

# ELKHORN AND STAGHORN CORAL SURVEYS

## FLORIDA KEYS NATIONAL MARINE SANCTUARY

### Scientists Study Threatened Corals

Coral researchers from Nova Southeastern University (NSU) Oceanographic Center (formerly with University of North Carolina Wilmington) have been conducting annual surveys of corals and other reef organisms in the Florida Keys National Marine Sanctuary since 1999. In more recent years, surveys have focused on staghorn coral (*Acropora cervicornis*) and elkhorn coral (*A. palmata*). In 2006, these two important reef-building species were listed as threatened under the Endangered Species Act due to significant declines in their populations throughout the wider Caribbean, including the Florida Keys.

Declines and lack of recovery have most likely resulted from a combination of stressors that has also affected other marine life in the region. Widespread coral bleaching (the loss of beneficial algae living in their tissues) and disease, especially white band disease, have caused significant losses in *Acropora* species in the past and still threaten their recovery. Destructive storms and predation by coral-eating snails, damselfish and fire worms have also contributed to tissue loss and mortality.



Nursery-grown corals thrive after being transplanted.  
Photo: Coral Restoration Foundation

### Surveys Collect Information on Habitats and Populations

Surveys of benthic (bottom) reef habitat have provided sanctuary managers with critical information on habitat distribution, sizes, and condition of staghorn and elkhorn corals in Keys' waters. Data have also been used to estimate the population, or total number of coral colonies, of each species. Surveys were conducted in collaboration with state and federal partners and encompassed a variety of coral reef habitats including hard-bottom, nearshore reefs and deeper fore-reefs to a depth of 89 feet. Sites were located throughout the Keys and both inside and outside of sanctuary protected zones (Sanctuary Preservation Areas, Research-only Areas, and Ecological Reserves).

Over the years sanctuary biologists have developed techniques to restore coral reefs damaged by vessels. Today, restoration efforts are also focusing on reefs that until the recent past had dense stands of staghorn coral. In a project coordinated by The Nature Conservancy and funded by a NOAA grant, thousands of nursery-grown staghorn corals are being transplanted to reef sites in the sanctuary where they once grew. Corals are being grown in underwater "nurseries" maintained by The Coral Restoration Foundation, Mote Marine Laboratory and Florida Fish and Wildlife Conservation Commission.

At each survey location, science divers recorded the number of *Acropora* coral colonies, sizes of colonies, live tissue area and general condition of corals found within 3.3 feet on either side of a 50 foot tape measure, or transect line. During the surveys, scientists also recorded the presence and condition of other corals, long-spined urchins (*Diadema antillarum*) and marine debris. Since 1999, over 2,100 sites in the Florida Keys have been assessed and data are available for each species by location, habitat type, colony size and zone type (inside vs. outside of a sanctuary protected zone).

### Most Staghorn Corals are Located Outside of Sanctuary Zones

In the 2012 Keys-wide surveys that included 600 locations from northern Biscayne National Park to Key West, staghorn coral colonies were found in nearly every reef habitat type. Mid-channel and offshore patch reefs, as well as shallow hard-bottom and inner reef tract habitats, had the greatest colony densities (measured as the number of corals per square meter). Colony sizes were also greatest in these habitats. Historically, large thickets of staghorn also existed on some deeper fore-reef areas, but such thickets have not been documented in the past decade. Population estimates indicate that approximately 98% of the existing staghorn corals in the Florida Keys, excluding the Dry Tortugas, are located outside of sanctuary protected zones.

<http://floridakeys.noaa.gov>



## Staghorn Colonies Tend to Be Small in Size, but Number in Millions

Measurements of staghorn colonies show a predominance of smaller-sized colonies, with about 65% of the colonies measuring less than 12 inches in diameter. This result has been evident for over a decade and suggests that while staghorn corals are broadly distributed in the Florida Keys, they are not attaining very large sizes or developing into larger thickets. Only 4% of the staghorn corals had a maximum diameter of 27 inches or greater. In addition, predation by snails, damselfishes and fire worms continues to be observed on relatively small colonies. Despite these continued threats and relatively small size of colonies, the population of staghorn corals in the Florida Keys has been stable since the study began in 1999. NSU scientists estimate that staghorn colonies number in the millions, thereby providing ample seed stock for recovery. Additionally, successful restoration results with staghorn corals in offshore nurseries suggest that environmental conditions support recovery of this species.

## Most Elkhorn Corals are Found on Spur and Groove Reefs

Elkhorn coral is much less abundant than staghorn coral and NSU scientists estimate that the remaining Keys' population is several hundred thousand colonies. Surveys of elkhorn coral indicate that it is also less broadly distributed than staghorn coral.

Although most of the spur and groove reefs in the Florida Keys were assessed in 2012, elkhorn corals were present at only 20% of the sites visited. Surveys from the late 1990s documented a few elkhorn coral colonies on offshore patch reefs, back-reef rubble, and shallow hard-bottom habitats. However, in 2012, nearly 80% of the elkhorn colonies were found in only two habitat types, high-relief spur and groove reefs and offshore patch reefs. Prior to the die-off that began in the late 1970s, elkhorn coral was found in major thickets at perhaps two dozen locations throughout the Florida Keys, reflecting the named reefs found on nautical charts. Today, elkhorn is found at less than half the sites where it previously thrived in recent history.

Elkhorn corals exhibited a mixture of size classes with both large and small colonies detected. A few spur and groove reefs in the Florida Keys support stands or thickets of elkhorn corals, not just isolated colonies. For example, South Carysfort Reef, Horseshoe Reef, Grecian Rocks and French Reef have thickets that range in size from 49 to 65 feet in diameter. Most, but not all, thickets are located inside Sanctuary Preservation Areas (SPAs). When compared with nearby sites outside of protected zones, the density, average colony size, and occurrence of elkhorn corals were all greater inside the protected SPAs. Approximately 52% of the elkhorn coral population in the Florida Keys, excluding the Dry Tortugas region, is found within sanctuary protected zones. This result is not surprising since many protected zones are located at popular diving sites in high relief spur and groove reef habitat where elkhorn corals were historically abundant.



Large elkhorn thickets are found on some fore reefs.

## Study Highlights Habitat Differences of Acropora Corals

Results from the surveys identify which habitats currently support elkhorn and staghorn corals and therefore could be important for species' recovery. Elkhorn coral is found primarily on spur and groove formations located on the fore-reef, even though it once formed abundant thickets on many reef flats. Staghorn coral is found in a variety of habitats, but is especially prevalent in patch reefs and shallow hard-bottom areas where smaller colonies predominate. Until relatively recently, deeper fore-reefs also supported staghorn thickets.

## No-trap Zones Help Prevent Damage to Corals

For years, sanctuary anchoring regulations and mooring buoys have helped prevent anchor damage to corals. In 2012, NOAA Fisheries Service, the agency charged with managing threatened marine species, implemented 60 relatively small no-trap zones around known stands of staghorn and elkhorn corals in federal waters within the Florida Keys National Marine Sanctuary. These zones, which prohibit the use of commercial lobster traps, are expected to reduce injuries to corals from traps that move during storms and damage corals. Coral survey data collected by NSU scientists were used by fisheries managers to identify coral stands that were candidates for the no-trap designation. While many elkhorn corals are located within SPAs where fishing is not allowed, no-trap zones will offer additional protection to corals outside these areas. Scientists will continue to monitor these two threatened species to provide critical information to ecosystem managers.