

Photo credit: NMFS.

KEY INFORMATION

Areas of Concern

Oculina Banks (east Florida).

Year Identified as “Species of Concern”
1991

Factors for Decline

- Habitat destruction from fishing gear
- Habitat modification
- Environmental variability

Conservation Designations

IUCN: Not Evaluated

Brief Species Description:

Oculina varicosa ranges from Cape Hatteras, North Carolina through the Gulf of Mexico and Caribbean, though the main population of concern is off east-central Florida (Figure 1) where it forms unique thicket-type structures in 70-100 m (230 to 330 ft) depth known as the Oculina Banks. There are deep and shallow growth forms. The deep-water growth form has been found in depths of 49-152 m (Reed, 1980), ranging from Florida to North Carolina of the southeastern United States. The high relief Oculina Banks, however, are only known off central eastern Florida. The shallow water form, which has symbiotic zooxanthellae algae, is known from Bermuda to the West Indies and Gulf of Mexico.

Colonies are arborescent, with highly clumped, irregular bushy branches; branches average one-fourth inch (6 mm) in diameter and colonies can be 4 to 5 feet (1.5 m) tall. Corallites are distributed in a spiral around the branches, and each corallite is approximately 0.1 inch (2-3 mm) in diameter. Deep water colonies are white in color and have thinly tapered branches with widely spaced corallites. The deep growth form (> 200 feet or 60 m) does not have symbiotic algae (zooxanthellae). Shallow water colonies are golden to brown due to symbiotic algae, and have shorter, stout branches with closely-spaced corallites. Shallow colonies differ anatomically in being stouter, shorter, and producing thicker branches (Reed 1980). Colonies are semi-isolated, patchy and low-growing (<1 ft) in shallow water. The deeper individuals have a growth rate that is about 50% faster than shallow individuals (Reed 1981).

Oculina suspension-feed on planktonic organisms. Over 300 species of invertebrates have been found living in the branches of *O. varicosa* (Reed 2002), so it serves as an important keystone species and habitat. Koenig (2001) found a relationship between the abundance of economically valuable fishes (e.g., grouper, snapper, sea bass, amberjack) and the condition (dead, sparse, and intact) of *Oculina* coral. These *Oculina* coral reefs off Florida have been identified as essential fish habitat for Federally-managed species. The species reproduces sexually by broadcast spawning. Spawning is believed to occur during July and August in the shallow populations, and during September in the deep populations, with no



Species of Concern

NOAA National Marine Fisheries Service

obvious relationship to lunar or tidal phase (Brooke and Young, 2003; Brooke and Young, 2005). Larvae settle after about three weeks in laboratory conditions (Brooke and Young, 2003). Though the taxonomy of the *Oculina* genus is unclear, recent genetic studies are providing mounting evidence that the deep-water form that occupies the Oculina Banks (80m) is substantially distinct from nearby shallow (3m to 30m) populations.

Rationale for “Species of Concern” Listing:

Demographic and Genetic Diversity Concerns:

“Species of Concern” listing rationale is based on well-documented declines in the Oculina Banks area. The Banks were first observed and described in the late 1970s (Avent et al. 1977; Reed 1980). Between 1975 and 1979, over 50 sites between 164 and 330 feet (50-100 m) were identified that had low-density populations of *Oculina*, while 14 sites had extensive thickets of contiguous colonies (1-2 m in height) and 5 sites were high-relief bioherms (17-24 m tall). Submersible and ROV surveys conducted from 1995 to 2005 indicated that extensive habitat damage existed throughout the area, and only two sites (Jeff’s Reef and Chapman’s Reef), within the original Habitat Areas of Particular Concern (HAPC) boundaries still contained extensive thickets (Koenig et al. 2005, Reed et al. 2005). Reed et al. 2007 documented the damage due to bottom trawls between 1978 and 2001 by revisiting 7 transects within the Oculina HAPC. This documented species decline is coupled with an apparent low level of sexual recruitment in the Oculina Banks habitat. Asexual fragmentation may provide for the establishment of some new colonies but habitat alteration from repeated trawl damage prevents the coral recruits from successfully settling on the coral rubble substrate. Little information is available concerning *O. varicosa* population status and trends in other areas.

Accumulating genetic evidence suggests the the Oculina Banks populations are demographically isolated from all other U.S. populations of *Oculina*, showing a sharp genetic break with shallow water populations nearby that is far greater than differences seen among shallow water populations of *Oculina* (even those presently with different names) sampled from North Carolina to the Florida Panhandle.

Factors for Decline:

The known and documented threat in the Oculina Banks area is damage from mechanical fishing gear, including dredges, bottom long lines, trawl nets and anchors despite supposed habitat-based protections (see below). Koenig et al. (2005) estimated that as of 2001, only 10% of *Oculina* coral habitat remained intact. In the 1970s fisheries efforts targeted bottom reef fish using roller trawls; they cause significant damage to the habitat and coral species on hard bottoms. Other sources of mortality may occur, but have not been documented in the deep Oculina Banks habitat. Colonies may be influenced by bottom currents, upwelling of cold-water masses, sediments, and red tides.

Status Reviews/Research Underway:

The South Atlantic Fishery Management Council has published an Evaluation Plan (<http://www.safmc.net/Portals/0/Oculina/OECAEvaluationPlan.pdf>) for the Oculina Banks Experimental Closed Area. A series of experimental restoration structures was deployed in the



Species of Concern

NOAA National Marine Fisheries Service

Oculina Banks area between 1996 and 2001 and evaluation is carried out opportunistically. Other research is focusing on clarifying the uncertain taxonomy of this species. Additional nuclear genetic markers are being developed as a means to more precisely define species boundaries within *Oculina*. Monitoring of the Oculina Banks Experimental Research Reserve is sporadic; mapping is ongoing.

Data Deficiencies:

Better data is needed on the levels of recruitment for both deep and shallow populations as are any sort of population data from different geographic areas (besides Central Florida).

Existing Protections and Conservation Actions:

In 1984, the South Atlantic Fishery Management Council established the 122 mi² (315 km²) Oculina Habitat Area of Particular Concern, the world's first protection granted specifically to a deep coral habitat. In 2000 the South Atlantic Council expanded the *Oculina* HAPC to 397 mi² (1029 km²) and prevented trawling in the area. The South Atlantic Council is currently reviewing and evaluating options for gear regulations and new coral HAPCs to protect four very large deep coral habitats as part of a Comprehensive Fishery Ecosystem Plan Amendment.

Ivory Bush Coral SOC Range

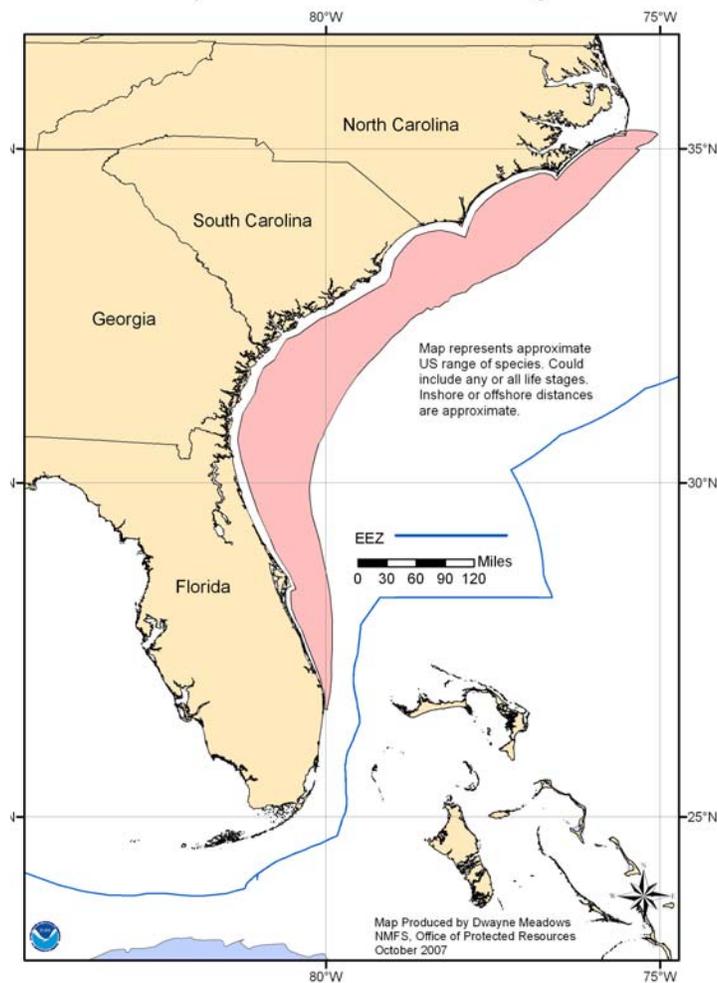


Figure 1. Range of the Ivory bush coral species of concern in the U.S.



Species of Concern

NOAA National Marine Fisheries Service

References:

- Avent, R.M., M.E. King, and R.H. Gore. 1977. Topographic and faunal studies of shelf-edge prominences off the central eastern Florida coast. *Int. Revue ges. Hydrobiol.* 62:185-208.
- Brooke, S. and C.M. Young. 2003. Reproductive ecology of a deep-water scleractinian coral, *Oculina varicosa* from the South East Florida Shelf. *Continental Shelf Research* 23:847-858.
- Brooke, S. and C.M. Young. 2005. Embryogenesis and larval biology of the ahermatypic scleractinian *Oculina varicosa*. *Marine Biology* 146:665-675.
- Koenig C.C. 2001. *Oculina* Banks: Habitat, fish populations, restoration and enforcement. Report to the South Atlantic Fishery Management Council. December 2001. 24 p.
- Koenig C.C., A.N. Shephard, J.K. Reed, F.C. Coleman, S.D. Brooke, J. Brusher, K.M. Scanlon. 2005. Habitat and fish populations in the deep-sea *Oculina* coral ecosystem of the Western Atlantic. In: Barnes P.W. and J.P. Thomas (eds.). *Benthic Habitats and the Effects of Fishing*. AFS Symposium 41, American Fisheries Society, Bethesda. p. 795-805.
- Reed J.K. 1980. Distribution and structure of deep-water *Oculina varicosa* coral reefs off central eastern Florida. *Bull Mar Sci* 30:667-677.
- Reed J.K. 1981. In situ growth rates of the scleractinian coral *Oculina varicosa* occurring with zooxanthellae on 6 m reefs and with out on 80 m banks. *Proceedings of the Fourth International Coral Reef Symposium*, May 1981, Manila, Philippines 2:201-206.
- Reed, J.K. 2002. Deep-water *Oculina* coral reefs of Florida: biology, impacts, and management. *Hydrobiologia* 471:43-55.
- Reed, J.K., A. Shepard, C. Koenig, K. Scanlon, and G. Gilmore. 2005. Mapping, habitat characterization, and fish surveys of the deep-water *Oculina* coral reef Marine Protected Area: a review of historical and current research. Pp. 443-465, In (A. Freiwald, J. Roberts, Ed.), *Cold-water Corals and Ecosystems*, *Proceedings of Second International Symposium on Deep Sea Corals*, Sept. 9-12, 2003, Erlanger, Germany, Springer-Verlag, Berlin Heidelberg.
- Reed, J. K., C. C. Koenig, and A. N. Shepard, 2007. Impacts of bottom trawling on a deep-water *Oculina* coral ecosystem off Florida. *Bulletin of Marine Science* 81: 481–496.
- South Atlantic Fisheries Management Council. 2005. Evaluation Plan for the *Oculina* Experimental Closed Area. http://ocean.floridamarine.org/efh_coral/pdfs/Oculina/FINALEvaluationPlan.pdf

Point(s) of contact for questions or further information:

For further information on this Species of Concern, or on the Species of Concern Program in general, please contact NMFS, Office of Protected Resources, 1315 East West Highway, Silver Spring, MD 20910, (301) 713-1401, soc.list@noaa.gov; <http://www.nmfs.noaa.gov/pr/species/concern/>, or Dr. Margaret Miller, NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr. Miami FL 33149 (305)361-4561 Margaret.W.Miller@noaa.gov, or Jennifer Moore, NMFS, Southeast Region, Protected Resources Division, 263 13th Avenue S., St. Petersburg, FL 33701, (727) 824-5312, Jennifer.Moore@noaa.gov.