Manta TRUST

Maldivian Manta Ray Project

Oceanic Manta Ray | Summary Report 2019

Conservation through research, education, and colloboration

- The Manta Trust

MALDIVIAN MANTA RAY PROJECT

WHO ARE THE MANTA TRUST?

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.

MALDIVIAN MANTA RAY PROJECT

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 a handful of 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 reef manta rays, from more than 60,000 photo-ID sightings. This makes the Maldives manta population the largest, and one of the most intensively studied populations in the world. The MMRP has also identified nearly 700 different individual oceanic manta rays.

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 ongoing management and protection both in the Maldives, and around the world.

THE CONSERVATION CHALLENGE

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 human body of a variety of ailments when consumed in tonic. There is no scientific evidence to support this claim.

Unregulated and badly managed tourism is also negatively affecting manta rays, and in turn the tourism industry, while climate breakdown, reef degradation and pollution is reducing the manta's food supply and suitable habitat.

Manta and mobula rays are particularly vulnerable because of their aggregating 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. With protection in place, populations are still slow to recover.

EXECUTIVE SUMMARY

This report presents data collected by the Maldivian Manta Ray Project (MMRP) on the oceanic manta ray (*Mobula birostris*) population sighted throughout the Maldives Archipelago during the 2019 peak oceanic manta sighting period (March-April). 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 manta rays. Both manta species have been continuously studied since 2007 by the MMRP, the founding project of the UK-registered charity, the Manta Trust; a non-profit, independent conservation, research, and education focused organisation.

During the 2019 peak sighting period, from March 1st to April 30th, a total of 323 sightings of 295 individuals were recorded directly by Manta Trust researchers, or submitted to the Trust by citizen scientists, in the Maldives' sub-equatorial atolls. The vast majority of these sightings (n=312) were recorded at Fuvahmulah Atoll. All but two of the individuals recorded were new to the database. The re-sighting rate of individuals within the peak sighting period was very low (7%), suggesting a transient population with minimal residency around Fuvahmulah Atoll. As with other years, the primary behaviour recorded was 'cruising'. However, a large difference in the sex ratio of individuals recorded during the season (with the arrival of male individuals first) suggests the possibility of reproductive drivers and/or differences in foraging strategies between the sexes may underpin the observed migration behaviour.

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 populations.

In 2019, the Manta Trust team increased their research efforts at Fuvahmulah Atoll. It is now clear that the reefs around this island are a world class location for both recreational diving and marine research as a result of the abundance and diversity of marine megafauna. A dedicated environmental research and education centre is proposed for Fuvahmulah, which would benefit visiting researchers, and involve local scientists from Fuvahmulah and the Maldives. Our hope it that such a centre will inspire and educate the next generation of Maldivians about the incredibly unique biodiversity surrounding Fuvahmulah Island.

STUDY PERIOD & SAMPLING METHODOLOGY

This report builds on the findings summarised in the Manta Trust's Oceanic Manta Ray Summary Report 2018, and focuses primarily on the oceanic manta season from the 1st March to 30th April 2019 in the two southernmost, sub-equatorial, atolls of the Maldives; Fuvahmulah and Addu (Fig. 1). The most frequent sighting location for oceanic manta rays in Fuvahmulah is at the southernmost tip of the reef spur. Here, there is a shelf plateau at approximately forty metres depth which extends out from the reef. This site is commonly referred to as Farikede (Fig. 2).

In 2019, the Manta Trust conducted its first extensive research fieldtrip to Fuvahmulah Atoll to study the oceanic manta population. From the 30th March, for a month, the Manta Trust had researchers based on Fuvahmulah Island diving twice daily to collect photo-ID data on the oceanic manta rays. This period coincides with the period in which the highest numbers of sightings have been recorded in previous years. In addition, through collaborations with local dive schools and liveaboard operators, the Manta Trust has grown an extensive network of citizen scientists who submitted sightings during the season. These sightings are also included in this report's findings.

In-water, individual manta rays were documented by photographing the unique spot patterns on their underside (ventral surface). The whole team were experienced scuba divers, 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. Multiple sightings or submissions of the same individual from the same location on the same day were counted only once.

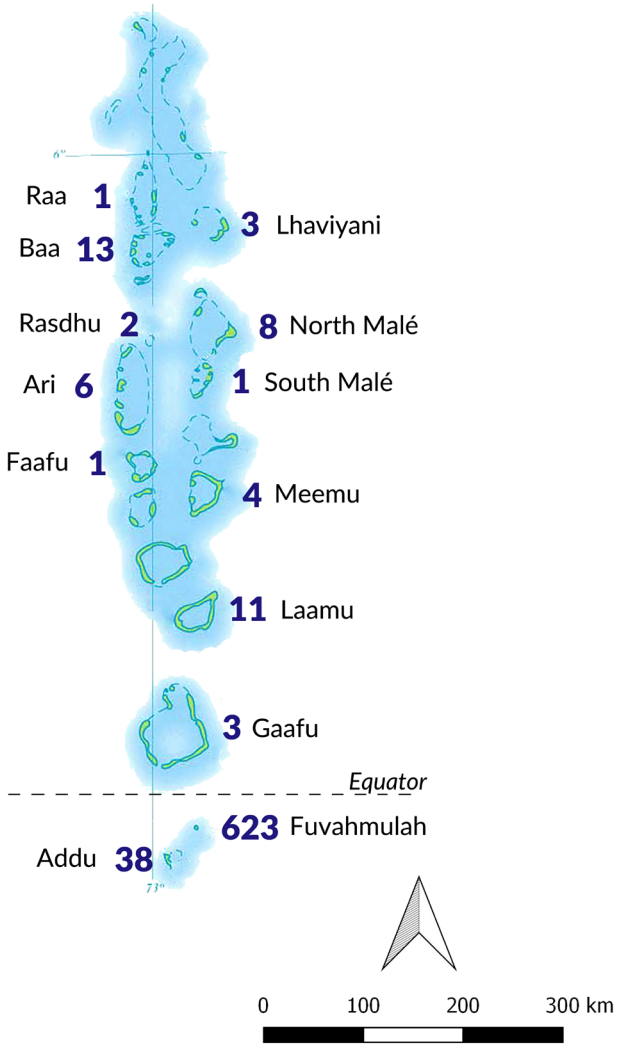

Figure 1: Location and number (in blue) of oceanic manta ray (*Mobula birostris*) sightings, by atoll, throughout the Maldives Archipelago (1996-2019).

MANTA RAY SIGHTINGS

Nationwide

Throughout the Maldives Archipelago, a total of 715 sightings of 678 oceanic manta ray individuals have been recorded between 1996 and the end of April 2019. 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). In 2019, as of the end of April, there have only been two confirmed sighting of an oceanic manta outside of Fuvahmulah and Addu; in South Malé Atoll and Gaafu Atoll. The findings summarised in the rest of this report will therefore only focus on the data obtained from the southernmost, sub-equatorial, region of the Maldives during the first four months of 2019.

Figure 2: Map of Fuvahmulah Atoll, including Farikede dive site (yellow circle).

Sub-equatorial Atolls

In the first two months of 2019, there were three confirmed sightings of oceanic manta rays in the Maldives from Fuvahmulah Atoll. However, starting in early March, the number of sightings increased substantially. Between the 1st March and 18th April there were 323 sightings of 295 different individuals from Fuvahmulah and Addu, with oceanic manta rays recorded on 42 of the 49 days during this period. The vast majority of these sightings (*n*=312) were from Fuvahmulah Atoll. The 2019 peak sighting period resulted in the highest number of recorded sightings for any study year to date (Fig. 3), although without standardisation for survey effort, these results should be noted with caution.

The appearance of large numbers of oceanic manta rays around Fuvahmulah and Addu Atolls in March and April

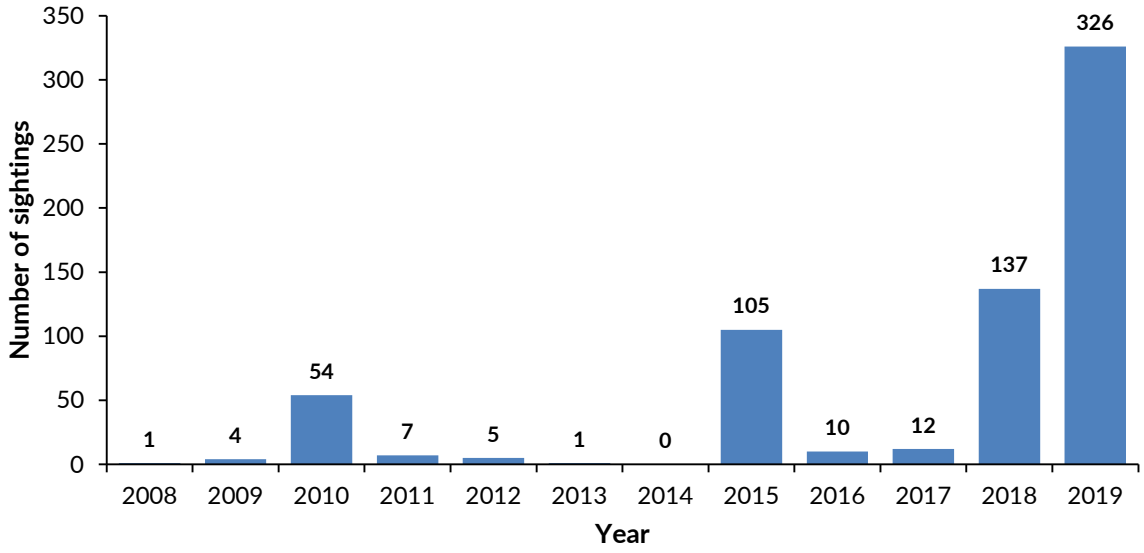

Figure 3: The total annual number of oceanic manta ray (*Mobula birostris*) sightings from Fuvahmulah and Addu Atolls.

in 2019 compliments previous year's data. Large aggregations have previously been recorded during these months in 2010, 2015, and 2018. There is clear seasonality in the sightings (Fig. 4), and although the Manta Trust do not have standardised survey effort throughout the year, the dive logs from Fuvahmulah Dive School show that there are dives at Farikede year-round (Fig. 5). Despite this year-round diving effort from local dive operators, reports of manta ray sightings and citizen science submissions outside of March and April are rarely received.

Less than 1% (*n*=2) of individuals sighted in 2019 were already recorded in the database prior to this year's study period. Such a high incidence of new individuals suggests that a very large population of oceanic manta rays is likely to exist in the region, numbering in the many thousands, to possibly tens of thousands.

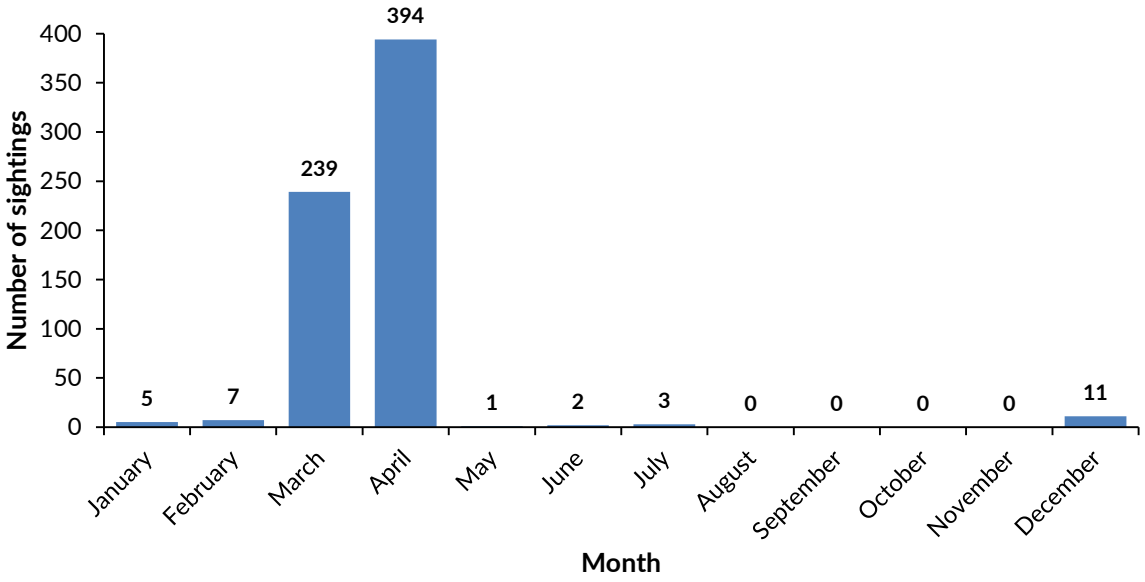

Figure 4: The total number of oceanic manta ray (*Mobula birostris*) sightings each month from Fuvahmulah and Addu atolls (2008-2019).

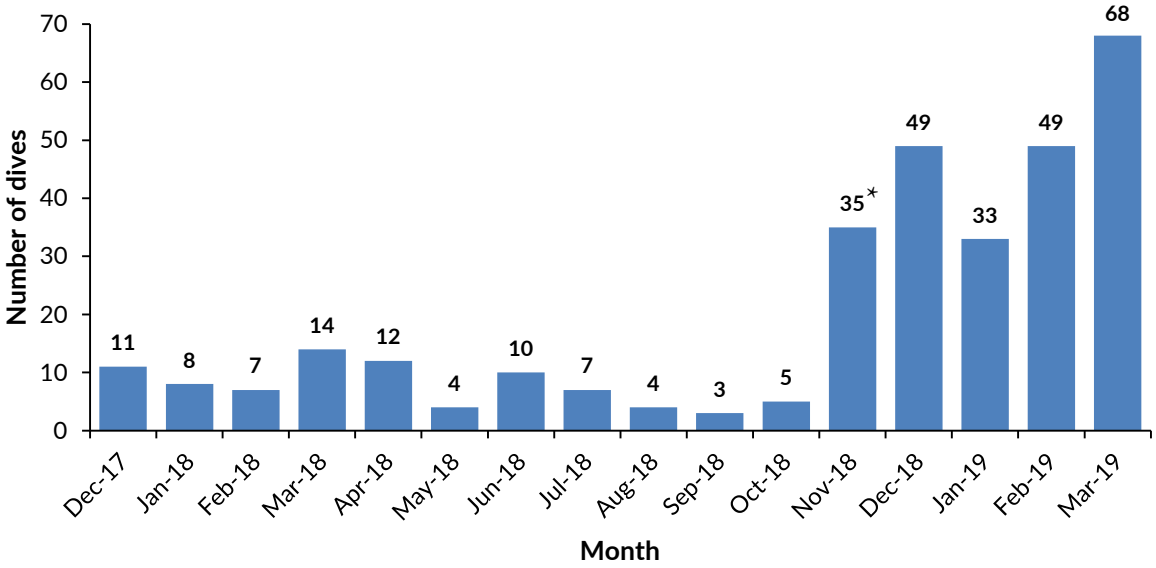

Figure 5: The monthly number of dives conducted at Farikede dive site by Fuvahmulah Dive School. * = A second dive boat was acquired in November 2018.

Re-sightings

The rate of oceanic manta ray re-sightings increased in 2019, which is to be expected with increased survey effort, and a longer time series of data collection. There were 28 re-sightings of 24 individuals during the 2019 peak sighting period. This equates to just 8% of the individuals being re-sighted. The remaining 92% of individuals (n=273) were only sighted once, despite near daily surveying during March and April 2019. Of the 28 re-sightings, 25 were individuals re-sighted around Fuvahmulah Atoll within the two month period. The period between these 25 re-sightings ranged from 1 to 23 days (average of 4.9 days). One individual was also sighted on four separate days over a 10-day period. The remaining three re-sightings were as follows:

- Adult male re-sighted around Fuvahmulah Atoll after a period of 403 days (11/02/2018 and 21/03/2019).
- Adult female re-sighted around Fuvahmulah Atoll after a period of 348 days (17/04/2018 and 31/03/2019).
- Adult male recorded at Addu Atoll on 13/03/2019, and re-sighted 29 days later around Fuvahmulah Atoll. This is only the second record of an inter-atoll movement by an oceanic manta ray within the Maldives.

Melanistic (black) Morph Occurance

Of the 300 newly identified individuals across the Maldives in 2019, just 1.7% (*n*=5) of them were black morphs. This is a slightly lower proportion than previously recorded. Black morph oceanic manta rays now make up just 2.2% (*n*=15) of the known population (*n*=678). Interestingly, there has never been a sighting of a black morph reef manta ray (*Mobula alfredi*) recorded in the Maldives despite it hosting the largest known population of this species in the world.

Population Demographics

There was a significantly higher number of male oceanic manta rays (*n*=196) than females (*n*=91) recorded in 2019 (for 13 individuals the sex could not be determined) (Fig. 6). This bias was most significant at the beginning of the peak sighting period, when there were far more males noted than females (Fig. 7). From the end of March onwards, the number of females and males sighted increased at a more similar rate (Fig. 7). Looking at the three previous aggregation years (Fig. 8), there has always been an unequal split of males and females. In 2010 and 2019, it was roughly a 70:30 male-to-female ratio, whereas in both 2015 and 2018, the bias was reversed, with roughly a 65:35 female-to-male ratio.

Of the 91 females observed, 24% (*n*=22) had visible mating scars, however most of them were not fresh. Only two pregnant females were recorded in 2019, and both were in the second trimester of pregnancy. In addition, among both sexes, just one juvenile and four subadult individuals were recorded in 2019. This is in accordance with previous years' observations, which have been represented predominately by an adult population.

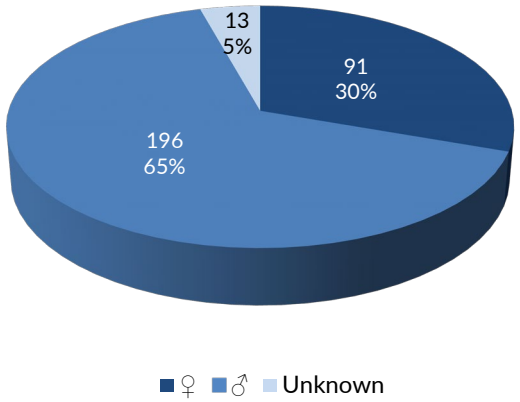

Figure 6: Number of male and female oceanic manta rays (*Mobula birostris*) recorded in the sub-equatorial atolls of the Maldives in 2019. Percent of population is noted below the actual number of individuals.

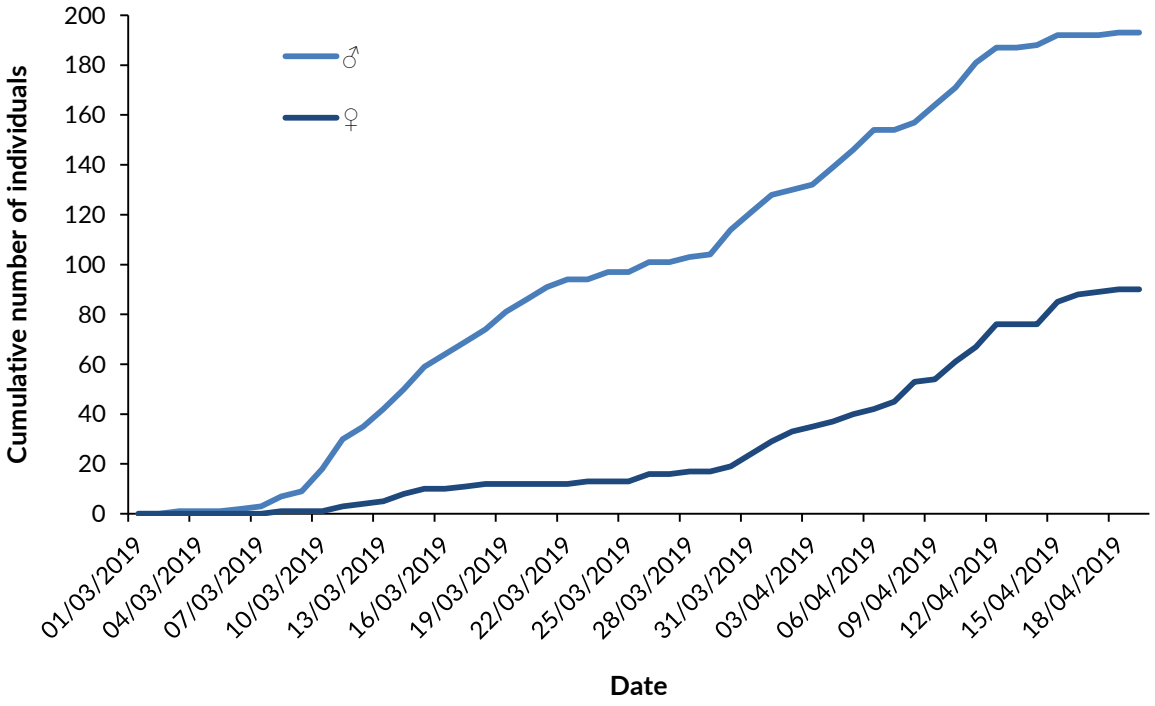

Figure 7: Cumulative sightings of male and female oceanic manta rays (*Mobula birostris*) during 2019 (March-April) in Fuvahmulah and Addu Atolls.

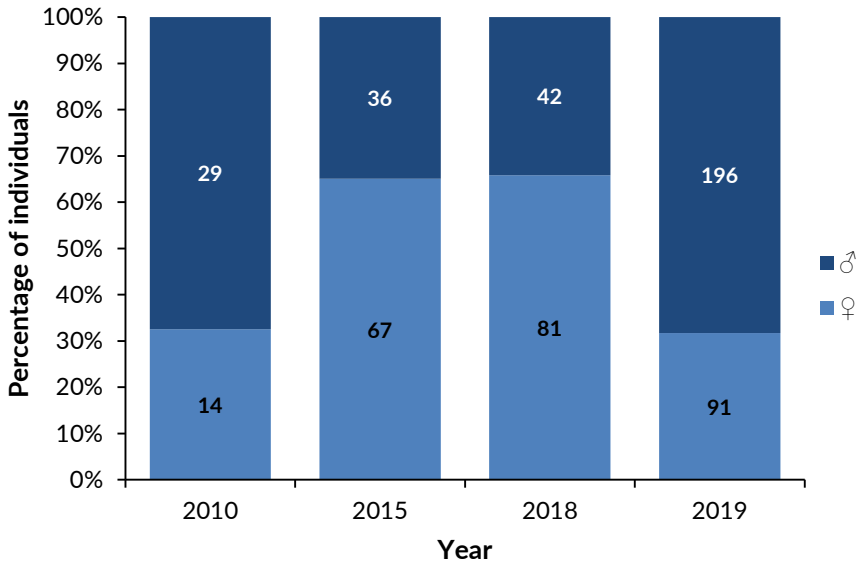

Figure 8: Population demographics of oceanic manta rays (*Mobula birostris*) during the four years when mass aggregations were recorded. Actual number of individuals on bars.

Behaviour

The primary behaviour observed during each manta encounter was noted. Only two behaviours were recorded in 2019; 322 encounters of 'cruising' individuals, and five encounters of individuals displaying 'courtship' behaviour. There were no confirmed sightings of feeding or cleaning individuals in 2019. Sightings are from throughout the water column; from the surface waters down to the limits of recreational diving at 30 metres.

MARINE RESOURCE MANAGEMENT & PROTECTION MEASURES

Tourism

Anecdotal observations of tourism numbers in Fuvahmulah suggest a sharp increase in divers, particularly those visiting by liveaboard safari boats. Although there are no data on the total number of liveaboards or divers visiting Fuvahmulah, a good proxy of the trend can be obtained by looking at the number of guests diving through Fuvahmulah Dive School. Tourism data is only available from November 2017 onward, yet there has already been a large increase in the number of guest dives (Fig. 9). It is expected that this trend will increase as awareness and promotion of Fuvahmulah as a world class dive destination continues.

There are very few locations worldwide where divers can see; whale sharks, oceanic manta rays, thresher sharks, tiger sharks, silvertip sharks, hammerhead sharks, and sunfish during a single trip. As a result, the marketability of Fuvahmulah as a top dive destination is very high. However, there is growing concern among the local dive community, and within marine conservation groups (including the Manta Trust), that the number of divers may soon reach unsustainable levels. Much of the diving in Fuvahmulah is centred on Farikede, resulting in all the local dive operators and the visiting liveaboards diving this site en-masse, often leading to overcrowding. The Manta Trust recommends limiting the number of divers and operators either per day, and/or per season, to prevent detrimental impacts on the reefs and megafauna from unrestricted tourism.

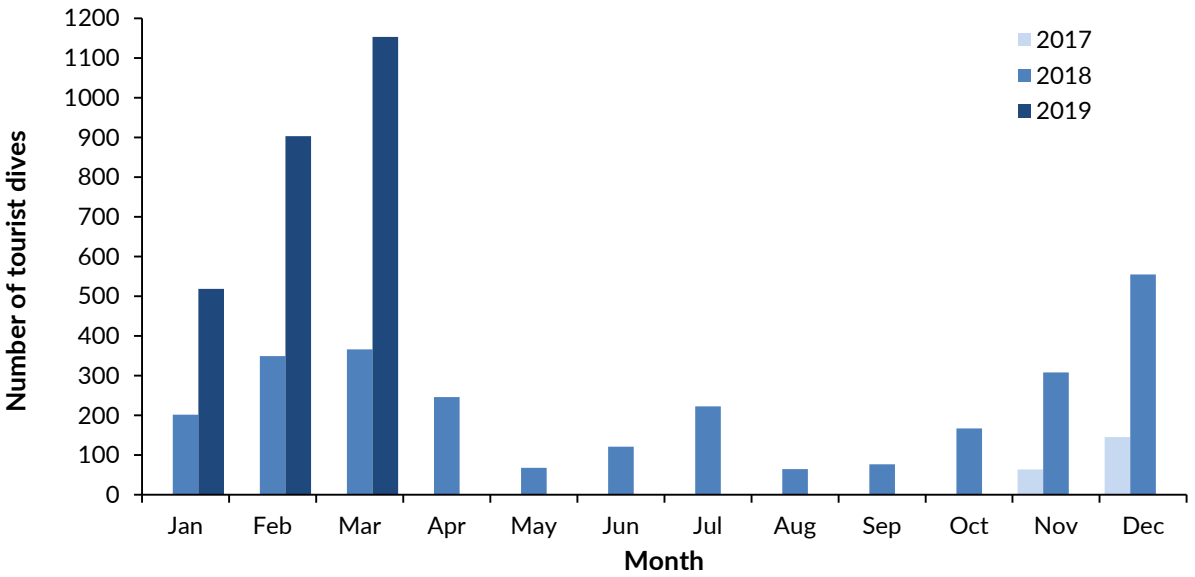

Figure 9: The total number of guest dives by Fuvahmulah Dive School per month (Nov 2017 – Mar 2019).

Marine Protected Areas

Currently in the Maldives, there are over thirty Marine Protected Areas (MPAs). However, Hanifaru Bay in Baa Atoll remains the only one with a fully implemented management plan. There are currently no MPAs designated as such for the protection and conservation of oceanic manta rays in the Maldives. Thoondi beach and lagoon on the north coast of Fuvahmulah has recently been designated an MPA due to the unique beach morphology. Thoondi area is also coincidently a location where oceanic manta rays are sometimes seen. The MPA extends out until the reef drop-off, and therefore, by default, includes this manta site. However, there is no protection in place for Farikede, the most important marine megafauna aggregation site at Fuvahmulah Atoll.

Fuvahmulah Environmental Research & Education Centre

Fuvahmulah is a unique diving destination in the Maldives, on par with some of the best diving locations in the world. Numerous pelagic species visit the single island atoll, which are rarely seen elsewhere in the Maldives, or globally. For this reason, Fuvahmulah lends itself to being a prime location for marine research and education. The Manta Trust envisages a dedicated environmental research and education centre on Fuvahmulah Island, where visiting scientists and researchers can be based, using onsite facilities to further education and research. This centre would include both laboratory and computer facilities, but also a tourist and local visitor centre where people can learn about the flora and fauna unique to Fuvahmulah and its coastal waters.

It is important that the local community is involved with, and benefits from, the research activities being conducted. During the 2019 oceanic manta season, with the support of the island council, the Manta Trust held an education day with four of the local schools in Fuvahmulah to raise awareness, inspire the younger generation and encourage environmental practices. The proposed research and education centre would cater for young Maldivian scientists wanting to pursue a career in environmental research, as well as offer a place for school trips from Fuvahmulah and other atolls. It is hoped that the local island council of Fuvahmulah, as well as the Ministry of Environment and Ministry of Education, will support the Manta Trust in creating such a facility.

CONCLUSIONS

Little is known about the population of oceanic manta rays which frequent the Maldives. The vast majority of sightings, particularly from the aggregations in the sub-equatorial atolls, are noted to be of individuals primarily cruising through the site. The fact that 97% of individuals sighted during the season were only seen once (a similar trend recorded in previous years) suggests that the population is transient, and only passing through the waters of Fuvahmulah and Addu, rather than using it as a location for foraging, cleaning or mating. However, the varying sex ratios of the individuals sighted during the peak sighting period suggest that these migrations may be linked to reproductive drivers and/or differences in foraging strategies between the sexes.

The 2019 peak sighting period saw the first re-sightings of individuals from previous years, and although this formed a very small proportion of the sightings, it was the first proof that some of the individuals return each year. It is expected that with further research and increased survey effort, more returning individuals will be recorded.

Despite the growing knowledge of this species in Maldivian waters, the threat from Sri Lankan and Indian fishing fleets outside the Maldives Economic Exclusion Zone remains a major concern. Every year, our understanding of the oceanic manta ray aggregation around Fuvahmulah grows, yet nothing is known about where these animals travel, and what they are doing, when they leave the reefs of these sub-equatorial atolls. With a growing tourism industry relying heavily on the oceanic manta rays as one of the main attractions, it is important to develop our understanding of their movements so they can be effectively protected. To address these protections, research efforts will rely heavily on the ability to conduct telemetry studies, and to take biopsy tissue samples for stable isotope, fatty acid, and genetic analysis. It is hoped that these will be permitted research methods for marine scientists in the Maldives in the near future.

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 and our other partners 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 has many implications on a global scale for manta ray conservation.

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

The Manta Trust would like to extend a special thank you to Fuvahmulah Dive School for their support with the field studies this year and for providing photo IDs of mantas whilst the Manta Trust are not on site.

FUVAHMULAH DIVE MALDIVES

We would also like to thank Farikede Divers, Tigershark Residence, all the liveaboard operators, and citizen scientists for submitting photo IDs of oceanic manta rays this year.

This report was compiled on behalf of the MMRP and the Manta Trust by:

Simon Hilbourne - MSc (Hons)
Research Officer - Oceanic Mantas Maldives

Dr. Guy Stevens
Chief Executive & Co-Founder

This document was created by:

Simon Hilbourne - MSc (Hons)
Digital Media & Communications Manager

For further information, please email:

info@mantatrust.org