Coral decline in the Pacific Islands

Top left: Pieces of dead coral reef scattered on a beach remind us of a habitat lost.
Right: Live corals provide vital fish habitat.

Description: Coral reefs are the ocean's equivalent to terrestrial rainforests. By providing a protective habitat, they offer sanctuary to arguably the most diverse plant and animal communities of any marine system. Fish and invertebrates thrive on coral reefs, particularly areas with high coral diversity, because of the abundant and varied food sources, the variety of niches to inhabit, and the opportunities to reproduce. Coral reefs act as a natural coastal buffer by protecting the shore from erosion and storm effects, and they provide humans with areas to collect fish, invertebrates, and seaweeds for food. Shallow areas for swimming, sandy beaches, and great snorkeling areas are all a result of healthy coral reef communities, and often support Pacific island economies.

Corals are relatively simple colonial invertebrate organisms, yet they are able to create complex coral reef structures. Symbiotic algae, called *zooxanthellae*, live within coral tissue and provide nutrients and oxygen to their host. They are critical to the survival and growth of most reef-building coral species. Corals sequester dissolved calcium carbonate from seawater with their fleshy tentacles, then use this material to construct a protective stony skeleton. Long-term accumulations of this material can result in massive individual coral colonies, and ultimately result in the creation of sometimes kilometer-scale coral reefs.

Threats: Globally, coral communities face many natural and man-made threats, and populations have declined dramatically in the past 30 years. Threats to Pacific island reefs include: global climate change, benthic invertebrate disease, over-exploitation which can lead to altered food webs, destructive fishing practices (blasting and chemical poisoning), and physical damage associated with human visitation (see photo at left). Also, coastal development projects in the Pacific islands are often associated with increased sedimentation, water pollution, and algal blooms on surrounding reefs.

Scientists are scrambling to predict the effects of global climate change on coral reefs. Predictions include: coral reef 'drowning' as a result of sea-level rise and the inability of corals to survive at the appropriate depth, increased incidence of coral bleaching (*zooxanthellae* expulsion from coral tissue) and disease due to heightened sea surface temperatures, physical destruction of coral reefs following more frequent storm events, and elevated seawater acidity resulting in the inability of corals to accrete limestone.

Although many coral reef habitats of the Pacific islands are considered 'pristine' and healthy, such as in the Northwest Hawaiian Islands, human-induced environmental changes threaten all reefs, no matter how remote. Healthy coral reefs remain resilient to acute disturbances, such as infrequent storms, but with chronic disturbances, such as steadily rising seawater temperatures, corals are less capable of full recovery. Without protective or carefully proactive management, coral reefs run the risk of continued decline.

Management: Fortunately, Pacific island national parks and federal marine reserves offer protection to regional coral reef ecosystems. Adaptive management techniques such as fish harvest limits, regulated visitor use, public educational and stewardship programs, as well as careful inventory and monitoring studies help to ensure the ongoing survivorship of coral reefs.

—D. McKay and L. Kramer

Left: Walking on coral reefs crushes and kills the slow growing organisms. This photo was taken near a PACN park. **Above:** A tiny Christmas tree worm (*Spirobranchus giganteus*) makes its home on a coral.