CLIMATE CHANGE

Stresses and Future Responses, Coral Reefs

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USP
PACIFIC CENTRE FOR ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

(Source: PACE SD EU GCCA Project)

The Importance of Coral Reefs

Globally, coral reefs cover a total ocean area of about 250,000 km^2, and are home to 25% of all known marine species, with 800 known species reef-building corals, and over 4,000 coral reef-associated fish species (Burke et al., 2012). Coral reefs are particularly vital for the health of communities and economic development; supplying direct subsistence for 30-40 million people. The Pacific region alone has about 65,000 km^2 of coral reef area (Burke et al., 2012), with Fiji having 6,704 km^2 or 3.52% of the world's total (Chin et al., 2011).

Coral reefs support fishing, aquaculture and tourism, major economies in the Pacific Islands. More than 2,500 dive centers located in 91 countries around the world take 15 million divers to coral reefs each year. Coral reef systems also provide coastal protection from cyclones and erosion. Coral reefs are known as the "rainforests" of the ocean, with the greatest biodiversity in the world, and a large number of new medicinal drugs for curing illnesses like cancer and malaria and active products are derived from marine organisms each year.

Stresses on Coral Reefs

Unfortunately there are a number of both natural and human-induced negative pressures on coral reefs globally, resulting in their decline.

These stresses include:

- Climate variability and change increase sea temperatures, ocean acidification, pathogens, frequency of cyclones, and El Niño events such as the extensive 1982-83 and 1997-98 coral bleaching events in some eastern Pacific reefs
- Agricultural and other pollutant discharges which choke reefs with sediments and nutrients, promoting algae-dominated systems
- The removal of coastal mangroves (which act as natural barriers, fish nurseries and sediment filters) increasing sediment load on coral reefs and decreasing biodiversity
- Overfishing destroying the ecological balance of reef predators and herbivores, and fishing methods using explosives or poisons which destroy the reef and kill all organisms
- Uncontrolled tourism, anchoring and diving equipment can disturb the reef

Vibrant Fiji coral reefs with both soft and hard corals (BBC Nature)

- Mining and deforestation in watersheds can cause soil erosion and sedimentation that can choke and smother the coral

- The removal of ocean resources such as coral blocks or sand destabilises reef systems

A bleached coral reef in Fiji (WWF)

Globally, at least 60% of all coral reefs are at risk of destruction – populations of fish and freshwater vertebrates have declined by nearly 50% and 40% of ocean fish stocks are overexploited compared to 20% in 1992. In Fiji, a massive bleaching event in the year 2000 killed 40-80% of corals, although many reefs returned to pre-bleaching levels within 6 years (Sykes, 2007). These numbers more than anything else show that governments have failed to live up to the provisions of 1992's Rio Declaration and Agenda 21.

Losses in coral reef systems can impact other species such as seabirds, turtles, sea grasses and mangrove systems. Key environmental impacts include changes to coral cover, reef structure and biodiversity. The ecosystem services that will be impacted include declining shoreline protection, tourism, fisheries, recreational amenity and cultural value.

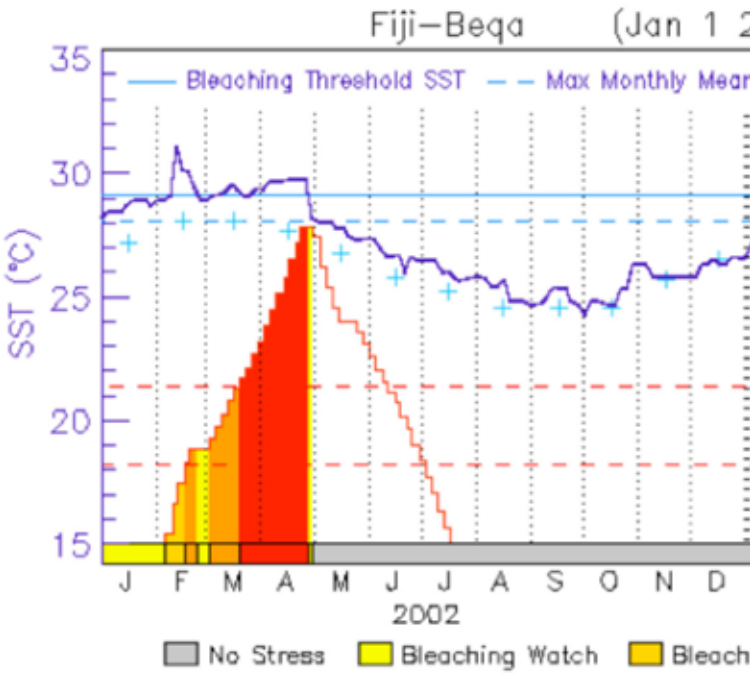


Figure 1: Satellite Virtual Station time series graphs display Degree Heating Weeks (DHW) for Beqa Island, Fiji (Courtesy

Impacts of Climate Change

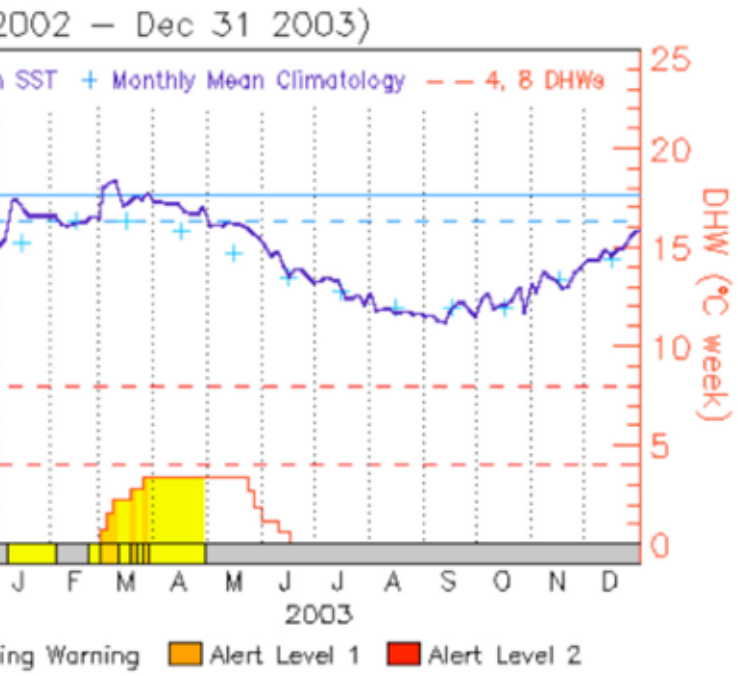
Of paramount concern are the impacts of climate change on coral reef systems including:

- Projected rising sea surface temperature are likely to result in dangerously frequent coral bleaching and irreversible damage; see Figure 1

- Rising concentrations of atmospheric carbon dioxide make the ocean more acidic (vinegar is a weak acid, and hydrochloric acid is a strong acid). Ocean acidification will restrict the ability of reef-building marine organisms like corals to form skeletons

- Increasing pathogen development and disease transmission, driven by rising sea surface temperatures

- Increasing atmospheric carbon dioxide alters the calcification process for coral skeletons



*the sea surface temperature (SST) and Coral Bleaching
NOAA)*

Adaptation and Strategic Responses

Successful management strategies in the Pacific includes :

- Establish locally managed marine protected areas (LMMAs) to protect reefs
- Protect coastal and land areas near reefs and replant mangroves to decrease inputs of sediment, nutrients and other pollutants
- Prevent deforestation of native forests in coastal areas
- Prevent over-fishing, for instance through the establishment of marine protected areas (MPAs) or tabu areas
- Prevent deforestation of native forests in coastal areas
- Encourage reef-friendly dive practices at resorts, dive centers and local communities

It is also important to note that the ecological adaptation of corals themselves is worthwhile to consider.

Historically, coral reef systems have shown that they are resilient and can cope with changes, thus changing the question from 'can corals adapt' to 'how fast and to what extent can they adapt' before it is too late?

In the Pacific, what we need to take up as a priority action is EDUCATION.

That is, education about the importance of responsible fishing, reef friendly tourism, sustainable management and protected areas.

For coral reef bleaching forecasts:
http://coralreefwatch.noaa.gov/satellite/index.html

References

Chin A, Lison De Loma T, Reytar K, Planes S, Gerhardt K, Clua E, Burke L and Wilkinson C. 2011. Status of Coral Reefs of the Pacific and Outlook: 2011. Global Coral Reef Monitoring Network, 260 p.

Burke L, Reytar K, Spalding M and Perry A. 2012. Reefs at Risk Revisited in the Coral Triangle. World Resources Institute, 72 p.

Sykes H. 2007. Status of Coral Reefs in the Fiji islands 2006. Fiji Coral Reef Monitoring Network/GCRMN/CRISP, 64 p.

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