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Comparison of Coral Bleaching Hotspot Mapping in Southeast Asia (Thailand, Cambodia and Vietnam) based on Sea Surface Temperature Modelling by National Oceanic and Atmospheric Administration Coral Reef Watch before and during Covid-19 Pandemic

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Abstract

Due to Covid-19 pandemic in the year 2020, international travel and hence the tourism was down by more than 95% globally. Influx of tourism has been regarded as one of the reasons for coral bleaching. In this study, attempt has been made to compare the coral bleaching hotspot (CBH) mapping in the year 2019 (pre-pandemic) and 2020 (during pandemic) based on sea surface temperature (SST) modelled data by National Oceanic and Atmospheric Administration Coral Reef Watch (NOAA-CRF). The NOAA 7-day maximum SST database is compared for the Coral Triangle region – with a focus on gulf of Thailand and south China sea covering Thailand, Cambodia and Vietnam in southeast Asia – for the first day of the month in Jan, Mar, June, Sep, and Nov both in 2019 and 2020. The CBH is taken as the measure of the difference between observed SST and monthly maximum mean temperature, and was measured in the range 0 to 5 °C. No visual (< 0 °C) CBH was observed in the region for the month January and March pre-pandemic and during pandemic. In the month of May, CBH (1 - 2 °C) was dominant in the gulf of Thailand covering mostly Thailand and Cambodia, and was higher during pre-pandemic period. During July, CBH (1 - 2 °C) was dominant in the south China sea covering Vietnam, and was also higher during pre-pandemic period. Surprisingly, CBH was higher during pandemic along the Vietnam in south China sea, the reason of which is still a matter of further investigation. In general, with an exception in September 2020, CBH was higher during pre-pandemic period. A detailed study covering daily, and monthly average SST would provide better understanding of impact of covid-19 pandemic on CBH.

Keywords: *Coral bleaching hotspot, covid-19 pandemic, sea surface temperature, National Oceanic and Atmospheric Administration, Coral Reef Watch, gulf of Thailand, south China sea*

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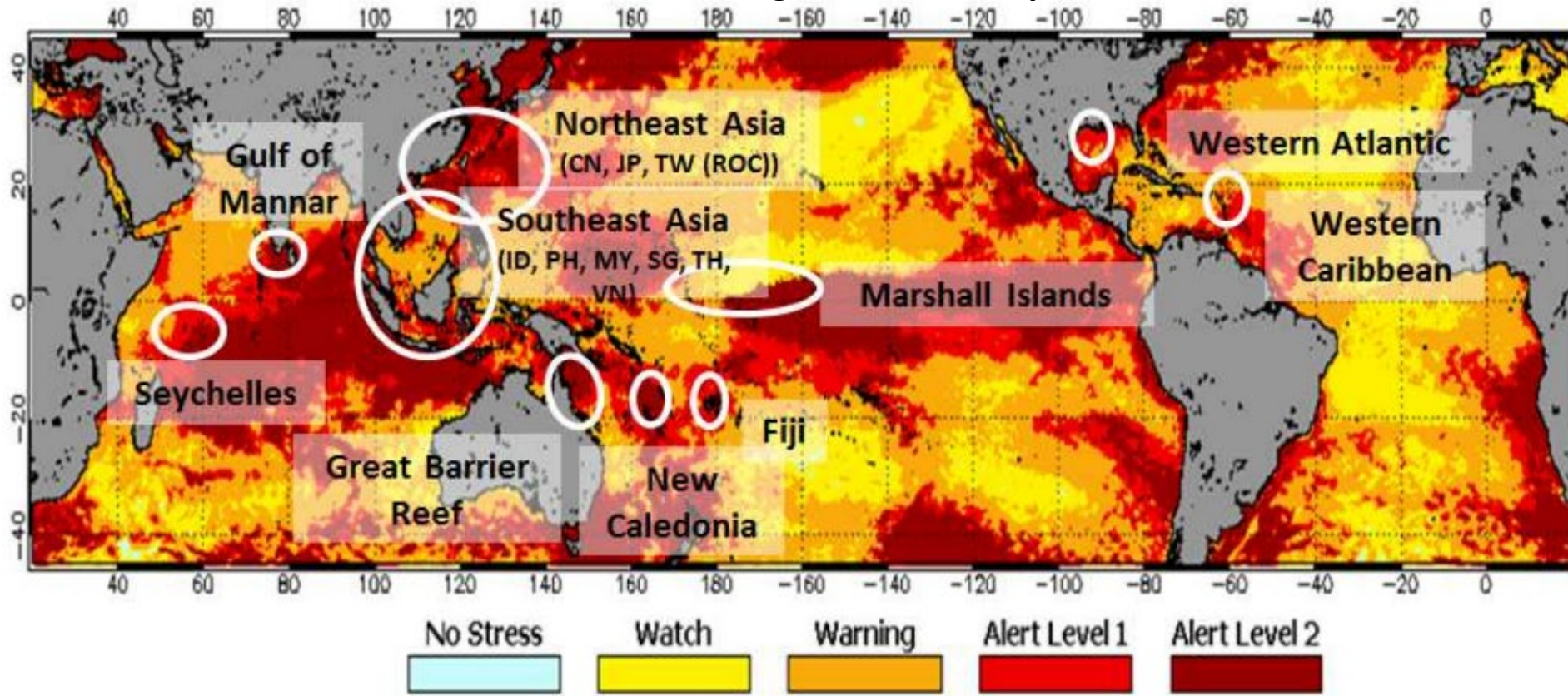


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Global coral bleaching 2014 -2017

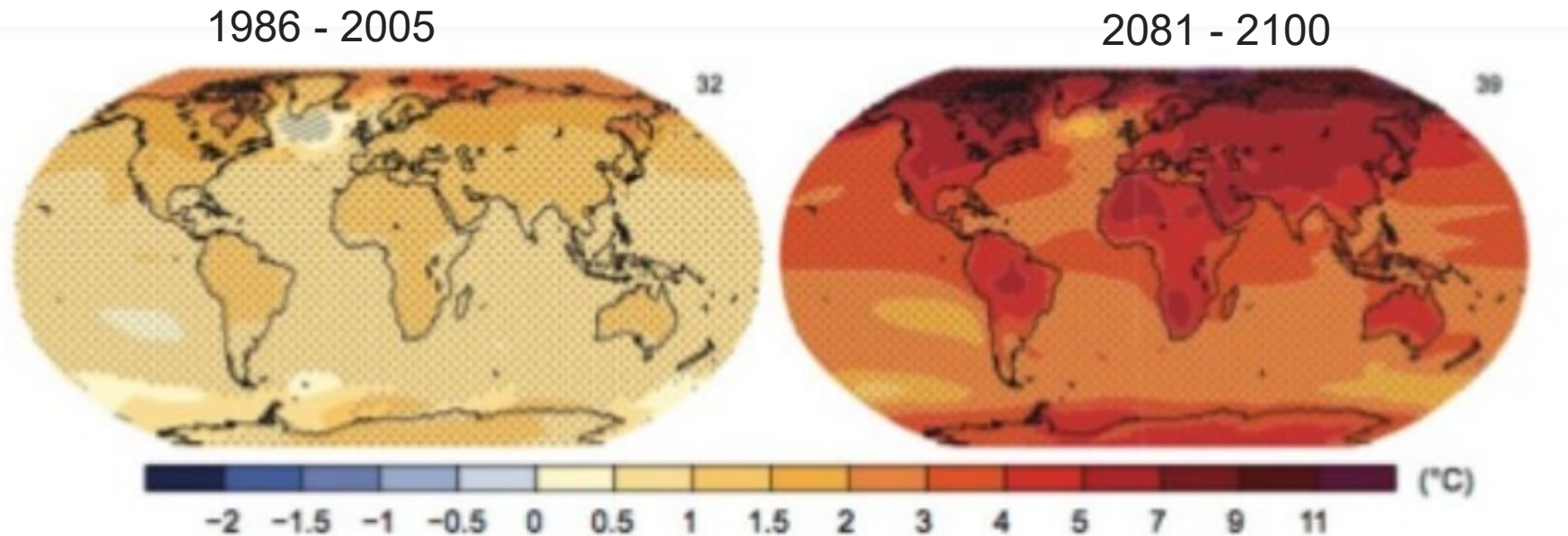
NOAA Coral Reef Watch Maximum Bleaching Alert Area map for 2016



Cambodia	Total site surveyed	Severely bleached	Moderately bleached	Minimally bleached	Year
	9	0	0	6	2015
	17	4	8	4	2016

Source:
MOE, Japan 2018

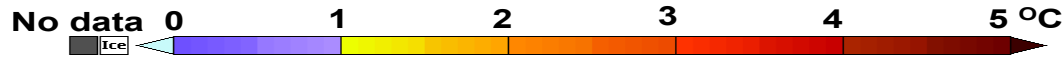
Global thermal stress



Change in Surface temperature - IPCC 2013 – Summary for policymakers
Mahabir, 2016

By 2050

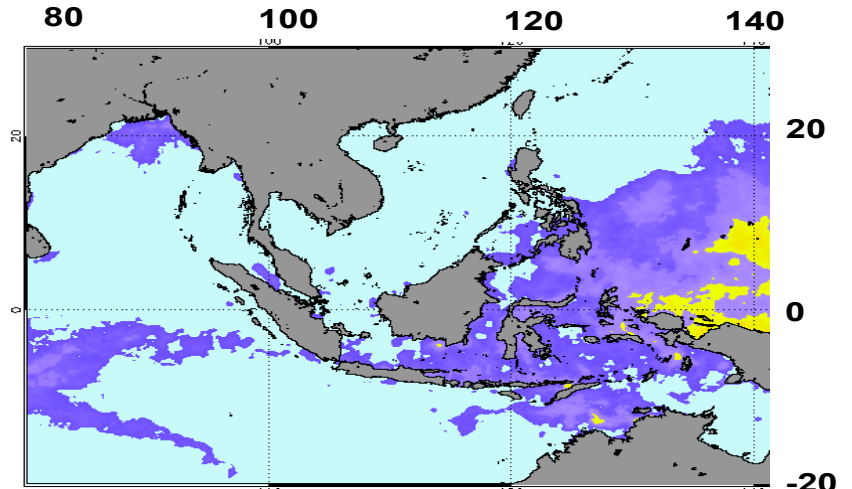
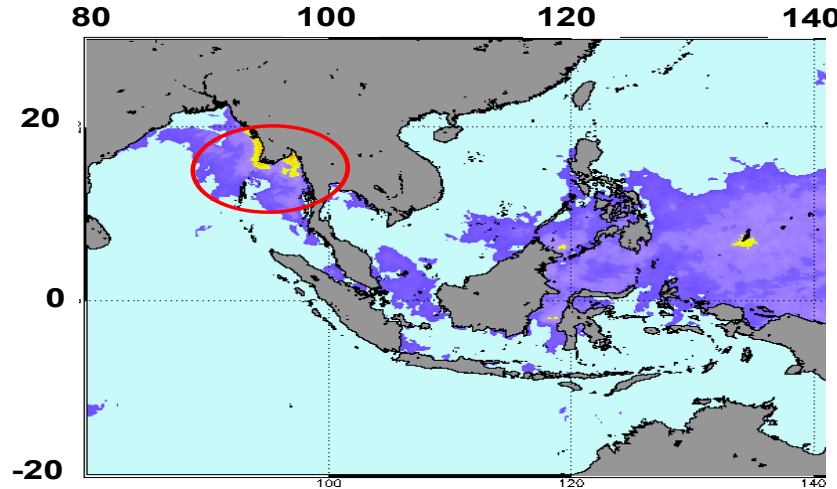
- **high thermal stress - 95% of coral reefs will experience and potential bleaching**
- **~ 15% of coral reefs will be able to in areas where aragonite levels are adequate for coral growth.**



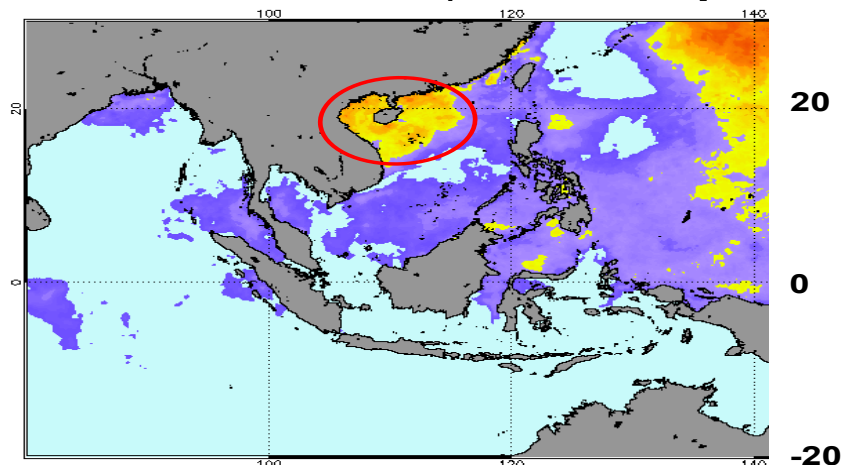
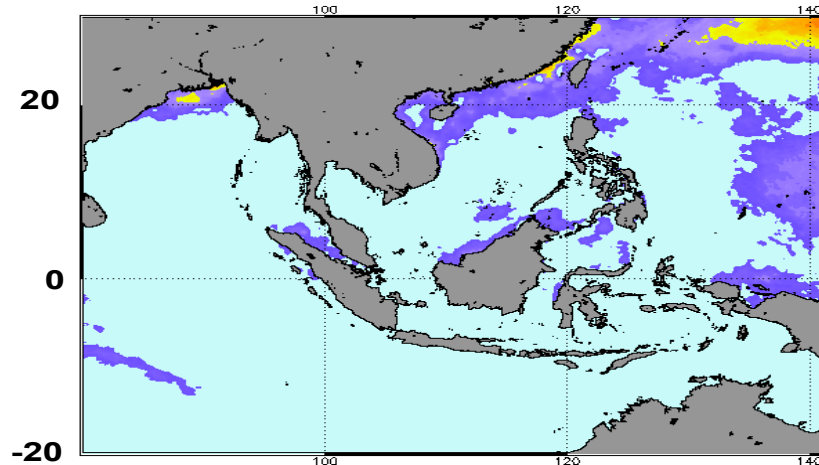
2019 (pre-pandemic)

2020 (during covid-19 pandemic)

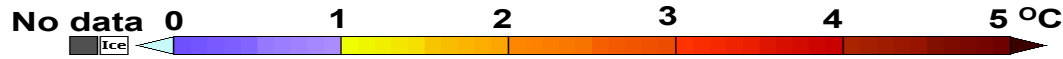
1 November



1 September

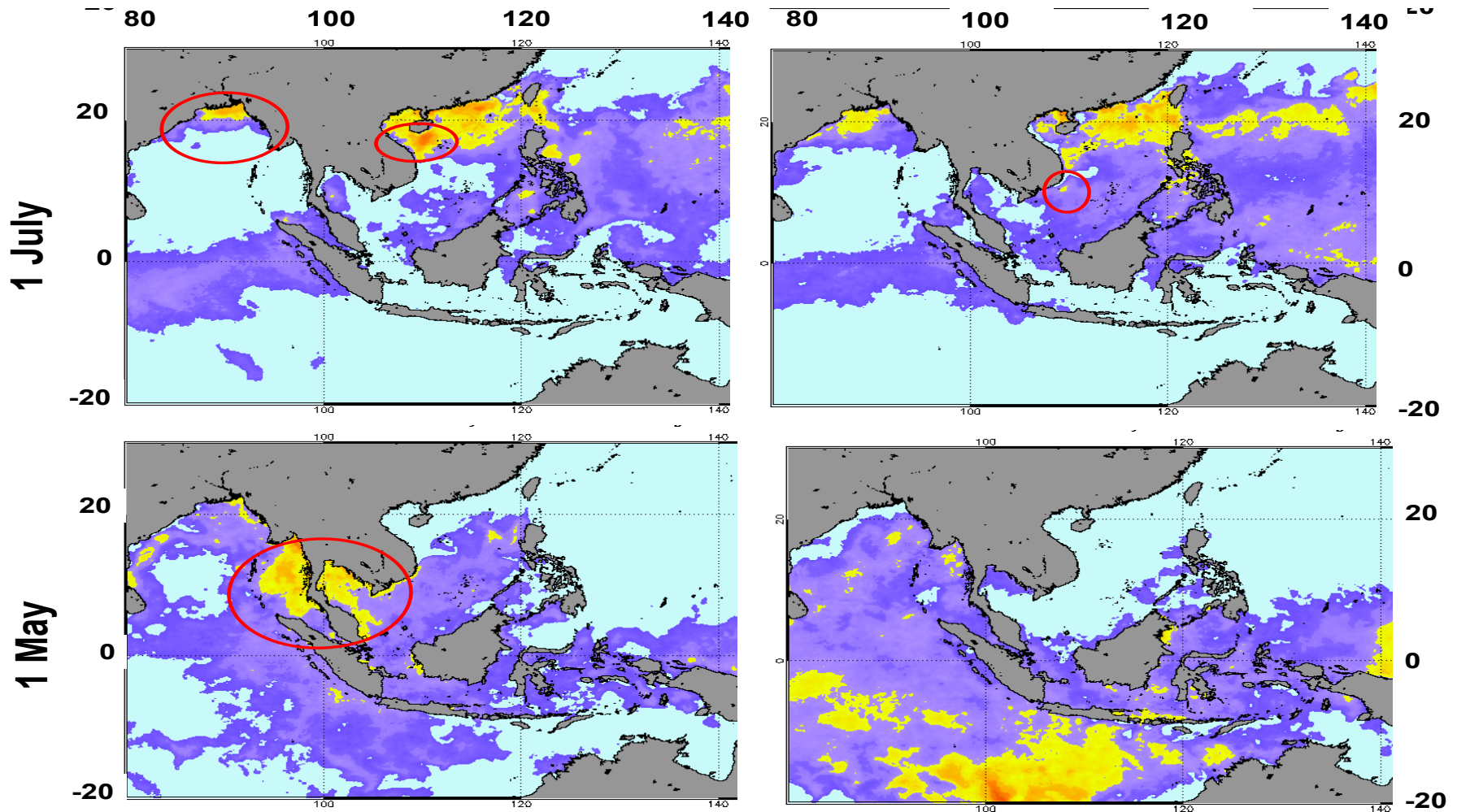


Coral bleaching hotspot mapping in the year 2019 (pre-pandemic) and 2020 (during pandemic) based on sea surface temperature modelled data by National Oceanic and Atmospheric Administration Coral Reef Watch.

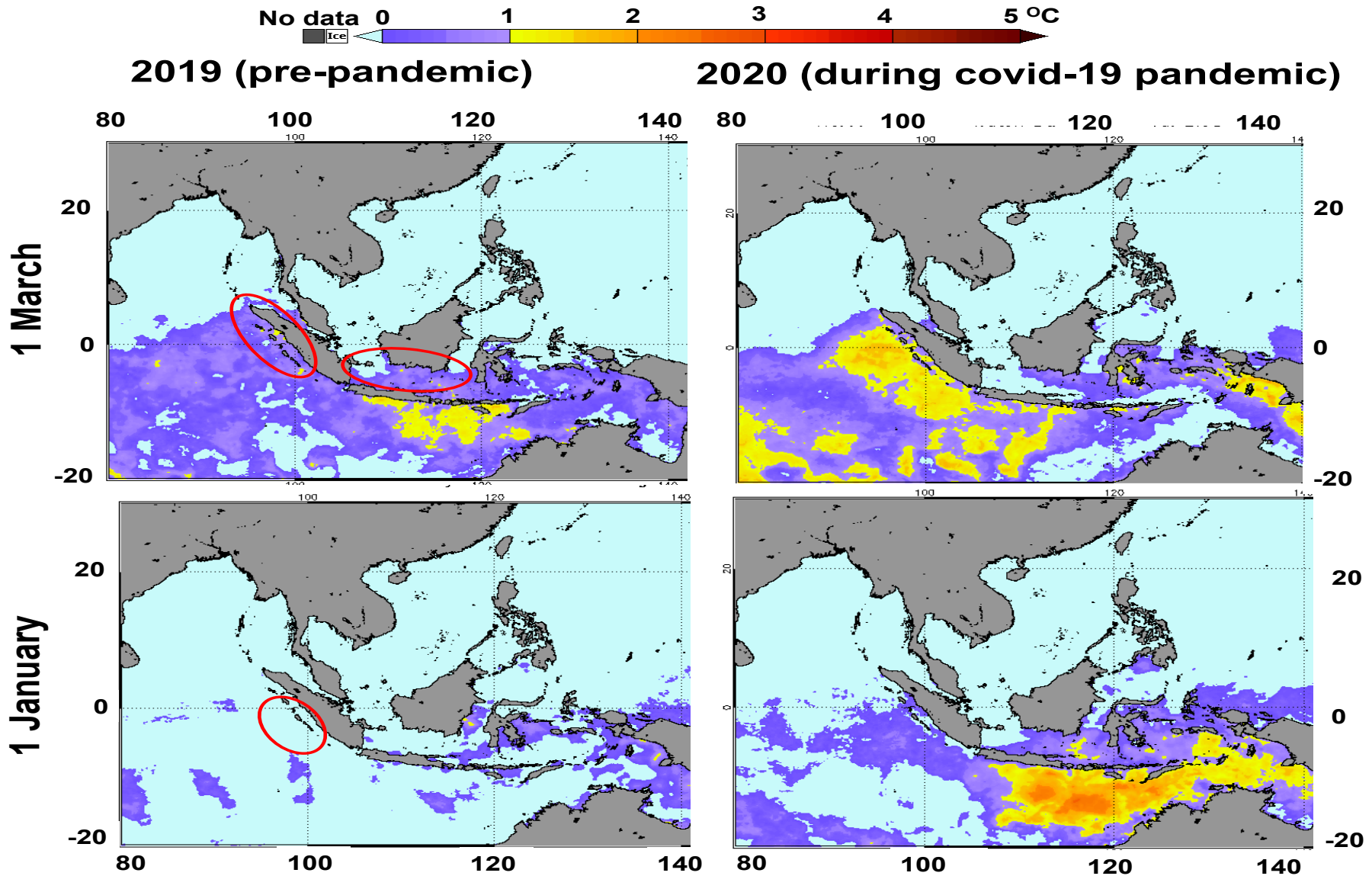


2019 (pre-pandemic)

2020 (during covid-19 pandemic)



Coral bleaching hotspot mapping in the year 2019 (pre-pandemic) and 2020 (during pandemic) based on sea surface temperature modelled data by National Oceanic and Atmospheric Administration Coral Reef Watch.



Coral bleaching hotspot mapping in the year 2019 (pre-pandemic) and 2020 (during pandemic) based on sea surface temperature modelled data by National Oceanic and Atmospheric Administration Coral Reef Watch.

Conclusions

Climate change

- Acidification – CO₂
- Sea level/temperature



Global

Pollution

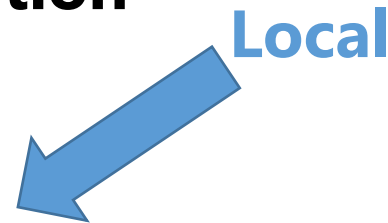
- Chemicals – UV filter
- Nutrient runoff/sedimentation



Global to local

Others

- Disease, invasive species
- Local stress - **tourism, coastal development,**
anchor, dynamite, (over)**fishing**, storms



Local

Acknowledgements

APN - Asia-Pacific Network for Global Change Research for funding this project - "Collaborative Research Platform to Manage Risk and Enhance Resilience of Coral Reef in Southeast Asia, CRRP2019-08MY-Khanal"

Photo: <http://wallpaperswide.com/>

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