

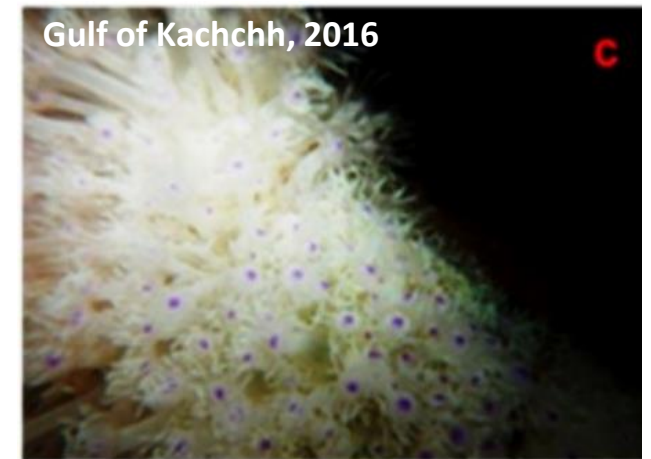
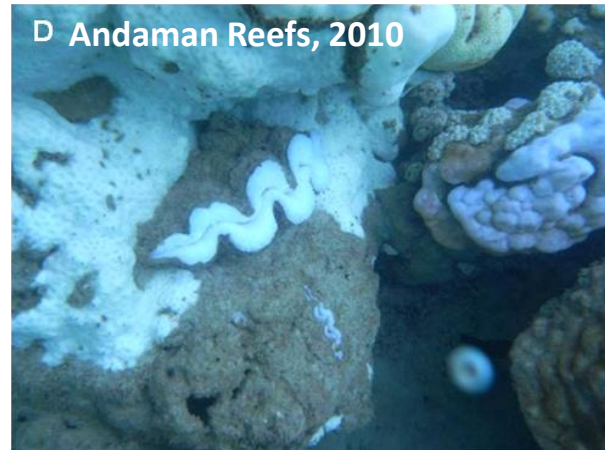
# Space based Coral Bleaching Monitoring over Indian Reef Region: Need for High-Resolution SST Data

Nandini Ray Chaudhury<sup>1</sup>, Shweta Mishra<sup>1</sup>, Divya Mhalaskar<sup>2</sup>, Kirtan Chauhan<sup>1</sup>,  
Chandra Mohan Bhatt<sup>2</sup> and Idrees Babu<sup>3</sup>



- 1: Space Applications Centre, ISRO, Ahmedabad,
- 2: Indian Institute of Remote Sensing, ISRO, Dehradun,
- 3: Department of Science & Technology, Lakshadweep, Kavaratti

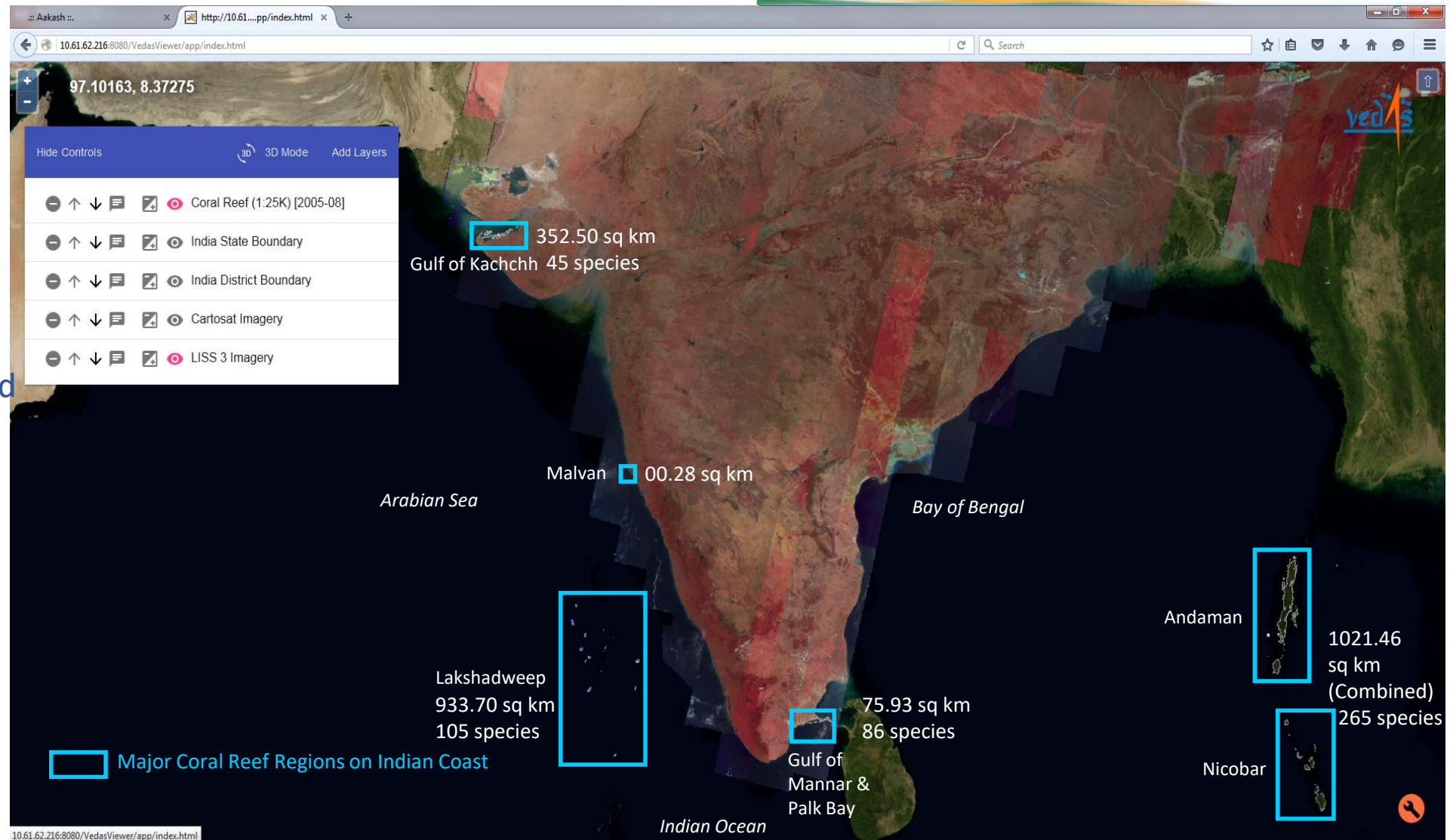
- ❖ MCB Events: Frequency on the Rise!
- ❖ Coral Bleaching Monitoring System developed and hosted on VEDAS geoportal of SAC
- ❖ Detection of Unusual Warming of Lakshadweep Seas in Summer 2020
- ❖ Ground confirmation of Coral Bleaching in Lakshadweep Islands in summer 2020
- ❖ Quick Comparison of Summer 2020 SST conditions with 2016 and 2023
- ❖ Improvisations Required in modeling Bleaching Forewarning





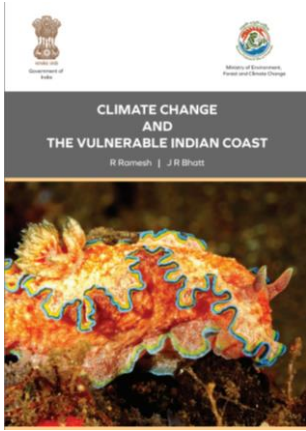
# Coral Reef Regions of India

- Naturally fragmented Habitat Regions in the Oceans;
- Continental Shelf Reefs in Gulf settings; Island reefs in Open Ocean settings;
- Regional settings demand independent approaches to study, model and forecast coral bleaching

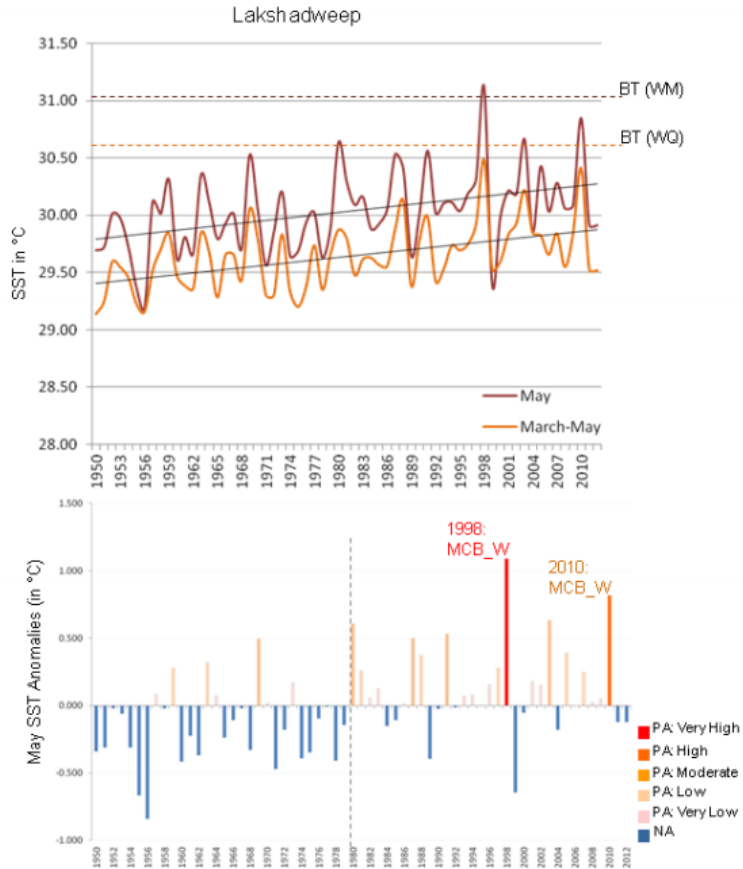


Source: <https://vedas.sac.gov.in/vstatic/eo/index.html>

Source: Area Figures: SAC Atlas, 2010  
Source: Reef building coral species: ZSI, 2012



Nandini Ray Chaudhury, Mohit Arora and Ashwin Gujrati



**Figure 1:** WM and WQ SST Trends for Lakshadweep. The lower panel shows WM SST Anomalies observed during 1950-2012. (PA = Positive Anomaly; NA = Negative Anomaly)

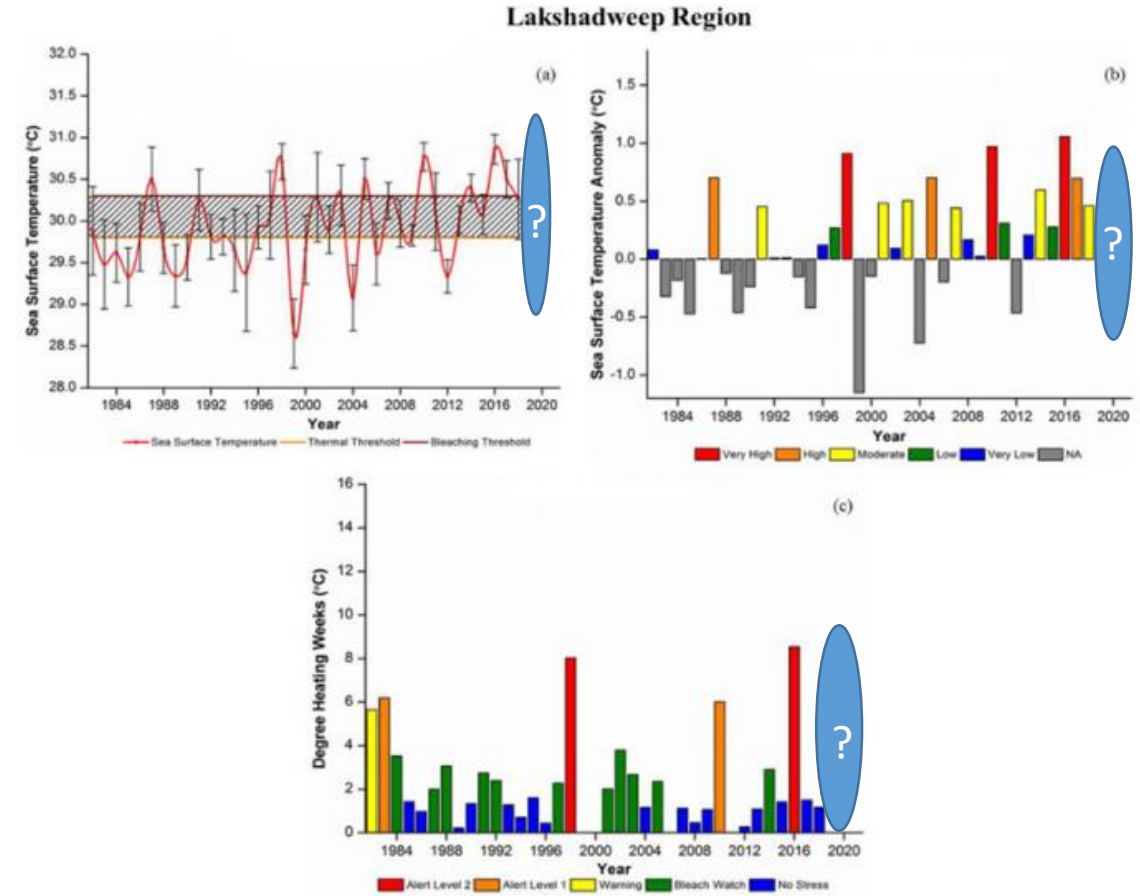


Geocarto International

Assessment of coral reef thermal stress over India based on remotely sensed sea surface temperature

Mohit Arora, Ashwin Gujrati, Nandini Ray Chaudhury, Prakash Chauhan & Ramesh Chandra Patel

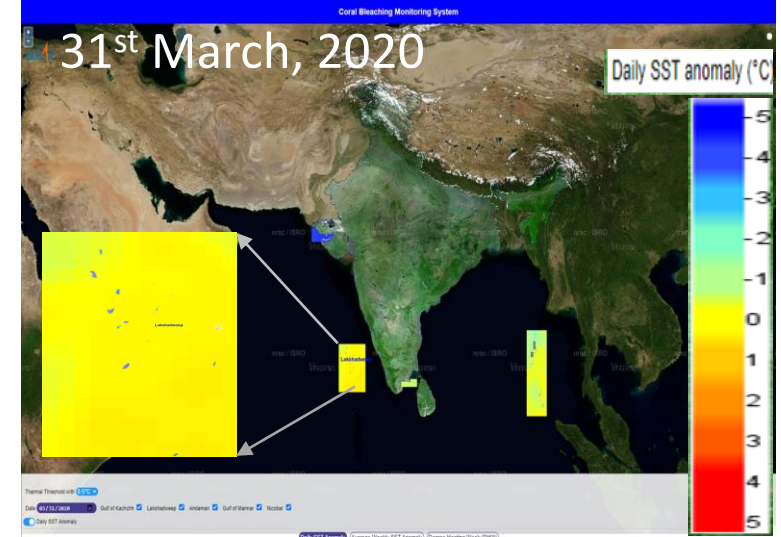
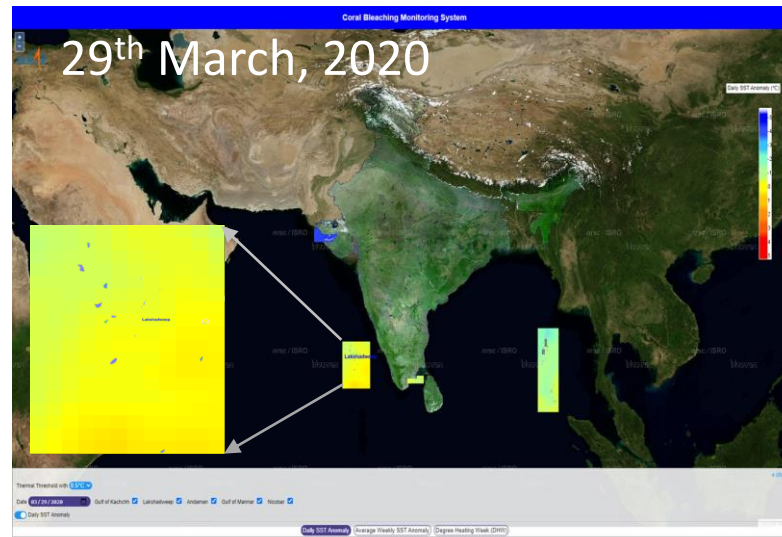
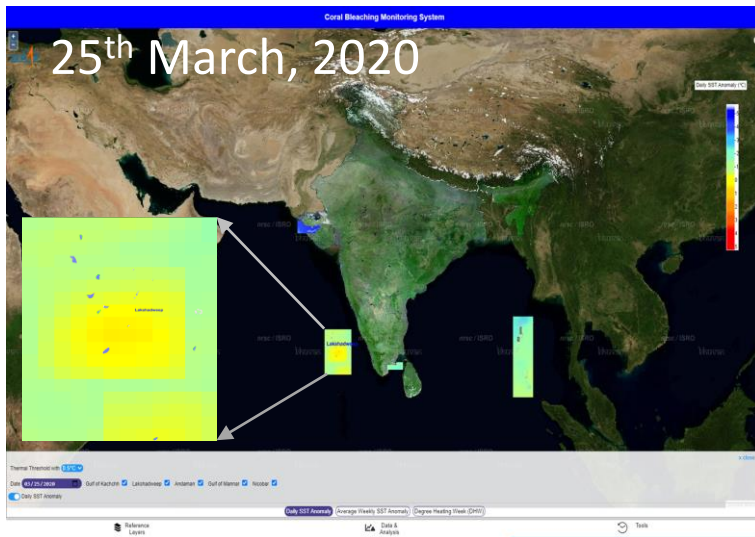
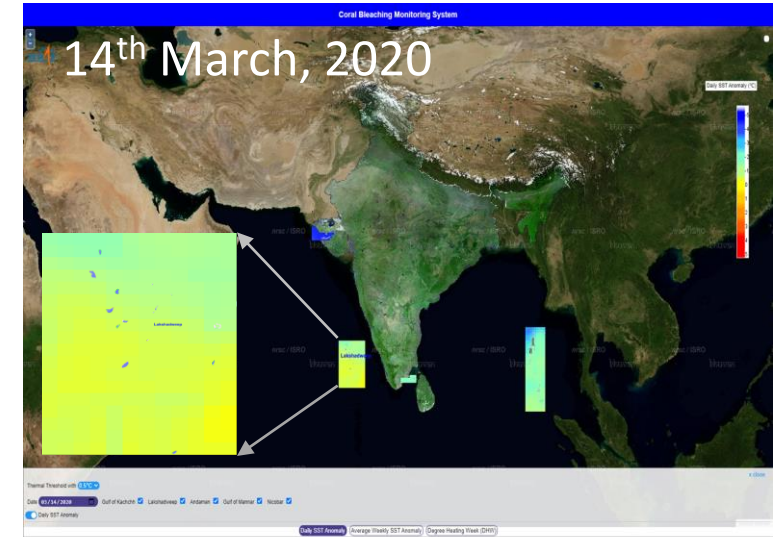
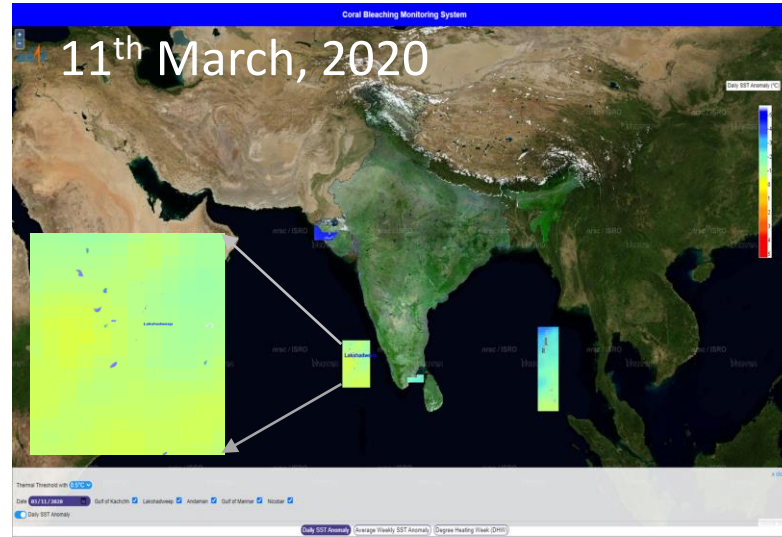
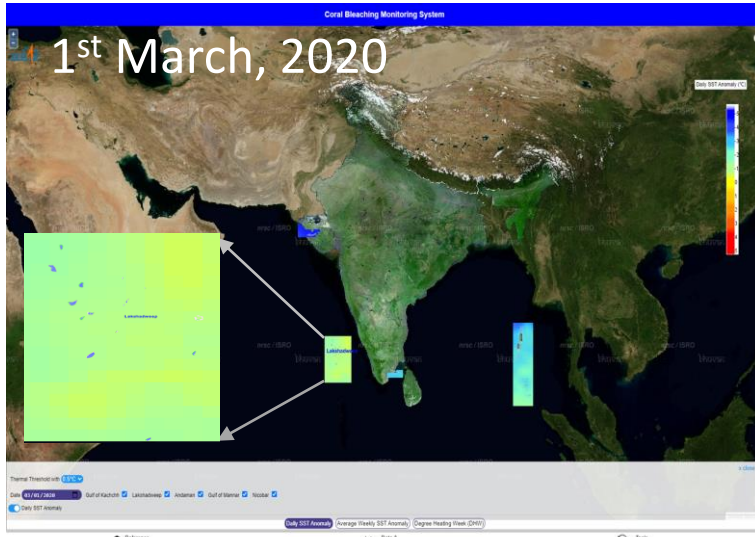
ISSN: 1010-6049 (Print) 1752-0762 (Online) Journal homepage: <https://www.tandfonline.com/loi/tgei20>



**Figure 5.** (a) Time series data of warmest month Sea Surface Temperature with standard deviation based on 0.25° resolution NOAA OISST data over Lakshadweep region, lower line (in orange colour) showing the Thermal Threshold and above line (in wine colour) showing the Bleaching Threshold; (b) Sea Surface Temperature (SST) Anomaly during the last 37 years represented in colours ranging from blue to red based on their intensity; (c) Degree Heating Weeks (°C) during 1982 to 2018 (represented in colours ranging from blue to red based on their intensity and duration of thermal stress).

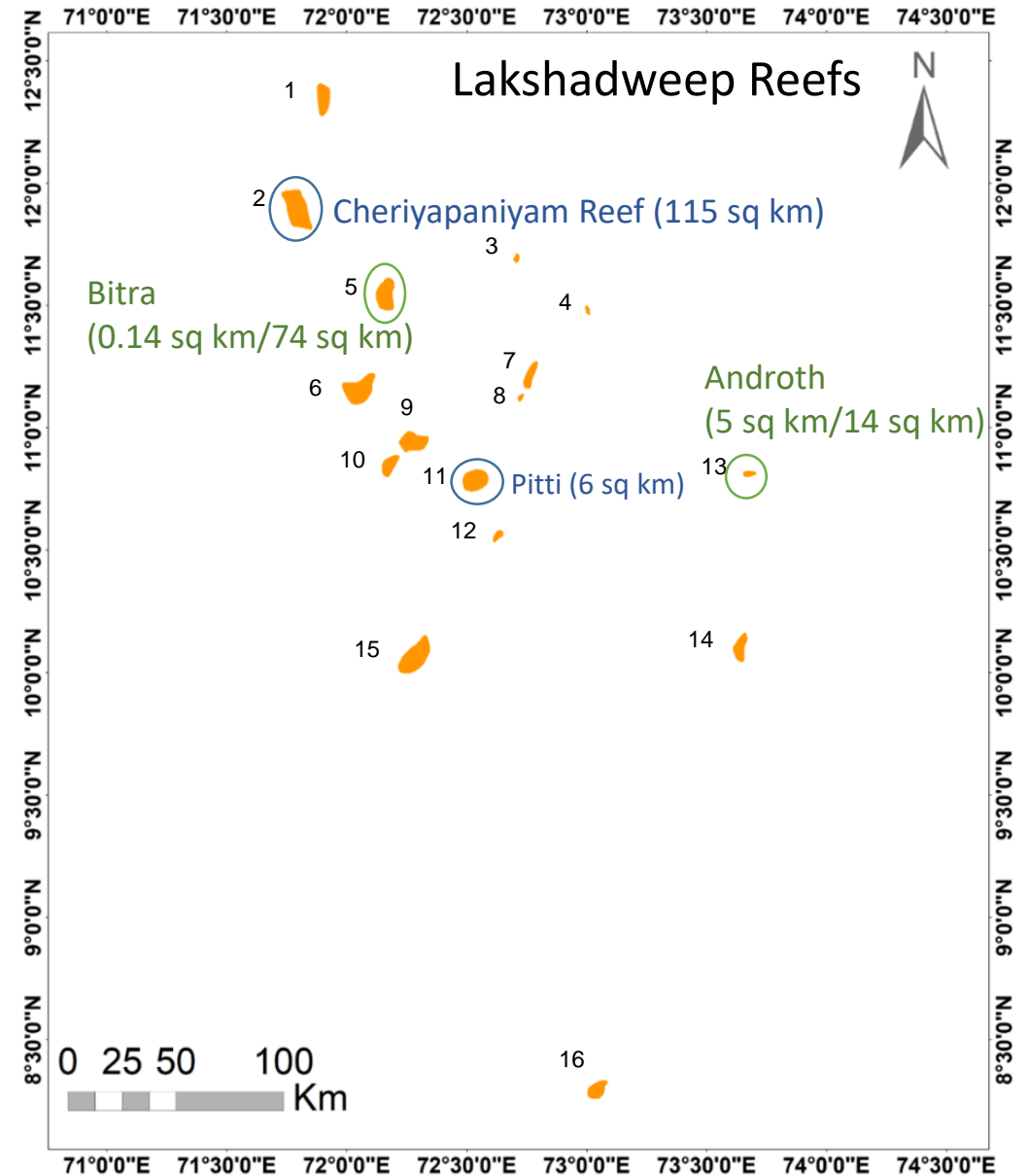
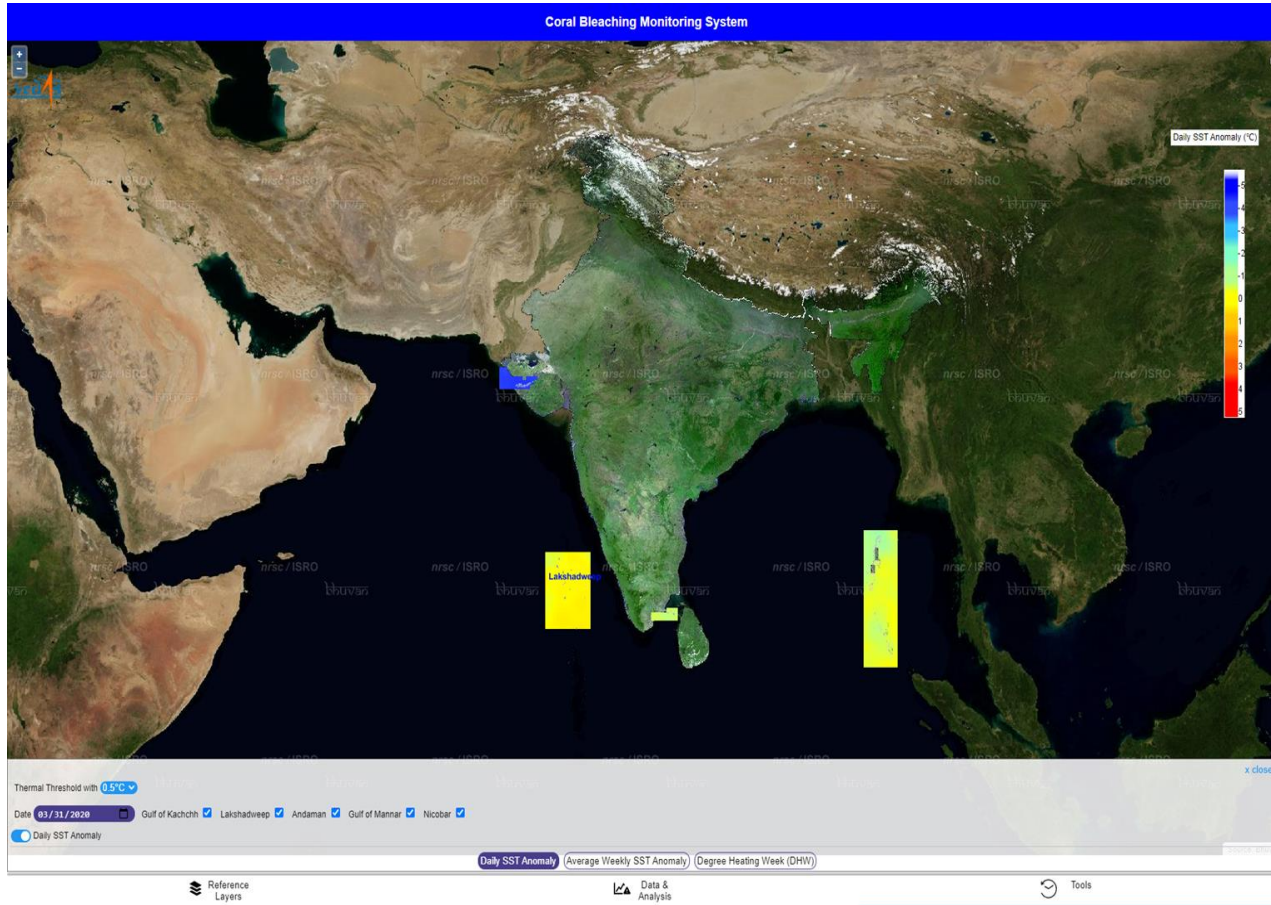


# CBMS on VEDAS shows successive warming of Lakshadweep Region: 2020

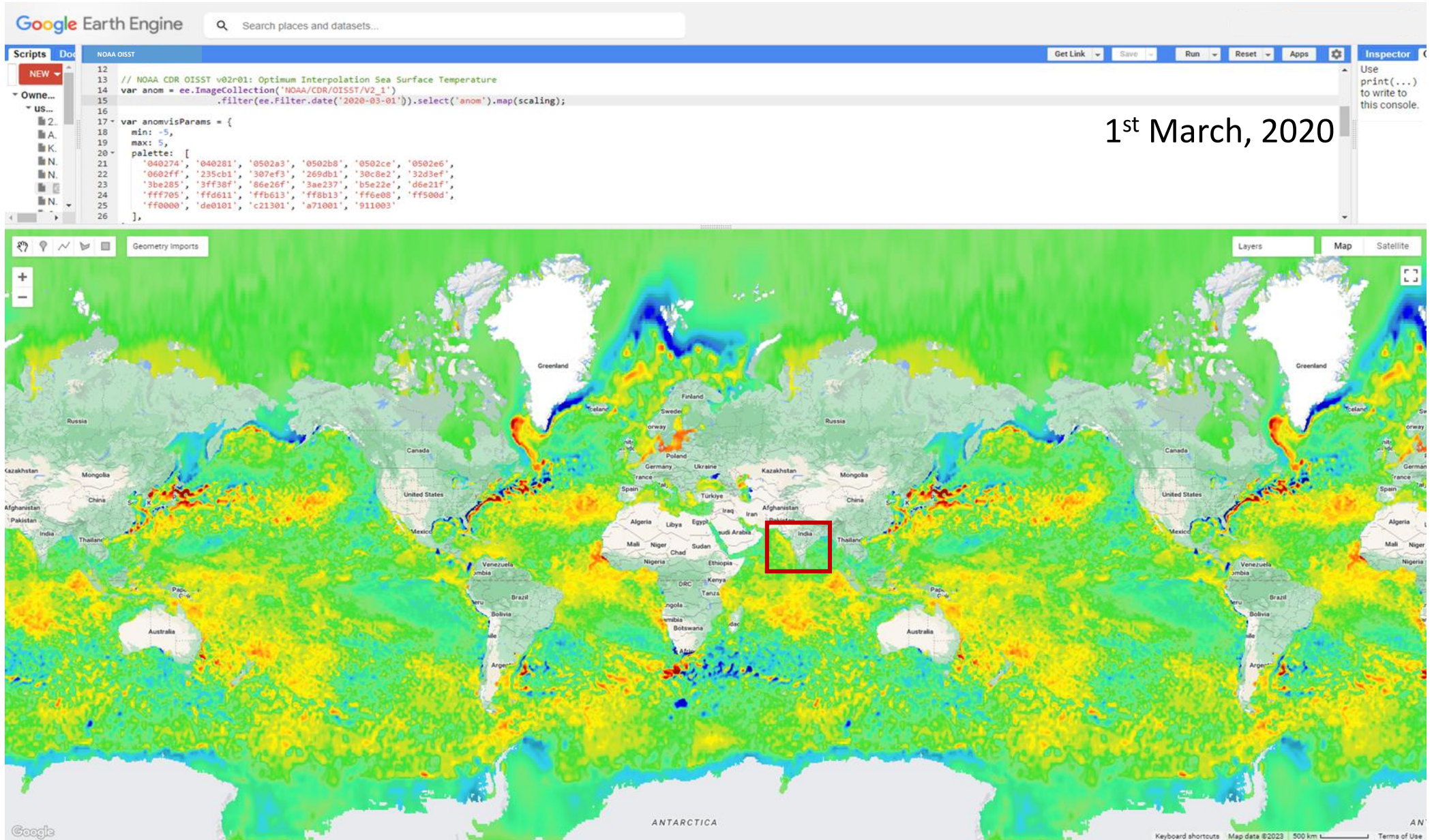




# What's happening at individual Reef Scale?



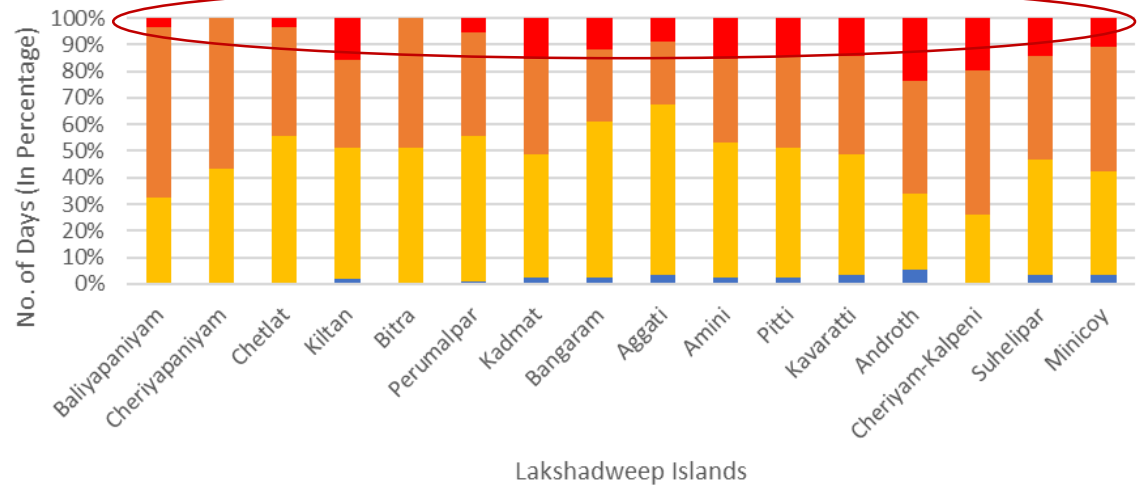




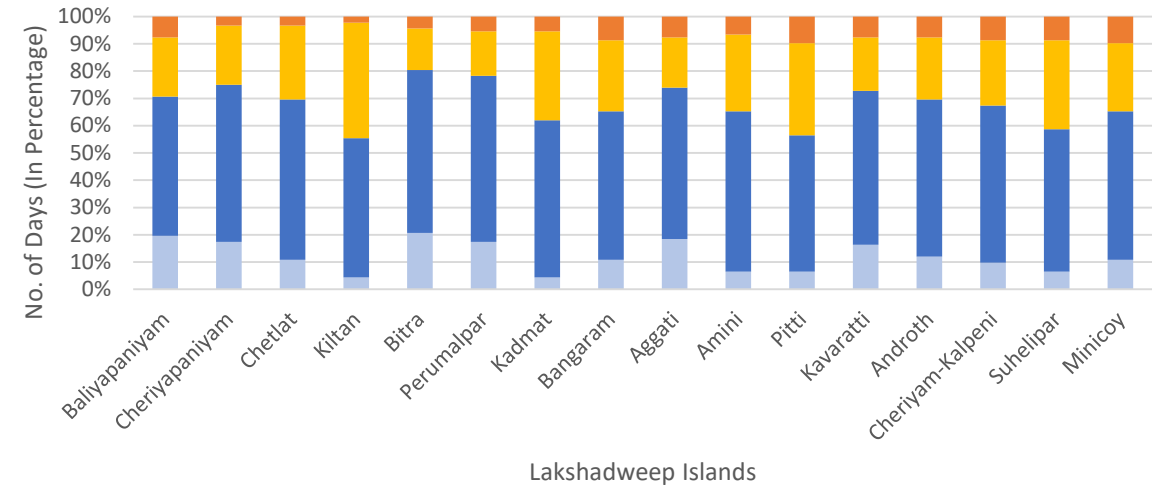
1<sup>st</sup> March, 2020



Year:2016

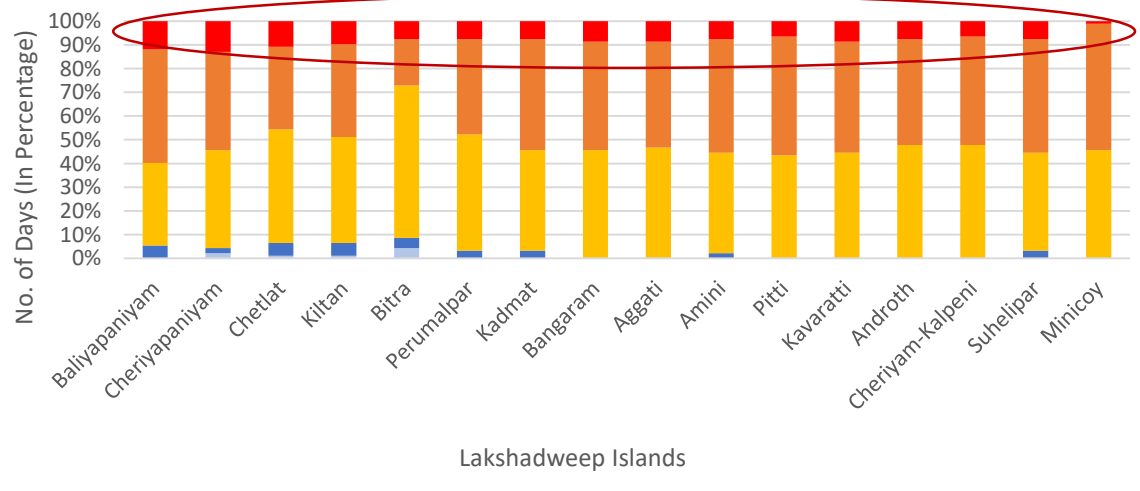


Year: 2019

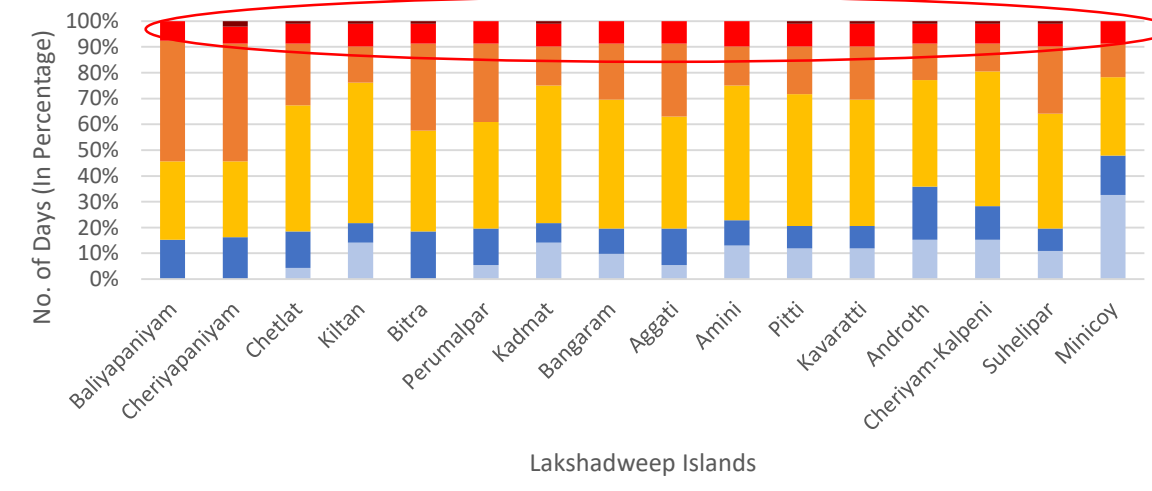


A= Anomaly; N.A. = Negative Anomaly

Year: 2020



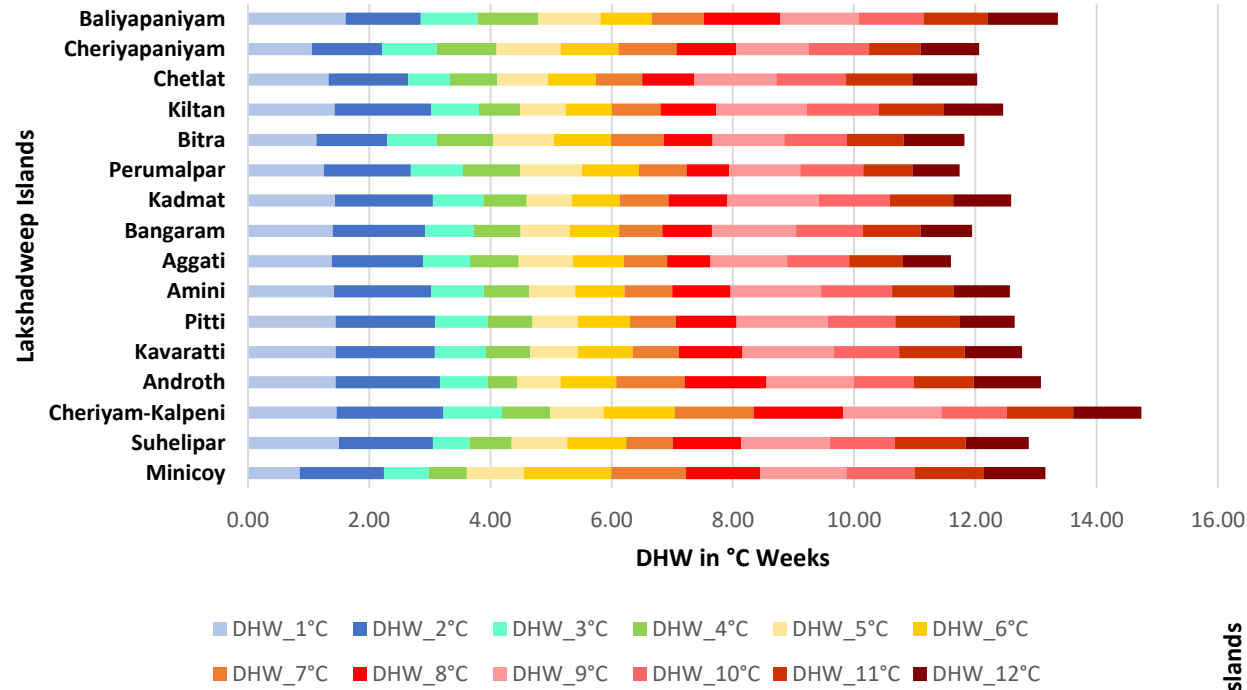
year:2023



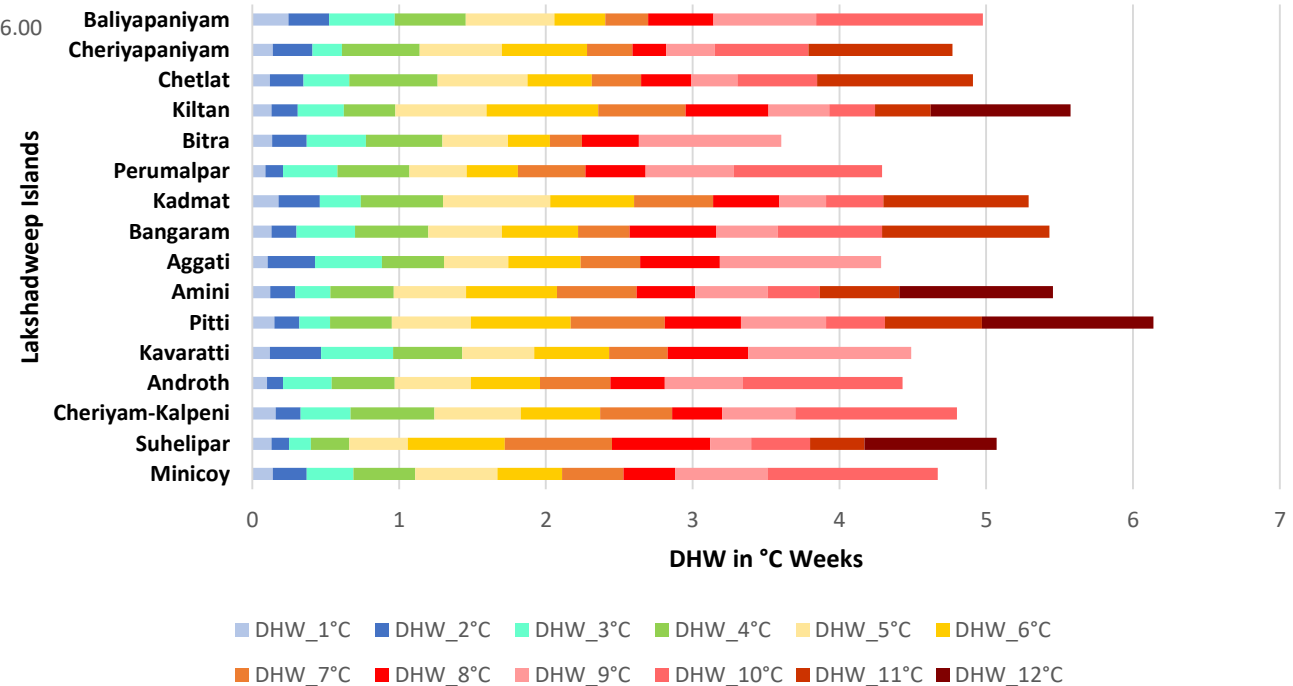


# Residence Time of the Thermal Stress: DHW Conditions

## DHW Conditions 2016: 1 to 12 Weeks



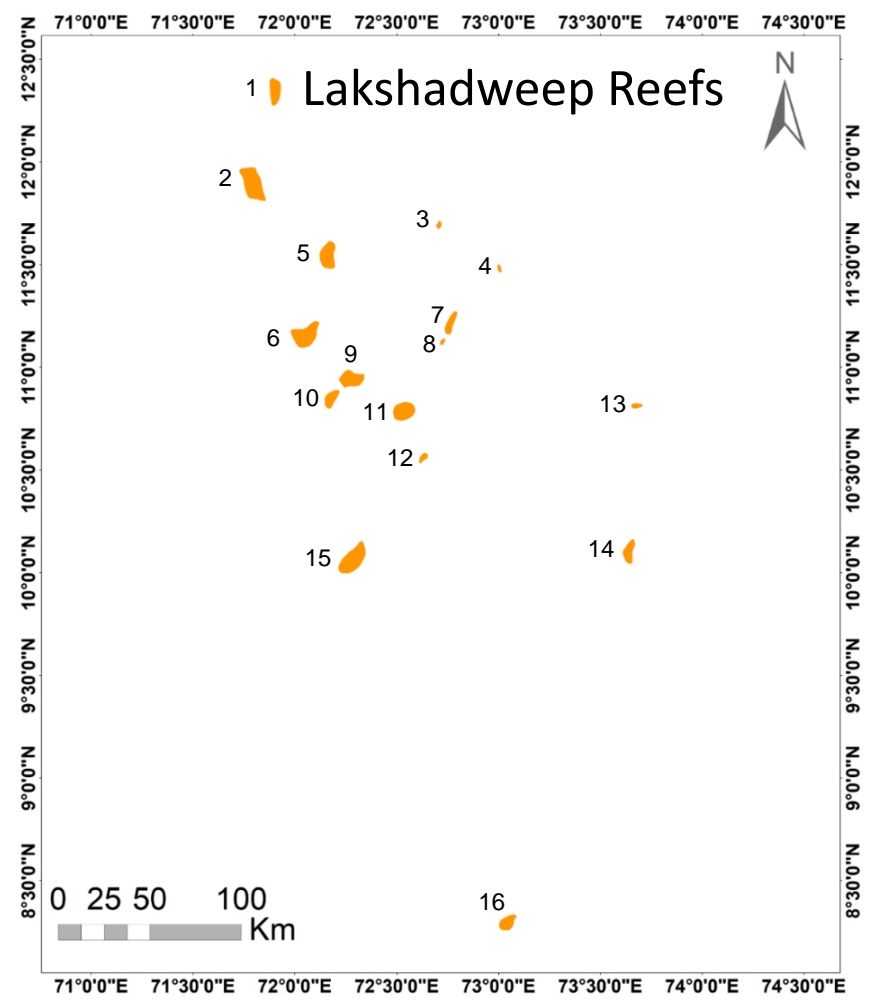
## DHW Conditions 2019: 1 to 12 Weeks



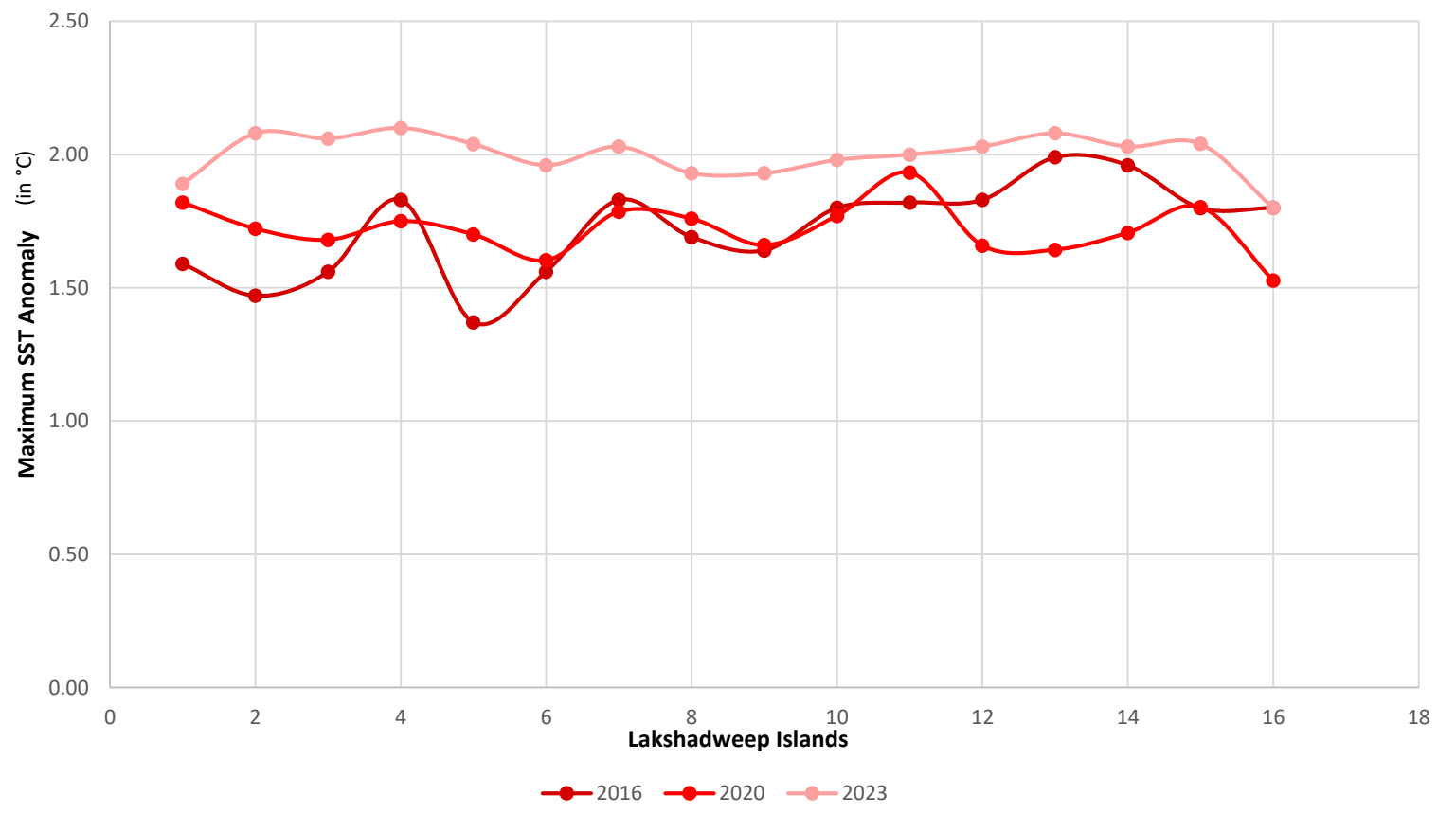




# Thermal Stress experienced by the Lakshadweep Islands

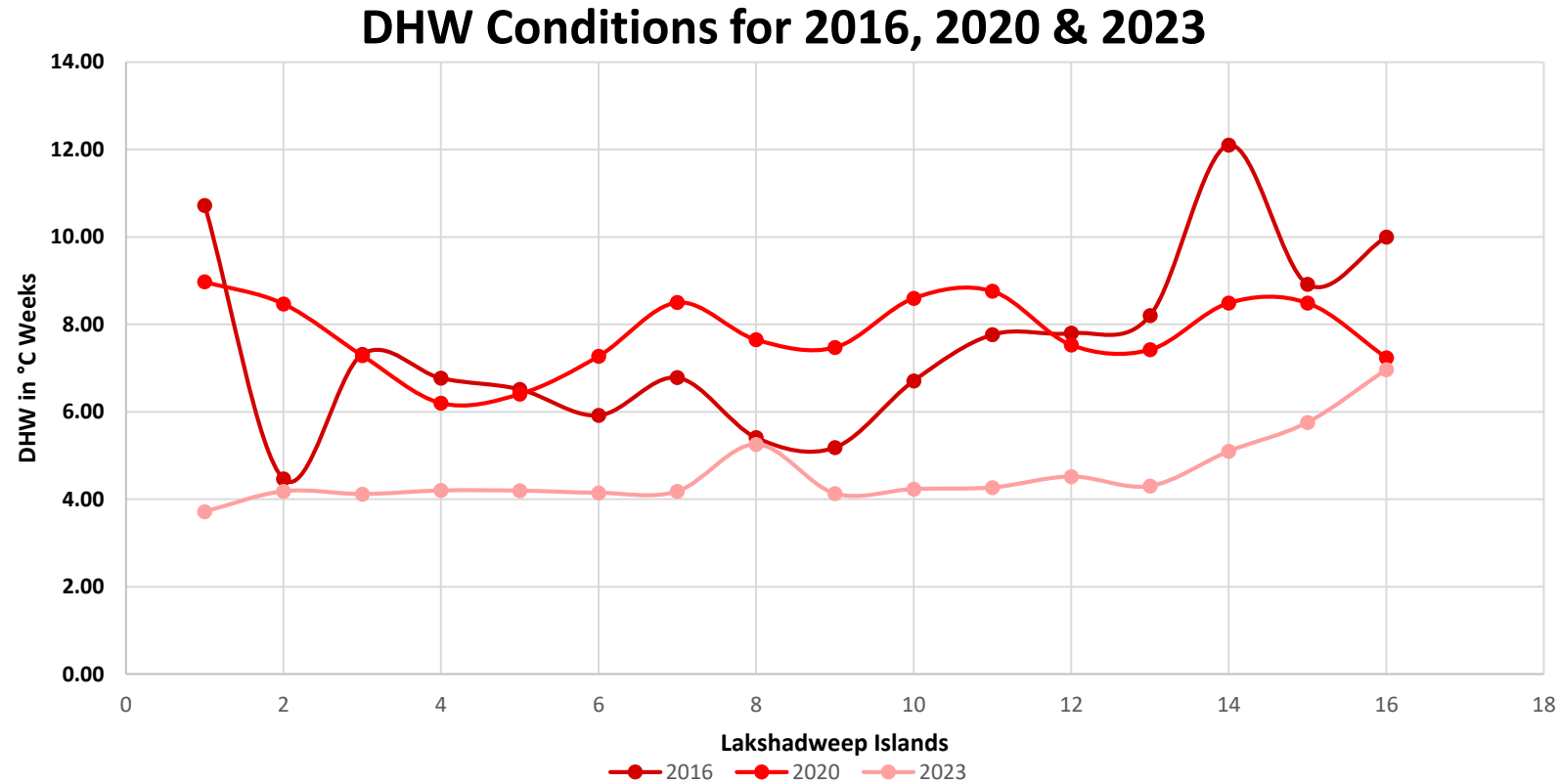
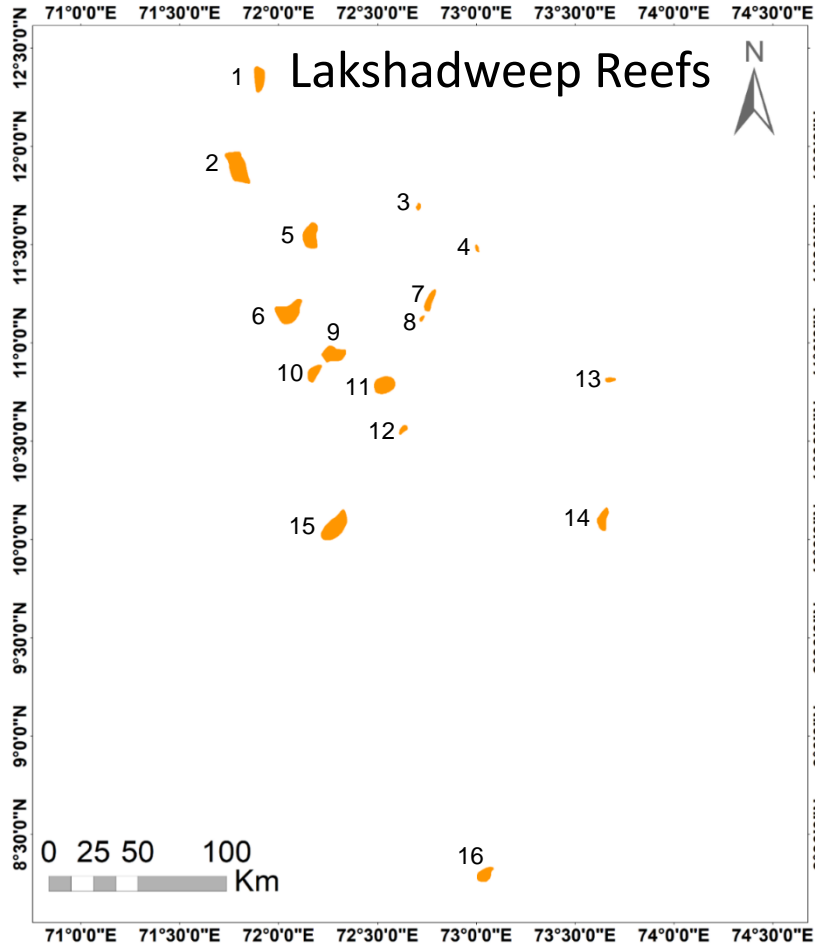


### Island-wise Maximum SST Anomaly for 2016, 2020 and 2023



Lakshadweep Islands (1 to 16) are numbered serially from North to South

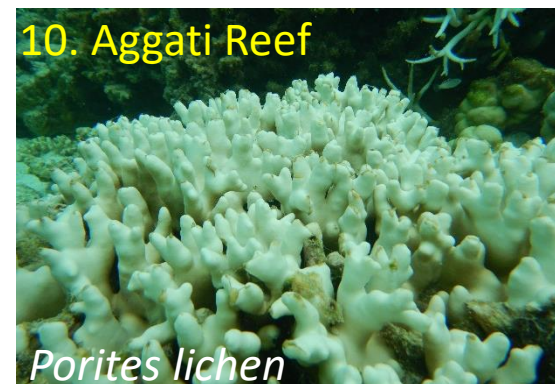
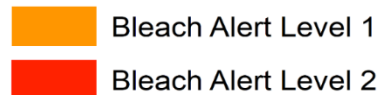
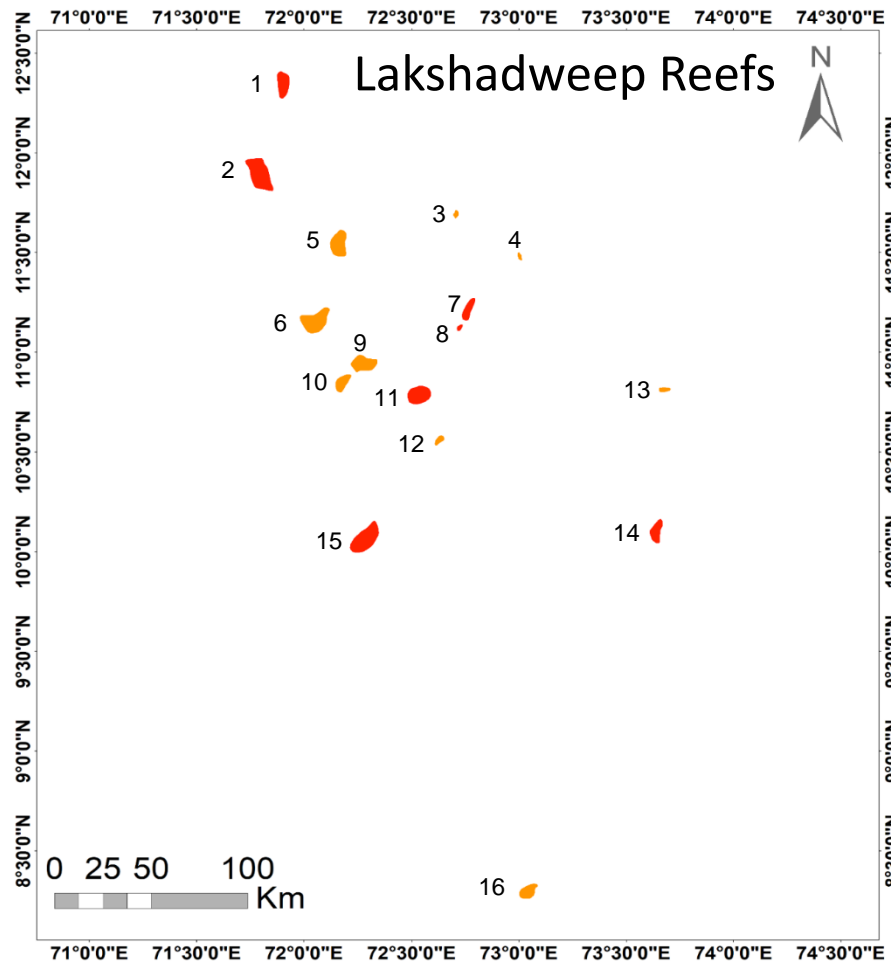
# DHW Conditions of Lakshadweep Islands for Anomaly Years (2016, 2020 and 2023)



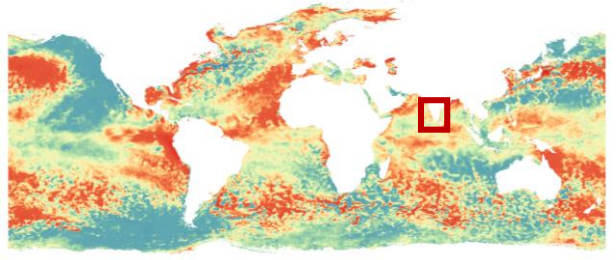
Lakshadweep Islands (1 to 16) are numbered serially from North to South



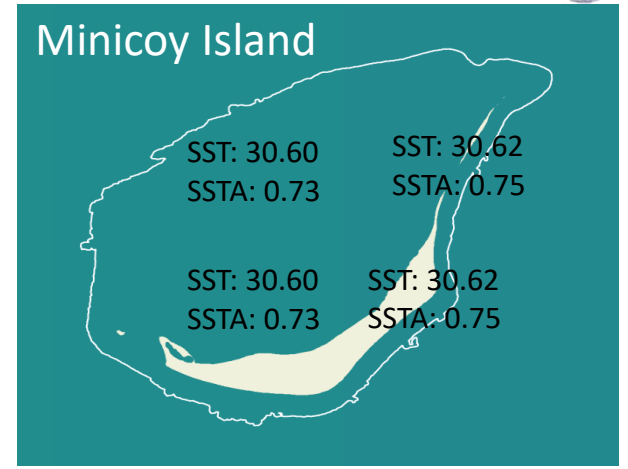
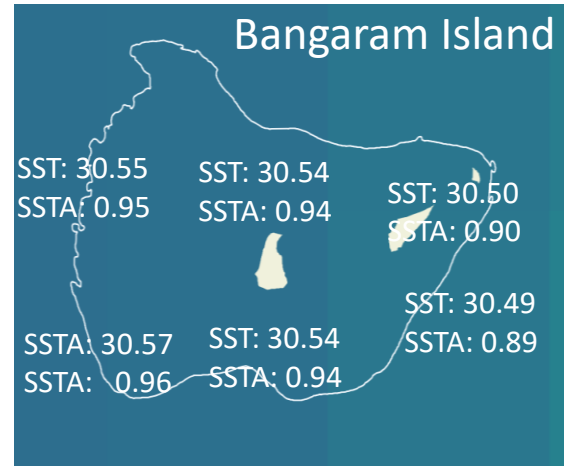
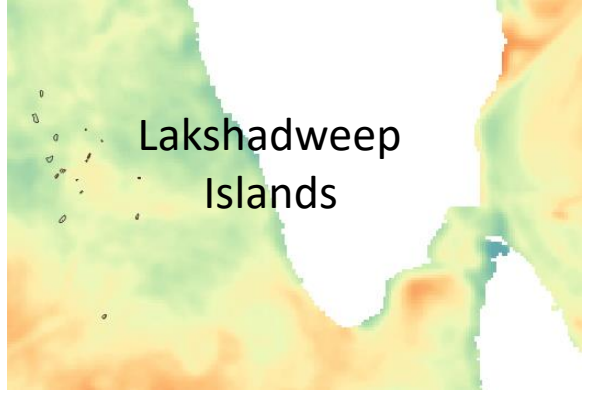
Bleach Alert Status Map of Lakshadweep Islands  
For Year: 2020



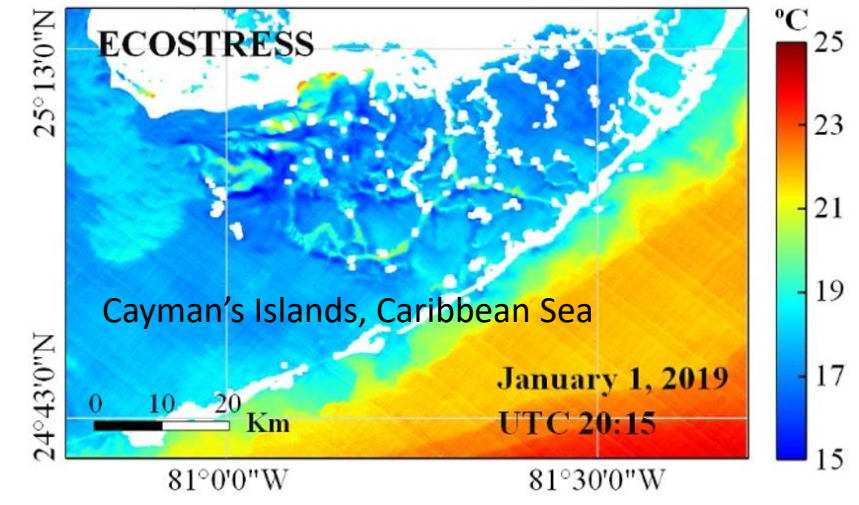
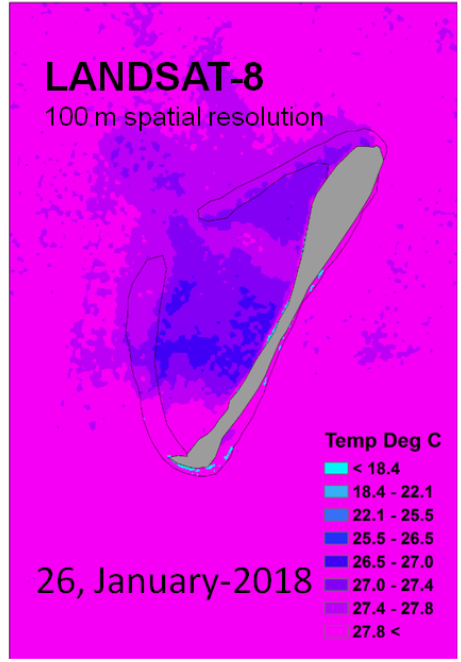
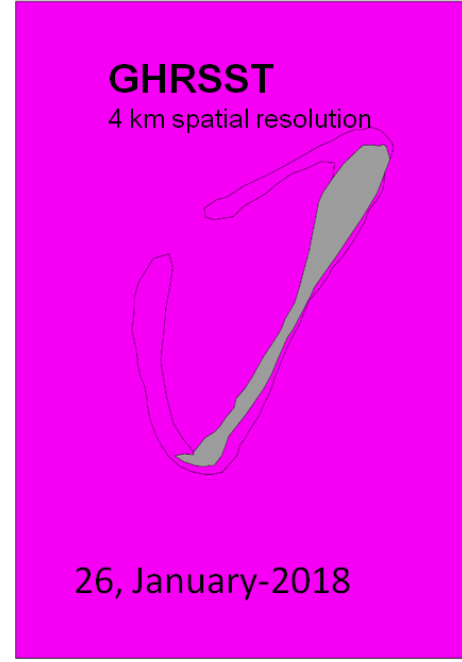
# Need for High-Resolution Data



Re-analysed CoralTemp Data (5 km spatial resolution) available from NOAA's Coral Reef Watch Website



## Agati Island, Lakshadweep





- ❖ Dependence on single-source Long-term, Daily SST Data for building algorithm and availability of real-time Daily SST data for SST Anomaly Characterization
- ❖ Availability of preferably Daily Night-time SST data for real-time monitoring, forewarning and management actions
- ❖ Dissemination time of the source SST Data: Preliminary data-products and Calibrated Data products (Currently 2 to 14 days time gap)
- ❖ SST Data product to match reef-scale/sub-reef scale observations and variability: Scaling down from Ocean/Regional scale observations and model (e.g. smallest reef of Lakshadweep i.e. Pitti : 6 sq km area is well covered in single pixel of OISST Data: 28 sq km)
- ❖ Improvement in the radiometric resolution of the data for better discrimination of reef and adjacent land (island/coastal) pixels

