Maldivian Manta Ray Project

OCEANIC MANTA RAYS | SUMMARY REPORT 2018

Conservation through research, education and collaboration.

- The Manta Trust

www.mantatrust.org
The Manta Trust is a UK and US-registered charity, formed in 2011 to co-ordinate global research and conservation efforts around manta rays. Our vision is a world where manta rays and their relatives thrive within a globally healthy marine ecosystem.

The Manta Trust takes a multidisciplinary approach to conservation. We focus on conducting robust research to inform important marine management decisions. With a network of over 20 projects worldwide, we specialise in collaborating with multiple parties to drive conservation as a collective; from NGOs and governments, to businesses and local communities. Finally, we place considerable effort into raising awareness of the threats facing mantas, and educating people about the solutions needed to conserve these animals and the wider underwater world.

Conservation through research, education and collaboration - an approach that will allow the Manta Trust to deliver a globally sustainable future for manta rays, their relatives, and the wider marine environment.

Formed in 2005, the Maldivian Manta Ray Project (MMRP) is the founding project of the Manta Trust. It consists of a country-wide network of dive instructors, biologists, communities and tourism operators, with roughly a dozen MMRP staff based across several atolls.

The MMRP collects data around the country's manta population, its movements, and how the environment and tourism / human interactions affect them. Since its inception, the MMRP has identified over 4,650 different individual manta rays, from more than 50,000 photo-ID sightings. This makes the Maldivian manta population the largest, and one of the most intensively studied populations in the world.

The long-term and nationwide data collected by the MMRP has allowed researchers to record and identify key patterns within this population over time. Not only does this invaluable information improve our understanding of these animals, but it informs their on-going management and protection both in the Maldives, and around the world.

In the last two decades manta and mobula rays have faced increasing threats from both targeted and bycatch fisheries, due in part to a growing trade in Asia for their gill plates. The gill plates are what these rays use to filter zooplankton from the water. In Traditional Asian Medicine, it is believed these gill plates will filter the body of a variety of ailments when consumed in a tonic. There is no scientific evidence to support this claim.

Manta and mobula rays are particularly vulnerable because of their aggregately behaviour and conservative life-history; they grow slowly, mature late in life, and give birth to few offspring. These traits make it very easy to wipe out entire populations in a relatively short period of time, and slow to recover if protected.
This report presents data collected by the Maldivian Manta Ray Project (MMRP) on the oceanic manta ray (*Mobula birostris*) population sightings throughout the Maldives Archipelago from 1996 through 2018. The Maldives is widely regarded as one of the best places in the world to see reef manta rays (*Mobula alfredi*). However, the Maldives is also frequented by their larger relatives; the oceanic mantas.

Key findings of the MMRP’s data collection on the oceanic manta ray population include: a total of 378 sightings, of 368 individuals. Re-sightings of just ten individuals have been made, with eight of these re-sightings occurring within both a short temporal (within days) and spatial range (same atoll). Temporal and spatial distributions of sightings are not uniform, with large aggregations of oceanic mantas seen in the southernmost atolls of the archipelago (Fuvahmulah and Addu) between March and April annually. The large majority (97%) of individuals recorded in the Maldives are adult or subadult individuals. The reason for the observed aggregations in the south of the country remains unclear, with most of the individual’s sighted recorded as cruising, rather than feeding, cleaning, or engaged in reproductive activity.

Sri Lanka, which is situated 300 kilometres to the north of the Maldives, is home to one of the largest manta and devil ray fisheries in the world. Fisheries research studies conducted by the Manta Trust in Sri Lanka have estimated that thousands of these threatened rays are landed every year across the country. The relatively close distance (1,000 km) between the aggregation sites in the south of the Maldives and the extensive fishery in Sri Lanka is a cause for concern, especially as the Sri Lankan fleet fishes intensively throughout this region of the Indian Ocean. However, at present we have no knowledge of the extent, if any, of the connectivity between these two populations.

Increased study effort on oceanic manta rays in the Maldives, with particular attention to the southernmost atolls, is urgently required to assess if this oceanic manta population is being effectively protected in the Maldives. Manta rays are an incredibly important economic resource for the Maldives, bringing tens of thousands of people to the country each year to dive and snorkel with them, generating millions of USD for the economy annually. With increasing knowledge of oceanic manta aggregations, there will inevitably be an increase in associated tourism around these southernmost atolls.
This report covers all recorded sightings of oceanic manta rays between 1996 (the earliest on record) and 2018. Specific survey dives were conducted during short periods in 2011, 2015, and 2018 in Fuvahmulah and Addu Atoll’s following reports of mass aggregations of this species in the region. In addition to this, ad hoc sightings of oceanic manta rays submitted by citizen scientists and researchers alike from across the Maldives Archipelago were included. With no consistent survey effort recorded, it is difficult to standardise sightings based on survey effort.

In-water, individual mantas were documented by photographing the unique spot patterns on their underside (ventral surface). The whole team were experienced scuba divers and freedivers, allowing them to obtain photo-ID shots whilst ensuring minimum disturbance to the animals. For the purposes of this report, a sighting is defined as a confirmed photo-ID of an individual manta ray on a given day.

Currently in the Maldives there are over 30 Marine Protected Areas (MPA). However, Hanifaru Bay in Baa Atoll is the only one with a management plan in place. There are currently no MPAs designated as such for the protection and conservation of oceanic manta rays. In Fuvahmulah, Thoondi beach and lagoon has recently been designated a MPA due to the unique beach morphology. Thoondi area is also coincidently a location where oceanic manta rays are often seen. The MPA extends out until the reef drop-off, and therefore, by default, includes this manta site.

In 2010, the Maldives banned all shark fisheries by nationally protecting all species within this group. All ray species were protected nationally in 2014. There has never been a commercial ray fishery in the Maldives (there has been an export ban in place for all ray species since 1995), however manta rays used to be incidentally caught by fishermen and used as bait to catch sharks.

Throughout the Maldives Archipelago a total of 378 sightings of 368 oceanic manta ray individuals were recorded between 1996 and 2018. These sightings were obtained from 13 of the 26 geographical atolls of the Maldives; from Raa Atoll in the north through to Addu Atoll in the south (Fig. 1).

The number of sightings across the Maldives is not consistent throughout the year (Fig. 2). There have been recorded sightings in every month, but sightings are much higher each year during March and April. However, with a heavy weighting of sightings from Fuvahmulah and Addu (see next section), trends across the rest of the country may be masked. When these sightings from the southernmost atolls are removed, there is still a similar trend with higher sightings in March and April, although the trend is less pronounced (Fig. 3). There have been only ten re-sightings of individuals, with a maximum of two sightings for any one individual. The majority (8 of 10) of the re-sightings are from the same location, within a 10-day period, suggesting a highly transient population with minimal site fidelity.

The two re-sightings of most interest are from individuals re-sighted over a longer period of time. One individual, sighted at Hanifaru Bay in Baa Atoll was re-sighted again in Baa Atoll nine years later. The other re-sighting of interest was from an individual first recorded in South Ari Atoll, and re-sighted 12 months later in North Malé Atoll (Fig. 4).

Anecdotal observations of oceanic manta rays in deep water around North Malé Atoll have been reported from dives in manned submersibles. Similar events have also been recorded in Mexico, where researchers observed an oceanic manta ray summersault feeding on a deep-water plankton layer at around 130-140 m.
Figure 1: Location and number of oceanic manta ray (*Mobula birostris*) sightings, by atoll, throughout the Maldives Archipelago (1996-2018).
Figure 2: The total number of oceanic manta ray (*Mobula birostris*) sightings each month throughout the Maldives Archipelago (1996-2018).

Figure 3: The total number of oceanic manta ray (*Mobula birostris*) sightings each month throughout the Maldives Archipelago (1996-2018), excluding Fuvahmulah and Addu.
Figure 4: Location of initial sighting (red dots) and re-sightings (blue dots) of two oceanic manta rays (*Mobula birostris*) in the Maldives.

“With increasing knowledge of oceanic manta aggregations, there will inevitably be an increase in associated tourism around these southernmost atolls.”

Photo by Simon Hilbourne.
The vast majority, 97% (n=357), of the individuals recorded in the Maldives are either adult or subadult; ranging from 3.5 – 5.0 m in size (size classes 4 and 5). This translates to a population of mostly adult and subadult individuals, with very few juveniles being sighted.

Courtship behaviour was recorded as a primary exhibited behaviour in only 6% (n=22) of the 378 sightings. All sightings of courtship behaviour have been from Fuvahmulah Atoll. In addition to this, the only two recorded incidences of pregnant oceanic mantas in the Maldives were from Fuvahmulah, in 2015 and 2018.

There is a slight sex ratio bias towards females within the documented population; with 190 females to 148 males (Fig. 5). However, with 30 individuals of unknown sex it is possible that this bias is misleading.

Three colour morphs are present in most oceanic manta ray populations globally. The most common colour morph is the chevron (Fig. 6), however leucistic (pale) and melanistic (dark) variations also exist (commonly referred to as black morphs). Out of the population documented in the Maldives, only 2.7% (n=10) of individuals are black morph mantas, with the remaining all being chevron morphs.
Figure 6: Two distinct colour morphs are found within the Maldives’ oceanic manta ray (*Mobula birostris*) population; the commonly sighted chevron morph (a – b), and the rarely sighted melanistic ‘black’ morph (c – d). Photos by Simon Hilbourne & Guy Stevens.

**SUB-LETHAL INJURIES**

The prevalence of injuries was noted from sighting images, and the probable cause assessed where possible. A total of 60 mantas had notable injuries, of which 19 were assessed as anthropogenic in source; from fishing hooks, fishing line, and/or entanglement. A further 33 individuals had natural injuries; likely caused by predatory shark attacks. The remaining eight injuries were from unknown causes (Table 1).

*Table 1:* Occurrence of natural and anthropogenic sub-lethal injuries in the oceanic manta ray (*Mobula birostris*) population recorded throughout the Maldives archipelago (1996-2018).

<table>
<thead>
<tr>
<th>Cause</th>
<th>No. of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropogenic</td>
<td>19</td>
</tr>
<tr>
<td>Natural</td>
<td>33</td>
</tr>
<tr>
<td>Unknown</td>
<td>8</td>
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Of the 378 sightings, 79% (n=299) were from Fuvahmulah Atoll. This is by far the largest known occurrence of oceanic manta rays in the Maldives. The second largest occurrence of oceanic manta ray sightings (n=27) is from Addu Atoll. Addu and Fuvahmulah are the two southernmost atolls of the Maldives Archipelago. Fuvahmulah is a single island atoll around 40 km from the nearest atoll. Extending from the southern tip of the island is a 3.5 km reef with a deep plateau. This area is commonly visited by pelagic species, including tiger sharks, sunfish, thresher sharks, hammerhead sharks, whale sharks, and oceanic manta rays.

Oceanic manta rays appear to aggregate around Fuvahmulah and Addu Atolls seasonally (Fig. 7), with the majority of sightings occurring during March and April each year. In three separate years (2011, 2015 and 2018), mass aggregations of oceanic mantas have been recorded from these locations. During these years as many as 20-30 mantas were sighted on a single dive.

Figure 7: Seasonality of sightings of oceanic manta rays (Mobula birostris) at Fuvahmulah and Addu Atolls in the Maldives Archipelago (1996-2018).
The conservative life history traits of oceanic manta rays (long-lived, slow growth, low fecundity, etc.) make this species extremely vulnerable to exploitation. Manta rays are fished in many countries throughout their range. These fisheries are often driven by the demand for their gill plates, which are used in Asian medicinal remedies. Fish market surveys conducted by the Manta Trust and the Blue Resources Trust estimate that the annual catch of oceanic manta rays in Sri Lanka numbers several hundred individuals. The price per kilogram of oceanic manta ray gill plate in Sri Lanka ranges from $115 – 172 USD. It is this high value which makes manta and devil rays a lucrative target catch. In Sri Lanka, only two local communities consume mobulid meat fresh. Throughout the rest of the country, the meat is dried and sold for consumption at a lower price than dried tuna. The dried gill plates are sold to ‘middle men’, and exported from the country to southeast Asia.

From satellite tracking work in other regions around the world, it is known that oceanic manta rays can travel over 1,000 km in six months. There is a significant possibility that the oceanic manta rays sighted in the Maldives are part of the wider Indian Ocean population that is targeted by the Sri Lankan fisheries once they leave the Maldives Exclusive Economic Zone. Understanding the extent of this connectivity, and the habitat use of the oceanic manta rays sighted in the Maldives, is vital for implementing effective conservation management strategies for this protected species.

Fuvahmulah Atoll, and the other southernmost atolls of the Maldives, are increasingly becoming popular locations for encountering large pelagic species. Tourism based around diving with large sharks (including silky, hammerhead, thresher, and tiger sharks) has only started to develop and grow in recent years in this region. Similarly, an increasing number of liveaboard dive vessels are visiting the area to dive with these animals. With more knowledge and understanding of oceanic manta ray’s seasonality, there will undoubtedly be an increase in tourism directed by this iconic species. Encounters with oceanic manta rays here can be compared to those in the Revillagigedo Archipelago in Mexico, where this species drives a tourism industry estimated to be worth around $14 million USD annually to the Mexican economy.
This report was made possible thanks to:

MALDIVIAN MANTA RAY PROJECT (MMRP)

The MMRP is highly regarded within the scientific community. It is the largest and one of the longest running manta ray research programmes in the world. We would welcome the opportunity to continue to work with the Maldives government for the long-term management and conservation of these species in Maldivian waters. The opportunity we have to learn about manta rays in the Maldives is unique, and our findings have important implications for manta ray conservation on a global scale.

The MMRP and the Manta Trust are happy to share with the Maldives government any data collected as part of this study.