

Tara-IUCN expedition

How are coral reefs coping with climate change?

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The effects of climate change on coral reefs are visible today on many reefs worldwide. Predictions for coral reefs are extremely dire with many experts arguing that major changes in abundances of shallow water coral assemblages are inevitable this century. As yet the effects of climate change and other agents of disturbance on coral reefs are not well understood.

It is critical for scientists and managers to determine the range of threats affecting this ecosystem and to predict the potential biological responses to these threats. Further, it is crucial to identify actions to mitigate threats, including climate change, to reef ecosystems. It is important to understanding how tolerant coral assemblages are to thermal stress and how resilience of a site will buffer a coral reef from the impacts of climate change. This is called monitoring for resilience, where resilience is the ability of a system to absorb or recover from disturbance while maintaining its functions and services. A number of resistance and resilience indicators have been proposed to allow coral reef managers to predict a coral community's response to thermal stress (IUCN Working Group on Climate Change and Coral Reefs weblink).

To address these research priorities, the IUCN Global Marine Program establishes critical partnerships with foundations, scientific bodies, and governments to undertake key multi-disciplinary coral reef conservation research and public/educational outreach projects. In particular, the IUCN Global Marine Programme recently developed a partnership with the Tara Foundation and provides technical support to its non-profit program, Tara Expeditions. Tara Expeditions is directed by Etienne Bourgois, chief executive officer of Agnès b, a French fashion brand. The program was initiated in 2003, thanks to the brand's founder, Agnès B., and her determination to commit herself to the planet's remediation. Tara Oceans is its current expedition. The starting point for Tara Expeditions was the acquisition of the unique expedition sailing schooner Tara, previously owned by Dr Jean-Louis Etienne and Sir Peter Blake.

Tara's voyages are dedicated to scientific research on the impact of global warming on the oceans by providing a platform for scientific research and exploration, and raising public awareness through these adventurous voyages. Tara's scientific program combines work on plankton, during long ocean crossings, and coral reefs, at selected islands and coastlines in between. IUCN's involvement focuses on the coral reef research components, contributing to the science program developed by Francesca Benzoni, of the University of Milano-Bicocca. While keeping a basic set of methods and research topics consistent among all sites, each coral reef leg also varies according to local interests and needs, and a changing complement of scientists.

In the first half of 2010, Tara visited three coral reef sites in the Indian Ocean – Djibouti, St. Brandons Island in Mauritius, and Mayotte. The first leg, in Djibouti, was conducted from 27 January to 12 February and included researchers from CORDIO (Coastal and Ocean Research in the Indian Ocean), the Monaco Marine Research Center, the University of Miami, and IUCN. The IUCN and CORDIO team conducted resilience and biodiversity surveys to provide an overview of the threats and state of the system at 27 different sites. One of the findings was that the reefs did not show signal of the

widespread bleaching in 1998 that affected the Indian Ocean, and that other local threats, such as sedimentation and crown of thorns seastar outbreaks, were also important determinants of reef health. Fishing pressure was, however, very high, shown by the absence of large fish and top predators at all survey sites.

Next, the Tara stopped at St. Brandons Island in Mauritius, from 22 April to 6 May – a small set of sand islands and reefs on the Cargados Carajos shoals some 400 km north of Mauritius. On this leg, scientists from the Mauritius Oceanography Institute, CORDIO, and the University of Miami were present. The islands are privately managed by a fishing company that conducts carefully controlled fishing of reef fish and astounded expedition members by having among the best fish populations they had ever seen in the Indian Ocean. Nevertheless, fabled sharks were absent from the waters, quite different from the last scientific surveys conducted in 1997, in which researchers often left the water as a result of the abundant and active sharks. The visit coincided with peak sea surface temperatures of the local summer season, with moderate levels of coral bleaching expected across much of the western Indian Ocean. Moderate levels of bleaching were found, but as yet very little evidence of any mortality.

For its last coral reef stop in the Indian Ocean, the Tara stopped in Mayotte, from 29 May to 18 June (see bottom left photo). With broad interest among French and European institutions, this leg had to be split in two parts to accommodate all scientists, adding the European Marine Biological Laboratory, IRD (Institut de Recherches et Developments) and the Museum of Tropical Queensland. This visit coincided with the end of the local summer season, and the expedition recorded the highest levels of coral bleaching and mortality yet seen in the Indian Ocean this year – affecting over 50% of corals and with mortality of over 30% at the most vulnerable reef habitats. Most of the branching Acroporas (the fastest growing and dominant corals on the reefs) were clearly pale, bleached white and dead (see bottom right photo). With over 70% cover of Acropora, the reefs have shown rapid recovery from the last major bleaching event in 1998, but it is not yet known how well they may withstand the increasingly frequent major bleaching that rising temperatures will impose.

In addition to the reef status and resilience work that was the focus of IUCN researchers, a variety of other research projects were conducted, including integrated systematics of corals, algal studies, coral calcification and bio-mineralization studies and imaging techniques.

With the end of its first season of coral and plankton work, the Tara will next cross the Atlantic and initiate its next round of coral work in the Pacific in 2011.

More information is available here: <http://oceans.taraexpeditions.org/>

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