Study Reveals Reefs Enhance New Jersey's Marine Environment

Results from a recent reef colonization study conducted from 1996 to present by the Division of Fish and Wildlife indicate that New Jersey reefs support hundreds of times more marine life than the sandy sea floor. The study was conducted to determine the types and amounts of marine life that colonize ocean reefs and to compare those levels with what is normally found on the sandy bottom. It was an attempt to answer the question: Do reefs *produce* marine life or simply *attract* it?

The study began in 1996 when 30 experimental reef habitats were placed on the Barnegat Light Reef Site. Each habitat consisted of a 3' x 1' x 1' plastic-coated wire box embedded in a concrete base. The boxes were filled with a variety of materials to imitate the hiding places found on reefs and to duplicate common reef-building materials. Each box contained 10 corrugated fiberglass panels, 50 whelk shells (large snails) and eight plates of four common, reef-building materials, steel, concrete rock and tire rubber.

Over the past five years, scuba divers retrieved a total of 10 habitats from the ocean reef site. The divers encapsulated each habitat in a plastic drum to capture all of the marine life inside. After each year's collection, Fish and Wildlife biologists spent four months in the lab removing, sorting, counting, identifying and weighing the marine life living within the experimental habitats. What they found was impressive. Over 145 species of marine life, including fish, crabs, shrimp, lobster, mussels, barnacles, starfish, urchin, snails, worms, sponges, anemones—and many more—had colonized the small, experimental habitats.

Biologists estimate that a one-square meter area of reef habitat is home to 432,022 individual marine organisms. In an area the size of a card table, the reef provided homes for 118,651 mussels, 29,310 barnacles, 4,626 anemones, 16,626 worms, 2,349 urchins, 3,545 crabs, 22 lobster and 133 young fish less than four inches long. In addition, the habitat also was colonized by colonial encrusting organisms such as stone coral, bryozoans, hydroids and sponges, that could not be enumerated, but collectively accounted for hundreds of thousands of organisms. These experimental habitats have the population of a city in a microcosm. The total biomass of all these organisms amounted to 129 pounds. Biomass is a biologist's measure of the weight of all the organisms living in a particular habitat. In this study, biomass referred to the weight of all marine life inhabiting a square meter of sea floor.

The Division also collected 60, one-foot-square samples of the sandy sea floor near the Cape May reef. A similar area (square meter) of sandy sea floor naturally has only about 2.5 ounces of marine life. Thus, on an equal area basis, reef habitats have 825 times more biomass than the sandy bottom. Reef structures are three-dimensional and thus, offer more attachment surfaces for marine life growth than the two-dimensional sea floor. Also, the firm substrate of a reef structure enables encrusting organisms to withstand storms which stir up the sand bottom. The numerous crevices and holes of a reef offer fish, crabs and other mobile animals secure places to hide from predators.

Experimental reef habitat fully colonized by marine life.

The increased biomass of the reef habitat is significant because it represents a far greater food source for ocean predators. The study revealed that marine life populations on the habitats which were exposed to predation were reduced by over 45 percent due to feeding by fish, crabs, lobster and starfish. The investigation also demonstrated that there were no significant differences in the colonization of various reef materials—concrete, rock, steel and tire rubber. Apparently, mussels, barnacles and other encrusting organisms are not discriminating, they just require something firm upon which to attach. Manmade materials (concrete, steel, rubber) are just as productive as natural rock.

New Jersey reefs are colonized entirely by marine animals. The depths on reef sites, generally over 60 feet, are too great for the penetration of sufficient light to sustain plant growth. Instead of plants, the foundation of the reef food-web consists of many species of filter feeding animals that live attached to reef structures and feed by straining the plankton carried past them by ocean currents. Filter feeders (i.e. mussels, barnacles, tubeworms and others) are in turn eaten by fish, crabs and lobsters. Stationary filter feeders serve another function on the reef by providing a carpet of cover or hiding place for small mobile invertebrates such as shrimp, snails and worms. These animals also may become food for larger predators that comprise this trophic web.

The goal of building reefs, which provide firm, stable substrate for the attachment of marine organisms, is to enhance the biological productivity of the sea floor. Based on the results of this study, reefs do enhance New Jersey's marine environment. By providing new homes for fish and shellfish, reefs also create new fishing grounds for anglers and interesting attractions for scuba divers.

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