Species of Concern
NOAA National Marine Fisheries Service

Hawaiian reef coral
Montipora dilatata


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KEY INFORMATION

Areas of Concern
Main Hawaiian archipelago, in Kaneohe Bay, Oahu; in the Northwestern Hawaiian Islands at Laysan Island; and in the northern and southern Line Islands of Kiribati and the Cook Islands.

Year Identified as "Species of Concern"
2004

Factors for Decline
- Habitat degradation
- Coral bleaching
- Freshwater kills
- Pollution
- Alien and invasive algae
- Limited distribution

Conservation Designations
IUCN: Endangered
Species of Greatest Conservation Need: HI

Brief Species Description:
Morphology of this species can be quite variable. Colonies may be any combination of encrustations, plates, knobs, and branches, making it difficult to identify. *Montipora dilatata* is a glabro-favoleate type that is characterized by a very smooth surface lacking papillae and verrucae (Vaughan 1907). Veron (2000) describes the species as follows: "Colonies are encrusting to submassive and up to 0.3 meters across, with irregular branch-like upgrowths up to 100 millimeters (mm) thick which become flattened near their ends. Coenosteum papillae are inconspicuous. Corallite walls are well defined." Studer (1901) originally described the species as a coral that builds horizontally expanding thin sheets that are often leaflike and 0.6 inches (15 mm) thick. This species requires calm water in subtidal environments. Colonies are usually purple or brown and reach 3 feet (1 m) in diameter. The species is easily broken into fragments by storms or natural bioerosional processes, with the fragments readily growing into new colonies.

This species is a hermaphroditic broadcast spawner that occurs in lagoons and bays and appears to be restricted to shallow, low-water motion environments. This species is presently very rare in Kaneohe Bay (Oahu) in the Main Hawaiian Islands, but at one time was more abundant and occurred in large patches on some of the reef flats in Kaneohe Bay. Jokiel et al. (1983) encountered areas of up to 20 feet (6 m) with scattered heads of this species. A histocompatibility grafting technique within and between four isolated patches of *M. dilatata* was used to determine which corals were asexually derived by fragmentation from a common ancestor. The "within patch" compatibility rate was 100% for *M. dilatata*, but only 5% for the closely related coral *M. verrucosa* (= *M. capitata*) over the same distance of separation, showing that the *M. dilatata* corals were all derived from the same ancestor. Grafts between corals from different patches of *M. dilatata* were incompatible, and hence there were only 4 genotypes involved. The restricted distribution of *M. dilatata* makes this species vulnerable to elimination by storm floods such as the 1988 event (Jokiel et al. 1993), which killed much of the shallow water coral within 1 m of the surface in Kaneohe Bay.

Montipora dilatata is very sensitive to thermal stress and was the first species to bleach during the 1996 event in Kaneohe Bay and few survived the event (Jokiel and Brown 2004). It is likely that much of the decline observed in this species in Kaneohe Bay is due to the fresh water flood event and warming trend that is pushing the limits of tolerance for this species.

Rationale for "Species of Concern" Listing:

Demographic and Genetic Diversity Concerns:

Montipora dilatata is considered "rare" and within Hawaii has only been observed at Kaneohe Bay on Oahu and at Laysan Island in the Northwestern Hawaiian Islands. However, the Laysan location has not been confirmed recently and may need further investigation (79 Federal Register 53851). In Kaneohe Bay, where it formerly was abundant, extensive surveys during 2000 identified only three colonies. More colonies have been located with increased survey effort.

Two other species, *M. turgescens* (*M. dilatata* cited by Dana 1971 at Kure Atoll in the NWHI is probably *M. turgescens*) and *M. cf. dilatata* (recorded at 1 site out of 30 sites surveyed at Maro Reef in 2000-2002) are genetically similar. Forsman et al. (2010) found from genetic analyses that *Montipora dilatata/flabellata/turgescens* are closely related and represent either population-level variation or incipient speciation.

Factors for Decline:

The main threats include: 1) vulnerability to coral bleaching (Figure 1) due to high temperatures; 2) fresh water kills and exposure at extreme low tide; 3) habitat degradation and modification as a result of sedimentation, pollution, alien alga species (*Gracilaria salicornia*, *Kappaphycus/Eucheuma* spp. algae) and invasive green alga (*Dictyosphaeria cavernosa*) (Kaneohe Bay); 4) a limited distribution (Figure 2); and 5) damage by anchors, fish pots, swimmers, and divers.

Figure 1. Bleached *Montipora dilatata*, Kaneohe Bay, Sept. 1996. Photograph © Paul Jokiel.

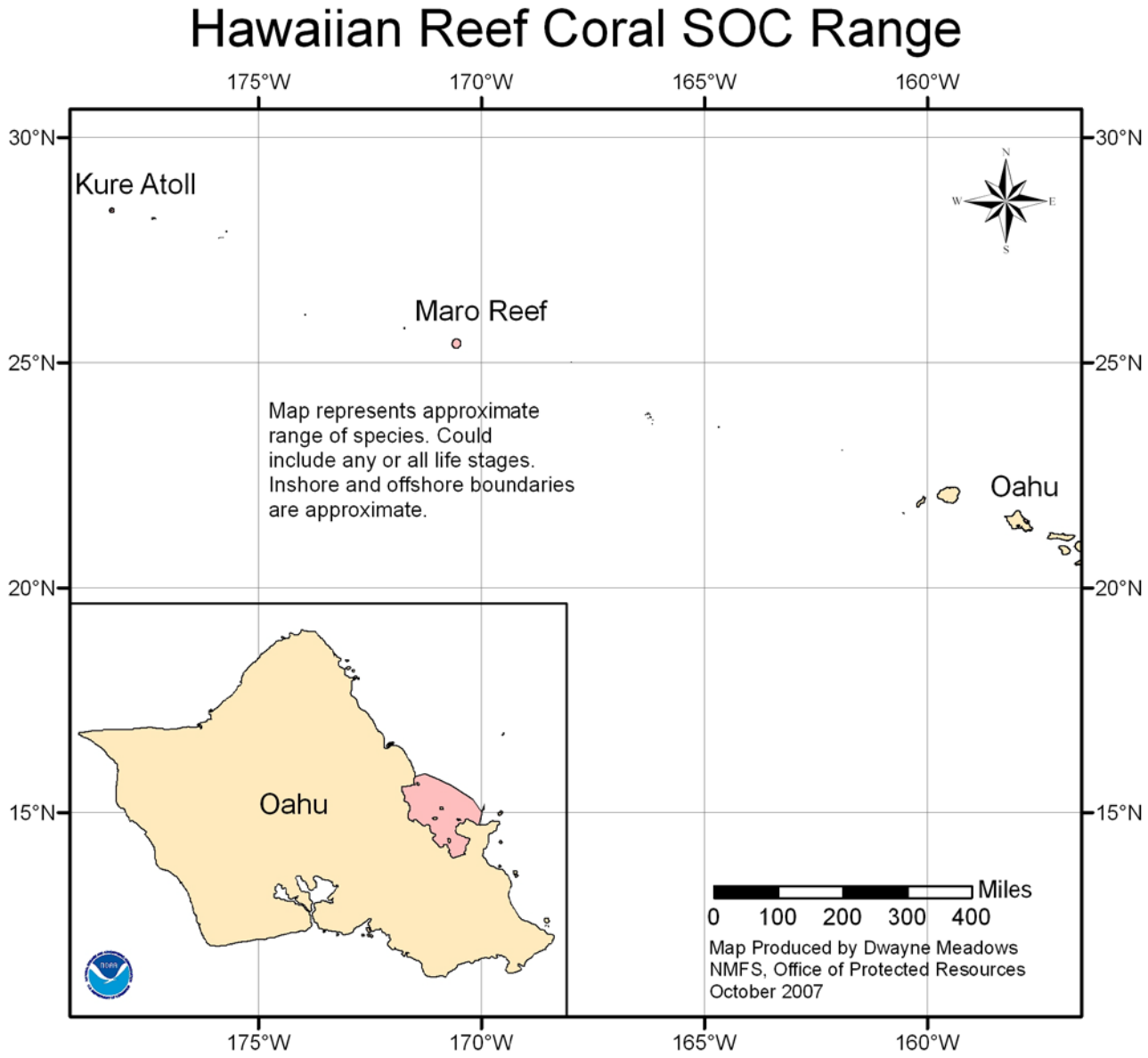

Figure 2. Locations for possible Hawaiian reef coral species of concern populations.

Status Reviews/Research Underway:
In August 2006, the National Marine Fisheries Service (NMFS) Pacific Islands Regional Office (PIRO) Protected Resources Division held its first Species of Concern workshop in Honolulu, Hawaii, for species in the Pacific Islands Region. The purpose of the workshop was to gather pertinent experts to share their knowledge or research, thereby providing overall information on the species, their habitat, threats, research, or conservation ideas. After the open discussion on the species, threats were prioritized, recovery actions/conservation efforts addressing each threat were identified, and data and research needs for each species were identified. These efforts contributed to the development

of a NMFS PIRO conservation action plan for the species. This conservation action plan is a living document that will aid NMFS PIRO to identify, prioritize, and fund conservation and research projects in the U.S. for each Pacific Islands Region Species of Concern over the coming years.

In 2009, we were petitioned to list this species (and 82 other corals) under the Endangered Species Act (ESA). However, after completing a comprehensive status review (Brainard et al. 2014) and reviewing additional information we determined that *M. dilatata* did not meet the definition of a threatened or endangered species, and thus did not warrant listing under the ESA (79 Federal Register 53851; September 10, 2014).

Extensive field work in Kaneohe Bay has been carried out annually by the University of Hawaii at Manoa's Dr. Cindy Hunter and the Marine Biology 403 course. Extensive quantitative surveys in 2008 systematically mapped the species' location and determined population size, revealing 20 *M. dilatata* colonies at 5 of the 24 surveyed sites (Hunter et al. 2009). In 2009, 38 *M. dilatata* colonies were found at 4 of the 16 sites (Hunter et al. 2010). In 2010, a total of 71 colonies (43 *M. dilatata* colonies and 28 *M. cf. dilatata* colonies) were found at 26 sites in Kaneohe Bay, continuing the uptick in locating this species with increased effort since the mid-2000s. In 2010, an effort was made to reduce algal competition and assess the long-term effectiveness of algal removal by a bio-control agent, the sea urchin *Tripneustes gratilla* (Hunter et al. 2011a). In 2011, predictive habitat maps were created and compared with current and previous data in order to analyze their accuracy. Results suggested a habitat preference in the southern end of Kaneohe Bay, possibly due to less wave action compared to the northern bay (Hunter et al. 2011b, Hunter et al. 2011c). In 2012, Hunter et al. (2012a) measured parameters such temperature, salinity, pH, and patch reef size. Patch reefs with established *M. dilatata* colonies were much larger (mean area of 41,690 m^2), had a higher temperature (as much as a 2.5 ºC higher), and significantly lower salinity than reefs without *M. dilatata* (mean area of 3,876 m^2). Differences in seawater pH were not statistically significant across patch reefs with and without the species. Additionally, the largest colonies were recorded on the north side of the patch reefs where current flow rates and sedimentation levels were lower (Hunter et al. 2012b). Lastly, for purposes of future transplanting of *M. dilatata* coral fragments into Kaneohe Bay, patch reefs were ranked according to which reefs had the best overall environments (Hunter et al. 2011b).

Based on the numerous threats this species faces, further monitoring of recorded colonies along with expanded conservation efforts are needed. Out-planting of additional sea urchins, particularly smaller individuals that might be better able to move into areas between colony plates and branches, may facilitate bio-control and improve coral survival.

Data Deficiencies:
Current and future needs include: 1) continue and expand quantitative surveys of Kaneohe Bay to monitor reported location and abundance, and measure variables such as temperature, salinity, pH, reef size, currents, and sedimentation to further an understanding of the environmental variables driving spatial patterns; 2) continue comprehensive surveys of the NWHI to determine location and population size; 3) determine if reintroducing the species into Kaneohe Bay is feasible and if so, begin test reintroductions; and 4) expand efforts to out-plant additional sea urchins, particularly smaller individuals that might be better able to move into areas between colony plates and branches, to facilitate bio-control of invasive algae and improve coral survival.

Existing Protections and Conservation Actions:
Coral collection is not allowed in the State waters of Hawaii without a research permit from the Department of Land and Natural Resources. Existing conservation actions include: 1) captive propagation of the species at the Waikiki Aquarium in Honolulu, Hawaii; 2) mass removal of invasive algae in Kaneohe Bay by hand and via a "Super Sucker" that is akin to an underwater vacuum; and 3) use of the sea urchin, *T. gratilla*, as a bio-control agent to reduce algal competition.

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Jim Maragos, USFWS

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