Maldives Marine Newsletter

Issue no 2. August 2014

IN THIS ISSUE

OUR MISSION

IUCN, the International Union for Conservation of Nature, helps the world find pragmatic solutions to our most pressing environment and development challenges by supporting scientific research; managing field projects all over the world; and bringing governments, NGOs, the UN, international conventions and companies together to develop policy, laws and best practice.

Our vision is a just world that values and conserves nature.

Our mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

The world's oldest and largest global environmental network, IUCN is a democratic membership union with more than 1,200 government and NGO member organizations, and almost 11,000 volunteer scientists and experts in some 160 countries. IUCN's work is supported by over 1,000 professional staff in 45 offices and hundreds of partners in public, NGO and private sectors around the world. IUCN's headquarters are located in Gland, near Geneva, in Switzerland.

IUCN has been undertaking and supporting environmental conservation and addressing development challenges in the Maldives since 1985 through its global and regional programmes. Currently, IUCN's work in the Maldives is supported by the Asia Regional Office based in Thailand and the Global Marine and Polar Programme based in Switzerland.

INTRODUCTION

Marine Conservation Science and Education in the Maldives

A message from Dr. Ameer Abdulla, Senior Advisor, Marine Biodiversity and Conservation Science, IUCN Global Marine and Polar Programme

To make a meaningful contribution to the environment you need to possess 2 fundamental attributes. First, the will and motivation to participate in meaningfull change of the world. Second, the relevant training and education to allow you to institute such a change. I know first-hand how frustrating it can be to have the first but not the second, for you see, I am Egyptian and for the majority of my adult life I have sought limited and rare opportunities to further my education. An education needed to competently explore the needs and identify the priorities of marine conservation, and define ways to address these needs.

Dr. Shazla Mohamed, Dean, Faculty of Science, MNU and Dr. Ameer Abdulla

A strong motivation to contribute towards meaningful change came early to me and from a passion for the ocean. As a toddler I turned over rocks in the tidal pools of Red Sea reef flats to observe the tiny marine critters and explore their microcosmos. Unbeknownst to me, I was hooked from that moment on and my life slanted towards pursuing a greater understanding of marine biology and its conservation. I was lucky to attend good schools that catered to my keen interest in science. By my twenties I was deeply immersed in marine science and was fortunate enough to be awarded a number of educational scholarships and fellowships to study in the United States and Australia.

Training in science, conservation, and management is key to balancing protection and sustainable use of marine resources and biodiversity. With over 99% of its Exclusive Economic Zone made up of marine waters, the wellbeing and fu-

ture of the Maldives rely significantly on the work of marine biologists and managers. The Government of the Maldives has supported and facilitated some unique opportunities for Maldivians to pursue undergraduate studies overseas. However, access to such an important career path for Maldivians has otherwise been limited.

In partnership with a number of local organizations, we are working towards improving Maldivian youth access to a career in these marine fields. A first step in this direction was to co-organize marine science seminars with the newly created Faculty of Science at the Maldives National University. This unique partnership is described in detail by the Faculty Dean, Dr. Shazla Mohamed on page 4. The seminars are open to the public, videotaped and uploaded online for convenient and long-term access to the information in perpetuity. The seminars also offer valuable marine science education for the many Maldivians who are already employed in marine fields such as dive guides, resort staff, NGOs, etc but who may not have completed academic studies in this discipline.

Student and youth exposure to field research and activities is also important, not only to complement theory taught in the classroom but also to better show the practicalities of a marine career in the field. A new and exciting internship and apprenticeship programme is now starting in the Maldives (see page 9). You can learn about the experience of two of our first interns, Shameel and Afau, and discover how meaningful an internship can be. I am especially proud of Afau, a young female Maldivian who is discovering and pursuing a new career in marine conservation.

To complement the work of a limited but growing number of marine biologists in the Maldives, our monitoring network of national partners and individuals is greatly expanding to include volunteers from all atolls. These citizen-scientists contribute extra capacity to monitor marine biodiversity, add valuable local knowledge, help raise awareness and implement much needed impact mitigation and management measures. It is important to use citizen scientists' contributions efficiently and respect their effort and commitment. Our partnerships are currently offering training sessions, promoting the use of standardized monitoring protocols and centralized database systems to ensure that data are collected consistently and can be used by science and government to guide conservation and management efforts. You can discover how marine biologists, citizen scientists and NGOs are contributing to the study and management of threatened marine life on page 12. With population growth, development, and tourism on the increase, it is of utmost importance to also understand the potential impacts on the marine environment and ensure sustainability of development (see page 16 and 18).

I am happy to share with you, through this newsletter, the inspiring stories of young Maldivians, citizen-scientists, and examples of best management practices, all activities contributing to safekeeping the marine ecosystems of the Maldives for generations to come.

All my best,

Ameer

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We encourage contributions to our newsletter
For more information, send an email to:
Monique Borboen, Communication Officer, at
monique.borboenabrams@iucn.org

SCIENCE EDUCATION

IUCN and Faculty of Science Public Seminar Series

By Dr. Shazla Mohamed, Dean, Faculty of Science, The Maldives National University

The Faculty of Science of the Maldives National University (MNU) currently offers a Bachelors degree in Environmental Management, a programme that is designed to meet the future need of skilled professionals in the Maldives in the area of environmental management. This includes areas such as environmental monitoring; environmental policy; land, water, energy and marine conservation; coastal management; pollution control; environmental health; climate change adaptation; and community development and education for the environment. Graduates with the appropriate knowledge, skills and aptitudes in these fields are vital for the country to ensure a sustainable human development through the wise use and management of natural resources, land use planning and community concern for the environment.

This year a public seminar series has been organized for environmental management students to expand their knowledge outside the formal teaching hours. The seminar series is a collaborative effort between IUCN and the Faculty on topics related to, but not limited to, climate change, marine ecosystems and conservation. One important objective of this initiative is to facilitate the knowledge exchange and collaboration between professionals working in the Maldives and our university students. It is also our intention to promote the involvement of our students in various research activities conducted in the Maldives in these fields. The seminars provide a platform for students to directly interact with those who are actively involved in research activities and to seek internship or apprenticeship opportunities. Any such activity should be taken as a means to create awareness on environmental issues and generate interest in the area. The seminars are open to the public and attended by environment enthusiasts and those working in this field, as well as school students from environmental clubs or studying marine science as a subject. An online training module will also be developed in the future based on these seminars.

The first half of the seminar series has been successfully concluded with a total of seven sessions on a variety of topics delivered by experts from research and conservation institutions working in the Maldives and from the academic world. The series kicked off with a very informative seminar by Dr. Ameer Abdulla, IUCN Senior Advisor on coral reefs and climate change. The seminar introduced the audience to the concepts of climate change and climate change implications on environmental management, with an emphasis on the importance of building ecological and social resilience to the impending impacts of climate change on coral reef communities. The students also had the opportunity to broaden their knowledge on charismatic marine species protected under Maldivian law such as mantas, whales and dolphins. Seminars dedicated to these important animals, delivered by Dr. Anne-Marie Kitchen Wheeler from the Manta Ecology Project and Ms Rachel Lambert from Six Senses Laamu, were also very popular among divers and school students. Their sessions focussed on the biology, ecology and behaviour of these species supple-

Photo © IUCN Maldives Marine Projects

mented with information on identification methods, interactions with humans and the guidelines that should be followed while observing them.

One of the series' highlights has been the "Case of Hanifaru Bay" seminar by Mr. Niv Froman from the Manta Trust. The seminar was an insight into the process that made Hanifaru Bay a Marine Protected Area by minimising the impacts of tourism and the exploitation of the unique and fragile manta ray population visiting the site. The conservation of such important resources for the generations to come was stressed. Environmental valuation, though a fairly new concept in the Maldives, is essential to better manage our resources and for policy planning. According to Dr. Mizna Mohamed from The Maldives National University, "understanding how local communities perceive and value their surrounding environment and its resources can ensure more synergistic outputs for future environment programmes". Her talk was based on her research towards understanding how local communities in the Maldives value their reef resources. Additionally, an interesting lecture by Dr. Michael Sweet from Derby University(UK) looked at an emerging area of research that defines the role of microbes in controlling the health of coral reefs and their ability to adapt to environmental change. Functions of different microbes in both healthy and damaged ecosystems were compared, highlighting the value of these unseen organisms and how they control the fate of entire ecosystems.

The second half of the seminar series is coming soon with even greater vigour; sessions will resume in August at the usual time and place (Saturday mornings at the Central Auditorium, Ameenee Building, Ameenee Magu, Malé). Anyone interested in attending the seminars is welcome.

More information on future sessions can be obtained by subscribing to our email list; please send your email address to info.fsc@mnu.edu.mv or aminath.afau@gmail.com. We wholeheartedly welcome researchers working in the Maldives or visiting the country who are interested in sharing their knowledge to contact us. With experience from previous sessions and renewed efforts in knowledge enhancement and creating greater awareness, we hope the upcoming seminars will be equally fruitful.

Videos of the public seminars are available from iucnmaldivesprojects.wordpress.com

Upcoming seminar (10:00 am to 12:00 noon, Central Auditorium, MNU, Malé):

- 16 August 2014. Ghost nets: addressing the problem in the Maldives

Photo © IUCN Maldives Marine Projects

SCIENCE EDUCATION

My two week experience at the University of Milano-Bicocca Research Station

By Mr Ibrahim Shameel, Maldives Whale Shark Research Programme (MWSRP)

In early May, I got an opportunity through IUCN to take part in a 2-week "Marine Biodiversity" workshop facilitated by the University of Milano-Bicocca Research Station at Faafu Magoodhoo, Maldives. I come from a background with no formal knowledge about marine biology and conservation and so I was very pleased that this opportunity came my way. My reaction when I first saw the list of subjects and lectures that were to be covered was a mix of excitement and nervousness, as I was not sure if I would be able to keep up with them all, given my little background knowledge in science!

The aim of the workshop was to facilitate research through bringing together experts from different parts of the world in order to help increase the information gathered on marine biodiversity in the Maldives. After two weeks of learning topics ranging from coral genetics, to fish and coral species identification, to the evolution of reefs in the world, I learnt more than I hoped for. Above all, the best part of the workshop was that the lecturers were expert scientists in their respective fields and shared their years of work with us as learning tools.

Personally, I enjoyed all of the lecturers and the practical sessions of the workshops because all I did in these two weeks was acquire knowledge about marine life and its diversity. I came back from the workshop with a completely new perspective on marine biodiversity and marine life.

I really wish to thank IUCN and the University of Milano-Bicocca for providing me with the opportunity to take part in the workshop. I do hope that there will be more workshops like this organized in the future, and that more Maldivians will take part in these initiatives.

Shameel is a full time staff member at the Maldives Whale Shark Research Programme (MWSRP). His involvement with the ocean started as a swimmer: he represented the Maldives in the Olympics on the swimming team back in his golden days! He worked in the swimming association of Maldives, helped organize various fundraising events for the association, and is still a valued member. So naturally, he loves the ocean and has engaged in its conservation with passion!

Photo © Ibrahim Shameel

SCIENCE EDUCATION

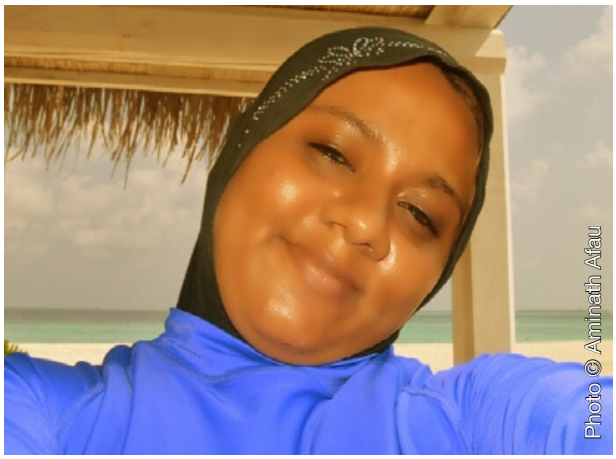
A golden opportunity for Maldivian youth!

By Ms. Aminath Afau, Junior Marine Project Officer, IUCN Maldives Marine Projects

Korallion Lab is a marine research station dedicated to coral and coral reef research on Vavvaru Island, Lhaviyani Atoll, in the Maldives. At this research station, people are trained every year to do coral reef field research thanks to a "Coral Reef Ecology Course". Two spots in this course are reserved for Maldivians. I had the opportunity to participate this year.

On 10th April 2014, I started my journey to the Korallion Lab to learn more about the rich marine environment of the Maldives. After a three hour journey, I reached the lab and was excited to meet the other participants. I was happy to see that two other Maldivians were taking part in the course while the others came from all over the world.

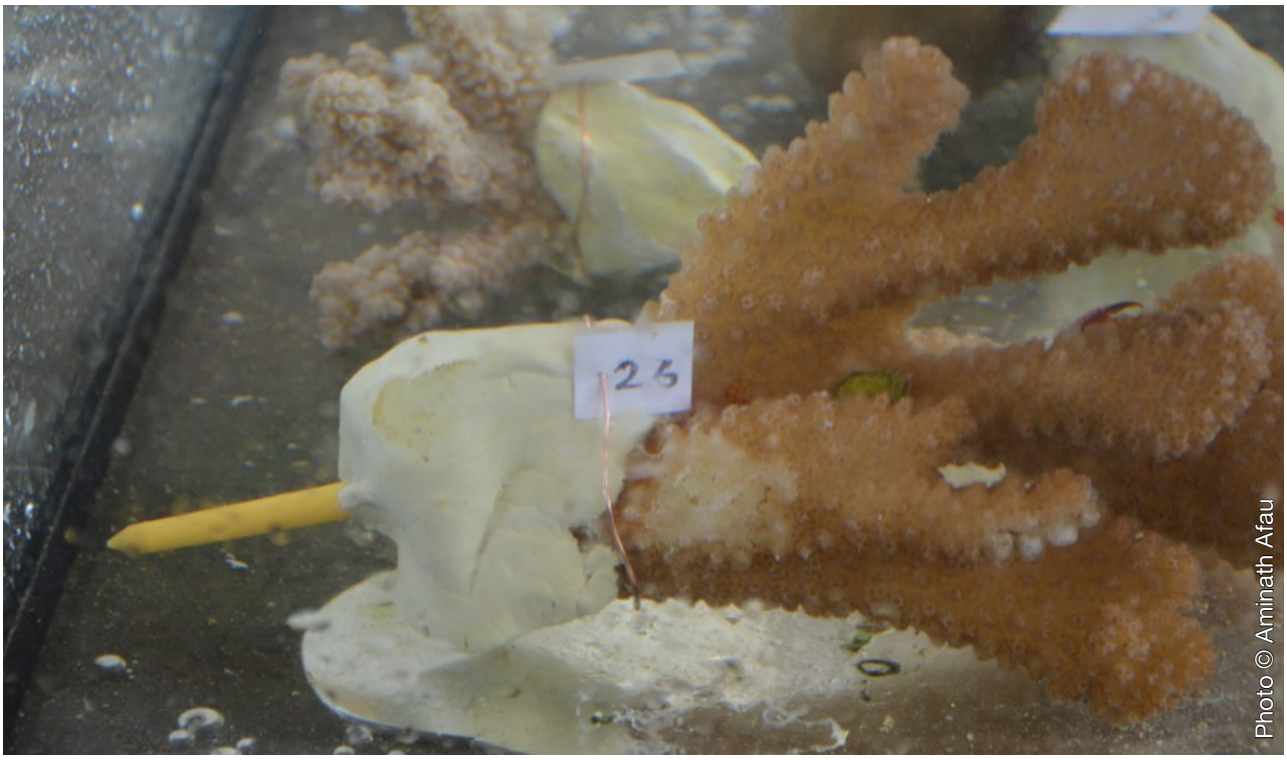
The coral reef ecology course at the Korallion lab is given by Dr. Michael Sweet. Dr. Sweet is a Lecturer in Invertebrate Biology and the lead researcher in the Coral Health and Disease Laboratory at Derby University in the UK. The course was very stimulating and educational. It was divided into three main parts; theory sessions, field work and independent research. The theory sessions consisted of lectures given in the library. The field work was mainly conducted during snorkelling sessions on the front and back reef of the island.



Ready to dive and study coral

Field work was also carried out in the lab where we studied the corals in detail under the microscope. We did presentations on corals we chose from specimens the lab looks after as part of its coral rehabilitation program. As field work we also had a coral reef rehabilitation session where we planted coral nubbins on the back reef of the island.

After five days of theory and field work sessions, everyone was given five days to do an individu-



al field research. With the help of the other two Maldivian students, I focused my research on the abundance, distribution and feeding behaviour of Butterfly fish species found on the fore reef of the island. The field activities were a lot of fun and I enjoyed them; at the same time I was learning more and more each day.

Of what I have learnt from this course, I was particularly attracted by coral identification, fish identification, corals and climate change, reef health and diseases. In addition to this, learning ways to conduct field research on the reef was something that fascinated me too.

Joining this course has made me realize how little we know about the coral reefs despite being surrounded by them, and thus it has made me interested in studying the coral reefs more thoroughly. Moreover, I believe that many Maldivians should try this course because it would help increase the awareness of the locals of their surrounding marine environment, and it would also increase people's interest in the field. I hope to see more Maldivian young people in this field, working together to save our beautiful coral reefs.

SCIENCE EDUCATION

Scholarship programme for internships and apprenticeships in the Maldives

By Dr. Agnese Mancini, Senior Project Officer, IUCN Maldives Marine Projects

As part of its work in the Maldives, IUCN Maldives Marine Projects is starting a scholarship programme to support internships and apprenticeships for promising young Maldivians. Offering equal opportunities to both genders, the programme is collaborating with research projects, governmental agencies and private companies operating in the management and conservation of marine natural resources sector. Through these opportunities, selected candidates will be able to develop a better understanding of the importance and process of natural resource management and will have a clearer idea of potential career paths they can follow in that field.

The internships will allow national and international researchers working in the Maldives to develop local ownership and national recognition for their work and allow them to share their activities with students and lecturers from the Maldives National University. The apprenticeships, on the other hand, will provide recent graduates or professionals with a better understanding of career opportunities related to the protection of the marine environment, and will increase their employability and skills.

In an effort to encourage employers and other groups to offer such opportunities, IUCN will provide selected candidates with a scholarship to cover food and accommodation expenses and (only for the apprenticeships) a salary.

Interested in offering an internship/apprenticeship opportunity?

If you are a research organization, an NGO working for the environment, a private company with an interest in environment, or a governmental agency and you would like to offer an internship or apprenticeship position to a motivated, Maldivian candidate, please contact us to receive further information.

Interested in becoming an IUCN Apprentice/ Intern?

If you are a student, a recent graduate or a professional wishing to give your career a more environment-oriented turn, please contact us to receive further information on available positions and how to apply.

Contact: agnese.mancini01@gmail.com

Photo © Carl Lundin

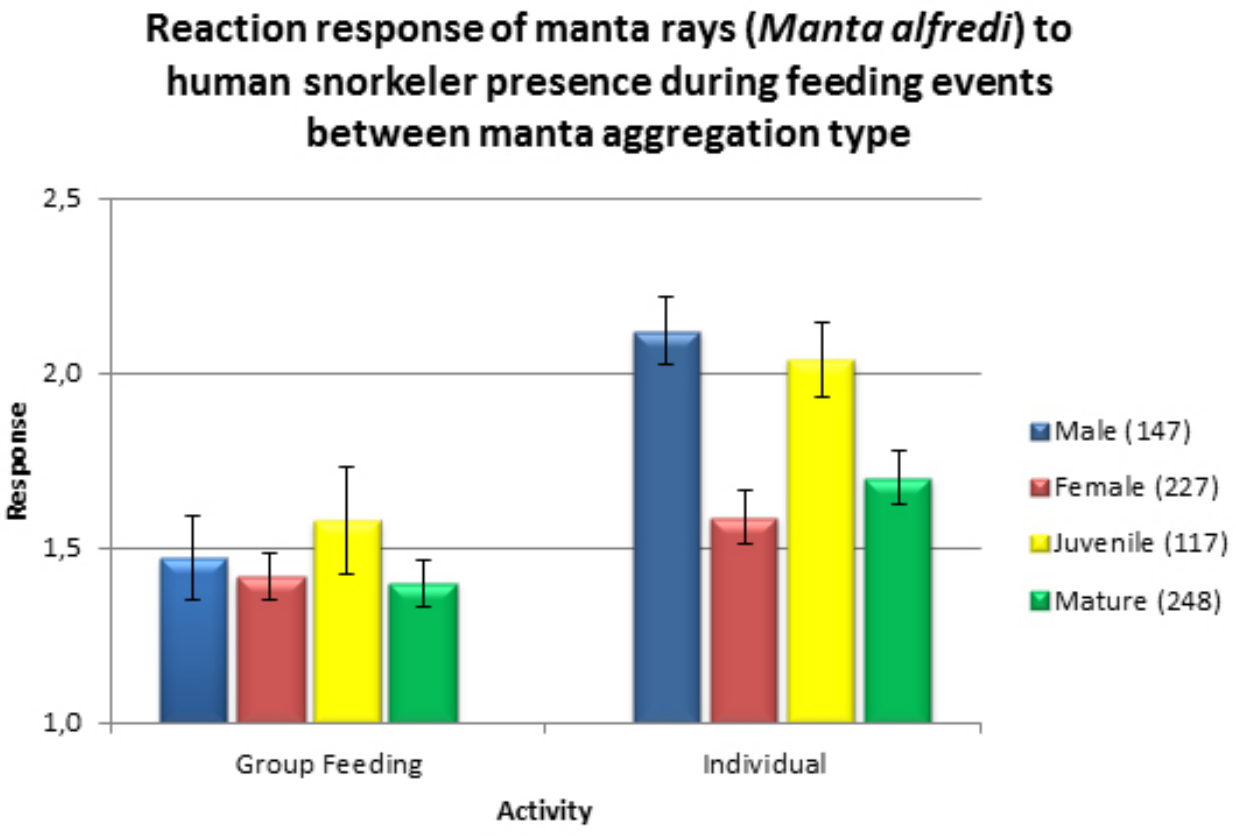
CONSERVATION

The impact of marine ecotourism on the resident Reef Manta population: Baa Atoll

By Ms. Annie Murray, Research and Education Officer, Maldivian Manta Ray Project, The Manta Trust

The Maldivian Manta Ray Project (MMRP) has been based in Baa Atoll since 2006, studying the population dynamics and habitat use of the resident reef manta rays (*Manta alfredi*). Since 2006, manta ecotourism has grown extensively, now generating over US$ 8.1 million in the Maldives annually. In light of this increase, the MMRP has focused on a 4-year study on the interactions between humans and mantas, specifically looking at the impact on their behaviour when encountered by divers and snorkelers. Visiting MSc students from the University of York have conducted practical research throughout the 2010 – 2013 manta seasons; the results of this study have been used to help create a comprehensive Code of Conduct for tour operators and dive guides.

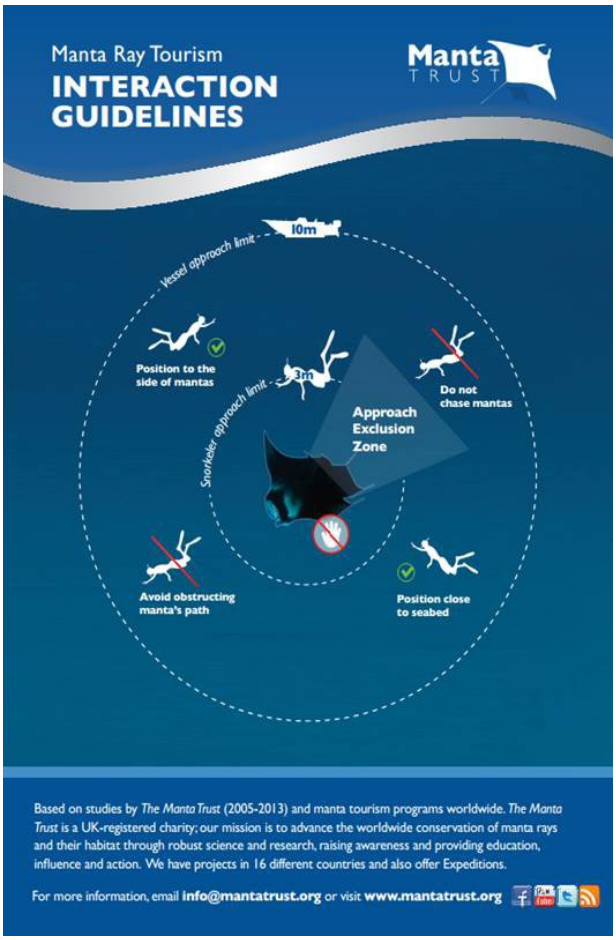
The initial study began in 2010 examining tourist uses of Hanifaru Bay Marine Protected Area. Throughout the study, various human infractions were noted: intentional touching, chasing and accidental collisions causing varied reactions, from no response to flinching, stopping feeding and leaving the area. Disruption was also observed caused by bubbles from the divers' regulator exhausts hitting the mantas' ventral surface, often causing them to stop feeding. Such observations made it obvious that the study also needed to focus on the behaviour of the tourists visiting the bay; their behaviour was just as important as the mantas'. With various sites in Baa Atoll known to attract mantas, the scope expanded to several sites in the region, looking more specifically at the reactions of mantas during in-water encounters.



Anecdotal reports commonly state that the larger females are “friendlier” during interactions and allow snorkelers/divers to have longer encounters. For my study, my task was to establish whether there was any truth behind this; to do this I examined the reactions of mantas of different sexes and ages, taking into account their activity type, location and the number of humans involved in the interaction. My daily routine consisted of filming the hundreds of mantas we encountered in order to gauge their level of response when faced with human onlookers. After trawling through hours (and I mean HOURS) of footage and completing my analysis, I found that statistically this hypothesis was true. Adult females registered the lowest response during interactions, with juveniles and males displaying a higher degree of disturbance. That said, there were a few exceptions to this, with a few bolder males vying for some human attention. One juvenile male in particular, Adidas, frequently put himself in the centre of the action and checked us out curiously.

Having the largest brain-to-body mass of any fish, manta rays are highly intelligent. This is obvious during encounters; approaching divers, mantas are curious and just as interested in us as we are in them. What this study clearly shows is that the key to passive interactions therefore is to allow the animal to control the encounter.

Using these data and research carried out by other Manta Trust projects around the world, the Manta Trust has created a Code of Conduct for both snorkel and dive interactions. The Best Practice Code of Conduct also includes guidelines on how to approach animals during boat encounters. With the largest recorded population of reef mantas in the world, the Maldives is unique and must remain that way. Follow these guidelines and participate in their preservation.



For more information on this project, go to: http://www.mantatrust.org/in-the-field/maldives/


Photo © Guy Stevens - Manta Trust 2010

CONSERVATION

Evaluating Diver-Impact at Manta Points in the Maldives

By Dr. Anne-Marie Kitchen-Wheeler, Manta Ray Ecologist, IUCN Maldives Marine Projects; Project Director, Manta Ecology Project

The Maldives is well known as a top destination for scuba diving with manta rays. An important leisure industry has developed over the past 40 years in order to cater for scuba divers who want to dive with mantas and see sharks, turtles, schools of fish and the amazing reefs for which the Maldives are renowned. Some world-famous manta diving points include Lankan Reef (North Malé), Madivaru (South Ari) and Hanifaru (Baa –restricted to snorkelling only since 2012), which attract around 200 divers per day per site during peak periods.

Lankan and Madivaru reefs include 'cleaning stations' - sections of reef where cleaner fish congregate to offer cleaning services to 'client' fish. While many different species of fish may act as cleaners, in the Maldives the most common cleaner fish are wrasses: blue-streak (*Labroides dimidiatus*), blunthead (*Thalassoma amblycephalum*), moon (*T. lunare*) and bi-colour (*L. bicolor*). The cleaners wait for clients to visit their stations and then remove mucus, dead skin, wound tissue and parasites. The benefits are a meal for the cleaner whilst the client has its health improved. Divers who accidentally swim across a cleaning station are often visited by cleaner fish! Some species of cleaners operate as part of a large colony containing up to 200 individuals which may all be involved in the cleaning of a large client. My recent research has indicated that manta rays can visit cleaning stations several times each month; they spend usually 20-35 minutes (but also up to 5hrs) being cleaned.

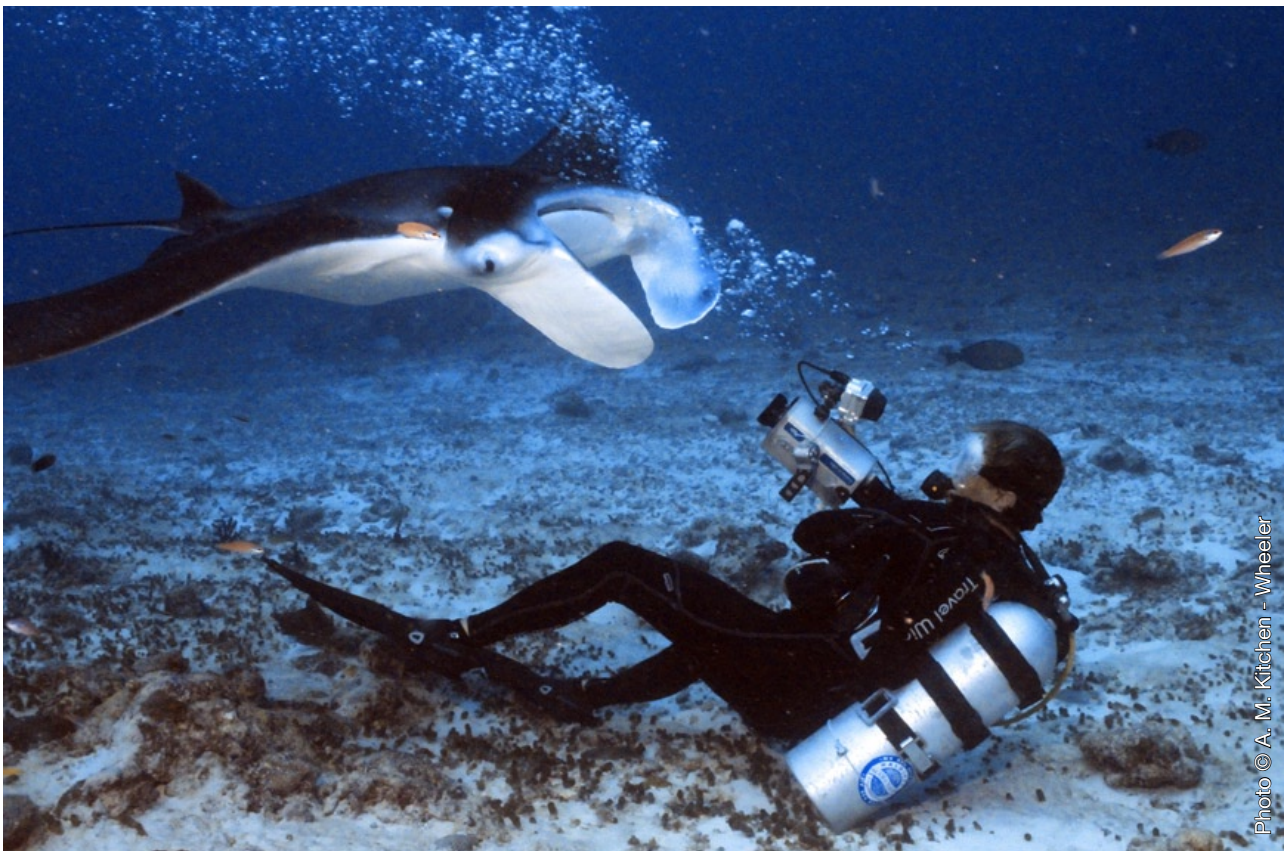


Photo © A. M. Kitchen - Wheeler

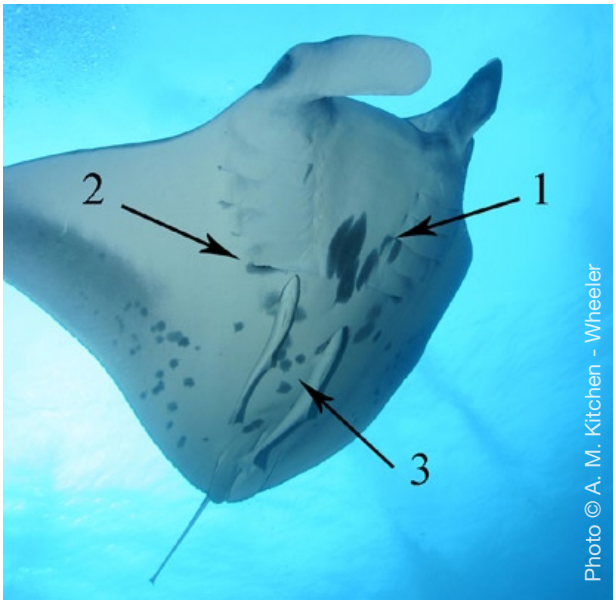
It has been suggested that the number of tourist divers visiting these well-known sites is likely to be having a negative impact on the mantas. Yet there is no hard evidence to support this. Research at Madivaru actually suggests the number of manta rays visiting the site has been very stable over the past 12 years. On the contrary, the number of manta rays visiting Lankan Reef has dropped significantly since 2011 and the large number of divers probably contributed to this decrease. However, the presence of divers at cleaning stations generally should not be considered negative. It is apparent that at certain sites, manta rays have been observed purposely swimming through the exhaled bubble stream. It is likely that the bubbles may massage the skin, removing dead skin or parasites, and therefore working as an additional cleaning tool. Alternately, the bubbles may just provide a stimulating massage for the manta in the same way that humans enjoy a Jacuzzi. It happens that manta rays swim away from the areas of cleaner fish specifically to seek out the bubbles exhaled by well-behaved divers that keep a certain distance from the cleaning station.

Having the manta ray swim overhead provides a perfect opportunity for a good ventral photo of the manta which can be used for identification. It is important that divers who visit cleaning stations report their manta encounters so that we can continue to evaluate the population and track changes in the numbers and the identities of mantas using any particular site. The Manta Ecology Project in collaboration with IUCN is helping train dive centre staff and marine biologists on how to identify manta rays, and they in turn are training tourist divers and snorkelers. The method we use, called “photo identification”, does no harm to the mantas and engages dive masters and tourists in useful conservation research. Photos of mantas can be uploaded to www.mantamatcher.org which automatically matches good ID photos.

As there are hundreds of known manta points throughout the Maldives, it is very important that resorts and dive centres “adopt” local manta sites and help gather monitoring data. As monitoring such a vast area is beyond the capability of a small team of individuals, citizen-science can make a real difference.

In the past four months we started more intensive monitoring of the populations of juvenile mantas in lagoons. In South Ari we have the team at Lux*Resort monitoring the population near Dhigurah island, while Carpe Diem liveaboard are monitoring Fesdu lagoon and Olhuveli resort are monitoring their own lagoon. If you often visit a nearby lagoon where manta rays are regularly seen, please contact us about setting up a local monitoring project.

Contact: Dr Anne-Marie Kitchen-Wheeler
amkw9@sky.com



Ventral photo showing the identification markings

Proper divers’ behaviour at cleaning stations:

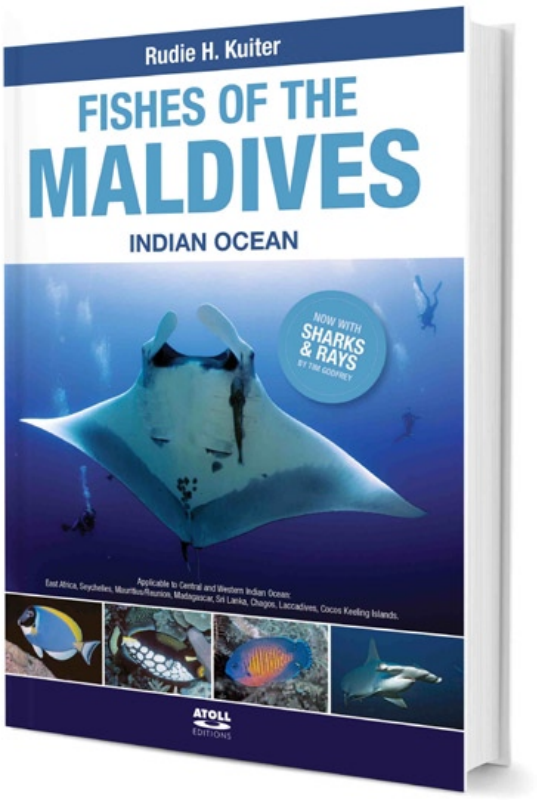
- stay at a distance from the areas of cleaner fish so that you are not seen as competition
- stay still and remain close to the bottom. Where possible find a rubble or sand-bottom on which to rest so that no damage is done to the reef
- wait quietly and let the manta swim through your exhaled bubbles from its own choosing

CONSERVATION

Fishes of the Maldives - A book by Rudie H. Kuiter

By Mr. Tim Godfrey, Publisher, Atoll Editions

With almost every fish, shark and ray likely to be seen by divers, from the beginner to the most experienced, and illustrated with underwater photographs mostly taken locally, this book is a handy guide to check on those mystery fishes seen during dives. The pages are packed with photographs and the book is a handy size to carry to dive locations. There is a full explanation of the basics of fish-science, behaviour and evolution as well as detailed drawings on fish-features, shapes and colour patterns. While text for each species is brief, it describes points of interest and differences between similar species. Species that vary in colour or between sexes are all illustrated with additional photographs. To assist in identifying families, small diagnostic silhouettes from the contents pages are distributed as thumbprints throughout the book. Some compromises were made to put more similar species closer together, thereby making comparison easier. "Fishes of the Maldives *Indian Ocean*" is applicable to the Central and Western



The role of taxonomy in understanding and managing marine ecosystems is pivotal. Taxonomy provides the basic and fundamental understanding of ecosystem components and units (biodiversity) that are important in its functioning, its maintenance and sustainable use. Without this understanding, it is very difficult to conserve species through targeted management intervention. The loss of global marine biodiversity at an alarming rate means that difficult but important decisions have to be made now to protect species and their habitats. Consequently, the accurate identification of species in the field would allow more people to understand and appreciate coral reef fish.

This Guide is a fundamental step forward in understanding and managing coral reef fish species of the Maldives. IUCN is proud to have played a role in guiding and supporting its design and production. Publication of the guide has been generously funded by USAID and Global Blue.

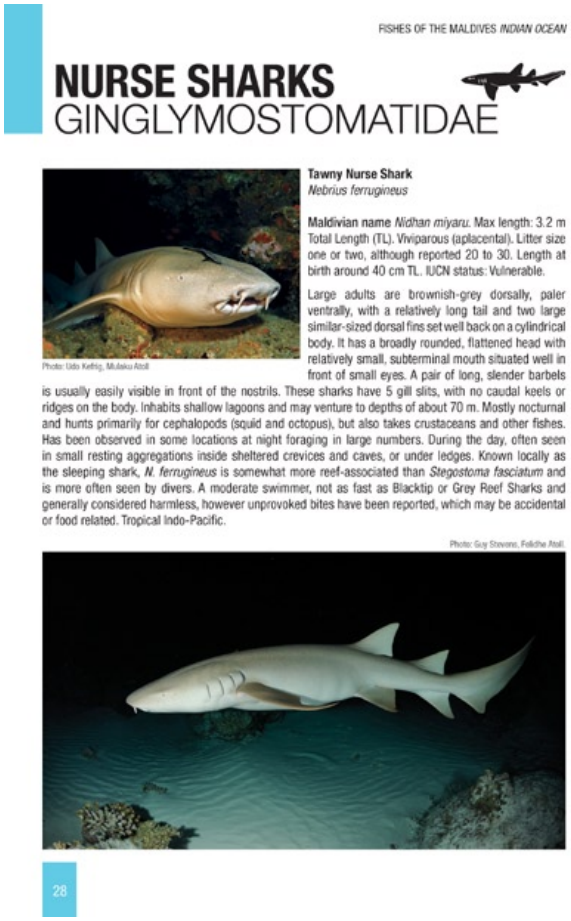
Dr. Ameer Abdulla
Senior Advisor, Marine Biodiversity and Conservation Science
IUCN Global Marine and Polar Programme

Indian Ocean. It is designed to encourage divers to take a greater interest in the smaller species, as well as the large, and to assist marine biologists and researchers in field work and conservation initiatives.

After more than 2 years of research, "Fishes of the Maldives *Indian Ocean*" is a fully updated and expanded version of "Photo Guide to Fishes of the Maldives" by Rudie H. Kuiter (Atoll Editions, 1998). The book includes almost every bony and cartilaginous fish likely to be noticed by divers, including the smallest species and mentions most recent research with input from the International Union for Conservation of Nature (IUCN).

This book serves mainly as a photo guide using images as the main tool for identifying particular species. It mentions the latest taxonomy changes and includes most Indian Ocean species known to depths within a diver's range.

For more information, go to: http://www.fish-esofthemaldives.com/



FISHES OF THE MALDIVES *INDIAN OCEAN*

NURSE SHARKS
GINGLYMOSTOMATIDAE

Tawny Nurse Shark
Nebrius ferrugineus

Maldivian name *Nidhan miyaru*. Max length: 3.2 m Total Length (TL). Viviparous (aplacental). Litter size one or two, although reported 20 to 30. Length at birth around 40 cm TL. IUCN status: Vulnerable.

Large adults are brownish-grey dorsally, paler ventrally, with a relatively long tail and two large similar-sized dorsal fins set well back on a cylindrical body. It has a broadly rounded, flattened head with relatively small, subterminal mouth situated well in front of small eyes. A pair of long, slender barbels is usually easily visible in front of the nostrils. These sharks have 5 gill slits, with no caudal keels or ridges on the body. Inhabits shallow lagoons and may venture to depths of about 70 m. Mostly nocturnal and hunts primarily for cephalopods (squid and octopus), but also takes crustaceans and other fishes. Has been observed in some locations at night foraging in large numbers. During the day, often seen in small resting aggregations inside sheltered crevices and caves, or under ledges. Known locally as the sleeping shark, *N. ferrugineus* is somewhat more reef-associated than *Stegostoma fasciatum* and is more often seen by divers. A moderate swimmer, not as fast as Blacktip or Grey Reef Sharks and generally considered harmless, however unprovoked bites have been reported, which may be accidental or food related. Tropical Indo-Pacific.

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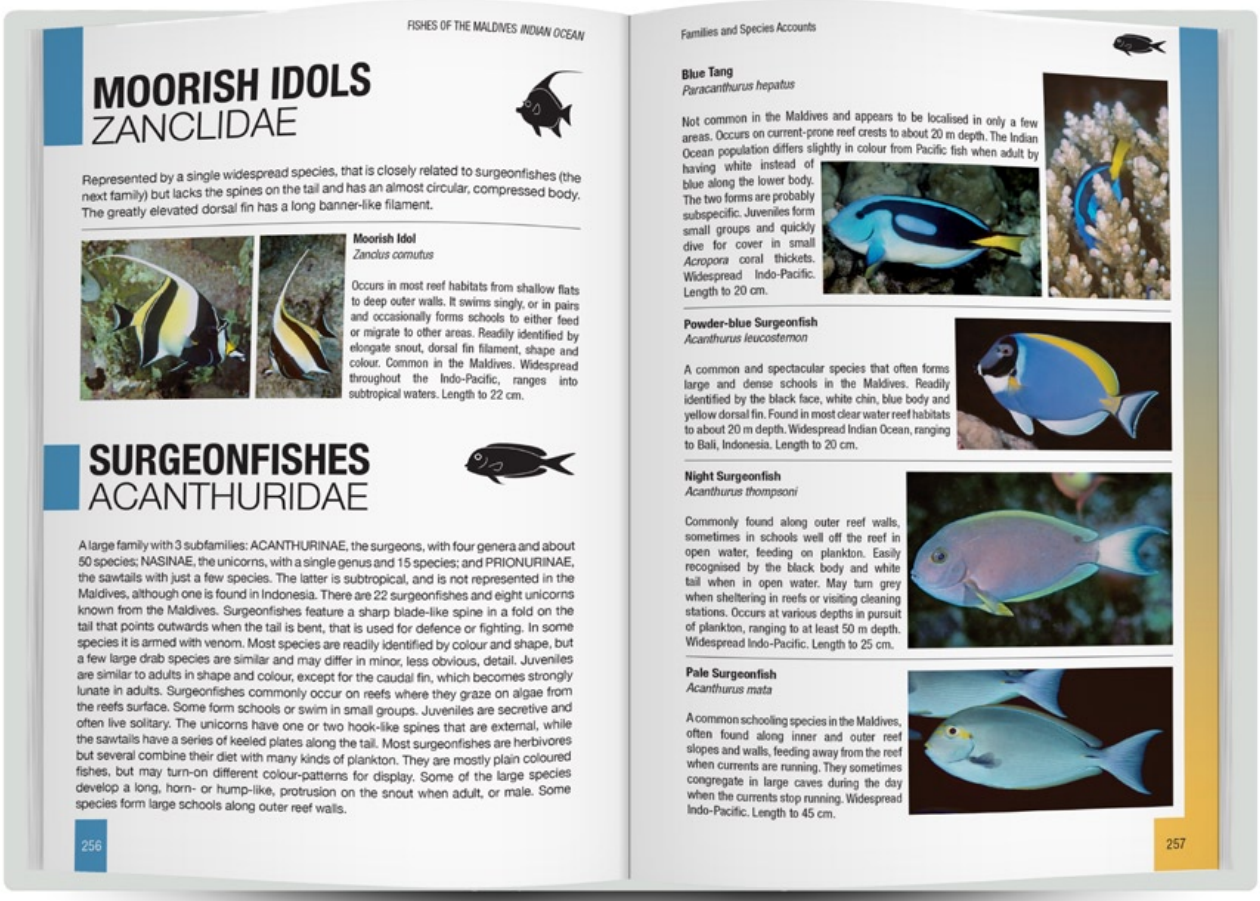

FISHES OF THE MALDIVES *INDIAN OCEAN*

MOORISH IDOLS
ZANCLIDAE

Represented by a single widespread species, that is closely related to surgeonfishes (the next family) but lacks the spines on the tail and has an almost circular, compressed body. The greatly elevated dorsal fin has a long banner-like filament.

Moorish Idol
Zanclus cornutus

Occurs in most reef habitats from shallow flats to deep outer walls. It swims singly, or in pairs and occasionally forms schools to either feed or migrate to other areas. Readily identified by elongate snout, dorsal fin filament, shape and colour. Common in the Maldives. Widespread throughout the Indo-Pacific, ranges into subtropical waters. Length to 22 cm.

SURGEONFISHES
ACANTHURIDAE

A large family with 3 subfamilies: ACANTHURINAE, the surgeons, with four genera and about 50 species; NASINAE, the unicorns, with a single genus and 15 species; and PRIONURIINAE, the sawtails with just a few species. The latter is subtropical, and is not represented in the Maldives, although one is found in Indonesia. There are 22 surgeonfishes and eight unicorns known from the Maldives. Surgeonfishes feature a sharp blade-like spine in a fold on the tail that points outwards when the tail is bent, that is used for defence or fighting. In some species it is armed with venom. Most species are readily identified by colour and shape, but a few large drab species are similar and may differ in minor, less obvious, detail. Juveniles are similar to adults in shape and colour, except for the caudal fin, which becomes strongly lunate in adults. Surgeonfishes commonly occur on reefs where they graze on algae from the reefs surface. Some form schools or swim in small groups. Juveniles are secretive and often live solitary. The unicorns have one or two hook-like spines that are external, while the sawtails have a series of keeled plates along the tail. Most surgeonfishes are herbivores but several combine their diet with many kinds of plankton. They are mostly plain coloured fishes, but may turn-on different colour-patterns for display. Some of the large species develop a long, horn- or hump-like, protrusion on the snout when adult, or male. Some species form large schools along outer reef walls.

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Families and Species Accounts

Blue Tang
Paracanthurus hepatus

Not common in the Maldives and appears to be localised in only a few areas. Occurs on current-prone reef crests to about 20 m depth. The Indian Ocean population differs slightly in colour from Pacific fish when adult by having white instead of blue along the lower body. The two forms are probably subspecific. Juveniles form small groups and quickly dive for cover in small *Acropora* coral thickets. Widespread Indo-Pacific. Length to 20 cm.

Powder-blue Surgeonfish
Acanthurus leucosternon

A common and spectacular species that often forms large and dense schools in the Maldives. Readily identified by the black face, white chin, blue body and yellow dorsal fin. Found in most clear water reef habitats to about 20 m depth. Widespread Indian Ocean, ranging to Bali, Indonesia. Length to 20 cm.

Night Surgeonfish
Acanthurus thompsoni

Commonly found along outer reef walls, sometimes in schools well off the reef in open water, feeding on plankton. Easily recognised by the black body and white tail when in open water. May turn grey when sheltering in reefs or visiting cleaning stations. Occurs at various depths in pursuit of plankton, ranging to at least 50 m depth. Widespread Indo-Pacific. Length to 25 cm.

Pale Surgeonfish
Acanthurus mata

A common schooling species in the Maldives, often found along inner and outer reef slopes and walls, feeding away from the reef when currents are running. They sometimes congregate in large caves during the day when the currents stop running. Widespread Indo-Pacific. Length to 45 cm.

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MANAGEMENT

The problem of waste in the Maldives

By Ms. Fathimath Thanzeela, Save the Beach Maldives

The beautiful Maldives islands are mostly known for their white shimmering beaches and tranquil turquoise waters. What many people may not know is that while this may be the natural state of the islands, this state of beauty no longer comes without a lot of hard work. Away from the heavily maintained resort beaches, the Maldives reality is often, depending on the currents, beaches full of plastic and other materials which drift ashore.

From the very early days, Maldivians' waste has generally ended up in the sea. Our country's waste management involved simply taking a walk to the beach to get rid of our waste, which was often then blown or washed away into the ocean. It wasn't a problem then because the waste was biodegradable. However, this has changed since the invention of plastic, which has found its way into all aspects of our life - from the very basic food, which is now almost always packaged in plastic, to almost every product we use being made either wholly or partly from plastic. With so much plastic being created and mostly for just a one-time use, finding a way to dispose of all this plastic has become a huge task in the Maldives. We are now faced with the problem of non-biodegradable trash on our beaches.

It is estimated that the average garbage generation rate for people in the Maldives ranges from 7 kg per person per day for tourists in resorts, 3.8 kg for those on safari boats, 3 kg for people living in Male and 1 kg for people living on others islands[1] [2]. Though there are regulations in place, there are no mechanisms to monitor the waters around the Maldives. The boats which are supposed to take the waste from resorts to Thilafushi (the garbage disposal island) sometimes dump the waste into the sea, to save a long trip. There are also a large number of boats on our oceans. Liveaboards (safari boats), fishing vessels, ferry boats, speed boats, private speed boats, and container shipping vessels, all produce waste along their journey. It is believed that some of their waste also ends up in the oceans, although statistics are not available for how much waste is discarded by the boats. We certainly need to strengthen our monitoring and even the implementation of our new waste regulations by imposing fines on the offenders.


Photo © IUCN Maldives Marine Project

Finally, there are only two islands out of the 200 or so on which people live, where an attempt is

1 "Assessment of Solid Waste Management Practices and Its Vulnerability to Climate Risks in Maldives Tourism Sector" 2013, Charles Peterson.

2 Source: Feasibility Study: Small Scale Waste to Energy Incineration Republic of Maldives (2007)

being made to manage waste. Some resorts too have started good waste management practices such as composting their kitchen waste and plant waste rather than disposing it directly into the ocean. With tourism developing on local islands, many island councils are now realizing the need for proper waste management. It is the beginning of the road to good waste management for the Maldives. More awareness needs to be raised, though, on the benefits of having a proper waste management system.


Photo © Save The Beach


Photo © Save The Beach

Our waste, if not properly disposed of, can affect lives beyond our borders. When plastic breaks down into smaller and smaller pieces, the chemicals these microplastics contain are eaten by marine creatures and enter the food chain to end up in the fish we eat. So the problem is not just an aesthetic one, but one of health risks and sustainability issues.

Managers of resort islands as well as the authorities of local islands are tackling the problem of solid waste disposal:

Photo © IUCN Maldives Marine Projects

- To reduce the amount of plastic waste, many resorts have started their own water plants directly on their island and produce drinking water in refillable glass bottles.
- Nowadays most of the waste is pre-separated before being transported to Thilafushi (waste disposal island) where recyclables can be sold.
- Resorts in Baa Atoll have started to cooperate with local islands and encourage waste separation by providing separate bins e.g. for diapers. Each resort collects rubbish on a weekly basis from a local island to bring it to Thilafushi.
- On the local island of Ukulhas - the first local island to have established a systematic waste management, and therefore known as the champion island of waste management in the Maldives, the process starts at home where people sort their waste into wet waste - biodegradable - and dry waste. All recyclable and even non-recyclable 'dry' waste, including plastics and metals, goes into this bin. With a small fee collected from each household, the island council collects both the organic and the dry (solid) waste from each house on a daily basis. At the Waste Management Centre, the solid waste is further segregated into glass, aluminium and other metals, and these recyclables are sold to buyers who pass through the island every few months. The plastic and other similar materials are then burnt on site using dry leaves as fuel, as the island does not have means to recycle these products and transport to Thilafushi is too costly (these materials would also end up burnt there anyway). The biodegradable waste is composted to produce organic fertilizers, which is sold off to nearby islands and resorts (sealed and labelled!).

MANAGEMENT

Ghost nets of the Indian Ocean – Olive Ridley Project

By Mr. Martin Stelfox, Olive Ridley Project

The Olive Ridley Project started in July 2013 in response to finding an alarming number of Olive Ridley sea turtles entangled in ghost nets. The project works towards removing ghost nets[3] from the Indian Ocean, and releasing any entangled marine organisms. We began recording each net we found, and compiling it into a database with the goal of trying to locate the likely origin of the nets.

Our data are collected mostly by citizens and marine biologists working within the Maldives. Boat captains, dive masters, and vacationers are among those 'citizen-scientists' usually providing data. We also have a large network of marine biologists based in various resorts throughout the Maldives who are contributing by actively recording and removing ghost nets.

We decided to call our initiative the Olive Ridley Project, because, unfortunately, the majority of entangled organisms we are finding are Olive Ridley turtles. However, ghost nets do pose a significant risk to other marine life, such as: other turtle species, whale sharks, dolphins, manta rays, invertebrates, and an array of fish species. It is our aim to record all organisms associated with ghost nets, whether they are entangled or not. We do this in order to understand the threats ghost nets pose on all marine creatures.

The Olive Ridley Project is excited to now have the International Union for Conservation of Nature (IUCN) as a technical partner, and to be sponsored by Global Blue. Our goal with this partnership is to increase our awareness network within the Maldives and begin to reach out to India and Sri Lanka. We will soon publish some preliminary results describing threats that ghost nets pose to marine organisms. To do this, we will create a centralized on-line portal to submit data regarding the specifications of any ghost net found, and all marine organisms associated with the ghost net. Further, we will be conducting workshops in the Maldives highlighting what we do, and how you can record the data we need. We will be focusing on teaching those who are in the water often (fishers, snorkelers, and divers), but everyone else is welcome to attend. We will also be creating two atlases: one for all types of ghost nets found in the Maldives, and another for all associated marine organisms found.

The first step to combating this problem is awareness. You can find more information about our project and upcoming events by visiting our new website www.oliveridleyproject.org, by liking our Facebook page Olive Ridley Project, or by following us on Twitter @ORP_INDIANOCEAN.

3 From ghostfishing.org: Derelict fishing gear, sometimes referred to as "ghost gear" or "ghost nets" is any discarded, lost, or abandoned, fishing gear in the environment. This gear continues to fish and trap animals, entangle and potentially kill marine life, smother habitat, and act as a hazard to navigation. Derelict fishing gear, such as nets or traps and pots, is one of the main types of debris impacting the marine environment today.
See more at: http://www.ghostfishing.org/the-problem

SPECIES HIGHLIGHT

Acroporids: so important but… do you know them?

By Ms. Barbara Gratzer, Resident Marine Biologist, IUCN Maldives Marine Projects/CDE -Reethi Beach Resort

Tiny upside down jellyfish-like creatures sit inside small holes in a limestone skeleton and reach out with their sticky tentacles to catch some food. "Flower-animals" is one of their names. We are talking about corals, unique animals whose importance is usually underestimated, in spite of forming islands and creating ecosystems that harbour a high biodiversity sustaining many livelihoods.

The most commonly found and largest genus of corals in Maldives, with 150 species described, is called "Acropora". Depending on their location, acroporid corals grow in different sizes and shapes: from tables to plates to fingers or large bush-like branches. If one takes a closer look, tiny bumps along the coral branch can easily be spotted. Each one of them is home to one animal, called a polyp. Each polyp can withdraw back into the skeleton in response to movement or disturbance by potential threats, but if they remain undisturbed, they protrude slightly. These polyps have no legs to go anywhere, no eyes to see with, but have a mouth in their centre and about six arms situated in a circle around it. All polyps (hundreds of them) are connected by their stomachs. Sometimes polyps appear purple or yellow or brown with blue tips towards the end. However, the actual animal is without colour. The colour derives from tiny one-celled algae that have a mysterious name: "Zooxanthellae". These tiny micro-algae function like a vegetable garden in the tissue of the coral and are an important nutrient source for the polyp; the Zooxanthellae convert the energy of light into starch, a sugary form of energy, which is then transferred to the animal.

Acroporid corals differ from all other corals by their axial polyp - an often slightly larger terminal polyp that is situated at the very end of each skeletal branch. Given the right conditions, Acroporaids can grow quite fast: pictures taken over a year indicate a 25 cm growth and individual colo-

Photo © Barbara Gratzer

nies can exceed a meter across in the wild. This makes them more vulnerable at the same time to storms and mechanical damage compared to their cousins (boulder coral) whose skeleton is much denser, with a growth rate of often less than 1 cm per year. Corals grow by extracting calcium from the seawater and then converting it into limestone, which they glue together bit by bit.

The Maldives islands are made of coral reefs: imagine how long it has taken to build the foundations of the islands 2000 m high until the structures we can see today were formed and the beaches that we find so alluring slowly grew. Some of the sand is actually made out of tiny pieces of corals that were eaten by fish and then ended up as fish excrement on the seafloor.

The Maldivian archipelago is sitting on a calcium carbonate layer 2,500 to 3,000m thick, which has been built over 55 million years[4]. Even though the calcium carbonate is not solely derived from coral growth, they are the major contributors to the reef structure throughout the Holocene, or since the last sea level rise. Over 2,000 distinct coral reef structures larger than 0.01 km2 occur in the Maldives, covering an area of 4,493.85 km2 (including enclosed reef lagoons and islands) to 30 m depth[5]. These coral reefs allegedly form the oldest atolls of the world today and represent about 3% of the world's coral reef area. They are therefore of both national and international significance.

4 Aubert, O and Droxler, A W. General cenozoic evolution of the Maldives carbonate system (Equatorial Indian-Ocean). Bulletin Des Centres de Recherches Exploration-Production Elf Aquitaine, 1992, Vol 16, Issue 1, p. 113-136

5 Naseer, A. and B.G. Hatcher. 2004. Inventory of the Maldives' coral reefs using morphometrics generated from Landsat ETM+ imagery. Coral Reefs, 23: 161–168

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