

***Acropora*- A Review of Systematics, Taxonomy, Abundance, Distribution, Status, and Trends: Florida, 1881 - 2000**

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Systematics

Phylum Cnidaria

Class Anthozoa Ehrenberg, 1834

Subclass Zoantharia deBlainville, 1830

Order Scleractinia Bourne, 1900

Suborder Astrocoeniina Vaughan and Wells, 1943

Family Acroporidae Verrill, 1902

Genus *Acropora* Oken, 1815

Acropora palmata (Lamarck, 1816)

Acropora cervicornis (Lamarck, 1816)

Acropora prolifera (Lamarck, 1816)

Genus description:

Acropora: Branched, bushy, plate-like, sometimes encrusting. Axial and radial corallites on branches. Two cycles of septa (=12); porous corallite walls, corallites without columella. The type species is *Acropora muricata* (Linné 1758), missing, type locality unknown.

Geographic distribution: Pacific and Indian Oceans, Red Sea, Persian Gulf, Western Atlantic-Caribbean.

Stratigraphy: Eocene (58 x 10⁶ YBP) to Recent

Veron and Wallace (1984) reported that there were 364 extant species of *Acropora*, 361 in the Indo Pacific and three in the western Atlantic. The three western Atlantic species, *A. palmata*, *A. cervicornis*, and *A. prolifera* are commonly referred to as elkhorn, staghorn, and fused staghorn corals.

Acropora palmata

Madrepora palmata Lamarck, 1816

Madrepora muricata forma *palmata* Brook 1893

Madrepora muricata Duerdan, 1899

Madrepora (Acropora) palmata Mayer, 1914

Acropora palmata (Lamarck) Vaughan, 1915

Acropora palmata (Lamarck) Wells and Lang, 1973

Acropora palmata (Lamarck) Veron 2000

Description: *Acropora palmata* is the largest of all *Acropora* species; colonies are up to four meters from branch tip to branch tip, two meters high, with a base trunk that is up to 40 cm in diameter. The base is firmly attached to the substrate. Branches are flat or less commonly round, tubular radial corallites are of various diameters and length. Brown to yellow-gold color.

Geographic distribution: Known from Dry Tortugas to Broward County in Florida. In the western Atlantic, *A. palmata* is known from the Bahamas, Greater and Lesser Antilles, Venezuela, Aruba, Bonaire, Curacao, Colombia, Panama, Nicaragua, Honduras, Belize, Mexico.

Stratigraphy: Late Pliocene to recent.

Bathymetry and habitat preference: Depth range is <1 to 17 m, optimal range 1 to 5 m. The nominal habitat is the seaward face of a reef such as the spur and groove formations and seaward portion of the reef flat. Branch fragments are often found occupying back reef areas following storms; *A. palmata* may form extensive barrier reef structures such as in Belize, Greater Corn Island, and Roatan.

Reproduction and growth: *Acropora palmata* is a hermaphroditic broadcast spawning species. The prime time for releasing eggs and sperm is in August and September. We documented that eggs, ova, and sperm were present in tissues (histological analysis) during June through August, 1978-1980. In 1977 and 1981, we did not see evidence of reproduction. Growth rate (branch extension) is 4 to 11 cm per year in Florida. A colony that was 2 meters in height would be 18 to 50 years old. The 4 cm rate is based on Vaughan's early studies in Tortugas and probably under estimates growth. *Acropora palmata* can rapidly spatially monopolize large areas by fragment propagation. Fragments cleaved from the colony may grow into new individuals (Highsmith et al., 1980; Bak and Crieens, 1981; Tunnicliffe, 1981; Highsmith, 1982; Rogers et al., 1982; Tunnicliffe, 1984).

Acropora cervicornis

Madrepora cervicornis Lamarck, 1816

Madrepora cervicornis Pourtalés, 1871

Acropora cervicornis (Lamarck) Goreau and Wells, 1967

Acropora cervicornis (Lamarck) Veron, 2000

Description: *Acropora cervicornis*: Arborescent, tubular branches, distinct axial-tubular corallites at branch terminals and radial corallites distributed relatively uniformly on branches. Radial corallites often form bracts rather than tubes. Secondary branches diverge from primary branches at 30 to 90 degree angles. Specimens from deep water tend to have long and slender (about 1.5-cm in diameter) branches and fewer secondary branches. Branches of colonies from shallow water tend to be thicker (about four cm in diameter) with a greater number of secondary branches. The color ranges from gold and yellow to brown. Colonies are often not firmly attached to the substrate. Branches may fuse to adjacent branches (anastomosis) forming a pretzel-like maze. Large thickets form a complex structure that may be two to three meters in height and 30 meters long (seen in Dry Tortugas in the early to mid 1970s).

Bathymetry: The species was reported to depths of 50 m off Discovery Bay, Jamaica (Goreau and Wells, 1967), but is more often seen in depths of 3 to 30 m in Florida.

Reproduction and growth: The species is a hermaphroditic, broadcast spawner. The ova, eggs, and sperm were seen during summer of 1978, 1979, and 1981; in 1979, there was active gonad generation from January through June (unpublished data). Propagation from fragments is common (Gilmore and Hall, 1976, Tunnicliffe, 1981). Growth rate for *A. cervicornis* is 4 to 12 cm per year. The species has a more rapid growth during warmer months in Florida (Jaap, 1974).

Acropora prolifera

Madrepora prolifera Lamarck, 1816

Madrepora prolifera (Lamarck) Pourtalés, 1871

Isopora muricata forma *prolifera* Vaughan, 1901

Acropora prolifera (Lamarck) Cairns et al. 1991

This species is the most enigmatic of the three. It is confused with *A. cervicornis* and poorly studied. The distribution includes Dry Tortugas, Yucatan, Belize, Jamaica, Columbia, Panama, and the Netherlands Antilles.

Florida status and trends

Acropora palmata:

Dry Tortugas- 1882 to 1993. Estimated area of coverage went from 109 acres (Agassiz, 1882), to 0.15 acres (Davis, 1982), to 0.35 acres (Jaap and Sargent, 1993).

Elkhorn Reef, Biscayne National Park, 1977 to 1981, *A. palmata* abundance ranged from 8 to 28 colonies (Figure 4) along three 25 m long transects from 1977 to 1981 (Jaap, 1983).

Key Largo- 1981 to 1986. At Elbow Reef, abundance ranged from 66 to 84 colonies within 16 one m² quadrats. At French reef, abundance ranged from 42 to 99 colonies within 26 one m² quadrats. At Molasses Reef, abundance ranged from 79 to 135 colonies within 25 one m² quadrats. The trend these reefs was very stable populations (Figures, 5-8).

Looe Key, 1983. Seventeen *Acropora palmata* colonies occurred in six quadrats on a spur, 2 to 7 m depth.

Coral Reef Monitoring Project, USEPA WQPP, 1996 to 2000, data from 160 video transects from north Key Largo to Smith Shoal. *A. palmata* occurred at five shallow reef sites. Data are processed by point count analyses, we identify benthos and substrate for approximately 600 points at each station, and there are four stations per reef. Percent cover data are computed from the relative number of points that were covering *A. palmata* colonies.

The percent cover contributed by *A. palmata* at upper Keys Reefs ranged from 7.23 percent in 1996 to 0.95 percent in 2000. In the lower Keys reefs, *A. palmata* cover ranged from 7.27 percent in 1996 to 0.85 percent in 2000 (Figures 10, 11).

Acropora cervicornis

In Dry Tortugas, Agassiz (1882) estimated *A. cervicornis* covered 1030 acres; Davis (1982) estimated coverage at 1181 acres. In 1976-77 a hypothermic event occurred, killing 90 to 95 percent of the population of *A. cervicornis* and *A. prolifera* at Dry Tortugas (Walker 1981, Porter et al., 1982). In 1983 there was a loss from a disease that caused significant losses of *A. cervicornis* (Peters et al., 1983).

In a study of several reefs in Biscayne National Park from 1977 to 1981 we saw a decline in abundance at Elkhorn Reef (N= 3 transects) of 32 to 15 colonies (Figure 4).

In a study at Key Largo Reefs from 1981 to 1986 we observed a decline of 175 to 0 colonies at French Reef and 120 to 3 colonies at Molasses Reef (Figures 7, 8).

In the CRMP study we observed declines: in the upper keys, *A. cervicornis* declined from 0.13 percent cover in 1996 to 0.03 percent in 2000, in the middle Keys, *A. cervicornis* declined from 0.26 percent cover in 1996 to 0.00 percent in 2000, and in the lower Keys, *A. cervicornis* declined from 0.11 percent cover in 1996 to 0.02 percent in 2000. In Dry Tortugas, at White Shoal, we saw a relatively stable abundance in *A. cervicornis* (Figures 12-15).

Causes for *Acropora* declines in Florida

Natural disturbances: hurricanes, hypothermia, hyperthermia, winter storms (1992 storm of the century).

Diseases: the white disease seen in *A. palmata* and in *A. cervicornis* can be very serious Gladfelter (1977) and Peters et al. (1983, 1986) report on the impact and causative pathogen.

Predators that feed on *Acropora* include the fire worm *Hermodice carunculata* (Marsden, 1960, Glynn, 1960); the gastropod *Coralliophila abbreviata* (Brawley and Adey, 1981), the three spot damsel fish (Kaufman, 1977, Potts, 1977). Competitors for lebensraum (space): Fleshy algae (Lighty, 1981)

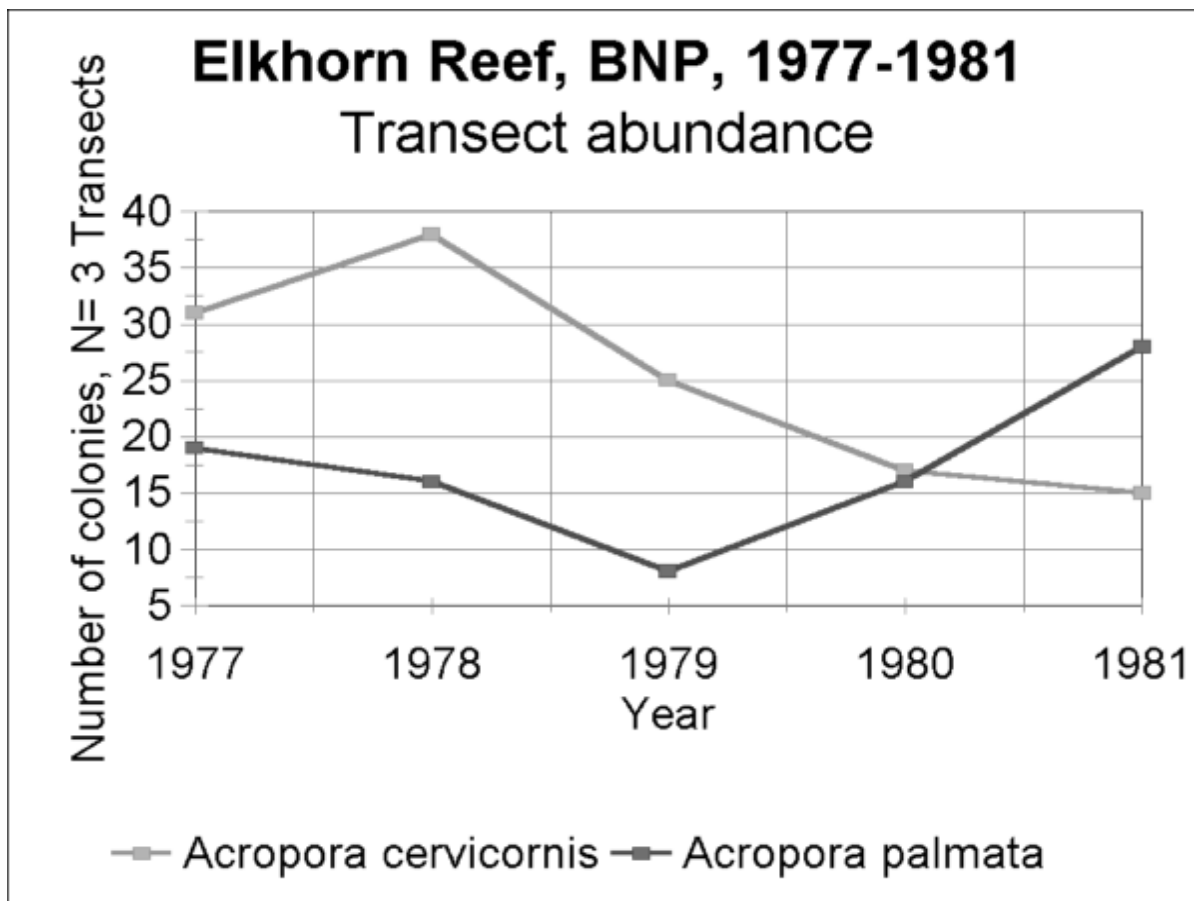


Figure 4. Abundance of *Acropora palmata* and *A. cervicornis* at Elkhorn Reef, Biscayne National Park, three 25 m long continuous line transects parallel to the depth contours (3 to 5 m depth).

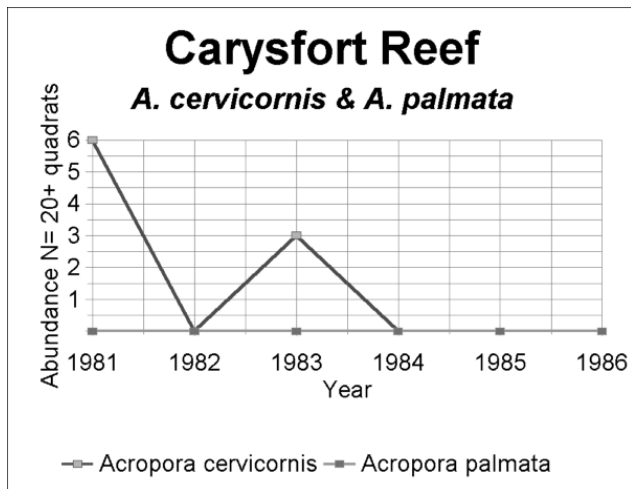


Figure 5. Abundance of *Acropora palmata* and *A. cervicornis*, Carysfort Reef, 1981-1986, based on inventory of 16 1m² quadrats per year.

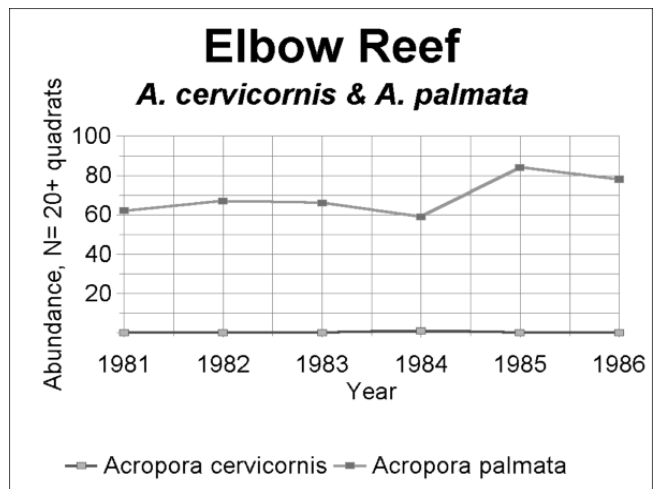


Figure 6. Abundance of *Acropora palmata* and *A. cervicornis*, Elbow Reef, 1981-1986, based on inventory of 26 1m² quadrats per year.

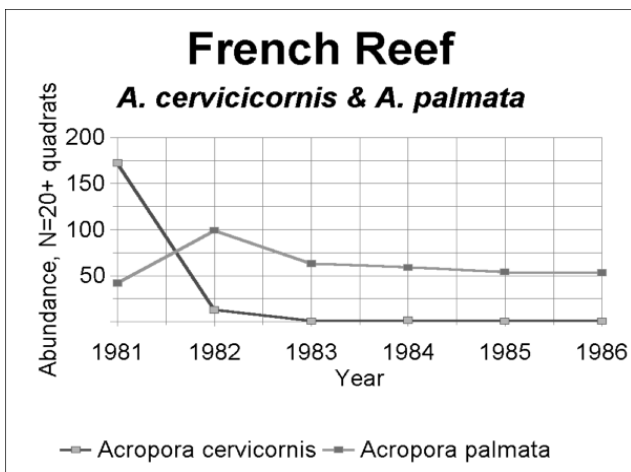


Figure 7. Abundance of *Acropora palmata* and *A. cervicornis*, French Reef, 1981-1986, based on inventory of 27 1m² quadrats per year.

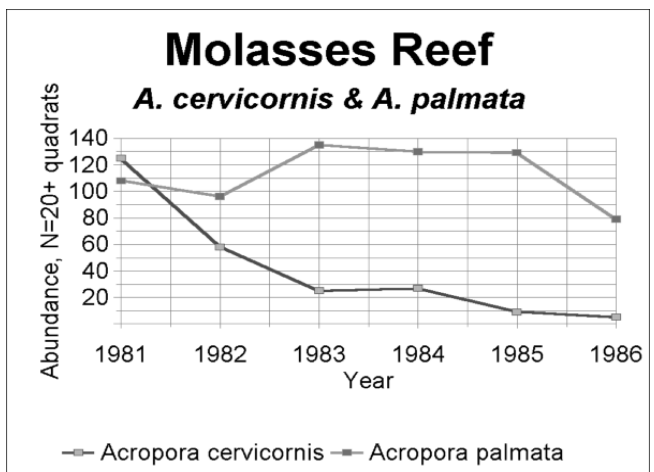


Figure 8. Abundance of *Acropora palmata* and *A. cervicornis*, Molasses Reef, 1981-1986, based on inventory of 25 1m² quadrats per year.

Figure 10. *Acropora palmata* cover at Upper Keys locations, 1996 to 2000, point count analysis of video images.

***Acropora palmata*, Upper Keys (n=7)**

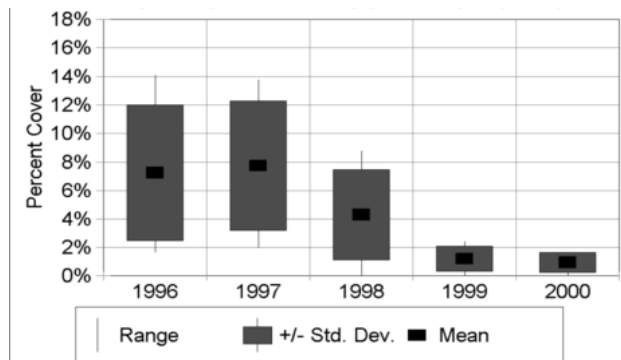
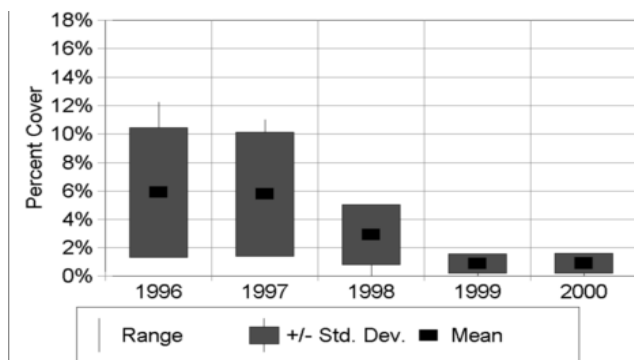


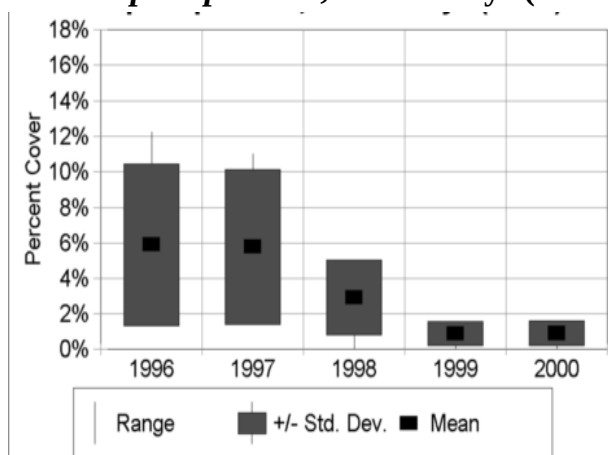
Figure 11. *Acropora palmata* cover at lower Keys locations, 1996 to 2000, point count analysis of video images

***Acropora palmata*, Lower Keys (n=12)**

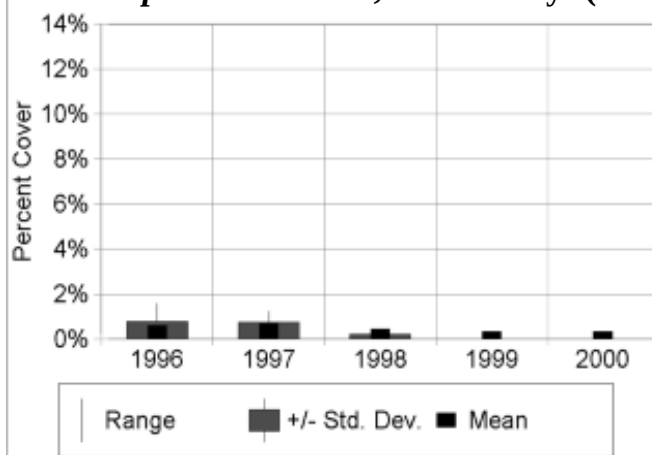


Figures 12-15, Percent cover by *A. cervicornis*, CRMP sites, upper keys, middle keys, lower keys, and Dry Tortugas, point count analyses of video images.

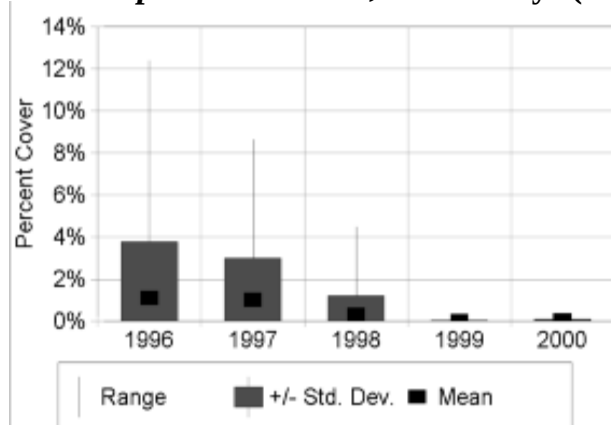
12. *Acropora palmata*, Lower Keys (n=12)



13. *Acropora cervicornis*, Middle Keys (n=9)



14. *Acropora cervicornis*, Lower Keys (n=25)



15. *Acropora cervicornis*, Tortugas (n=7)

