Population, Density, Size Structure and Condition of *Acropora* Corals

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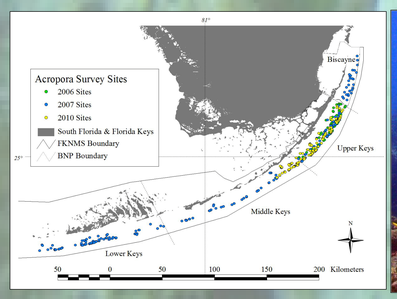
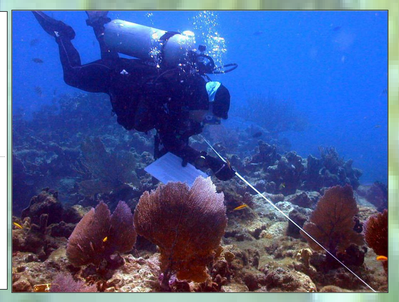
Background

Population declines of staghorn coral (*Acropora cervicornis*) and elkhorn coral (*A. palmata*) are often-cited examples of Caribbean reef change since the 1970s, due, in part, to disease and localized effects from storms and predation. Both corals were listed as threatened on the U.S. Endangered Species List based upon range-wide decline and poor recovery.

Staghorn coals* (Acropora cervicornis) *(top) are more widely distributed than elkhorn coral* (Acropora palmata) *(bottom), but are more abundant and larger on channel and offshore patch reefs. Elkhorn is most abundant on the shallow platform margin, but large thickets are now relatively rare and restricted to a few reefs such as Sand Island, Grecian Rocks, and South Carysfort Reef.

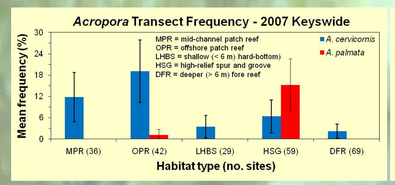


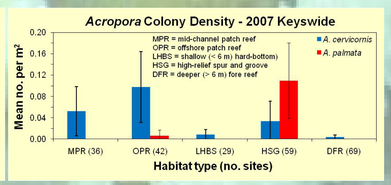


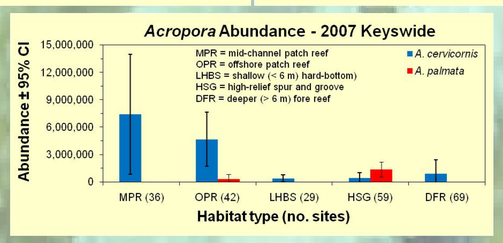
Focused surveys for* Acropora *corals in the Florida Keys were conducted during 2006, 2007, and 2010 (left). Diver-based surveys (right) quantified the transect frequency of occurrence, colony abundance, size (tissue surface area), and condition of colonies.

Survey Methods

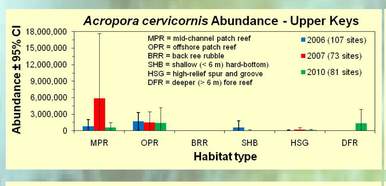
A two-stage stratified sampling design using belt transects incorporated cross-shelf habitats from the nearshore island platform to the deeper fore-reef slope to ~27 m depth, as well as along-shelf position and sites inside and outside of no-take zones. A total of 4,212 belt transects encompassing 1,053 sites and 66,920 m^2 of benthic habitat were surveyed for site presence and transect frequency of occurrence from 1999-2009. Focused surveys of colony density, colony size, and condition (disease and predation) were undertaken at 107 sites during 2006 in the upper Keys, 235 sites Keys-wide in 2007, and 120 sites in the upper Keys in 2010.

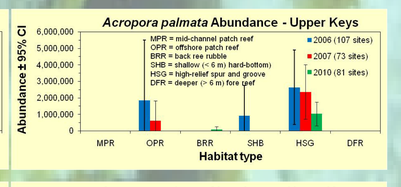


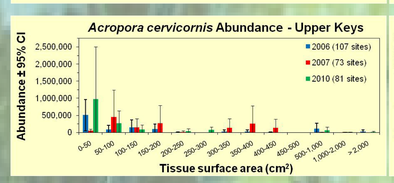


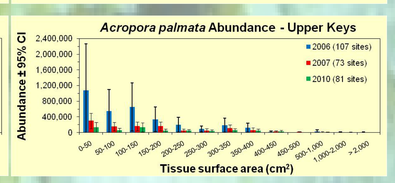


Acropora *coral mean (± 95% CI) transect frequency and colony density (top) and population abundance estimates by habitat type (bottom) from 2007 Keys-wide surveys from northern BNP to SW of Key West.*





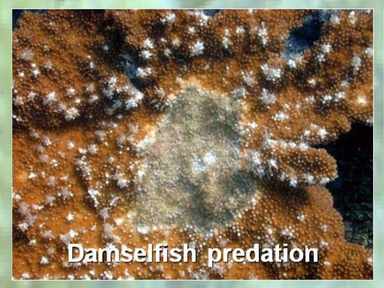




Population abundance estimates (± 95%CI) by habitat type (top) and size class (bottom) for staghorn and elkhorn coral in the upper Keys (Pickles Reef to the BNP boundary) during 2006 (107 sites), 2007 (73 sites), and 2010 (81 sites).

Staghorn Coral

Acropora cervicornis is widely distributed among habitats and is particularly abundant on patch reefs. Transect frequency of occurrence is significantly greater ($P < 0.05$) on inshore patch reefs (19%), offshore patch reefs (16%), and mid-channel patch reefs (13%) compared to most other habitats sampled. Colony densities are as high as 1.22 colonies/m^2, with surface area coverage upwards of 2%. Higher colony densities and tissue surface area are found on patch reefs. Population abundance estimates for *A. cervicornis* indicate a population size of ~13.7 ± 12.0 million colonies in the habitats surveyed (2007 estimate), but ~67% of the colonies are less than 150 cm^2 in surface area.



Elkhorn Coral

Acropora palmata only occurs on offshore patch reefs, shallow hard-bottom, and high-relief spur and groove. Mean transect frequency of occurrence is significantly greater ($P < 0.05$) on high-relief spur and groove (12%) compared to all other habitats, with upwards of 1.25 colonies/m^2 and surface area cover of 25%. Interlocking stands of this species remain in only a few locations and abundance estimates indicate that there are perhaps ~1.6 ± 1.4 million *A. palmata* colonies from Fowey Rocks to Western Dry Rocks, with nearly 80% occurring on spur and groove reefs .

Acknowledgments

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