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An international research expedition assess the biodiversity and health of New Caledonia coral reefs

A research mission on coral reefs in New Caledonia conducted in association with the IRD has just ended. Over 30 days, coral reefs around New Caledonia were assessed, confirming their exceptional status in the Pacific Ocean. This should provide additional motivation to pursue the conservation efforts of these fragile ecosystems.

The Khaled bin Sultan Living Oceans Foundation has completed an intensive, 30 day coral reef research expedition in New Caledonia aboard the research vessel *M/Y Golden Shadow*. The science team was comprised of researchers from the Living Oceans Foundation staff, Living Oceans Foundation fellows from a variety of universities, Institut de Recherche pour le Développement (New Caledonia Center), Florida Museum of Natural History, University of Miami, Nova Southeastern University Oceanographic Center in Florida, and other volunteer scientists. This multinational science team is a testimony to the value of the Foundation's *Science Without Borders*® program.

This research mission is part of a larger, six-year program called the *Global Reef Expedition* that is circumnavigating the globe to map and survey the world's reefs during a time of alarming coral reef decline, unprecedented in human history. As a public benefit organization, the Living Oceans Foundation's scientific habitat maps, reports, and recommendations are provided freely with the hopes of facilitating efforts to sustainably manage these valuable natural resources. The *Global Reef Expedition* focuses on identifying factors that promote coral health, specific threats to the reefs and how corals may adapt to changing sea temperatures and acidity.

In New Caledonia, the research team has focused their efforts on coral reefs found around Ile des Pins and Prony Bay in the South, and Cook Reef and D'Entrecasteaux atolls in the North. This geographically wide selection, despite the logistics challenges, allowed including exposed reefs around a continental island, reefs in a closed bay, a section of the longest barrier reef in the world (1600 km), and remote atolls. Except reefs in Prony Bay, all studied reefs are listed as World Heritage Areas since 2008.

Few Crown of Thorns Seastars observed

The multidisciplinary science team records diversity, abundance and population structure of corals and other invertebrates, fishes, and algae while simultaneously collecting field data to identify different marine habitats and create detailed reef habitat maps. Local New Caledonia scientists and their collaborators have focused on collecting various biodiversity datasets to study evolution, systematics and taxonomy in these remote regions of New Caledonia. Studies on coral physiology and feeding regime were also undertaken in Ile des Pins. Once all the data from New Caledonia has been fully analyzed over the next 6-9 months, the detailed survey reports and maps will be presented to the local authorities that have granted authorization to work on New Caledonia coral reefs. This includes the Government of New Caledonia, both the South and North Provinces, and the customary authorities in Ile des Pins. In addition, the High-Commissioner offices, representing France, have followed and encouraged this expedition.

Initial field observations by the scientists have been mostly positive, in context of the coral reef crisis affecting the world. The reefs of New Caledonia support diverse coral communities and fish populations with some of the most impressive numbers of the larger predators like sharks and groupers observed to date during the *Global Reef Expedition*. In the past year and half, the GRE have visited reefs in Galapagos, French Polynesia, Cook Islands, Fiji and Tonga. Executive Director of the Living Oceans Foundation, Philip Renaud, said: "It is encouraging to see that the destructive signs of Crown of Thorns Seastars (COTS) are mostly absent in New Caledonia except in the vicinity of one of the Guilbert Atolls, in the

D'Entrecasteaux group." He added, "COTS are one of the prominent threats to coral reefs of the central and southern Pacific Ocean. They often reach plague proportions and destroy entire reefs in very short timeframes."

Coral reefs still preserved

In general the reefs in the north are in very good condition, which is aligned with our expectations given their remote location and low human impacts. However, one thing is puzzling. "We have been finding a significant amount of disease affecting the table and branching acroporid corals." said Chief Scientist Dr. Andrew Bruckner. He continued, "We believe that many diseases in corals occur in response to environmental stress caused by human disturbances and climate change, so it is mysterious that a remote region like the D'Entrecasteaux Atolls is affected by coral diseases. With additional research and laboratory studies, the Foundation hopes to be able to identify some of the causes of coral disease being observed around the world."

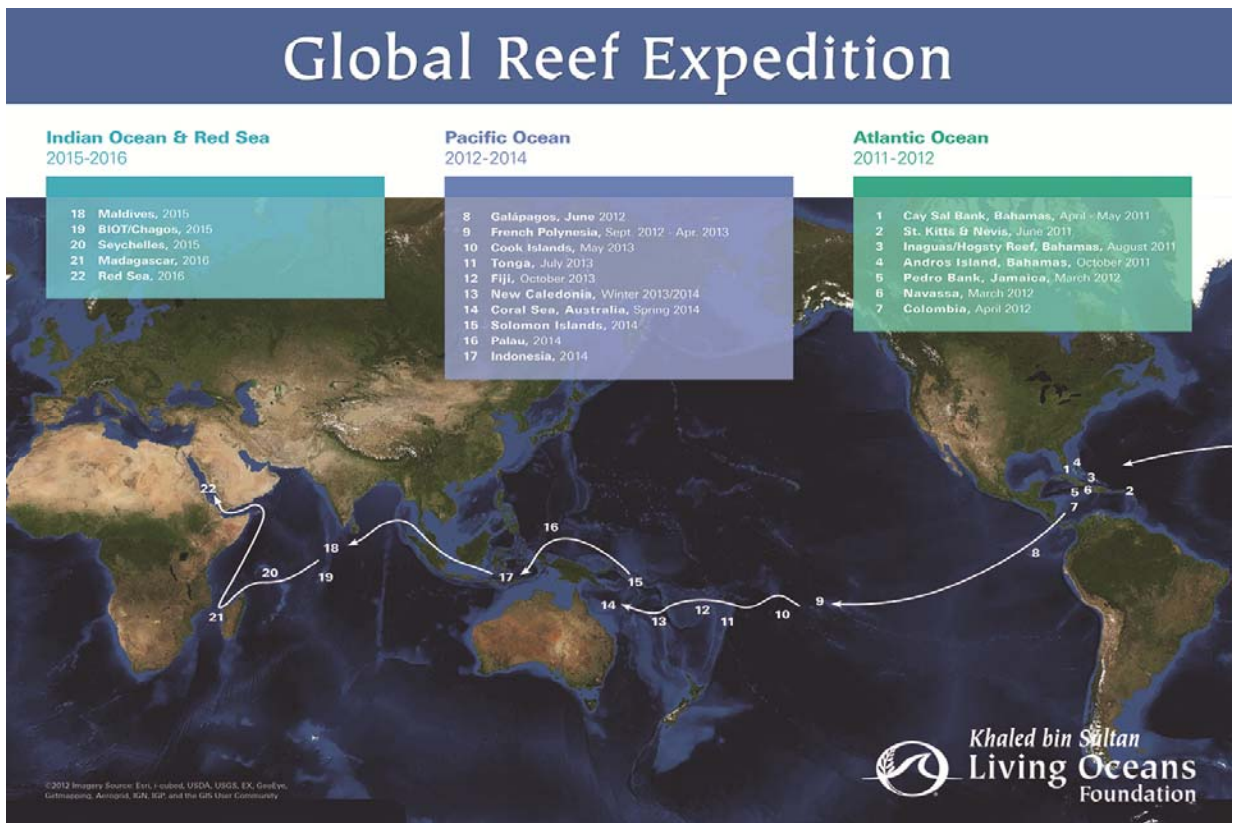
The New Caledonia scientists will continue to interact with the Living Oceans Foundation scientists in the future to ensure that the collected data, when processed and available, can be used for local reef management. In particular, new data and knowledge should be useful to the local UNESCO World Heritage Areas committees, and to identify new priorities for research. Serge Andréfouët, one of the IRD scientist on board during the entire mission said that "there is a long history of coral reef research in New Caledonia, from the pioneer work of PrCatala in the 1950's to the fundamental work of numerous taxonomists and geologists in the 80-90's, and now with more research directly linked to conservation and management, in the face of climate change."

New research fields identified

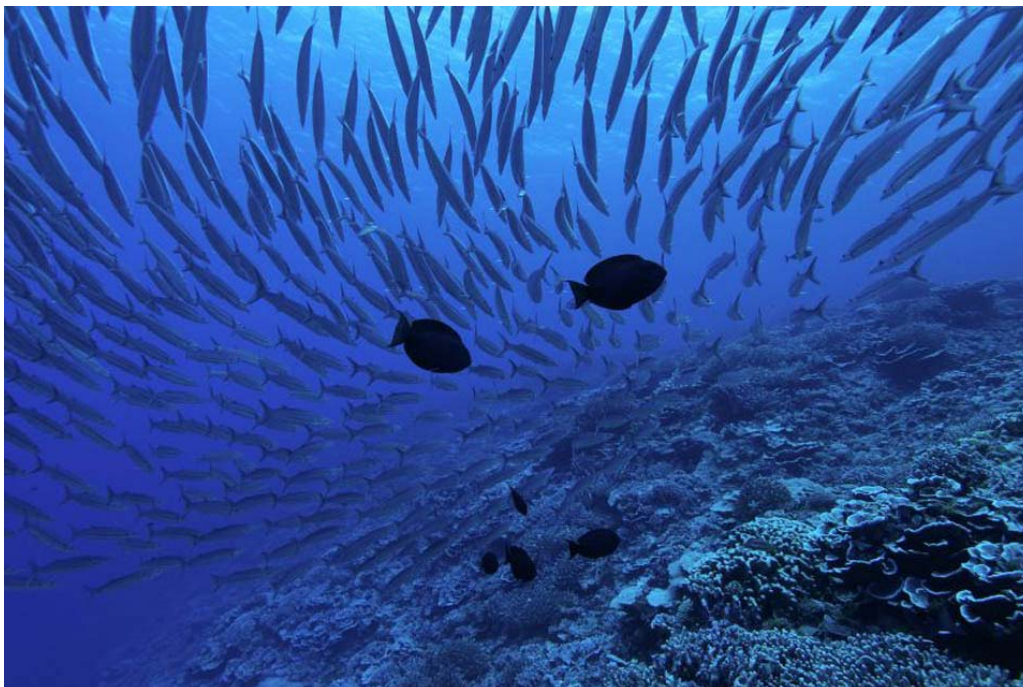
Despite the amount of expertise and knowledge accumulated on NC reefs, there are still many gaps in scientific knowledge, and reefs are dynamic ecosystems continuously changing. The large amount of baseline data collected during this expedition will enhance our understanding on how reefs are, and how they could change. It also points to new research priorities: Ile des Pins, with its colder environment and specific communities is a key area to study climate change and witness how a reef system could evolve with global warming. The work conducted on Cook Reef and D'Entrecasteaux atolls, the latter already a managed zone with integral protection in some sectors, reinforces the fact that these areas are unique. They deserve more scientific investigation to keep characterizing the different living communities and their functioning, still fairly preserved from human impacts, even if not completely. It should also provides additional motivation to the authorities to keep maintaining their conservation efforts".

The research in New Caledonia marks the end of the Foundation's sea-based research in 2013. Next year the team will return to the M/Y *Golden Shadow* to continue surveys in the Solomon Islands, the Coral Sea and the Marshall Islands.

Pictures gallery



The Global Reef Expedition covers all coral reefs in the world. © LOF



Coral reef in New Caledonia are still preserved. © LOF



The expedition is conducted aboard the oceanographic research ship Golden Shadow. © IRD / S. Andrefouët



Coral reef in the Surprise Islet. © IRD / S. Andrefouët



Petit Guibert Coral reef. © IRD / S. Andrefouët



Scientists underwater exploration. © LOF / K. Marks