



A Quick Little Quiz about a Keystone Herbivore

Martin "Skip" Moe, Marine Biologist



***Diadema* urchins can produce millions of eggs at spawning and it may be possible to rear large numbers of juveniles for restoration experiments. Martin Moe, shown here attempting controlled spawning of these urchins, is working with the Mote Marine Laboratory to develop the basic techniques for large scale propagation of *Diadema* urchins.**

What coral reef animal was super abundant on the reefs of the Florida Keys 30 years ago, and was abhorred by lobster divers and greatly feared by snorkelers? Another clue--this animal suffered a great plague in 1983 that reduced its numbers throughout the western tropical Atlantic by about 98 percent. At first, most divers were happy to see them gone because they were no longer subjected to frequent and painful encounters with this little beast.

The answer, of course, is the long-spined sea urchin, *Diadema antillarum*. This species was the keystone herbivore on the coral reefs of the tropical Atlantic Ocean.

The ecological importance of the grazing done by the *Diadema* urchins was soon very apparent when the large fleshy macro algae quickly began to overgrow corals and trap coral-killing sediments on and near corals. At first, it was thought that because of their vast reproductive potential, *Diadema* would recover quickly to their previous population levels. But after almost 25 years this has not occurred, and the reefs continue to decline. The loss of *Diadema* is not the only cause of the decline of our coral reefs, but was a tipping point, and many of the problems we are facing today are a result of that catastrophic loss. Our reefs have little chance of resisting the effects of global warming and human impacts without the natural presence of an effective grazer to maintain the balance between coral and algal growth.

Diadema are still present on Florida reefs, but are widely scattered over extensive reef areas. Thus, individuals are isolated and as broadcast spawners, their eggs and sperm are released so far apart that fertilization is ineffective and their reproductive potential is severely compromised. It may be many, many decades, if ever, before they regain their past population levels.

We may, however, be able to help them return to the reefs. There are two avenues for this effort. The first is to relocate and concentrate the small juveniles that settle each summer and fall on the shallow rubble zones on the reef crests. These rubble areas are very suitable for settlement of juveniles, but the storms of fall and winter churn these rocks and destroy the little urchins before they can reproduce. Moving them to deeper reefs where they have a chance to grow to adults helps both the reefs and the urchins. Ken Nedimyer is spearheading the effort to save these at-risk urchins.

The second avenue is to culture and grow these urchins in the laboratory to a size that allows them to best survive on the reefs and use them, along with the juveniles rescued from the rubble zones, to create and maintain "*Diadema* reefs" at various intervals all along the reef line. These *Diadema* reefs will allow certain high value reef areas to grow and live with the historic natural balance of coral and grazers and also provide areas of urchin densities that will facilitate natural *Diadema* spawning.

In summary, the Florida Keys National Marine Sanctuary, Mote Marine Laboratory, Florida Institute of Oceanography, The Nature Conservancy, Ken Nedimyer and myself are working together to rescue at-risk rubble zone juveniles and develop the technology for production of laboratory cultured juvenile *Diadema* urchins for experimental restoration on specific coral reefs of the Upper Keys. If these efforts are successful, we may, through science, management, and community effort, be able to restore the natural balance of coral and algae to at least some of our most valuable coral reefs.



Ken Nedimyer, a marine biologist and marine life fisherman, has worked on research projects to move and save as many of these valuable algae grazing urchins as possible to help extend their populations and effect some control of algal growth on certain reef areas. Here, Ken is collecting these urchins on the rubble zones of Conch Reef.