WESTERN INDIAN OCEAN

Regional coral bleaching alert

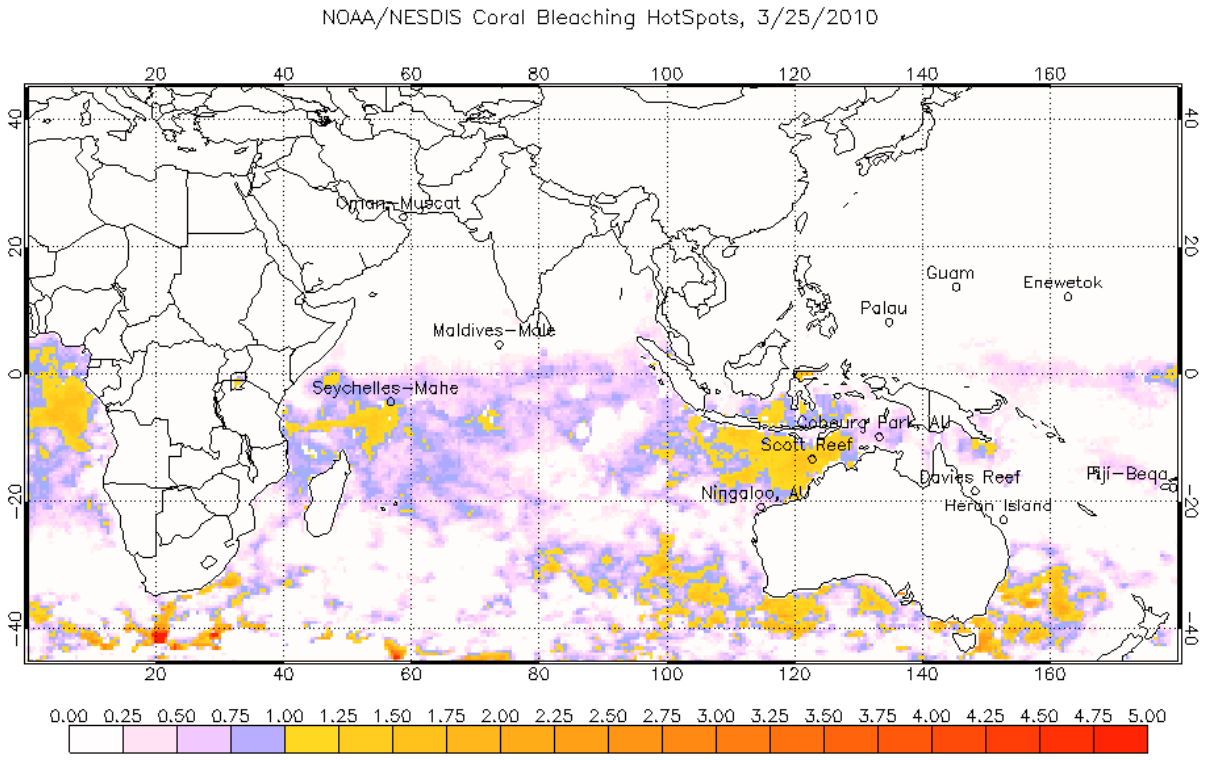
DATE OF THIS ALERT: 29 March 2010

Contact: bleaching@cordioea.org; for past alerts visit: http://www.cordioea.org/bleachingalert/

Bleaching alert

High moderate low none expected

Date	Level	Observation	Alert
29 Mar 10	Moderate	Bleaching risk has dissipated for Madagascar with high level of hotspots in Mahe-Seychelles. High risk for Tanzania and moderate to high for Kenya in the next month.	Seychelles, Tanzania, Kenya



Please return any comments and observations, particularly of coral bleaching, to the contact above

This bleaching alert runs from January to May each year, compiling publicly available information and observations from the field into an accessible document.

The "Bleaching alert" above summarizes information from remote sensing and local observations into a prediction for low, moderate or high risk of bleaching. See later pages for more detailed information and original sources.

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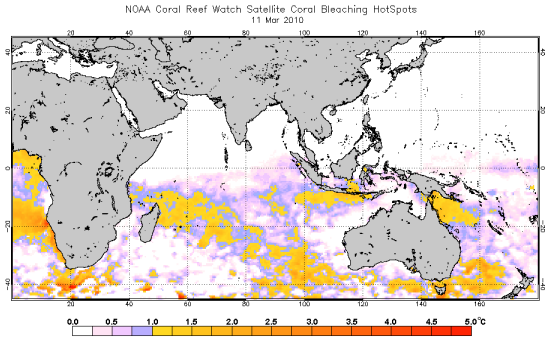
Bleaching observations *in situ*

Lat.	Date	Location	Sites	Observation	Source
12° S	25 March	Comoros	Grande Comore & Moheli	Extensive paling and low-level bleaching with no mortality yet. *Pocillopora* and *Acropora* most strongly affected with up to 10% of colonies and 80% in the most affected sites. Others are *Porites, Montipora, Pavona, Physogyra, Funga, Favites, Favia* and others. Pale colonies down to 25m at some sites.	David Obura dobura@cordioea.org
14° S	20 March	NE Madagascar	Masoala/Baie d'Antongil	Moderate bleaching of corals on fringing reefs and in Baie d'Antongil. *Pocillopora* most affected, and diversity of other genera. No mortality observed	Bemahafaly, bemahafaly@wcs.org
22° S	9 Feb	SW Madagascar	Andavadoaka, SW Madagascar	Bleaching of 24 hard coral genera. Up to 60% of the colonies showed bleaching mainly *Pocillopora* and those with little bleaching or paling included *Acropora, Physogyra, Acanthastrea, Fungia, lepatrea, Diploastrea, Favia, Favites, Lobophillia & Platygyra*. In situ sea surface temperature were around 31.1°C during the period of 20-30 Jan 2010.	Sophie Benbow & Chiara Franco Alasdair Harris al@blueventures.org

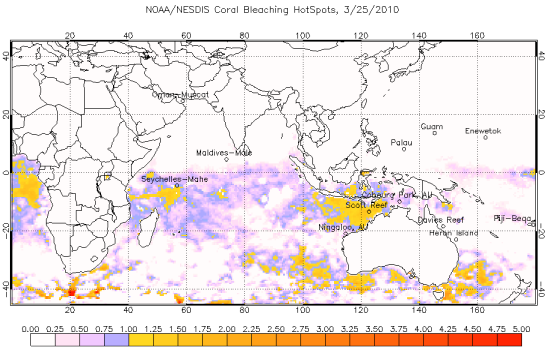
Sea Surface Temperatures

SST maps

11 March 2010



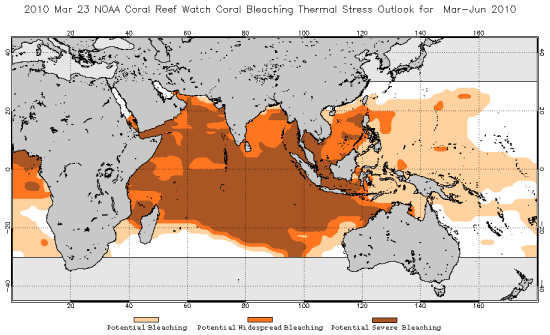
25 March 2010



The extensive hotspot of 11 March covering the south-central ocean has cleared by 25 March and is seen developing in Tanzania and persisting in Seychelles.

The two cyclones reported in the last two weeks (see below) have likely dissipated the hotspot in the central Indian Ocean.

Predicted Bleaching



Source: http://coralreefwatch.noaa.gov/satellite/index.html

Potential sever bleaching predicted earlier for most areas in the WIO has reduced to potential bleaching while part of Tanzania, Kenya and Seychelles are still listed to potential severe bleaching.

NOAA Virtual Stations Summary – March 25 2010

Station	Name	Status
5:	Kiunga, Kenya	nil
6:	Mombasa, Kenya	Bleach watch
7:	Zanzibar, Tanzania	Bleach watch
8:	Maluane, Mozambique	Bleach watch
9:	Comoros	Bleach warning
10:	Aldabra, Seychelles	Bleach warning
11:	Glorieuse Island, France	Bleach watch
12:	Andavadoaka, Madagascar	Bleach watch
13:	Reunion, France	Bleach watch
14:	Rodrigues, Mauritius	Bleach watch
15:	Mahe, Seychelles	Bleach warning
16:	Chagos Archipelago, UK	Bleach warning

Source: http://coralreefwatch.noaa.gov/satellite/data_nrt/sba/current_vs_alerts.txt

Wind-driven mixing

Two cyclones have occurred in the southern Indian Ocean:

1) Tropical Cyclone Hubert which lasted for 24 hours from 10 March may have prevented the spread of hotspots south
2) Tropical Cyclone Imani, which is dissipating on 26 March and was located at about 85^{o} East

Global and regional indicators 2010

- The Global average temperature remained high at + 0.67^{0}C by end of February (Dr. Roy Spencer former-NASA scientist). This has the potential of breaking the records of 1998 during the El Nino of the century.
- The Southern Oscillation Index (SIO) shows sustained negative values indicating a continuing El Niño phase.

Prior alerts this year

Date	Level	Observation	Alert

15 Mar 10	moderate	Reduced thermal stress with patchy hotspot development in some areas but sustained thermal stress in NE Madagascar for sometime leading to high risk. Bleaching risk is moderate overall.	N. Madagascar Kenya, Tanzania
1 Mar 10	moderate	High level of thermal stress observed earlier in February is reduced and hotspot development is patchy and variable. Overall, bleaching risk is moderate, but with high risk in NE Madagascar	NE Madagascar, southern Mozambique channel
12 Feb 10	High	Bleaching predictions are high especially northeast Madagascar, Mauritius and Reunion due to increased hotspot development and intensity from the previous alert.	NE Madagascar, Mauritius, Reunion
29 Jan 10	moderate	Increased hotspot intensity in central Mozambique channel and NE Madagascar compared to the past few weeks. Indicators are still for moderate bleaching risk.	Mozambique channel, NE Madagascar & Mauritius
15 Jan 10	moderate	Global indicators suggest a warm but not severe year with moderate El Niño conditions. Bleaching predications for the Indian Ocean are relatively high. But hotspot development is so far very low, conflicting with these observations. Cautious prediction of moderate bleaching risk.	NE Madagascar

Explanations

Sea Surface Temperatures (SST)

The surface of the sea heats up by direct insolation, causing stress to corals and other organisms. Satellites directly measure the skin-temperature of the sea, from which these maps and coral bleaching alerts are derived.

Degree heating weeks (DHW)

The DHW product accumulates any Hotspots greater than 1 °C over a 12- week period, thus showing how stressful conditions have been for corals in the last three months. It is a cumulative measurement of the intensity and duration of thermal stress. DHWs over 4 °C-weeks have been shown to cause significant coral bleaching, and values over 8 °C-weeks can cause widespread bleaching and some mortality.

Predicted Bleaching

The Bleaching Thermal Stress Outlook is based on sea surface temperature (SST) forecasts generated by the Linear Inverse Model from the NOAA Earth System Research Laboratory. In a normal year, the Outlook forecasts no potential for bleaching. When forecast SST exceeds bleaching thresholds over a long enough period to cause bleaching, the outlook maps display the bleaching potential.

Predicted Bleaching Alert Area

Coral bleaching alert area outlines the area where bleaching thermal stress currently reaches various bleaching stress levels based on sea surface temperature.

NOAA Virtual Stations Summary

Provide near-real-time information on thermal stress that induces coral bleaching for selected reef sites around the globe. The information is extracted from near-real-time satellite remotely sensed global SST measurements and derived indices of coral bleaching related thermal stress surrounding or close to these reef sites.

Wind-driven mixing

Wind is an important physical factor influencing conditions conducive to coral bleaching. Wind-driven mixing reduces temperature stress and wind generated waves can scatter harmful levels of incoming solar radiation.

- *Cyclones - cause strong mixing, reducing SST.*
- *Doldrums - periods of sustained low wind promote stratification, and heating of the upper layers of water. They therefore promote environmental conditions adverse to corals experiencing thermal and/or light stress.*

Global indicators, January 2010

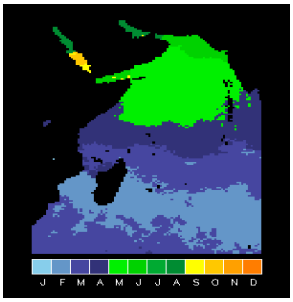
Local temperatures are affected by global and regional trends. With global warming, temperatures are expected to rise over longer periods (decades), but significant variation can occur between years, and under the influence of regional factors such as ocean-atmosphere interactions across the Pacific and Indian Ocean. Major influences at the beginning of 2010 are summarized here.

Multivariate ENSO Index (MEI)

El Niño/Southern Oscillation (ENSO) is the most important coupled ocean-atmosphere phenomenon to cause global climate variability on interannual time scales. Negative values of the MEI represent the cold ENSO phase (La Niña), while positive MEI values represent the warm ENSO phase (El Niño).

Southern Oscillation Index (SOI)

The Southern Oscillation Index (SOI) is calculated from the monthly or seasonal fluctuations in the air pressure difference between Tahiti and Darwin. A 'deep' and consistently negative SOI pattern (less than about minus 6 over a two month period, with little change over that period) is associated with El Niño conditions. (Note, a negative SOI is equivalent to a positive MEI)



Long-term warmest month – Western Indian Ocean

The long-term warmest month for sea surface temperatures is the one with highest risk for bleaching of corals. In southern Madagascar/central Mozambique this is in February, and moves northwards with the sun and the ITCZ through March and April in Tanzania and Kenya, to May in the northern IO

(Month of Maximum Monthly Mean temperature, source: NOAA/Coral Reef Watch/Scott Heron)

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