

WESTERN INDIAN OCEAN – Regional coral bleaching alert

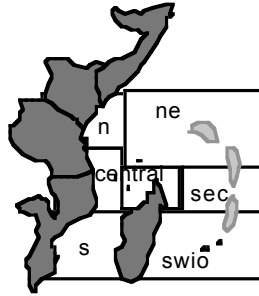
DATE OF THIS ALERT: 15 April 2011

Current alert level – 15 Apr 2011

- none – all regions

Temperatures are decreasing throughout the region and southerly winds indicate switching of seasons to the cool southeast monsoon.

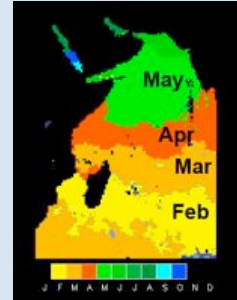
No further warming or bleaching is expected after this alert.



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David Obura & Majambo Jarumani

Bleaching risk progresses northwards from January to May each year during the 'summer' in the WIO.



Recent history – bleaching alert

31 Mar – low all regions

15 Mar – low all regions

28 Feb – low all regions

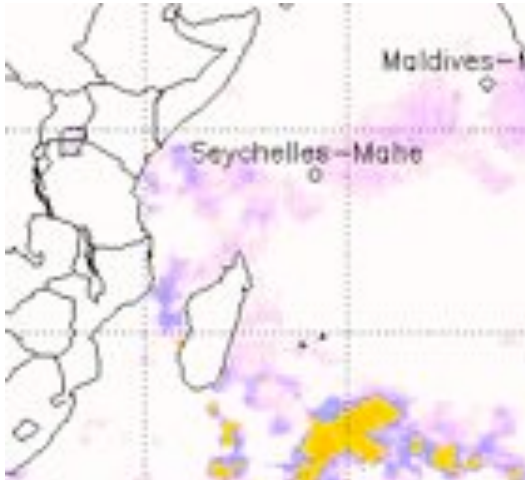
15 Feb – low – southern and central regions

1 Feb – moderate – south Mozambique channel; low – swio and central

15 Jan – Low, S Mozambique channel & SE Madagascar.

Sea Surface Temperature–14 Apr 2011

SSTs throughout the region are decreasing, and all thermal stress has dissipated.



Regional and Global indicators 2011

Global temperatures, ENSO and Indian Ocean Dipole indicators are moderate and in opposition for early 2011 so high temperatures are not expected.

Bleaching observations

1 April 2011

- **NE Madagascar, Antongil Bay.** Minor paling of massive *Porites*, low bleaching in *Fungia*, *Leptoria*.

15 Feb 2011

- **South Africa** – minor paling of corals, very low (< 1%) bleaching, mainly *Montipora*. Michael Schleyer, Oceanographic Research Institute.
- **SW Madagascar (Andavadoaka)** – minor partial bleaching in *Pocillopora* and *Montipora*. Sophie Benbow, Blue Ventures.

NOAA Bleaching outlook (Feb-May 2011)

The outlook alert level has decreased throughout the region, remaining low in a band north of the equator as the summer season passes into the northern hemisphere

Cyclones – None

Doldrums – Low wind conditions are occurring in the Mozambique channel and north of Madagascar as the monsoon prepares to switch.

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Explanations

WIO climatology regions

In 2011 alerts will be given for six regions in the WIO defined by oceanography:

SEC – south equatorial current – source waters for the region

swio – southwest Indian ocean – fed

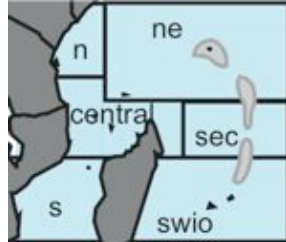
by southward flow from the SEC (eastern and SE Madagascar, Mauritius, La Reunion).

Central – fed by flow of SEC north of Madagascar, the Comoros gyre, northern Mozambique channel (northern Mozambique and Madagascar, southern Tanzania, Comoros).

S – south – southern Mozambique channel (central & southern Mozambique and west & southwest Madagascar)

N – north – fed by East African Coastal Current (northern Tanzania and Kenya)

NE – northeast – Seychelles banks and outer islands, including Aldabra group, Farquhar.



Boundaries are defined by latitude (8 and 16°S) except for NE/SEC boundary, at 10.5°S). Analysis and justification of these climate regions is in progress.

Sea Surface Temperatures (SST)

The surface of the sea heats up by direct insolation, causing stress to corals and other shallow water organisms. Satellites directly measure the skin-temperature of the sea, providing these maps and coral bleaching products for early warning.

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. The outlook map is presented over a 4 month period into the future.

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.

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.

El Niño/Southern Oscillation (ENSO)

The El Niño/Southern Oscillation (ENSO) is the most important coupled ocean-atmosphere phenomenon to cause global climate variability on interannual time scales.

Multivariate ENSO Index (MEI) - Negative values of the MEI represent the cold ENSO phase (La Niña), while positive MEI values represent the warm ENSO phase (El Niño).

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)

The Niño 3.4 index is similar to the SOI, but focused on the central Pacific Niño region, straddling the equator and from 170-120°W.

Indian Ocean Dipole

The Indian Ocean Dipole is analogous to the ENSO, but for the Indian Ocean. It is calculated using the Dipole Mode Index (DMI), which calculates the gradient between the western equatorial Indian Ocean (50E-70E and 10S-10N) and the south eastern equatorial Indian Ocean (90E-110E and 10S-0N).

Global indicators

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.

Data sources

<http://coralreefwatch.noaa.gov/>
http://ioc3.unesco.org/oopc/state_of_the_ocean/sur/ind/
<http://www.jamstec.go.jp/frsgc/research/d1/iod/>
http://www.esrl.noaa.gov/psd/enso/enso.mei_index.html
<http://australiasevereweather.com/cyclones/index.html>
<http://www.mtotec.com/>