

Coral bleaching forecasting for Eastern Africa - 2011

www.cordioea.org/bleachingalert

Early warning and predication

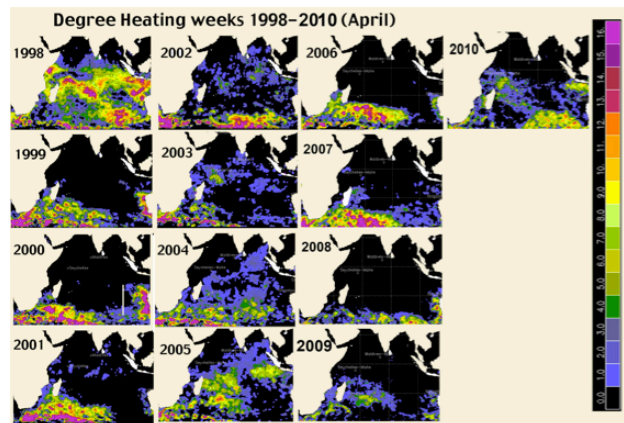
Coral bleaching and widespread degradation of coral reefs are among the first planet-wide consequences of climate change, a result of rising sea surface temperatures. Coral bleaching events can now be predicted from weeks to months in advance on a regional scale, enabling the provision of this as a public service. This can be used for managing coral reefs for conservation, fisheries and tourism benefits, as well as for building capacity and understanding of climate change impacts. Accurate prediction raises the possibilities for reducing vulnerability to impacts by forward planning and pre-emptive building of resilience.

Forecasting coral bleaching

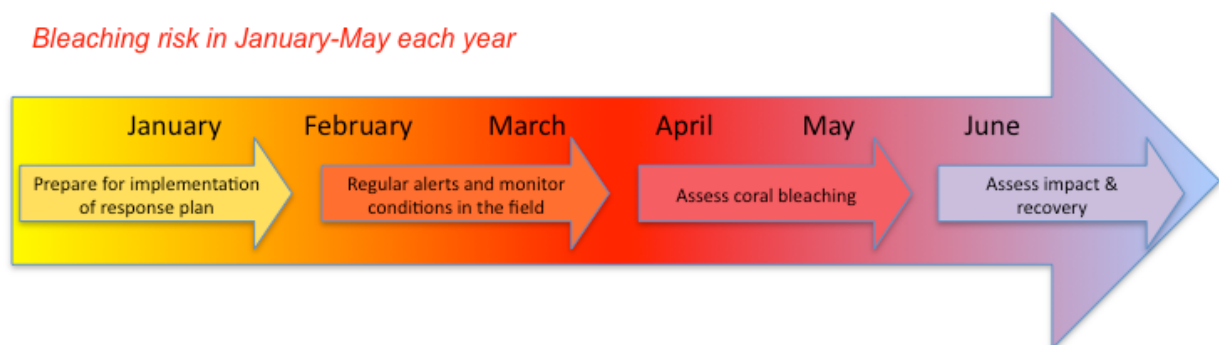
Globally, a basis for early warning of bleaching events has been established through the NOAA Coral Reef Watch programme, which publishes and disseminates bleaching warnings at multiple levels, based on Degree Heating Week hotspot analyses.

However bleaching risk does vary greatly from regional to local levels as a result of spatial and temporal variation in multiple factors. The accuracy of local to regional warnings can be improved using other climate prediction and observation tools, including global temperature projections, the El Niño Southern Oscillation, the Indian Ocean Dipole and additional atmospheric and oceanic indicators such as of winds and currents. In addition, local climate over the months preceding months affects the risk of bleaching.

Local and regional knowledge is therefore essential in providing accurate predictions, and in Eastern Africa the high-risk period extends from January to May each year.



Bleaching risk in January-May each year



East Africa bleaching forecasts – 2007-10

Since 2007 CORDIO in conjunction with the IUCN Climate Change and Coral Reefs working group has run a regional bleaching alert for the western Indian Ocean/Eastern Africa. This

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services the following countries: Kenya, Tanzania, Mozambique, Madagascar, Comoros, Seychelles, Mauritius, South Africa and Reunion (France).

In 2010 the bleaching alert is being upgraded through the following activities and projects:

- a) formal analysis of the accuracy and precision of bleaching warnings verified against bleaching observations in the field (2007-10). Output: peer review publication and improvements to the methodology.
- b) Incorporation of the bleaching alerts into a Coastal Climate Outlook of the Kenya Meteorology Department, to bring the methodology in line with formal procedures for climate hazard alerts at the country level. The project runs from May 2010 to April 2012.

Next steps and future directions

CORDIO is seeking partners to extend provision of coral bleaching forecasts through formal channels at a regional level in eastern Africa, with relevance to:

- national and regional meteorology services
- weather and climate hazard warnings to reduce impacts at local, national and regional levels
- disaster risk reduction (DRR) networks to reduce vulnerability of people and economic sectors to potential disasters

To achieve this, improved visualization and presentation of the alerts is necessary, along with quality control and standardization to meet the standards of rigour required for formal climate alert systems.

SERVIR Africa has the resources (experts, visualization tools, internet platform) to complement CORDIO's expertise in taking the alerts to the next level, and we would be interested in partnering to achieve this. Next steps could potentially be:

2011 bleaching season, from January to May – improve the visualization and presentation of the bleaching alert.

2012 and beyond – prepare a project proposal to increase support to the partners to upgrade the analytical procedures in preparing the alerts and upgrading the visualization and interactive possibilities for release on SERVIR Africa and CORDIO websites.

CORDIO resources

Personnel – Dr. David Obura (coral bleaching and prediction expert), Majambo Jarumani (coral bleaching and prediction assistant), Dennis Macharia (ocean and climate data, spatial analysis assistant).

ICT – internet access (256k), website, spatial analysis packages (variety of open source, ESRI and IDRISI).

Data resources:

Global temperatures: annual global temperatures are presented and projected by NOAA and the Hadley Climate Center, and give an indication of the likely heat stress in the coming year.

Sea Surface temperature (SST) anomaly: this is produced by subtracting the long-term mean SST (for that location in that time of year) from the current value. A positive anomaly means that the current sea surface temperature is warmer than average, and a negative anomaly means it is cooler than average. SST anomaly product makes it possible to quickly pinpoint regions of elevated SSTs throughout the world oceans. Source: NOAA Coral Reef Watch

Coral Bleaching Hotspots: highlights regions where the SST is currently warmer than the highest climatological monthly mean SST for that location. The HotSpot value of 1.0 °C is a threshold for thermal stress leading to coral bleaching. To highlight this threshold, HotSpot values below 1.0 °C are shown in purple and HotSpots of 1.0 °C or greater range from yellow to red in the coral bleaching hotspot charts. Source: NOAA Coral Reef Watch

El Niño Southern Oscillation (ENSO): The biggest influence in year-to-year climate variability for the tropical ocean. Abnormally warm sea surface temperatures (SST) often signal the beginnings of positive SST anomalies over a much larger domain. Source: NOAA Earth Systems Research Laboratory

Indian Ocean Dipole (IOD): This is a coupled ocean-atmosphere phenomenon which is normally characterized by anomalous cooling of SST in the south-eastern equatorial Indian Ocean and anomalous warming of SST in the western equatorial Indian Ocean. Source: Japan Agency for Marine Earth Science and Technology, UNESCO Ocean Observations Panel for Climate (OOPC).

Cyclones: These are obtained from Eumetsat products giving cyclone tracks and strengths in the western Indian Ocean. Cloud cover and mixing by cyclones reduces sea surface temperatures, reducing the risk of coral bleaching. Source:

Doldrums: This is a product from NOAA which identifies and tracks regions of sustained low wind speed conditions that may lead to coral bleaching. Wind-driven mixing reduces temperature stress and periods of sustained low wind promote environmental conditions adverse to corals by increasing thermal and/or light stress. Source: NOAA Coral Reef Watch.