

# WESTERN INDIAN OCEAN

## Regional coral bleaching alert

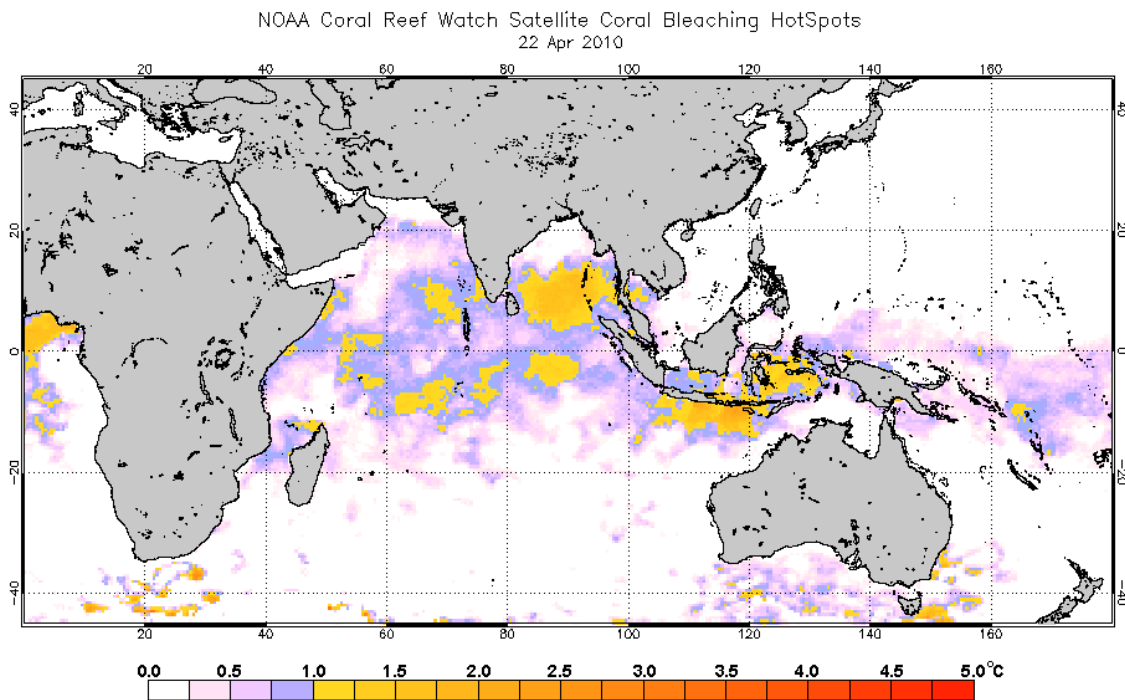
**DATE OF THIS ALERT: 27 April 2010**

Contact: [bleaching@cordioea.org](mailto:bleaching@cordioea.org); for past alerts visit: <http://www.cordioea.org/bleachingalert/>

### Bleaching alert

High moderate low none expected

Date	Level	Observation	Alert
27 April 10	moderate	The southeast monsoon in the WIO has set in early even before the end of march, dissipating the hotspot rapidly on the east African coast, but it <b>persist over Seychelles granitic islands</b> . No new or intensification of bleaching/mortality for East Africa though more may yet occur in Seychelles.	<b>Seychelles</b>



*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.

## CONTENTS

Bleaching alert .....	1
Bleaching observations <i>in situ</i> .....	2
Sea Surface Temperatures .....	4
Degree Heating Week (DHW) maps .....	4
NOAA Bleach watch alert for Seychelles–April 22 2010 .....	4
Global and regional indicators 2010 .....	4
Prior alerts this year .....	5
Explanations .....	6

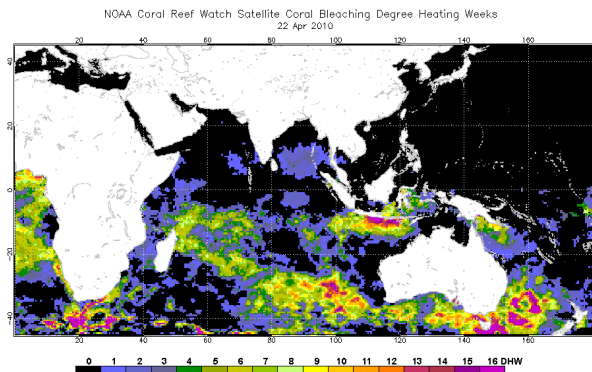
## Bleaching observations *in situ*

Lat.	Date	Location	Sites	Observation	Source
22 ° S	April	SW Madagascar	Andavadoaka  Grand Recif de Tulear  Belo Sur Mer	High levels of bleaching over the past 8 weeks, affecting 32 coral genera as well as <i>alcyonaria</i> and <i>zooanthids</i> , at depths of up to 24m across all reef types. <i>Pocillopora</i> most strongly affected with up to 95% of colonies bleached on some shallow nearshore sites and some evidence of mortality indicated by immediate algal overgrowth. Water temperature were around 32°. Minimal bleaching of 5 genera; <i>Pocillopora</i> , <i>Acropora</i> , <i>Echinopora</i> , <i>Lobophyllia</i> , and <i>Favites</i> . Calculated bleaching index (after McClanahan 2004) remained less than 4. Wide spread bleaching of 30 genera to depths of up 20m, in particular <i>Lobophyllia</i> , <i>Pocillopora</i> , <i>Pachyseris</i> , <i>Fungi</i> and branching <i>Porites</i> . While <i>Pocillopora</i> are severely affected here, large <i>Porites</i> colonies (estimated at 2m in diameter) are also affected.	Benbow, S., Harris, A. & Gough, C. Blue Ventures Conservation
12.5 ° S	April	NE. Madagascar	Diego/Antsiranana to Voahemmar	Moderate mortality at many sites, from ≈5-30% of colonies affected, especially <i>Acropora</i> , <i>Montipora</i> , <i>Porites</i> , <i>Stylophora</i> . On some reefs, bleaching down to 30m of deep water genera (e.g. <i>Leptoseris</i> ). No mortality observed.	David Obura dobura@cordioea.org CORDIO East Africa
3 ° S	8 April	N. Coast	Malindi-Watamu	The bleaching extent is average with 43% bleached colonies out the 193 sampled colonies. 9 genera bleached with extensive bleaching of <i>Pocillopora</i> (50%) and <i>Acropora</i> (25%) followed by <i>Favites</i> and <i>Goniastrea</i> . Other notable genera with signs of bleaching were: several massive <i>Porites</i> with mild paling-bleached, <i>Favia</i> , <i>Montipora</i> , <i>Galaxea</i> and <i>Echinopora</i> .	Dennis Macharia dmacharia@cordioea.org & Majambo Jarumani majamboj@cordioea.org CORDIO East Africa

1° S	9 April	N. Coast Kenya (Kiunga Marine park)	Shimo la Tewa	24% of colonies affected by bleaching with <i>Pocillopora</i> being the most affected. Other genera affected include: <i>Favites</i> , <i>Favia</i> , <i>Leptoria</i> , <i>Platygyra</i> , <i>Tubinaria</i> , <i>Hydnophora</i> , <i>Goniastrea</i> , <i>Echinopora</i> and <i>Acropora</i> . 2-4 <i>Pocillopora</i> observed dead.	jmwaura@kmfri.co.ke, Kenya Marine and Fisheries Research Institute, Mombasa, Kenya
	8 April		Mkokoni	Highest number of colonies with signals of bleaching and paleness. The genera affected are <i>Pocillopora</i> , <i>favites</i> , <i>favia</i> , <i>Acropora</i> , <i>Echinopora</i> , <i>Goniastrea</i> , <i>Coscinarea</i> and <i>Montipora</i>	
4° S	1 April	S. Coast Kenya	Kisite park	Low to moderate incidence of paleness on a number of coral genera; <i>Acropora</i> , branching <i>Porites</i> and <i>Montipora</i> , <i>Echinopora</i> , <i>goniastrea</i> , <i>Astreooora</i> while <i>pocillopora</i> , columnar <i>Galastrea astreata</i> and <i>Fungia</i> were partially to whole bleached. Some affected <i>Pocilopora</i> and <i>Galaxea astreata</i> branches had algal turf.	jmwaura@kmfri.co.ke, Kenya Marine and Fisheries Research Institute, Mombasa, Kenya
	2 April		Upper Mpunguti	Low to moderate prevalence of paling on <i>Porites lutea</i> , <i>Favia</i> , <i>Favites</i> , <i>Astreopora</i> , <i>platygyra</i> , <i>Goniastrea</i> while <i>Acropora</i> , <i>Pocillopora</i> , and <i>Alveopora</i> species having partially to whole bleached levels	
	3 April		Sii island corner	Extensive paling of most corals such as <i>platygyra</i> , <i>Porites lutea</i> , <i>Gadinoseris</i> , <i>Acanthastrea</i> , while partially to whole bleached genera included mostly <i>Pocillopora</i> , <i>Fungia</i> , <i>Favites</i> , and <i>Acropora</i>	
6° S	30 March	Zanzibar	Chapwani Island	Widespread bleaching/palling of significant portion of corals including <i>Acropora</i> , <i>Lobophyllia</i> , <i>Physogyra</i> , <i>Galaxea</i> , <i>Porites</i> (massive and branching), <i>Pocillopora</i> , <i>Herpolitha</i> , <i>Millepora</i> , <i>Fungia</i> , <i>Diploastrea</i> , Sea anemones.	Mohammed mohammed@ims.uds.m.ac.tz
12° S	25 March	Comoros	Grande Comore & Moheli	Extensive paling and low-level bleaching with no mortality yet. <i>Pocillopora</i> and <i>Acropora</i> most strongly affected with upto 10% of colonies, and 80% in the most affected sites. Others are <i>Porites</i> , <i>Montipora</i> , <i>Pavona</i> , <i>Physogyra</i> , <i>Fungia</i> , <i>Favites</i> , <i>Favia</i> and others. Pale colonies down to 25m at some sites.	David Obura dobura@cordioea.org CORDIO East Africa
14° S	20 March	NE Madagascar	Masoala/Baie d'Antongil	Moderate bleaching of corals on fringing reefs and in Baie d'Antongil. <i>Pocillopora</i> 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 <i>Pocillopora</i> and those with little bleaching or paling included <i>Acropora</i> , <i>Physogyra</i> , <i>Acanthastrea</i> , <i>Fungia</i> , <i>lepatrea</i> , <i>Diploastrea</i> , <i>Favia</i> , <i>Favites</i> , <i>Lobophyllia</i> & <i>Platygyra</i> . 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

### Degree Heating Week (DHW) maps



The overall thermal stress is low but the accumulated thermal shown by the DHW dataset is still high in some parts of the WIO e.g. NE Madagascar and Seychelles where the DHW ranges 4-7. Based on this wide spread bleaching might be observed in these area.

### NOAA Bleach watch alert for Seychelles–April 22 2010

The current alert level has not changed, but the DHW value has exceeded the historical maximum DHW value which was 4.5 Deg C-weeks in 1998.

Satellite observations:

4:00h UTC 15 Apr. 2010 - 3:00h UTC 19 Apr. 2010

- Bleaching Degree Heating Weeks : 4.9 Deg C-week
- Historical Maximum Degree Heating Weeks : 4.5 Deg C-week (1998)
- Coral bleaching HotSpot : 1.0 Deg C
- Sea surface temperature : 30.5 Deg C
- Maximum Monthly Mean SST at site : 29.5 Deg C

Previous Three Alerts for Seychelles-Mahe:

- 04/15/2010 Bleaching Alert Level 1
- 04/01/2010 Bleaching Warning
- 03/29/2010 Bleaching Watch

Current Status:

Bleaching Alert Level 1

Source: [http://www.osdpd.noaa.gov/ml/ocean/cb/virtual\\_stations.html](http://www.osdpd.noaa.gov/ml/ocean/cb/virtual_stations.html)

### Global and regional indicators 2010

- The Global average temperature continues to be warm at + 0.65<sup>0</sup>C by end of March which was about the same as January (Dr. Roy Spencer - <http://www.drroyspencer.com/>). Therefore the global temperatures still remains high.
- The MEI still shows sustained positive values representing the warm phase of ENSO (El Niño) but this will decay in the following months.

## Prior alerts this year

Date	Level	Observation	Alert
13 April 10	moderate	Thermal stress has reduced in most areas of the Indian Ocean thus reduced bleaching risk. <b>High risk is seen in Seychelles</b>	Seychelles-Mahe
29 Mar 10	moderate	Bleaching risk has dissipated for Madagascar with high level of hotspots in Mahe-Seychelles. <b>High risk for Tanzania</b> and moderate to high for Kenya in the next month.	Seychelles, Tanzania, Kenya
15 Mar 10	moderate	Reduced thermal stress with patchy hotspot development in some areas but sustained thermal stress <b>in NE Madagascar for sometime leading to high risk</b> . 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, <b>but with high risk in NE Madagascar</b>	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

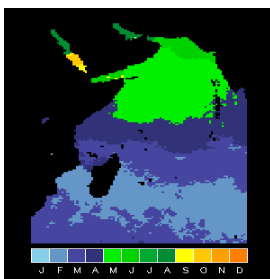
Local temperatures are affected by global and regional trends. With global warming, temperatures are expected to rise over longer periods (decades), but significant variation can occur between years, and under the influence of regional factors such as ocean-atmosphere interactions across the Pacific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