo

Anthropogenically changes to the floristic diversity of sabal palmetto woodland: an endemic vegetation type from Mexico

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Poster session 5, Drivers of biodiversity changes

Sabal palm woodland is a tropical vegetation type dominated by *Sabal mexicana* with restricted distribution to southern Veracruz, Mexico. Sabal palms grow on poor soils but accumulate large quantities of richer soils on their crowns, harbouring a contingent of plants epiphytes and hemiepiphytes that use it as a phorophyte.

Although it is a threatened ecosystem, basic information on its physical environment and biodiversity is scant. In this paper, besides analyzing ground and crown soil quality, we assess the impact of human activities on this vegetation, by examining: the floristic diversity of this vegetation and how it varies with the predominant anthropogenic impact in its distribution range; the potential for floristic regeneration and its variation with conservation status; and the floristic diversity of plants that use the sabal palms as phorophytes and how is it impacted by human activity.

We sampled all plants present in transects within a conserved and an adjacent perturbed area in southern Veracruz. Floristic richness, composition and diversity were affected by disturbance. Trees and regeneration vegetation in the disturbed site were 5- and 1.6-times less diverse than in the conserved site. Species typical of intact vegetation (trees and understory) were substituted by heliophytes in the disturbed site. In contrast, abundance of adult palms was not affected by disturbance and richness/diversity and identity of epiphytic/hemiepiphytic plants were similar.

This study shows that even monodominated tropical ecosystems in poor soils have a high floristic diversity and that current anthropogenic impact not only threatens species and populations but entire vegetation types as well.

Keywords: palmetto woodland, human disturbance, endemic vegetation, floristic diversity, epiphytic, hemiepiphytic flora

Mahanta, Chandan

Potential Impact of C-N-P Biogeochemical Flux on the Declining Aquatic Biodiversity of the Brahmaputra Basin

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Poster session 5, Drivers of biodiversity changes

Early signs of biodiversity loss would appear earlier in the places of most sensitive nature – endemic hot spots like the Brahmaputra basin, which is located at the transitional zones between different climatic regions and different distinct ecosystems, where temperature contrast will occur earlier than other regions. The thermal and dynamic influence of the Tibetan affects climatic modulation of organic matter fluxes and resultant aquatic faunal diversity.

This study, based on laboratory analyses of particulate nutrient concentrations at 38 locations over the basin, indicates that high sediment discharge and their nutrient status affect biodiversity of the region. Flux of particulate organic carbon, phosphorous and nitrogen through the Brahmaputra River at a downstream location was computed as 6.24×10^6 tons/year, 8.4×10^4 tons/year and 8.5×10^5 tons/year respectively.

In the light of the Brahmaputra-Ganges carrying almost 5% of the global dissolved and particulate C-N-P input, current uncertainty about future ecological processes of

the region is increasing having critical implications for the food webs. The magnitude and direction of the change could be significant both in relative and absolute terms. The future of biogeochemistry of the Indian Ocean may be impacted significantly by the nutrient flux of the Brahmaputra-Ganges.

The profound change brought about by the immensity of material transport through the Brahmaputra would have critical implications to the riverine and coastal bio-sustainability, largely mediated by particulate chemistry. Considering the current stagnancy in fish population and decline in species like the river dolphins, and since many of the habitats have started receiving urban waste, the changing nutrient biogeochemistry impact to the aqua-ecology of the entire region could be critical.

Keywords: nutrient, flux, biodiversity, Brahmaputra, impact

Maldonado, Luis A; Quintana, Erika T

Exploitable microbial diversity from Mexican soils

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Poster session 6, Biodiversity and ecosystem functioning

The term 'biological diversity' (more commonly "biodiversity") defines diversity at 3 levels of complexity: genetic, species and ecological. The simplest measure of biodiversity, species richness, is the number of species present in a given area or habitat. In this context, regions of the globe which are highly diverse (hot-spots) are expected to contain great species richness. There is an urgent need for a taxonomic inventory of such locations (including Mexico) to determine the extent of biodiversity for exploitation in search and discovery programs. Inventories of natural products show that 30000 bioactive compounds have been described from bacterial sources. It is well known that certain groups of microbes (e.g. Actinobacteria) are prolific sources of secondary metabolites, such as avermectin, rifampin, streptomycin, and vancomycin. Hence microbial biodiversity, natural products discovery, and novel species identification are interconnected disciplines. In the present study, Mexican soil samples taken from different regions of the country were evaluated to assess their actinobacterial diversity for exploitable purposes. Molecular methods based on DNA extraction from the Mexican soils guided our choice of selective isolation procedures to recover groups of Actinobacteria detected by unique 16S rRNA gene signatures using specific set of oligonucleotides. Members of the genera Actinomadura, Actinoplanes, Amycolatopsis, Nocardia, Nonomurea, Planomonospora, Rhodococcus, Saccharothrix, Streptomyces and Williamsia were recovered after using a combination of molecular and cultivation procedures. One isolate was found to represent a novel genus within the family Pseudonocardiaceae on the basis of 16S rRNA gene sequencing and phylogenetic analyses. Some of the isolates recovered in this study are being screened to evaluate their antimicrobial activity against animal and human pathogens.

Keywords: Actinobacteria, biodiversity, natural products, species richness, taxonomy

Maldonado, Susana

Red Latinoamericana de Botánica: capacity building and partnership for the development of plant sciences and conservation of biodiversity in Latin

America

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Poster session 2, International Programmes

Latin America harbors a megadiverse flora that is being endangered by over exploitation and inadequate management. Since 1988 the Red Latinoamericana de Botánica - RLB (Latin American Plant Sciences Network) has been engaged in the task of improving the number of qualified Latin American botanists in order to adequately survey the vegetation, understand the functioning of the ecosystems and provide the basis for the conservation and management of their important natural resources. This is being achieved by training young botanists from Latin American countries using the expertise and infrastructure available in more than 25 qualified scientific institutions located in 6 Latin American countries. Until now, the RLB has trained 182 graduate level researchers from 17 Latin American countries as well as funded 50 short-term courses and 92 scientific events, and provided 160 small grants for botanical research in Latin America. The funds invested reach just over US\$ 3.5 million, of which 80% have been used to support the substantive actions of the RLB, the rest being utilized for the core operation of the program. These resources have been available thanks to the grants from a number of private foundations as well as from in-kind support offered by some of the collaborative institutions of the RLB. The modest but cost-effective work of the RLB is a worthwhile investment in a region in which knowledge and its policy application are important elements in the face of the pressures for the conservation and sustainable use of biodiversity. The contribution of the RLB has centered in areas of the utmost importance for the regional and global future: training in the field of biology, particularly focused in ecology and conservation of resources; and generating the scientific knowledge needed in order to have an impact on ecological policy and decision making for maintenance, recovery and sustainable use of biodiversity throughout Latin America.

Keywords: biodiversity, capacity building, networking, plant sciences, Latin America

Mandelik, Yael; Chikatunov, Vladimir; Dayan, Tamar; Kravchenko, Vassily Rapid biodiversity assessment at the local scale: is the higher taxa approach a reliable shortcut?

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Poster session 10, Monitoring biodiversity changes

Time and resource constraints associated with many development activities require the application of tools for rapid quantification of biodiversity. A promising shortcut for the quantification of biodiversity is to focus on the identification of genera and families rather than species. At the global and regional scales, spatial concurrence between species and higher taxa richness patterns is generally high. However, very few studies examined how well this approach performs at the local scale, which is the most relevant in many land-use conflicts. We investigated the reliability of the higher taxa approach for quantification of species richness and composition patterns (turn-over rates) in a Mediterranean ecosystem. We investigated three species-rich taxa, commonly used as biodiversity indicators: vascular plants, ground-dwelling beetles, and moths. The research was conducted in the Jerusalem Mountains and Judean foothills, in forty 1000m² plots, representing the variety of habitats in the region. We performed an annual survey of beetles and moths, and a spring survey of vascular plants. Correlations between species and genera richness patterns were high for all

three taxa, but decreased sharply for the vegetation and moths when moving to the family level. Similar patterns emerged when looking into the correlation between composition of species and higher taxonomic levels (using similarity indices for pairs of plots). We conclude that genus level assessments are a reliable surrogate of species richness and composition in Mediterranean ecosystems, but family level assessments perform poorly and their use should be avoided.

Keywords: biodiversity assessments, higher taxa approach, conservation planning, Mediterranean ecosystems, biodiversity indicators

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Multi-taxon changes along a management intensification gradient in coffee farms located in central Veracruz, Mexico

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Poster session 3, Agriculture and biodiversity

Agroecosystems in general, and shade coffee farms in particular, are critical for conserving biodiversity and the socio-economic well-being of a large proportion of the Mexican population. Coffee agroecosystems world-wide are currently undergoing a crisis of overproduction and low prices that could provoke land-use changes resulting in a considerable loss of the biodiversity and other ecosystem services provided. The development of sustainable management solutions to this problem will require balancing the production and earnings concerns of coffee growers while simultaneously maintaining the structure and function of these agroecosystems. The BIOCAFE project seeks to improve understanding of the relationship between productivity and biodiversity in coffee agroecosystems and thus provide coffee growers with solutions which use the biodiversity of their farms to both lower production costs and increase alternative revenue sources. Here we report the first results from this multi-year project where we monitored changes in biodiversity of 15 different groups of plants and animals along a management intensification gradient including four coffee farms and two cloud forest control sites located in central Veracruz, Mexico. Our findings suggest that: 1) the relationship between diversity and management intensity is non-linear, 2) taxonomic responses to increases in management intensity are not uniform, 3) traditional shade coffee farms conserve a significant fraction of the biodiversity of cloud forest fragments remaining the region, and 4) multi-taxon studies are key in understanding the complex array of changes in coffee agroecosystems as management is intensified. These findings are discussed in the context of the ecosystem services provided by coffee farms and their potential for generating additional revenue for coffee growers in the region and elsewhere.

Keywords: agroecosystems, biodiversity, ecosystem services, sustainability, coffee

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Diversity of Root Pathogenic Fungi in the Los Tuxtlas Biosphere Reserve , Veracruz, México.

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Poster session 12, Systematics, phylogeny and evolution

Root pathogenic fungi (RPF) have been studied mainly as a cause of disease and economic losses; however they may play ecological and evolutive important roles in

natural plant communities and in soil microbial communities through multitrophic interactions with the soil microorganisms and the plant roots. Several questions raise: Is RPF community specific for a type of plant community? Does the diversity and community composition of RPF change with soil disturbance? Could RPF be used as bioindicators of soil health? To answer some of these questions, this research assessed the diversity, abundance and root damage caused by some of the main RPF, *Phytophthora* sp., *Pythium* sp., *Fusarium* sp. and *Rhizoctonia solani* in four land use types. Rainforest, agroforestry, grassland and maize were sampled at each one of three communities. From 32 plots, eight subsamples were taken at the first 20 cm of depth. Different selective media for isolation and culture of RPF were used: PARHP, 3P, Kerr, SNA, and Ko and Hora, and PDA. Soil dilution plate technique was applied for isolation and quantification of the soil population density in rhizosphere soil. Disease infection was assessed plating ten 1.0 cm long pieces of feeding roots in each of one plate with the selective media. Plates were incubated from 28 to 30°C from three to fifteen days. Fifteen genera of fungi are represented, each with several different isolates (morphospecies); the highest number of morphospecies were detected in the agroforestry and grassland, followed by the rainforest and maize. Similar number of isolates were obtained from roots and rhizosphere soil. The highest number of RPF isolates were detected in San Fernando followed by López Mateos and Venustiano Carranza. *Fusarium solani*, *F. oxysporum*, *F. equiseti* and *F. trinciticum* have been identified. RPF grew in all ecosystems and agroecosystems but possibly the difference would be in the grade of damage caused by the RPF in the plant community.

Keywords: belowground, soil ecology, plant pathogens, natural communities, plant diseases

Martinez, Sylvia

Swiss Biodiversity Forum – The Network of Biodiversity Experts

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Poster session 1, DIVERSITAS National Committees

The Convention on Biological Diversity, adopted at the UN Earth Summit in Rio de Janeiro in 1992, was followed by numerous projects to investigate biodiversity, its sustainable use and its conservation. However, the problems to be solved are complex, and human and financial resources scarce. In this situation, close collaboration and an intensive information exchange between scientists from every discipline, practitioners and the public are essential. As a consequence, the Swiss Biodiversity Forum established a network of biodiversity experts from a large array of disciplines. Scientists, practitioners and policy-makers as well as institutions are invited to take part in this lively knowledge exchange platform of the Swiss Academy of Science.

Keywords: biodiversity, networking, national committee, interface, science input to policy making

Massin, Nirmala; Gonzalez, Andrew

Diversification under disturbance: theoretical and experimental approaches with *Pseudomonas fluorescens*

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Poster session 5, Drivers of biodiversity changes

The ecological theory of adaptive radiation provides a powerful explanatory framework, yet the effects of environmental disturbance are poorly understood and have remained unstudied. Here we investigate the effect of disturbance and more specifically of its autocorrelation pattern on the diversification of the bacterium *Pseudomonas fluorescens*.

We compared the dynamics of adaptive radiation over many generations in disturbed and undisturbed habitats, where the disturbance represented an abrupt homogenization of the liquid habitat. Replicate series were examined for each disturbance treatment (autocorrelated and uncorrelated). We also conducted simulations with a model based on the adaptive dynamics framework that mimics the *P. fluorescens* diversification.

In the experiment, disturbance significantly delayed the evolution of diversity, and did so more strongly when autocorrelated than when uncorrelated. Although the rate of accumulation of diversity was slower in the disturbed environments by the end of the experiment diversity had converged to a similar steady level across disturbance treatments. Theoretical results show a complex pattern, though diversification seems to be impeded more strongly by autocorrelated disturbance than by uncorrelated disturbance.

Both experiment and model show a strong effect of disturbance and of its autocorrelation pattern on adaptive radiation.

Keywords: adaptive radiation, disturbance, autocorrelation, *Pseudomonas fluorescens*, adaptive dynamics

Mathieson, Gavan

Linking global issues and local action

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Poster session 11, Policy for sustainable development

Incentives for private land owners to participate in protected area systems and conserve biodiversity have traditionally focused on addressing sites already in an advanced state of environmental degradation, and rewarding farmers and land managers with financial incentives. This has also taken place in an environment of decreasing personal contact between 'extension' officers and private land owners, and an increased reliance on communication media to deliver environmental messages. The goal of the program was to reach out to individual private land owners and engage them in a partnership to protect biodiversity that has many inter related benefits such as the provision ecosystem services, improved community relationships and individual and family capacity building.

Local (Municipal) Governments in Australia are developing innovative models for expanding protected area networks and acknowledging the role local land owners play in this process. Hornsby Shire Council has developed a program that encourages landholders to conserve and enhance habitat in protected areas through a combination of individual property visits, educational workshops, incentives for on-ground works linked to property management plans and annual payments based on the land owners performance and commitment to conserving biodiversity on their property.

Ninety individual properties have registered in the 1st year of the program. Twenty

five of the properties have been taken through individual property planning workshops and have commenced biodiversity conservation actions on their properties.

Local programs aimed at engaging private land owners in a cost sharing approach can play a pivotal role in conservation outside of protected areas. The multi layered benefits of biodiversity & social change can influence not only local & regional biodiversity conservation but also sustainable community development.

Keywords: incentives, ecosystem services, landscape change, capacity building, cost-sharing

McCall, Sarah; Milacek, Kathy; Rozzi, Ricardo

Avoiding homogenization of place in the pristine Cape Horn Archipelago: an eco-architecture approach to tourism infrastructure

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Poster session 4, Biodiversity conservation

The Cape Horn Archipelago, at the southernmost tip of the Americas, is one of the most pristine and remote areas remaining in today's globalized world. However, this unique area is currently under pressure from intensive tourism development. During the last decades tourism has frequently been environmentally and culturally degrading. A proliferation of chain hotels across the globe with the same architecturally and environmentally insensitive infrastructure causes both a direct visual impact and unseen environmental consequences such as pollution, stresses on local resources, and the introduction of foreign invasive biota.

Recent ecotourism initiatives have tried to achieve a better balance between economic needs and conservation of cultural and biological diversity. Eco-tourism establishments offer an alternative because they can be locally owned, sustainably built and operated, and include input from the biological and cultural environment into the architecture. Such designs provide a visual integration with the landscape, and promote the continuation of traditional cultural practices.

Our study is focused on three recently established eco-tourism building designs in Cape Horn: a traditional craft centre operated by Yaghan indigenous women, an eco-visitor centre on Horn Island, and a biocultural conservation centre at the Omora Ethnobotanical Park. This infrastructure is culturally and biologically sensitive, and specific guidelines are being incorporated to ensure "green" building standards are met. Special care is being taken to prevent the establishment of invasive ruderal species that often accompany development, since the Cape Horn Archipelago is one of the few remaining areas void of exotic species. In this manner, eco-architecture is helping to avoid homogenization and promote the continuation of cultural and biological diversity in the unique and still undeveloped region of Cape Horn.

Keywords: Cape Horn, ecotourism, biocultural diversity, invasive species, sustainability

McClung de Tapia, Emily, Martinez-Yrizar, Diana; Adriano-Moran, Cristina; Ibarra-Morales, Emilio; Solleiro-Rebolledo, Eliazbeth; Gama-Castro, Jorge; Sedov, Sergey
Prehispanic human impact on biodiversity in temperate ecosystems: agriculture and urbanization in the Teotihuacan valley, Mexico

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Poster session 13, Biodiversity and urbanization

The analysis of plant micro- and macrofossils recovered from soils and archaeological contexts in the Teotihuacan Valley, Central Mexico, indicates that prehispanic inhabitants developed intensive/extensive agrosystems to support large pre-industrial populations at the expense of natural vegetation and fauna, the hydrological system and the soils. Two major periods are considered: ca. A.D. 100-650 (Teotihuacan occupation) and ca. A.D. 1300-1520 (Aztec occupation). This research purports to evaluate the extent of prehispanic human impact on regional biodiversity through time.

Pollen, phytoliths, seeds and charcoal, recovered from controlled archaeological excavations and stratigraphic soil profiles undertaken in the region provide important complementary evidence for deforestation, agricultural expansion, urbanization, and hydrological modifications. Examined qualitatively in temporal and spatial frameworks, these data suggest changes in the distributions of key genera.

Regional biodiversity is considerably reduced during major occupations. Some regeneration appears to take place during a period of relative landscape stability following the decline of the urban center of Teotihuacan (>A.D. 650). However, as a consequence of the Spanish Conquest (>A.D. 1500), Aztec landuse practices were gradually replaced by European agricultural techniques, animal husbandry and major deforestation of the surrounding slopes, leading to considerably greater landscape instability and further reduction of biodiversity.

To a certain extent similar events affected other sectors of the Central Highlands of Mexico. A historical perspective thus allows us to gain insight about the effects of human activities at different temporal scales.

Keywords: Biodiversity, Human Impact, Prehispanic agriculture, Teotihuacan, Deforestation

Mendes, Sara; Freitas, Maria Helena; Keating, António; Santos, Joaquim; Sousa, José Paulo

Effects of understory vegetation management in soil macrofauna from a cork-oak Montado in South Portugal

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Poster session 5, Drivers of biodiversity change

Cork oak “Montados” are a particular Mediterranean man-made ecosystem found in Southern Portugal, mainly used for cork production and cattle farming, hosting high biodiversity. Current management imply shrub clearing with heavy machinery, which can be highly disruptive for soil biota. In order to evaluate the effects of understory vegetation management on soil macrofauna and to define bioindicator species for this system, 5 areas were defined along a chronosequence of shrub clearing: a non-disturbed area (Z1), and areas where understory vegetation was cut at 4-5 years (Z2), 3-4 years (Z3), 2 years (Z4) and 1 year (Z5). A sixth area (Z6) was defined in a pasture, where cattle is occasionally present. Soil fauna was sampled, using “pitfall” traps, in 2003 and 2004. Except for Z6, that presented a lower species richness, all other areas presented similar species diversity and richness. However, local richness was higher in Z3, which could be consistent with the IDH; this area represents the intermediate time frame regarding disturbance frequency combining habitat

characteristics from recently disturbed and non-disturbed areas. Multivariate analysis separated recently disturbed areas from those intervened longer; Formicidae, Scydmaenidae, most Araneae and insect larvae appeared closely associated to Z1 to Z3 (with high shrub cover and thick litter layers), whereas other Hymenoptera, Gastropoda and most Coleoptera, appeared associated to recently disturbed areas (Z4 and Z5) and to Z6, with lower shrub cover and lower accumulation of litter. These results indicate that effects of the disturbance can endure for 2 or 3 years; after that, the natural regeneration of the understory vegetation seems to support the restoration of the macrofauna community, indicating that the sustainable management strategy adopted (cutting shrub every 5-6 years) sounds reasonable regarding the effects on this group. The obtained data was also used to adapt the IBQS index to Mediterranean areas.

Keywords: soil quality index, soil macrofauna, understory management, cork oak forests, bioindicators

Mendoza Sabogal, Javier Eduardo; Lozano Zambrano, Fabio; Vargas, William Gerardo

Comparison of the alpha, beta and gamma vegetal diversity among three landscapes with different fragmentation levels in the central Andes of Colombia

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Poster session 10, Monitoring biodiversity changes

Biodiversity spatial patterns change over multiple scales. The observed pattern within a local community can be different from the pattern found over broad scales such as landscapes and regions. We analyzed different biodiversity levels (alpha, beta, gamma) in order to establish potential effects of habitat loss in terms of vegetal richness and diversity in Sub Andean landscapes of Colombia. We sampled three 2,500 ha rural landscapes with different fragmentation levels between 1,700 and 2,100 m on the western slope of the Central Andes: Mid Otún River watershed (80% native forest); Barbas River Canyon (46%), and Mid Chambery River watershed (25%). We analyzed different landscape elements such as forest fragments, streams, forestry plantations, and grasslands, among others. Gamma diversity was taken as the number of species in the landscape. Alpha diversity was measured through Alpha Fisher's index. Beta diversity was calculated by Morisita-Horn index. The Barbas landscape showed the highest richness value (399 species) followed by the Otún landscape (322). In every landscape, the elements with native forest had the highest alpha diversity values. The beta diversity was high in all landscapes showing similarity lower than 50%. Complementarity between the fragmented landscapes was high (Barbas & Chambery 0.75). Between the non-fragmented landscape (Otún) and Barbas and Chambery, the complementarity was low (0.39 and 0.31). The high similarity between fragmented landscapes is mainly related to presence of heliophytic species. In addition, the high turnover value and the high percentage of endangered and mature forest species in Otún, may suggest compositional changes due to habitat loss. Our work is one of the first conducted regarding vegetal beta diversity in the Andes and highlight the conservation importance of remnant forests in fragmented landscapes because they preserve particular species assemblages and contribute to maintain high landscape heterogeneity

Keywords: fragmentation, diversity levels, vegetation, rural landscapes, Colombia

Mihailescu, Simona; Munteanu, Dan Victor

Strategies for implementation of Natura 2000 network for protected areas in Romania

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Poster session 4, Biodiversity conservation

The establishment of the Natura 2000 European Network implies a continuous effort in writing up the adequate ground documentation in order to include sites designated at national level. We need to promote biodiversity conservation by maintaining or restoring certain habitats and species at 'favourable conservation status' within the context of Natura 2000 sites, in the same time taking into account economic, social, cultural and regional requirements, as means to achieve a complex sustainable development.

Ways of conserving biodiversity:

- Conservation of species
- Conservation of site
- Conservation of habitats

The national network for protected areas is the foundation for the Natura 2000 sites documentation.

In the last few years Romania has achieved great progress in conservation of important areas from the biodiversity point of view. This implies that the status of new protected areas has to be based on a scientific documentation, with a detailed map of the area containing also the situation of land owners.

As a result of this legislative act, the process of the extent of national network of protected areas has been launched. In this regard, the surface area of the natural protected areas is continuously increasing reaching by 2005 a 7% from total land surface of Romania.

-General requirements for Natura 2000 in Romania.

-Consolidating existing systems of protected areas.

-In regions where extensive farming and forestry systems with a high economic value continue to exist, the proposed sites of Community importance tend to be a larger size.

-Evaluation of the possibility of diversifying rural income, such as through tourism (including ecotourism) and valorisation of natural resources by local communities for their benefit.

-The Government and regional or local authorities must favour and encourage the conservation of the wider environment.

Keywords: Natura 2000, strategies, protected areas, evaluation biodiversity, habitats

Mondragon, Demetria; Aguilar, Remedios; Cruz, Mariel

EPIPHYTIC DIVERSITY OF A MEXICAN'S WET OAK FOREST

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Poster session 12, Systematics, phylogeny and evolution

Epiphytic diversity has been evaluated in several kinds of ecosystems, where more of them had been carried out in tropical forest. Oak forest has been poor study at the scope of epiphytic diversity; here we present one of the first studies of the vascular

epiphytic richness in this kind of forest.

Santo Domingo Cacalotepec is located at 17° 24'58"N and 96° 19'54" W with an altitude of 1153 masl, one temperature 116 C and a precipitation of 2250mm. During August to December of 2004 we sampled 542 trees. We recorded all vascular epiphytes individuals present at those trees. Species identification was carried out by mean of taxonomic key. Voucher specimens have been deposited at the CIIDIR-OAXACA's herbarium.

We found 78 species, representing 33 genus, seven families and two divisions. Three families and six genera belong to Pteridophyte division, where the best represented family was the Polypodiaceae with four genera and 11 species, of which seven belong to Polypodium genus; the Grammitidaceae and the Aspleniaceae families just had one genus with one and two species respectively. The Magnoliophyta division was present with five families and 28 genus; among these, the Orchidaceae was best represented at the genus (21) and species level (35), followed by Bromeliaceae (with three genera and 22 spp). Cactaceae family had two genera, each of them with one specie; while Piperaceae and Araceae had only one genus represented by three the former and one species the later.

Our study reveals that this forest posses a high epiphytic diversity, contrary previous reports for other oak forest. This high diversity could be attributed to the presence of humid wind coming of the Gulf of Mexico, but more studies will be necessary to assert that.

Keywords: epiphytes, richness, Orchid, Bromeliad, Oaxaca

Montaño-Arias, Noé; García-Oliva, Felipe; Gavito, Mayra E.; Larsen, John; Sandoval-Pérez, Ana Lidia

Bacterial biodiversity and carbon availability in soils from a tropical dry forest in Mexico.

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Poster session 6, Biodiversity and ecosystem functioning

We investigated the seasonal diversity of soil bacteria in sites with contrasting availability of carbon in a tropical dry forest to identify the importance of this factor on the diversity of bacterial populations. Contrasting sites were found in neighbouring hill tops (rich) and hill slopes (poor) of the forest. Soil samples were taken in the dry season, beginning of the rainy season, and middle of the rainy season, from the top 5 cm (after removing the litter layer) in ten replicate 10 x 15 m plots at each site.

Composite soil samples were used to make dilutions and plate counting on selective media, and for further isolation of morphotypes and biochemical identification of the isolates with fatty-acid profiles (MIDI-software). We found that the number of colony forming units (CFU) was similar for hill tops and hill slopes at all sampling dates and peaked at the beginning of the rainy season. There was no seasonal difference in the frequencies of morphotypes in hill tops but in hill slopes it was lowest at beginning of the rainy season. The number of morphotypes and species identified was higher in hill tops than in hill slopes. Almost half of the species identified were either found only in hill tops or only in hill slopes, and they were predominantly Gram +. Bacillus and Brevibacillus species accounted for 30% of the bacterial isolates found, with a large number of other genera with less than 3 species and, surprisingly, only one species of Pseudomonas. The results suggest that, as expected, the rich sites contained a higher bacterial diversity than the poor sites but the variation in the frequencies of

morphotypes may indicate that not all of them responded similarly to resource availability. We will discuss these results in the context of other complementary studies conducted.

Keywords: bacteria, carbon, diversity, soil, tropical dry forest

Moreira, Pedro; Carvalho, Vitor; Pego, Silas; Vaz Patto, Carlota
Maize landraces collection in maize bread ('broa') Portuguese traditional regions.

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Poster session 3, Agriculture and biodiversity

The introduction of maize in Portugal (XVI, a.D.) increased maize germplasm fitness due to natural and human selection, leading to Portuguese maize landraces. Most of them are flint types with technological ability for bread-making, representing a valuable source of genes. Additionally traditional maize bread (broa) still plays an important socio-economic role on Central and Northern rural communities. However the progressive adoption of intensive hybrid varieties, not suitable for bread production, are threatening these traditional systems. An expedition was done to collect the enduring maize landraces among the traditional farmers.

From February to April 2005 seed samples of maize landraces and their associated crops were collected (legumes, rye, etc.) in Northern and Central regions of Portugal with local technicians support. Cultural practices, soil samples and ethnobotanic parameters were also recorded.

In total, 30 maize landraces and 105 varieties of other crops were collected.

Production relies mainly on polycropping systems and low nitrogen inputs. Diversity of kernel and cob colours, ear sizes and forms was found among and within the maize landraces. Variability of resistances to pests and plant morphology also appears to be present but needs scientific confirmation. The bread-making technological ability of these materials will be analysed and a participatory breeding approach will be established with the most promising farmers and landraces.

Despite the progressive genetic erosion, traditional Portuguese farmers are still conserving maize genetic diversity, with particular technological traits. Although the physical-chemical aspects and genetic control of these traits are still to be cleared up, these materials represent valuable source of genes for modern varieties. Support should be provided to rural communities to preserve and promote on farm conservation.

Keywords: Zea mays, landraces, on-farm conservation, sustainable development, maize bread

Moreno, Claudia; Halffter, Gonzalo

Scale and diversity: ant species richness and turnover in micro-environments, communities and a land

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Poster session 10, Monitoring biodiversity changes

Many current reviews about the alpha, beta and gamma components of species diversity are done at the geographical scale, following macroecological approaches. However, at local and landscape scales, studies that relate these components to the

factors that influence them are still scarce. Based on evidence that supports the idea that ants are a good indicator group for assessing diversity, we analysed species richness, composition and turnover of ants (Hymenoptera: Formicidae) at three spatial scales: micro-environment level, community level and landscape level. The study was done at the Barranca de Metztitlán Biosphere Reserve, an arid zone in central Mexico. The landscape was a ravine in which we sampled three communities: 1) the valley, strongly perturbed by human activities, mainly irrigated agriculture; 2) the intermediate altitude zone with steep slopes, that corresponded to an area protected as the nuclear zone of the reserve, and characterized by xerophytic shrubs; and 3) hills (ca. 2000 masl) with xerophytic shrublands. We established six survey locations and sampled ants in three micro-environments: soil (0-10 cm deep), ground level and vegetation (shrub stratum). We analysed point alpha diversity as the species richness of each micro-environment within the same community type; mean alpha diversity as the mean number of species of points within a community; and accumulated alpha diversity as the total sum of species encountered in each community. We assessed species turnover (beta diversity) at two scales: between micro-environments of the same community, and between communities in the landscape. Finally, gamma diversity was measured as the total number of species in the landscape. Several variables are associated with the alpha, beta and gamma components and may explain patterns in diversity at local and landscape scales. Our working strategy has generated comparable results for different indicator groups in several environments.

Keywords: indicator group, Mexico, spatial scale, Formicidae, alpha, beta, gamma

Mouillot, David; Mason, Norman; Tomasini, Jean-Antoine

Environmental drivers of various facets of fish functional diversity in brackish lagoons

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Poster session 5, Drivers of biodiversity changes

Factors controlling biodiversity have been the focus of numerous recent investigations with all of these occurring differently at each observation scale.

Nevertheless these investigations mainly consider only one facet of biodiversity: the species richness.

It is now generally accepted that functional diversity is a key factor for ecosystem processes and ecological interactions. However, due to the lack of a sound definition its nature and measurement are still poorly understood. In the same way that species diversity can be split into species richness and species evenness, so functional diversity can be split into functional richness (i.e. the amount of functional trait/character/attribute space filled) and functional evenness (i.e. the evenness of abundance distribution in functional trait space).

The aim of our study was twofold: (1) to present the different the different “facets” of functional diversity and a simple way to estimate them and (2) to seek relations between functional diversity of fish communities and environmental gradients in coastal lagoons.

Fish sampling was carried out in two brackish lagoons (Mediterranean Sea). Using functional traits measured on each individual, the different facets of functional diversity of fish communities were estimated using recently published functional diversity indices. Thereafter the functional diversities were related to various

environmental variables such as pheophytin a ratio, particulate organic matter ratio, temperature, salinity and Ph.

As a result, salinity was positively related to the functional diversity of fishes in both lagoons. We also observed a negative relationship between particulate matter ratio or pheophytin ratio and the functional diversity of the fish community in both lagoons suggesting that some environmental constraints might influence the functional diversity of fishes and thus the functions of the fish compartment even if the richness was not affected.

Keywords: functional evenness, gradients, functional traits, eutrophication, salinity

Muenkemueller, Tamara

How important are local population dynamics in spatially structured landscapes for species persistence and coexistence?

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Poster session 12, Systematics, phylogeny and evolution

Although the role of space for species persistence and coexistence has become the focus of considerable theoretical research, less attention has been paid to the influence of local population processes. However, local density regulation may potentially contribute to both persistence and coexistence: It affects the synchronising potential of dispersal which in turn is important for metapopulation persistence. Furthermore, it can lead to non-linear responses to resource availability which in turn can affect species coexistence. Thus, this study focuses on the influence of local density regulation on both persistence and coexistence of species in spatially structured landscapes.

For our simulation experiments we use a process-based metapopulation model which explicitly considers different local density regulation types, e.g. intraspecific density compensation under territorial behaviour or overcompensation under resource exploitation.

Our results show that both undercompensatory and overcompensatory density regulation can lead to high synchrony of local population densities. Metapopulation persistence is highest under compensation and low overcompensation. Increasing dispersal mortality, density dependent dispersal, or increasing patch turnover with subsequent patch regeneration shift the maxima for both synchrony and metapopulation persistence towards density regulation types with higher overcompensation. Considering interspecific competition we found that the type of local density regulation influences coexistence conditions.

Our results suggest that ignoring local population dynamics may lead to misleading conclusions. We show that overcompensatory density regulation enhances persistence in highly dynamic or hostile landscapes and influences the coexistence conditions in fragmented landscapes.

Keywords: density compensation, dynamic landscapes, metapopulation dynamics, simulation model, spatial heterogeneity

Muessner, Rainer; **Sousa Pinto, Isabel**

Networking and science-policy interfaces in biodiversity: New ways in improving the impact and relevance of biodiversity research

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Poster session 2, International Programmes

Halting the loss of biodiversity in Europe by 2010 is a commitment agreed by the European Commission, its member states and many other countries of the world. The role of the scientific community in conservation biology is to contribute to this political goal as effectively as possible. This means, biodiversity science should not only reflect on its ability to adequately address the right questions but also on the effectiveness of making its results known and useful for the people and institutions that are responsible for policy and its implementation.

Even so, throughout Europe there is evidence that biodiversity research is not organised in a structured and efficient way. There is not efficient information exchange between research centres to allow coordination of efforts and there is no revue of best practices in biodiversity research. On top of this, biodiversity researchers still face problems in disseminating their results to the policy makers and other users, as well as to the wider public. Based on these findings and the central question: "How can science contribute better to the halt of biodiversity decline" the EC Research Directorate is currently supporting the idea of creating a genuine and coherent commune research policy, the so called European Research Area (ERA). With the concept of ERA on Biodiversity as background, the authors introduce different initiatives and instruments on the European level to enhance networking in Biodiversity research. Bioplatfrom as thematic network instrument of FP 5 and the European Platform for Biodiversity Research Policy (EPBRS) as science-policy interface will be presented and critically reviewed. The advantages, constrains and options for networking in biodiversity are discussed and key-recommendations for future networking and science-policy interfaces will be given based on the experiences made.

Keywords: research networks, science policy interfaces, communicating research, dissemination strategies, European Research Area

Musila, Winfred; Dalitz, Helmut; Todt, Henning; Uster, Dana

Effects of human disturbance on soil physico-chemical patterns in deeply weathered tropical soils of Kakamega forest, Kenya

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Poster session 5, Drivers of biodiversity changes

Human disturbance in forests can have a lasting effect on the biogeochemical and physical properties of soils and may in turn influence the recovery of forest ecosystems following land abandonment. Knowledge of soil nutrient patterns is useful in understanding the ecological processes operating in an area, evaluating change and for setting general management goals, yet the long-term consequences of different disturbance regimes on soil dynamics is not sufficiently understood. An array of forest soils were studied along a successional vegetation gradient and a gradient of disturbance history in the Kakamega tropical rainforest to answer three questions: (1) Is there a relationship between soil properties and successional vegetation?, (2) Do the most severely disturbed sites have the most depleted soils? and (3) Is the effect of disturbance reflected in deeper soil layers up to 2m depth? Mineral soils were sampled in three successional vegetation types i.e. grassland,

shrubland and forest within four sites and in 10 forested sites and that differed in land-use history in Kakamega forest. Generally, the concentrations of nutrient cations, total C and N, and electrical conductivity decreased with depth. The forest soils had significantly higher concentrations of available K, available Ca, available Mg, pH and EC than in shrubland and grassland ($p < 0.05$) at all depths. Total C, total N and available Mn did not vary significantly between the vegetation types. The forest soils had higher soil stocks of C, N, Ca, and Mn than the grassland and shrubland soils. The most disturbed sites were more acidic and had low concentration of nutrients. These results suggest that disturbance has persistent effects on soil properties and may also influence structure and dynamics in the biota. It can be concluded that, the forest cover provides the most effective means for regeneration of Kakamega soils.

Keywords: Human disturbance, soils, tropical forest, nutrient cycling, successional vegetation

Mutke, Jens; Barthlott, Wilhelm; Kreft, Holger; **Küper, Wolfgang**; Sommer, Jan Henning

Plant diversity patterns at global, continental, and regional scales – implications for biodiversity conservation

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Poster session 10, Monitoring biodiversity changes

Knowledge on the spatial distribution of biodiversity is crucial for its conservation and sustainable use, as well as for the identification of future research priorities. Despite the importance of vascular plants in terrestrial ecosystems, studies in the fields of large-scale conservation and macroecology are dominated by a few, well known vertebrate groups.

We analyze the largest available datasets for plant diversity on a global scale and for Sub-Saharan Africa. Case studies on three spatial scales (global maps of plant diversity, continental datasets of species distributions and diversity patterns for Sub-Saharan Africa, and regional examples from the BIOTA Africa transects) are used to discuss the following questions: What kind of information on plant diversity is currently available at which spatial scale? Which data is lacking? How can the available information at different spatial scales facilitate the development of conservation strategies and priorities? How can the impact of future climate change be addressed? What priorities for the implementation of the 2010 target and the GSPC can be derived at each of the spatial scales?

At a global scale, the currently available inventory-based plant diversity data allow a fairly precise documentation and macroecological analysis of diversity gradients and maxima and potential threats. More detailed information on the distribution of individual species is provided by taxon-based data derived from herbarium collections and taxonomic revisions, for which databases exist mainly at (sub)continental scales. They allow the development of more advanced conservation strategies by the incorporation of complementarity and qualitative aspects of biological diversity. Furthermore, taxon-based data is essential to assess the impact of climate change and habitat conversion on the geographic ranges of single species. Finally, regional and local scale studies are required to incorporate population data in conservation planning.

Keywords: global maxima of plant diversity, conservation planning, biogeographical information system, Africa, GSPC

Nagdeve, Dewaram

Population Change, Natural Resources and Environment

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Poster session 8, Biodiversity changes and health

The rapid population growth, industrialization and urbanization in country are adversely affecting the environment. Though the relationship is complex, population size and growth tend to expand and accelerate these human impacts on natural resources and the environment. Population pressures on arable land contribute to the land degradation, as more and more marginal land is cultivated to feed more and more people. In the recent past, natural resources are under increasing pressure, threatening public health and development. Water shortages, soil exhaustion, deforestation, air and water pollution afflicts many areas. The present paper is an attempt to study the population change, increasing urbanization and its influence on natural resources, and the environment.

An analysis, of changes and trends of secondary data obtained from censuses and compendium of environment statistics during last five decades, has been conducted. The analysis reveals that rapid population growth plays an important role in depleting natural resources from deforestation to land degradation, air and water pollution and environmental problems of the country. The considerable magnitude of air and water pollution pulls up the number of people suffering from respiratory and water borne diseases and many a times leading to deaths and serious health hazards.

The paper concludes with some population policy reflections and emphasizes the potential importance of natural resources for sustainable development. Population and development policy aimed at overall development should certainly include efforts to control population and environmental pollution for sustainable development and for better health of present and future generation.

Keywords: population, natural, resources, environment, pollution

Nakashizuka, Tohru

DIWPA: DIVERSITAS Western Pacific and Asia

Research Institute for Humanity and Nature, Japan

Poster session 1, DIVERSITAS National Committee

Nakashizuka, Tohru; Kamitani, Tomohiko

The effects simplified forest-use on local landscape and wildlife

Research Institute for Humanity and Nature, Japan

Poster session 6, Biodiversity and ecosystem functioning

Japanese forest policy subsidized to convert primeval and secondary broadleaf forest into more fast-growing, and commercially important conifer plantation until 1990s.

Thus, the conifer mono-culture increased to almost half of the Japanese forests. We tried to elucidate the effect of this change on landscape and wildlife by estimating the

spatial distribution of feed and habitat for wildlife.

We developed a method to estimate the hare feeds in 21 km² in Gumma, central Japan, by using the data of vegetation canopy profile and the relationship between canopy height and feed amount. The canopy height profile was made into the digital elevation model measuring the canopy height by aerial photographs taken in 1968, 1983, and 1999. Hunting habitat of golden eagle are defined to be the places with the vegetation height lower than 5 m, and we detected its distribution history by using the canopy profile data.

The hare feeds amount was high in young vegetations and small in developed forests, in particular man-made conifer forests. There were large areas of young man-made forests in 1968, causing large amount of hare feeds, though the feed amount decreased according to the growth of man-made forests. Also, the newly planted man-made forests distributed in the lower elevation in 1968 and changed to higher areas, and caused the great shift of the distribution of hare feeds. The hunting habitat for golden eagle were much in 1968, though decreased greatly in recent 30 years.

The increase in monoculture of conifers seemed to have increased hare population and hunting habitat for the eagle in 30 years ago, though it decreased after the forest development. It seems the important reason of the decreasing in populations of hare and golden eagle generally occurred in Honshu Island, Japan.

Keywords: landscape, wildlife, Digital elevation model, hare, golden eagle

Narváez-Trujillo, Alexandra; Portero, Carolina

A molecular approximation to determine the genetic relationship of *Manihot leptophylla* to south and central American species of the genus and the evaluation of introgression with cassava

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Poster session 12, Systematics, phylogeny and evolution

Manihot leptophylla is a poorly studied species whose area of distribution includes the pacific coast in Ecuador and is sympatric to the crop. In sympatric zones feral forms of cassava have been found for which introgression may be probable.

Additionally, this species has been proposed as a synonym of *M. esculenta* ssp. *flabellifolia* in a report by Costa Allen in 2002.

The genetic relationship between *M. leptophylla* and seven species of the genus *Manihot* of Central and South America, including *M. baccata*, *M. chlorostica*, *M. flabellifolia*, *M.* was evaluated using 15 microsatellite primers. Since there have been numerous accounts of post-domestication contributions to the genetic constitution of the crop species by local species the possibility of introgressions between populations of *M. leptophylla* from the Ecuadorian coast and cassava varieties from the same geographical area were also analyzed. Data from 15 microsatellite loci (SSRs) revealed a high level of polymorphism in a cross species analysis. Principle Coordinate Analysis and UPGMA dendrograms based on Nei's genetic identity indicated that *M. leptophylla* is more closely related to the South American species than to the Central American species. In addition it was found that *M. leptophylla* cannot be considered synonym of *M. esculenta* ssp. *flabellifolia*; however this study proposes that it could be a synonym of *M. brachyloba*. Pacific coast varieties of cassava are most genetically similar to *M. leptophylla* than to the cassava varieties from the Amazonian basin. Additionally more variation was detected between sweet varieties of cassava from the Pacific coast and from the Amazonian region than between bitter and sweet varieties from the Amazonian region and the Guyana

plateau.

Keywords: cassava, gene flow, microsatellites, domestication, Manihot

Nelson, Joanna; Zavaleta, Erika

Effects of changing fire regime on ecosystem services in the boreal forest, Alaska

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Poster session 7, Biodiversity and ecosystem services

Fire is the dominant form of disturbance in boreal forest. Changes in fire regime are occurring in response to climate and land use change and fire suppression. These altered fire regimes affect ecosystem functioning and the delivery of ecosystem services, including subsistence services that contribute economically, culturally and nutritionally to human communities in Alaska and Canada. Our objective was to assess the effects of changing fire regime on subsistence goods and services in the North American boreal forest. Our field studies focus on ecosystem services of edible plants.

We reviewed published and unpublished literature on boreal fire effects on plant and animal species contributing to human subsistence in Alaska and northwestern Canada. J. Nelson quantified edible berry abundance along a chronosequence of forest burns in central interior Alaska and conducted interviews in surrounding communities about subsistence services, environmental and biodiversity change, and individual and community goals.

Wildlife species utilizing boreal forest differ markedly in their tolerances and responses to wildfire. For example, wildfire is generally observed to benefit moose populations, but to decrease caribou use for decades or longer. Changing fire frequency could therefore have contrasting effects on human communities reliant on different species – such as moose-dependent Galena and caribou-dependent Hughes, Alaska. Plants respond to both fire and fire effects on permafrost. Near Galena, Native and non-Native people report declines in berry production. Results from pilot transect studies are inconclusive, but residents of Nulato are pursuing a program of controlled burns to increase berry availability.

An integrated approach of ecological field studies and interviews gathering local knowledge will help to assess biodiversity trends linked to climate and fire regime change and their impact on human well-being.

Keywords: human subsistence, fire, ecosystem services, berries, indigenous knowledge

Nielsen, Anders; Bjercknes, Anne-Line; Ohlson, Mikael; Totland, Ørjan

Alien invasion and habitat disturbance: effects on pollination and reproduction in a native boreal forest herb

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Poster session 9, Invasive species

The impacts of alien plant species on pollinator visitation and reproductive success of native species has been little studied, and no studies have examined such impacts in habitats of contrasting human disturbance. We studied how experimental introductions of an alien species (*Phacelia tanacetifolia*) affect pollinator visitation and

female reproductive success of a native (*Melampyrum pratense*) in recently logged and in undisturbed boreal forest habitats.

We adopted an experimental design using 5 pairs of disturbed and undisturbed forest stands. Within each forest stand we established one study site and defined 10 2x2meter plots within each site. In 5 of the plots within each study site we introduced 15 individuals of the invasive species (*P. tanacetifolia*). For two weeks we observed bumble bee activity within the study plots, and at the end of the flowering season we collected capsules for estimation of seed production.

Phacelia significantly increased the number of bumblebees entering plots in both habitat types. However, the alien species had a strong negative impact on visitation rate of the native species in both habitat types. Despite this negative impact on pollinator visitation, the alien had no effect on female reproductive success of the native species in any habitat.

Our results show that seed production may be more robust to alien invasion than pollinator visitation, and that impacts of alien invasion may not differ between habitats of contrasting disturbance history.

Keywords: Boreal forest, competition for pollination, alien invasion, flower visitation rate, seed production

Normant, Monika; Szaniawska, Anna

Non-native crustaceans in the Polish coastal waters (Baltic Sea) – increased biodiversity or environmental threat?

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Poster session 5, Drivers of biodiversity changes

The Baltic Sea, due to its recent geological origin and low biodiversity still offers a profitable ecological habitats to alien species. During the last few tens many new species of flora and fauna have been appeared there. Crustaceans consists more than 20% of all introduced species. Our goal was to study distribution and ecological consequences of introduction of alien crustaceans, like Chinese mitten crab *Eriocheir sinensis*, American mud crab *Rhithropanopeus harrisii* and American amphipod *Gammarus tigrinus*, to the Polish coastal waters.

Animals were collected at different stations located along the Polish coast over the period 1998-2005. Morphometry as well as interactions with other species, role in the food web and parasitism were studied.

E. sinensis is not able to reproduce in the Polish waters due to the low salinity. Adult specimens, which occur there, came from Germany, where they were born. *E. sinensis* shelter and transfer small invertebrate species, which inhabit the dense patches of hair covered the claws or grow on its massive carapace. *R. harrisii* has found a suitable ecological habitat in the Polish waters and established population. For over fifty years, this crab has been coexisted with indigenous species. Although *G. tigrinus* came recently to Polish Baltic waters, it has established population there. It had become the dominant of phytal, where it competes with native species. *G. tigrinus* plays a role in transfer of native parasites. All studied crustacean species are the new components of the food web and influence the energy flow through the ecosystem.

It is difficult to draw a general conclusion on positive or negative aspects of the new species presence in the Polish Baltic waters and therefore every case should be discussed independently.

Keywords: Baltic Sea, brackish waters, Crustaceans, non-native species, macrozoobenthos

NOVAK, Waltraud

Cañihua (*Chenopodium pallidicaule* Aellen) an indigenous Andean food crop, and its contribution to iron supply of rural women in risk of anaemia in Puno (Peru)

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Poster session 3, Agriculture and biodiversity

Cañihua (*Chenopodium pallidicaule* Aellen) is a little studied, native Andean food crop, which in addition to low demands for inputs and a high resistance to frost, drought, saline soils and pests, has a high iron content of 12mg/100g. This amount is the highest found in all commonly used vegetables or cereals. The species is therefore of interest in regions with a predominately cereal- and vegetable-based nutrition with iron deficiency problems. Despite its numerous nutritional and agricultural advantages, Cañihua, like other indigenous crops, has been marginalized and substituted through other food species like rice and wheat. The aim of this study was to investigate the nutritional properties of Cañihua and by this contribute to reveal its value in the esteem of the Andean population.

In the Andes of Peru high rates of iron deficiency anaemia are observed, with a prevalence of up to 35%. For this, the effect of a daily nutritional complementation with Cañihua on the iron status has been investigated.

25 non-pregnant and non-lactating women with anaemia of Puno, Peru, received during 7 weeks a daily food ration containing 50 g of Cañihua, providing 6 mg of iron. As a parameter for iron status, haemoglobin levels were analysed weekly, and 24h-recalls (interview about nutritional habits) were recorded. None of the women fulfilled the daily iron requirements before initiation of the trial.

After the test period, all women had, compared to a control group, significantly higher haemoglobin-levels than before, and these levels were within a healthy range.

It can be suggested that Cañihua is a good iron source, and the available iron from 50 g of Cañihua per day is a successful way to obtain a satisfactory iron supply, which is capable of improving mild anaemia. The participating women, who learned about the potentials of Cañihua, will act as multipliers.

Keywords: *Chenopodium pallidicaule*, indigenous crops, iron supply, anaemia, Andes

Ocegueda, Susana; Hernandez, Diana; Koleff, Patricia

A key element in biodiversity information system: nomenclatural catalogues

Conabio, Mexico

Poster session 10, Monitoring biodiversity changes

Scientific names are the key to organize and retrieve biological information. As an effort to manage, analyse and divulgate our biodiversity information, Conabio (The National Commission for the Knowledge and Use of Biodiversity) has the main task to develop the National Biodiversity Information System of Mexico (SNIB, for it

Spanish acronym) that is mainly based on specimen data from national and foreign collections and recently from observational data. In order to guarantee interoperability and integrity among databases that supply information to the SNIB, Conabio uses the nomenclatural catalogues developed by experts, which are called the 'Taxonomic authority files' as standards of data quality control.

These databases consist in hierarchical databases reviewed by expert taxonomists, based on recognized classification systems, that integrate valid/accepted names and their synonymies with the respective references. Common names and distribution information are integrated when available. These databases are available with Biotica software developed by Conabio, which is used by more than 100 institutions in Mexico and some abroad. About 50,000 valid names of different taxa have been integrated and are also available through the Conabio's website, and recently begun to integrate them to ITIS-North America, a regional initiative to retrieve taxonomic information on plants, animals, fungi, and microbes of North America and the world. Metadata referring the sources of data collection, version, updates and description of the contents. Taxonomic authority files databases are an essential tool for using biodiversity data from different sources and for different supported by scientific knowledge.

Keywords: standards, taxonomic data bases, catalogues, metadata, nomenclature

Susana Ochoa-Gaona, **Esperanza Huerta Lwanga**, Christian Kampichler, Violette Geissen, Bernardus H.J. de Long, Salvador Hernandez Daumas, Simon Hernandez de la Cruz, Lauritania Ibarra Hernandez

Application of sustainability indices in rural areas in tropical Mexico

El Colegio de la Frontera Sur, Mexico

Poster session 10, Monitoring biodiversity changes

In order not to compromise development needs of future a huge number of sustainability indicators have been published. But how can we apply sustainability indicators in the humid tropics where lack of field data and literature often are limiting? We hypothesize that simple comprehensive and low-cost indices have to be applied to evaluate the sustainability in rural areas of Latin America. We gathered field data on 176 sites with different land-use in Tabasco, South-eastern Mexico, including natural and secondary forest, agricultural land, and rangeland. We interviewed farmers about characteristics of the actual land use (fertilizer or pesticide application, management, etc.) and about the history of each plot (time since deforestation, former land-use, etc.). We furthermore analyzed soil profiles on physical and chemical characteristics on each site. Also we used soil macrofauna as an indicator of soil quality. Additional data were obtained from maps and satellite images. We reviewed published sustainability indicators and tested them for applicability for each production system studied. First results indicated that (1) about 43 % of the sites are private property, (2) more than 50 % of the plots are larger than 25 ha, (3) the majority of farmers use pesticides and fertilizers in rangelands, (4) the majority of soils show signs of acidification with pH values ranging from 5.0 to 6.5. (5) We found the lowest earthworm biomass ($7.30 \pm 6.36 \text{ g.m}^2$) in an intensive pasture, and the higher in a red cedar (*Cedrela odorata*) plantation ($81.38 \pm 52.72 \text{ g.m}^2$). Based on the selected indicators we elaborated sustainability maps in order to (1) identify the most environmental friendly form of land-use for any given place by applying a rule-based fuzzy model, and (2) to determine critical regions where land-

use is unsustainable and need to change or to adapt management measures to guarantee sustainability goals.

Keywords: rural areas, tropical production systems, land use evaluation, soil fertility, tropical forest

Olvera-Vargas, Miguel; Figueroa-Rangel, Blanca; Vazquez-Lopez, Martin
Spatio-temporal analysis of species coexistence in mixed-oak forests in Western Mexico

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Poster session 10, Monitoring biodiversity changes

A number of investigations have attempted to explain the relative importance of factors controlling coexistence in species-rich communities. These accounts are typically built upon an empirical approach carried on tropical rain forests where many of the factors invoked to explain species coexistence are difficult to extrapolate to other latitudes and; a theoretical approach which is frequently dogged by a lack of appropriate long-term data. In this research we firmly tackle the above constraints by looking at a group of sympatric *Quercus* and allied species on which little ecological research has been undertaken.

The purpose of this research was to ascertain how species composition temporally and spatially varies and how these processes can be understood in the context of species coexistence. We ask the following research questions: Are *Quercus* and associated species represented by distinct communities or by a compositional drift? If vegetational patterns exist, do these reflect patterns in the environment? Does their floristic structure suggest that they are in compositional equilibrium? Our investigation relies on long-term data derived from 105 permanent sample plots established since 1991.

Our results accounts for notorious species richness; at least nine *Quercus* including twenty-seven broadleaved species were found coexisting in various degrees of mixture. Our results support the hypothesis that even phylogenetically close related sympatric species must have spatio-temporal niches; otherwise they would not reveal vegetational patterns in the environment.

We conclude that micro-niche zonation processes caused by a high degree of environmental heterogeneity combined with individual species traits explain the observed species composition. *Quercus* forests in the study area are well represented by non-equilibrium conditions.

Keywords: *Quercus*, species diversity, coexistence, niche, dispersal limitation

Oszlányi, Julius

Survey of the chosen projects concerning biodiversity in Slovakia

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Poster session 1, DIVERSITAS National Committee

Oszlányi, Julius; Halada, Lubos

Species diversity trends in abandoned grasslands in the Carpathians

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Poster session 10, Monitoring biodiversity changes

Eastern Carpathians were and are characteristic with mountain grasslands and meadows, the biodiversity of which is very valuable and stable. However, depopulation, migration, forced migration and collectivisation of agriculture resulted in the abandonment of grasslands in the last two decades. Ungrazed meadows, especially in the higher altitudes, remained without trees and shrubs, but the herbaceous and grass species composition has changed significantly.

Altogether, 5 plots are situated at the altitude of the uppermost forests and represent their grasslands substitute. Here, the studies were performed.

Plots were studied in 1994 – 2004, species composition and abundance and structural characteristics of plant communities as diversity, naturalness, life forms, life strategies, endangering, rarity and endemism were evaluated.

General trend on species biodiversity in these grasslands due to their gradual abandonment, sporadic usage is characterised by a significant increase of abundance of *Calamagrostis arundinacea* and *Vaccinium myrtillus*, *Polygonatum verticillatum* and decrease of formerly abundant species like *Campanula abietina*, *Anthoxanthum odoratum*, *Viola dacica*, *Nardus stricta*.

The valuable landscape biodiversity and also the species diversity of grasslands must be maintained, preserved and in some cases restored. The most effective way to achieve this is the continuous usage of grasslands by mowing and grazing. Long-term studies showed the inevitability of permanent intervention of Man into growing process to preserve the species composition and species diversity itself.

Keywords: meadows, pastures, biodiversity, abandonment, Carpathians

Pasquis, Richard

Governance in Amazonian agriculture frontier of soybean

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Poster session 3, Agriculture and biodiversity

The current globalization of agri-food systems puts agro-exporting countries in direct competition with one another, and competitiveness is becoming the main challenge for production systems.

In the specific case of the soybean market, and to respond to a growing demand, Brazil has begun a large colonization movement of Amazonian forest lands.

The challenge was to raise arguments to influence policies by obtaining better information on the main determinants and impacts of the expansion of soybean crops in forest areas. This study would allow us to produce and improve information available to build negotiation mechanisms among players in the soybean production chain.

In order to identify the causes of such rapid progression of soybean culture in the region, we have analyzed the different strategies of the players by conducting interviews, meetings and a participative appraisal.

After a wide bibliographic review, we visited the main agronomic and environmental research institutions and carried out local impact assessments.

Little by little the Amazon is becoming a “commercial landscape” polarized by

competitive advantages of the territory that connect natural resources with the voracity of the international market of commodities.

Beyond the privatization of free environmental services, soybean expansion and forest conversion for agriculture have a number of socio-environmental consequences, like an important loss of biodiversity, soils erosion, water pollution, local climate changes, and increased vulnerability to fires. The land concentration provoked by the mechanization needs of commodity monoculture intensifies rural exodus and degradation of social conditions of small producers.

The main reasons lie in the weakness of conservation measures vis-a-vis very efficient private and public economic policies furthered by the lack of information and fora of discussion. Thus, governability remains the main challenge to find some elements of solution

Keywords: soybean, Amazon, policies, deforestation, globalization

Peccinini Seale, Denise; Sena, Marco Aurelio; Rocha, C.F.D

Genetic Diversity in Lizards and Amphisbaenians from Southeastern Atlantic Forest of Brazil

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Poster session 12, Systematics, phylogeny and evolution

In the Southeastern Atlantic Forest there is a high degree of endemism. There are species with a population distribution restricted to very small geographic areas. This particular configuration of the Atlantic Forest indicates a large and very special potential for research on genetic diversity and evolutionary mechanisms on species and population levels. However, expansion of land use for agriculture and habitation had a disastrous effect on the native flora and fauna. The heterogeneous fauna distribution in the Serra de Paranapiacaba, Serra do Mar and Restingas is evidenced, so far, by the karyotypes of 18 species from 7 families of Sauria and two species of Amphisbaenia. Chromosomal preparations were obtained from tissue samples of bone marrow, testis, spleen and epithelial cells of intestine. Conventional staining with Giemsa and AgNOR banding techniques were used. Comparative chromosomal studies between Restinga species and those at high altitudes indicate that those species from Restingas show a higher diversity of species as well as a higher diversity in the number and morphology of chromosomes. There is a very low density of animals with no geographic variation in the same species; however there is a high interspecific chromosomal variability. There are common species at both high and low altitudes as *Tupinambis merianae*, $2n=38$ chromosomes and *Placosoma glabella*, $2n=36$; there are some species from low altitudes and some from high altitudes only. There are endemic species in Restingas as *Liolaemus lutzae*, $2n=36$ and the recently described, *Cnemidophorus littoralis*, $2n=46$ both with a very restricted geographic distribution. Some species show chromosomal mechanisms of sex determination and mutations related with speciation, which suggests recent evolutionary processes.

Keywords: genetic diversity, lizards, Amphisbaenians, atlantic forest, mountains, restingas

Pereira, Elvira; Pereira, Henrique; Queiroz, Cibele

The impacts of agricultural abandonment on biodiversity: considering local and global values

Universidade Técnica de Lisboa, Portugal

Poster session 5, Drivers of biodiversity changes

The abandonment of mountain rural areas is a common trend in European countries and in recent years there has been an increasing concern about the environmental, economic and social consequences of land abandonment. The main goal of our study was to understand how local people in a rural mountain community value biodiversity and perceive the impact of land abandonment on biodiversity. Local values were then compared to global conservation values. The research was conducted within the framework of Portugal's Sub-Global Assessment of Millennium Ecosystem Assessment.

To assess local values and perceptions of change we used a range of participatory tools and other field methods, such as direct observation, familiarization and participation in activities, semi-structured interviews, agro-ecosystem resources ranking and trends, landscape/habitat ranking, species list and species ranking. Secondary data were used to evaluate landscapes and/or species according to the following global conservation criteria: diversity, degree of endemism, degree of threat and scientific importance, and to assess changes on biodiversity.

Local people attach a wide range of values to biological resources including direct use values, indirect use values and non-use (intangible) values. Diversity of biological resources is also valued. Nonetheless people have contrasting feelings towards biodiversity. On one hand they appreciate fauna and flora diversity but on the other hand they have negative feelings towards species that have a long history of conflict with the local population, such as carnivorous mammals and reptiles (some of which have high conservation value).

Land abandonment will have different impacts on different species and its consequences will be differently assessed as positive or negative when considering local and global conservation values.

Keywords: biodiversity, participatory study, land abandonment, mountain community, local values

Perroni, Yareni; Montana, Carlos

Relationship between plant richness and soil nutrient availability in a semi-arid environment

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Poster session 6, Biodiversity and ecosystem functioning

Experimental work has shown positive relationship between plant richness and ecosystem productivity. However, natural patterns have shown the inverse pattern. Highly productive systems have low richness, while systems with lower productivity have higher richness. This inconsistency could be due to the difficulty of controlling variables in natural systems and failing to take into account soil nutrient availability. We present data from a semi-arid tropical system where aboveground and belowground variables were monitored. We compared plant richness and soil nutrient availability of "fertility islands" promoted by two leguminous trees versus areas without canopy cover. We also evaluated the relationships between plant richness and the availability of nutrients in the soil at micro-scale.

This study was carried out in the Zapotitlan Valley, central Mexico. Plant richness was estimated in plots of similar size and understory density under two leguminous tree species, and on open sites. The concentration of organic C, total N, available mineral N (ammonium and nitrate), total P, and P available in the soil were evaluated. The net rate input and micro biota consumption of C and N were evaluated by incubating soil.

Plant richness was positively correlated with concentration and availability of C and N in the soil but not with total P. This suggests that nutrients that are vulnerable to strong leaching are related with plant richness as opposed to nutrients with low vulnerability to leaching.

We suggest that plant richness is a natural retention and conservation mechanism of soil nutrients due to a feedback processes. Maximization in the acquisition of nutrients by various plant species and minimization of nutrient loss through leaching on one hand, and increase in diversity of soil decomposers by organic litter from different sources on the other.

Keywords: plant-richness, nutrient-availability, semi-arid-environment, cercidium-praecox, prosopis-laevigata

Pineda, Eduardo; Escobar, Federico; Halffter, Gonzalo; Moreno, Claudia E.

Forest transformation and shade coffee: species diversity of three taxa in a landscape of Mexico

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Poster session 3, Agriculture and biodiversity

We compared the species diversity of frogs, copronecrophagous beetles (Scarabaeinae) and bats in tropical montane cloud forest (original vegetation) and shaded coffee plantations (an agroecosystem common to the region) for a landscape in central Veracruz, Mexico. We sampled for three tropical montane cloud forest fragments and in three coffee plantations with traditional polyculture shade between 1998 and 2001. The three focal groups responded differently to the transformation of tropical montane cloud forest into shaded coffee plantations. The species richness of frogs decreased by one fifth and there was two thirds of dissimilarity in the species composition between forest fragments and coffee plantations. On the other hand, the number of beetle species and their abundance was notably greater in coffee plantations than in the forest fragments, whereas species richness and species composition of bats were virtually the same in both habitats. The majority of the abundant species remained as such in both communities, but species that were less abundant did not remain scarce in both habitats. We attributed differences in the species assemblages to the differing degrees of penetrability of the borders of the two habitat types (especially for the coffee plantations) and to the differences in natural history traits among species. Shaded coffee plantations form a matrix that envelops the remaining fragments of cloud forest. Together they connect the forest fragments with the other habitats of the landscape and represent a highly functional resource for the preservation of biodiversity that serves as a complement to, but not a substitute for cloud forest in this notably modified landscape.

Keywords: Frogs, Dung beetles, Bats, Tropical montane cloud forest, Indicator groups

Ploetz, Christiane; **Athkar-Schuster, Mariam**

ProBenefit - process-oriented development of a model for a fair benefit-sharing for the use of biological resources in the Amazon Lowland of Ecuador

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Poster session 14, Economics of biodiversity

The UN Convention on Biological Diversity (CBD) gives all countries the sovereign rights over their genetic resources. Many countries now develop regulations for access and benefit sharing (ABS), among them Ecuador. However, so far no well-documented model procedures for ABS exist that respect both the needs of local and indigenous communities and of small and medium-sized pharmaceutical companies that seek access to medicinal plants.

The goal of ProBenefit is to work out a model procedure and agreement for a fair and transparent sharing of benefits from the sustainable use of biodiversity in the Amazon lowland of Ecuador. The agreement is developed in transparent negotiations and consultations with local indigenous communities in Ecuador, relevant NGOs, the Ecuadorian authorities and a medium-sized pharmaceutical company from Germany. The base of the work of ProBenefit are the regulations of the CBD. Legal and socio-political analyses, scenario development, participatory approaches, ethnobotanical studies and pharmaceutical testing make up the methodological set-up of the interdisciplinary project.

In the first phase of the project, different scenarios for the future of access to genetic resources in Ecuador have been developed. The legal analyses have clarified the legal conditions at the international, regional and national level. The elements and conditions for a fair and transparent consultation procedure have been worked out on the basis of a stakeholder workshop with representatives from various indigenous organizations. This project-specific approach is time-consuming but has helped to keep up a dialogue on access to resources with all relevant stakeholders. The project will provide suggestions and standards for working out similar agreements in the future.

After successful negotiations of an agreement on ABS, the ethnobotanic and pharmaceutical studies of phase 2 will begin.

Keywords: benefit sharing, Convention on Biological Diversity, stakeholder consultation, Ecuador, phytomedicine

Ponce de Leon, Leticia; Hernandez Cardenas, Gilberto; Jimenez Sierra, Cecilia; Jimenez Sierra, Cecilia; Perez Garcia, Martha; Perez Garcia, Martha

Biodiversity at risk: a biological critical perspective of the Mexican biosecurity law

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Poster session 11, Policy for sustainable development

Mexico has made great progress in approving environmental laws despite having recently opposed to that trajectory. The Congress approved a controversial Biosecurity Law concerning GMOs (Genetically Modified Organisms). The purpose of this work was to analyze, with a biological framework the pertinence of some articles of the Biosecurity Law of GMOs that place biodiversity at risk. We also considered the congruence with the more general environmental Mexican laws. According to the General Law of Ecological Equilibrium and Environmental Protection (LGEEPA), GMOs fall under the definition of pollutants. Although, article 89 authorises the

possibility of OGMs introduction in natural protected areas for the purpose of plague control and bioremediation. The introduction of GMOs must be prohibited where natural processes take charge of re-establishing the equilibrium which was temporally broken by possible plagues. Bioremediation neither can be a justification to introduce GMOs because of the unpredictable consequences in micro organism natural diversity. The law authorise the creation of areas free of GMOs by a complicated administrative process. Article 90 demands to present evidences that GMOs can not coexist with native species, being precisely the coexistence that makes possible the genetical pollution. The declaration of free zones seems then legally unreachable. Other concerns for the weak law protection to centres of origin and centres of diversity for plant and animal species are also discussed. Finally one of the most serious problems is that the transgression of the law is safeguarded only by a civil responsibility, not by an objective responsibility, making the clear assignation of responsibilities and the application of sanctions difficult, and mega corporations could cheat the law. The Mexican experience could be useful to avoid mistakes in biosecurity laws in other countries.

Keywords: GMO, Environmental Law, Natural Protected Areas, Conservation, Environmental and social risk

Queiroz, Cibele; Gomes, Inês; Pereira, Henrique Miguel; Vicente, Luís

Biodiversity and land-use change in a mountain rural landscape

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Poster session 5, Drivers of biodiversity changes

It is widely accepted that land-use change is the main cause of biodiversity loss, but while in the developing world we are assisting to conversion of natural habitat to agriculture, in European mountain areas natural vegetation is replacing abandoned agricultural land. Consequences of abandonment to local biodiversity and ecosystem services remain a controversial issue. We studied plant species diversity across a gradient of land use in a mountain agricultural landscape in Portugal and discuss the consequences of abandonment through the perspective of ecosystem services. Plant data were collected across a gradient of five different land-use types. We sampled 120 plots of 1.6 m x 1.6 m. A nested sampling design was used. Local diversity, α , and species turnover, β , were calculated for both plant species and families. Factors affecting species distribution were examined with Multi Dimensional Scaling (MDS). We used native forest area as an indicator of the condition of regulation and supporting ecosystem services.

Differences between land uses were significant for both α and β diversity. Maximum α and β diversity occur for intermediate land uses. These sites are submitted to frequent moderated disturbances and these results are in agreement with the "Intermediate Disturbance Hypothesis". Conversion of agricultural land to pasture or forest will negatively affect local provisioning or cultural services but can have positive impacts over regulation and supporting services.

Although conversion of agricultural land has positive impacts on local plant species richness, consequences of abandonment to local ecosystem services are not straightforward, and the existence of trade-offs between services must be taken into account in the definition of conservation priorities and management options to mountain rural agro-ecosystems.

Keywords: biodiversity, land-use change, abandonment, ecosystem services, intermediate disturbance hypothesis

Quétier, Fabien; Lavorel, Sandra; Liancourt, Pierre; Thébault, Aurélie

Scenario based projections of ecosystem services in mountain grasslands: comparison of a state and transition model incorporating ecosystem services and a more widely applicable method based on modeli

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Poster session 7, Biodiversity and ecosystem services

Making scenario based projections of changes in ecosystem services requires an interdisciplinary approach linking ecological and social data.

We developed a methodology linking widely applicable plant functional traits response to land use change and ecosystem services. It uses ecological field data (including plant functional traits & ecosystem properties) and social data (ecosystem services and the biophysical criteria used to evaluate service delivery) obtained through stakeholder surveys.

Using the same datasets, a state and transition model of ecosystem types and their associated ecosystem services can be constructed. Such a model can be used for scenario based projections.

This study will confront the plant trait based modelling approach to the alternative typological approach using data from a common set of semi-natural grassland ecosystems and for a common set of land use change scenarios.

Ecological field data and social data were collected on grasslands representative of the main land use changes having occurred in Villar d'Arène, a 25 km² sub-alpine agro-pastoral area in the central French Alps.

Land use change scenarios were interpreted as resource and disturbance maps.

Projected changes in plant traits will be modelled on these maps, using a landscape modelling shell (LAMOS). These will feed the plant trait response based methodology.

The same scenarios will be translated into land cover maps using the state and transition model, providing an alternative ecosystem service maps.

Discussion will focus on tradeoffs between (1) the wide applicability of the trait based method and stakeholders detailed knowledge of local ecosystem types, (2) the consequences of extrapolating current typologies to unknown future conditions and (3) the advantages and drawbacks of each approach for stakeholder participation.

Keywords: ecosystem services, ecosystem functioning, land use scenarios, plant traits, state and transition model

Quijada-Mascareñas, Adrian; Wüster, Wolfgang

Cryptic biodiversity revealed by DNA markers: the case of the Neotropical rattlesnake *Crotalus durissus*.

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Poster session 12, Systematics, phylogeny and evolution

Molecular DNA markers are revolutionizing the concept of species, revealing a more complex biodiversity than originally perceived. Mitochondrial DNA (mtDNA) has revealed the existence of cryptic species (true genetically distinct species that

morphologically are very similar). Cryptic species may represent hidden biodiversity that could easily be lost simply because no one knew it existed. Using mtDNA phylogenies, we present a case study of previously undetected cryptic species of rattlesnakes.

We analyzed the phylogenetic and phylogeographic relationships of the *Crotalus durissus* rattlesnake complex throughout its geographical range (from Mexico to South America). The taxon is poorly differentiated morphologically. We sequenced the Cytb, ND4, and ND2 regions and analyzed them using Maximum Parsimony, Maximum Likelihood, Bayesian analysis, and nested clade analysis.

Our phylogenies revealed the existence of three highly distinct lineages in morphologically poorly differentiated populations in Mexico and Central America, which are regarded as separate evolutionary species: *C. totonacus*, *C. culminatus* and *C. tzabcan*. In contrast, all South American populations are closely related (including the taxa *C. vegrandis* and *C. unicolor*, often regarded as separate species) regarded as a single species: *C. durissus*. The Mexican lineages are narrowly distributed, and their habitats currently altered and threatened. Habitat changes are not simply impacting a widespread species, but in reality affecting three different species. Thus, biodiversity losses may be underestimated, at least on phylogenetic grounds.

Protecting cryptic biodiversity must be an important consideration of conservation efforts. Special precaution must be taken to understand the genetic variation of species in order to avoid the loss of cryptic species.

Keywords: Cryptic biodiversity, cryptic species, DNA, *Crotalus durissus*, phylogeography

Rahman, Syed; Farhana, Khandaker

Creating conditions for a quantum leap of biodiversity through organic agriculture in Asia and the Pacific

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Poster session 3, Agriculture and biodiversity

Countries in the Asia Pacific region had already lost 70-90 per cent of their original wildlife habitat to agriculture, infrastructure development, deforestation and land degradation. The most severe losses occurred in Bangladesh, India, Philippines, Sri Lanka, and Viet Nam. Approximately 850 million hectares had some degree of land degradation, representing more than 28 per cent of the region's land area. The major causes land degradation in the Asia Pacific region are -Agricultural activities (212 million hectares), vegetation removal (310 million ha), over exploitation (46 million ha), over grazing (280 million ha) and industrial activities (1 million ha).

Within this context research assesses the impact of organic agriculture for a quantum leap of Biodiversity in Asia and the Pacific. Content analysis method is applied to assess the data.

Organic agriculture is promising alternative to reverse and halt the degrading bio diversity. It includes all agricultural systems that promote the environmentally, socially and economically sound production of food and fibers. It dramatically reduces external inputs by refraining from the use of chemo-synthetic fertilizers, pesticides and pharmaceuticals. A million wetland rice farmers in Bangladesh, China, India,

Indonesia, Malaysia, The Philippines, Sri Lanka, Thailand and Viet Nam have shifted to organic agriculture so yields increased about 10 per cent. In Bangladesh, more than 50000 farmers practiced this farming system, so production costs and livelihood risk have decreased, livestock populations have increased by 100-200 per cent, mixed cropping is three times more productive, income has increased by around 50-200 percent, farmers have a lot healthier and less skin problems. Organic agriculture is considering as one of the major strategies to maintain bio diversity. Farmers can protect biodiversity through organic agriculture and now it has earned a distinct identity as a land use approach.

Keywords: Biodiversity, Organic agriculture, Content analysis, Sustainability, Farmers

Rai, Nitin

The ecological and socio-economic aspects of forest fruit harvest in the Western Ghats of India.

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Poster session 5, Drivers of biodiversity changes

Background: The initial exuberance that greeted the idea that harvest of non-timber forest products could reconcile biodiversity conservation and livelihoods has been tempered by recent findings. To understand the conditions under which NTFP harvest could be socially equitable, economically viable and ecologically sustainable, I studied the life history characteristics of *Garcinia gummi-gutta*, socio-economic factors that influence fruit harvest, and the ecological effect of fruit harvest. What factors affect fruit production, regeneration and population structure? What institutional structures ensure the sustainable harvest of fruits?

Methods: Socio-economic methods included interviews and secondary data analysis. Ecological methods included an analysis of *G. gummi-gutta* life history. Stage structured matrix models were used to estimate population growth and determine effect of fruit harvest.

Results and Discussion: Results from my ecological studies suggest that, due to stable fruit production, seed dispersal by animals, persistence of seedlings in shade and adequate seedling recruitment under high fruit harvest, fruits of *G. gummi-gutta* might be harvested with few adverse demographic effects. I suggest that dependence by households on forest products is problematic due to unstable markets, inequitable access, variable distribution and fluctuating yield. Moreover, the lack of security of tenure resulted in rampant harvest and tree damage.

Conclusions: I argue that greater local control over forest resources, better market access and establishment of local institutions will benefit communities and conservation alike. The findings add to the increasing body of knowledge that suggests that fruit harvest might not have a significant impact on the rate of population growth. A web of social, economic and ecological interactions characterise the human-forest landscape. A multi-disciplinary approach is thus crucial for the success of forest resource use initiatives.

Keywords: non-timber forest products, matrix models, security of tenure, life history, community

Ram, Hitendra; Billore, Suresh Kumar

Practices of traditional knowledge and culture of Bhil tribe for sustainable development and conservation of biodiversity.

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Poster session 3, Agriculture and biodiversity

Indian sub continent have great richness of traditional knowledge and culture with most diversified ethnic community after African continent. Empirical knowledge of tribal society is the result of their close relations with the nature and natural resources and transfer orally from one generation to other without any documentation. This knowledge is generated through millennia of experimentation, observations, and trial and error methods and need to conserve through documentation.

In India about 572 different tribal communities are found and majority of them live in remote villages and belongs to diverse life style, belief, traditions and cultural. Among the tribes, Bhil constitute the second largest group in India and mainly found in western Madhya pradesh.

The present work attempts to Asses the knowledge and culture of Bhil tribes to play a vital role in environment management and development through their traditional practices. Under present study different practices are documented.

Knowingly and unknowingly tribal people have evolved strategy for doing so in the form of ritual, belief and taboos. Results indicate that ecological management technologies practiced by certain tribes are far superior and eco-friendly to so called modern means of conservation.

This is an area of research that presents a variety of opportunities for sustainable development and conservation of biodiversity. It requires nations to document and protect the traditional knowledge and customary practices related to the use of biological resources.

Keywords: Traditional knowledge, Bhil tribe, Culture, Biodiversity, Ethnic community

Ramseier, Dieter

Can flat roofs be improved as refuges for rare plant species?

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Poster session 4, Biodiversity conservation

In Central Europe, an increasing number of roofs are built as flat roofs. Many of them are extensively vegetated. On the one hand advantages include insulation, cleaning of rainwater, water retention and thus relieving of the sewage system. On the other hand, these sites can serve as refuges for rare species. The goal of this study is to find optimal substrates and determine their best thicknesses to enhance plant species diversity and to test whether especially rare species could be maintained in the long run.

Ten substrates were used for the experiment on three flat roofs in Switzerland on sites ranging from 780 to 1050 mm yearly precipitation. With four of the substrates, the influence of substrate thickness was tested with 5, 8 and 12 cm. Two replicates per treatment and roof were applied. All plots were seeded with a mixture of 49 species. The experiment has been running for 7 years.

Increasing thickness had a positive influence on species diversity with a mean of 11 species at 5 cm and 25 species at 12 cm. The properties of the substrates had a significant influence as well. The two sites with higher precipitation have higher

species numbers than the one with lower precipitation. The percentage cover of spermatophytes increased during the experiment to about 90 %. For mosses, less substrate is favourable.

The set of species is different on different substrate thicknesses, whereby there is a considerable overlap. Interestingly, some species are favoured by specific substrates even when the overall biomass production is about the same, indicating specific requirements. Some rare species like *Petrorhagia prolifera* can be maintained very well.

Flat roofs can contribute very favourably to plant species diversity and the conservation of rare species. Considering the dimension of these areas there is a considerable potential for species conservation.

Keywords: flat roof, biodiversity, rare species, species conservation, substrate

Ribeiro, Natasha

interaction between fires and vegetation in miombo woodlands in Mozambique

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Poster session 5, Drivers of biodiversity changes

Miombo is the colloquial term used to describe those central, southern and eastern African woodlands, dominated by the genera *Brachystegia*, *Julbernardia* and/or *Isoberlina* that cover about 2.7 million sq. Km. In the last few decades, miombo woodland has been undergoing perturbation through deforestation and fires as a consequence of increasing human population. Large mammals such as elephants play also an important ecological role as they simultaneously browse on and uproot trees when they move along the landscape. The aim of this study is to address the interaction between fires and elephants and how they influence the above ground net primary production (ANPP) of miombo woodlands. The study has been carried out in the north of Mozambique in the Niassa Reserve, a 42000 sq.km conservation area. MODIS imagery with 1 * 1 km of spatial resolution is being used to address patterns in fire and vegetation changes from 2000 to 2005. Aerial countings of elephants have been conducted in Niassa Reserve every 2 years since 2000. An extensive fieldwork has been carried out to collect data on trees grass ANPP along a disturbance gradient within the reserve. The damage of each individual plant by elephants and fires is being assessed in the field using a classification scheme adapted from Guy (1989). Using this integrated methodology the proposed study intends to examine how the two major disturbance forces in the miombo region, fires and elephants, alter biomass production over time. This in turn provide insight into the sustainability of the current land use and management approach. Some preliminary results indicate that as fires and density of elephants decrease along the gradient of disturbance, the biomass of the woody component increase while grass biomass decrease. tree composition also changes along the gradient.

Keywords: Miombo woodlands, biomass production, fires, Niassa Reserve, Mozambique

Rincon Ruiz, Alexander; **Cabrera Montenegro, Edersson**; Armenteras, Dolores; Ortiz, Nestor

Biodiversity, economy and human well-being in the coffee western region of

Colombia

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Poster session 14, Economics of biodiversity

The article presents a study realized in the coffee western region of Colombia, this region represents nearly 5,5 % of the continental national area and presents an economic, social and environmental importance for the country because its participation in the national GDP is highly significant, represented between 30 % and 32 % of the GDP in the last decade (1990-2000), this region has an importance in biodiversity and presents the highest levels of life quality of the country.

Nevertheless in this region negative aspects have been identified that are generating pressure, transformation and decrease of the biodiversity, as the demographic growth and economic activities that affect biodiversity. The human well-being and the advance towards the sustainable development depend fundamentally of a better managing of the ecosystems to be able to assure the conservation and sustainable utilization of these. Nevertheless, at the same time, as the services demands given by the ecosystems grow, the human activities produce reduction in the capacity of many ecosystems to satisfy these demands.

The article presents a set of indicators that allow monitoring and evaluation of the National Politics of Biodiversity in this region. These indicators identify the changes in the condition (state) of the biodiversity as well as the pressures and the actions of response (politic decisions) that affect the state of biodiversity.

In the study statistical exercises were done, as a initial step to approach the complex topic of the relations between economy, population and environment

Keywords: biodiversity, Colombia, indicators, coffee, human well-being

Rocha, Pedro L. B; Cardoso, Márcio. Z; Viana, Blandina F

Changes in the animal communities among landscape components in southern Bahia, Brazil

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Poster session 10, Monitoring biodiversity changes

In recent years Eucalyptus monocultures have sharply increased in the highly fragmented Atlantic rainforest of southern Bahia, with unknown effects on the local species. We evaluated how animal communities differed between three landscape elements (primary forest, forest remnants and 6-yr. old Eucalyptus plantations). We trapped lizards, anurans, soil arthropods, bees and butterflies within each element and gathered environmental and landscape data as well. We analyzed differences in species abundance and environmental variables via multiple response permutation procedure and species abundances through NMDS and a PCA based on correlation matrix and varimax rotation on matrix of environmental variables. Communities differ among landscape components: Eucalyptus is significantly different from both primary forest and remnants, the latter being similar. Lizards, euglossine bees and anuran were mainly associated with primary forest; hexapods with primary and forest remnants; arachnids and myriapods with remnants and Eucalyptus; butterflies with Eucalyptus. PCA shows that landscape components are very distinct from each other with regards to environmental variables. Eucalyptus plantations represent an inadequate matrix for the forest fauna; remnants are better despite not being as representative as the primary forest. Eucalyptus monocultures sustain a small subset of the fauna and do not represent an adequate matrix for species dispersal.

Keywords: Biodiversity, Eucalyptus, Tropical forest ecology, Community ecology, Matrix effect

Rocha-Olivares, Axayacatl; Lopez-Castro, Melania C.; Segura-Garcia, Iris H.

Assessing biodiversity patterns in the Gulf of California

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Poster session 10, Monitoring biodiversity changes

The Gulf of California (GoC) is one of the hotspots of marine biodiversity of the world. Due in large part to its isolation, its geological history, and to its peculiar physical and biological features, the rich waters of this marginal sea provide an ideal evolutionary setting for the generation and maintenance of marine biodiversity. Unfortunately, the GoC is not without threats. In light of problems of coastal development, increased marine traffic, pollution, and habitat degradation, the biodiversity of this strategic region faces serious challenges. The assessment of baseline levels of marine biodiversity is long overdue as is the level in which GoC populations are interconnected.

In this paper we address this problem by providing information about the levels of connectivity and habitat partition among populations of important marine vertebrate species currently protected by Mexican laws. We have used mitochondrial molecular markers to assess the levels of genetic differentiation of the bottlenose dolphin (*Tursiops truncatus*) and olive ridley marine turtle (*Lepidochelys olivacea*) populations in the GoC and the eastern Pacific.

We have identified levels of genetic partitioning nesting olive ridleys from Baja California Sur indicating a very pronounced genetic isolation from the rest of rookeries in the eastern Pacific, which can be considered as a single panmictic population. Population structure in bottlenose dolphins appears to be strongly influenced by ecological and habitat partitioning into coastal and oceanic populations with some level of overlap.

Our results highlight the need to reassess our notions of population connectivity, even in very vagile species such as large marine vertebrates. Ignoring hidden reproductive isolation and demographical independence can lead to dire consequences to the health of native populations and the levels of regional biodiversity.

Keywords: Gulf of California, conservation, marine mammals, marine turtles, connectivity

Rodiles-Hernandez, Rocio; Hendrickson, Dean A.; Lundberg, John G.

A new Mesoamerican catfish family and the need for its conservation

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Poster session 1é, Systematics, phylogeny and evolution

The aquatic biota of the Montes Azules Biosphere Reserve, as well as that of the Río Usumacinta in general, is still inadequately studied. Despite designation as a reserve, anthropogenic deforestation and other drastic ongoing habitat changes, as well as threats of hydroelectric powerplant installations, make it important to thoroughly inventory this fauna.

A diversity of methods was used between 1996 and 2003 to sample the fish fauna of

rivers of the Montes Azules reserve.

A new family, genus and species of the order Siluriformes (catfishes) was discovered, the description of which is in the process of being published. The description is based on 32 specimens, some of which exceed 500 mm Standard Length. It is found in deep areas (18 m) of high current velocities (whirlpools) in small caves along cliffs or among large rocks. Preliminary phylogenetic analyses indicate this taxon to represent an ancient group that dates to at least early Tertiary.

The very surprising discovery of a new family of living vertebrates, especially one of such large size, emphasizes how little is known about the biodiversity of this region. The phylogenetic position of this organism makes it especially valuable scientifically and emphasizes the need for conservation actions for the species. Although found in the Reserve, anthropogenic activities still place it in grave danger. Based on the information we have to date, we consider this catfish endemic to the Reserve, with a very restricted distribution, and vulnerable to the documented environmental impacts in the area and probably generally susceptible due to population demographics and specialized habitat requirements. We propose that it should be considered threatened in the Norma Oficial Mexicana and we propose various actions at an international level for protection of its habitat and the aquatic ecosystems of the Usumacinta basin.

Keywords: biodiversity, siluriforms, freshwater, Chiapas, Mexico

Rodriguez, Pilar; Arita, Héctor; Lira-Noriega, Andres; Munguia, Mariana; Ochoa-Ochoa, Leticia; Soberón, Jorge

Scale and patterns of vertebrate diversity in Mexico: an integrative approach

Instituto de Biología, México

Poster session 10, Monitoring biodiversity changes

Mexico is a megadiverse country ranking as one of the highest in mammals, birds, amphibians and reptiles worldwide. Surprisingly, no multi-taxa analyses have been developed for understanding the factors explaining this extraordinary biodiversity. Moreover, the simple description of patterns has been performed following different protocols, making difficult across taxa comparisons. The aim of this study is to analyze the patterns of diversity of the endemic vertebrates of Mexico using an integrative approach, emphasizing on the effects of the scale and beta diversity. We applied a novel and robust method for scaling diversity. Data for species of different terrestrial vertebrate groups were generated by modelling the distribution based on genetic algorithms and fundamental ecological niche (General Algorithm for Rule production, GARP). The models were generated by using the most complete collection of data point for each taxa, compiled from biological collections worldwide. We generated graphs scale-log species, which depict alpha, beta and gamma diversity simultaneously. The analyses were performed for 10 scales ranging from squares from 1 km² to 512 km².

Preliminary results showed contrasting patterns of diversity between the different taxonomic groups. Beta diversity was high in all vertebrates, particularly at central and southern latitudes of Mexico; however, strong differences were found regarding the scale where beta diversity was higher. While beta diversity of reptiles and amphibians was high along all scales, mammals were more sensitive to larger scales. Conversely, birds were the least sensitive group showing low beta diversity countrywide.

The preliminary results confirm the important role of beta diversity in the conformation of the biogeographic patterns of the megadiversity of Mexico.

Keywords: beta diversity, scaling, self-similarity, range distribution, prediction models

Rodríguez-Zaragoza, Fabián A.; Arias-González, J. Ernesto
Coral reef fish biodiversity in the north sector of Mesoamerican Barrier Reef System

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Poster session 10, Monitoring biodiversity changes

Biodiversity assessments have been performed mainly for terrestrial ecosystems and a few have been applied on marine ecosystems. This study used a terrestrial design applied on 11 coral reefs of the north sector of Mesoamerican Barrier Reef System (nsMBRS), which increases in area and habitat complexity in a north-south gradient. They have 4 well-identified zone-habitats: lagoon, front, slope and terrace. Our aim was to evaluate the reef biodiversity through an indicator group (coral reef fish) in different space scales. 636 visual census were analyzed. The alpha (habitat), gamma (reef) and epsilon (region) diversities were estimated. Beta diversity among habitats and among coral reefs was calculated. The alpha diversity was evaluated for bootstrap and rarefaction procedures, and non-parametric statistics. Beta diversity was computed with Whittaker index; Gamma and epsilon diversities were estimated with Schluter and Ricklefs equation. Results showed that alpha diversity was higher in front, slope and terrace than that of lagoon's, because there was a bigger ratio of resident fish species that live in these 3 habitats. Beta diversity was greater between lagoon and front, since lagoon is a nursery zone for recruits and juvenile fish due to its sea grass beds and mangroves. The gamma diversity was determined by average alpha diversity. Mahahual, Boca Paila and Yuyum coral reefs had higher gamma values. The beta diversity in a latitudinal gradient was bigger between Mahahual-El Placer and between Punta Maroma-Boca Paila. But in pairwise comparison, Mahahual, Boca Paila and Yuyum were the ones with the most similar species turnover. The epsilon diversity had 169 species and was found among the highest of Caribbean Sea. Our results showed the importance of conserving different reef habitats, and despite the fact that some reefs such as Mahahual may be a key place for the maintenance of the biodiversity of the nsMBRS, they do not have status of conservation yet.

Keywords: biodiversity assessment, coral reef fish, Alpha, beta, gamma and epsilon diversities, spatial scales, MBRS

Rufino, Cristina

Soil macrofauna diversity and habitat indicator taxa in the Doñana National Park

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Poster session 10, Monitoring biodiversity changes

Doñana National Park, is one of the largest and most important remaining wetlands in Europe. Although hosting a great variety of habitats and a large diversity of animal and plant species, the park is still an understudied ecosystem, particularly regarding

terrestrial invertebrates. Integrated in the ECODOCA programme, the main goal of this study was to evaluate the diversity of soil macrofauna in the different habitat types of the park and to define indicator taxa for each typology of habitats.

Two sampling methodologies were used. For euedaphic macrofauna a modified TSBF methodology was been used. At each site, 4 sampling points were selected and a soil monolith was collected at each point. For epigeal macrofauna pitfall traps were used (9 traps per site left for 5 days).

Wetlands ("Marisma") were the habitat type presenting the highest richness and also the highest number of characteristic (indicator) species (mainly from Coleoptera and Araneae). The vegetation cover and structure in stabilized dunes ("Monte Blanco" and "Monte Negro"), forested areas ("Bosque") and grasslands ("Vera") originated an higher richness and diversity in these habitats when compared to sand dunes ("Duna"). Multivariate analysis separated humid habitats from drier sites and showed "species-sites" associations mainly driven by the vegetation type and habitat structure.

This study contributed to the characterization of the biological heritage of the Doñana National Park not only by inventorying soil invertebrate fauna, but also by enhancing the importance of wetland habitats for conservation. Furthermore, the obtained results gave a contribution to the development of a soil quality index for Mediterranean systems based on soil fauna.

Keywords: soil fauna diversity, indicator taxa, soil quality index, multivariate analysis, Doñana National Park

Russell, Roly

Exploring the role and rubric of feedback cycles in socio-ecological systems

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Poster session 6, Biodiversity and ecosystem functioning

What underlies sustainable interactions? I propose that feedback cycles, and specifically the diffusivity and speed of feedbacks between consumers and their resources, strongly influence the adaptability, and thus the sustainability, of consumer-resource interactions. Fast and cohesive feedback cycles, I predict, foster sustainable interactions. I further hypothesise that this relationship holds within both ecological and social systems, as well as the interactions between these two inextricably linked systems.

To explore this thesis, I present a multi-faceted approach utilizing a) a synthetic conceptual review of pertinent complex adaptive systems theory, b) a quantitative analytical review of contemporary marine fisheries resource management systems, c) some empirical tests of the pattern derived from reconstructed prehistoric relations between Alaskan Aleuts and their natural resources, and d) case study review focused on the Aleuts, the Maya, and the Easter Island peoples.

A conceptual framework focused on the role of feedback cycles in sustainable interactions is synthesized. The foundations for this framework span human-exclusive and human-inclusive interactions, prehistoric and contemporary time-scales, and ecological and social dynamics. I focus my discussion on the conceptual and empirical support for tight and fast feedbacks driving sustainability of interaction (e.g., the persistence of Alaskan Aleut civilization and the collapse of the Maya), as well as giving thorough consideration to understanding plausible explanations of the situations where feedbacks were tight and fast, yet consumer-resource interactions

did, in fact, collapse (e.g., Easter Island).

In conclusion, I believe that the pervasive role of feedbacks proposed herein can provide a novel perspective and paradigm that will help guide and inform our attempts to foster sustainability within coupled social-ecological systems.

Keywords: sustainability, complex adaptive systems, feedbacks, coupled human-natural resource system, prehistoric civilizations

Salas, Raúl; Fidalgo, Beatriz

The use of diversity and structure indices to assess the diversity vegetation in sub-urban forest

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Poster session 10, Monitoring biodiversity changes

The management practices modify the structure and composition of the forest stands, and therefore associated values like: aesthetic, conservation and recreation. This study aims to assess the diversity and structure of the stands and to propose a global biodiversity index modifying the Meerschaut's index.

The study was conducted in Portugal. Special attention was given to environmental variables, under-story, vertical and horizontal stand structure, natural regeneration and dead trees. The analysis was done by strata. The alpha and beta index of diversity, evenness and similarity indices were estimated. The vertical and horizontal structure was evaluated. A X² homogeneity test was performed for all the indicators among the studied stands. For the global biodiversity index, a weight to each indicator was given, applying Diakoulaki's method.

Low diversity values were observed such as those found in Finland. However, the occurrence of the native species, presenting natural regeneration and irregular stands is increasing. The X² test revealed that the diversity and structure indices were statistically significant among stands. Young stands resulting from recent explorations showed higher diversity values in the under-story, simultaneously, the evenness revealed the dominance of some species. In contrast, irregular stands with mature trees showed higher diversity in tree layer and lower in the under-story with no dominance of any species. The structure indices confirmed these results. The global index also corroborated the results and seems to be a good guide to explain diversity considering the characteristics of the stands.

The alpha, beta and structure indicators were useful in biodiversity assessment. As consequence of the management, the diversity of under-story is reduced in the irregular and mature stands. The global diversity index showed good results.

Keywords: biodiversity, assessment, indicators, forest management, temperate

Sánchez, Ada; Rodríguez-Clark, Kathryn

The effect of landscape structure on population dynamics: Spectacled bear populations (*Tremarctos ornatus*) in Venezuela.

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Poster session 5, Drivers of biodiversity changes

The geographic distribution of Andean bear includes the tropical Andes from Venezuela to the Bolivia-Argentina border. In Venezuela, Andean bear populations

are located in the Mérida and Perijá mountains, which coincide with areas of high human population density. The viability of Andean bear populations may depend of the degree of isolation between habitats patches and habitat quality but the importance of these factors may be different for the different vital rates influencing population viability. Therefore, here we evaluate the relative importance of fecundity, survival and dispersion in the viability of populations in Venezuelan landscapes with different degrees of habitat quality and fragmentation. We first build a habitat suitability map using presence data for Andean bears. The role of fecundity, survival and dispersion in population viability in different landscapes is evaluated using a spatially explicit population model. Population dynamics are simulated using a set of landscapes that combine different habitats types (high, medium and poor quality) and configurations (high, medium and low fragmentation). We use logistic regression to analyze the sensitivity of population growth rates to changes in fecundity, survival and dispersion in each landscapes set with the relative importance of each variable indicated by the regression coefficient. When habitat is of high quality, our analysis indicates that adult survival is the most important variable influencing population viability in landscapes with low fragmentation, while in highly-fragmented landscapes fecundity is the most important variable. Dispersion only appears to be important in highly fragmented landscapes with poor quality habitat. These results indicate that the value of conservation strategies aimed at influencing different vital rates will vary according to local habitat configurations, such that their implementation should be appropriately tailored in Andean bear management.

Keywords: fragmentation, Andean bear, population dynamics, conservation, habitat map

Sandoval-Castillo, Jonathan; Perez-Jimenez, Juan Carlos; Rocha-Olivares, Axayacatl; Sosa-Nishizaki, Oscar; Villavicencio-Garayzar, Carlos

Unmasking cryptic diversity in elasmobranch populations of the Gulf of California

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Poster session 12, Systematics, phylogeny and evolution

The Gulf of California represents one of the most prominent Mexican marine regions in terms of species diversity for a variety of marine fauna, including fish. This is particularly true for cartilaginous fishes; levels of species diversity, however, may underestimate the real levels of biologically significant genetic and phylogenetic diversity warranting both species- and community-level management and conservation measures.

Here we describe the results of collaborative projects aiming to characterize intraspecific levels of molecular genetic variation in elasmobranch populations from the Gulf of California and the Pacific coast of Baja California.

Genetic variation in mitochondrial and nuclear genes of rays (*Myliobatis californica*, *Rhinobatos productus*, *Rhinoptera steindachneri*, *Narcine entemedor*, *Gymnura marmorata*) and sharks (*Mustelus* spp.) have shown the existence of significant levels of divergence in some Gulf of California batoid populations as well as the existence of new species of butterfly rays and hound sharks. Our comparative analyses have revealed that these patterns do not appear to be correlated to some life-history features such as fecundity and mobility, but rather may reflect the

combined effect of historical events on the demography and connectivity of allopatric populations.

Our results highlight the importance of molecular genetic studies to assess levels of regional biodiversity that often goes unnoticed using traditional morphological approaches.

Keywords: Gulf of California, elasmobranchs, sharks, rays, genetic diversity

Saner, Philippe, Christopher Philipson, Andrew Hector, Reynolds

Does the growth performance of dipterocarp saplings follow an ecological trade-off?

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Poster session 6, Biodiversity and ecosystem functioning

In my thesis I measured the growth of saplings. The saplings belong to a family of tropical trees called Dipterocarpaceae, a widespread family in tropical forests of South-East Asia. This family of tropical trees is of interest because

-it is dominant in this ecosystem

-these trees are harvested intensively for commercial reasons

-these trees regenerate only under certain light conditions.

Research on species of this family may therefore help to improve future regeneration projects in tropical forests.

Why is it that so many different species of tropical trees can coexist in a tropical rainforest? According to the competition exclusion principle (Gauss 1970) species can only coexist if they use resources in different ways. Plants depend on resources such as light, water, nutrients and space.

In this experiment we focus on the aspect of light. Since the canopy of a forest absorbs most light, saplings on the forest ground have to wait for a treefall gap for increased light conditions. Denslow (1980) assumed that different sized gaps lead to different light conditions, thereby allowing species to specialize into different niches and this may lead to coexistence.

We tested this hypothesis and predicted a trade-off for different light conditions if the hypothesis should be correct. Certain species will grow best under certain light conditions and grow less than others if these conditions change.

To test this prediction, we set up an artificial shadehouse experiment to measure the growth of saplings of different species under different light conditions.

The expected trade-off could not be shown. All species developed best under increased light conditions. One possible explanation for this result may be that the gap-size niche partitioning hypothesis as proposed by Denslow (1980) is not correct.

Keywords: dipterocarp, tropical ecology, functional groups, plant ecology, silviculture

Sarkar, Santoshkumar; Bhattacharya, Asokkumar

Biodiversity of Polychaetous Annelids in Sundarban Mangrove wetland : a useful tool for monitoring environmental change

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Poster session 10, Monitoring biodiversity changes

The paper documents the community structure of polychaetes in four ecologically distinct zones of Sundarban mangrove wetland, northeast India with the objective to

assess their in the context of marine pollution and habitat disturbance. Polychaetes were collected using a metallic quadrat and heavy metals (Zn, Cu, Cr, Cd, Mn, Pb, Co, Ni) in body tissues were measured by aspirating the samples in atomic absorption spectrometry and total mercury by cold vapor AAS. Levels of heavy metals in polychaete body tissues reveal an interspecific and regional variations. The predominant polychaete fauna have different response patterns to habitat disturbances and exhibited a distinct regional assemblages as follows : (i) *Mastobranchius indicus* – *Dendronereis heteropoda* in the sewage-fed substratum (ii) *Lumbrinereis notocirrata*- *Ganganereis sootai* – *Glycera tessellata* at the mouth of the Ganga estuary where chronic anthropogenic stress and contamination with agricultural and industrial effluents occur (iii) *M.indicus* – *D. heteropoda* - *L. notocirrata* under moderate human-driven stress and (iv) *Namalycastis fauveli* – *L. notocirrata* – *Lumbrinereis polydesma* at comparatively pristine site. The study demonstrates that textural composition of the sediment together with the hydrodynamic and geotechnical properties seem to have the greatest control in quantify the differences of the polychaete community in four stations. Coefficient of similarity showed lowest and intermediate level of affinity (0 – 25%). The study confirms that polychaete can provide a sensitive indicator of environmental change in response to anthropogenic inputs. An in-depth comparative study of polychaete community structure at multiple spatial scales is strongly recommended .

Keywords: polychaetous annelids, heavy metal, biodiversity, environmental change, mangrove forest

Saunders, James; Paterson, David

Ecosystem engineering by *Arenicola marina* on intertidal mudflats; influences on biodiversity and sediment erosion rates

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Poster session 6, Biodiversity and ecosystem functioning

Intertidal cohesive sediment systems are under increasing erosional pressure from rising sea levels, more frequent storm events and anthropogenic influences. The prediction of sediment erosion and deposition rates is vital for management and protection of such systems. The presence of organisms living within the sediment and microphytobenthic activity near the surface can cause a five fold increase in sediment stability, therefore a thorough understanding of biological influences is essential for constructing accurate models of sediment dynamics. In North West Europe intertidal mudflats are often dominated by the large (20cm) polychaete *Arenicola marina* which has a considerable impact on the physical and biological structure of the ecosystem through its feeding and bioturbation of the sediment. The influence of *A. marina* on the ecological and physical properties of the system and how this affects sediment stability and erosion potential was examined.

On the island of Sylt, Northern Germany, three high tide and three low tide 20x20m meshes were buried 10cm below the sediment surface to exclude *A. marina*.

Adjacent plots were dug up but no mesh was laid as a control. Sampling occurred in winter and summer 2005. The Cohesive Strength Meter (CSM), a portable device that fires water jets at the sediment surface, was used to measure sediment stability and a range of physical and environmental factors were recorded as well as macrofaunal and microphytobenthic samples.

Initial results demonstrate that the high tide plots have larger sediment grain sizes

and higher stability than low tide plots. Exclusion plots had a higher diversity and number of organisms than controls. The resulting higher bioturbation and predation levels were proposed as an explanation for lower sediment stability in the exclusion plots. The role of *A. marina* as an ecosystem engineer in temperate intertidal cohesive sediment systems was elucidated.

Keywords: estuaries, *Arenicola marina*, sediment stability, exclusion experiment, bioturbation

Seják, Josef

Integrating biodiversity into decision making processes

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Poster session 4, Biodiversity conservation

Presents a critical overview of biodiversity valuation methods, identifies several dogmas of mainstream economics that reduce and falsify the possibilities of monetary valuations of biodiversity, themes that are predominantly of public substance. Presents the Hessian method of monetary valuation of biotopes as the carriers of ecosystem functions and services.

The Hessian method (recommended by the EU White Paper on Environmental Liability, COM(2000)66 final) is an interdisciplinary expert valuation of all kinds of biotopes that exist in the respective national territory. Each biotope is valued by a group of ecologists using points according to eight ecological characteristics, each of them with the potential point value from one to six points. Point values are transferred into monetary terms by means of the average national restoration costs necessary per one point increase. This method brings a new dimension of economic value that reflects the life-supporting potential of the biotope, it evaluates the intrinsic value of nature in monetary terms.

Results obtained are important in several ways. In the macroeconomic field of national accounting (by combining the biotope values and the land cover approach, the results enable to quantify the concept of national natural capital). In the field of territorial planning and decision-making (comparing the values of environmental functions and economic functions for a respective territory can generate relevant information for political decisions). In the microeconomic field for the construction of economic instruments (can contribute to changing the behaviour of economic agents towards sustainable development).

Monetary valuation of biotopes encompasses to reflect the intrinsic value of environment and biodiversity and enables to equate economic and environmental functions of a respective area.

Keywords: biodiversity valuation, neo-classical economics, market and non-market values of environment, monetary valuations of biotopes, intrinsic value

Senbeta, Feyera; Denich, Manfred; Velk, Paul

The effects of wild coffee management on the forest biodiversity in the Afromontane rainforests of Ethiopia

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Poster session 3, Agriculture and biodiversity

Coffea arabica L. is an indigenous understory small tree in the Afromontane

rainforests of Ethiopia. The local communities living in and around the rainforests by tradition manage the rainforests for coffee production. The level of management can vary from undisturbed the Forest Coffee to Semi-Forest Coffee system. This study analyses the effects of wild coffee management on the floristic diversity and community structure in the two systems. **Materials and Methods:** The study was conducted in the Harennna and Berhan-Kontir rainforests of Ethiopia. A 20 x 20 m quadrates, were laid down along the transects in each forest. In each plot, all vascular plant species identified and counted, and height and diameter of all woody plants > 2 cm dbh were measured. Environmental data such as slope, altitude, exposition, and soil were recorded. **Results and discussion:** Floristic composition and diversity was highest in the Forest Coffee and lowest in the Semi-Forests Coffee at both forests. A total of around 8% and 30% species reduction were observed in the Semi-Forest Coffee system of Harennna and Berhan-Kontir respectively. The values of Shannon diversity indices and evenness values were very low in the Semi-Forest Coffee. The family dominance ranks also changed from the Forest Coffee to the Semi-Forest Coffee reflecting the targeted removal of species. Species richness of some life forms such as lianas, small trees and shrubs declined to 50% in the Semi-Forest Coffee systems. Population structure of the main tree species was also differed in the different forest categories because of selective removal. **Conclusions:** Although the magnitude of disturbance between Harennna and Berhan-Kontir forests differ, in both cases conversion of Forest Coffee into Semi-Forest Coffee depressed tree regeneration, reduced tree density and eventually led to the disappearance of the forest and forest species, while promoting coffee plants temporarily.

Keywords: diversity, forest coffee, semi-forest coffee, wild coffee, Ethiopia

Shao, Kwang-Tsao

Integration of Taiwan Biodiversity Information Networks – TaiBNET & TaiBIF

Academia Sinica, Taiwan

Poster session 10, Monitoring biodiversity changes

Building a comprehensive database and a national portal for biodiversity is the most direct and efficient way to manage and use biological resources. Under the support of National science Council, the project of Taiwan Biodiversity Information Network (TaiBNET) (<http://taibnet.sinica.edu.tw>) contains both experts and catalogue of life was started in 2001. More than 500 local taxonomist and ecologists' information and 45,000 native species were collected in 2004. User can click the species name from checklist, classification system or search by string to hyperlink to domestic or global databases to retrieve more detail species information of any particular species. The compilation of Fauna and Flora of Taiwan in English is also conducting right now.

TaiBIF (<http://www.taibif.org.tw>) is a national portal for GBIF which was established in 2004. It is an on-line integrated database and administrative system which provides species, ecological and environmental information via GIS and species name. It also provides all specimen collections in different museums, local biodiversity literatures or related news or activities in Taiwan. Since 2005, Council of Agriculture offered the Ecological Engineering grant to persist with the maintenance and to enrich the content on both ecological engineering and local biodiversity data. Nowadays, TaiBIF has been an important data centre in Taiwan. To integrate all ecological survey or monitoring data using EML system is what we are promoting in present.

Keywords: biodiversity, GBIF, Taiwan, database

Shibru, Admasu

Agricultural value of wild coffee genetic resource in Ethiopia: implication for conservation

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Poster session 3, Agriculture and biodiversity

Coffee is the most important commodity for export and the livelihood of about one-fourth of Ethiopian population. There exists diverse wild arabica coffee population in Ethiopia. Due to threats on wild coffee forest, a research project is underway to develop effective conservation and use concepts. To recognize the respective contribution for conservation of different stakeholders, it is necessary to differentiate the local and global values of the genetic resource. In order to justify the conservation based on facts, the valuation process needs to consider the potential values besides the observed use values.

this piece of work is aimed to assess the agricultural value of wild coffee genetic resource for local coffee producers. It is to approximate the demand for improved coffee breeding products in relation to production constraints that farmers are facing. The agricultural value of the resource is estimated in terms of producers' willingness to pay for improved planting materials that can be developed through breeding. The estimation is made with attribute based choice experiment. The hypothetical profiles are based on the fact that certain wild coffee germplasms are indeed recognized by breeders to have valuable attributes like resistance to diseases, pests, etc.

A conditional logit model indicates that farmers nearer to forest areas are paying less which can be associated to the resistance nature of their forest based coffee.

Although all coffee producers can get planting materials for free, they are willingness to pay considerable for improved materials due to attributes especially resistance to coffee berry disease, coffee wilt disease and vigour. Recalling the significance of coffee for a million coffee producers and the country in general, the high demand for improved planting materials can justify conservation of the genetic resource in particular and the forest habitat in general.

Keywords: wild, conservation, local value, experiment, coffee

Shiponeni, Ndafuda; Allsopp, Nicky; Carrick, Peter

Competitive relationships and root partitioning between grass and leaf succulent shrub at the ecotone between Nama karoo and Succulent karoo biomes

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Poster session 6, Biodiversity and ecosystem functioning

The ecotone between the winter rainfall succulent karoo and the summer rainfall nama karoo biomes in southern Africa is characterised by C4 grasses typical of summer rainfall nama karoo and succulent shrubs that predominantly grow in winter rainfall succulent karoo. Current climate change scenarios predict less winter rainfall, and it is not clear how the vegetation will shift or respond. There is also poor understanding on coexistence and interactions between succulent shrubs and perennial grasses. This study was aimed to investigate the nature of interactions between *Stipagrostis brevifolia*, a perennial C4 grass and *Ruschia robusta*, a

facultative CAM leaf succulent shrub, the two codominant species along the ecotone. Nearest-neighbour analysis was used to examine the competitive interactions between the two species in mixed communities. Vertical root partitioning was also analysed.

Results showed competitive interactions both within and between species.

Intraspecific competition in both species was stronger than interspecific, and by this way species could coexist. Grass exerts stronger competitive force on the succulent shrub than the effect of shrub on grass.

The leaf succulent shrub exhibits shallow roots whereas the grass root system occupies intermediate depths and this might explain weaker interspecific competition. Although vertical partitioning of roots and an observed weaker interspecific competition might facilitate coexistence, a stronger competitive impact on *R. robusta* from *S. brevifolia* could lead to the dominance of grasslands at the ecotone, and even more so if current climate predictions are true. Research is continuing to investigate how the distribution of grasses and succulent shrubs has changed.

Keywords: C4 grasses, succulent shrubs, summer-winter rainfall ecotone, competitive interactions, root partitioning

Solis-Weiss, Vivianne; Flot, Jean-François; Hermoso Salazar, Margarita; **Solis-Marin, Francisco**

The depauperate benthic invertebrate macrofauna of Clipperton Island

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Poster session 12, Systematics, phylogeny and evolution

Selected groups of the benthic invertebrate macrofauna of Clipperton (scleractinian corals, polychaetous annelids, crustaceans and echinoderms) were studied to assess its biodiversity. Previous records of the fauna surrounding this closed atoll are very scarce and limited to a few collecting expeditions, most recently the Mexican expedition SURPACLIP-I in 1997.

Sampling was conducted on March 3-12, 2005 as part of the French "Mission Clipperton 2005" expedition. Corals were collected while scuba diving from a depth of 52 meters to the surface on the southwestern side of the atoll. For the other groups, six diving zones between 10 to 25 meters depth around the island were selected as representative of the whole study area. Corals and echinoderms were sampled directly by hand. Polychaetes and crustaceans were extracted in the laboratory from dead-coral rock samples.

Five genera of polychaetes (*Eunice*, *Naineris*, *Eurythoe*, *Polydora* and *Notomastus*) and 9 families of crustaceans (*Paleamoniidae*, *Alpheidae*, *Hippolytidae*, *Porcellanidae*, *Diogenidae*, *Trapeziidae*, *Xanthidae*, *Portunidae* and *Grapsidae*) were recorded in only 2 stations. We found 21 echinoderm species, of which 9 are new records for the atoll. Corals of five genera (*Pocillopora*, *Pavona*, *Leptoseris*, *Porites* and *Tubastrea*) were collected, plus one or two yet unidentified cryptic species of solitary corals that may represent new records for the area.

The invertebrate benthic macrofauna of Clipperton is remarkably depauperate compared to the western shores of the Mexican Pacific closest to the atoll (1200 km) and to the Western Pacific. The very isolated geographic situation of Clipperton has probably played an important role in the distribution and thus the biodiversity of its fauna.

Keywords: coral reefs, polychaetes, corals, crustaceans, echinoderms

Son, Hoang Van

Biodiversity of Non-Timber forest products

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Poster session 10, Monitoring biodiversity changes

Ecologically, the role of non-timber forest products (NTFPs) and timber is different forest ecosystem. Most of the species giving NTFPs are under timber trees, therefore, they less influence to the stability of tropical forest ecosystems.

Nghe An is a Province located on North-Central of Vietnam, The discovery of 4 new beasts of the World that is living in 4 Nature Reserve Areas of Nghe An showed that this province is one of a few important valuable address of biodiversity.

Study method

- By using PRA method to investigate and access the local people's uses of NTFPs, also analyze their economic influences
- To gather data, use survey question guidelines and also experts
- To define species in botany in order to point out the diversity of species components of NTFPs.

Diversity of NTFPs used is very high. There are 600 species of plants provided NTFPs belonging 385 Genus, 128 Families of the 5 Phylum using for household consumption and soling. Of which, there are 14 rare and precious species recording in the Vietnamese Red Book. There are 10 Families provided 11 to 52 species. Of which, Fabaceae is biggest Families that provided NTFPs (52 species of 20 Genus). 145 species (24% of total NTFPs species) are common use, of which 24 species used for market demand with different levels.

One of the highest values of the NTFPs is diversity of using purpose, of which one species could be provided diversity of using. There are 567 species used for medicine (94,5% of total), 45 species for food (7,5% of total). Of the 145 common NTFPs species, there are 103 species (71% of total) only used for medicine or food. There are 42 species are used for medicine, food and other purpose. There are 8 species could be developed for households income.

In the mountainous areas of Nghe An, 40%-50% of household income was from NTFPs in average, of which, most of poor households are depending on NTFPs collection (70%-80% of income).

Keywords: Biodiversity, Non-timber forest products, ethnic people, mountainous area, poor households

Sosa Lopez, Atahualpa; Flores Hernandez, Domingo; Mouillot, David; Ramos Miranda, Julia

Fish richness decreases with salinity in tropical coastal lagoons

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Poster session 12, Systematics, phylogeny and evolution

The major environmental factors which influence the distribution of organisms in coastal ecosystems is salinity and temperature. Studies of diversity linked to salinity in temperate estuaries are well documented, but little information exists about tropical coastal systems, particularly on the analyses of the relationship between fish species richness and salinity. In this work, we investigated the fish species richness as a

response to salinity gradients in a tropical coastal lagoon. To determine whether the salinity gradient was influencing the fish species richness or not, we used data from experimental surveys carried out in the Terminos lagoon (latitude: 18-19°N; longitude: 91-92°W, Southern Gulf of Mexico) in two annual periods (1980-81 and 1998-99). In 17 sampling sites, fishes were collected monthly using a 5 m shrimp otter trawl and salinity was measured before each tow. Relationships between fish richness showed significant negative correlations with salinity (e.g. R values ranging between 0.51 - 0.78; at P

Keywords: Terminos lagoon, Southern Gulf of Mexico, linear models, fish diversity trends, fish richness

Sousa Pinto, Isabel; Araújo, Rita

Grateloupia turuturu (yamada): a recently introduced species in the Portuguese coast

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Poster session 12, Systematics, phylogeny and evolution

Grateloupia turuturu was first reported in the Portuguese coast in 1998 and has not been studied in this area.

With this work we aim to establish the geographical distribution of G. turuturu in the Portuguese coast and evaluate its impact on the native benthic macroalgal assemblages.

We have visited 27 sites along the northern coast of Portugal, to search for localities where G. turuturu occurred. Two localities where G. turuturu was well established were selected to perform two different experiments: total removal experiments, where all the macroalgal present within 50x50cm plots were removed and selective removal experiments, where only G. turuturu individuals were removed, from same size plots. Evolution of assemblages subjected to the removal experiments was compared with control plots. Additionally, the individuals removed in selective removal experiments were measured and their reproductive status ratio was studied.

G. turuturu was found in 10 places. These results seem to indicate a recent introduction.

G. turuturu was reproductive in all the sampling occasions with a high percentage of reproductive individuals. A reproductive peak was registered in August.

In early stages of colonization of cleared substrata, G. turuturu seems to have competitive advantages in relation to other species, as demonstrated by its high cover percentage in total removal plots. However, G. turuturu was also able to recolonize plots with high cover percentage of other species and from where it was removed.

The results of this experiment indicate that G. turuturu might be regarded as potentially invasive in the Portuguese coast.

Keywords: Grateloupia, invasive species, seaweed, Portugal, geographical distribution

Squeo, Francisco; Arroyo, Mary T.K.; Gutiérrez, Julio

Using species – ecosystems approach to build a conservation portfolio

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Poster session 4, Biodiversity conservation

Biodiversity includes four hierarchical levels: gene, populations, species and ecosystems. However, definitions of priority areas for conservation of biodiversity usually use only one level, like species richness. The implementation of a global strategy derived from Convention on Biological Diversity (UNEP 1992) required from countries to develop guidelines for the selection, establishment and management of protected areas to conserve biodiversity. The goal of this work is to explore a multi-hierarchical approach in order to define conservation areas at regional/country scale, using as a model plant diversity in the Coquimbo Region, Chile.

Spatial distribution of total native, endemic and threatened species richness were used to locate hotspots areas defined at the species level (Red Book of Coquimbo Flora, Squeo et al. 2001). Spatial distribution of terrestrial ecosystems were based on the Survey of native vegetation resources of Chile (CONAF 1999). We defined natives plant communities as the best spatial record for delimiting terrestrial ecosystems.

Coquimbo flora have 1,478 native species, 14% of them being threatened species. Fourteen sites defined, representing 4% of the regional surface, contain 65% of the regional flora and 80% of the threatened species. Two of these sites (0.35% of the regional surface) are in the Chilean System of Natural Protected Areas (SNASPE). Using the ecosystem approach, the Coquimbo Region needs near 356,900 hectares (i.e., 8.8% of the regional surface) to reach the conservation goal of 10% of each natural ecosystems represented. More than 96% of the land needed is outside of the current SNASPE. There are partially overlapping between sites selected using both species and ecosystems approach. We conclude that to build the best portfolio for conservation of biodiversity in a country is necessary to use a multi-hierarchical approach.

Keywords: conservation, threatened species, terrestrial ecosystems, priorities areas, Chile

Stellmacher, Till; Gatzweiler, Franz W.

Organizing a public ecosystem service economy for the sustainable use of biodiversity

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Poster session 7, Biodiversity and ecosystem services

The core question this paper attempts to address is how social organization needs to respond to biodiversity features and functions in order to achieve its sustainable use. Scholars have suggested that governance of complex systems should be dispersed across multiple centers of authority and that complex systems can successfully be maintained by polycentric governance with a variety of response mechanisms. But how should polycentric governance of biodiversity be organized? We will suggest directions of institutional change and design principles for organizing a public ecosystem service economy.

Case studies from Ethiopia and literature review.

Borrowing from the organization of public economies in metropolitan areas we distinguish between production and provision of public ecosystem services and suggest the direction of institutional change for the organization of a public ecosystem service economy. We provide empirical evidence of the emergence of polycentric governance for biodiversity conservation in the Ethiopian coffee forests.

The Ethiopian Coffee Forest Forum has been established to pool different stakeholders, namely government, forest user communities, coffee industry, non governmental organizations and Public Private Partnerships. If the market alone cannot solve the allocation of public ecosystem services, economic efficiency criteria based on hypothetical markets are not sufficient.

The need to combine “top-down” with “bottom-up” approaches is not new and has been suggested for developed countries. This paper provides a better understanding of the broader context and directions of institutional change and thereby can serve as orientation for the organization of public ecosystem economies in different political and development contexts.

Keywords: use of biodiversity, governance, institutional change, Ethiopia, coffee forest

Sua, Sonia; Davila, Daniel; Mateus, Ruben; **Morales-R., Mónica**

Biological records georeferencing and digital localities gazetteer

Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Colombia
Poster session 10, Monitoring biodiversity changes

The natural resources knowledge of a region requires a profound study of its biota in relation with its biological diversity, abundance and ecological distribution. This knowledge is generated through basic research that contributes to the nation’s knowledge of its real biological richness and this will help in the sign and ratification of national and international treaties for the conservation and sustainable use of biodiversity.

The increased necessity to have georeferenced biological information, led us to the construction of a georeferencing standard , a methodology for the geographic location of localities of biological registries accessible to different users. The documentation of data of the locality where the registries are collected is indispensable because besides providing origin data, will later allow the display and the analysis of this information in space and time, generating capacity and knowledge for decision making.

To generate the standard and protocols it was necessary to organize the localities of biological records following a geopolitical distribution, but starting from the punctual description of where the sample is taken to the highest general hierarchical level, also a data quality control methodology was incorporated. At the same time a GIS Application in MS Visual Basic 6.0, ESRI map objects (GIS software) and data base in Access were developed to allow the automatic and manual localization of the localities of biological records.

A standard and an implemented methodology for the georeferencing localities of historical and new biological records. A data base “Digital localities gazetteer” where localities for biological records are stored, and can be accessible by users from an application.

That devolvement of this standard, protocols and digital localities gazetteer harness the analysis of the distribution patterns of species and helps detect holes in biological information.

Keywords: biological georeferencing, digital localities gazetteer, biological records, biodiversity, Colombia

Suazo-Ortuño, Ileri; Alvarado-Díaz, Javier; Martínez-Ramos, Miguel
Effect of habitat disturbance on the herpetological community in a Mexican tropical dry forest

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Poster session 5, Drivers of biodiversity changes

Highly diverse tropical dry forest in México has been severely disturbed mainly by agricultural activities and livestock grazing. There is a paucity of information regarding consequences of such disturbance on herpetofaunal assemblages in tropical dry forests. Here, we assess effects of human disturbance on frog and reptile assemblages at Chamela-Cuixmala Biosphere Reserve, México. Our aim was to detect species which are negatively, positively, and neutrally affected by disturbance to provide guidelines for conservation, and to explore present and possible future community changes in the herpetofaunal assemblages in human disturbed landscapes. Six watersheds (ca. 100 ha each) were used as sampling units: three with pristine forest and three disturbed by agricultural and grazing activities. Ten 100 x10 m, non-permanent transects were randomly established at each watershed, along the main stream, every two to three months during two years. At each date, diurnal and nocturnal intensive surveys of amphibians and reptiles were carried at each transect (in total, eleven surveys). In total, 779 records were obtained including 18 amphibian, 18 lizard, 23 snake, and 3 turtle species. Species diversity significantly differed between conserved and disturbed forest in all herpetological assemblages. Snake, turtle, and mainly amphibian assemblages showed significantly lower diversity in disturbed forest. Lizard diversity showed the opposite pattern. Population size of 22 species (35.5% of total) was significantly different between forest conditions. While several amphibian species were absent or rare in disturbed forest, several lizard species were significantly more abundant in the disturbed conditions. Our results indicate that habitat modification by human activities produce an impoverishment of anuran assemblages and a strong change in the structure and composition of herpetofaunal assemblages as a whole.

Keywords: tropical dry forest, human disturbance, frog and reptile assemblages, species diversity, community structure

Szarzynski, Joerg; Linsenmair, Eduard; Schmidt, Michael; Vlek, Paul
Integrated assessment of biodiversity, climate and land cover changes:
Scientific networking and capacity building in West Africa

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Poster session 10, Monitoring biodiversity changes

Within such ecologically sensitive regions as West Africa, where rain fed and irrigated agriculture are primary sources of food security and income, concerns about climate variability must be taken seriously. Moreover, extensive anthropogenic land cover changes occurred during the past decades. Analysing the complex environmental impacts on biodiversity, natural resources and socio-economy remain among major challenges facing scientific researchers.

Funded by the Federal German Ministry for Science and Education (BMBF) an integrative monitoring concept was designed within the framework of the BIOTA West and GLOWA Volta projects in strong cooperation with local institutions. The observation network combines relevant features of instrumental ground measurements and remote sensing techniques in order to monitor vegetation,

hydrologic and bio-geophysical dynamics and to detect changes of land cover. A suite of products visualizing and quantifying biophysical features in time and space will be employed to up-scale the in situ derived information. Within biodiversity observatories in Burkina Faso, Benin and Côte d'Ivoire standardized methods are used to monitor the dynamics of flora and fauna with special regard to structural features and spatial patterns.

The multiscale data collection from the observation sites is increasingly developed into a web-based GIS database. Additionally, sites are proven for comprehensive ground-truth surveys, essential for the assessment of accuracy of classified satellite imagery. At the same time they are used by local students and research scientist and thus serve to build capacity in the region.

Based on data and model outputs the final goal of BIOTA and GLOWA is to provide local stakeholders and decision makers with reliable information to promote the sustainable use and conservation of biodiversity and other natural resources in West Africa.

Keywords: BIOTA, biodiversity monitoring, natural resource management, climate variability, capacity building

Tanaka, Hiroshi; Inoue, Takenari; Makino, Shun'ichi; Okouchi, Isamu
Changes in species richness and assemblages of plants and insects due to conversion of deciduous forests to conifer plantation: a comparative study in Japan

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Poster session 5, Drivers of biodiversity change

Conifer plantations (CPs), many of which have been converted from natural or secondary broad-leaved forests (BFs), occupy nearly a half of Japanese forested area. Since CPs are mostly monospecific, it is expected that assemblages of forest organisms are much simpler there than in BFs. Our goal is to clarify how and to what extent CPs differ from BFs in terms of biodiversity, focusing on two major components of forest organisms, plants and insects.

We monitored plants and insects in 7 post-harvest secondary deciduous BFs, ranging from 1 to 70-year old in age after clear-cutting, and in 9 evergreen CPs (*Cryptomeria japonica* plantation), 3 to 75-year old. Three old-growth deciduous BFs (> 100-year old) were also monitored. Studied forests were located in a cool-temperate zone, central Japan.

BFs and CPs had different stand structures along a chronosequence after clear-cutting, and plant species compositions of the two types of forest were distinctly different. Species richness of insects was generally poorer in CPs than in BFs of similar ages as expected. In some taxa, butterflies, for example, species assemblage in CP was similar to that in BF in young stands, but differences between them became greater as the forests grew older. Species richness decreased in both type of forests, as the forests grew older. In case of moths, species assemblages in CPs were also different from those in BFs. Species richness of moth did not change much in BF along with forest age, but it sharply decreased with canopy closure and recovered after that in CP.

Conversion of deciduous broad-leaved forests into evergreen conifer plantations causes degradation of local biodiversity of many taxa. In order to ameliorate the problem, it is important to preserve deciduous forests and consideration of spatial

arrangement of both types of forests at landscape level is necessary.

Keywords: temperate forest, stand age, monoculture, clear-cutting, biodiversity

Tellez, Oswaldo; Davila, Patricia; Lira, Rafael

The Diversitas project strategy: a study case in the Tehuacán-Cuicatlán biosphere reserve, México

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Poster session 10, Monitoring biodiversity changes

This biosphere reserve is the southernmost arid place in North America, with 3000 species of vascular plants, one third are endemic. However, a detailed knowledge about its biological diversity is still fragmentary, and natural events and man activities are degrading this outstanding diversity. All this reason makes this reserve an ideal place to carry a particular long-term conservation project using the strategy of the DIVERSITAS project.

The project is based on GIS methodology, designing a stratified sampling method throughout the climatic and topographic variation to high spatial resolution (90 m cells), to build-up a functional floristic database. In addition, for each sampling point we generate a bioclimatic profile related to 19 biological meaningful climatic parameters, topographic variables, and in some cases soil information. Some localities are considered permanent sampling sites on the basis of their biological and environmental features, for monitoring the long-term changes on composition, physiognomy and phenology of plant associations, due to natural events (climate change) and those provoked by man activities.

The preliminary results show important changes due to changes in land use practices and climate change effects. Analysis on models of potential distribution testing several climate change scenarios show shifts in distribution patterns of individual species as well as, in groups of species. The floristic inventory and models of potential distribution have allowed defining richness and rareness hotspots. We have identified a regional biological corridor, where several already documented biological outstanding processes and events occur.

Now we have a clearer view about environmental, biological and human events occurring into the reserve, with which will be able to propose strategies about conservation and sustainable management in this region of Mexico.

Keywords: Mexico, Tehuacan-Cuicatlan, monitoring, climate change, conservation

Tillier, Simon

EDIT: a network to move Taxonomy from cottage industry to integrated processes

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Poster session 12, Systematics, phylogeny and evolution

Taxonomy provides the basis for qualifying biodiversity. For biodiversity science the challenge for taxonomy is not only quantitative, because a majority of living species are still unknown. It is also operational because most taxonomic knowledge and capacities which have been built up since two centuries are still not easily accessible to their users. The European Distributed Institute of Taxonomy, EDIT, is the collective answer of 27 leading European, North American and Russian Taxonomic institutions

to the call of the European Commission for a network in "Taxonomy for Biodiversity and Ecosystem Research".

The objective of EDIT, which is lead by the French National Museum of Natural History, is to improve both production and delivery of taxonomy through (1) coordination of research policies of its member institutions, which employ altogether ca 1500 researchers and trainees in taxonomy; (2) progression toward integration of their scientific expertise and infrastructures to improve both production and access to taxonomic knowledge and information, within the network as well as in the framework of international structures and initiatives; and (3) induce cultural change allowing improvement in the production of taxonomic results by building an internet platform for elaboration and publication of collaborative revisions on the web, and making this platform freely available to all taxonomists worldwide.

EDIT will start in 2006 and will be supported by the EC for five years, during which the network will build up durable integration to improve both production and delivery of taxonomic knowledge for biodiversity sciences. The EDIT network holds the most comprehensive body of literature, specimens, research and expertise in the world. EDIT wants to integrate this body not only inside the initial network, but also over the whole taxonomic community and beyond to create a virtual center of excellence widely opened to users and potentially expandable worldwide.

Keywords: taxonomy, taxonomic institutions, Europe, information, bioinformatics

Tobar, Diego

Diversity, richness, and abundance of the community of diurnal butterflies in a fragmented landscape in northern of Costa Rica

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Poster session 12, Systematics, phylogeny and evolution

Diversity, richness, abundance and composition of the community of diurnal butterflies were studied in a fragmented landscape in northern of Costa Rica. A total of 3946 diurnal butterflies were observed, belonging to 103 species in four contrasting habitat: forest fragments, riparian forest, pasturelands and live fences. The study found that the highest values of diversity, richness and abundance of species were encountered in the fragments of forest and the lowest values in the live fences. *Hermeuptychia hermes*, *Cissia libye*, *Mechanitis polymnia*, *Heliconius sara*, *Phoebis philea* and *Dryas iulia* were the most abundant and common in the region. The analysis of species accumulation curves corroborated that in the forest habitat (forest fragments and riparian forest had higher values of species richness due to the fact that they were associated to the large numbers of rare species encountered. In conclusion, in this agricultural landscape, fragmented forest and riparian forest are key habitat to maintain and to conserve most of the diversity of butterflies.

Keywords: species abundance, fragmentation, Papilionoidea, species accumulation curve, diversity

Torres Hernández, Leonel; Ameca y Juárez, Eric Isaí

Demographic issues and conservation of *Zamia furfuracea* in coastal dunes of Veracruz.

Instituto de Investigaciones Biológicas, México

Poster session 4, Biodiversity conservation

Zamia furfuracea is endemic to the coast of central and southern Veracruz. Its most favourable habitat is the coastal scrub, a strip of about 50 m wide and about 150 Km long. The highest density occurs in this coastal margin, where about 50 % of the population is made up of seedlings, juvenile plants and young adults while the other 50% is made up of mature and senile plants. The coast has been slightly deforested by local inhabitants. Nevertheless there are severe erosive processes that gradually diminish the space suitable for *Z. furfuracea*. Its other habitat is the inland sand dune system, where *Z. furfuracea* density is lower but the dwelling area much larger (almost 60 Km²). The dunes' natural vegetation has been severely transformed and fragmented by cattle raising.

Goal of Study

- determine sexual and age composition of the population.
- determine critical areas for conservation in the wild.

Materials

- GIS
- Maps
- quantitative and qualitative measures
- Statistical approach

Some of the demographic and distributional aspects of this threatened and legally protected plant were studied under a wide scale scheme throughout its entire natural distribution area during a two-year period. We distinguished two distinct populations, one extending along the sand (beach) or rock (cliff) littoral and the other inhabiting the inland sand dunes.. The whole *Z. furfuracea* population in the wild is estimated at 43 to 250 thousand individuals. 84 male plants and 83 female were found in the plots, making a practically 1:1 ratio, but 78.45% of the plants showed no sexual structures during the research. Age structure was based on the number of leaf crowns per plant. Young adults (one crown, 4-10 years old) were the most frequent in the plots: 35%, followed by the oldest adults (>1 crown, >10 years): 38%. Immature plants (seedlings and juveniles) were the least: 18.5%, and 8.5% of the plants were inaccessible for crown counting.

Keywords: *Zamia furfuracea*, coastal dunes, endangered, endemic, demographic issues

Trejo, Irma; Aguilar, Alejandra; Hernandez-Lozano, Josefina; Ramos, Fernando **Social participation in the conservation of Santa María Yavesía forests, in** **Sierra de Juárez, Oaxaca, México**

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Poster session 11, Policy for sustainable development

Oaxaca state, located on the South of Mexico, owns about 30 000 km² of temperate forests. Particularly, Sierra de Juárez has been considered as a diversity center. Most of these forests are under a social property regimen, known as community property.

To analyze the magnitude and the conservation state of the forests located at Santa María Yavesía to know the role that social participation plays in conservation.

For the study to take place field samples of vegetation will be taken in areas of 1000 m²; structural basic parameters and regeneration were registered on these areas.

Through the use of satellite images Landsat ETM, the vegetal cover of the studied area is analyzed and then compared within a regional context.

Yavesía lies at the river head of the basin of the Papaloapan river, it covers a 9000 area in an altitudinal gradient that goes from 1900 to 3200 m a.s.l, where *Abies hickelii* forests are established, pine and oak forests where 9 species of *Pinus* have been registered, among them we can find *P. hartewi*, *P. ayacahuite*, *P. leiophylla*, *P. oaxacana*, and 13 *Quercus* such as *Q. acutifolia*, *Q. ocoteafolia*, *Q. glabrescens*, *Q. laurina*, *Q. obtusatha*, *Q. laeta*, *Q. castanea*, *Q. affinis*. These species show their environmental preferences, contributing to β diversity. Structural parameters show a good state of the conservation of forests. About 90% of the area that belongs to the community is covered by forests; therefore, this also represents an important carbon reservoir.

By own decision Yavesía's inhabitants have declared their forests as a conservation area based on a culture of water that has prevailed through generations. It needs to be recognized the role that this social participation plays on resources conservation when the cover and state of this forests is compared with other zones near it where forest management prevails.

Keywords: temperate forest, biodiversity, social participation, communal reserve, conservation

Trujillo Argueta, Sonia; del Castillo, Rafael; Newton, Adrian

Patterns of genetic diversity and mating systems

Instituto Politecnico Nacional, México

Poster session 10, Monitoring biodiversity changes

Few studies of the genetic structure have been undertaken in tropical pines, despite the fact that they represent half of the world's species. *Pinus chiapensis* is a pine found in secondary forest in montane humid and subtropical areas of southern Mexico and Guatemala. Most of the populations show little regeneration and are discontinuous due to geographic and anthropogenic factors. This species is listed as a vulnerable (IUCN). We examined the patterns and levels of genetic variation of *P. chiapensis* using isozymes, in 13 populations throughout its entire range, and estimated the mating system in populations contrasting in size. The proportion of polymorphic loci, the mean number of alleles per locus and an allelic richness estimator that corrects for differences in sample size, were generally low and variable among populations. A multilocus autocorrelation analyses revealed a significant and positive correlation between Nei's genetic distance between pairs of populations at both very near and very distant populations, and a significant negative correlation at intermediate geographic distances. This pattern coincides with a previous mitochondrial DNA RFLP analysis performed on this species. Heterozygosity was low compared to random mating expectations. F-statistics shows that most of the genetic variance takes place within populations. We attributed this result to high pollen dispersal and the high level of outcrossing detected. Most of the populations have a mixed mating system, and one population analyzed was fully outcrossed. The southernmost populations of Chiapas and Guatemala were the most genetically diverse. Recent postglacial events could explain the distribution of genetic variation observed and the low levels of genetic diversity. The rates of deforestation in *P. chiapensis* areas in Chiapas are among the highest in the world. Therefore, implementation of ex-situ and in situ conservation practices are urgently needed in

this area.

Keywords: Pinus chiapensis, genetic variation, conservation, mating system, mating system

Truong quang, Tam

Biodiversity in the limestone area of Ha Tien and Kien Luong, Kien Giang province

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Poster session 12, Systematics, phylogeny and evolution

The limestone of Hatien and Kien Luong (Kieng Giang province) is unique for the landscape of the Mekong delta area .It supports a high diversity both for the flora and the fauna .Due to their isolation karsts support extremely high endemism .Preliminary survey has showed the presence of 272 species of vascular plants and 155 species of vertebrate . Especially the presence of 6 mammals especially with the presence of the silvered langur first time recorded in the area and 5 reptiles and 6 birds recorded in the Red Book of Vietnam. For landsnail 55% of them are endemic for hill to hill.However the karst of Kien giang is now suffering by human impacts especially lime exploitation. It needs an appropriate consideration and management for the conservation.

Keywords: Unique landscape, Mekong region, high endemism, severe threats, conflicts conservation, exploitation

Keywords: Unique landscape , karst, endemic, cement industry, threats

Umaña, Ana Maria; Alvarez, Mauricio; Echeverry, Maria Angela; Escobar, Federfico; Gast, Fernando; Mendoza, Humberto

Status and diversity patterns of plants, birds and insects in the East side of the East Cordillera, North Andes Colombia.

Instituto Alexander von Humboldt, Colombia

Poster session 12, Systematics, phylogeny and evolution

The east flank of the East Cordillera (voCO) is one of the most pristine and less known areas in the Andes of Colombia. The objectives were to acknowledge the actual forest area of voCo and to determine the Alfa and Beta diversity patterns along an altitudinal and latitudinal gradients. A 1:500.00 scale map was developed, covering a range of 950 km latitudinal between 07023'N and 00028'N. Along this in seven locations, altitudinal transects were performed in the range from 1,000 to 2,000 m. At every location, standardized inventories were performed each 500 altitudinal meters, including plants (woody plants, Rubiaceae and Melastomataceae), insects (butterflies, ants and muck-collector scarab) and birds. A total of 44% of the area (around 3.2 million hectares) correspond to forest, while the rest is already transformed, representing the 74% of the whole East Cordillera and 43% of all the Andes in Colombia. The sampling effort for Melastomataceae, Rubiaceae, birds and muck-collector scarab in each sample point was around 80-100% efficient according to the non-parametric estimator analyzed in each group. While for woody plants, butterflies and ants the representation fell below the 60% of the expected. For the entire biological group the richness increase from north to south (border with Venezuela to Ecuador), and decreased from lower to higher altitudes. The species

exchange (Complementary index) between the two most extreme latitudinal sample points was around 75 and 95% for all the biological groups. For Rubiaceae and Melastomataceae the exchange was higher than 80% in a 250 km linear distance. In the altitudinal sites the exchange of species for Rubiaceae, Melastomataceae and muck-collector scarab was between 52 and 95%.

Keywords: Colombia, Andes, Biodiversity, Inventories, plants, birds, insects

Ungar, Paula; Caro, Isabella

Science and Decision-Making: A Reflection from the Colombian Amazon

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Poster session 4, Biodiversity conservation

A multitude of visions of nature and practical problems meet in the Amacayacu National Natural Park, in the Southern Colombian Amazon. Park staff has to face the challenges posed by overlapped Indigenous territories, the highest tourist affluence in the region and significant pressure from timber loggers. This is also the Protected Area (PA) where the highest number of academic research projects has been carried out in the last five years. According to some strands of current environmental thought, the quality of knowledge for decision-making under complexity may critically depend upon broad participation by a variety of stakeholders. The aim of this study was the identification of common ground between scientists and PA staff for the joint production of knowledge, through an investigation into their perception of their own role in conservation and their mutual expectations.

We carried out semi-structured interviews with PA staff and academic researchers who have worked in the PA in the last 5 years, as well as an analysis of the PA's management plan and its formulation process.

While Park staff sees scientific knowledge as an indispensable tool for conservation, the actual use for decision making of the knowledge that has been produced in the PA is difficult to identify for them. Scientists, on the other hand, feel their work is not appropriately valued by park staff and consider the usefulness of the knowledge they generate to be the responsibility of policy-makers.

A gap between knowledge and action exists in the studied area. Interaction failures can be partly explained as a result of institutional features. There are also signs that indicate the way research is made should change if it is to be used for conservation decisions. In the present circumstances, it is difficult to foresee a legitimate voice for scientists in an eventual participative process.

Keywords: protected Areas, decision making, participation, conservation science, public ecology

Villaseñor, José L.; Maeda, Pedro; Ortiz, Enrique

The potential use of three plant families as indicators of plant biodiversity in Mexico

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Poster session 10, Monitoring biodiversity changes

Three speciose plant families (Asteraceae, Fabaceae s. l., and Poaceae) are evaluated for appropriateness as indicators of overall regional patterns of Mexican

plant diversity. These families fulfill criteria advocated by several authors for usefulness as indicators, e.g., adequate taxonomic knowledge, and widespread occurrence both geographically and ecologically.

Mexico was divided in $1^\circ \times 1^\circ$ cells. Known richness was determined from a database restricted to 14,688 species or subspecific taxa recorded in ca. 200 floristic inventories. Subsequent analysis was restricted to 168 cells with at least one of these floristic inventories. Each species was categorized by "preferred" vegetation type (temperate forest, dry tropical forest, humid tropical forest, xerophytic scrubland). Total species richness and proportion in each of the vegetation types were determined by cell. Pearson correlation coefficients between total richness and the richness of each family per cell were calculated, assuming the more significant the correlation, the better the family as an indicator.

Species per cell ranged from 24 to 2898 (average 812.9). Correlations by cell showed a significant ($p < 0.01$) relation between each pair of values (total taxa vs family; species in each vegetation type vs family). The lowest correlation value: Poaceae in dry tropical forests ($r = 0.77$); highest: Fabaceae s. l. in humid tropical forests ($r = 0.92$).

Results indicate that these three families can be used as potential indicators for total plant biodiversity patterns in Mexico; best estimates are obtained with Asteraceae and Fabaceae s. l.

Keywords: biodiversity, indicators, Mexico, plants species richness, surrogates

Vitale, Sergio

Objective subdivision in study sub-areas of Central Mediterranean Sea by the analysis of bottom trawl discard species

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Poster session 10, Monitoring biodiversity changes

Demersal discard fauna of bottom trawl in Central Mediterranean Sea is various and consist of more than 221 species occupying different sub-strata at depth between 0 and 800 m. The goal of study was to find an objective criterion to determine the subdivision in study sub-area of Central Mediterranean Sea.

During the Spring 2001 statistical significant samples of discard were collected by 14 commercial fleet, two in each of seven study sub-area individuated by fisherman as major commercial fishing grounds. The study sampling scheme was based on the "stratified sampling in space" method. The most common diversity indices were used: Richness (S), Shannon-Wiener (H), Simpson (d) and Pielou. The K-dominance curves, for each sub area, were plotted as cumulative percentage, while the numerical abundances for each sub area were analyzed using multi-dimensional scaling (MDS) based on the Bray-Curtis similarity.

The lowest value of S was 47 (area 2) and the highest value was 82 (area 1), while the H values ranged between 1,47 (area 2) and 3,75 (area 1). The K-dominance curves showed the differences in discard community among each sub-areas. The dominant species in the sub-areas 1, 3, 4, 5, 6, 7 ranged between 13,6% and 35,5% while in the sub-area 2 was 68,7%. The plot analysis of MDS showed four different groups, the sub-areas 2, 4, 5, 6 were the biggest group, while the other 3 groups were 1, 3, 7.

These data came from one season and could have a bias related to different aspects: (1) different exploitation among the seven areas during the last decades; (2)

the size and depth of the sub areas are different and reflect only the fishermen habits. Although our results suggest that four different spatial assembled species can be considered, new and more accurate observations are necessary to define a more appropriate catch effort survey protocol for further investigations.

Keywords: bottom trawl, discard, multi-dimensional scaling, diversity indices, Central Mediterranean Sea

Waithaka, John

Conserving biodiversity as an asset of sustainable economic development within human-dominated landscapes – A case study from Southern Kenya, East Africa

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Poster session 4, Biodiversity conservation

The Amboseli, Maasai Mara and Magadi ecosystems in Southern Kenya are linked geographically, ecologically, culturally and politically. The area is inhabited by the nomadic Maasai who move across the entire region in search of pasture for their livestock. Ecologically, the area is probably one of the most biologically diverse in Africa: Maasai Mara, has the world's most diverse large mammal populations and is home to the largest terrestrial migratory herds on earth. The Magadi ecosystem to the south ranks among the highest biodiversity hotspots in the region with a gradient of habitats from the rift valley alkaline lakes, semi desert savanna, and unique forests. South of Magadi is the Amboseli ecosystem which is historically known for having the highest density of elephants in Africa. This entire region typifies the uniqueness of the African savanna in today's world and is probably the most important savanna conservation zone in Eastern Africa. It has Pleistocene remnants of big migratory herds, high species and ecosystem diversity and dramatic settings. It is the largest earner of tourism revenue in the country, contributing more than half of the total tourism revenue.

However, the ecosystems are currently threatened by a burgeoning human population, land subdivision, changing land tenure systems, crop farming, poaching, habitat fragmentation, blockage of wildlife migratory corridors, environmental degradation and poverty. Wildlife conservation is in conflict with agriculture while tourism has taken away the best grazing areas for livestock.

Several efforts to initiate innovative ecosystem partnership programs that incorporate the ecological needs of wildlife and the aspirations of the local people have been established. The paper examines how these programs have affected both the ecological diversity of these areas and the socio-economic well being of the people.

Keywords: ecosystem partnerships, biodiversity conservation and land use conflicts, socio-economic, wildlife migrations, environmental degradation

Wasno, Robert; Barnes, Tomma; Bert, Theresa

A community-based approach to biodiversity conservation through fish stock enhancement

University of Florida Sea Grant Program--Lee County, USA

Poster session 4, Biodiversity conservation

In Florida, USA, aquaculture-based stock enhancement has been adopted by federal

and state fisheries managers as a tool for conserving harvested aquatic species and, thereby, the community diversity and structure they inhabit.

The red drum (*Sciaenops ocellatus*), an abundant, high-level carnivore that influences local biodiversity, is extensively harvested. A unique, small-scale, community-based stock enhancement program for the conservation of this species--REDstart—is a decentralized partnership involving resource managers; extension personnel; public and private research, conservation, and fishing groups; and local leaders and citizens. Technical guidance for this aquaculture-based project is provided by a Science Advisory Board representing several organizations with complementary strengths, including aquaculture methods; water management; fish biology, conservation, and management; funding sources; and legal aspects. The most unique element in REDstart is the extensive utilization of citizen volunteers to participate in the project's execution.

A total of 35 volunteers have contributed 4,250 documented hours for fund-raising (\$42,118) and for facility construction (two 98,410-l aquaculture tanks with life-support systems), maintenance (routine schedules for checking the entire system), and operation (e.g., all types of monitoring protocols).

Progress and success to date suggest that this type of partnership may significantly augment public stock-enhancement-based biodiversity conservation programs. The criteria for declaring the project a "success" are diverse. They range from finding adequate funding through maintaining continued volunteer work force interest to successfully rearing and releasing red drum. These, and other, components must be sustained for ultimate success—the documented supplementation of the local red drum population.

Keywords: Florida, stock enhancement, biodiversity, conservation, fish

Wehn, Sølvi

Predicting influence of different agri-environmental policies on suitable habitats of the endemic mountain herb *Primula scandinavica* – a scenario modelling approach

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Poster session 3, Agriculture and biodiversity

Grazing by large wild ungulates has shaped Norwegian mountain landscapes. Livestock grazing replaced the wild herbivore impact after human arrival more than 500 years ago, but during the last century decreased livestock and changed human use has facilitated forest succession on previous non-forested habitats. The endemic herb *Primula scandinavica* is restricted to open habitats, and is thus declining along with increasing forest invasions. *P. scandinavica* is an indicator of high plant biodiversity since it grows on base-rich and easily disintegrated bedrock where species rich plant communities establish. This study aims to predict the effect of different agri-environmental policies on suitable habitats of *P. scandinavica*, and thus on mountain plant diversity.

Classification tree analyses were used to investigate influences on the distribution and to estimate suitable habitats of *P. scandinavica*. When changing values of land-use variables in such a way different agri-environmental policies could influence them, future suitable habitats were predicted.

Grazed habitats with little or no fertilizers and patches of exposed mineral soil along paths and gravel roads are the most suitable habitats for *P. scandinavica*. The

livestock composition is also critical. Domestic browsers that consume woody species are impeding reforestation. Livestock that prefer grass more than herbs, reduce competition and increase survival of *P. scandinavica*. Modelling future scenarios show that suitable habitats will decrease to critical levels if the present agri-environmental policies remain unchanged.

Disturbance caused by livestock and human use is a key factor for establishment of *P. scandinavica*. Agri-environmental policies that encourage continued land-use with heterogeneous livestock composition is thus necessary for maintaining high plant diversity in Norwegian mountains.

Keywords: habitat modelling, agri-environmental policies, endemic plant, biodiversity, livestock grazing

Wenyang, Wang

The effect of land management on plant community composition, species diversity, productivity of alpine Kobersia steppe meadow

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Poster session 5, Drivers of biodiversity changes

Large-scale grassland rehabilitation has been carried out on the severely degraded lands of the Tibetan Plateau. Our goals were to examine the relative influence of various rehabilitation practices on species composition, diversity and productivity in communities in early secondary succession, and to evaluate the degree to which severely degraded land altered vegetation properties relative to non-disturbed native meadow.

All sedge and grass species of native meadow had disappeared under the severely degraded land. The aboveground and root biomass in the severely degraded treatment was only 38 % and 15% of those in the control, respectively. So, the original ecosystem has been dramatically altered by land degradation on alpine steppe meadow.

Seeding measures may promote aboveground biomass, particularly grass biomass, and ground cover. However except grasses seeded, other grass and sedge species did not present in seeding treatments in the sixth year of seeding. Establishment of grasses in the natural recovery treatment progressed slowly compared to that of the seeding treatments. A lot of annual forbs have invaded and established during natural recovery. There was higher for diversity in the natural recovery treatment than seeding treatments.

The aboveground biomass, in seeding and natural recovery treatments, was respectively 114% and 55% of biomass in native meadow. No significant differences in root biomass occurred among the rehabilitation treatments. Root biomass in rehabilitation treatments is 23%-31% of that in the control.

Loss of dominant species of original ecosystem had significant influence on function of ecosystem in alpine meadow. Residual effects of grassland degradation on structure and function of rehabilitation grasslands are evident from comparisons with the native meadow. But, compared with unrestored state, grassland rehabilitation may be more appropriate options.

Keywords: alpine Kobersia steppe meadow, land degradation, rehabilitation, species diversity, productivity

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A comparison of diversity of soft-bottom Polychaeta in Arctic and Antarctic.

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Poster session 12, Systematics, phylogeny and evolution

The general interest in large scale patterns in marine diversity has driven the questions of relative diversity of the Arctic and Antarctic. It is generally assumed that the Antarctic fauna is more diverse due to longer history and higher heterogeneity of the Antarctic sea bottom; however the comparable quantitative data sets on the benthic fauna from polar areas are sparse. We aimed to compare the diversity of soft-bottom Polychaeta of three Arctic fiords (west Spitsbergen) and one Antarctic site (Admiralty Bay). In all sites the fauna was sampled with use of van Veen grabs, sieved on 0.5 mm sieve. The polychaetes were dominating component of macrobenthic communities in all sites. The numbers of species per sample was highest in Arctic fiord Kongsfjord (19.9 ± 10.71). The number of species in Antarctic site (15.7 ± 10.5) was not significantly different from two of Arctic sites (13.7 ± 9.7 , 13.5 ± 7.9). The Hurlbert rarefaction index for 50 individuals in Antarctic samples (9.48 ± 4.96) differed also only from one of the Arctic sites (3.29 ± 1.79) while was not different from the other two studied Arctic fiords (8.03 ± 3.37 , 8.34 ± 4.33). The shape of species accumulation curves for Arctic and Antarctic sites were similar and intersected. The total number of species was similar for the three intensively sampled fiords: 101 in Admiralty Bay, 97 and 91 in two Arctic fiords. The Chao2 estimates of the species richness gave the similar values for different sites as well. Within the sediment fabric there is no heterogeneity of the scale described for the epibenthos. We suggest that the homogeneity of soft-bottom habitat results in the lack of differences in species richness between Arctic and Antarctic sites, irrespective of the differences in the age of fauna of two polar regions.

Keywords: marine diversity, Polychaeta, soft bottom, Arctic, Antarctic

Yayoi, Takeuchi; Tohru, Nakashizuka

Genetic diversity, genetic structure and inbreeding depression of four dipterocarp species in a tropical rain forest

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Poster session 12, Systematics, phylogeny and evolution

Seed and pollen dispersal plays an important role in tree demography, especially at young stages, by influencing inbreeding depression and genetic structure. In spite of the several advantages of seed/pollen dispersal, there are large variations in seed/pollen dispersal distance even among related species is essential.

Furthermore, for sustainable forestry, detailed knowledge of the amount of genetic diversity, genetic structure and level of inbreeding depression in primary forest.

The Dipterocarpaceae, a dominant family of trees in the tropics of Southeast Asia, have developed a wind-dispersal system that varies greatly among genera and species. For instance, both *Dipterocarpus* and *Shorea* species with and without winged seeds co-occur in the same forest.

This study was conducted in a tropical rain forest at Lambir Hills National Park, Sarawak, Malaysia. We chose four dipterocarp species, *Shorea beccariana*, *S. laxa*, *Dipterocarpus globosus* and *D. tempehes* to contrast the differences in abilities in pollen and seed dispersal. The seeds of *D. globosus* and *S. beccariana* have wings

permitting wind-dispersal, while the other two are wingless, suggesting limited seed dispersal distance. As for pollen dispersal, both *D. globosus* and *D. tempehes* are pollinated by giant honeybees, which fly long distances, whereas two *Shorea* are pollinated by small beetles which are expected to disperse pollen over shorter distances.

Genetic diversity and genetic structure of adult trees in a roughly 60 ha plot and saplings in 0.8-4 ha plot in the center of the 60 ha plot was examined using microsatellite markers. The levels of inbreeding depression of the four dipterocarp species were estimated by genetic data and demography/growth data over 3 years. We discuss the relationship between seed/pollen dispersal distance, and inbreeding depression and genetic structure.

Keywords: genetic structure, Dipterocarpaceae, Lambir Hills National Park, inbreeding depression, genetic diversity

Zander, Kerstin

Determining the right priorities for conserving farm animal genetic resources – the case of the Borana cattle in East Africa

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Poster session 3, Agriculture and biodiversity

Borana cattle are the main source of livestock-keepers' income in the Ethiopian and Kenyan lowlands and represent an immense cultural aspect. Nowadays the existence of this breed is threatened due to intensifying crossbreeding and eventually dwindling records of pure Borana animals. Conservation of the Borana genetic resources is important for future use and enhancement of biodiversity, but financial aid for conservation initiatives is scarce. This study addresses two crucial topics in conservation theory: the question of which Borana animals should be conserved and hence deserve priority in funding, and the question of who should conserve them. Three hundreds and seventy livestock-keepers on the Borana plateau were selected for conducting semi-structured questionnaires and choice experiments. The models were then analysed using NLOGIT 3.0.

The first question is driven by the fact that currently three subtypes are kept on the Borana plateau. Appropriate allocation of funds among them must take place according to their economic and genetic values. Economic values are determined by applying discrete choice analyses estimating livestock-keepers' willingness to pay and relative preferences for different attributes of Borana. Genetic values depend on extinction probability and marginal genetic diversity. Applying a random parameter logit model sheds light on heterogeneity in livestock-keepers' preferences and willingness to pay for different cattle attributes and hence enables us to target groups of livestock-keepers that could be best participate in conservation initiatives.

Results suggest that Borana cattle are particularly important because of their adaptability and performance attributes and that their value vary significantly among livestock-keepers with different production systems and in different areas.

Keywords: animal genetic resources, east african borana cattle, choice experiment, random parameter, conservation

Zuria, Iriana

Species richness and abundance of birds in field margins of El Bajio, Mexico: local and landscape-scale effects

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Poster session 10, Monitoring biodiversity changes

In many agricultural landscapes of central Mexico, vegetated field margins are important elements that represent a valuable habitat for many bird species. Despite their abundance and importance for the conservation of birds and other wildlife, these structures have not been studied in much detail. Therefore, I analyzed data concerning resident and Nearctic-Neotropical migratory birds found in field margins of El Bajio. Resident and migratory birds were surveyed during the spring and winter 1999 and 2000 in 40 field margins located in this agricultural landscape. The structural and botanical characteristics of the field margins, as well as the characteristics of the surrounding landscape, were related to species richness and abundance of birds. I found a significant relationship between bird species in field margins and the environmental variables measured at both the local and the landscape scale. At the local scale, the size of the field margin, its vertical complexity, and the abundance of trees and tree species had a positive influence on bird species richness and abundance. Native trees, especially mesquites, were particularly important for many bird species. The most important landscape-scale variable was the density of hedgerows around field margins. Bird species richness and abundance of birds was positively influenced by the length of the hedgerows measured within 100-m, 200-m, and 500-m radius circles centered on each field margin. Also important was the distance to the closest area covered by native scrub forest. In general, field margins closer to the scrub forest had more bird species and more individuals. Different bird species responded differently to local and landscape-scale variables, therefore management of field margins for the benefit of birds must be directed toward specific goals. My observations would have management implications for the conservation of birds in the region.

Keywords: hedgerows, spatial scale, agro-biodiversity, Nearctic-Neotropical migratory birds, bird conservation