



2016 Annual Report

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Created by Lea Bluntschli and Daniel Brühlmann

Photos by MWSRP and Daniel Brühlmann (p. 1, 3, 4, 5, 8), Grampus de la Parra (p. 9), James Hancock (p. 10), Thomas Ha (p. 11, 12), Maldives Marine Expo (p. 13), Alex Childs (p. 14, 15).



Overview

Mission Statement

The charity's objectives are to promote for the benefit of the public the conservation, protection and improvement of the physical and natural environment of whale shark and marine biological diversity by: (a) promoting and carrying out for the public benefit research and publishing or otherwise disseminating the useful results of such research: (b) raising awareness and understanding of marine conservation.

Background

The whale shark *Rhincodon typus* is the largest species of fish on Earth, attaining lengths in excess of 12m. Nonetheless, very little is known about its distribution, habitat requirements, movements or reproduction – all of key importance for conserving and managing this marine mega-vertebrate. The Maldives appears to be unusual, perhaps unique in the Indian Ocean, in supporting a year round aggregation of whale sharks, making the archipelago a superb place to study their behaviour and biology.

Despite these opportunities for research, there were virtually no scientific studies of whale sharks in the Maldives before the MWSRP engaged in a three-month research expedition in 2006. That pilot study documented several dozen sharks and also highlighted the need for further research, conservation and education and provided the seed for the creation of the MWSRP.

The MWSRP has accumulated over 3370 photographic sightings of 302 individual sharks dating back to 1999. The scope for future work in the Maldives is extensive, with questions about spatial distribution, long distance movement and diving behaviour still unanswered. Furthermore, of the 302 individuals identified up to February 2017 only 30 are females, with 181 males and 91 where gender is unidentified. Of those where

gender is identified therefore, a 83% male bias is recorded, extending the long held belief that the sub-population in this region principally consists of sub sub-adult, immature males. The male bias in the Maldives aggregation, as in many other whale shark aggregations in the Indian Ocean (e.g., W. Australia, Mozambique, Seychelles) is puzzling and further research is required to account for an apparent lack of female whale sharks.

The MWSRP's research in to the characteristics and movements of the whale shark population in the Maldives provides the scientific basis behind the Programme's role as a grassroots conservation charity. Since 2006 the MWSRP has made numerous school visits, conducted education field trips and facilitated international cultural exchange programmes for local children. Industry stakeholders, fisherman and local-island governing agencies have also been continuously consulted and the Programme has been successful in fostering cooperation between resort and island communities and re-establishing an important bond between the local community and the whale shark.

The MWSRP has continued to provide key information to the various ministries of the Maldivian government. Two notable achievements to date include the government's adoption of whale shark encounter guidelines for tour operators developed by the MWSRP in stakeholder consultations and more recently in 2009 the gazetting of the Maldives largest collaboratively managed Marine Protected Area (MPA).

The South Ari Atoll Marine Protected Area (MPA) encompasses the Maldives primary whale shark aggregation site and by forging partnerships with resorts and local communities, the MWSRP is continuing to assist the government by building the management capacity of the local stakeholder and island communities within the MPA.

Achievements and Performance

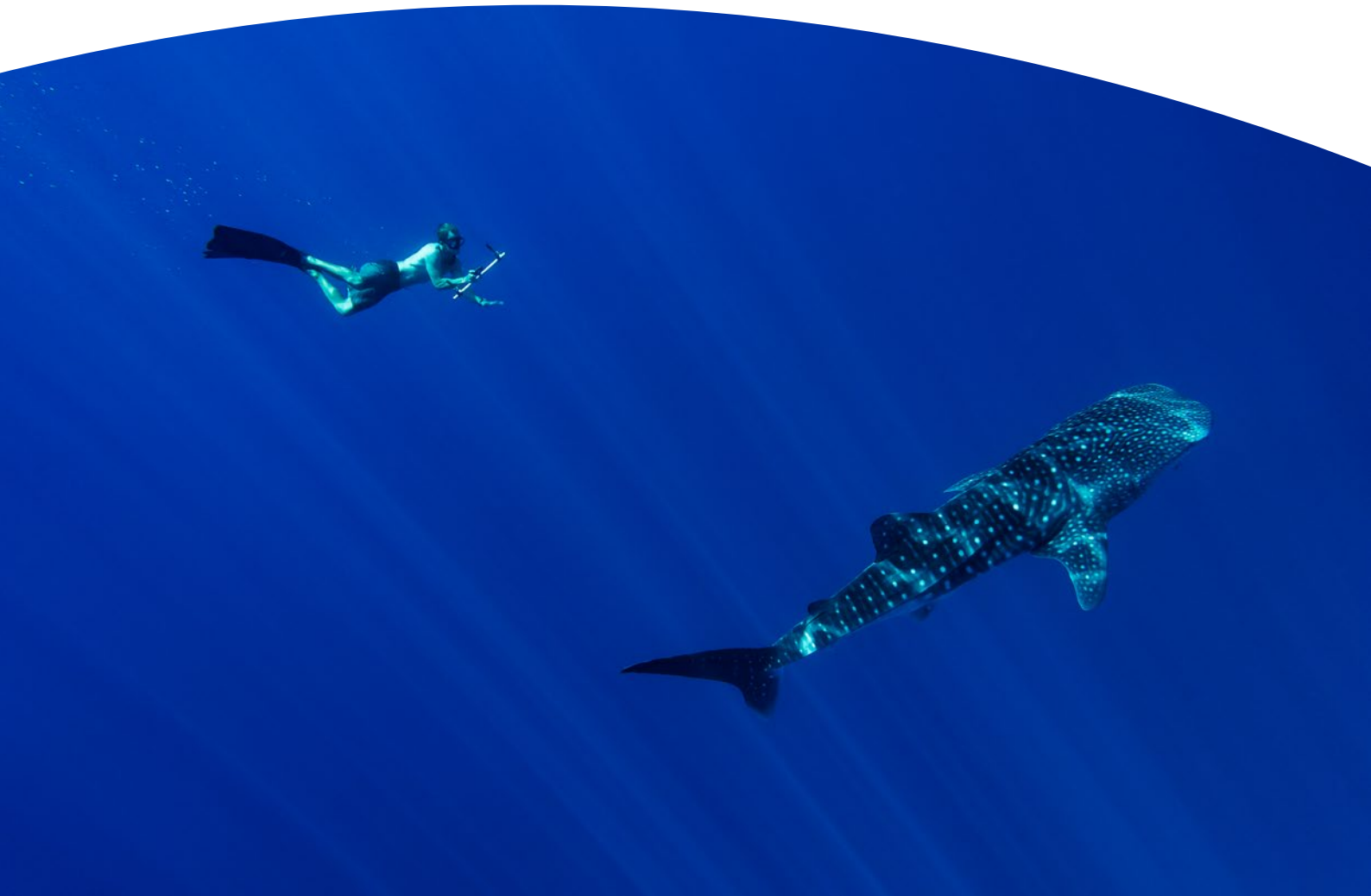
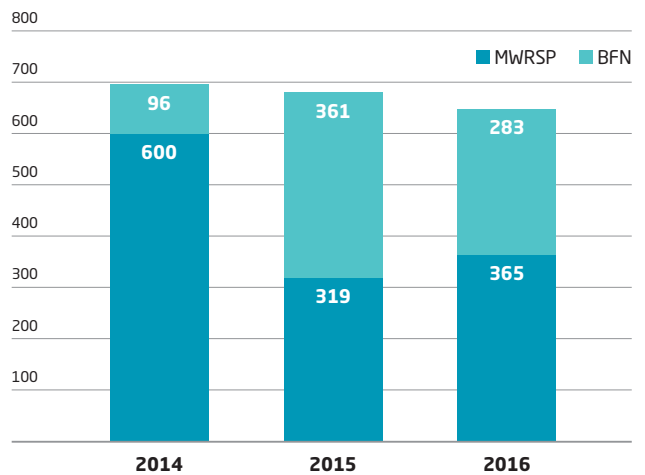
Research Summary

Overall Whale Shark Encounter Log Information

For the third year in succession, the total number of whale shark encounters recorded over the 12 months has remained near constant. Despite small changes in stakeholder involvement, MWSRP search effort and other variables, there has been strikingly little variance across the last three years.

Between February 2016 and February 2017 there was a total of 648 whale shark encounters recorded to the Big Fish Network in the Maldives. This is against 680 in 2015 and 696 in 2014 seasons, all three of which were at a time that MWSRP had a near year round presence and BFN was operational. This comprised of 365 encounters recorded by the MWSRP researchers (up from 319 in 2015), which also included environmental parameters. The remaining 283 encounters (down from 361 in 2015) were contributed by citizen science stakeholders of the Big Fish Network (BFN), predominantly from active members of the tourism sector.

Total Sightings





302

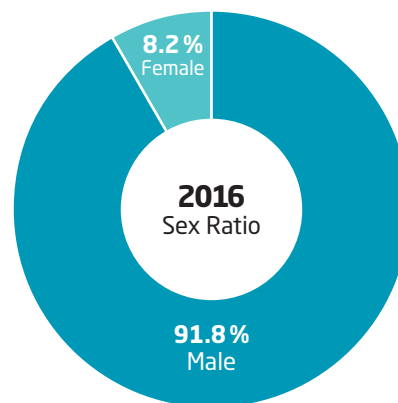
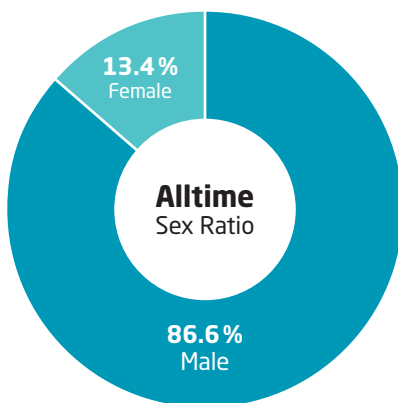
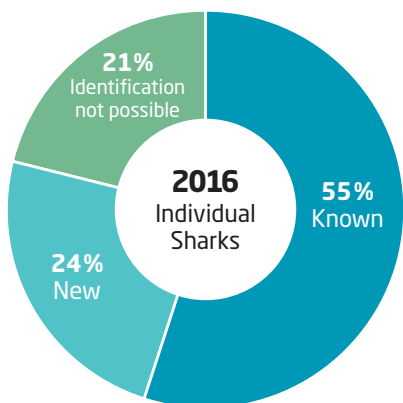
At the time of writing, the total number of different individual whale sharks recorded from across the Maldives since 2006 now stands at 302.

Of the whale sharks encountered, there were 73 different positively identified individuals, with an additional 19 encounters where identification of the individual was not possible. Of the definitively identified sharks, 51 individuals were previously known and were present on the individual whale shark library prior to the 1st February 2016. There were 22 new individuals to the Maldives individual whale shark database during this period. The total number of different individual whale sharks recorded from across the Maldives since 2006 now stands at 302.

Gender makeup for the 302 sharks on record breaks down as follows; 30 females, 194 males and 77 unknown. Taking only that data where the gender has been positively identified, that results in a gender bias of 86.6% male, very closely aligned to last year's total. For the newly identified sharks, the breakdown is 14 male, 3 females and 5 unknown, so just 82.3% male where sex has been verified. What does stand out is the 3 female sharks added to the record were all also all from the southern atolls, exclusively Gaaf Alifu.

The overall bias for all whale sharks recorded by the BFN from all parts of the Maldives during this 2016 season was 91.8%

male (61 whale sharks where sex was confirmed; 56 were male, 5 female). Breaking that down over region, we see that sharks seen in the South Ari atoll area are again significantly biased toward being male. Of 49 different sharks seen there, 43 were positively sexed of which 42 were male and just 1 was female – a 97.7% bias. However, in Thaa and Gaaf Alifu atolls, there were 22 different sharks encountered of which 16 were positively sexed. There were 12 confirmed male and 4 females, a 75% male bias. Thaa atoll was exclusively male for those 9 sharks where gender was confirmed, with 4 of unknown sex. More interestingly, considering just the 9 individuals from Gaaf Alifu atoll, 2 were of unknown sex, 3 were male and all 4 of the females were present; a 57% bias toward females. Once again, this season's data suggested that there is a possibility that some degree of sex segregation may be occurring in the Maldives, with females favouring the southern regions for as reasons which remain unknown. MWSRP will be seeking resources to continue to explore this trend and respectfully request all BFN members operating in this region to make all efforts to acquire gender confirmation photographs during their encounters.

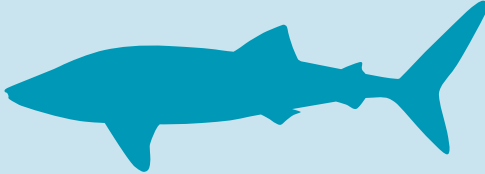


Average length of the whale shark was estimated by BFN or MWSRP members for 486 encounters during this period, with an average estimated length of 5.58m over all regions. This compares strikingly to the 2015 season total of 5.55m over 680 encounters. Minimum estimated length was 2.5m, while maximum was 9.5m. There was also a variance in recorded lengths by region. Sharks in Gaaf Alifu averaged just 5.25 (min 3.5, max 7) while Thaa sharks were considered to be significantly larger, averaging 6.82m (min 3.5, max 9.5). Sharks around the South Ari Atoll Marine Protected Area (S.A.MPA) were once again similar to previous years at 5.52m on average (min 2.5, max 8.5).

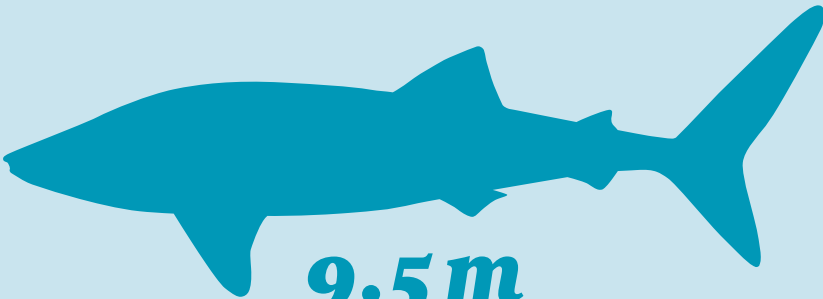
The most frequently encountered individual whale shark over the 2016 season was the home bird WS071 'Fernando', recorded 36 times and taking his tally of repeat encounters to 205 since April 2008. Interestingly, in all that time he has never been seen outside of S.A.MPA. Second place is WS018 'Adam' with 35 sightings. Again, this shark is extremely well known to the team and was one of the original sharks of the first 2006 season. He has since been seen 181 times in the following 11 years. Once again these frequency of sightings, spread across the year, highlight the huge importance the Maldives and the S.A.MPA hold to immature male whale sharks and should highlight the responsibility all stakeholders in this area should embrace to ensure the safety and good health of these revisiting 'old friends'.



2.5 m
Minimum length



5.58 m
Average length



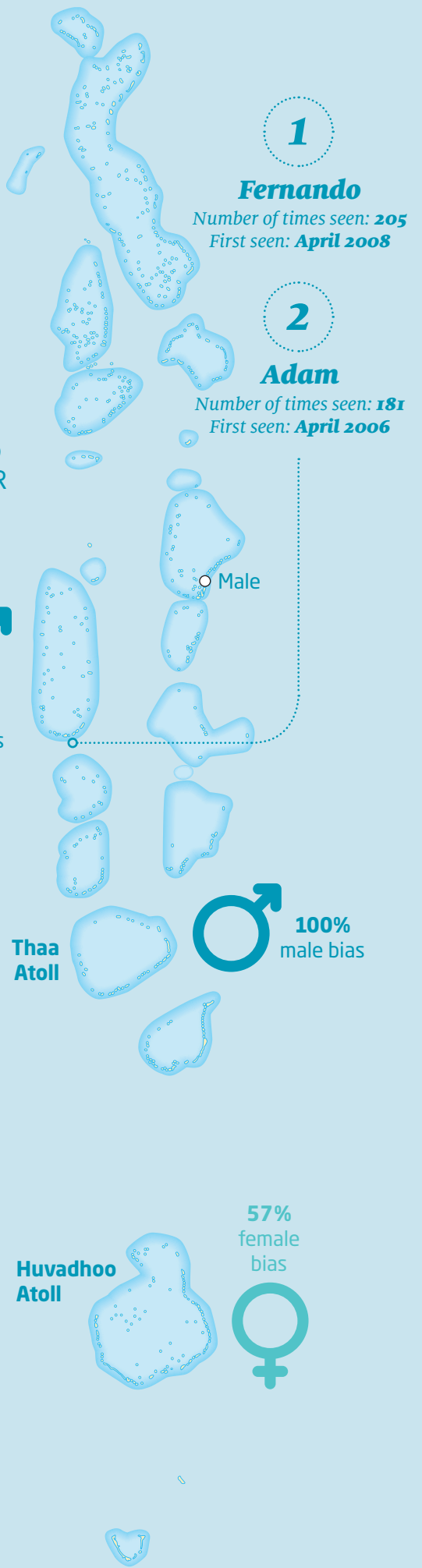
9.5 m
Maximum length

**2016
GENDER
DATA**

**Ari
Atoll**



**97.7%
male bias**





Top 5 Contributors during this period



Top Guest House Contributor

Boutique Beach



Top 5 Liveaboard Contributors

56
Lux*

21

Manta Trust

36

Maafushivaru

27

Maalifushi by COMO

22

Constance Moofushi

14

MV Four Seasons Explorer

14

MV Keana

9

Carpe Nova / Vita / Diem

14

MV Princess Dhonkamana

10

Emperor-Divers

Data Contributed by Big Fish Network Stakeholders

There were 283 encounters from 25 different tourism stakeholder contributors. As in 2015 this includes 8 safari vessels, who often contribute encounter information which is furthest removed from the bulk of the baseline data MWSRP receives.

BFN members contributed data on 60 different sharks where positive identification of the individual was possible. In an additional 9 encounters, a positive identification was not possible. This is a superb rate of shark identification success and is an excellent testament to the work of contributing tour guides. We would like to take this opportunity to sincerely thank all contributors for their efforts in this regard as we understand the operational realities of their excursions and the care they have to give to their guests is of primary concern, whilst still being able to capture images of individual sharks for the BFN is a brilliant effort.

Of the 60 positively identified sharks, 18 were newly added in the 2016 season with 42 being previously known. From the 18 new sharks, 15 were first recorded by those same stakeholders!

BFN members contributed data on 60 different sharks where positive identification of the individual was possible.

This represents an enormous addition of valuable data to the BFN and is a very positive example of cooperative working increasing our understanding.

Overall, of the 60 identified sharks submitted by BFN stakeholders, 48 were male, 5 were confirmed as female and just 7 were of unknown sex. This 80% male sex bias continues the trend of BFN members contributing a more diverse demographic overview of the Maldives as a whole.



Other research

The 2016 season represented the most prodigious period of report outputs in MWSRP history. Six reports were produced as either dissertation or thesis projects during the past year, with at least three of these on their way to becoming a peer reviewed paper at the time of writing. They represent a wide range of topics and approaches and are all built on the long-term collection of baseline data. A short summary of each report can be seen below;

1 Does Bathymetry Drive Whale Shark Aggregations?

This study examines the bathymetry in areas R. typus aggregation events occur, with the aim to understand whether bathymetry influences aggregations. The research carried out shows there are similarities in bathymetry between aggregation sites, significantly different from other coastal areas within R. typus' global range. This study concludes that bathymetry does influence Rhincodon typus aggregations and has assisted in filling in the knowledge gaps in previous research.

2 Motivations behind the 'Site Fidelity' of whale sharks (Rhincodon typus) in South Ari Atoll and Baa Atoll, Maldives

This study looks at two key aggregation sites in the Republic of Maldives to assess what are the primary factors that influence whale shark 'site fidelity'. At the South Ari MPA, whale sharks predictably occur all year round, whereas at Hanifaru Bay in Baa Atoll, whale sharks predictably aggregate only during the south-west monsoon season.

3 Finding the balance between tourism and conservation: The pathway to safe and sustainable whale shark tourism in South-Ari Atoll

Globally, the marine wildlife tourism industry has been growing exponentially over the past years, raising concerns regarding its sustainability. This research has found that a larger effort for cross-stakeholder communication, collaboration and education does have the potential to make whale shark tours a more enjoyable experience for both tourists and whale sharks.

4 Monitoring tourist pressure on whale shark (Rhincodon typus) behaviour in South Ari MPA, Maldives

By video analyzing each whale shark encounter in South Ari and recording tourist and whale shark behaviour underwater, results suggest a low tourist compliance to regulations. The results obtained and the different management measures recommended, have the potential to improve our understanding of whale shark ecology and the management in South Ari MPA.

5 Tourism influence on whale shark behaviour in South Ari Atoll, Maldives

The aim of this study is to provide a data basis, on which a concept for a more sustainable form of tourism could be developed. This study investigated if disturbance factors, caused by human activities, such as the number of people in the water, the number of boats nearby the shark or the shark-boat distance had a potential influence on whale shark behaviour.

6 Remora as External Indicators of Whale Shark Thermoregulation Stage

Whale sharks partake in deep dives often followed by prolonged surface swims in a pattern of behaviour known as oscillatory vertical displacement. It is widely theorised that these surface intervals are a form of thermoregulation behaviour. This study statistically analyses the association between remora attachment and whale shark behaviour of those individuals frequenting the S.A.MPA, in an attempt to establish whether remora attachment can be used as an associative method for classifying recuperation levels in whale sharks. Results from the study revealed a significant association between active sharks and remora attachment, yet also highlighted the importance of alternative determinants in both whale shark behaviour and remora attachment likelihood.



Tissue samples collected from a dead whale shark

In December 2016 the MWSRP field team had the opportunity to collect tissue samples from a dead whale shark which had washed ashore in Hulhulmale. Unfortunately the stage of decay and the fact that the shark had been cut into two sections, one of which missing, from an attempt to remove it meant the cause of death could not be established and more regretfully, that an identification could not be taken.

The team were able to take several samples which were sealed and frozen. The MWSRP issued an open offer to worldwide specialist whale shark researchers for the samples, which were accepted from institutions in Australia, the UK, the USA and others. It is hoped that the sad death of this individual does however allow for sophisticated science, involving genetics, aging and stable isotopes.

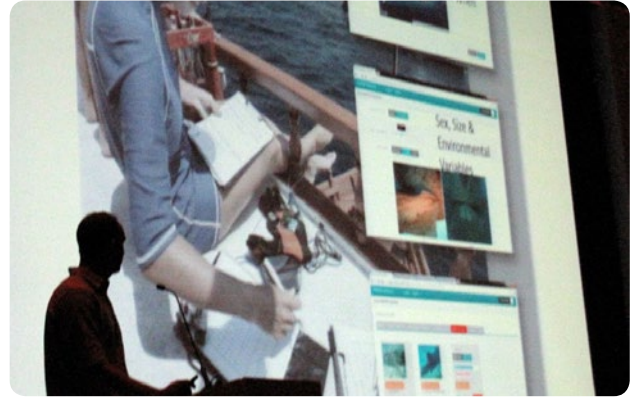
Inter-atoll movements by individual whale sharks continue

The MWSRP supported through encounter data submissions from BFN contributors have identified 29 whale sharks who have performed inter atoll movements since 2006, with an additional 12 records of sharks moving just between North and South Ari atolls which are not included in the following data.

- Of these 29 sharks' movements, **10 individuals were recorded making inter atoll movements** in the past 12 months.
- **The most frequent movements were between Baa and South Ari atoll and Thaa and South Ari atoll**, consisting of 15 sharks and 7 sharks recorded respectively.
- Some of the more interesting movements were where sharks were recorded visiting more than two atolls. **On two occasions individual sharks were recorded moving back and fore between 3 different atolls.**

10

whale sharks were recorded making inter atoll movements in the past 12 months



MWSRP represented at iwsc4 in doha

The 4th International Whale Shark Conference (IWSC4) was held over 15-18th May 2016 in Doha, generously hosted by Maersk Oil. James Hancock went to represent MWSRP and present the organisations work on a global scale.

Whale shark specialists presented their work and future plans as well as updates on major conservation policies for the species, such as the re-classification of whale sharks to the 'Endangered' level on the IUCN Red List of Species. James presented on the development of the mobile app and the Big Fish Network data summaries, as well as giving overviews on movements, injury rates and other information from the Maldives. A very positive event, which provided MWSRP with numerous new project ideas and contacts for future work.

Location Map of Whale Shark Encounters

The above map show the location of recorded whale shark encounters in the Maldives during the period applicable to this report.





Megafauna surveys

The MWSRP continued the organisations long running collection of megafauna data during 2016. Every time a marine megafauna species was encountered over the course of the daily whale shark search transects, the species, behaviour, number of individuals, location and time was diligently recorded. For the period Feb 1st 2016 – Feb 1st 2017, a total of 1774 recordings were made, up from 1448 in 2015.

One of the most striking observations from the 2016 season was the similarity in the observed number of Hawksbill turtles (*Eretmochelys imbricate*). Once again this was the most frequently encountered species, by number of separate instances, with 663 separate sightings, consisting of 670 individuals. This compares almost exactly to the 2015 season where 672 sightings of 686 individuals were made.

Of the rays, once again the reef manta ray (*Manta alfredi*) was the most commonly seen and a direct reflection to the close location of several well known sites for this species. A total of 53 individuals were encountered over 37 occasions.

Another species – the spinner dolphin (*Stenella longirostris*), showed a marked reduction of over 60% in overall sightings during 2016 over the previous season, dropping to just 51 encounters with at least 909 individuals over the year. Whilst the team have no reasons for this reduction, strangely it corresponds to a near 30% increase in the number of bottlenose dolphin encountered in 2016, where 121 encounters with at least 1929* were recorded.

Table

A full table detailing the number of each species sighted

Species	Number of Encounters	Number of Individuals
Hawksbill Turtle	663	670
Green Turtle	140	143
Olive Ridley Turtle	N/A	N/A
Loggerhead Turtle	N/A	N/A
Marlin	15	17
Sailfish	4	4
Blue whale	2*	3
False Killer Whale	3	56
Bottlenose Dolphin	121	1929
Risso's Dolphin	N/A	N/A
Spinner Dolphin	51	909
Eagle Ray	28	42
Reef Manta Ray	37	53
Mobula Rays Sp's	39	48
Oceanic Manta Ray	1	1
Stingray Sp's	7	7
Black Tip Reef Shark	9	10
Grey Reef Shark	2	2
Leopard Shark	1	1
White Tipped Reef Shark	3	5

* ONE WAS OF A DEAD SPECIMEN

Community Outreach Summary

As in previous years, community outreach initiatives constituted a considerable proportion of MWSRP's resource allocation in 2016.

The MWSRP conducted numerous small scale activities focussing on schools at islands across the atoll. The majority of these workshops were awareness sessions, using art and presented material to convey important conservation messages and understanding of the environment of the area.

In total, 292 students attended the various initiatives on local islands in South Ari atoll whilst many more people had the opportunity to meet and ask questions at national conferences in Malé.

A break down of the individual events can be seen below;

School outreach initiatives

- **26th March** – School workshop on Dhidhoo. 14 students (the whole school) were treated to an information session on turtle protection and whale shark identification
- **10th May** – Children's Day at Dhigurah School. 20 students enjoyed a stall with crafts, microscope showing planktonic whale shark food and microplastics and a whale shark naming session
- **12th May** – School workshop on Mahibadhoo. 60 students learnt about whale shark identification, biology and ecology in the local area
- **26th May** – School workshop on Maamigili for grade 7–9 students. 40 participants involved in a session focussing on whale shark Identification
- **1st June** – School workshop for Dhangheti island. 20 students learnt about whale shark identification, biology and ecology in the local area
- **4th August** – Another school workshop on Dhigurah. 20 students this time focussed on whale shark biology and ecology
- **9th August** – Workshop at Maamigili school for 60+ students about coral bleaching, marine waste and then a hands on beach clean
- **6th October** – School workshop for Fenfushi. 28 students learnt about whale shark identification, biology and ecology in the local area
- **2nd November** – School workshop on Mandhoo island. 30 students had a day learning about the whale shark and attempting their own identification of individuals





Beach cleans

Though seemingly simple events, beach cleans are both directly positive for their removal of waste from the marine environment and the aesthetics of the islands but also because they can be easily turned into educational activities. The MWSRP team have made concerted efforts to promote awareness of marine debris, particularly plastics, at these events, with a 'biodegrading timeline' being a favoured tool. This process uses actual material found to highlight how long it would take to break down in the environment and therefore how long the materials presence is causing pollution. As part of the procedure at the beach cleans, totals of each item found are recorded so that quantities of marine debris could be gauged.

National conferences

Gatherings of international NGO's, local marine focussed NGO's and groups and resort marine biologists in the Maldives form an important part of networking opportunities in the country. They also improve efficiency of the work being conducted through improved understanding and outsider participation and wider support. MWSRP make every effort to have representatives present at each of these events and are thankful for the invitations to attend. During the past 12 months the MWSRP attended 3 national level events specifically focussed on marine conservation. They were;

- **2-5th March** – The first conference of the year saw team member Iru attend and host a stall for the IUCN Project Regenerate conference.
- **4-6th August** – Iru represented the MWSRP at the IUCN hosted event 'Muraka Meehun' ('Resilient Reefs, Resilient People') in Hulhulmale. This event was focussed on emphasising the critical relationship and interdependencies between coral reefs and human populations and promoted positive changes in the behaviour of citizens in order to reduce pressures on coral reefs. MWSRP ran a stall at the event
- **27th October** – Once again it was Iru who fronted for the MWSRP at the Maldives Marine Science Symposium. This symposium was created to bring together scientists from different areas of the field to share their knowledge and experiences from the various research projects that are being carried out in the Maldives. Iru presented "The 'Big Fish Network': Using new technology to incentivise citizen science engagement in the Maldives" to a large gathering of prominent Maldives marine sciences.

Maldivian volunteer scheme

The MWSRP continued its long standing policy of offering free placements on the volunteer programme for Maldivian nationals in 2016. As with international volunteers, local volunteers participated in all aspects of the MWSRP's research work, including data collection in water with whale sharks and documentation and record keeping, data entry procedures and use of specialist software programmes. It is hoped that this experience provides the volunteers with both practical knowledge to use in future employment or an insight into whether science or the tourism industry is the right choice for them in future.

Paid Maldivian Apprenticeship Scheme

For the third successive year, MWSRP were able to offer a paid apprenticeship scheme of 4 months in order to provide an experience in field work and marine sciences.

MWSRP strongly believes that this opportunity is a positive step in developing future Maldivian marine scientists and will aim to offer similar schemes in future.



Stakeholder Outreach Summary

After focusing on developing materials in 2015, 2016 saw a concerted effort for MWSRP representatives to meet tourism stakeholders and their guests using the MPA. Awareness sessions on best practice procedures as well as on the whale shark itself were the key message.

The MWSRP also continued to host visiting stakeholders at their base and on the research vessel to provide free training on theory and practical best practice procedures as well as access to the Big Fish Network.

As always, the goal is to encourage and promote a culture of self-regulation within the MPA for the betterment of all tourism stakeholders experiences and of course the safety and continued welfare of the whale sharks themselves.

Liveaboard Association of Maldives, Maldives Marine Expo, Malé

Between 25th September and 1st October team members Alex and Iru attended Liveaboard Association of Maldives hosted Maldives Marine Expo. This was a gathering of prominent liveaboard groups, marine researchers and other ocean focussed groups in the Maldives.

The team conducted a live on stage interview which was also broadcast on national television channel TVM. The following day Iru gave a presentation to gathered stakeholders outlining the work of the charity and information about the sharks seen in Maldivian waters.

This was a fantastic event and a good opportunity for MWSRP to showcase the organisations work, for which we would like to extend thanks to LAM.

Stakeholder training events and presentations

Stakeholders joined MWSRP for full day theoretical and on the water training sessions. Guides were taught about the biology and ecology of whale sharks, how to identify whale sharks, input their encounter data into the BFN portal and how to collect field data for their contributions to the Big Fish Network. On water work involved best vessel approach practice, safe entry and exit techniques, managing guests on an encounter and good in water whale shark encounter practices.

MWSRP would like to take this opportunity to thank all those involved for their passion and concern and for taking time out of their programmes to embrace this important and well meaning learning experience.



Stakeholder Presentations

In addition to the training days, there were 15 presentations given by MWSRP team members to tourism stakeholders and their guests during the past 12 months. ScubaSpa, Secret Paradise, Carpe fleet and local guesthouses comprising the majority of those visits. The MWSRP welcomes approach by any stakeholder in the S.A.MPA region for a presentation or other awareness session to be held at their facility.

Big Fish Network updates and user additions

The Big Fish Network welcomed 11 new stakeholder members in the last year.

One notable addition was Wildbook for whale sharks, the accepted international individual whale shark ID and re-capture database. This addition was a two way agreement, with MWSRP sharing all of the individual whale sharks ID's on the BFN in the hopes of finding an Indian Ocean scale movement with other countries. Alas, at the time of writing no cross over has been found. As is MWSRP policy, data is open to others who may find it useful so a continuous update to Wildbook for Whale Sharks will continue.

The addition of the liveaboard stakeholders is very well received as this expands data collection capabilities in more remote areas. From the movements of individual whale sharks being seen, this is already bearing fruit.

New to the BFN in 2016;

- Emperor Divers
- Scubaspa Ying
- Milaidhoo Island
- Carpe Novo
- Wildbook for Whale Sharks
- MV Keana
- SoleilAriston Dive
- Aveyla Maldives
- OceanPro Divers Mirihi
- Per Aquum Huvafen Fushi

Other notable achievements

MWSRP App selected by apple for Wddcr16 keynote montage

After creating an updated version of the ‘Whale Shark Network Maldives’ mobile app, MWSRP were contacted by representatives of Apple. The story of the apps development, the innovation behind it and its value to conservation through improved efficiency in citizen science engagement meant that it had been selected from over 2.5 million others on the app store to be championed in the Keynote of Apple’s annual World Web Developers Conference on the 13th June 2016.

The link to the montage can be found on Youtube by entering ‘Apple – New Beginnings’ or for persons reading this report digitally by clicking on this link; <https://www.youtube.com/watch?v=cJAGqDYmW1o>

Television Appearances & Media Outputs

As part of MWSRP’s work to share the organisation’s discoveries, the MWSRP has once again hosted national television crews and written or been represented in international literature.





Plans for the Future

Research

The MWSRP has created a series of questions for researchers both within the team and external students to pursue over the next twelve months. These topics have been chosen either as specific follow ups to previous projects or to begin examination of future large scale projects and research directions.

The MWSRP will look to continue the important baseline observational research, the basis for all the long term studies which are now possible because of this extended dataset. In addition to conducting this work in the S.A.MPA, the MWSRP will also look to travel to Thaa and Gaaf Alifu atolls in order to bolster the number of individual whale sharks from that area on the Maldives individual whale shark database.

Project titles for 2017 research questions

The following questions have been created to guide the 2017 research studies and outputs;

Biology & Ecology

- 1 Explore and define the ecological role of whale sharks.**
- 2 Can whale sharks be deterred from approaching hazards?**
- 3 Create a habitat usage map for marine megafauna in the South Ari atoll Marine Protected Area (S.A.MPA), Maldives.**
- 4 Assess South Ari atoll Marine Protected Area (S.A.MPA) as an appropriate aggregation site for whale sharks.**

Conservation & Human Impact

- 1 Use Trip Advisor to refine Code of Conduct (CoC) guidelines for whale shark viewing excursions in South Ari atoll Marine Protected Area (S.A.MPA), Maldives.**
- 2 Explore inhibitors to citizen science contribution in whale shark research and how these may be overcome to increase research data submissions**

Continuation of observational research

We aim to increase understanding of;

- a) The physical characteristics, distribution and behavioural ecology of whale sharks in the Maldives and
- b) Further explore the significance of the primary aggregation site, South Ari atoll.

Physical Characteristics, distribution and Behavioural Ecology

Significance of South Ari Marine Protected Area

The abundance of surface swimming whale sharks in South Ari might suggest the presence of a reliable food source. However the apparent lack of feeding behaviour exhibited by the individuals encountered near the surface has led MWSRP to

hypothesise that the South Ari area may provide the optimum combination of habitats for these juvenile whale sharks. It is thought that the proximity of a deep water channel may offer opportunities for whale sharks to seek food at depth or facilitate long range movements, whilst also remaining in close proximity to a warm shallow water habitat for post-dive recuperation and thermoregulation. It is a key objective of the MWSRP to further understand why whale sharks are encountered in South Ari so consistently compared to other areas of the Maldives. We would like to establish what physical parameters make South Ari such an important aggregation site and which environmental conditions may affect the frequency of whale shark sightings in this area.

The MWSRP aims to:

- Continue to build a central register of whale shark individuals identified using photo-identification
- Keep an encounter log of observational data including shark characteristics, shark behaviour and environmental parameters
- Establish and maintain a national citizen-science monitoring network, through which tour operators from across the Maldives can submit encounter information and photographs via an online portal
- Identify key environmental and oceanographic parameters within the South Ari area





Stakeholder and Community Outreach

In addition to the previous research initiatives, the MWSRP plans to continue and expand on existing outreach work. Ongoing outreach initiatives include community and industry stakeholder presentations and workshops, international school exchanges and school field trips.

For 2017 the MWSRP's flagship outreach project will be 'Moodhu Kudhin', or 'Children of the Sea'. This aims to bring school children literally face to face with the marine environment and expand on the theoretical aspect of understanding too.

Moodhu Kudhin

In celebration of the 10th year researching whale sharks in the Maldives, the Maldives Whale Shark Research Programme (MWSRP) will introduce the Moodhu Kudhin programme, where teachers and students of the schools of South Ari will be able to join the team on the research dhoni, learn about how research is conducted and have the opportunity to swim with a whale shark.

Continuation of Internship & volunteer positions for Maldivian nationals

MWSRP will continue to offer annual opportunities for interns and volunteers. The selective intern positions focus on producing well trained and experienced individuals who stand the best possible chance of continuing in a career in the marine sciences or sustainable tourism sectors.

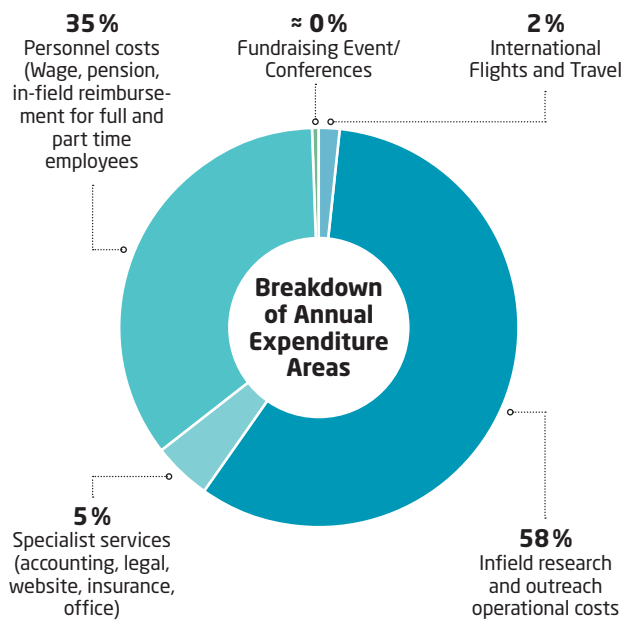
Local volunteer placements are intended as an opportunity to embark on an experience with minimal commitment so as to provide an accessible first look at work in the marine biology or sustainable tourism sectors. These positions are ideal for persons considering a move into these areas.

Engage the tourism industry through citizen science and stewardship initiatives

The aim of MWSRP to engage with excursion operators through training and awareness initiatives to try and minimise environmental impacts of whale shark excursions. We aim to take a two pronged approach; firstly we want to inform the guests about the nature of the challenge and about the impacts they and the excursions they embark on are having on whale sharks. Secondly we will work to ensure that the resorts share and promote a standard, factual message. Ultimately it is hoped that it is the guests themselves who will drive the levels of expectations for an excursion which is safe and enjoyable, but also based on the expectation of self-regulation. The objective is to decrease tourist pressure on the whale shark in South Ari MPA through provision of standardised training and materials for whale shark tour operators and their guests whilst also encouraging greater citizen-science participation.



Financial Overview





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- Thanks to the Dr. Shiham Adam and his team at the Marine Research Centre, the Environmental Protection Agency of Maldives and the Ministry of Environment and Energy for their continued support of our work.
- To the people and island councillors of Dhigurah and the islands of South Ari atoll and the South Ari atoll councillors, we appreciate so much you allowing us to spend time in your islands and thank you for your hospitality and for sharing your wealth of knowledge with us.
- Our Dhigurah island hosts TME Retreats Maldives for their logistical support, especially Fayaz Mansoor, Ilyas Mohamed and Richeef.
- School principle Shifa and the students and other teachers of Dhigurah school who so enthusiastically engage with our programme are offered special mention, we really appreciate you giving your time to work with us.
- To all of the tourist industry that take the time to contribute their whale shark sighting information to our database. Thank you.
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- Tom Jenkins deserves special mention for his unshakably patient technical support and for all the hours poured into continually building on and troubleshooting the BFN portal and the app on behalf of MWSRP. Also for his vision and work to keep MWSRP's outreach and research tools at the sharp end.
- We thank Fernando Cagua for providing expert scientific advice and continued support and guidance.
- The Shark Trust for their ongoing support.
- Last but by no means least we would like to sincerely thank Lea Bluntschli and Daniel Brühlmann for their generosity in reaching out to assist MWSRP in creating this annual report, as well as for their graphic design skills and patience in realising the final version you have read today.

Tables and Figures

Tables

Table 1; Summary of the whale shark encounter information collected by MWSRP

From	May 2011	Nov 2011	May 2012	Oct 2012	Feb 2013	Feb 2014	Feb 2015	Feb 2016
To	May 2011	Feb 2012	June 2012	Feb 2013	Feb 2014	Feb 2015	Feb 2016	Feb 2017
No. of Whale Shark Encounters	6	171	51	155	352	308	319	365
No. of different Individual Sharks	4	36	20	33	44	50	45	49
Known Sharks	3	34	20	28	14	45	39	40
of which Male	3	32	19	28	13	40	35	47
of which Female	0	2	1	0	1	3	3	1
of which Sex Unknown	0	0	0	0	0	2	1	1
New Sharks	1	2	0	5	30	5	2	9
of which Male	1	0	0	5	26	4	1	8
of which Female	0	2	0	0	1	0	0	0
of which Sex Unknown	0	0	0	0	3	1	1	1
Average Shark Length (Metres)	4.5	6.08	5.64	5.58	5.82	5.92	6.2	5.46
Total Individual Whale Sharks in MWSRP Database	161	168	172	181	206	226	275	302

Table 2; Summary of the whale shark encounter information collected over the whole research period by members of the tourist sector

From	May 2011	Nov 2011	Mar 2012	May 2012	Jul 2012	Feb 2013	Feb 2014	Feb 2015	Feb 2016
To	Oct 2011	Feb 2012	Apr 2012	Jun 2012	Feb 2013	Feb 2014	Feb 2015	Feb 2016	Feb 2017
No. of Whale Shark Encounters	32	55	38	10	122	493	388	361	283
No. of Different Individual Sharks	24	25	23	7	33	U/Av	63	91	60
Known Sharks	19	25	19	6	27	U/Av	48	47	42
of which Male	17	23	18	5	26	U/Av	44	35	37
of which Female	2	2	1	1	1	U/Av	2	2	2
of which Sex Unknown	0	0	0	0	0	U/Av	2	10	3
New Sharks	5	0	4	1	7	U/Av	15	44	18
of which Male	5	0	3	1	7	U/Av	6	11	11
of which Female	0	0	1	0	0	U/Av	2	12	3
of which Sex Unknown	0	0	0	0	0	U/Av	7	21	4
Average Shark Length (Metres)	5.26	6.07	5.54	5.65	5.39	U/Av	5.17	5.59	5.71
Total Individual Whale Sharks in Database	161	168	172	173	181	206	226	275	302