



RECOVERY OUTLINE

GIANT MANTA RAY

The giant manta ray (*Manta birostris*) was listed as threatened under the Endangered Species Act (ESA) on January 22, 2018 (83 FR 2916). The National Marine Fisheries Service (NMFS) will develop a recovery plan for this species. In the interim, NMFS has developed this recovery outline to provide a preliminary strategy for the conservation of the giant manta ray. This recovery outline guides initial recovery actions while ensuring that future recovery options are not precluded due to a lack of interim planning. As such, this outline is meant to serve as an interim guidance document to direct recovery efforts, including recovery planning, for the giant manta ray until a full recovery plan is developed and approved. A preliminary strategy for recovery of the species is presented here, as are recommended high priority actions to stabilize and recover the species.

This recovery outline initiates our recovery planning process and is intended primarily for internal use by NMFS as an interim planning document. Formal public participation in recovery planning for the giant manta ray will be invited upon the release of a draft recovery plan for the species. However, any new information or comments provided by the public in response to the release of this recovery outline will be taken into consideration during the recovery planning process. Interested parties may contact Maggie Miller (301-427-8457).

Listing Information:

Species Name: Giant manta ray, *Manta birostris*

Species Range: Global (United States and foreign waters)

Recovery Priority Number: 6C

Listing Status: Threatened

Lead Office: NMFS Office of Protected Resources

Lead Contact: Maggie Miller, 301-427-8457, Margaret.H.Miller@noaa.gov

BACKGROUND

Type and Quality of Information to Date:

Details of the biology, life history, range, and habitat preferences of the giant manta ray are described in the status review report (Miller and Klimovich, 2017) and the proposed and final listing rules (81 FR 8874, February 23, 2016; 83 FR 2916, January 22, 2018, respectively).

Species-specific data are scarce and much of the available data have many limitations.

Uncertainties exist with respect to setting recovery objectives and recovery actions, including but not limited to the availability of specific information regarding the species' taxonomy, range, and population structure, as well as essential habitat features, historical and current abundance, and species-specific life history characteristics, such as migratory patterns and routes, age structure and growth, reproductive seasonality and periodicity, locations of breeding and nursery areas,

and natural and fishing mortality rates throughout the species' range. In addition, much of the range of the species, as well as the most significant threats to its continued existence, lie outside of U.S. jurisdiction. These limitations will significantly affect recovery efforts. Continued communication and collaboration with manta ray experts and researchers, both domestically and internationally, as well as supporting ongoing and future research efforts, is necessary to recover the species.

Life History:

Giant manta rays inhabit tropical, subtropical, and temperate bodies of water worldwide, and are commonly found offshore, in oceanic waters, and near productive coastlines. Within waters under U.S. jurisdiction, the giant manta ray can be found along the east coast as far north as Long Island, New York, within the Gulf of Mexico, and off the coast of the U.S. Virgin Islands, Puerto Rico, Hawaii, and Jarvis Island (one of the U.S. Pacific remote island areas). Unconfirmed sightings have also been reported off the coast of the Northern Mariana Islands, Guam, and American Samoa. The giant manta ray is considered to be a migratory species, with satellite tracking studies using pop-up satellite archival tags registering movements of the giant manta ray from Mozambique to South Africa (a distance of 1,100 km), from Ecuador to Peru (190 km), and from the Yucatán, Mexico into the Gulf of Mexico (448 km) (Marshall *et al.* 2011). Although some populations may undergo seasonal migrations, Stewart *et al.* (2016) found evidence of site fidelity in near- and offshore populations of giant manta rays off the coast of Mexico. The giant manta ray is a long-lived species, reaching at least 28 years of age (Stewart *et al.* 2018). Female mantas mature between approximately 4,200 and 4,500 mm Disc Width (DW), with males maturing at slightly smaller sizes, between 3,200 and 4,000 mm DW (White *et al.* 2006; Marshall *et al.* 2009; Rambahiniarison *et al.* 2018). Mantas, like all myliobatiformes, are viviparous (i.e., the species gives birth to live young) and supply nutrients to developing embryos through lipid-rich histotroph, sometimes called uterine milk (Wourms 1981, Hamlett *et al.* 2005). Although the precise duration of gestation is unknown, it is suspected that gestation would be similar to that observed in the closely related reef manta ray (*M. alfredi*), which is generally accepted to be 12 to 13 months (Kitchen-Wheeler 2013). In addition, Rambahiniarison *et al.* (2018) reported that a portion of the mature females observed in their study, which spanned over a year, were neither pregnant nor did they show evidence of recent parturition (birth), suggesting a potential resting period between pregnancies. This may indicate that not all individuals reproduce every year. These authors also indicated no significant difference in median fetus size from November to May during the study period, but that near-term embryos were present in February, March, and April (Rambahiniarison *et al.* 2018). Investigations of pregnant females with intact embryos indicated the presence of a single embryo per pregnancy (Müller and Henle 1841; Beebe and Tee-Van 1941; Coles 1969; Rambahiniarison *et al.* 2018) with size at birth being approximately 2,000 mm DW (Rambahiniarison *et al.* 2018).

Limiting life history characteristics:

Life history characteristics such as long gestation, the potential for one to two years between pregnancies, and low fecundity (one pup per litter) result in low overall productivity and limit the ability of giant manta rays to cope with threats and recover from decreases in abundance. Additionally, manta rays can migrate long distances, including across jurisdictional boundaries, so regional and international cooperation will be essential for the effective conservation and recovery of the species.

Primary Threats:

The most significant threat to the giant manta ray is overutilization for commercial purposes. Giant manta rays are both targeted and caught as bycatch in a number of global fisheries throughout their range; however, pressure from the industrial purse seine fisheries and artisanal gillnet fisheries are of particular concern for the survival of the species. Lawson *et al.* (2016) reported that manta rays have been caught in at least 30 fisheries of varying scales across 25 countries. Estimated take of giant manta rays, particularly in many portions of the Indo-Pacific, frequently exceeds numbers of observed individuals in those areas, and are accompanied by observed declines in sightings and landings of the species. While the majority of these fisheries target manta rays for their meat, there has been an increasing demand for manta ray gill plates for use in Asian medicine, primarily in the Indo-West Pacific. Efforts to address overutilization of the species through regulatory measures appear inadequate, with evidence of targeted fishing of the species despite prohibitions (Indo-Pacific; Eastern Pacific) and only one regional measure to address bycatch issues, with uncertain effectiveness (Eastern Pacific). Additionally, given the migratory behavior, national protections are less likely to adequately protect the species from fisheries-related mortality.

Current Biological Status of the Species:

Although there is considerable uncertainty regarding historical and current abundances, the best available data indicate that the giant manta ray has experienced significant declines and continues to decline, particularly in the Indo- and eastern Pacific portions of its range. Specific country and area data are summarized in the status review report (Miller and Klimovich 2017) and suggest localized declines of 71% to 95% with possible extirpations in some areas. Yet, larger subpopulations of the species still exist, including off Mozambique, Ecuador, and Thailand. However, giant manta rays are a migratory species and continue to face fishing pressure, particularly from the industrial purse-seine fisheries and artisanal gillnet fisheries operating within the Indo-Pacific and eastern Pacific portions of its range. This significant threat, coupled with the species' low reproductive output and overall productivity may severely limit its ability for compensation and recovery.

Conservation Actions to Date:

Current conservation measures that may facilitate the recovery of this species are summarized in the status review report (Miller and Klimovich 2017). Conservation actions exist to protect giant manta rays at local, state, national, and international levels. Internationally, *M. birostris* was protected under the Convention on International Trade in Endangered Species (CITES) Appendix II in 2013, which regulates the trade of the species and its parts. A study on the gill plate trade found that all of the reported source countries of *M. birostris* gill plates are parties to CITES. The Appendix II listing may help curb targeted fishing of the species primarily for international trade as countries that are parties to CITES must ensure that manta ray products are legally obtained and trade is sustainable. To protect manta rays caught in the eastern tropical Pacific tuna fisheries, the Inter-American Tropical Tuna Commission (IATTC) passed a resolution (C-15-04) in 2015 prohibiting the retention or sale of all mobulid rays (*Manta* rays and *Mobula* rays) taken in its large-scale fisheries. Cooperating IATTC members must also report mobulid catch data and ensure safe release; however, developing countries were granted an exception for small-scale and artisanal fisheries that catch these species for domestic consumption. Additionally, some of the reported source countries of *M. birostris* gill plates have enacted laws that protect them within the country, including Indonesia (2014), Philippines

(1998), Mexico (2006), and Brazil (2013). However, enforcement of these laws continues to be a challenge. Although China, identified as the main trade center for gill plates, does not have specific laws to protect mobulids, the Protection of Wildlife Law prohibits hunting of CITES Appendix II listed species without special permission from the Chinese government (O'Malley *et al.* 2017).

Research and conservation efforts have been supported by non-profit organizations dedicated to manta ray protection. These organizations have had some success in decreasing consumer demand for gill plates through consumer awareness campaigns (Croll *et al.* 2015; Lawson *et al.* 2016). Awareness campaigns have also been used to educate tourists on appropriate behavior during dives with manta rays, and best practice codes of conduct have been developed to guide dive operators (Miller and Klimovich 2017). Additionally, NMFS has provided support to and collaborated with manta ray researchers on a number of recent research projects dedicated to further understanding the life history and ecology of giant manta rays.

Recovery Priority Number: 6C

Based on NMFS Recovery Priority Guidance (82 FR 24944, May 31, 2017), the giant manta ray should be assigned a recovery priority number of 6 due to the following: 1) the species has a moderate demographic risk; 2) major threats to the species are known and the species' response to those threats is well understood; 3) management or protective actions to address major threats are mainly beyond U.S. jurisdiction, authority, or ability to influence those major threats; 4) there is moderate certainty that management actions will be effective in removing, reducing, or mitigating effects of major threats; and 5) the species is in conflict with forms of economic activity.

INTERIM RECOVERY PROGRAM

Interim Recovery Strategy

In advance of an approved recovery plan, the initial focus of the interim recovery program will be two-fold: 1) to stabilize population trends through reduction of threats, such that the species is no longer declining throughout a significant portion of its range; and 2) to gather additional information through research and monitoring on the species' current distribution and abundance, movement and habitat use of adult and juveniles, mortality rates in commercial fisheries (including at-vessel and post-release mortality), and other potential threats that may contribute to the species' decline. Because the major threat currently contributing to the species' decline is overutilization in waters outside of U.S. jurisdiction, international coordination will be critical to ensuring recovery of the species. Therefore, to be effective, all of these actions would need to be undertaken throughout the species' range, both domestically and internationally.

Action Plan

Domestic

- Improve understanding of bycatch and investigate best methods for safe release of giant manta rays caught in U.S. fisheries.
- Improve understanding of associated mortality rates in key commercial fisheries (including at-vessel and post-release mortality), including impacts of various factors such as gear type, temperature, temporal and spatial fishing effort, etc., for informing future fisheries management strategies to reduce fisheries interactions and associated mortality.

- Improve understanding of taxonomy, population distribution, abundance, trends, and structure through research, monitoring, and modeling.
- Identify and protect key habitat areas, including breeding and nursery grounds through research, monitoring, modeling, and management.
- Improve understanding of movement and seasonal distribution to inform future management measures for minimizing impacts to the species during key life history functions.
- Investigate the impact of other threats to the species (e.g., foul-hooking, vessel strikes, entanglement, climate change, pollution, tourism) through research, monitoring, modeling, and management.
- Coordinate with partners and non-governmental organizations (NGOs) to reduce threats (e.g., foul-hooking, vessel strikes, entanglements, pollution, and tourism) through outreach and education in order to prevent additional mortalities.

International

- Coordinate with relevant Regional Fisheries Management Organizations to improve, where needed, reporting and compliance related to current conservation measures for giant manta ray to address bycatch mortality.
- Coordinate with international partners and NGOs to reduce primary threats (i.e., directed fisheries and bycatch) through outreach and education in order to prevent further declines in species' abundance and stabilize populations.
- Investigate areas with high concentrations of giant manta rays worldwide and identify areas of overlap with fisheries to help support international efforts to reduce giant manta ray bycatch.
- Review available information to determine if any countries continue to catch detrimental amounts of giant manta rays and/or are involved in the trade of gill plates. Work with CITES and international partners to improve compliance with requirements and prioritize outreach and coordination.

PRELIMINARY STEPS FOR RECOVERY PLANNING

Recovery Plan Development

NMFS will develop a recovery plan for the giant manta ray pursuant to section 4(f) of the ESA. The plan will be a single species plan and will include site-specific measures that will lead to recovery of the species, objective and measurable criteria that will enable NMFS to evaluate progress toward recovery and delisting, and estimates of time and costs of recovery.

A small group of individuals within NMFS with expertise on the species will be responsible for developing and writing the recovery plan. Recovery planning efforts will also be coordinated with the relevant NMFS Fisheries Science Centers and Regional Offices, Office of Sustainable Fisheries Highly Migratory Species Division, Office of International Affairs, and relevant Fishery Management Councils. The draft recovery plan will be peer-reviewed before being made available for public review and comment.

Stakeholder Involvement

While NMFS is ultimately responsible for developing and implementing this recovery plan, the plan will have a greater likelihood of success if it is developed in partnership with key

stakeholders, including others who have the responsibility and authority to implement specific recovery actions.

Key stakeholders include:

- Federal, state, territorial, local, and international agencies
- Domestic and foreign universities and research organizations
- Domestic and foreign conservation organizations
- Domestic and foreign fisheries management organizations
- Domestic and foreign fisheries agencies and fishermen

Recovery Planning Milestones

2019

- Finalize recovery outline; post to [NOAA Fisheries giant manta ray species page](#).
- Identify individuals within NMFS with expertise on manta rays who will be responsible for developing and writing the recovery plan.
- Identify potential key stakeholders who have an interest in being involved in manta ray recovery.
- Initiate research on giant manta ray movement in U.S. waters off Florida and within the Flower Garden Banks National Marine Sanctuary to provide a better understanding of habitat use.
- Collect genetic samples from giant manta rays during planned research surveys to provide information on taxonomy and population structure.
- Support development of an automated program that will assemble bycatch and bycatch mortality estimates for *M. birostris* in U.S. fisheries.
- Support research assessing the effect of gear characteristics and fishery practices on post-release mortality of giant manta rays in gillnet fisheries.
- Add giant manta ray to NMFS Northeast and Southeast Observer Program capture reports, logbooks, and manuals/reports, and provide a mobula identification guide to observers to facilitate accurate identification.
- Develop an aerial survey manta and devil ray identification guide to facilitate accurate species identification.
- Coordinate with applicable States to add giant manta rays to current Section 6 agreements to allow those States the option to receive funding through the Species Recovery Grants program for giant manta ray recovery efforts in state waters.
- Begin outreach campaigns (both on a National level through social media and on the NMFS website but also in select locations in Florida) to increase public awareness, minimize harm, and encourage reporting of manta ray sightings and encounters.

2020

- Continue research on giant manta ray movements in U.S. waters off Florida and within the Flower Garden Banks National Marine Sanctuary.
- Continue to collect genetic samples from manta rays during planned research surveys to provide information on taxonomy and population structure.
- Conduct manta ray health assessments during planned research surveys located in U.S. waters off Florida.
- Develop preliminary species distribution model for giant manta rays in the U.S. Atlantic and Gulf of Mexico.

- Hold meetings with international liaisons to develop international outreach strategies.
- Solicit input from key stakeholders on manta ray recovery strategies.
- Begin development of the draft recovery plan.
- Continue to support research on manta ray genetics, movement, habitat use, and threats.

2021

- Continue development of draft recovery plan.
- Begin development of recovery implementation strategy with input from key stakeholders.

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