

SPINY LOBSTER & MARINE ZONES

FLORIDA KEYS NATIONAL MARINE SANCTUARY

Spiny Lobsters are Valuable Invertebrates

Also known as crawfish, spiny lobsters are widely enjoyed as food throughout the Caribbean. They are harvested by recreational and commercial scuba divers and by commercial fishermen. In the Florida Keys, commercial lobstering brings in over five million dollars annually to the local economy. To help sustain the fishery, state and federal fisheries councils have placed restrictions on the size and numbers of lobsters harvested during the open season for both the commercial and recreational fishery.

Caribbean spiny lobsters (*Panulirus argus*) are marine invertebrates found throughout the Caribbean. They are closely related to crabs, shrimp, and other decapod (10-legged) crustaceans. Keenly adapted for their bottom-dwelling, or benthic, existence, adult lobsters have a hard outer shell (exoskeleton), long antennae for defense and a tail that enables them to escape quickly by swimming backwards. These nocturnal and highly mobile animals sometimes migrate long distances in lines called queues. Lobsters can live up to 15 years and reach three feet or more in overall body length.



This lobster was fitted with an acoustic tag to track its movements.
Photo courtesy of Larry Benvenuti



A post-larval lobster fits on a human thumb.
Photo: FWC Fish and Wildlife Research Institute

Spiny Lobsters Use Different Habitats During their Life Cycle

When it comes time to reproduce, a mature female spiny lobster usually selects the largest available male as her mate, then cares for her fertilized eggs before releasing the larvae into the ocean. A larval lobster may spend up to nine months drifting in the ocean currents before shedding its exoskeleton multiple times in a process called molting. This new post-larval form then swims toward shallow coastal waters and settles down on the seafloor where it assumes a benthic lifestyle. After settling in algae and living alone, young lobsters begin to congregate in hard bottom habitat. Adult lobsters spend their days in deeper waters further from shore hiding in rocky or reef crevices, and actively forage at night on the sand and grass flats for clams, conch and other prey.

Marine Zones Protect Critical Habitat

In 1997, after seeking input from anglers, commercial fishermen, environmentalists, and other stakeholders, the Florida Keys sanctuary implemented several types of marine zones. These zones set aside areas for specific activities to balance commercial and recreational interests with the need for sustainable ecosystems.

Three types of highly protected zones* were implemented in sanctuary waters. All three types are closed to lobster fishing and most other consumptive uses. Sanctuary Preservation Areas (SPAs) were implemented to protect coral reef habitat and to separate divers and anglers at popular reef sites, while Research-only Areas are closed to entry and were set aside to provide untouched habitat for scientific study. Ecological Reserves, including the one at Western Sambo in the Lower Keys, promote biodiversity and ecological integrity by protecting an entire range of habitats from the mangrove shoreline, across the seagrass meadows to the coral reef.

<http://floridakeys.noaa.gov/>



Scientists Study Lobsters in Marine Zones

As part of the sanctuary's Research and Monitoring Action Plan, scientists from the Florida Fish and Wildlife Conservation Commission launched a long-term monitoring program to track spiny lobster populations within and outside of three highly protected zones. From 1997 to 2006, researchers conducted surveys in the Western Sambo Ecological Reserve, Looe Key SPA and Eastern Sambo Research-only Area, and in three corresponding fished areas used for comparison purposes. During these visual counts, the size, sex, molt stage, reproductive state of females, den number and depth were recorded for each lobster encountered. These data provided information on lobster size, abundance and population structure within and outside of the three highly protected zones.



Lobsters use their pair of long antennae for defense.

Larger Lobsters Are More Abundant in the Reserve

The long-term monitoring results showed that prior to the zones, very few study sites had lobsters larger than the minimum legal size for harvesting. After 10 years of zone protection, though, legal-sized lobsters were significantly more abundant within the Western Sambo Ecological Reserve when compared with the corresponding fished site and when compared with the two other protected zones, Looe Key SPA and Eastern Sambo Research-only Area. This study shows that while the SPA and Research-only Area offer significant protection for adult lobsters and critical reef habitat, these smaller zones are not large and diverse enough to fully protect these mobile animals throughout their complex life cycle.

Size Data and Abundance Trends Point to Migration from Reserve

Larger lobsters from the Western Sambo Ecological Reserve (those with a carapace size greater than 4 inches) may be migrating to nearby fished sites. The reserve itself had the greatest proportion of large lobsters, but two nearby fished sites also had high proportions of larger lobsters, suggesting that lobsters may have moved from the reserve to these sites. Lobster abundance data also support the idea that migration from the reserve may be occurring. While the greatest positive trend in increasing lobster abundance was seen within the reserve, similar, but smaller trends were observed at the two nearby fished sites.

Acoustic Tagging Tracks Lobster Home Range

To learn more about lobster movements, especially at night, scientists fitted selected lobsters within and around the Western Sambo Ecological Reserve with acoustic tags and tracked their movements for several weeks during different times of the year. The tracks reveal that many individual lobsters, both male and female, have foraging and sheltering habitat that they visit routinely. The lobsters also have alternative habitats and may shift their sheltering or foraging preference from time to time. Female lobsters sometimes made trips lasting several days during the spring and summer reproductive season to release fertilized eggs into deeper waters beyond the forereef. These studies have shown that lobsters routinely cross the boundary on the ocean side of the reserve when undergoing nomadic movements or when migrating to release eggs in the deeper ocean currents.

Large Ecological Reserve Offers Protection for Life

Results from the zone monitoring and acoustic tagging studies indicate that a resident population of spiny lobsters is becoming established in the Western Sambo Ecological Reserve and some larger individuals may be migrating to nearby fished sites. As lobsters move through their life cycle and daily activities, the reserve, with its range of habitats, appears to be sufficiently large to protect a certain portion of the adult population. Protected lobsters can live relatively long lives and the full benefits of reserve protection may become even more evident as further research is conducted. Scientists are continuing to monitor spiny lobsters within and outside of marine zones and have now adopted area-based surveys that include habitat analysis. For more information, visit http://floridakeys.noaa.gov/research_monitoring to read the sanctuary's zone monitoring report.

* Also called No-take Marine Reserves (NTMRs)

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