REFLECTIONS

A New Threat to Coral Reefs

Mark M. and Diane S. Littler
Department of Botany
National Museum of Natural History
Smithsonian Institution
Washington, D.C.

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Coralline lethal orange disease consuming the reef-building coralline alga *Porolithon onkodes* on Aitutaki Atoll, Cook Islands during June 1993.

Coral reefs are the most threatened ecosystem in coastal areas worldwide, due mainly to habitat destruction. A coral reef is a highly complex symbiotic system, involving coral animals, coralline algae, and other autotrophic organisms that are intermingled with the coral animals. In coralline algae, the cellulose cell walls are heavily impregnated with calcium carbonate. Coralline algae contribute greatly to the overall food production in coral reefs.

Reef-building coralline algae, particularly *Porolithon onkodes* in the Pacific, are the principal cementing agents that maintain the reef crest. The intertidal wave-resistant reef crest is a critical component of many reefs because of the protection it affords, which permits the development of other shallow-water reef communities as well as absorbing wave forces that could erode emergent land masses. There are no previously known diseases that cause significant mortality of coralline algae.

We have recently discovered a bacterial pathogen (perhaps better characterized as a predator) that is distributed and abundant in Rarotonga and that rapidly spread during 1993 throughout the Great Astrolabe Reef, Fiji. Due to the importance of coralline algae in reef ecology and carbonate accretion, pathogens that result in their mortality should be cause for considerable concern. For example, when corals undergo large-scale mortality (due to disease, environmental stress, severe storms, human influences, or predation), reef-building coralline algae may increase in relative dominance, thereby compensating for potential reductions in primary productivity and carbonate accretion. Because of the critical role played by coralline algae on Indo-Pacific reefs, coralline lethal orange disease represents the first case of a widespread algal pathogen having the potential to influence tropical reef ecology and reef-building processes. In addition, human activities are a major cause of the widespread destruction of coral reefs.

Relationships of this sort are of great importance for biological control. If the prey becomes so rare that it is an infrequent event for the predator species to encounter it, the predator itself may become extinct. Ideally, in the case of deliberate biological control, the prey will survive in small numbers, thus making it possible for small populations of the predator to survive as well and for the prey species to be controlled indefinitely.

In Australia, prickly pear cactus (*Opuntia*), introduced from Latin America, once overran the ranges and became so abundant that vast areas were effectively closed to cattle grazing (figure 24.15). The situation was changed dramatically with the introduction of the moth *Cactoblastis.* The larvae of the moth feed on the pads of the cactus and rapidly destroy the plants. Within relatively few years, the moth had reduced the cactus to the status of a rare species in many regions where it was formerly abundant. It is now exceptional to find an individual of *Cactoblastis,* but the moth is still present and evidently keeps the cactus in check.

The future is more problematic for the American chestnut (*Castanea americana*), a species of tree that has virtually been driven to extinction by the accidental introduction of

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