



Maldivian Manta Ray Project

Oceanic Manta Ray | Summary Report 2022

*Conservation through
research, education, and collaboration*

- The Manta Trust





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 30 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 5,000 different individual reef manta rays, from more than 70,000 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 over 800 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 in 2022, with a focus on the oceanic manta ray peak sightings 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 oceanic relative. 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.

Throughout 2022, there were 60 sightings of 58 individuals. The 2022 peak sighting period around Fuvahmulah ran from April 8th to April 22nd, during which a total of 38 sightings of 36 individuals were recorded directly by Manta Trust researchers or submitted to the Manta Trust by citizen scientists. All but two of the individuals recorded this year were new to the database. The re-sighting rate of individuals within the season was very low (5%), 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 2022, the Manta Trust team continued their increased 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 has been agreed for Fuvahmulah, which would benefit visiting researchers, and involve local scientists from Fuvahmulah and the Maldives. We will be working with Fuvahmulah City Council over the coming years to implement these plans. Our hope is 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 Reports between 2018 and 2021. This report covers all data collected on oceanic manta rays up until December 2022. However, the report focuses primarily on the oceanic manta season from the 8th April to 22nd April 2022 in the sub equatorial atoll of Fuvahmulah in the Maldives.

The two most frequently sighted locations of oceanic manta rays at Fuvahmulah are the southernmost tip of the reef spur and the northeast corner of the Island referred to hereafter as Farikede Faru and Thundi Faru respectively (Fig. 1). On the spur reef there is a shelf plateau at approximately forty-five metres depth which extends out from the reef. In 2022, the Manta Trust conducted an extensive research seasons in Fuvahmulah Atoll to study the oceanic manta population. From the 13th of March until the 29th of April, the Manta Trust had researchers based on Fuvahmulah Island conducting four-hour daily snorkel and boat surveys to collect photo-ID data on the oceanic manta rays.

Additional drone surveys were used to survey larger areas in a shorter period. 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 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 and free 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 are counted only once.

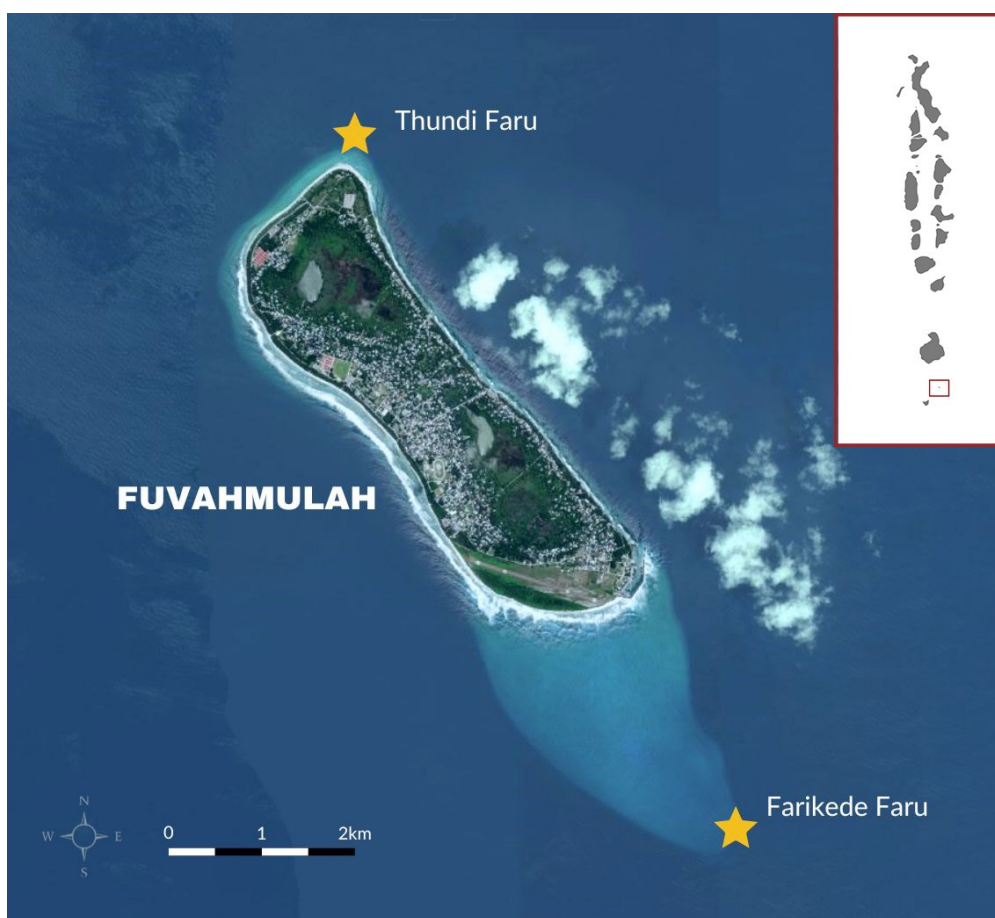


Figure 1: Map of Fuvahmulah Atoll in the Maldives archipelago (inset) with the two main locations where oceanic manta rays (*Mobula birostris*) have been sighted.

MANTA RAY SIGHTINGS

Nationwide

Throughout the Maldives Archipelago, a total of 921 sightings of 847 oceanic manta ray individuals have been recorded between 1996 and the end of 2022. These sightings were obtained from 16 of the 26 geographical atolls of the Maldives; from Thiladhunmathi Atoll in the north through to Addu Atoll in the south (Fig. 2). Throughout the country, there were 60 sightings of oceanic manta rays in 2022 (Fig. 3). A significant difference has been identified over the years between sightings of oceanic manta rays in

the deep south of the Maldives (Fuvahmulah and Addu) and the rest of the country. For this reason, sightings from these regions will be analysed separately. The recorded photo-IDs showed no significantly biased gender split (sex ratio 1F:1.11M, $\chi^2 = 2.23$, $df = 1$, $p < 0.05$), across the total recorded population with 417 males (50%) and 375 females (44%). However, there are 55 individuals (6%) with unknown gender.

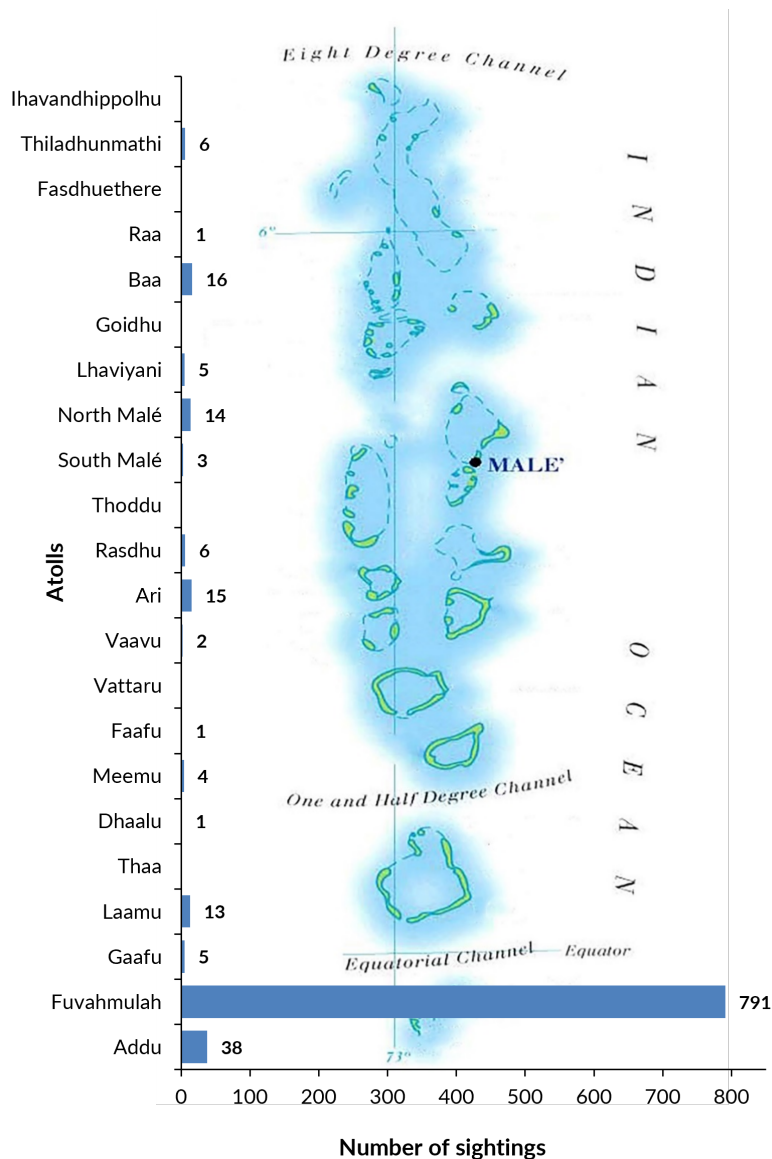


Figure 2: Number of sightings ($n=921$) of oceanic manta rays (*Mobula birostris*) across atolls throughout the Maldives (1996 – 2022). Note – some individuals have been sighted in more than one atoll throughout the Maldives Archipelago.

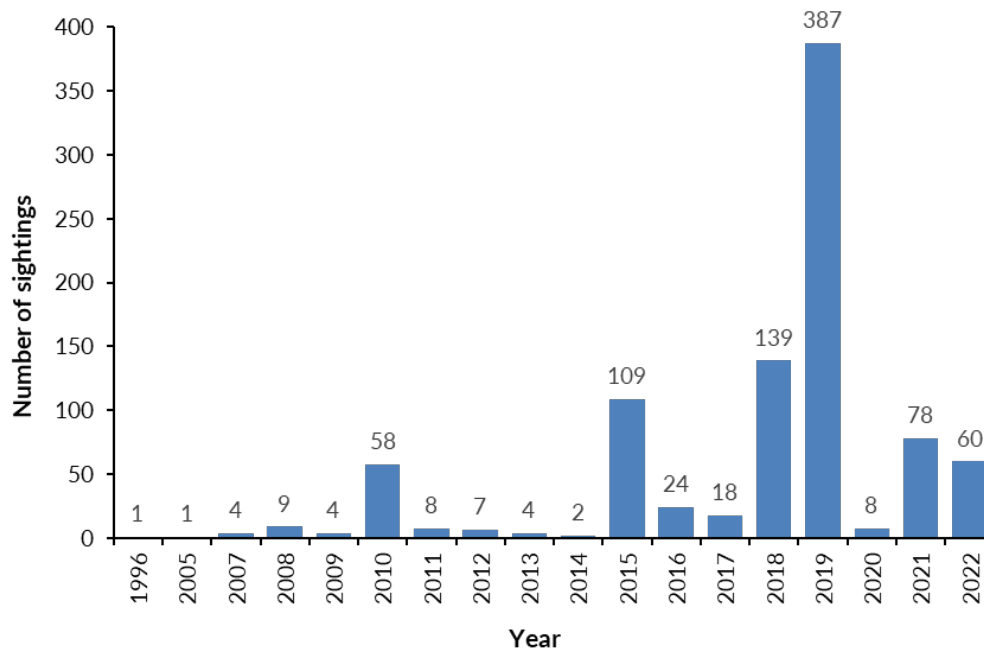


Figure 3: Number of oceanic manta ray (*Mobula birostris*) sightings (n=921) throughout the Maldives (1996 – 2022).

NATIONWIDE (EXCEPT FUVAHMULAH & ADDU)

Manta Ray Sightings

Between January 2022 and December 2022, 14 sightings of 14 individuals were recorded outside of Fuvahmulah Atoll (Table 1).

Due to the low number of sightings for most atolls in the Maldives, further analysis on sightings and seasonality was not conducted in this report.

Table 1: Number of sightings of oceanic manta rays (*Mobula birostris*) in 2022 from atolls other than Fuvahmulah.

Atoll	2022
Ari Atoll	2
Gaafu Atoll	2
Lhaviyani Atoll	2
North Malé Atoll	3
South Malé Atoll	2
Rasdhu Atoll	1
Thiladhunmathi Atoll	2
Total	14

Re-sightings

Two of the sightings in 2022 were re-sightings of individuals. The first individual was an adult female (ID number MV-MB-0749) that was sighted at Makunudhoo Kandu in North Malé Atoll in September 2021 (1a in Fig. 4). The same individual was then re-sighted 287 days later at Kuramathi Kandu, Rasdhoo Atoll (1b in Fig. 4).

The second individual to be re-sighted was seen in Hurai Faru, Baa Atoll and then again 456 days later at Huravahli Kandu, Lhaviyani Atoll (2a & 2b in Fig. 4). Both re-sightings represent inter-atoll movements which are rarely recorded for this manta ray species in the Maldives.

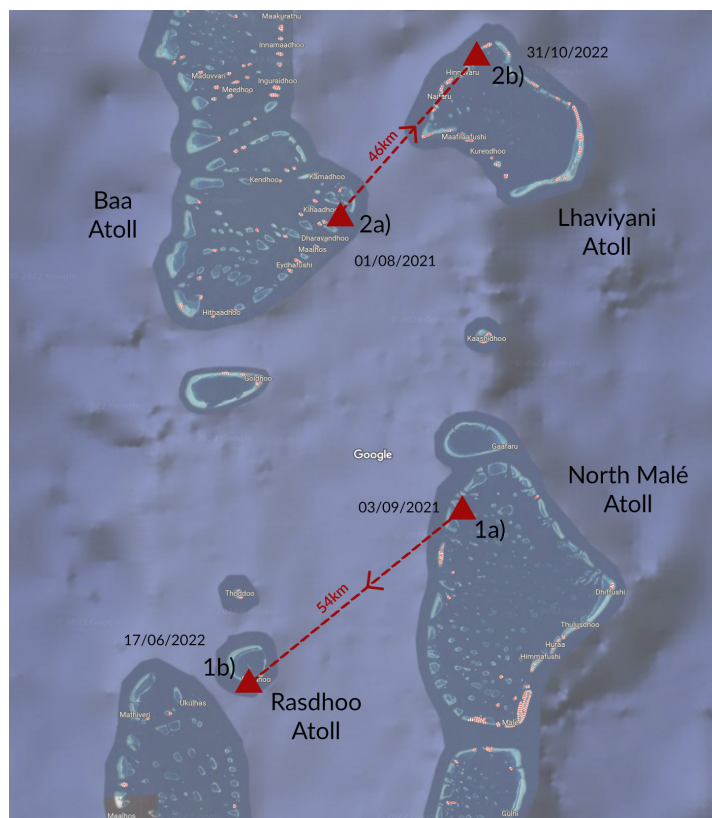


Figure 4: Locations of initial (1a and 2a) and secondary sightings (1b and 2b) of two oceanic manta rays (*Mobula birostris*). The dotted line illustrates connectivity between the sites, however the actual route of the manta rays is unknown.

Population Demographics

In 2022, there were more females recorded than males (sex ratio 1.8F:1M) with nine females and five males. However, due to small sample sizes, statistical analysis on significant differences was not possible. All individuals were adults and of the nine females, one individual was recorded as being visibly pregnant.

When not considering Fuvahmulah and Addu, none of the oceanic manta rays sighted in 2022 throughout the rest of the Maldives were melanistic (black morph), all were chevron colour morphs.



Behavioural Observations

The primary behaviour that the manta rays were exhibiting was recorded during each encounter. Most sightings throughout 2022 were of cruising or just swimming individuals (Table 2). Two incidents of oceanic manta ray courtship behaviour were recorded, each involving two individuals. The first was in Mirihi Faru, Ari Atoll where a male was observed pursuing a female at fast pace over a one and half hour encounter in January (Figure 5). Courtship behaviour between oceanic manta rays was observed around South Ari Atoll in January 2021 as well.

A second, similar, encounter was observed at Kuredihavru Faru in Thiladhunmathi Atoll over a two hour encounter in July 2022.

Table 2: Primary behaviour recorded during oceanic manta ray (*Mobula birostris*) encounters in the Maldives (except Fuvahmulah & Addu) in 2022.

Behaviour	Number of sightings
Cleaning	0
Courtship	4
Cruising / Just Swimming	10
Feeding	0



Figure 5: A series of screenshots of two oceanic manta rays (*Mobula birostris*) in courtship observed at Mihiri Faru, Ari Atoll in January 2022. A pregnancy bulge can be seen in on the lead (female) manta ray in 5a and 5b. Image credit: Lynn Jula Kessler.

FUVAHMULAH & ADDU ATOLLS

Manta Ray Sightings

Fuvahmulah and Addu Atolls, the two southern most atolls of the Maldives, have historically been the area with the most oceanic manta ray sightings. In 2022, there were 46 confirmed sightings of 44 oceanic manta ray individuals from Fuvahmulah Atoll, and zero from Addu Atoll (Fig. 6). Of

the 46 sightings, 38 of these were recorded during a 14-day period between April 8th and April 22nd (Fig. 7). Seasonality of sightings around Fuvahmulah in 2022 align with those in previous years, with a peak sighting period in March and April (Fig. 8).

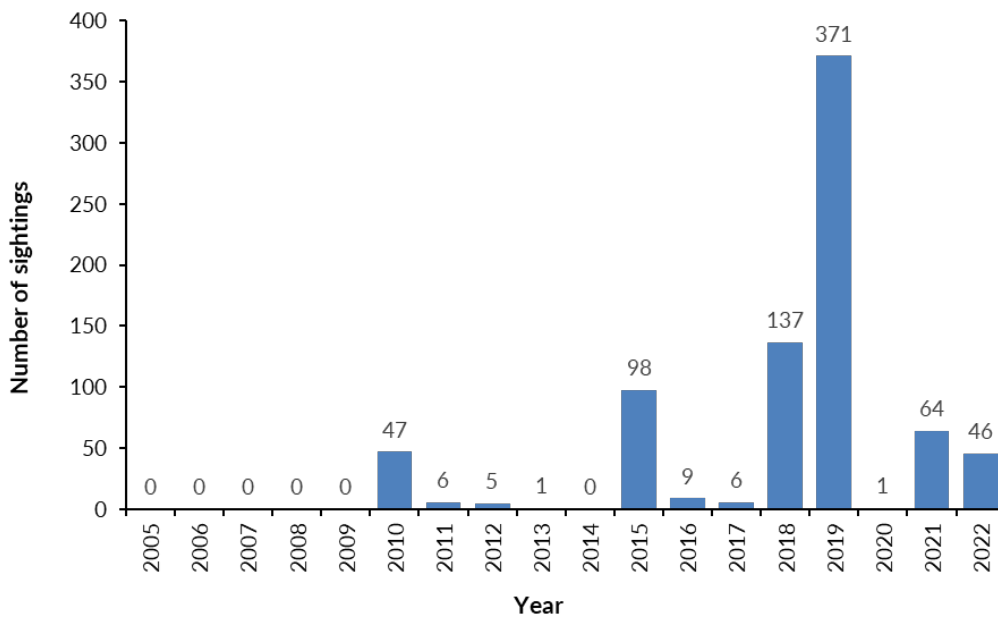


Figure 6: Annual total number of sightings of oceanic manta rays (*Mobula birostris*) from Fuvahmulah Atoll (2005 – 2022).



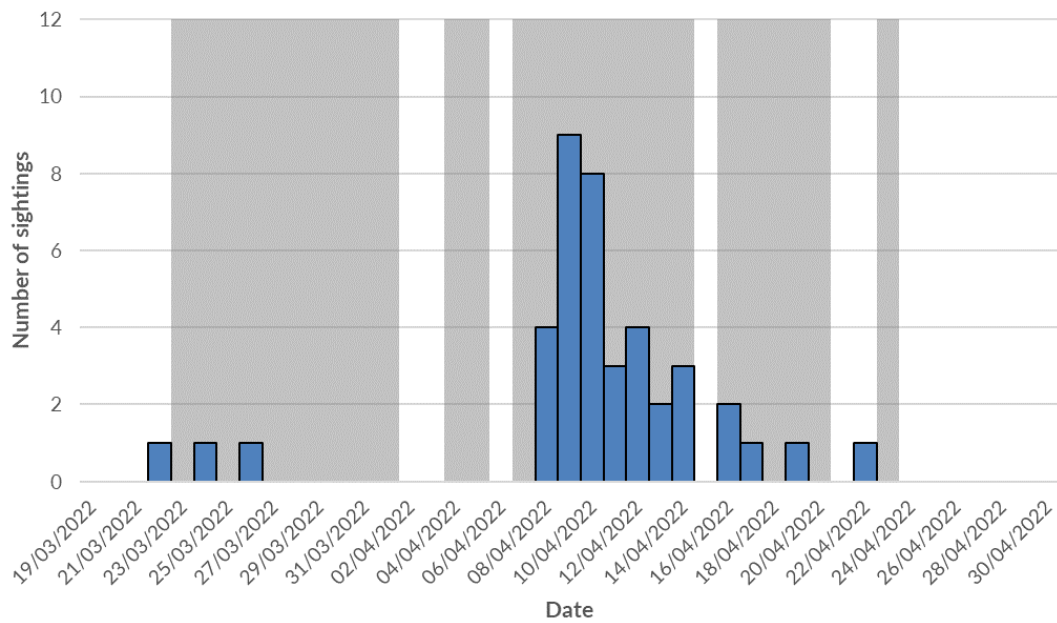


Figure 7: Number of oceanic manta ray (*Mobula birostris*) sightings per day (blue bars) between March 19th and April 30th, 2022. Manta Trust research team survey days (n=28) are greyed out.

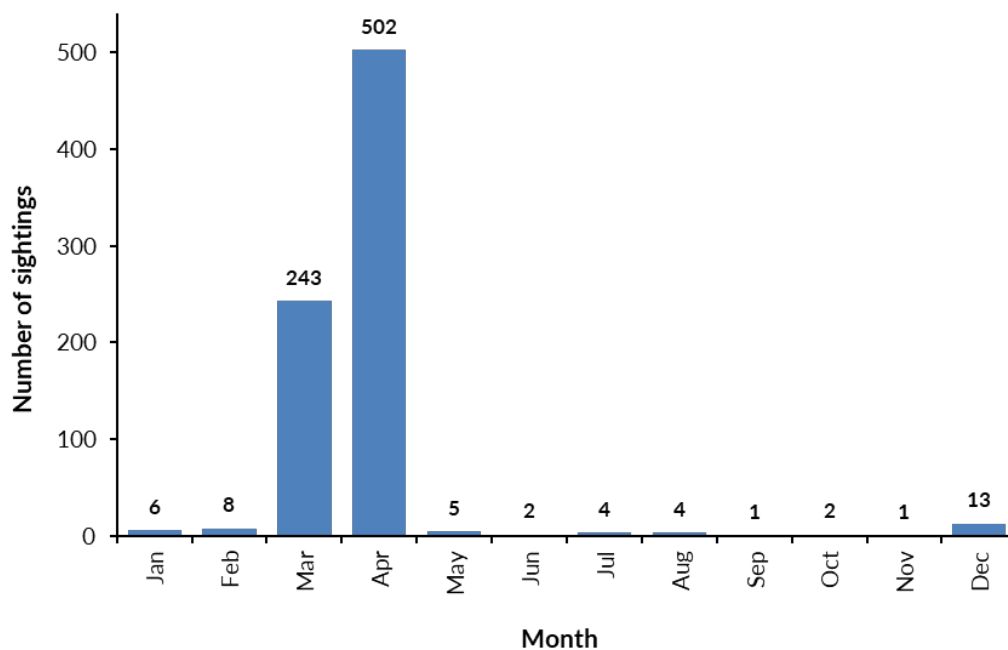


Figure 8: The total number of oceanic manta ray (*Mobula birostris*) sightings (n=791) each month from Fuvahmulah atoll (2008 – 2022).

Although the Manta Trust do not have standardised survey effort throughout the year, the dive logs from a local dive operator show that there are dives at Fariked Faru year-round. 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. The Manta Trust team conducted surveys around the whole island, although we focused on the two primary sighting locations of Fariked Faru and Thundi Faru. All but seven sightings came from these sites.

Re-sightings

None of the 44 individuals recorded around Fuvahmulah in 2022 had been recorded in the database prior to the 2022 study period. In previous years the number of inter-annual sightings has also been low (2% in 2021, and 1% in 2019). Such a low incidence of resighted individuals suggests that a very large population of this species is likely to exist in the region, numbering from thousands to possibly tens of thousands.

There were two re-sightings of individuals around Fuvahmulah within the 2022 season. This equates to just 5% of the individuals being re-sighted. The remaining 95% of individuals (n=42) were only sighted once, despite near daily surveying during the peak manta ray period. The periods between these two re-sightings were one and two days (table 3).

Table 3: Demographics and details of the re-sighted oceanic manta rays (*Mobula birostris*) (n=2) around Fuvahmulah Atoll in 2022.

Manta ID Code	Demographic	Initial Sighting Date	Initial Sighting Location	Re-Sighting Date	Re-Sighting Location	Days Between Sightings
MV-MB-0808	Adult female	09/04/2022	Fuvahmulah	10/04/2022	Fuvahmulah	1
MV-MB-0821	Unknown Gender	12/04/2022	Fuvahmulah	14/04/2022	Fuvahmulah	2

Population Demographics

There was no significant difference ($\chi^2 = 1.882$, $df = 1$, $p < 0.05$) between the number of male (n=13) and female (n=21) manta rays observed in the 2022 peak period around Fuvahmulah (for 2 individuals the sex was unable to be determined) (Fig. 9).

Of the 21 females observed, 33% (n=7) had visible mating scars or wounds. One pregnant female was recorded in 2022 and all individuals, both male and female, were assessed to be adults based on their size, and in the case of males, on the size and calcification of their claspers. This is in accordance with previous years' observations, which have

been represented predominately by an adult population with low incidences of pregnancies.

Of the 44 newly identified oceanic manta rays in 2022 around Fuvahmulah, just 1 (2%) was melanistic. This is in line with the long-term trend, with melanistic oceanic manta rays making up just 2.1% (n=18) of the known population (n=847). Interestingly, there has never been a sighting of a melanistic reef manta ray recorded in the Maldives despite it hosting the largest known population of this species in the world.

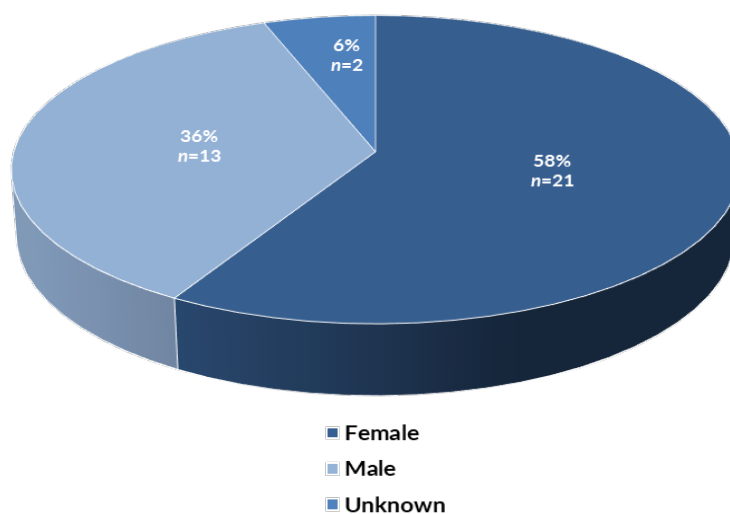


Figure 9: Number of male and female oceanic manta rays (*Mobula birostris*) recorded around Fuvahmulah Atoll of the Maldives in 2022.

Behavioural Observations

The primary behaviour observed during each manta encountered was noted. Only one encounter with two individual displayed courtship behaviour was recorded around Fuvahmulah in 2022. This sighting was of a mature male pursuing a pregnant female with ventral mating scars at high speed for around 25 minutes near Fuvahmulah Harbour

entrance. The remaining 44 sightings were recorded as 'cruising' individuals. There were no confirmed sightings of feeding, or cleaning individuals in 2022. Sightings were from throughout the water column, from the surface waters down to the limits of recreational diving at 30 metres.

OTHER RESEARCH ACTIVITIES

Eyes On The Reef (EOTR) Cameras

In 2022, the team deployed long term non-baited timelapse cameras at Farikedde Faru and Thundi Faru to record megafauna occurrences over a longer period. The cameras were set to take still images every minute from sunrise to sunset. With regards to oceanic manta research, it was hoped that the cameras would verify the seasonality of oceanic manta rays as well as provide insight into timings of sightings during the day and in relation to tidal and lunar

phases. This project is now being developed by an MSc student who plans to look at the presence and seasonality of marine megafauna at three different sites around the island between March and August 2022. This data will be published in a peer-reviewed journal and shared with the Maldives government and Fuvahmulah island community in due course.

Table 4: Relative abundance of shark and ray species on EOTR cameras around Fuvahmulah Atoll in 2022.

Common Name	Scientific Name	IUCN Red List Status	Relative abundance on EOTR
Whale shark	<i>Rhincodon typus</i>	Endangered	Low
Pelagic thresher shark	<i>Alopias pelagicus</i>	Endangered	High
Grey reef shark	<i>Carcharhinus amblyrhynchos</i>	Endangered	Medium
Oceanic manta ray	<i>Mobula birostris</i>	Endangered	Low
Whitetip reef shark	<i>Triaenodon obesus</i>	Vulnerable	High
Tiger shark	<i>Galeocerdo cuvier</i>	Near Threatened	High
Scalloped hammerhead shark	<i>Sphyrna lewini</i>	Critically Endangered	Low

Crittercam Deployments

National Geographic Society Crittercam suction cup cameras have been deployed by the Manta Trust on oceanic manta rays in Mexico (Fig. 10) and reef manta rays in the Maldives to analyse behaviour. Permits were obtained for the deployment of Nat Geo Crittercams in 2022, however

the systems were faulty in the USA and could not be troubleshooted in time for the oceanic manta ray peak season. The systems were never sent to the Maldives. The Manta Trust will request an extension of the permit to conduct the research in 2023.



Figure 10: An oceanic manta ray fitted with a non-invasive suction cup camera in the Revillagigedo archipelago, Mexico. The Crittercams are programmed to detach after a period of hours filming the manta rays behaviour from its perspective.

Satellite Telemetry & Tissue Biopsy

In order to better understand the movements, migration, habitat use and connectivity of populations, the Manta Trust has applied for permits to deploy satellite tags and collect biopsy tissue samples in 2021 and 2022. In both seasons permits were not granted and therefore these research activities were not undertaken. However, in line with requests from the Maldives EPA, extensive education and outreach was conducted with the local community in Fuvahmulah. All the dive centres, and their staff, were invited to attend presentations and hands on workshops to see the equipment mentioned in the permit application first hand and to learn about field techniques and data analysis for these research methods.

Letters of no objection for satellite tagging and tissue

biopsying studies were obtained from the Fuvahmulah City Council, Maldives National University as well as five of the six local dive centres (Fuvahmulah Dive School, Pelagic Divers Fuvahmulah, Diving Club Olige, Fuvahmulah Scuba Club, Shark Island Divers) following these workshops.

It is apparent that any opposition to such research techniques is based off misinformation and a lack of understanding of how these technologies and methods work. After workshops and knowledge sharing, the perception towards these methodologies improved.

The Manta Trust will reapply for permits to conduct satellite tagging, crittercam, and tissue biopsying studies in 2023.

MARINE RESOURCE MANAGEMENT & PROTECTION MEASURES

Fishery Photo-ID Comparison

In 2022, the Manta Trust ran a check on the IDs of manta rays collected by the Blue Resources Trust (an affiliate project of the Manta Trust) in the fish markets in Sri Lanka (Fig.11a). Blue Resources Trust have been conducting shark and ray fisheries monitoring programmes across Sri Lanka

for a number of years and opportunistically collect photo ID images where possible. Often oceanic manta rays are cut up in order to haul them on board and store them in the fishing boat's freezer, therefore identification images are not always possible to attain (Fig. 11b).

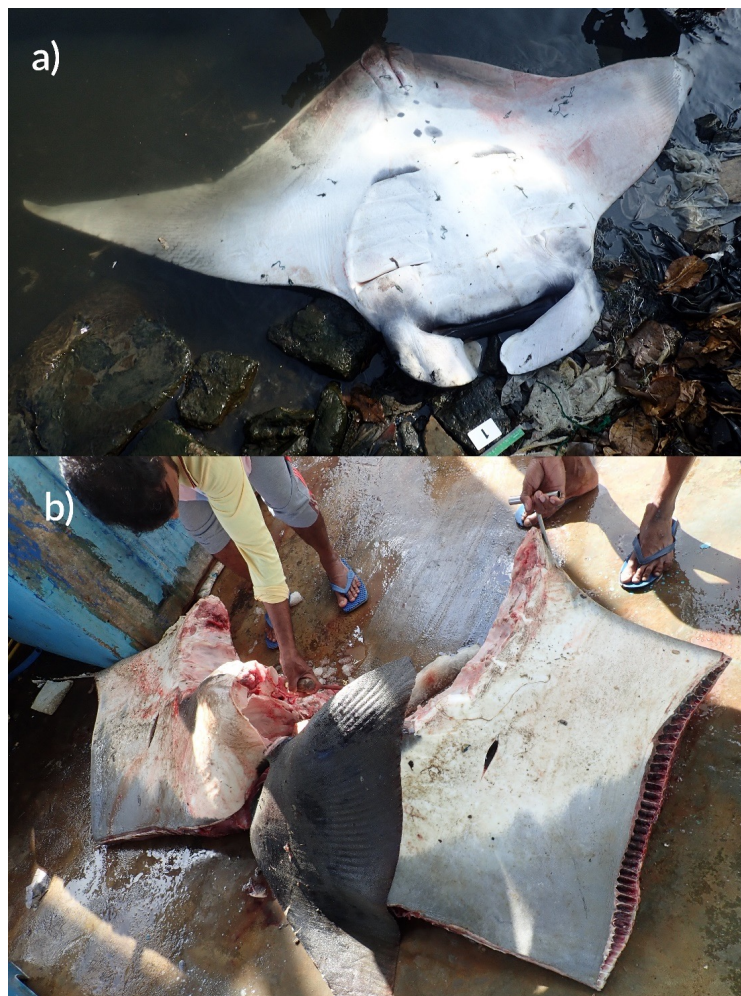


Figure 11: Examples of dead oceanic manta ray (*Mobula birostris*) specimens landed either whole (a) or cut up (b) in Sri Lanka. Images credit: Blue Resources Trust.

Intact or semi-intact IDs of deceased manta rays from Sri Lanka were compared against the database recorded in the Maldives. We compared 42 oceanic manta rays against the Maldives database but found no matches.

Even if a match was found, this would provide limited information. It would show connectivity between the oceanic manta rays in the Maldives and Sri Lankan fishing fleets, but it would not indicate where fisheries are overlapping with oceanic manta ray habitats, something that satellite telemetry can help answer.

Separate populations

Over recent years a potential trend has emerged with sightings. Despite a far greater number of oceanic manta rays sighted in the sub-equatorial atolls of Addu and Fuvahmulah ($n=762$), none of these individuals have been re-sighted in atolls further north, and only 0.1% have been seen in more than one atoll. Contrarily, above the equator, only 85 individuals have been documented but 3 (3.5%) have been recorded in multiple atolls. Once re-sightings within a short period (one week) have been removed, a greater re-sighting rate amongst fewer individuals is seen.

This suggests a smaller population in the north than the south, with higher site fidelity. It is surprising that none of the oceanic manta rays from Fuvahmulah and Addu have been sighted further north. It leads to the hypothesis that oceanic manta rays sighted throughout the Maldives may originate from two distinct populations separated by prevailing oceanographic current systems with the North Equatorial Current above the equator and South Equatorial Current impacting the southernmost Maldives atolls.

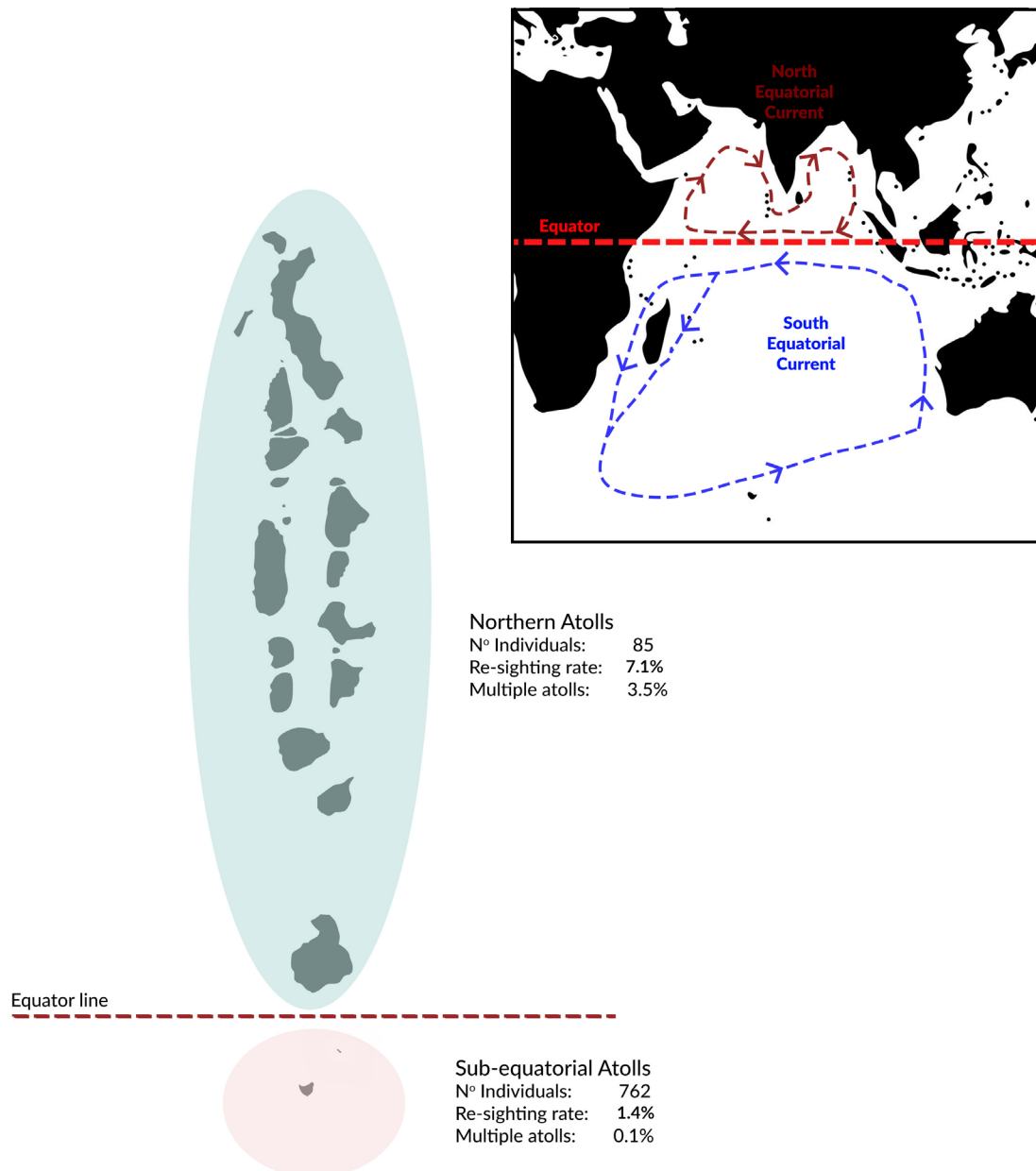


Figure 12: Map of the Maldives Archipelago illustrating the potential two populations of oceanic manta ray (*Mobula birostris*) found on either side of the equator.

Education & Outreach

In 2022, Ramadan coincided with the research season and subsequent school and office closures made some of our education and outreach objectives harder to achieve. Despite this, the Manta Trust, along with the Maldives Whale Shark Research Programme, were able to conduct extensive marine education and outreach sessions. During the 2022 oceanic manta season in Fuvahmulah, the Manta Trust hosted many community outreach events to encourage sound environmental practices within the community and foster interest in the younger generation. The seminars provided information on the state of the Maldives' oceanic manta ray population and an in-depth insight into the research methods. This involved explanations of tagging and biopsy procedure, photo identification practicals and more. We had the actual satellite tags and tagging equipment on hand for the attendees handle and better understand.

The team ran one-hour presentations on whale shark and oceanic manta ray research with over 210 students aged six to 14 years old from Gnaviyani Atoll Education Centre, Brightway Elementary School, and Zikuraa School. Sessions included information on marine animals sighted around the island and demonstrations of research equipment utilised, such as the 'Eyes on the Reef (EOTR)' camera, current meters, and laser photogrammetry tools. The pupils also tested out the virtual reality experience.

Presentations about our ongoing research objectives and findings were given to six of the Fuvahmulah island council members which culminated in discussions about the

proposed research centre. Presentations were also given to dive centre guests during the season.

Some marine science students, aged sixteen to eighteen, accompanied the research team to learn about data collection and processing techniques for photo-ID surveys and the 'EOTR' cameras with hands-on training in data collection, analysis and archival methods. Two local students were involved, together with another two community members. They participated in surveys on the research boat and attended demonstration sessions on oceanic manta biopsy sampling and tagging research methodologies. These young conservationists also spent time with our team inputting data, matching IDs and processing sightings. We hope to foster and grow these relationships and offer paid positions on the research team when they are eighteen years old.

As mentioned in the Research Activities section of this report, we also ran in-depth workshops with nine local divers on research methods. These involved hands on practicals with satellite tags, biopsy tips and applicator poles. We demonstrated how the data is collected and processed using examples from other locations as well as a full demonstration of the photo identification method and sightings database inputting.

Additionally in 2022, the research team supported the Rolex Our World Underwater EU Scholar.



Tourism

Anecdotal observations of tourism numbers in Fuvahmulah suggest a sharp increase in divers in recent years. Before the COVID-19 pandemic the number of safari boats visiting Fuvahmulah between December and April (Iruvai Season), appeared to be increasing.

Although there is no data on the total number of liveaboards or divers visiting Fuvahmulah, there has been an increase in the number of dive centres operating on the island (Fig. 13). 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, and hammerhead sharks

during a single trip, and 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 around Farikedde and Thundi Faru. As a result, all the local dive operators and the visiting liveaboards often dive these sites en masse, 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. We also recommend that a fee system will be required to enable patrolling, enforcement, management and affective protection of the site.

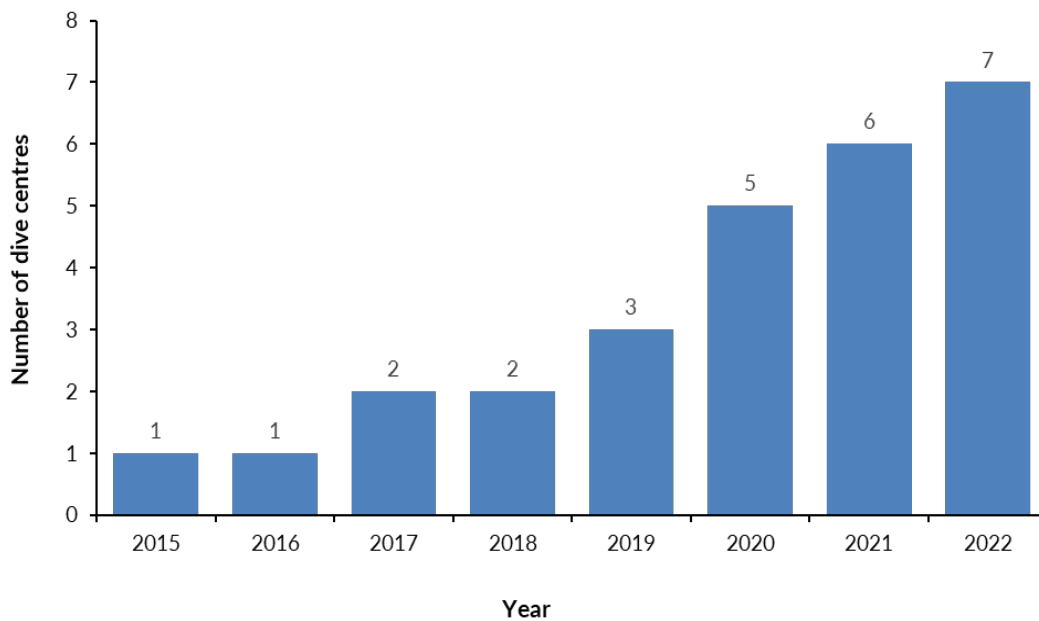


Figure 13: Number of operational dive centres on Fuvahmulah Island (2015-2022).

Marine Protected Areas

In 2020, Addu and Fuvahmulah Atolls were awarded UNESCO Biosphere Reserve status. Data on the presence of oceanic manta rays around these islands supported the application.

The Manta Trust have been informed that we will be consulted as a stake holder in the planning stages of the UNESCO Biosphere Reserve management plan. However, to date, we have not been contacted regarding this.

Fuvahmulah Environmental Research 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 from within the Maldives and abroad 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 community 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 also involved with, and benefit from the research activities being conducted, and this will be facilitated by a marine research and education centre. The Manta Trust put forward a proposal to the Fuvahmulah City Council and obtained their support for such a project. The marine research and education

centre will encompass a visitor centre full of information about the maritime history of Fuvahmulah, information about the marine biodiversity and species around the island as well as on-going research. This information will be in both English and Dhivehi. Additionally, the centre will have a multipurpose function room, classrooms, office space, marine biology lab, and accommodation for visiting researchers. The lab facilities will be available for Fuvahmulah and visiting Maldivian school groups to use.

Depending on the plans of the UNESCO Biosphere Reserve in Fuvahmulah, it would make sense to incorporate any staff, rangers, and ticketing office into this facility. Plans and developments for the centre progressed in 2022 and a more detailed account of the facilities. It is apparent that for the longevity of such a centre there would need to be a continual source of funding with the obvious solution being a portion of any biosphere visitor fees being allocated to such a centre. A masters student with the Manta Trust will be conducting interviews with tourists about their willingness to pay a marine park fee.

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 Deep South, are noted to be of individuals primarily just cruising through the site. The fact that 95% 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, Addu, rather than using it as a location for foraging, cleaning or mating. However, the varying sex ratios of the individuals sighted during the season suggest that these migrations may be linked to reproductive drivers and/or differences in foraging strategies between the sexes.

In 2022, all the individuals recorded around Fuvahmulah were new to the database, although it is known from previous years that some 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 Maldives 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 southern 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.

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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.

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