Giant Manta Ray

Giant Manta Ray

Mobula birostris

Protection Status

ESA THREATENED
Throughout Its Range

CITES APPENDIX II
Throughout Its Range

SPAW ANNEX III
Throughout the Wider Caribbean Region

Quick Facts

WEIGHT	Up to 5,300 pounds
LENGTH	Disc width up to 26 feet
LIFESPAN	Up to 45 years
THREATS	Bycatch, Harvest for international trade, Overfishing
REGION	New England/Mid-Atlantic, Pacific Islands, Southeast

About the Species

Giant manta ray in Flower Garden Banks National Marine Sanctuary. Credit: NOAA/George Schmahl

The giant manta ray is the world's largest ray with a wingspan of up to 26 feet. They are filter feeders and eat large quantities of zooplankton. Giant manta rays are slow-growing, migratory animals with small, highly fragmented populations that are sparsely distributed across the world.

The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch in a number of global fisheries throughout its range. Manta rays are particularly valued for their gill plates, which are traded internationally. In 2018, NOAA Fisheries listed the species as threatened under the Endangered Species Act.

Population Status

The global population size is unknown. With the exception of Ecuador, the few regional population estimates appear to be small, ranging from around 600 to 2,000 individuals, and in areas subject to fishing, have significantly declined. Ecuador, on the other hand, is thought to be home to the largest population of giant manta ray, comprising over 22,000 individuals, with large aggregation sites within the waters of the Machalilla National Park and the Galapagos Marine Reserve. Overall, given their life history traits, particularly their low reproductive output, giant manta ray populations are inherently

vulnerable to depletions, with low likelihood of recovery. Additional research is needed to better understand the population structure and global distribution of the giant manta ray.

Appearance

Manta rays are recognized by their large diamond-shaped body with elongated wing-like pectoral fins, ventrally-placed gill slits, laterally-placed eyes, and wide, terminal mouths. In front of the mouth, they have two structures called cephalic lobes which extend and help to channel water into the mouth for feeding activities (making them the only vertebrate animals with three paired appendages).

Manta rays come in two distinct color types: chevron (mostly black back and white belly) and black (almost completely black on both sides). They also have distinct spot patterns on their bellies that can be used to identify individuals. There are two species of manta rays: giant manta rays (*Mobula birostris*) and reef manta rays (*Mobula alfredi*). Giant manta rays are generally larger than reef manta rays, have a caudal thorn, and rough skin appearance. They can also be distinguished from reef manta rays by their coloration.

Behavior and Diet

The giant manta ray is a migratory species and seasonal visitor along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts. The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior.

Although the giant manta ray tends to be solitary, they aggregate at cleaning sites and to feed and mate. Manta rays primarily feed on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae, and shrimp, but some studies have noted their consumption of small and moderately sized fish as well. When feeding, mantas hold their cephalic fins in an “O” shape and open their mouths wide, creating a funnel that pushes water and prey through their mouth and over their gill plates. Manta rays use many different types of feeding strategies, such as barrel rolling (doing somersaults over and over again) and creating feeding chains with other mantas to maximize prey intake.

Giant manta rays also appear to exhibit a high degree of plasticity or variation in terms of their use of depths within their habitat. During feeding, giant manta rays may be found aggregating in shallow waters at depths less than 10 meters. However, tagging studies have also shown that the species conducts dives of up to 200 to 450 meters and is capable of diving to depths exceeding 1,000 meters. This diving behavior may be influenced by season and shifts in prey location associated with the thermocline.

Where They Live

The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and in productive coastal areas. The species has also been observed in estuarine waters, oceanic inlets, and within bays and intercoastal waterways. As such, giant manta rays can be found in cool water, as low as 19°C, although temperature preference appears to vary by region. For example, off the U.S. East Coast, giant manta rays are commonly found in waters from 19 to 22°C, whereas those off the Yucatan peninsula and Indonesia are commonly found in waters between 25 to 30°C.

World map providing approximate representation of the giant manta ray's range

Lifespan & Reproduction

Manta rays have among the lowest fecundity of all elasmobranchs (a subclass of cartilaginous fish), typically giving birth to only one pup every two to three years. Gestation is thought to last around a year. Although manta rays have been reported to live at least 45 years, not much is known about their growth and development.

Threats

Overfishing and Bycatch

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, and are most susceptible to artisanal fisheries and industrial purse-seine fisheries.

Efforts to address overutilization of the species through current regulatory measures are inadequate, as targeted fishing and illegal retainment of the species still occurs despite prohibitions in a

significant portion of the species' range. Also, measures to address and minimize bycatch of the species in industrial fisheries are rare.

Harvest for International Trade

Demand for the gill plates of manta and other mobula rays has risen dramatically in Asian markets. With this expansion of the international gill plate market and increasing demand for manta ray products, estimated harvest of giant manta rays, particularly in many portions of the Indo-Pacific, frequently exceeds numbers of identified individuals in those areas and are accompanied by observed declines in sightings and landings of the species of up to 95 percent.

Other potential threats that should be monitored include entanglement, vessel strikes, marine debris/pollution, climate change, recreational fishing interactions, tourism, and the aquarium trade.

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Chondrichthyes
Order	Rajiformes
Family	Mobulidae

Genus	*Mobula*
Species	*birostris*

Last updated by NOAA Fisheries on 04/17/2024

How You Can Help

Follow Manta Ray Safe Handling and Release Guidelines

Manta rays are incidentally captured in a variety of commercial and recreational fisheries. Because fisherman may accidentally catch manta rays while fishing for other species, safe handling and release procedures for hook and line gears (PDF, 1 page) have been developed to reduce injury and harm to manta rays.

Report Manta Ray Sightings

If you encounter a giant manta ray, email us at manta.ray@noaa.gov. Photos are very helpful and can be used to identify individual manta rays. Also, if you can report **where** you saw the manta, **how big** it was, and **what condition** it was in—this information will help us learn more about giant manta ray movements and habitat use and can inform recovery efforts for this threatened species.

Keep Your Distance

Be responsible when viewing marine life in the wild. Manta rays, in particular, are curious animals; however, please observe them from a safe distance. Never entice manta rays to approach you. Disturbing manta rays may interrupt their ability to perform critical functions such as feeding, breeding, resting, and socializing.

Additionally, collisions with vessels are a cause of injury to manta rays. If you encounter a manta ray, please reduce speeds to idle and slowly distance your vessel from the animal.

Reduce Ocean Trash

Entanglement in ocean trash (e.g., ropes and netting, packing material, garbage) can cause injuries to giant manta rays. Small plastic debris ("microplastics") can also be accidentally ingested by manta rays, which may harm this threatened species. Reduce marine debris that pollutes giant manta ray habitat.

- **Participate in coastal clean-up events**
- **Reduce plastic use**
- **Properly stow or dispose of fishing gear**

Learn more about marine debris >

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In the Spotlight

Last updated by NOAA Fisheries on 04/17/2024

Management Overview

The giant manta ray is listed as threatened under the Endangered Species Act (ESA).

In addition, all manta rays are listed under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Recovery Planning and Implementation

Recovery Action

Under the ESA, NOAA Fisheries is required to develop and implement recovery plans for the conservation and survival of listed species. NOAA Fisheries has developed a recovery outline 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. The recovery outline presents a preliminary strategy for recovery of the species and recommends high priority actions to stabilize and recover the species.

The major actions recommended in the recovery outline include:

- 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 effects 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 effect 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.

- 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.

Species Recovery Contacts

- Maggie Miller, Giant Manta Ray Recovery Coordinator

For more information on giant manta rays in our regions:

- Calusa Horn, Southeast Region
- Chelsey Young, Pacific Islands Region

Conservation Efforts

At the 2013 meeting of the Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Parties agreed to include all manta rays (*Manta spp.*) in Appendix II of CITES, with the listing effective on September 14, 2014. The inclusion of manta rays in CITES Appendix II will help ensure that the international trade in these species is legal and sustainable.

The U.S. Fish and Wildlife Service is the government agency designated under the ESA to carry out the provisions of CITES. NOAA Fisheries provides guidance and scientific support on marine issues given our technical expertise.

Key Actions and Documents

Actions & Documents

Determination on the Designation of Critical Habitat for Giant Manta Ray

We, NOAA Fisheries, have determined that a designation of critical habitat is not prudent at this time. Based on a comprehensive review of the best scientific data available, we find that there are no identifiable physical or biological features that…

- Notice (84 FR 66652, December 5, 2019)
- Bibliography for Manta Ray Critical Habitat Determination

Notice

, New England/Mid-Atlantic, Pacific Islands, Southeast

PUBLISHED

December 5, 2019

Final Rule to List the Giant Manta Ray as Threatened Under the Endangered Species Act

On January 22, 2018, NOAA Fisheries issued a final rule to list the giant manta ray (Manta birostris) as threatened under the Endangered Species Act. On November 22, 2023, we issued a direct final rule to revise the scientific name of the giant manta…

- Direct Final Rule to Revise Taxonomy (88 FR 81351, 11/22/2023)
- Final Rule (83 FR 2916, 01/22/2018)
- Proposed Rule (82 FR 3694, 01/12/2017)
- 90-day Finding (81 FR 8874, 02/23/2016)
- Endangered Species Act Status Review Report: Giant Manta Ray and Reef Manta Ray…
- Petition (2015)

Final Rule

, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast

EFFECTIVE

February 21, 2018

Last updated by NOAA Fisheries on 04/17/2024

Science Overview

NOAA Fisheries and our partners conduct various research activities on the biology, behavior, and ecology of the giant manta ray. Our partners include federal agencies and nonprofit organizations. The results of this research are used to inform management decisions and enhance our understanding of this threatened species.

Tracking Giant Manta Ray Movements

Our research partnership includes four related movement tracking projects to inform population structure and environmental drivers of movement for giant manta rays. The four projects are unique in their locations, involve some overlapping partnerships, and will be combined into a single analytical framework to improve our understanding of manta ray distribution, abundance, population connectivity, life history, response to environmental drivers, and duration of exposure to potential anthropogenic stressors throughout the northwestern Atlantic and Gulf of Mexico.

Southeast Florida

Researchers with NOAA Fisheries and the Marine Megafauna Foundation are working together to place satellite and acoustic tags on manta rays in south Florida. Scientists with the Marine Megafauna Foundation have recently described this area as a possible juvenile nursery habitat for giant manta rays. The team has successfully tagged numerous juvenile manta rays and the tags are programmed to stay on for up to six months – both satellite and acoustic tags are very carefully attached by scientists using techniques that are as minimally invasive as possible.

Watch a video of a giant manta ray that was tagged by researchers. This tag will allow us to track the movements of this juvenile giant manta ray.

Ventral side of manta ray named Gillie. All research activities conducted under FWC permit. Credit: Jessica Pate/Marine Megafauna Foundation.

Flower Garden Banks National Marine Sanctuary

Scientists with NOAA Fisheries, National Marine Sanctuaries, Manta Trust, and Marine Megafauna Foundation have conducted several research cruises in the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico. The team has conducted surveys throughout the sanctuary in an effort to find and tag giant manta rays. To date, the team has deployed 2 satellite and 1 acoustic tags on giant manta rays. On World Manta Day (September 17th), the team will leave for a week-long mission to attempt to tag more giant manta rays. The Flower Garden Banks National Marine Sanctuary and the surrounding banks in the northwestern Gulf of Mexico have been suggested as important juvenile giant manta ray nursery habitat. The information provided by these tagging efforts will help us determine the distribution of depth and temperature used by manta rays, as well as evaluate residency and movement patterns.

Watch a video prepared by our conservation partners at Marine Megafauna Foundation highlighting the 2023 research cruise at the Flower Garden Banks National Marine Sanctuary.

Researchers at Flower Garden Banks National Marine Sanctuary diving with two giant manta rays. Credit: NOAA/George Schmahl

Coastal Louisiana

NOAA Fisheries and the Marine Megafauna Foundation conducted boat-based surveys in coastal Louisiana with specific focus on the Mississippi delta region. A recent study published by NOAA Fisheries scientists and partners indicates that giant manta rays may congregate in the Mississippi delta region during specific times of the year - suggesting that this is an important aggregation site. These findings are further supported by the numerous public sighting reports and fisheries bycatch data. With further study and the deployment of satellite and acoustic tags on giant manta rays in this study area, we hope to better understand their spatiotemporal distribution, habitat use, and site fidelity in the Mississippi Delta region.

Photograph of giant two manta rays swimming taken during the Louisiana survey efforts. Credit: Jessica Pate, Marine Megafauna Foundation

Mexican Yucatan

NOAA Fisheries scientists teamed up with partners from the Mexican Caribbean Manta Project, Manta Trust, and El Colegio de la Frontera Sur (ECOSUR) on giant manta ray research efforts off Isla Mujeres, Mexico. The Mexican Caribbean Manta Protect has been studying the giant manta ray populations in four different Marine Protected Areas off the northeastern Yucatan Peninsula since 2013. This is a highly productive area where giant manta rays aggregate to feed on zooplankton. Researchers are working to tag and collect genetic samples from the manta rays in this region. Data derived from this collaborative effort will help inform the connectivity between giant manta rays in the southern Gulf of Mexico and Mexican Caribbean with the northern Gulf of Mexico and the east coast of the United States.

Reducing Bycatch

Through our work with Manta Trust, we have supported research to assess the effects of fishing gear and fishing practices on manta ray survivorship. Off Indonesia, scientists are using a special kind of satellite tag to assess post-release mortality of mobulids, including giant manta rays, after being caught in gillnets by artisanal fisheries. Results from this research can be used to develop standards for manta ray bycatch reduction and safe release practices, and inform management measures at a national and international level.

Tissue Sampling

Small tissue samples are collected during tagging or capture for genetic analysis. Genetics are useful in understanding population structure, diversity within the population, and genetic exchange between populations. For example, we are collecting genetic samples to help us determine whether there is movement and genetic exchange among giant manta rays in the Atlantic and in the Gulf of Mexico. We are also collecting tissue samples from mobula rays incidentally caught by fisheries operating in the Pacific, Atlantic, and Gulf of Mexico to determine species composition and investigate genetic stock structure. Tissue samples are less than 0.5 oz and collected by scientists and trained fishery observers using non-invasive methods.

Gear Modification

Given that fishing mortality is the main threat to the species, NOAA Fisheries is funding studies to explore bycatch mitigation methods to decrease the number of interactions between fishing gear and giant manta rays. One such study is currently testing the efficacy of bycatch sorting grids to quickly and accurately sort and release mobula rays from purse seine vessels operating in the Pacific. Reducing the handling time of manta rays when caught by fishing vessels can help decrease post-release mortality rates. For this study, NOAA is partnering with the International Seafood Sustainability Foundation (ISSF), in collaboration with researchers from the University of California at Santa Cruz, AZTI research institute, industry partner American Tunaboat Association, and U.S. purse seine vessel owners.

Citizen Science and Reporting

By reporting sightings of giant manta rays, members of the public can help researchers gather valuable data on distribution patterns and habitat use.

Please report manta ray sightings to manta.ray@noaa.gov. To the extent possible, please include the following information: When and where did you see the manta? How big was it? What condition was it in (e.g., any injuries or unusual behavior)? Photos are also helpful and can be used to identify individual manta rays.

The collection of manta ray sighting information is authorized under the OMB Control Number included in the Citizen Science & Crowdsourcing Information Collection page. This information helps

inform recovery efforts for this threatened species.

Last updated by NOAA Fisheries on 04/17/2024