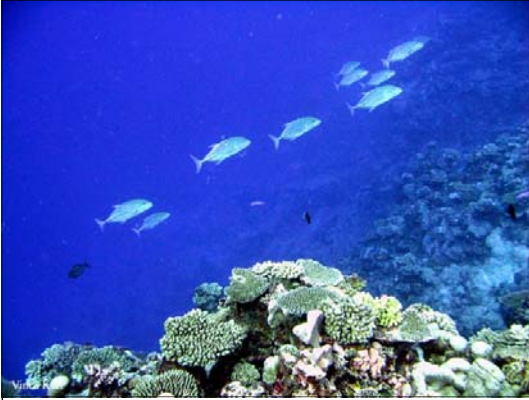


Coral Reefs Can they Survive?

Exploring a coral reef from above or below the water surface is an inspiring experience. From above, calm turquoise waters provide yachts from around the world with safe, relaxing havens to spend a few days, weeks, or months. Hop off the boat with a mask and snorkel, and a whole new vibrant world of life, colour and activity is revealed. But how long can this last? Sadly, coral reefs are among the greatest contributors to the health of our planet and are among the most threatened. OceansWatch, a conservation group with links to the world's yachting and diving communities, is raising public awareness about emerging threats to corals reefs as well as playing a positive role in providing resources for research and humanitarian aid to those places affected.



Why Are Coral Reefs Important?

Corals on a reef act much like trees in the forest: they provide both the physical structure and life supporting 'powerhouse' which supports a range of habitats (homes) for plants and animals. Different habitats, separated by variations in light (affected by both depth and shading), nutrient levels, temperatures, water movements created by waves or currents, and depths, create so many different habitats that coral reefs can lay claim to among the highest numbers of species co-existing in one area on the planet. The scientific term for this great richness of life is 'biodiversity' and coral reefs are important partially because of their high biodiversity.

Coral reefs occur in warm, relatively shallow tropical seas. Their great abundance of life seems almost out of place in these clear, comparatively barren tropical seas – sometimes referred to as 'tropical deserts' because they are so low in nutrients. But what the oceanic water lacks, the reefs make up for. A unique partnership exists between corals and the microscopic single-celled algae which live inside them. This symbiotic relationship is the basis for the complex, interconnected web of life that we call 'coral reefs'.

In these days of deep concern about climate change and control of carbon in our atmosphere, it is also worth remembering that coral reefs, like rain forests, play a very significant role as 'carbon sinks'. They do this by locking dissolved carbon dioxide into the calcium carbonate that forms their skeletons.

Coral reefs also play vital roles for the people who live along their nearby shores. They act as buffers, protecting coastlines from erosion caused by strong wave action during storms. They are also a major source of food – one estimate reveals that coral reefs provide food for one billion people in Asia alone. The larger coral reef systems may produce enough seafood to support both local consumption and a thriving export trade. Indeed, the economic value of coral reefs often plays a key role in local economies. In addition to fish and other sea food, they are a source of medicinal products and very often of thriving tourism generated by visiting divers, snorkelers, recreational fishers, sailors and other holiday makers.

Current Threats to Coral Reefs

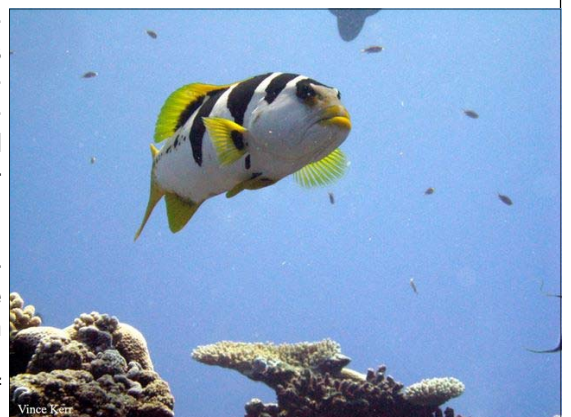
Coral reefs are in danger almost everywhere, whether as a result of local conditions or from global changes, or both. This is a very serious situation for our planet. A quarter of the planet's existing coral reefs are recognised as biodiversity hot spots, places that support unusually high numbers of different species and are at serious risk of being lost forever.

So what's killing them?

The answer, unfortunately, is a large number of different human activities and related global conditions.

Let's start with land-based activities. Unfortunately people are slow to realise the impact these can have on coastal marine life. **Pollution** in the form of silt, fertilizers, sewage, agricultural and industrial run-off is flushed down streams and rivers into the ocean. The culprit projects, such as forestry or mining, are frequently many kilometres inland. Their transported wastes damage water conditions around the reefs themselves. Silt, for example, reduces light intensity and clogs delicate coral polyps. Sewage and fertilizers unnaturally boost nutrient levels causing an algae bloom, called eutrophication, which starves reef life of light and oxygen. This can also be caused by yachts dumping their sewage on sheltered reefs where water exchange with the open ocean is restricted.

Unfortunately coral reefs, by their very nature, attract many of the activities that are causing their downfall. Local abundance of fish creates the illusion that such stocks are inexhaustible. Nothing could be further from the truth and **destructive fishing practices** such as – almost universal over-fishing, dynamite fishing (the impact bursts the swim bladders of



reef fish, causing them to float to the surface) and poison fishing (the use of cyanide to stun and capture live reef fish) have devastating effects on reef life. Commercial fishing operations among coral reefs usually target particular species of fish. For example, herbivorous (plant-eating) fish are sought-after as aquarium pets and their removal from a reef breaks a previously connected 'food chain'. Without these fish to keep it well grazed, algae can grow unchecked, overtaking the corals and other fixed reef inhabitants such as sponges, sea-fans and tubeworms.



Tourism can add more pressure to the reef, but it is sometimes possible to control. Sailboat anchoring over corals and dumping of rubbish and sewage also cause problems for the reefs and their associated marine life. Plastic bags are enemies to fish, dolphins, turtles and the corals themselves! Often the most well-meaning of visitors to coral reefs are a source of damage. Divers, snorkelers and reef walkers routinely break corals merely by touching them, a trauma that may result in the whole colony dying.

Natural Events such as hurricanes and cyclones can devastate reefs, breaking pieces of coral that have taken hundreds of years to develop. An increase in El Niño related storms in recent years has been linked to increased reef damage. These events also cause *coral bleaching*. Corals are animals made up of two parts, a hard skeleton and the soft polyp within. Inside each of these polyps live symbiotic algae, single-celled

plants using sunlight to create oxygen and nutrients which are exchanged with the coral polyps for carbon dioxide and other requirements. Certain conditions can trigger an en mass exodus of the symbiotic algae from the coral which leave it white and dying. This is what is meant by coral bleaching and the good news is that it can be reversible, with the symbiotic algae returning to the coral before it dies.

There are also times when one reef member causes havoc for the rest of the reef. 'Plagues' of Crown of Thorns Starfish have devastated large areas of coral reefs. These animals eat their way through many kilometres of reef and produce thousands of larvae which settle on nearby reefs and continue the destruction. The doubt is whether the sudden population explosions are triggered by natural causes, by human kind, or both! The response is often to gather divers together and physically remove the adult starfish from a reef area. When an outbreak was discovered in Bunaken Marine Protected Area (Pasir Panjang) in 2003, local managers, fishermen, divers and others began removing them from the reef hopefully prior to their spawning. Within a year, at least 2300 individuals were removed. There are differing views on how worthwhile such efforts are, but the action certainly prevented many local corals from being eaten by the starfish.

The most crucial threat to coral reefs right now, is the phenomenon of **Climate Change**, also known as global warming. Warmer water temperatures lead to increases in coral bleaching, as well as reduced growth rates. The increased intensity of El Niño and hurricane damage have been linked to our changing climate. Current research has shown that one effect of excess carbon dioxide in our atmosphere will be an increase in carbonic acid in the ocean. The seas will switch from the alkaline side of the pH meter to the acidic side. Just as many plants are unable to grow in acidic soils, so it is with marine life and particularly those animals that deposit calcium carbonate as part of their metabolism. Corals are top of the list. In the face of climate change, protecting corals as a possible 'carbon sink' is a positive action we can take for our planet.

How Do We Monitor Reef Health?

Traditionally, changes on the reef were witnessed by the local communities situated near the reefs. By having to head further away from the village to find a certain type of fish, a fisherman may recognize that something is wrong on the usual fishing grounds. This local information was the way most coral reef research began and still is an important way of monitoring reef health. Anecdotal, verbal and written histories and simple changes in abundance are the basis of how reefs have been monitored for hundreds of years.

With increasing technologies, come more advanced monitoring systems. The National Oceanic and Atmospheric Administration (NOAA) in the United States uses satellite imaging to assess coral reef health. Marine biologists are using a variety of technologies such as time-lapse photography and water chemistry changes to record changes on the reef.



Organizations such as Reef Check and CoralWatch are training scuba divers to observe and record what they see happening on the reef. Networks connecting those working and interested in the state of coral reefs include the Planetary Coral Reef Foundation (PCRF), the Global Coral Reef Monitoring Network (GCRMN) and the International Union for the Conservation of Nature (IUCN). Information recorded by many of the above groups is recorded by research groups at universities including Woods Hole (US), University of Queensland (Aus), UC San Diego Scripps Institute (US), and the University of Exeter's Marine Spatial Ecology Lab (UK).

What Needs to be Done?

One estimate is that 90% of coral reefs in the Pacific have not been surveyed on the basis of coral health. It is from those 10% of reefs that have been studied, that estimates have been made about the state of the rest of coral reefs. More **assessment** is urgently needed to determine where problems lie and to support management plans for the future of these areas.

Current **legislation** and **mitigation** needs to be updated, especially as research reveals areas of coral reefs that are especially at risk. This legislation includes changes to catch quotas for commercial fisheries, land-use planning especially as it relates to mining, forestry and development proposals, as well as regulations for implementation of tourism projects. In terms of protecting coral reefs, Marine Protected Areas (MPA) and Locally Managed Marine Areas (LMMA) are two initiatives available to policy makers.



Education of coral reef users is in desperate need. This should include local communities and schools, commercial operations, sailors, divers and tourism operators. Many people who spend time on reefs are not aware of how sensitive these areas are and how even seemingly unrelated stresses like sewage washed from a nearby town, or rubbish thrown overboard, can have dramatic impacts. Educating and empowering people to become stewards of these exceptionally valuable ecosystems are the key to their survival.

In terms of coral reefs which have seen significant damage, **restoration** projects are a possible way to encourage the return of healthy reefs. In places such as the Philippines, mangrove forests are being re-established along the coast. These mangroves are important to filter silt, excess nutrients and toxins out of the water before they reach the corals, as well as providing a safe nursery for juvenile fish to grow. Restoration projects are also taking place underwater. Coral reefs can re-grow after bleaching events, but it can be a slow process. Starting in the Red Sea and now taking place in Fiji, Florida and the Middle East (among others) are rehabilitation projects where pieces of healthy coral are transplanted to damaged reefs to encourage quicker re-colonization. It is a skilled and laborious task, but there have been some promising results.

What Can OceansWatch Do?

OceansWatch provides a practical opportunity to address some of the current threats to coral reefs (and other marine environments) while empowering island people with the resources to prevent continued reef damage or mediate areas where it has occurred. The OceansWatch charity is creating a global network of interested sailors, biologists, teachers, divers, social workers, philanthropists and other skilled volunteers who can share their time and resources to meet this challenge. Some provide their yachts and crews to participate on planned projects, while others give financial support or dedicate themselves to voluntary work connected with the organisation of OceansWatch's work. This network also offers education to the yachting and diving communities about how to behave near coral reefs and at anchorage.



Data collected by OceansWatch members is provided to affiliated organizations such as Reef Check, CoralWatch and other researchers. The organisation is growing organically and has received considerable support to date. As this support continues there will be more boats, including environmentally-friendly Wharram catamarans, more personnel, more equipment and more expertise.

OceansWatch is also working on education materials and humanitarian aid for communities affected by the degradation of their coral reefs. Business models are being created to empower these communities to shift towards a sustainable economic base, for example by ecotourism, finding markets, streamlining production (on products such as coconut oil and vanilla) and providing alternative energy information (solar). Education on Reef Check and CoralWatch will be provided so reef monitoring can be done by the local people. In addition, education on environmental conservation and stewardship will be provided to schools.

Through its rapidly expanding global network of concerned members with a variety of resources, OceansWatch will continue to provide much needed training, research and aid to those who share in our mission to play our part in helping to conserve our marine environment and to assist people whose livelihoods depend upon it.

You can play your part in this international effort by joining OceansWatch

www.oceanswatch.org