Inspiring People to Care About our Oceans Since 1995

DIVERS FOR THE ENVIRONMENT

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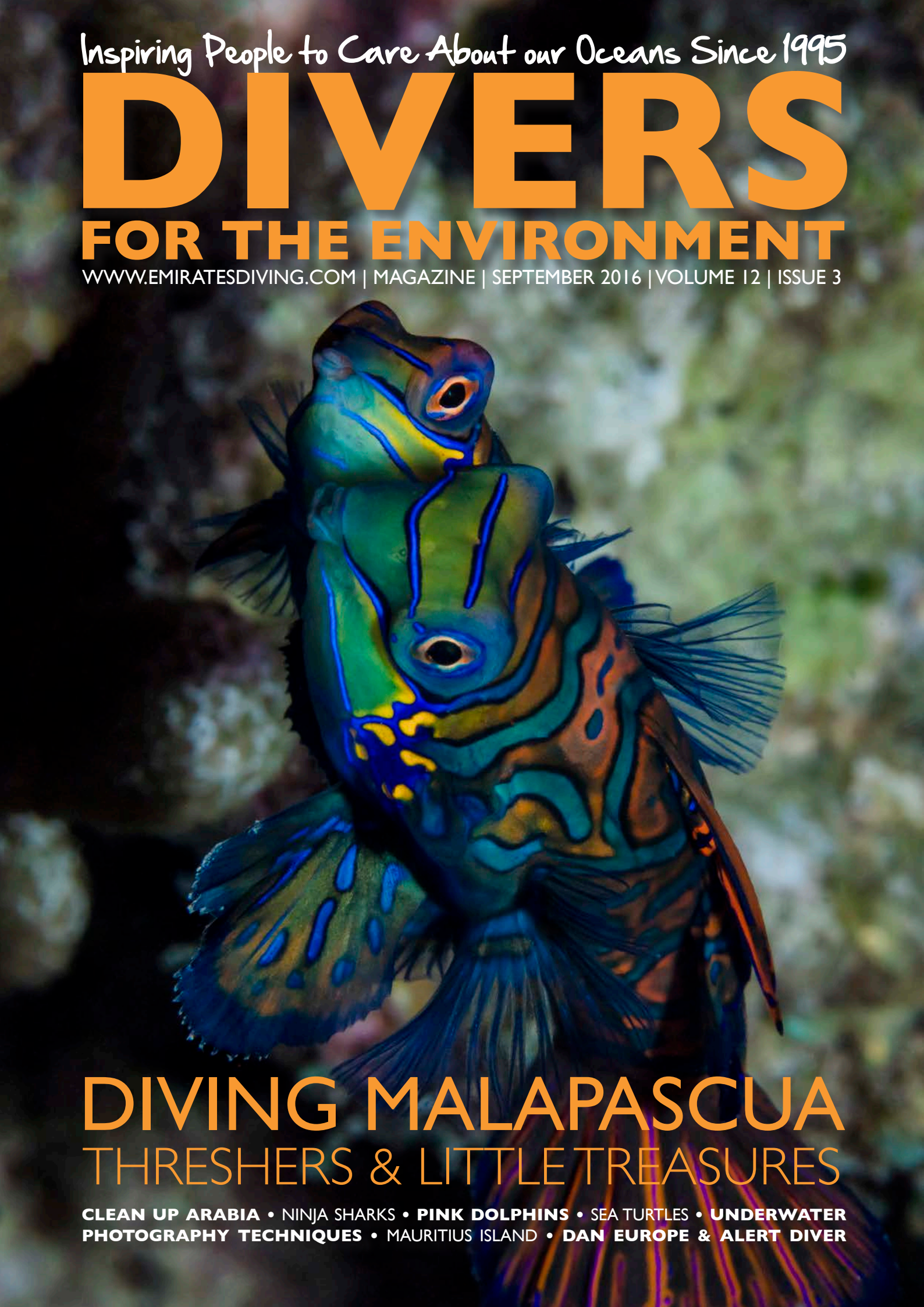

DIVING MALAPASCUA

THRESHERS & LITTLE TREASURES

CLEAN UP ARABIA • NINJA SHARKS • **PINK DOLPHINS** • SEA TURTLES • **UNDERWATER PHOTOGRAPHY TECHNIQUES** • MAURITIUS ISLAND • **DAN EUROPE & ALERT DIVER**

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• EDA 2016 •

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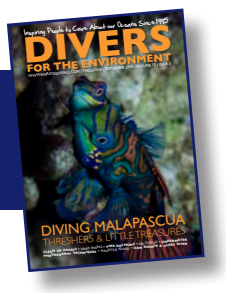
DIVERS FOR THE ENVIRONMENT

Please note that EDA's magazine, "Divers for the Environment" includes articles written by individuals whose opinions, whilst valid, may or may not represent that of EDA. It is hoped that the magazine can become a platform for individuals to voice their opinion on marine and diving related issues. You are welcome to suggest an article for the next issue of "Divers for the Environment" released in December 2016. Send all articles, feedback or comments to: **magazine@emiratesdiving.com**

COVER
PHOTO BY SIMONE CAPRODOSSI
Mandarin Fish (*Synchiropus spendidus*) at Lighthouse



REDUCE REUSE RECYCLE

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KIDS CORNER – FONT USED: **DYSLEXIE FONT**

Dyslexie font has developed a typeface especially for people with dyslexia called Dyslexie. People with dyslexia have problems distinguishing some letters. They sometimes turn, mirror and switch letters whilst reading. The Dyslexie typeface targets these problems by altering the shape of the letters so they are clearly different from any other letter. As well as this the spaces between the letters are improved and capitals and punctuation are bolder so people with dyslexia don't read words or sentences together anymore.

RESEARCH

Representative research among many dyslectics has now shown that the font actually helps them with reading texts faster and with fewer errors.

THE QUARTERLY CONTRIBUTORS

Meet the regular quarterly magazine contributors who share their passions, interests and the expertise of their fields for our readers of, 'Divers for the Environment'.

Want to contribute? Email: **magazine@emiratesdiving.com**

DR. ADA NATOLI
Ada is a specialist in population genetics applied to conservation of species. Having been involved in whale and dolphin research since 1992, she is a member of the IUCN Cetacean Specialist List and founder of the UAE Dolphin Project. **www.uaedolphinproject.org**

SIMONE CAPRODOSSI
Simone is an Italian underwater and travel photographer with a passion for diving and the sea. Simone uses his photography to support environmental initiatives and is heavily involved in local shark and turtle conservation projects. **www.simonecaprodossi.com**

PATRICK VAN HOESERLANDE
Diving opens up a whole new world. Being a writer-diver and co-editor of the Flemish divers magazine Hippocampus, I personally explore our underwater world and share it through articles with others, divers and non-divers. You'll find a collection of my articles on **www.webdiver.be**

PAUL WARWICK
Born and educated in the UK leading to a career as an officer in the British Army. Now a specialist consultant for the UAE Government inbetween his other interests and his passions which are family, scuba diving (A PADI IDC Staff Instructor), conservation and marine management.

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PHILIPPE LECOMTE
Having followed in his father's and brother's love for the sea, French diver and underwater photographer Philippe, took to underwater photography in 2006 after having moved to Abu Dhabi in 2003 and now seldom travels without his camera. **www.plongee-passion-photo.over-blog.com**

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THE SUMMER'S ROUNDUP

IBRAHIM AL-ZU'BI
EDA Executive Director

It is my great pleasure to present to you our September issue of 'Divers for the Environment'. As always, I am overjoyed with the support, not only with our diving campaigns and clean ups, but also with the quality and quantity of articles we regularly receive from our loyal readers, fellow divers and friends; including those from various diving sites around the world who send in their experiences and advice to other divers, and keep us updated about international diving, other marine environments and conservation events.

It has been a busy summer so far for the EDA team – we've been working with local authorities to promote for diving among local voluntary teams and making sure that all health and safety requirements are met, to ensure the safety of the volunteers who are so keen to participate in our events and clean up campaigns.

In other EDA news, this summer saw our Project Manager, Ally, head over to Malapascua to explore the diving there and share her experiences with you. This is the first time for EDA to visit the Philippines, so be sure to keep an eye out for her fascinating article.

Since our establishment in 1995, EDA has been committed to marine conservation and our flagship project such as Reef Check and the Coral Conservation Project are becoming a platform for scientists, divers and activists to take practical action on to protect our coral reefs by studying them, collecting data, raising awareness based on a scientific approach and sharing the results regionally and globally. We're very proud that the Reef Check section in this magazine is becoming a must read for all. As some of you may know, EDA is a Reef Check (RC) Training Facility, the Global Diving and RC movement are using tools such as 'Divers for the Environment' to promote and share their work, so I am sure you will enjoy reading our Reef Check news and finding out what your fellow divers are up to in other countries.

You will also read in the news section of this issue, about all of the great work organized by the UAE dive centres, clubs and individuals – from cleanups and courses, to all the fun events you can have as a diver.

EDA's annual 21st Clean up Arabia will be on the 30th of September this year, and I am sure you are all excited to join us all over the Gulf region to ensure we do the best we can to keep our oceans as clean as possible. The campaign is organized in collaboration with the Ocean Conservancy who will start the global campaign this September. Looking forward to seeing you all there and a big thank you in advance to all our clean up volunteers and of course, our sponsors.

Finally, I want to remind you to follow us on twitter www.twitter.com/EDA_UAE and send us your tweets! You can also like us on Facebook and share your thoughts, stories, experiences and photography!

I hope you have all managed to have a diving holiday and explored somewhere new this summer. It's a wonderful world, so if you haven't managed to go off exploring just yet, then make sure you get a chance in September for the Eid break. Eid Adha Mubarak in advance, and as always, happy eco diving.

Dive Safe!

Ibrahim Al-Zu'bi

Ibrahim Al-Zu'bi

U.A.E. DOLPHIN PROJECT

Support us, report a sighting!

CITIZEN SCIENCE: UNITY IS STRENGTH!

FEATURE **ADA NATOLI** MAPS BY **AYSE DEMIRER**

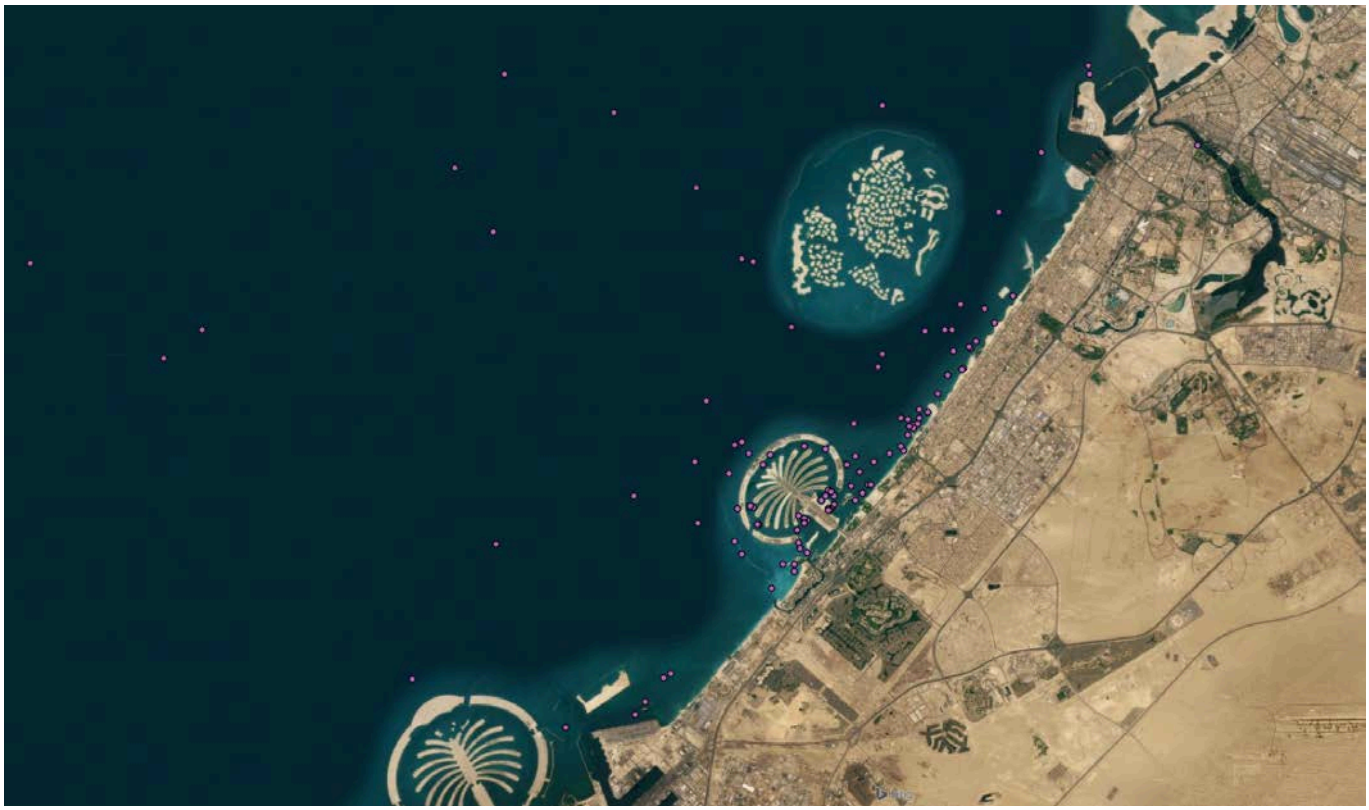
Locations of the sightings reported by the public from 2013 to date. | Dolphins in the UAE often occur in the waters close to the coastline commonly frequented by the public. It is not uncommon to see them from the shore in some areas such as the Palm Jumeirah or Saadiyat Island.

Combine this with determination and the perseverance of those that sent us their data every time they saw dolphins, and we see the results: 430 sightings recorded in our database! Numbers themselves don't mean much but when you plot them on a map, the result is evident!

When we started this project just over three and half years ago, there was almost no information about dolphins along the UAE coast. Now we are standing infront of a map that shows sightings pretty much everywhere, even in neighboring countries as far as Kuwait. And this information comes from the public… we just pulled it together! Of course we have more sightings in the more frequented areas. Still, dolphins were there when the public reported them! When looking at the map, if you recognize some areas where no dots are present, but you have dolphins there, well, it is most likely because you haven't reported your sighting! Sightings can be reported at any time, as long as you have a date, time and approximate location. Our oldest sighting reported, dates back to 1972!

Public data has so far allowed us to confirm the presence of a number of species such as humpback dolphins, bottlenose dolphins and finless porpoises among the most common, but also killer whales (spotted more than once close to Dubai and Abu Dhabi and reported as far as Kuwait waters) and Bryde's whales (these are indeed big animals!). From the Fujairah side, spinner dolphins, bottlenose dolphins, false killer whales and sperm whales have been reported too.

From this data, we can now clearly state that dolphins are regularly encountered in the urban waters of Dubai and Abu Dhabi, two major cities of our coastline where populations of the past ten years have grown exponentially. Despite all the disturbance that these areas have been undergoing, these species are still here! The big question is, how long will they be able to survive in this highly impacted environment? How are the populations doing? Are they decreasing? These are the questions that the research part of the project is aiming to answer, to propose immediate conservation measures that will ensure their protection.



Above, locations of the sightings reported by the public from 2013 to date in Dubai and below, in Abu Dhabi.

For the most common species, the bottlenose and humpback dolphins, based on the sightings reported, we can now start seeing a possible difference in habitat use. The bottlenose dolphins tend to frequent more offshore waters while the humpback dolphins and finless porpoises enjoy the coastal waters. Humpback dolphins have been repeatedly reported in the waters inside the Palm Jumeirah, Dubai, and in many channels in Abu Dhabi, sometimes up to Al Raha Beach (about 10km from the open sea).

The public also reported strandings and as much as these are sad events, they are extremely useful because they allow researchers to collect samples and measurements that would not be possible to collect from live animals. Their frequency also provides us with an idea of how the population is doing. All dolphins and whales are long living animals with a slow reproductive rate, if frequent strandings are recorded in an area, it is generally a signal of an unhealthy marine environment and an imminent threat for the local dolphins.

If you see a dead dolphin, even if it's just bones, please let us know! Skeletons provide extremely valuable information because they often allow the identification of the species and comparison with other populations.

Public data helps track dolphin movements! We received an increasing number of pictures and videos. These are great as they can allow us to confirm the species reported, but also track the presence of individuals that we have identified during our boat based surveys. We have a number of cases where the public reported a dolphin that we had previously identified. Dolphins are gregarious animals and generally stick together with their mates. Identifying one individual means the whole group of dolphins are most likely still roaming in the area.

Most importantly, this data tells us where to concentrate future boat surveys that we are hoping to start very soon and they will be the core of relevant international scientific publications that will help support the conservation of these species in UAE waters.

So, please keep reporting! Unity is strength! The more sightings, the stronger the message! Your efforts in reporting won't go wasted! Taking pictures of dolphins can be a challenge, but no matter the quality, send us your pictures, they will be used!

REPORT YOUR SIGHTING

If you encounter a dolphin or whale, dead or alive, please 'Report Your Sighting' on **www.uaedolphinproject.org**.

Alternatively, you can text **056 671 7164** or email the information to **sighting@uaedolphinproject.org** or post it on the UAE Dolphin Project Facebook or Twitter pages (**@UAEdolphinproject**).

DON'T FORGET TO MENTION:

1. Date
2. Time
3. Location

and if available, add:

4. Photo or Video

INFORMATION IS THE FIRST STEP TO CONSERVATION.

LEARN MORE : WWW.UAEDOLPHINPROJECT.ORG

REPORT A SIGHTING (WITH DATE, TIME AND LOCATION) BY:

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facebook:	tinyurl.com/UAEdolphinproject
twitter:	@UAEdolphinproje
website:	www.uaedolphinproject.org
email:	sighting@uaedolphinproject.org

MINI HOW-TO:

- Bottlenose dolphin
- Finless porpoise
- Humpback dolphin
- Dugong is not a dolphin!

REPORT NOW!

U.A.E. DOLPHIN PROJECT

SEE. REPORT. SAVE.

BU TINAH SHOAL RECOGNISED AS ONE OF THE TEN MOST IMPORTANT SITES FOR MARINE TURTLES IN THE INDIAN OCEAN REGION

BY **ENVIRONMENT AGENCY - ABU DHABI (EAD)**

The Environment Agency - Abu Dhabi (EAD) has recently been informed by the Indian Ocean and South East Asia (IOSEA) MoU secretariat, of the inclusion of Bu Tinah shoal in the "IOSEA Marine Turtle Site Network, as an important site for Marine Turtles". The Secretariat is part of the United Nations Environment Programme's Regional Office for Asia and the Pacific based in Bangkok, Thailand.

Of the seven species of marine turtles in the world, two can be found in Abu Dhabi's waters: the critically endangered Hawksbill turtle (*Eretmochelys imbricata*) and the endangered Green turtle (*Chelonia mydas*). In Abu Dhabi, turtles nest on at least 17 offshore islands from mid-March to mid-June and EAD's aerial and field survey findings indicate that about 5,750 sea turtles inhabit Abu Dhabi's waters during the winter season and 6,900 during the summer season.

His Highness Sheikh Hamdan Bin Zayed Al Nahyan, Chairman of EAD and the representative ruler of the Western Region of Abu Dhabi in his congratulatory note said, "I am extremely delighted to learn that Bu Tinah Shoal and its biodiversity is being recognised globally. It is a matter of pride for the country and its rich culture of preserving our natural resources. "I congratulate the Environment Agency - Abu Dhabi and the Ministry of Climate Change and Environment for their endeavor in successfully showcasing Bu Tinah Shoal in a global forum" he added.

Congratulating EAD, Dr. Douglas Hykle, coordinator of the IOSEA Secretariat stated, "Bu Tinah's official certification will hopefully bring about an even greater appreciation, among the authorities and the general public, of the area's richness in biodiversity. It should also help to stimulate even closer ties and cooperation with other network sites that have similar conservation challenges and needs".

Her Excellency Razan Khalifa Al Mubarak, the Secretary General of EAD said, "The inclusion of Bu Tinah Shoal in the IOSEA Marine Turtle Site Network recognises its importance as a regional foraging area and nesting ground for species of global importance. It also acknowledges the EAD's long-lasting conservation efforts at the site. Bu Tinah Shoal is one of only 10 sites in nine countries across the Indian Ocean to have received this distinction. I am delighted and congratulate all of our stakeholders and partners who made this a reality".

Dr. Shaikha Salem Al Dhaheri, Executive Director of Terrestrial and Marine Biodiversity Sector at EAD and the technical focal point of the UAE for the IOSEA Marine Turtle MoU said, "The inclusion of Bu Tinah under the "Network of important Marine Turtle sites" is a matter of great honor for the Emirate of Abu Dhabi". "The network serves as a mechanism for the management authorities of sites to cooperate with each other and encourages regional collaboration to research and management", Dr. Al Dhaheri elaborated.

Ayesha Y. Al Blooshi, Director of the Marine Biodiversity Division explained, "Bu Tinah is one of the 10 sites selected by the IOSEA secretariat based upon 18 evaluation criteria which were divided into four categories including ecological/biological, governance, socio-economic and regional and global representativeness. All of the sites were deemed to be of particular importance for marine turtles and other biodiversity, after a rigorous selection process that carefully evaluated their many ecological attributes".

The Bu Tinah Shoal, which is managed and monitored by EAD since 2000, is a core area within the established Marawah Marine Biosphere Reserve, the first and largest UNESCO Man and Biosphere (MAB) marine site in the region. At a distance of almost 150km west of Abu Dhabi city, the Island can easily be accessed from the coastal towns of Al Mirfa and Jebel Dhana.

The Bu Tinah shoal and its surrounding waters are strictly protected from human activities such as fishing. In spite of the harsh temperatures and high salinity, its habitats and species, including coral, seagrass, mangroves, Green and Hawksbill turtles, dolphins and many species of birds, continue to thrive, making the island an important location and a living laboratory for climate change studies. The shoal is also home to one of the most charismatic but endangered marine mammals, the dugong.

SCUBALYMPICS 2016

FEATURE **RED VARGAS** PHOTOGRAPHY **GIGIT VARGAS AND MITCH CANTILLANA**

Before the whole world gathered in Rio for the 2016 Summer Olympics, a group of divers came together to compete in the Filipino Scuba Divers Club (FSDC) annual Scubalympics last May 27. This year, the venue for the underwater competition was at the olympic sized swimming pool of the Iceland Waterpark in Ras Al Khaimah. All of the events from the previous years had all been conducted in a salt water environment in Dubai (with all of the sand and silt). This year's location, proved to be incredible with the water's excellent visibility and the reassurance of a safer environment to conduct the games.

The Scubalympics embrace the principles of proper and safe diving. Since diving is to be enjoyed with a buddy, the competitors are placed in teams of two. These divers can be of any level from Open Water to Dive Instructor. It can be both male or both female or a mix. Each dive team had to face a series of challenges that reflect and encourage good diving practices. These included proper equipment assembly, buoyancy control, buddy support, recovery skills and rescue procedures. The teams were ranked for each event, 50pts for 1st place, 40pts for 2nd, and so on.

The first event of the day was the scuba equipment assembly contest. The divers had to assemble their BCDs, regulators and cylinders. All straps and buckles had to be secure and the tank turned on. The masks had to be worn or secured around the neck, weights donned, while the fins could just be carried. The first team to have completed this and step across the threshold were the event winners. However, if there was a mistake, e.g. inflator hose not connected or octopus not properly secured, the team were disqualified and the next team to finish were regarded as the winners. The frenzy began as soon as the whistle was blown to start. One of the divers had been so excited, she put the regulator on backwards.

All the teams had to go underwater for the next event. The dive teams had to swim together to the other side of the pool and come back. The catch was that only one of them could have a mask. When they reached the other end, the mask was passed on to the other diver for the swim back. Again, the teams were ranked based on speed. Team trust and coordination were the key elements in the excercise as the masked diver was the partner's guide. However, it was amazing to see that, in some cases, the diver without the mask had been ahead of the other diver and had been leading.

The next challenge, the buoyancy control relay, was the only one that did not require speed. The first diver of each team had to swim through 3 underwater hula hoops kept in place by weight belts. Further along, there was an object before each hoop to pick up and drop right after the respective hoop. When the diver reached the end, the other diver would swim back through the hoops while doing the same thing, thereby returning the objects in their original position. All the teams were given 50 points to start with. However, if any part of the diver or equipment, including the SPG, alternate air source, fins or even the snorkel touched the hoops, there was a deduction to the score. To emphasize buoyancy control, there was no time limit during the activity. It was not as easy as it sounds, as all of the teams had deductions. Can you guess what scuba equipment was the most common culprit? Clue: it rhymes with schmins.

The last underwater competition required recovery skills from the divers. Each of the teams were given 2 plastic bags, rope and a 2 pound weight. The objective was to use the bags and rope in whatever way, to make the weight reach the surface or become positively buoyant. As soon as the rattle sounded to start, the teams began to create their own lift bag contraptions. Some put the weight in one

of the bags. Others used rope to secure the weight. It was wonderful to see all of the teams carefully putting air in the bags using their alternate air source. Safety was emphasized to prevent any weight inadvertently falling from the devices. The first to finish had used both plastic bags as lift devices while securing the weight with the rope. Knowledge from recovery skills such as knot tying had definitely been an advantage.

The final activity was the tired diver tow which had been held at the pool surface. One diver posed as the victim while the other propelled said partner using tow or pull techniques. To prevent "extra help", the fins of the tired diver were removed. When they reached the end of the pool, the divers switched roles, wherein the victim diver had to put on his/her fins and lead the other diver back to the starting point. This is the most strenuous of all the challenges since only one diver was doing all the exertion at each leg. The other just had to lie still and be as streamlined as possible. It was a close race as friends and supporters cheered the teams as they reached the finish line.

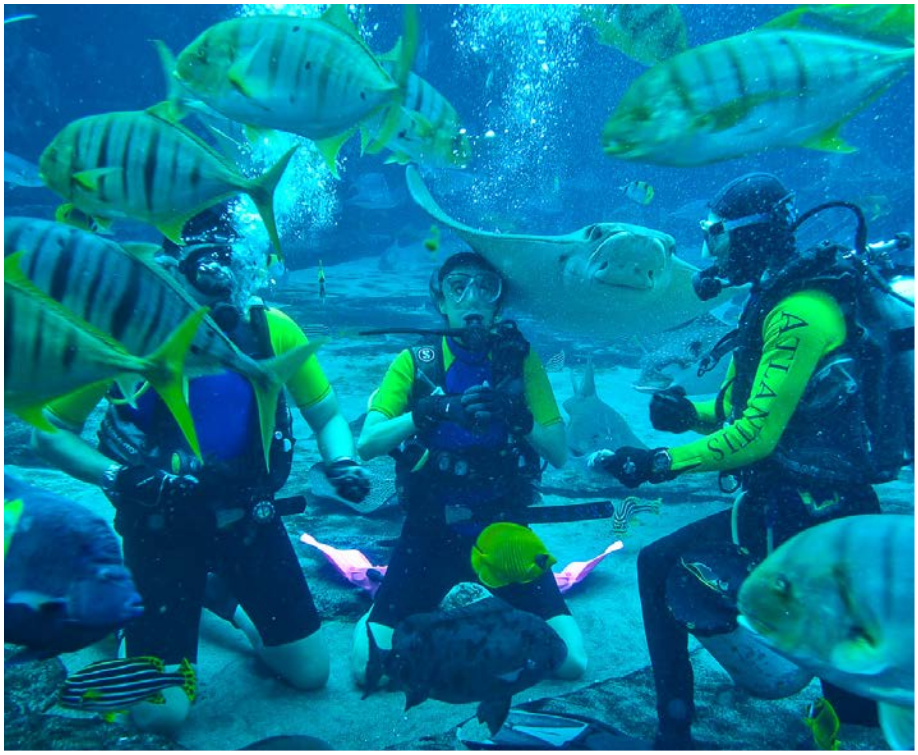
As the contenders came out of the water and took a well deserved rest, the officials tallied the scores from all the teams in all the challenges. Everyone gathered in the food area of Iceland and were treated to a sumptuous breakfast. After the meal, everyone assembled back into the pool area to wait for the tally results. The awards ceremony's Bronze medals were awared to Ruth Derige and Marielle Gutierrez. Silver medals went to Dennis Go and Nom Bernad and Gold medals, went to none other than Firas Al Haija and Ella Fajardo. Various scuba diving prizes and gifts were awarded to the participants, but the pride of being the Overall Champions of Scubalympics 2016 was the best prize of all.

This gathering of sportsmanship and camaraderie brings out the best in all divers and instills the principles of teamwork through buddy teams. Since no one should dive alone, relying and trusting your buddy leads to victory. Thanks to all of the hard work by the FSDC officers, volunteers, photographers and the Iceland waterpark. See you again at the games next year!

For more photos, look up Scubalympics 2016 at www.facebook.com/FSDCuae/photos/ and there is a video on the Youtube page.

THE PREDATOR DIVE EXPERIENCE

BY **SLAVA NOOR** | **WWW.THEPINKFINS.COM**



Although nothing beats diving with sharks in the wild, hectic Dubai lifestyles do not always allow us to take a week off and head to Maldives, Fiji or even neighbouring Oman. Still, I wanted to plan something special for a little anniversary with my fiance who is a passionate scuba diver and adventurer, like myself.

This is when I remembered going on a dive at the Atlantis a couple of years ago which was simply mind blowing. The diving program has slightly changed since that time, yet I was happy to discover that it was still possible to interact with sharks and rays as a part of the Shark Night Dive or the Predator Dive experiences. Since Marco had never had the feeding experience, we chose to go for the Predator Dive which allowed us to hand feed different types of sharks and rays in the world famous Ambassador Lagoon.

We were super excited to witness and photograph some of the 65,000 marine animals. Divers and snorkelers can spot sharks, rays, jellyfish, seahorses and even piranhas among the ruins! I was also going through the shark chart by the Elasmo Project so that I could identify every shark I saw during the dive.

At the dive centre, we were briefed on marine animals we were about to encounter as well as the general dive plan. Gear on, final ok and we were in the silent world surrounded by the most beautiful and colorful fish. We moved towards the bottom of the tank, an eagle ray following us as it felt the scent of the squids we carried for the feeding.

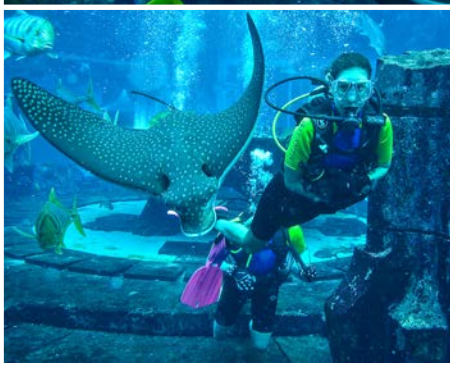
Once our dive leader found a good place for the feeding, we got on our knees side by side. The dive instructor handed us pieces of squid, one by one to feed to all the rays that were circling around us. Some of them were very gentle while others quite pushy and impatient. We had to hold a squid like an ice cream so it would be easier for them to grab. I was laughing quite a bit as some bigger rays kept covering us. A guitar shark also came to us curiously, but did not seem to be interested in the squid as much.

Once we were done with the feeding, we went around the aquarium which allowed us to see other fish, enjoy the views and take more photos. The iconic shot was made when we sat on the chairs holding hands and totally got photo bombed by a cownose ray. Oh well, I guess he thought he was a part of the family too!

Seeing all the curious kids on the other side of the glass wall, I waved at them and flipped my fins to their excitement. An older tourist wanted to take a photo with me, so I posed for a few moments too. Marco kept making videos with the GoPro and I knew we would have a lot to discuss once we were back at the surface.

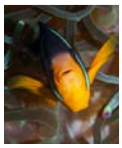
It was true, we shared what we saw bubbling with excitement and could not wait to see all the photos that were taken by the professional photographer which turned out to be just great!

So if you feel like having an adventurous dive but don't have time to travel far, this may be the answer for you.



AL MARSA TRAVEL AT YOUR SERVICE

BY **AL MARSA TRAVEL**



Al Marsa Travel is a PADI 5 Star Dive Centre. We opened in 1999, with our offices located in the Dibba Oman port, along the waterfront. PADI has named us one of their 'Top 10 PADI Dive Centres' across the whole Musandam Peninsula. We have built a reputation over the years as one of the Musandam's top dive centres and we are well known amongst the Musandam dive community for our good team spirit and level of professionalism. Dive with us and you can relax knowing you're in the good company of the Musandam's most respected dive operation with some of the region's most experienced professional dive team. We are also listed on **www.tripadvisor.com** as one of Dibba Musandam's top dive centres.

We are the main recommended dive centre for many national and international travel agents and tour operators offering tours in Oman and have been working with most of these companies for many years and continue to provide service to their guests, such as Schoener Tauchen, Beluga Reisen, Dive Worldwide, Orca Reisen, SUBOCEA, Dive & Travel, and Fun & Fly. We also have many loyal customers that return year after year and recommend us to their friends, and have therefore built up a good reputation by word of mouth, of which we are very proud.

At Al Marsa, we have a dedicated, permanent team who are all passionate about diving! Our Instructors, Dive Masters and maintenance crew are all highly skilled and qualified and have an excellent command of English. The team have worked with Al Marsa for many years and bring a wealth of diving knowledge and experience that covers the Musandam area. We have many dive sites here in Musandam, each unique in its own right and breathtakingly beautiful, and our dive team have a sound knowledge of all of the sites and will guide divers around the best and most famous dive sites.

The centre is fully equipped with the latest scuba gear and we frequently purchase new kit, everything from the regulators to the fins, BCD's to masks are all well known quality brands. We have our own compressor on board and a highly skilled maintenance crew. We also have our own classroom facility with air conditioning and white board facilities as well as an open learning/briefing/discussion area.

AL MARSA *Musandam*

DIVEHEART MALAYSIA MAKING WAVES AT MALAYSIA INTERNATIONAL DIVE EXPO MIDE 2016

Malaysia International Dive Expo (MIDE) 2016 held their 11th edition of its maiden voyage since 2006. The Expo was held from 29 to 31 July 2016 at Putra World Trade Centre, Kuala Lumpur.

MIDE is the premier show that is designed to build a high-end Scuba Diving exhibition platform to expand the dive market. The show is also the meeting place for dive businesses where decision makers meet for trade networking with industry players.

MIDE 2016 showcased 250 booths and occupied a space of 8,500sqm. It was estimated that approximately 15,000 visitors came through to visit and trade with exhibitors. It was projected more than 2,000 trade delegates came to visit the biggest dive show in Malaysia. The show also attracts visitors from 50 countries yearly. MIDE has grown from strength to strength over the years and contributes towards a vibrant scuba diving industry in Malaysia with international recognition.

MIDE supported the Disabled Divers organization with the Diveheart Foundation who exhibited for the First time during MIDE. During the 3 Day Exhibition, The Ambassador for Diveheart Malaysia, Hj Syed Abd Rahman of Kids Scuba worked Closely with The Department of Rehabilitation Medicine, the University of Malaya Medical Center UMMC on the Disabled Divers program with a special presentation from the President of the Malaysian Association of Rehabilitation Physician, Dato Professor Dr Zaliha Omar alongside with our local TV newscaster, Ms Ras Adiba Radzi on stage presenting in inclusivity the sport of scuba diving and her personal experience involving people with disabilities.

During the Exhibition, the Diveheart booth was visited by divers who wish to assist and extend their help as volunteers in assisting Diveheart Malaysia and disabled divers on their regular scuba diving training. We believe a disabled person deserves the right to lead a normal life routine. One of the distinguished guests sharing their experience was the only person with disability, Malaysia Parliament Senator, Ms Bathamathi Krishnan, alongside two students from the University of Malaya, Mr Basri and Mr Rizal whom are Phd undergraduate students to share their scuba diving experiences with Kids Scuba and Diveheart Malaysia.

1. Training Disabled Divers in Malaysia

Kids Scuba is a PADI 5 Star Dive Center in Subang Jaya, Kuala Lumpur, Malaysia which strongly supports the Diveheart program. Hj. Syed Abd Rahman, the Founder and Director of Kids Scuba, is a PADI IDC Staff Instructor and is currently the Ambassador for Diveheart Malaysia. He sees this as a special program designed for people with disabilities which allows them to experience zero gravity underwater in a weightless environment.

The objective of the program is to build confidence, independence and self-esteem in the lives of children, adults and veterans with disabilities through the sport of scuba diving, scuba therapy and related activities.

The purpose of the program is to provide and support educational scuba diving programs with the PADI courses such as the PADI Seal Team, PADI Junior Open Water and Open Water Diver courses in the hope of providing both physical and psychological therapeutic value to that person.

The programs focus both on training and travelling as we have divers and participants joining our island trips to the Tioman Island in Pahang Malaysia, as well as the Island of Bali in Indonesia to complete their PADI Open Water certifications.

2. Response Toward the Disabled Divers in Malaysia

The responses have been good in Malaysia, especially in Kuala Lumpur. We now work closely with the University of Malaysia Medical Center, Department of Rehabilitation Medicine, with the professors and doctors in training the students from the University of Malaya in training the second batch of disabled divers for the PADI Open Water course.

Kids Scuba and Diveheart Malaysia work with individuals who have a variety of disabilities, including physical and developmental, vision and hearing impairments, amputations, post traumatic stress disorder and more. Kids Scuba and Diveheart Malaysia seek to help its participants, "Imagine the Possibilities – We Can Do It " into their lives.

3. Benefits of Scuba Diving for People with Disabilities

The program is to instill, "I Can Do It and We Can Do It" spirit in participants, inspiring them to take on challenges that they may not have considered before. Using zero gravity and the adventure paradigm, with the program we help participants believe that if they can scuba dive they can do anything. We've discovered the forgiving and weightless sensation, the water column provides the perfect gravity-free environment for those who might otherwise struggle on land. In the underwater environment, we are all equal.

Scuba diving can help those with impaired hearing to make a career in commercial diving. Leg amputees can also be given a chance in commercial diving.

4. Marine Parks and Dive Spots in Malaysia for Disabled Divers

Tioman Island in Pahang State, Redang Island in the State of Terengganu, Kota Kinabalu Marine Park and Mabul Island in the State of Sabah, Borneo, are all dive spots in Malaysia where diving and snorkelling programs involve disabled divers for certification in PADI Open Water and Advanced Open Water diver courses.

5. Advice to Other Dive Centers Looking to Incorporate the Disabled Diver Programs

As a PADI Dive Professional and a Scuba Educator of the past 15 years, I strongly believe that we should always reach out to the other communities and assist others in what we have, and share our professional knowledge as a role model in the sport of scuba diving.

Organizations such as Diveheart have a complete training program to assist certified divers and dive professionals courses designed to coach, train and guide disabled divers in the sport of scuba diving, involving water therapy.

The accomplishments, efforts and successes of disabled divers after completing their scuba diving excursions and PADI dive courses are just amazing beyond words.

"Imagine the possibilities – we make the difference."

www.diveheart.org

HJ. SYED ABD RAHMAN
Director, Scuba Educator
PADI IDC Staff Instructor #302849
Ambassador Diveheart Malaysia

KIDS SCUBA
PADI 5 Star Dive Center
PADI Youth Diver Education Award Dive Center
PADI Outstanding Contribution to Diving Industry Award 2013/2014/2015

NYLON STOCKINGS

STORY BY PATRICK VAN HOESERLANDE ILLUSTRATION PETER BOSTEELS

"A wetsuit?" asked Skubba surprised.

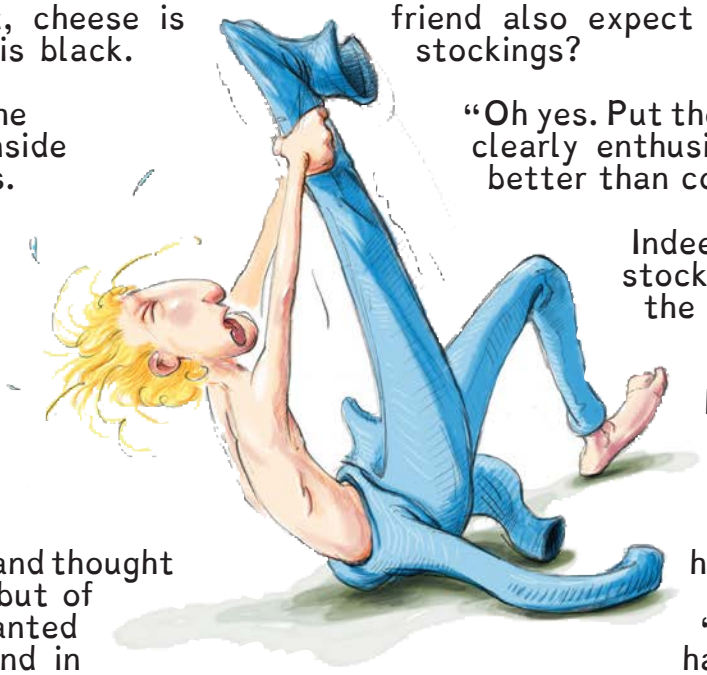
Yes, his mother had bought him a real diving suit. Wow! Cool!

Fred took a piece of chalk and drew a piece of cheese with holes on the sidewalk.

"Neoprene is like a sandwich with cheese," he said.

Skubba looked rather surprised. My mom gave me a suit of cheese? Must I dive in that? But, cheese is yellow and my suit is black.

"The outer layer, the buns, protect the inside against sharp things. The inside, the thick layer of cheese is rubber, such as a rubber band, but with air bubbles trapped in it. These bubbles will keep you warm in cold water."



Skubba heard water and thought no more of cheese, but of scuba diving. He wanted to get in his suit and in the water as quickly as possible. However, getting in the suit was not that easy. He did not want to use excessive force because he was afraid to destroy the neo-thingy. What would happen if he tore the outer layer and all those air bubbles suddenly escaped from the suit? Would he fly away like a balloon? Halfway up his leg, his foot got stuck. What now?

"What I wanted to tell you was that it is not easy to put a neoprene suit on. It's like a new rubber band, you have to stretch it a little so that it fits your body," said Fred.

"But how do I get into it without tearing it?" asked Skubba still thinking about the balloon flying through the air with a brrr-sound.

"Put some socks on."

"Socks?"

"Yes, it will be easier to put it on."

The moment Skubba put a sock on to get into his suit, his mother came back into the garage. She had a pair of nylon stockings with her.

"Take these. They are old ones."

Skubba looked at Fred, puzzled. Did his friend also expect him to put on girls stockings?

"Oh yes. Put them on." Fred sounded clearly enthusiastic. "Nylon glides better than cotton. Put them on!"

Indeed, with his mother's stockings on, getting into the suit was easier. But must he now wear nylon gloves to get his arms in the suit?

Fred had already foreseen the question and was holding a plastic bag.

"Put this over your hands and glide your arm into your suit."

"But I cannot dive with my hands in a bag."

"Put your arm through the sleeve," Fred said.

After Skubba's hand came out of the sleeve, Fred pulled the bag off and put it on the left hand.

Two legs and two arms in the suit. After some pulling and pushing, all the wrinkles were gone. The first time in a neoprene suit felt like being buried in the sand on the beach. However, Skubba was very happy and felt, for the first time, like a real diver in a real diving suit. He was beaming. He was ready for another adventure.

TRIMMING OUT

STORY BY PATRICK VAN HOESERLANDE ILLUSTRATION PETER BOSTEELS

By now he was quite successful at quickly slipping into his suit. The suit was new and therefore not really flexible, but with mom's stockings and the trick with the plastic bag, he did it well.

The first time he went into the water, he could feel the cold water flowing into his suit. Oops, was it leaking? Did he put the suit on the right way? Did he forget to close a zipper? Where were the leaks?

Fred watched the chills run over Skubba's body.

"There are no leaks!" he exclaimed as if he could read Skubba's mind. "It is normal that there is water in your suit. That little bit of water will warm up with your body heat and then it will keep you warm."

Soon after Fred's explanation, the chilly feeling was gone. Skubba felt no cold water anymore. It works! His suit was not leaking. Great.

To test his suit, he decided to swim a little. Jumping in was easy, but swimming was difficult. It felt like he was not deep enough in the water. As if he was floating. His kicks went up in the air. After a short, tiring swim, he decided to put his mask on and felt ready for the real stuff. Diving.

When he tried to put his head in the water, he felt his legs coming up. As he pushed his legs down, his head came up. Weird?!?

Maybe he should adopt a more active style? But even when he moved his arms and legs like a madman, he did not get any deeper into the water! What now? A high jump?

He crawled back to the edge and went to the fishing platform, or whatever you call a wooden platform built by a fisherman to be closer to the water. Because he knew that this was built above a deep part of water, he jumped in head first. Yes, he dove underwater. But suddenly, it felt like there was an invisible hand pulling him up. He was soon floating back on the water's surface.

"I cannot stay under with my suit on," Skubba exclaimed. "The suit protects me from the cold, but I cannot dive with it Fred!"

"Of course not. You have forgotten all about Archimedes!" answered Fred.

"Archimedes? The one with the floating cup?"

Fred asked Skubba to give him the suit. He took it and threw it in the water. It floated.

"You see," said Fred, "the bubbles in your suit keep you warm, but it also makes you float. We have to make it sink."

Then he took the lead blocks and asked Skubba to lay them one by one on his floating suit. He called this activity, 'trimming out'. Skubba thought it sounded better as, 'putting lead on' because you put lead 'on' the suit, but Fred was a man of difficult words.

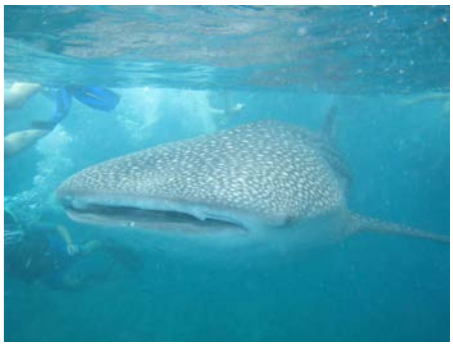
After 4 blocks, the suit began to sink. "We have to fix four extra blocks to trim you out. Those extra blocks will push your suit down when you're diving so that you can stay under. A bit like our bucket." Fred explained.

With a rope around the hip and the shoulders, Fred made a kind of belt for holding the blocks. A weight belt.

Suit, mask and weight belt. Check. Skubba was back in the water. Ready to dive...

BIOSPHERE EXPEDITIONS ASSESSES WHALE SHARK TOURISM IN NEW REPORT

BY **BIOSPHERE EXPEDITIONS**



Biosphere Expeditions is excited to announce that the 2015 Maldives coral reef & whale shark report is now available.

This report is particularly important, "as the El Niño event has continued at unprecedented levels into 2016, it is important that we continue to survey to understand the long-term resilience of areas we monitor." It also highlights an "out of control" and therefore unsustainable whale shark tourism industry that needs to be "reined in".

The report covers the results of the September 2015 survey and concludes that "at present the Maldivian reefs surveyed do not seem to be suffering from significant levels of bleaching and disease. The low incidence of coral damage recorded seems to be due to storm damage and Drupella predation…It is crucial to keep a lookout on Ari Atoll reefs as well, given the imminent threat of bleaching."

Additionally, "Maldivian local communities are only slowly becoming more aware of human impacts on reefs…Given the very real threats to coral reefs and the rapid pace of change, communities, politicians and government must be more proactive in managing the coral reefs of the Maldives properly and sustainably."

Regarding whale shark tourism in South Ari Marine Protected Area, the report states that "although the area is a Marine Protected Area, as of yet it is merely a paper park. Despite suggestions for regulations being put forward by the MWSRP (Maldives Whale Shark Research Programme), there is neither a proper management plan that all the stakeholders agree on, nor a governing body actively involved in enforcing these regulations. In most cases, it is clear that some of these tourists are either not given a safety or environmental briefing about the code of conduct while swimming with sharks, or they do not care, or both." However, there are also numerous examples worldwide of well-managed MPAs engaging in sustainable income generation through interaction with nature and the presence of whale sharks; one example mentioned is Ningaloo in Australia, with strictly enforced codes of conduct.

It is also noted that where officialdom is failing, civil society and committed Maldivians are stepping in. Ever since Biosphere Expeditions started running its annual research cruise to the Maldives in 2011, it has educated and trained Maldivians in Reef Check survey techniques. This culminated in the first-ever all-Maldivian reef survey in November 2014 and other community-based conservation initiatives.

Win a place to join a unique SCUBA diving coral reef conservation expedition to Oman, the Maldives or Malaysia! In partnership with Reef Check and the Marine Conservation Society, Biosphere Expeditions is offering a free place on an expedition to Musandam (Oman), the Maldives or Tioman Island (Malaysia). Each trip includes training and certification as a Reef Check EcoDiver.

FINDING DORY, SAVING NEMO:
PROBLEMS FACING MARINE AQUARIUM FISH

BY **DR. GREGOR HODGSON, REEF CHECK EXECUTIVE DIRECTOR**

How many of your friends own a home aquarium with tropical fish? It is a popular home hobby and over 10 million Americans own an aquarium. When Finding Dory, the sequel to the film Finding Nemo was released this week, many environmentalists worried that we would have a repeat of the Nemo disaster when thousands of kids tried to flush their clownfish down the toilet to "save" them by returning them to the sea.

But there is a more serious environmental concern regarding marine aquarium fish and that is fisheries management. For large food fish like tuna, national and international management organizations try their best to track both the size of tuna populations and the size of the fish. Using sophisticated models, scientists calculate what they think is a reasonable number of fish that can be caught each year and these are allocated to fishermen. Although our track record in fisheries management is terrible, generally the failures are due to politics and not the scientific recommendations.

Like tuna, most tropical saltwater fish are captured alive, but unlike tuna they are kept alive and transported from countries like the Philippines and Indonesia to the US and Europe for eventual sale to consumers. Compared to the $30 billion world tuna trade, the entire marine aquarium trade is estimated to total less than $100 million. So it doesn't get as much attention, and the fact is that 90% of marine aquarium fish are caught from unregulated and unmanaged fisheries. In places like Hawaii and Australia, the fisheries are regulated.

Although the entire marine aquarium trade is small compared to tuna, the prices of some rare species of marine aquarium fish are the highest of any fish in the world – exceeding $100,000 per pound. Even relatively common fish like the Blue Tang (Dory) could fetch $100 per pound!

In addition, sadly, almost all tropical marine aquarium fish are caught using sodium cyanide mixed in water as a "knock out" chemical to disable the fish but not kill it. In the Philippines, for example, a diving fisherman will use a bottle of cyanide solution to squirt the poison into a crevice on the coral reef where a small fish like a Blue Tang, is hiding. If done properly, the fish stops swimming and is easily scooped into a net, but the cyanide also kills the corals and other animals surrounding the crevice. On reefs where cyanide fishing is carried out every day, the reef can be damaged. Although cyanide fishing is illegal in most countries, the laws have been difficult to enforce. So the damage continues, and without fisheries management plans, the populations of marine aquarium fish are often reduced below "safe" levels.

In addition to problems at the source, there can be problems when the live fish are transported long distances by airplane. A typical flight from Manila to Los Angeles takes 15 hours. Buyers and sellers don't want any fish to die but accidents happen, and cold temperature and lack of oxygen can cause fish to die in transit.

There are also problems in the importing countries including the US. Like learning to drive, learning to keep tropical marine fish alive in a home aquarium requires special knowledge and training. Unlike clownfish, which are fairly easy to keep in captivity for several years, the Blue Tang requires special handling and food. Some fish are almost impossible to keep alive. But unlike driving a car, no license is required to buy even the most difficult-to-care-for tropical marine fish. As a result, many fish die in home aquaria. In a small study carried out by one of my former UCLA students in Sydney, Australia about 50% of the fish bought by home aquarium owners died within two weeks of purchase. Even if a larger study were to show it is only 10%, this is a lot of dead reef fish when over 12 million fish are imported into the US every year.

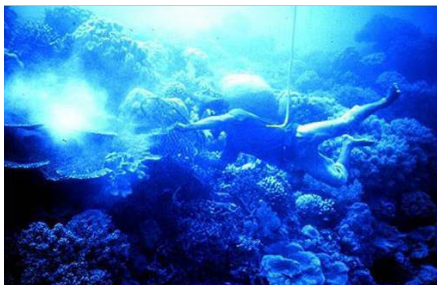
Given that some fisheries are formally managed using science and given that Reef Check is a science-based conservation organization, over ten years ago we accepted an invitation from conservation partners to try to work out a better management system for marine aquarium fisheries. We worked on this problem until 2008, and had some successes and some failures.

On the success side we were able to develop a suite of survey methods, a fisheries model and strategies to properly manage marine aquarium fisheries. These were tested in several countries and worked well. We also found that we could engage aquarium fishermen in setting up Marine Protected Areas to help build up their fish stocks and this improved stocks of both aquarium and food fish. Our partners had success in training fishermen to catch fish using nets and without cyanide.

Now, many environmentalists believe that the marine aquarium trade should be shut down because these are beautiful wild-caught animals much like an Amazon parrot or a Burmese python. I understand this point of view, but most marine aquarium fish species are extremely abundant, so if we ban the marine aquarium trade, to be fair, should we ban all fishing?

Assuming that the trade will continue for the near future, what are the major issues that need to be addressed now to make it "sustainable" in the sense that we are not jeopardizing healthy populations of any species?

1. **Reduce wild catch:** Figure out how to breed more marine aquarium fish through aquaculture. Only a few have been solved.
2. **Reduce cyanide use:** Crack down on cyanide use by providing resources to the enforcement agencies specifically for this



purpose. Provide net-catch training for 1000s of fishermen by using training of trainers.

3 **Enforce the Lacy Act:** It is illegal to import anything obtained illegally in violation of the exporting country. Cyanide fishing is illegal in these countries. On March 9, 2016 a consortium of marine conservation groups filed a legal petition to force the US government to enforce the Lacy Act.
4 **Improve fisheries management:** Use the MACTRAQ methods developed by Reef Check to better track and manage marine aquarium fisheries in exporting countries.
5 **Reduce transport mortality:** Regulate the transport of wild caught fish to maximize survival.
6 **Reduce post-purchase mortality:** Retailers should use well-known rankings of difficulty to control the purchase of each fish species by requiring the labeling of fish, and limiting purchases to buyers who have been trained and certified to keep each level of marine fish.

As a scientist, I'd like to believe that we can use science to successfully guide management of marine aquarium fisheries. As a former Peace Corps Volunteer with the Bureau of Fisheries and Aquatic Resources in Cebu, Philippines – a center of cyanide fishing, I am familiar with enforcement issues and I know how poor the coastal fishermen are. I know that if they can't make money from aquarium fishing they will put even more effort into fishing for food, further damaging the reefs. And at the same time, I wonder how many kids have been poisoned inadvertently by fishermen mixing cyanide solution in their homes? If the trade is going to continue, we all need to do a better job of solving the problems noted above.

RECENT PAPER SHOWS GENETIC DIVERSITY AFFECTS HOW FISH POPULATIONS GROW

BY **REEF CHECK CALIFORNIA DIRECTOR DR. JAN FREIWALD**
PHOTOGRAPHY **DAN SCHWARTZ (SEAWINDOWS.ORG)**

In a recent paper published in the Journal of Ecology, authors Darren Johnson, Reef Check's Jan Freiwald and Giacomo Bernardi used data on genetic diversity and Reef Check California's survey data from southern and central California to investigate the strength of population regulation in black surfperch (*Embiotoca jacksoni*) and how it is affected by their genetic diversity. Population regulation is the mechanism by which natural populations grow or shrink in size depending on their current population size (i.e. number of individuals). This is often related to the resources, predators and other habitat features present at a site. This type of regulation is called density-dependent population regulation because it is dependent on how many individuals are present in a given habitat and ultimately limits the number of individuals that can be supported by an environment. This is an essential process in ecology because it determines how many individuals of a species can be present in an area or habitat. Differences in the ways animals utilize available resources might determine how tightly regulated their populations are. For example, if individuals of the same species can utilize a wide variety of food resources, their population might be less regulated (i.e. their populations can grow larger) than when all individuals compete for the same resource. The way in which individuals use different available resources is linked to their variability, meaning that populations in which individuals differ more in their morphology or physiology will be able to use more resources than populations in which all individuals are similar. As much of the morphological characteristics of individuals are determined by its DNA, it is likely that genetically diverse populations are less tightly regulated and therefore can grow larger than populations with low genetic diversity.

In this study, they evaluated how much of the variation in density-dependent regulation between local black surfperch populations can be explained by their genetic diversity. Black surfperch are a common species on nearshore reefs in southern and central California. Reef Check has monitored this species since 2006 and the authors used monitoring data from 45 sites ranging from San Diego to Monterey.

Genetic diversity is an important source of biodiversity and in this study they showed that it can have a strong influence on how populations grow or shrink. Because genetically diverse populations are spread out more uniformly on the reef, they are able to use more of the available resources and grow faster when resources are available than low diversity populations where individuals are staying closer to each other and therefore are competing for resources more intensely. The results of this study suggest that the size of populations with higher genetic diversity can be up to twice as large compared to that of low-diversity populations if they experience similar environments. This study demonstrates that loss of genetic diversity can have real consequences for the size of fish populations on local reefs. In light of the potential loss of genetic diversity in wild fish populations, for example through overfishing or environmental change, this finding highlights how important it is to not only protect species, but also work to maintain their natural diversity through management and conservation.

REEF CHECK IRAN RELAUNCHES WITH ECODIVER TRAINING ON KISH ISLAND

BY **REEF CHECK ECODIVER TRAINERS NIKOO CHEHELTANI & MOHAMMAD HOSSEINPOUR**

PHOTOGRAPHY **DIVE PERSIA**

In April 2016, the Dive Persia Training Center organized an EcoDiver Course on Kish Island, Iran with the support of the Kish Free Zone Organization, Kish Environmental Organization and Kish Seashell Diving Academy. As part of an effort to train more Iranian EcoDivers and to encourage more divers to participate in Reef Check monitoring, the course was offered for free.

The course was conducted over two full days by two EcoDiver Trainers and Scuba Instructors from Dive Persia: Mohammad Hosseinpour (MSc. Ichthyology) and Nikoo Cheheltani (MSc. Marine Biology). The first day involved a classroom session which included an introduction to Reef Check, course presentations and an explanation of Reef Check methods. Even some non-divers participated in the classroom session to get familiar with the course. On the second day, which involved a practical session, diver participants were separated into four groups and asked to identify Reef Check target species and practice Reef Check methods underwater. The training went well and all student divers passed the tests.

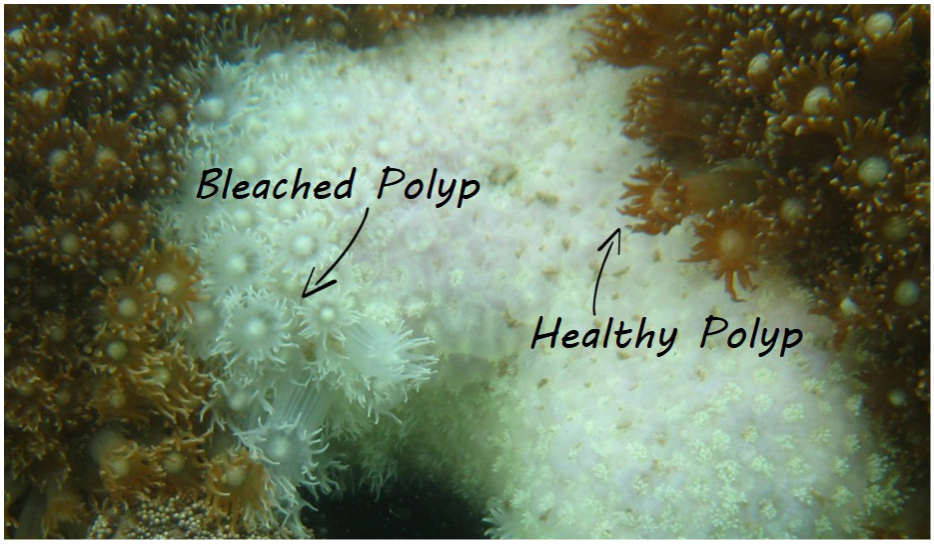
The Arabian Gulf has very unique coral reefs. Corals in the Arabian Gulf have a high thermal tolerance; they typically can tolerate temperatures as high as 36°C during summer and as low as 13°C in winter. Most coral reefs in temperate climates, however, can withstand temperatures only as high as 29°C before they bleach. Therefore researchers and marine biologists believe that genetic clues in the coral reefs of the Arabian Gulf may help coral reefs around the world survive global warming.

Not many Reef Check surveys have been conducted in Iran since 2012. However, we hope that by holding more courses like this, the number of surveys will increase and more data will be collected by EcoDivers of Iran – especially by trained scuba instructors, dive center staff and local divers. We set up the Reef Check Iran team to conduct Reef Check surveys in all of the islands around the Arabian Gulf. In the near future, with the help of Iranian EcoDivers, marine biologists, scientists and the Reef Check Iran team, we are planning to provide a separate regional Reef Check Field Guide for Arabian Gulf coral reefs.

To join the Reef Check Iran team and become a Reef Check EcoDiver, please contact Mohammad Hosseinpour at +98-912-2604560 or Nikoo Cheheltani at +98-0937-6069998, or email divepersia@gmail.com.

BLEACHING UPDATE FROM REEF CHECK AUSTRALIA

BY **REEF CHECK AUSTRALIA**



Since February, Reef Check Australia teams have been out to more than 40 sites along the Queensland Coast and on Ningaloo Reef, Western Australia. You can see what our teams witnessed out in the field throughout Queensland with our field photo album.

In the midst of a whirlwind of fieldwork, we also finalized the report for our 2015/16 South East Queensland survey season. South East Queensland is home to numerous subtropical reefs, home to tropical, subtropical and temperate marine species. Results from 33 surveys conducted from September 2015 to May 2016 on sites from the Sunshine Coast to Gold Coast showed average hard coral cover of 20%, a reminder that these often over-looked reefs host important coral communities! Almost every survey recorded some evidence of coral bleaching (90% of surveys), but only affecting on average a small portion of the population (7%). Follow-up surveys on sites with higher levels of bleaching later in the year will help capture any evidence of coral mortality.

Our Great Barrier Reef survey season is still underway and we'll be sharing more detailed updates later this year.

Reports on the largest recorded global coral bleaching event continue to pour in around Australia and around the world. On the Great Barrier Reef (GBR), results from surveys conducted by the Great Barrier Reef Marine Park Authority and partners indicate that the overall coral mortality on the Great Barrier Reef is 22 percent. Much of that die-off (85% of observed mortality) has occurred between the tip of Cape York and just north of Lizard Island, 250 kilometres north of Cairns. Impacts vary widely across different reefs.

We've been getting lots of questions about what the "real" story is about bleaching on the GBR…but as you've probably noticed, it is a complicated story to tell. The GBR is the size of 70 million football fields, with depths from 1 to 2,000+ metres, including 3,000 reefs, and 600+ species of coral. The impacts of coral bleaching vary across this matrix of different regions and habitat types. Some areas will fare OK and some areas are/will be devastated.

Reefs are complex ecosystems and coral bleaching impacts can be considered at the colony, site and reef level. Different types of coral have different sensitivities to heat stress and even corals of the same species in a small area can demonstrate different responses to bleaching. At a single research site, surveys document the impact of bleaching at the population level (e.g. if 10 out of 100 corals are impacted, that's 10% of the population). Even within a reef, some shallow areas may be heavily impacted and other deeper or highly-flushed areas may show lower levels of bleaching. Therefore surveying many different areas on the reef can provide a representative sample for overall impact at the reef level. This explains why you might hear about some varying numbers for the level of bleaching impact.

But the resounding message is clear – this is our call to action. It's not too late, but decisive progress in how we work together to look after reefs is critical. We need to relieve immediate reef pressures such as water quality issues or localised overfishing. We need to support investment in the systems, policies and collaborations that manage reefs. We need to help find better ways to quickly document and understand major events that impact reef health (citizen science can help!)

We are dedicated to reefs and we challenge you to look for ways to transform your love for reefs into tangible actions in your life. Instead of pointing fingers, now is time for people to unite and work together.

2016 KICKSTARTER CAMPAIGN TO SUPPORT OUR BIG SUR AND CHANNEL ISLANDS EXPEDITIONS

Reef Check is currently running a Kickstarter campaign to raise the funds needed to reach remote areas of the California coast for monitoring. Please consider donating to our 2016 Assessment of California's Remote Marine Ecosystems.

Click here to donate: **https://www.kickstarter.com/projects/2033378493/2016-assessment-of-californias-remote-marine-ecosy**

In 2015, Reef Check California launched two successful Marine Ecosystem Assessments – the Channel Islands and the Big Sur coast. These multi-day expeditions were part of a sustained effort by Reef Check California for the long-term monitoring of these unique coastal ecosystems. The data we collected is publicly available on Reef Check's Global Reef Tracker for scientists, marine managers and the general public to use.

This year we plan to return to these sites to measure differences in marine life, to ascertain what trends are occurring and what steps need to be taken to protect these remote ecosystems. We will lead two teams of trained volunteer citizen scientists to scuba dive and survey fish and other species using scientific protocols that are integrated with studies being done throughout the rest of California. The Channel Islands and Big Sur coast together represent 275 miles of some of the most undeveloped areas of coastline in the state. These areas are located where cool nutrient-rich waters provide an environment for a variety of endangered species, thriving kelp forests and sensitive habitats not found anywhere else along the California coast. The remoteness of these areas puts them out of reach of polluting industries and human population centers, but also makes it difficult for scientists to study and manage.

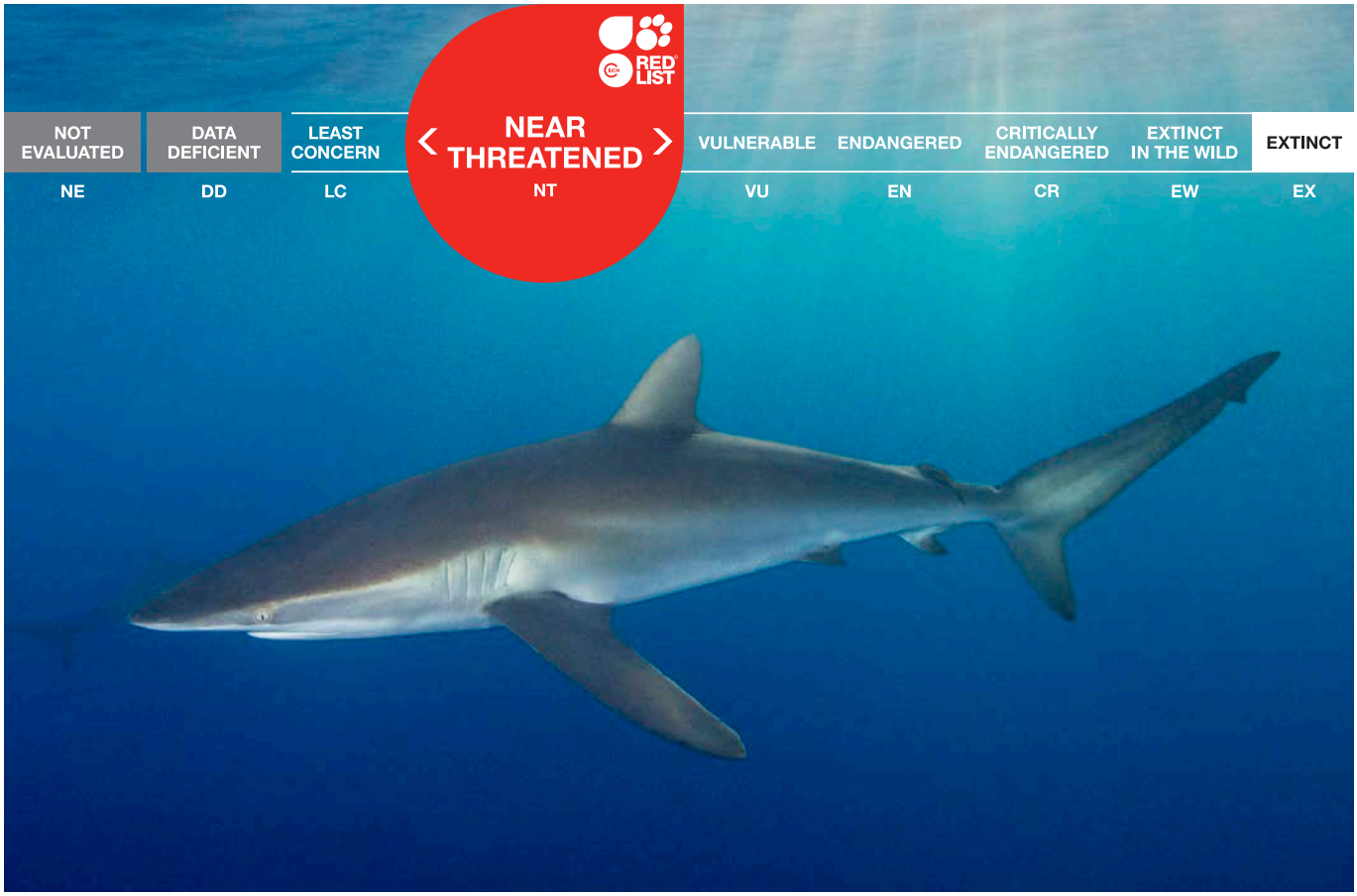
In this era of global environmental stressors like ocean acidification, rising sea temperatures and the vast reach of plastics pollution, the knowledge of what changes are occurring is key to successfully adapting management and conservation actions to protect these rich habitats. In 2015, we documented trends that were both alarming and encouraging. In Big Sur, we found evidence that populations of recovering fish stocks were doing better inside the three Marine Protected Areas (MPAs) along the coast. But we also documented the decline in sea stars due to Sea Star Wasting Disease and an associated increase in purple urchins – which are voracious grazers of kelp forests. The trend was most pronounced outside of MPAs, evidence that these underwater parks are successfully protecting biodiversity.

This year, we need to go back to these sites to see if these trends of decreasing sea stars, increasing urchins and associated decrease in kelp forests that we have observed in the other parts of the state are occurring here and to what extent. On Santa Cruz Island we saw a big increase in the number of crowned urchins, a species that is normally found in greater numbers in warmer water to the south. Their spread is likely related to the recent warm water along the California coast. At Scorpion Anchorage, which has been an MPA since 2003, we found giant kelp has returned and the urchin barren that has been there since we first started monitoring in 2008 is gone. At other sites on the islands outside of MPAs, urchins have increased. These trends and more can be viewed on our Global Reef Tracker.

Our goal for this survey season is to go back and document what further changes have occurred in the past year, which has been one of the strongest El Niños in history. At each place we anchor, a team of roughly two dozen volunteer scientific divers will enter the water, and using well established scientific protocols, will count fish, invertebrates and kelp to come up with a comprehensive picture of the status of marine life in these remote areas. Kelp forests are critical ecosystems along California's coastlines and provide food, shelter and oxygen for hundreds of species, including humans. These ecosystems are changing due to rising ocean temperatures, invasive species, marine diseases and other environmental stressors. This project aims to address these issues by collecting data that will be added to previous years' information so that fisheries managers, researchers and the public can have the scientific information they need to protect these precious habitats.

FEATURE CREATURE
SILKY SHARK (*CARCHARHINUS FALCIFORMIS*)

FEATURE **IUCN RED LIST 2009** PHOTOGRAPHY **ANDY MURCH** | **WWW.ELASMODIVER.COM**



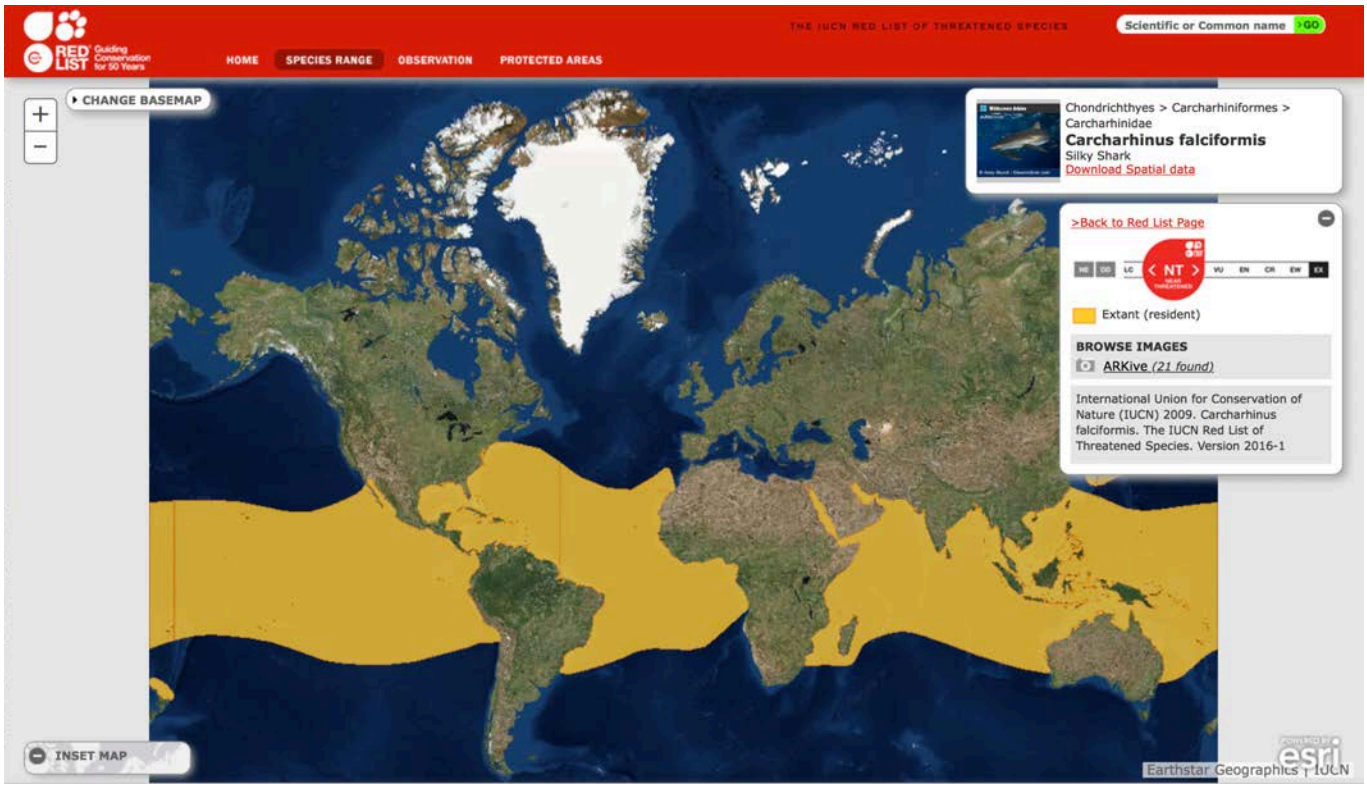
RED LIST CATEGORY & CRITERIA: NEAR THREATENED
Scientific Name: *Carcharhinus falciformis*
Common Name: English: Silky Shark

Justification: This oceanic and coastal-pelagic shark is circumglobal in tropical waters, where it dominates as a target species or bycatch in certain pelagic fisheries, particularly purse seines on drifting FADs (fish aggregating devices). The Silky Shark (*Carcharhinus falciformis*) has a generation period of 11 years and is significantly less resilient to fisheries than the Blue Shark (*Prionace glauca*). It is vulnerable to a wide variety of pelagic fisheries, and is taken in large numbers, but there are no population estimates and most catches are unreported. It is highly associated with seamounts and is the dominant shark in tuna purse seine fisheries on drifting FADs, where declining catch rates have been recorded in the eastern Pacific. Silky Shark ranks among the three most important sharks in the global shark fin trade, with between half a million and one and a half million Silky Sharks traded annually. Estimates of trends in abundance from standardized catch rate indices for Carcharhinus species combined in the northwest Atlantic range from non-significant trends, to a decline of 85% over 19 years. Species-specific trends for Silky Sharks are difficult to estimate because of difficulties distinguishing it from other Carcharhinid sharks. Declines are also inferred in other areas, and Silky Sharks are known to be particularly important in pelagic fisheries in the Indian Ocean. Globally this species is assessed as Near Threatened, and may prove to meet the criteria for VU A2bd+3bd+4bd in the future.

In addition to the Near Threatened global assessment, a number of regional assessments have also been designated for this species as follows: Vulnerable A2bd+4bd in the eastern central and southeast Pacific; Vulnerable A2bd+4bd in the northwest Atlantic and western central Atlantic; Near Threatened in the southwest Atlantic; and Near Threatened in the Indian Ocean and western central Pacific.

Eastern Central and Southeast Pacific

Silky Sharks are taken in pelagic commercial fisheries and also artisanal fisheries in this region and fishing pressure from longline and purse seine fisheries targeting tunas and swordfish is high. Silky Sharks are the most commonly caught species of shark in the purse seine fishery for tunas in the eastern Pacific Ocean. Preliminary estimates of relative abundance trends for large Silky Sharks derived from purse-seine fisheries in this region show decreasing trends over the period 1993-2004 for each of three types of purse-seine sets (~65%). According to IATTC it is not known whether these decreasing trends are due to fishing, changes in the environment, or other processes, however, these results were also consistent with a separate descriptive study of Silky Shark bycatch rates in dolphin sets. This descriptive analysis showed a decrease in the probability of obtaining sets with bycatches greater than or equal to each of the three threshold levels over the same period. In addition, a study of the tropical central Pacific (which overlapped FAO areas, but mainly included the eastern central Pacific) estimated a decline in abundance of ~90% and in biomass >90%. A comparison of standardized catch rates of pelagic sharks caught off Costa Rica from 1991-2000 (of which Silky Sharks comprised 60-70%) also showed a decreasing trend (~60%). Given the trends described above and continued fishing pressure from



pelagic fleets in this region, this species is assessed as Vulnerable A2bd+4bd there.

Northwest and Western Central Atlantic

Silky Sharks are taken as a target or bycatch of both commercial and artisanal pelagic fisheries in this region, including in the US commercial shark bottom longline and the pelagic longline fishery, targeted artisanal longline fisheries off Venezuela and recreational fisheries. This regional assessment is based on several estimates of trends in abundance of both Silky Shark and Carcharhinus species combined from standardized catch rate indices, which estimate declines ranging from 46-91% over different areas and time periods. Given the apparent decline in abundance in the northwest and western central Atlantic, and high fishing pressure from pelagic fleets throughout, this species is assessed as Vulnerable A2bd+4bd this region.

Southwest Atlantic

The Silky Shark is taken in several longline fisheries in the southwest Atlantic, including those off Santos, southern Brazil, Natal, northeastern Brazil and Uruguay, and is retained. It is also targeted by fisheries in northeastern Brazil. Although there is a lack of catch data, the life-history characteristics of this species make it vulnerable to fisheries. Given the declines observed where this species is heavily fished in the northwest and western central Atlantic, this species is considered Near Threatened as a precautionary measure.

Indian Ocean and Western Central Pacific

This species is taken as a target and bycatch of shark and tuna longline and tuna gillnet fisheries in Indonesia and throughout many areas of its range in the Indian Ocean and western central Pacific. Pelagic fishing pressure is high, with reports of increasing effort in recent years. Sri Lanka is one of the only countries that reports landings of Silky Sharks to the FAO. These landings rose from 5,000t in 1960 to a peak of 25,400t in 1994, after which they declined to just 1,960t in 2006 (with landings not exceeding 7,000t in the last five years of the series), suggesting possible collapse. Maldivian shark fishermen who specialize in longlining for oceanic sharks report declining catch rates of Silky Sharks, although specific data are not available. Whilst Japanese assessment of data from research longline surveys in the Pacific and Indian Oceans suggests that Silky Shark catch per unit effort showed no remarkable change in the 1990s when compared to levels in the 1970s, pelagic fishing effort has increased in recent years. Given the significant declines observed in other areas including the central tropical Pacific, the large decline in reported landings off Sri Lanka, reports of declines in catch rates off the Maldives and high and continuing fishing pressure across this region, an assessment of at least Near Threatened is considered appropriate.

Range Description: Silky Sharks have a circumglobal distribution in tropical waters (Compagno in prep).

Western Atlantic: Ranges from Massachusetts, USA, to southern Brazil, including the Gulf of Mexico and the Caribbean Sea. Also from St. Paul's Rocks in the Central Atlantic (Marín et al. 1998, Compagno in prep).

Eastern Atlantic: Ranges from Madeira, the Atlantic coast of Spain, and from Senegal to northern Angola (Compagno in prep).

Indian Ocean: Occurs off Madagascar, Mozambique, Tanzania, Comoros and Aldabra Island, also from Somalia to the Maldives, Oman, Red Sea, and Sri Lanka (Compagno in prep.).

Western Pacific: Occurs off Thailand, Philippines, New Caledonia, New Zealand, China and Taiwan (Province of China). Also Caroline Islands, Phoenix and Line Islands westwards (Compagno in prep).

Eastern Pacific: Ranges from Southern Baja California to Peru. Also Hawaiian Islands, Cocos Island, Revillagigedo Islands, Clipperton and Malpelos Islands (Compagno in prep.).

Countries Occurrence: Native: Angola (Angola, Angola, Cabinda); Anguilla; Antigua and Barbuda; Australia (Coral Sea Is. Territory, Northern Territory, Queensland, Victoria, Western Australia); Bahamas; Bangladesh; Barbados; Belize; Benin; Brazil (Rio de Janeiro, São Paulo); Brunei Darussalam; Cambodia; Cameroon; China; Colombia (Colombia (mainland), Colombian Caribbean Is.); Comoros; Congo; Congo, The Democratic Republic of the; Costa Rica (Cocos I., Costa Rica (mainland)); Côte d›Ivoire; Cuba; Djibouti; Dominica; Dominican Republic; Ecuador (Ecuador (mainland), Galápagos); Egypt; El Salvador; Equatorial Guinea (Annobón, Equatorial Guinea (mainland)); Eritrea; French Guiana; Gabon; Gambia; Ghana; Grenada; Guadeloupe; Guatemala; Guinea; Guinea-Bissau; Guyana; Honduras (Honduran Caribbean Is., Honduras (mainland)); Hong Kong; India (Andaman Is., Laccadive Is., Nicobar

Is.); Indonesia (Bali, Jawa, Sulawesi, Sumatera); Iran, Islamic Republic of; Jamaica; Kenya; Liberia; Madagascar; Malaysia (Sabah, Sarawak); Martinique; Mauritania; Mexico (Baja California, Campeche, Colima, Guadalupe I., Veracruz, Yucatán); Montserrat; Morocco; Mozambique; Myanmar (Coco Is., Myanmar (mainland)); New Caledonia; New Zealand (North Is., South Is.); Nicaragua (Nicaragua (mainland), Nicaraguan Caribbean Is.); Nigeria; Oman; Pakistan; Panama; Papua New Guinea (Bismarck Archipelago, North Solomons, Papua New Guinea (main island group)); Peru; Philippines; Portugal (Madeira, Portugal (mainland)); Puerto Rico (Puerto Rico (main island)); Saint Lucia; Saint Vincent and the Grenadines; Saudi Arabia; Senegal; Sierra Leone; Somalia; Spain (Canary Is., Spain (mainland)); Sri Lanka; Sudan; Suriname; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Togo; Trinidad and Tobago; Turks and Caicos Islands; United States (Florida, Georgia, Hawaiian Is., Louisiana, Massachusetts, New Jersey, New York, North Carolina, Rhode Island, South Carolina, Texas, Virginia); Venezuela, Bolivarian Republic of (Venezuela (mainland)); Viet Nam; Virgin Islands, British; Western Sahara; Yemen (North Yemen, Socotra, South Yemen).

FAO Marine Fishing Areas: Native: Atlantic – eastern central; Atlantic – western central; Atlantic – northwest; Atlantic – southeast; Atlantic – southwest; Indian Ocean – western; Indian Ocean – eastern; Pacific – western central; Pacific – eastern central; Pacific – southeast; Pacific – southwest

Population: This oceanic and coastal-pelagic shark is circumglobal in tropical waters, where it dominates as a target species or bycatch in certain pelagic fisheries, particularly purse seines on drifting FADs (fish aggregating devices). Population dynamics and structure are poorly known, although life history parameters seem to vary geographically, perhaps reflecting the existence of distinct stocks for different ocean basins.

Habitat and Ecology: The Silky Shark is essentially pelagic and is most often found near the edge of continental and insular shelves at depths of 200m or more in the epipelagic zone although it occurs to at least 500m depth offshore (Compagno in prep). It is often associated with islands, near insular slopes and over deepwater reefs. It has also been recorded inshore to as shallow as 18m depth (Compagno in prep). It is an active swift species, preferring warmer waters (about 23°C). Smaller sharks are often found in coastal nurseries and adults further offshore over deeper water. However, in the central Indian Ocean juveniles are oceanic, associated with drifting objects (C. Anderson pers. comm.).

The Silky Shark is a live bearer, usually having around 6-12 pups every one or two years (2-15 per litter, Last and Stevens 1994). The gestation period is 12 months (Bonfil et al. 1993). Life history parameters of Silky Sharks seem to vary geographically, perhaps reflecting the existence of distinct stocks for different ocean basins. In the Gulf of Mexico, Silky Sharks grow at a moderate rate and first attain maturity at about 215-225cm TL for males and 232-246cm TL for females, or around 6-10 years and 7-12+ years respectively (Branstetter 1987, Bonfil et al. 1993). They can live to at least 22+ years (Bonfil 1990) and attain a length of up to 330cm TL. In this part of the world, the young are born at about 76cm TL during the summer, whereas in other oceans the species seems to have no seasonality in reproduction (Bonfil et al. 1993). This species has a moderate to low intrinsic rate of increase; estimated at 0.043 by Smith et al. (1998) (moderate range: 0.04-0.07). Hoyos (2003) provides information on the life-history parameters of silky sharks from Mexico in the Eastern Central Pacific and Ruíz and Ixquiac (2000), Morales (2002) and Villatoro and Rivera (1994) from Guatemala and El Salvador. Both males and females reportedly mature at 180-182cm TL off Mexico in the Eastern Central Pacific, with females reaching a maximum size of 316 TL and producing 2-9 pups per litter (Hoyos 2003). Oshitani et al. (2003) reported on the age and growth of silky sharks in the Pacific Ocean (using samples collected from Japanese tuna longline and purse seine fisheries). They found that males mature at >186cm TL and at

5-6 years of age, and females at 193-200cm TL and 6-7 years of age. Size at birth ranged from 65-81cm TL. In contrast to earlier studies in the Pacific Ocean, Oshitani et al. (2003) noted that their results were similar to those of studies in the Atlantic Ocean. In the Maldives, Indian Ocean, males are estimated to mature at about 205cm TL, reaching a maximum size of 242cm TL; females reaching a maximum size of 263cm TL (Anderson unpublished data). Size at birth is reported at 56-72cm TL in this area (Anderson unpublished data).

Recently, intensive demographic modelling of shark populations revealed that the Silky Shark from the southern and the northern Gulf of Mexico has moderate levels of intrinsic rate of increase (ca. 0.10 and 0.055) (Cortés 2002).

Silky Sharks generally leave their coastal nursery grounds and move offshore to a more oceanic existence as sub-adults, frequently joining tuna schools on which they seem to feed (Branstetter 1987). The Silky Shark is a piscivorous shark feeding on sea catfish, mullets, mackerel, yellowfin tuna, albacore, porcupine fish and other fish species, as well as on a variety of cephalopods (Compagno 1984, Bonfil 1990).

Systems: Marine

Movement Patterns: Full Migrant

Use and Trade: Meat utilised for human consumption, fins are taken for the shark fin trade to make soup, skin has been processed for leather and the liver has been used for liver oil (for its high vitamin A content in this species) (Compagno in prep).

Major Threat(s): The Silky Shark is probably fished either directly or as a bycatch throughout its range. It is taken in coastal longline fisheries, oceanic purse seine fisheries on drifting FADs (fish aggregating devices) (particularly the latter) targeting tuna, swordfish and other billfish around the world, as well as by coastal artisanal fisheries. Whether they are an incidental catch or not, Silky Sharks are often retained for their meat and fins. Catch statistics for this species are under-reported. Total catch reported to FAO has decreased steadily since 2000; 11,680 t were reported in 2000, 9,330 in 2001, 8,384 in 2002, 5,305 in 2003, to 4,358 in 2004 (Maguire et al. 2006).

The number of pelagic sharks landed by fishing fleets in all oceans has become increasingly important in recent years (Mejuto et al. 2006). The Spanish pelagic longline fishery for swordfish and sharks is expanding rapidly in the Pacific, with effort expanding from the traditional grounds in the southeast Pacific into the central south Pacific and areas of the North Pacific in recent years (Mejuto 2005).

Silky Sharks were found to represent at least 3-4% of the fins auctioned in Hong Kong, the world's largest shark fin trading center – the 3rd highest after Blue Sharks (*Prionace glauca*) and Scalloped Hammerhead Sharks (*Sphyrna lewini*) (Clarke et al. 2006a) – and Hong Kong is thought to make up more than 50% of the global shark fin trade (Clarke et al. 2004, 2006b). Silky Shark fins are valuable to the trade, although they are not one of the highest value fin types (S. Clarke, unpubl. data).

Rough estimates of numbers of Silky Sharks taken as bycatch in tuna longline fisheries of the south and central Pacific Ocean (Bonfil 1994) indicate that perhaps up to 900,000 individuals were taken there during 1989. However, there is large uncertainty surrounding these calculations and there are no estimates of numbers discarded alive and numbers actually killed. Large numbers of Silky Shark are caught in Mexico, Yemen and Sri Lanka. Bonfil et al (1993) conclude that local stocks of this species cannot support sustained heavy fishing pressure.

Eastern Central and Southeast Pacific

Silky Sharks are taken in pelagic commercial fisheries in the eastern central and southeast Pacific, as well as in artisanal fisheries. Fishing pressure from longline and purse seine fisheries targeting tunas and swordfish is high, and it is the main shark species caught using fish aggregating devices (FADs). The IATTC observer database from 1993-2005 shows that silky sharks were caught throughout the ocean west of central America, Colombia, Ecuador, and Peru out to about 170°W on purse seines set on FADs. Accurate identification is an issue because of the similarity to other Carcharhinids and it is often grouped with other Carcharhinid species. Silky Sharks are the most commonly caught species of shark in the purse seine fishery for tunas in the eastern Pacific Ocean (IATTC 2007). Preliminary estimates of relative abundance trends for large Silky Sharks derived from purse-seine fisheries in the eastern Pacific Ocean show steadily decreasing trends over the period 1993-2004 for each of three types of purse-seine sets, from a catch per set of 10.4 in 1994 to 3.6 in 2005 (decline of ~65%) (IATTC 2007). According to IATTC it is not known whether these decreasing trends are due to fishing, changes in the environment (e.g., the 1997-98 El Niño event), or other processes. These results were also consistent, however, with a preliminary descriptive study of Silky Shark bycatch rates in dolphin sets. Whilst it is thought that Silky Sharks are attracted to floating objects, Silky Sharks caught in dolphin sets may have been caught simply by chance. Because the distribution of Silky Shark bycatch per set in dolphin sets is extremely right-skewed, the descriptive analysis focused on bycatches above and below the following three thresholds: presence or absence of any sharks, presence or absence of more than five sharks per set, and presence or absence of more than 20 sharks per set. This analysis showed a decrease in the probability of obtaining sets with bycatches greater than or equal to each of the three threshold levels from 1994-2005 (IATTC 2007).

Strasburg (1958 in Castro et al. 1999) noted that Silky Sharks comprised 52% of all sharks caught south of 10°N latitude in the equatorial Pacific, in a sample of 4,157 sharks. Silky Sharks are important in many fisheries along the Pacific coast of Central America. Observations made on a longline research vessel that sampled waters in the EEZs of Panama, El Salvador, and Guatemala found that silky sharks constituted 30.94%, 47.21% and 29.11% of the total catch respectively, and 79.80%, 63.3% and 44.29% of the shark catch respectively (Porras 1996). Off Chiapas, southern Mexico, Silky Sharks along with Scalloped Hammerheads form the large bulk of the shark catch (Soriano-Velásquez and Acal Sánchez 2008). In Tres Marías Islands, Mexico, Silky Sharks are one of the most important species, constituting 27% of landed sharks in 1996 (Pérez-Jiménez et al, 2005). In San José and Buena Vista, Guatemala, Silky Sharks constituted 73% of recorded catches landed, in a sample of 4,211 sharks, from 1996 to 1999 (Ruiz and Ixquiac 2000). In Acajutla, El Salvador, from 1991-1992, Silky Shark landings ranged from 60.3% to 32.6% of the total catch, in a sample of 412 sharks (Villatoro-Vaquiz and Rivera-González 1994).

International longline vessels operating in the eastern central Pacific landed and exported over 8,000 tons of shark carcasses and 900 tons of shark fins from Costa Rica in 2002 (Costa Rica official INCOPESCA Fishery Statistics 2003), the large majority of which are recorded as Silky Sharks. However, these figures are likely underestimates, because landings also occur at private docks where enforcement and monitoring is very difficult. Furthermore, international vessels are known to trans ship shark products on the high seas, going unreported. A comparison of standardized catch rates of pelagic sharks (species-specific information was not available) in the EEZ of Costa Rica from 1991-2000 showed a decrease of 60%, with Silky Sharks comprising 60-70% of recorded shark catch (Arauz et al. 2004). In 1991, sharks formed 27% of the total catch. In 2000, only 7.64% of the total catch was sharks, 71% of which were Silky Sharks. In 2003, the proportion of sharks in the total catch decreased further to 4.9% of the total catch, 58.2% of which were silky sharks (Arauz et al. 2004).

In Manta (the largest fishing port in Ecuador), Southeast Pacific, artisanal fisheries data from September 2003 to the end of 2006 showed the total landings of sharks was 150,321 individuals, of which C. falciformis represented 15% of the total (over 22,000 individuals) (J. Martínez pers. comm. Feb. 2007). The females ranged in length from 61-309cm total length, and the males ranged in length from 63 -288cm total length. In the tuna purse seine fishery, Silky Shark is caught as a bycatch, and is

the main shark species caught using FADs) (J. Martínez pers. comm. Feb. 2007.

Recent information from the tropical Central Pacific suggest community biomass reductions to only 11% of historic levels, from the 1950s to the 1990s, with a current community of smaller fish and fewer large predators (Ward and Myers 2005). This study estimated that the Silky Shark population had declined in abundance by about 90% and in biomass by more than 90% (Ward and Myers 2005). These estimates were made by a comparison of pelagic longline research surveys in the 1950s carried out in the tropical Pacific Ocean with recent data (1990s) collected by observers on pelagic longline fishing vessels, which have been standardized to account for differences in depth and soak time (Ward and Myers 2005).

Indian Ocean and Western Central Pacific

This species is a very common component of shark and tuna longline and tuna gillnet fisheries in Indonesia (White et al. 2006) and throughout many areas of its range in the Indo-West Pacific. They are usually retained and marketed. Pelagic fisheries have operated in the Indian Ocean for more than 50 years; Japanese long-liners in the eastern Indian Ocean since 1952 and in the western region since 1956. Russian, Taiwanese and South Korean vessels have fished there since 1954-1966 (Gubanov and Paramonov 1993). The Spanish swordfish longline fishery, which also targets sharks, is also active across the Indian Ocean (ICCAT 2006) and Mejuto et al. (2006) report that fishing effort has increased since 1993. Sharks are targeted in several areas, including off India where they are captured using hook and line and in large mesh gillnets, which are among the world's largest (Anderson and Simpfendorfer 2005). Pelagic fishing effort is high and continuing. Silky Sharks were the most commonly caught shark at FADS in the Indian Ocean during a small pilot study of observers onboard French vessels – 61.5% of silkies were discarded dead at sea, 30.5% partially alive kept onboard, ~7% discarded alive (Viera and Pianet 2006).

In the Maldives, it is estimated that some 85% of Oceanic Shark catch is *C. falciformis* (C. Anderson unpublished data). Although no specific data is available, Maldivian shark fishermen who specialize in longlining for Oceanic Sharks report declining catch rates of Silky Sharks (C. Anderson unpublished data). A fishery for Silky Sharks has operated off Sri Lanka for many years and Sri Lanka are one of the only countries to report species-specific Silky Shark catch to FAO (although Bonfil noted that only 75% of the reported catch may be attributed to Silky Sharks). Landings reported to FAO progressively rose from 5,000 t in 1960 to a peak of 25,400t in 1994, after which they began to decline to 20,875t in 1998, 8,240t in 2001, 6,830t in 2002, and continued to decrease to just 1,960t in 2006, suggesting that the fishery collapsed.

The tropical waters of the western and central Pacific Ocean currently support the largest industrial tuna fishery in the world with an annual catch approaching one million metric tonnes. The two main gear types, longline and purse seine, accounted for over 90% of the target tuna catch in this area in 1999 (Williams 1999). The most prevalent species found in longline sets are Blue Shark, Silky Shark, Pelagic Stingray and the Oceanic Whitetip. The most prevalent species found in purse seine sets are Silky Shark and the Oceanic Whitetip (Williams 1999).

Japanese assessment of data from research longline surveys in the Pacific and Indian Oceans suggests that Silky Shark catch per unit effort showed no remarkable change in the 1990s when compared to levels in the 1970s. In recent years, based on longline logbook data, recorded Japanese catches of Silky Sharks worldwide ranged from 0-11mt with an average of 2.2mt. The resource is considered stable with no management action required other than ongoing monitoring (Japan Fisheries Agency 2006).

Whilst the Japanese longline surveys described above showed no change in CPUE of Silky Sharks between the 1970s and 1990s, pelagic effort began 20 years earlier in the 1950s and has reportedly increased in recent years. Given the significant declines observed in other areas including the central tropical Pacific, the large decline in reported landings off Sri Lanka after 1994, reports of declines in catch rates off the Maldives and high fishing pressure across this region, with reports of increasing effort, continued fishing pressure is thought to be unsustainable.

There is data on Silky Shark catches from the Australian east coast Tuna and Billfish Fishery, however, these have not been analyzed to date, and need to be looked at in the future (J.D. Stevens pers. comm. Feb. 2007).

Northwest and Western Central Atlantic

The first longline fisheries in the Atlantic were begun by the Japanese in 1956 in the western equatorial waters (Uozumi and Nakano 1996). The fleet expanded rapidly in the 1960s, and covered almost the entire Atlantic by the late 1960s (Bonfil 1994), including the areas currently fished by the American fleet. Fishing pressure is high and ongoing. In the US, Silky Sharks are caught by the commercial shark bottom longline and the pelagic longline fishery, and in recreational shark fisheries. The northwest and western central Atlantic assessment is based on several estimates of trends in abundance from standardized catch rate indices. The first analysis is for the Gulf of Mexico, and is based on data from US pelagic longline research surveys in the mid-1950s and US pelagic longline observer data in the late-1990s. This analysis suggests that Silky Sharks in the Gulf of Mexico declined by 91% (95%CI: 85-95%) over this forty year period (Baum and Myers 2004), which is similar to the length of three generations (~45 years).

The second analysis, which encompasses both the northwest and western central Atlantic regions, is of the US pelagic longline logbook data between 1992 and 2000 (Baum et al. 2003). This analysis is not species-specific (because of problems with identification among Carcharhinid sharks), but instead estimated a decline of 61% (95%CI: 55-66%) over this time period for six species in the genus Carcharhinus combined. Species-specific analysis on the same US logbook data set for 1992-2000 by Brown and Cramer (2002) reveals a non-significant trend, although accurate identification of Silky Sharks in the data set is an issue, as stated above. Another species-specific analysis of the same logbook data for the same time period by Cortés et al. (2007) estimated a decrease of 50% in Silky Sharks since 1992. Cortés et al. (2007) also report the results of this logbook analysis restricted to the Gulf of Mexico and Caribbean areas only, for the 1992-2000 period, which showed a decline of 48%. This analysis had little temporal overlap with Baum and Myers (2004) analysis of data from the longline research surveys and observer data in the same area (described above), which almost covered the entire three generation period for this species (1950s-1990s).

The most recent analysis of observer data from the US Atlantic pelagic longline fishery from 1992-2005 (which combined catches of Dusky Sharks, Silky Sharks, and Night Sharks because of identification problems) suggests that this species complex has continued to decline significantly, by 70% (95%CI: 54-81%) during this recent time period (Baum et al. in prep). When the two estimates obtained by (Baum et al. in prep) for Carcharhinus species are combined (i.e., 1986-2005), the estimated decline amounts to 85%. However, it should be noted, again, that this is not a species-specific estimate for Silky Sharks, but it is difficult to obtain species-specific estimates for Silky Sharks because of difficulties distinguishing it with other Carcharhinid sharks. Cortés et al.'s (2007) species-specific analysis of the observer dataset for the same time period, showed a similar decline since 1992 to that they estimated in the logbook data (46% vs 50%), but larger inter-annual variation (r=-0.047, 95% CI: -0.290 to 0.197). The nominal observer series showed a 40% decline from beginning to end.

The Silky Shark is one of the five most important shark species caught in the Cuban longline fishery (Espinosa 2004). In Belize, Silky Sharks were frequently caught off the barrier reef and atolls by commercial pelagic longline fisheries during the 1980s and 1990s.

Although no landing data is available, anecdotal observations by former shark fishers noted a decline in catches and mean size for all shark species caught and pelagic fishing pressure has declined as a result (R. Carcamo and D. Neal pers. comm.). Landings data recorded at artisanal shark fishing ports in Mexico and Central America also indicate that Silky Sharks constitute one of the main components of the catch. In 1987, the Silky Shark (and Scalloped Hammerhead Shark), represented >80% of the shark by-catch of the winter swordfish/tuna longline fishery of the northwestern Gulf of Mexico (Branstetter 1987).

Silky Sharks are thought to be overexploited as juveniles in the fishery of Yucatan (Bonfil 1990), but due to the lack of estimates of total catches of this species and the size of the population, the status of the stock as a whole is unknown.

In Venezuela, sharks are targeted by both artisanal and industrial longline fisheries, and Tavares (2005) comments on a history of over-exploitation. In artisanal longline fisheries targeting sharks around Venezuelan offshore islands, the Silky Shark is one of the most important species (Tavares 2005). Shark fishing is increasing at these Venezuelan oceanic islands and a monitoring programme has been instigated (Tavares 2005). However, given the life-history of the species, it is unlikely that Silky Sharks will be able to sustain continued, let alone increasing, directed fishing.

Southwest Atlantic

This species is taken in several longline fisheries in the Southwest Atlantic, including those off Santos, southern Brazil (Arfelli and Amorim 1994, Amorim et al. 1998), Natal, northeastern Brazil (Hazin et al. 1990) and Uruguay (Marín et al. 1998). It is primarily oceanic and epipelagic, although it is taken in artisanal gillnet fisheries off southern Paraná State (Costa and Chaves 2006). Lessa et al. (2000) also noted that Silky Sharks were the main species to be targeted by fisheries in northeastern Brazil. They are generally retained and marketed (Arfelli and Amorim 1994, Marín et al. 1998).

Rincon et al. (2000) analysed fins unloaded in Natal, Rio Grande do Norte, Brazil, from April to July, 1998. This species represented 50% of total fins sampled; however the number of shark fins did not correspond to the number of carcasses. In 1997, 233 tons of dry fin corresponded to 15,533 tons of carcasses, while only 2,603 tons of unloaded carcasses were registered. This may indicate extensive finning practices being carried out at sea.

Conservation Actions: The Silky Shark is a member of the family Carcharhinidae, which is listed on Annex I, Highly Migratory Species, of the UN Convention on the Law of the Sea. States are urged to cooperate over the management of these species. No such management yet exists. Precautionary adaptive collaborative management of target and bycatch fisheries is urgently needed for this highly migratory species. It is also essential to improve and sustain data collection and develop stock assessments for this species. Listing on international resource management agreements, such as the Convention on Migratory Species (CMS) could help to drive improvements in national and regional management and facilitate collaboration between states, for this species and other migratory sharks.

The adoption of shark finning bans by fishing states (e.g., USA, Australia), regional entities (EU) and regional fisheries organisations (e.g. ICCAT, IOTC, IATTC, WCPFC) is accelerating and should increasingly prevent the capture of oceanic sharks for their fins alone.

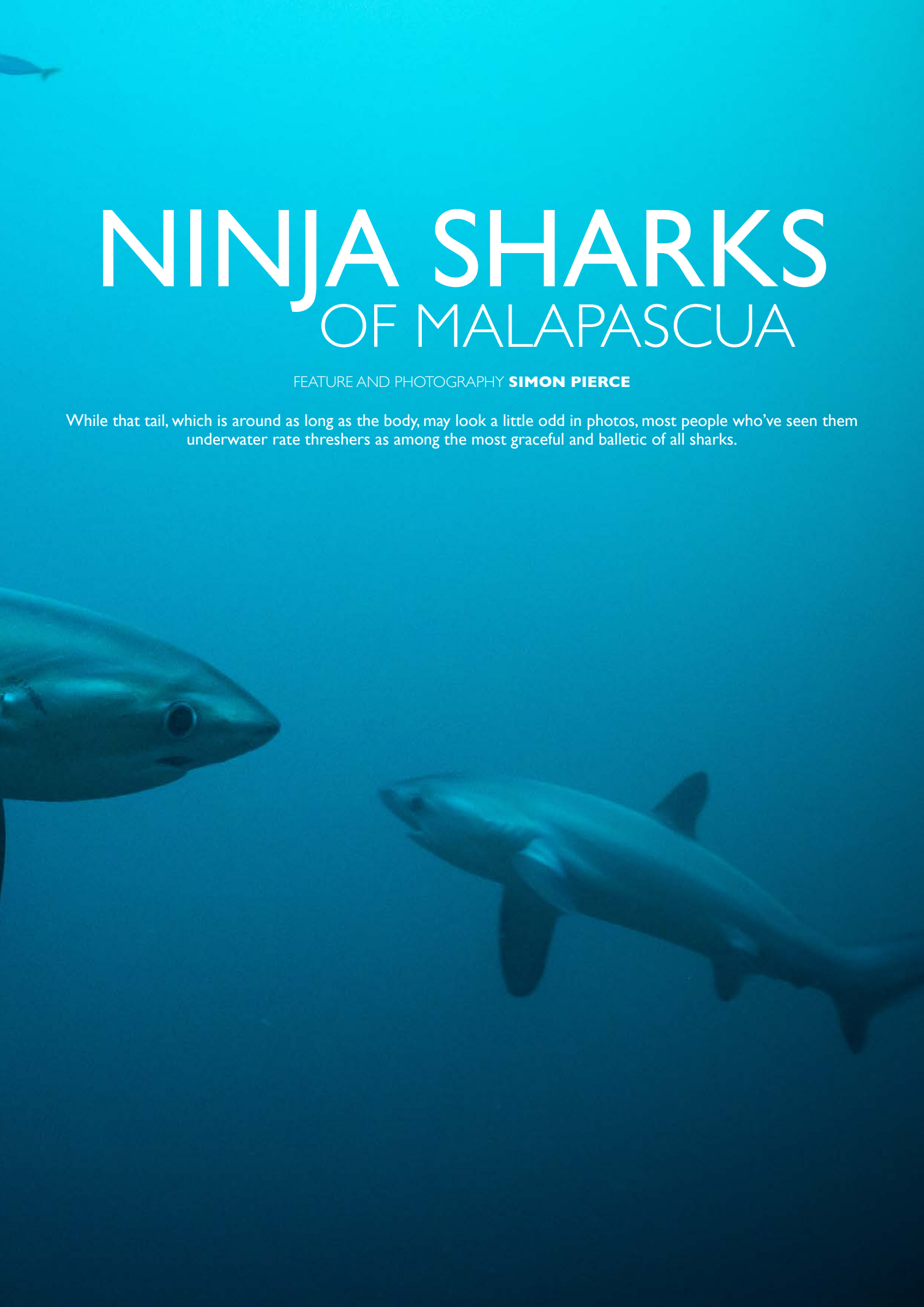
Citation: Bonfil, R., Amorim, A., Anderson, C., Arauz, R., Baum, J., Clarke, S.C., Graham, R.T., Gonzalez, M., Jolón, M., Kyne, P.M., Mancini, P., Márquez, F., Ruíz, C. & Smith, W. 2009. ***Carcharhinus falciformis***. The IUCN Red List of Threatened Species 2009.

www.iucnredlist.org

NINJA SHARKS OF MALAPASCUA

FEATURE AND PHOTOGRAPHY **SIMON PIERCE**

While that tail, which is around as long as the body, may look a little odd in photos, most people who've seen them underwater rate threshers as among the most graceful and balletic of all sharks.



Monad Shoal, a large seamount off Malapascua Island in the Philippines, is the only place in the world where pelagic thresher sharks are consistently seen. They're amazing creatures. Pelagic threshers are a large shark, growing to 3.75m in total length, including their oversized tail. While that tail, which is around as long as the body, may look a little odd in photos, most people who have seen them underwater rate threshers as among the most graceful and balletic of all sharks.

While I can sympathise with that point of view, and they're certainly no danger to people, I personally prefer to think of them as deceptively violent ninja sharks. But I'll get to that later.

Pelagic threshers are one of three species of thresher sharks, more tropical than the common and bigeye thresher species, and only found in the Indian and Pacific oceans. Most knowledge on pelagic threshers has come from fisheries studies, which have revealed some interesting biological facts. They're relatively fast-growing for a large shark, reaching adulthood at 7-9 years, with an estimated maximum age of 16. Only two pups are born per litter, one developing in each uterus. The developing embryos have a unique means of obtaining nutrition. The mother continues producing eggs over her pregnancy, and these yolk-filled egg capsules provide food for the pups growing in her uterus. The strategy is termed oophagy, literally "egg eating". The pups are free-swimming at birth, and almost half the length of their mother at 1.3-1.9m.

Outside the Philippines, pelagic thresher sharks are rarely seen by divers, and the behaviour of the species is poorly-known. That's not unusual. Contrary to popular myth, divers know that most sharks are completely disinterested in people. In fact, sharks often purposefully avoid them. That's why most "shark dives" use bait to overcome this natural inhibition. Monad Shoal, which hosts several thresher shark cleaning stations, is a pleasant exception to that norm. Thanks to the researchers at the Thresher Shark Research and Conservation Project team, operating from Malapascua, several studies have been published on the species.

I think of cleaning stations as a bit like a fish health clinic. Sharks accumulate unpleasant little external parasites over time, which can cause chronic disease, developmental problems and issues with respiration if they attach to the gills. Normal wear and tear from their active predatory lives also results in minor injuries and dead skin, which could lead to infection. Specialist cleaner fish pick off these parasites and remove dead tissue, providing a useful service to the sharks, while also obtaining a meal for themselves.

At Monad Shoal, both blue-streaked cleaner wrasse and moon wrasse service the sharks.

Obviously, sharks eat fish, so you can see how this could create a perception issue for the cleaners. When the threshers turn up to be cleaned, they lower their tail and circle over the cleaner fish's "stations" in a specific posture to explicitly signal harmless intent and a desire to be cleaned. The sharks also slow right down to make it easier for the small cleaners to do a thorough inspection. It appears that the cleaner fish focus on the small parasitic flatworms that are often found around the shark's pelvic area.

Normally, reef fish accumulate parasites overnight while they're sleeping around the substrate, so they clean during the day. Thresher sharks don't stop swimming, and they're most active at night, but they also clean during the daytime – particularly early in the morning. Why? Well, the cleaner fishes sleep overnight. When they wake up, with empty stomachs, they're hungry. It's likely that the thresher sharks get a better clean from the highly motivated, probably hangry cleaner fishes first thing in the day. That makes for a very early start to the diving day in Malapascua, but I assure you it's thoroughly worthwhile.

Cleaning is an important activity for these pelagic threshers. Not much is known of their activities away from the shoal, but presumably they're off hunting. Studies from the Eastern Pacific found that much of their diet was composed of squid, particularly the large and somewhat fearsome Humboldt squid, and mesopelagic fish species. Males are thought to forage more in offshore waters, with females possibly more coastal as adults.

That all seems normal enough. So what's the tail for? I'm so glad you asked.

A study at Pescador Island, off Cebu in the Philippines, used video footage to examine thresher shark hunting strategies for their preferred local prey, sardines.

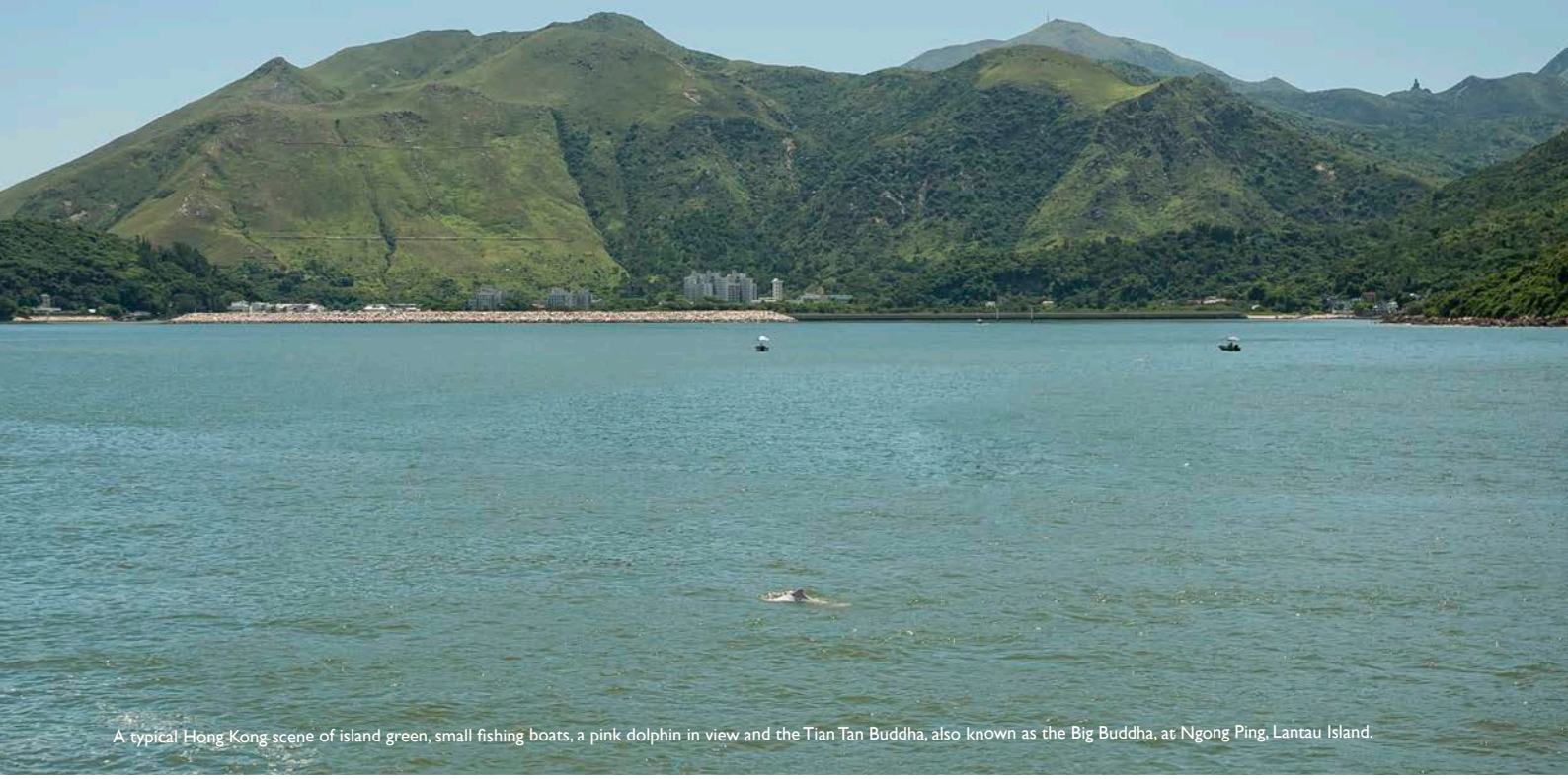
It turns out that fish don't like to be eaten. Even for fast-swimming sharks, chasing down their prey on a one-on-one basis is energy intensive, and often results in failure. Where these fish are in a school, and individuals are difficult to target, life is even tougher for a hungry shark. However, this schooling behaviour has a downside: it places a large number of baitfish in close proximity to one another.

Frame-by-frame video analysis reveals the sharks' strategy. They lunge forward, then use their large pectoral fins to stall their whole body and deliver an overhead tail-slap at measured speeds of up to more than 30 metres per second, so fast that the tip of the tail literally causes water to bubble. Up to seven sardines were killed in a single strike.

So there we have it. Although threshers look rather concerned in photos, it's the small fish that should be worried. Deceptively violent ninja sharks. Told you so.

HONG KONG'S PINK DOLPHINS

FEATURE AND PHOTOGRAPHY **ALLY LANDES**



A typical Hong Kong scene of island green, small fishing boats, a pink dolphin in view and the Tian Tan Buddha, also known as the Big Buddha, at Ngong Ping, Lantau Island.

On a recent visit to Hong Kong, I made some time to go and see the near threatened Chinese White Dolphin (*Sousa chinensis*) which is the local name of the Indo-Pacific Humpback species, also known in Hong Kong as the Pink Dolphin, due to their unique colour. There are currently only 50 left in Hong Kong, with a rapid death rate of 10 per year. The pink dolphins will very sadly disappear completely if the government choose to do nothing to protect them.

The Hong Kong Dolphinwatch has been running trips in Hong Kong for 21 years and strictly adhere to the code of conduct to run their dolphin watching activities which are to always observe the dolphins from a distance, to not attempt to physically contact, feed or harm the dolphins. Additionally, boats must maintain a slow and steady speed, not exceed 10 knots, and maintain a parallel movement to the dolphin's course. They put maximum efforts into raising dolphin awareness especially amongst the Hong Kong residents. The dolphins mainly live in the waters of Lantau North, Southeast Lantau, the Soko Islands and Peng Chau, but are mostly seen north of Lantau and around the Soko Islands.

The dolphins are born a very dark grey and it's only after a few months that the babies start to fade to a light grey. Within the next few years, the grey begins to turn to pink or white, leaving grey spots behind that eventually disappear when the dolphins get older. The pink colour is not from a pigment, but from blood vessels that overdevelop by thermoregulation, which is the blood flushing to the outer layers of the skin, regulating the body temperature.

With so few of them known to be around, I was surprised to see them come so close to the boat and to see as many as we did in that area, it was very special. Although we saw no babies, we did see a couple of young, very light grey ones which enabled us to better understand the change of colour their skin goes through.

The construction of the The Hong Kong–Zhuhai–Macau Bridge seen in the background.

A younger dolphin in the light grey stage.

Babies are born about a metre long and stay with their mother until about 3 years old, during which time the mother will not have another baby. They give birth to only one baby at a time. Females reach sexual maturity around 10 years and males are thought to reach their sexual maturity at 13 years. Adults grow to 2.5-3 metres and life expectancy should reach 40 years except in Hong Kong where their life span is only expected to reach half of that due to the deterioration of the environment with all the new developments taking place.

There are so few left in the wild because of the destruction of habitat, over fishing, fishery by-catch, heavy sea traffic and pollution caused by the developments to the new airport extension, the Disneyland train station and the new 42km bridge being built to link Hong Kong, Macau and Zhuhai which sits right in the middle of the pink dolphins' habitat in the Pearl River Delta. There is talk of a second bridge to be built to link the main bridge to Tuen Mun. With all the noise created from the construction work, dredging, reclamation, and the traffic of 20,000 vehicles expected to cross the bridge per day once finished, the dolphins' echolocation is also greatly affected.

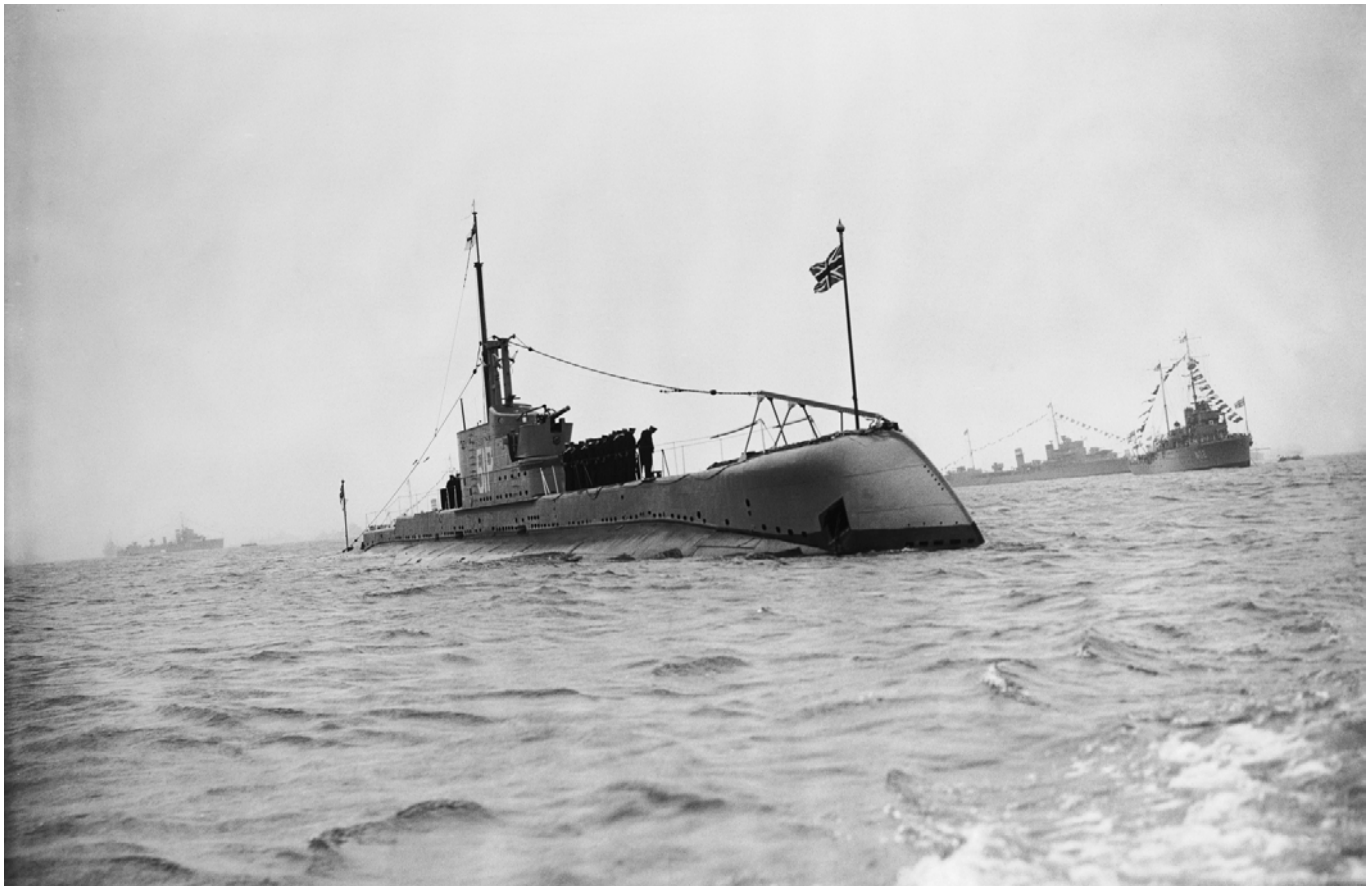
Sadly, the Hong Kong government is only interested in the new developments. If the dolphins are to survive, the governments in Hong Kong, Macau and China have to seriously address the pollution issues, fisheries management and marine conservation. The Dolphinwatch are encouraging people to write to the government and media, spread the message, support the research and check the "Save the Dolphins" page on their website.

Hong Kong Dolphinwatch Ltd.
1528A, Star House, Tsimshatsui,
Kowloon, Hong Kong
Email: info@hkdolphinwatch.com
www.hkdolphinwatch.com

WRECK OF THE P311 SUBMARINE

INTERVIEW WITH MASSIMO BONDONE, TECHNICAL DIVER AND AUTHOR

FEATURE **NICO DE CORATO – ADMINISTRATOR OF DUBAIBLOG**
PHOTOGRAPHY **MASSIMO BONDONE AND HIS TEAM**



During the Second World War, the British Submarine HMS P311 (a T-class submarine of the Royal Navy) departed from Malta on a mission against the Italian Navy. She sank in January 1943 after hitting the antisubmarine mines positioned to protect the port of La Maddalena.

Shipping documents confirm the presence on board of 17 British service members. It was the sub's first mission. The state of the vehicle, damaged by a possible explosion, but without visible holes, revealed that the crew were possibly killed due to a lack of air.

The Genovese diver, Massimo Bondone, expert Underwater Technical Operator and passionate wreck diver and recreational sailor, discovered the submarine after 73 years.

We've got in touch with Massimo who has kindly agreed to exchange a few words in between dives.

Nico: Hello Massimo. In addition to congratulating you for the discovery, we join you in dedicating a thought to the crew and their families. How long did it take you to complete this feat?

Massimo: I started being actively interested in the P311 in 2015. I was aware of its possible location in Sardinian waters thanks to the information available on **www.relitti.it**. Research can last for years and remain dormant before something pushes it into motion; sometimes all it takes is a name, a number or just a little luck.

Thanks to the web, researching is much easier nowadays, even though you need to be careful in assessing what you find online. Fortunately, there are experts available on the subject matter, be it a submarine or surface vessel.

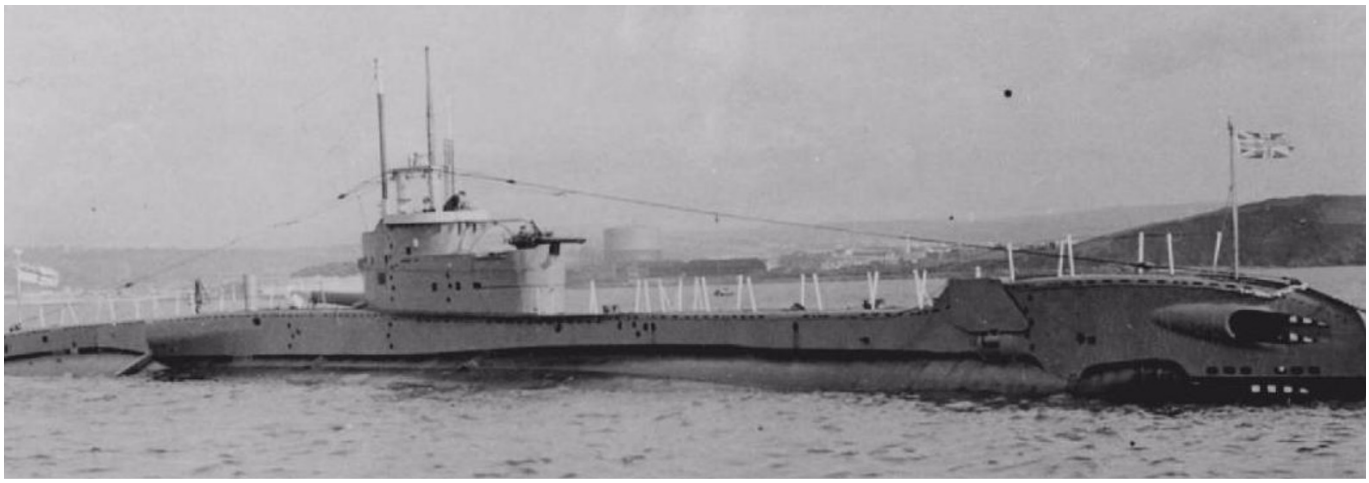
It is very important to find a testimony from both parties to make an objective assessment; in the case of the P311, news reported a massive explosion off the coast of Tavolara, in the days in which the attack was to take place at the base of La Maddalena. Knowing that there were minefields and enemy attack attempts, it is quite easy to assess it sank due to a mine.

No bodies or floating wreckage was ever found; this made me think that the P311 could possibly be intact, lying on the bottom…and that is how I saw it for the first time after 73 years.

Nico: Can you give us some technical details about this project?

Massimo: Of course in these kinds of technical dives, a rebreather is a must to have longer bottom times. Longer bottom times require appropriate decompression time, and rebreathers are the ideal tool for their flexibility. I used a Megalodon hCCR, with a hybrid system (mechanical and electronic) for ppO2 control; 4lt cylinders for bigger autonomy between recharges.

On this dive site I had about 40 minutes bottom time, almost all at the max depth given the low elevation of the wreck, with a total time of 180-240 minutes. We scheduled 60 minutes, but shorter time was enough given the relatively small size of the wreck. An emergency deco station was placed at the shot line, with an additional 4 bottles I regularly use for bail out. Unfortunately the strong winds of the previous days diving generated a gentle current carrying suspension, however visibility was great, as always when you dive in Sardinia. I used a reb of ISC, the Megalodon hCCR, with a hybrid system of ppO2 control, mechanical and electronic cylinders of 4 litres for greater autonomy between charges, and everything



you need to dive in open water such as a diving reel, surface marker buoy, etc.

Nico: When you are looking for a wreck, is there a time when you say "that's enough; it can't be found, I abandon the feat?" What brings a team to terminate a search?

Massimo: There is a point of no return in these efforts and you get close to it when difficulties appear insurmountable. Adverse weather, difficult operating conditions, excessive expenses (there is no economic return).

Then, at the last minute, something changes and the result is the P311. In my case, the trigger was my assistant, Luca Magliacca that pressed me on to not give up, in addition to the few others who knew of this project. To get results, a team or an individual must be deeply motivated, in such a way as to resist the inevitable disappointments.

If the target is only to climb a peak, once it is reached, it quickly loses its charm. In wreck diving, the diving outweighs everything else, but not quite.

If a wreck is not as beautiful as expected, there is still the satisfaction of having found and identified it; luckily for me, the P311 is gorgeous. The satisfaction we got from the discovery, the identification and the reaction of the relatives of the crew was fantastic.

The world's media hype has certainly not disappointed me. The news was presented as accurately as possible.

Nico: What is the most delicate or complex moment in an effort of this kind?

Massimo: The psychological aspect is the most complex moment; the rest are things I've been used to for years. Everything that characterizes diving in deep water can be dealt with the necessary experience and equipment. It is more difficult to control the urge to go "beyond" through cold reasoning; in a nutshell you have to understand when it's time to stop.

Nico: Which feats have given you the greatest satisfaction?

Massimo: Many; recently the discovery and identification/documentation of the Kreta at a depth of 170m in Tuscany. It was a dive of great sport and documentary value; the Kreta is the only wreck of its kind found in the Mediterranean.

Nico: What advice would you give to lovers/experts who want to find wrecks in the world?

Massimo: The only advice I can give is…never give up, the wreck hunting is a marathon, only those who resist for a long time, reach the bottom.

Nico: Are you in favour of projects considering the controlled sinking of wrecks to enhance certain areas?

Massimo: Absolutely in favour of controlled sinkings; they promote tourism, fish re-stocking and spread the passion for wreck diving.

Nico: One last question. Have you ever been to Dubai? Have you ever dived in that area?

Massimo: No, I came through in transit when I worked on the boats of an Italian company in those areas; I never dived there; I do not know those areas.

Dear Massimo, thanks again for your time!

THE WORLD SEA TURTLE DAY RELEASE

FEATURE AND PHOTOGRAPHY **ALLY LANDES**

The Dubai Turtle Rehabilitation Project released 100 critically endangered turtles including Beau, a large 50kg male amputee Loggerhead Turtle from the Burj Al Arab's Jumeirah beach to celebrate World Sea Turtle Day on the 16th of June. Beau was the second amputee to be released back into the wild since Al Ouda's – the large 120kg female Green Turtle – successful release back in April. Beau was also fitted with a satellite tag to monitor his movements through his new adaptation. His right flipper had to be amputated after it had been severely damaged from what was thought to have happened from being tangled in nets.

Five juvenile turtles were also fitted with small satellite tags to record their movements and collect the valuable data used to monitor the release following the medical course implemented by the DTRP team during their rehabilitation.

The tags don't stay on long on juvenile turtles due to their fast growth rate. The glue holding the tags onto the carapaces eventually crack and break off as the shells take on their new form. The tags' batteries are made to only last 90 days, and although this is a short period of time, the juvenile turtles' journeys are just as import as those of the adults.

These 5 small tags were sponsored by the Dubai Aquarium and Underwater Zoo. The five juvenile turtles were of three different species. One Loggerhead named Cousteau, two Greens, Alpha and Angelo, and two Hawksbills, Ali and Pawee. It is the first time juvenile Loggerheads and Greens have been tagged in the region.

All the turtles rescued and brought in to the DTRP are either done so by members of the public or conservation organisations, and all turtles come from UAE shores. The most common are the critically endangered juvenile Hawksbill Turtle and the endangered Green Turtle. There are a number of reasons for the turtles' demise which includes the effects from cold waters during the winter months of December to February, the ingestion of plastic rubbish polluting the waters, and boat injuries.

Warren Baverstock, Burj al Arab's Aquarium Operations Manager said, "We are very proud to celebrate World Sea Turtle Day today by releasing more rehabilitated sea turtles back to their environment. We are especially grateful to the local community and organisations such as TDIC and the Emirates Marine Environmental Group that found a lot of these sick and injured turtles and took the time and trouble to get them to us so we were able to get them well again.

We are also very happy to have worked with the Dubai Aquarium this year where for the period of 90 days, they assisted us with the final stages of rehabilitating these five critically endangered tagged sea turtles. Due to the large number of visitors that went to see these turtles at the aquarium, we were able reach out to more people than ever and generate awareness about turtle conservation. Today, we have released those five turtles with special satellite tracking technology which was provided by the Dubai Aquarium to support our ongoing turtle tracking initiative. This technology will allow us to continue tracking these turtles' progress once back out in their environment as well as allowing us to develop the important picture of a young turtle's journey in this region. We encourage everyone to join in on tracking their journey and updates can be observed on our Facebook page."

ABOUT THE DUBAI TURTLE REHABILITATION PROJECT

The project impacts the national, regional and international sea turtle populations by increasing the number of animals in the environment that would have otherwise perished. Only one out of 1,000 sea turtle hatchlings will reach sexual maturity. By saving these animals and releasing them back into the wild, the DTRP are increasing the chances of the number of turtles that could possibly reach the breeding age.

The DTRP is based at the Burj Al Arab and Madinat Jumeirah and is run in collaboration with Dubai's Wildlife Protection Office, with essential veterinary support provided by the Dubai Falcon Hospital and the Central Veterinary Research Laboratory.

For more information about the DTRP, visit **www.facebook.com/turtle.rehabilitation** or if you find a sick or injured sea turtle, call the DTRP team on **+971 4 301 7198**.

The satellite tagged turtles can be followed up on **www.seaturtle.org**.

SEA TURTLES

ARE WE HUMANS CARELESS, CRIMINAL OR CUSTODIANS?

PART TWO: WHAT IS SO SPECIAL ABOUT THEM?

FEATURE AND PHOTOGRAPHY **PAUL WARWICK**

PHYSIOLOGY

PHYSICAL CHARACTERISTICS

Size: Species of sea turtle vary in both size and weight, however unlike many other reptilian species, both marine and terrestrial unusually have no variation in size between the sexes, even when they reach full maturity.

Body Shape: All sea turtles, including fresh water turtles (e.g. Snapping Turtles, Alligator Turtles etc) and their terrestrial cousins – the tortoise, are characterized by a large, streamlined protective shell.

COLORATION

- Depending on the species, the colour of sea turtles can range from an olive-green, yellow, greenish-brown, reddish-brown, or black in colour.
- Interestingly enough the Green Sea Turtle gets its name, not from the colour of its shell or hide, but from the colour of its body fat.

FLIPPERS

- A sea turtle's limbs are its flippers which have been adapted for swimming:
  - Usually the forelimbs are long and paddle-like.
  - Long digits are fused throughout the flipper to provide rigidity.
  - Only one or two claws are present on each fore flipper, depending on the species.
  - A sea turtle swims with powerful wing-like beats of its fore flippers.
- Hind flippers serve as rudders, stabilizing and directing the animal as it swims. The hind flippers of some species are quite dexterous and used for digging nests in the sand.
- A sea turtle cannot retract its limbs into its shell like a terrestrial tortoise can.

HEAD

- A sea turtle cannot retract its head under its shell like a terrestrial tortoise can.
- Sea turtles have large upper eyelids that protect their eyes from damage.
- Sea turtles do not have any external ear openings.
- Each species has a jaw shape and structure that has adapted to enable it to forage for its primary diet. Like other turtles, sea turtles lack teeth.

SHELL

- The dorsal (top) side of the shell is called the carapace.
- Depending on the species, the adult carapace ranges in shape from oval to heart-shaped.
- In all species except the leatherback, the bony shell is composed of broadened, fused ribs, and the backbone is attached to the carapace.
- The ventral (bottom) side of the shell is called the plastron.

- In all species, except the Leatherback, the shell is covered with a layer of horny plates called scutes:
  - Scutes are firm but flexible, not brittle.
  - Scientists can identify sea turtle species by the number and pattern of scutes.
  - The Leatherback Turtle has a thick and oil-suffused skin, which is an excellent insulator, allowing this species to venture into cold water.
  - The Leatherback's carapace is composed largely of cartilage raised into prominent longitudinal ridges. A layer of thousands of small dermal bones lie just below the leathery skin.
- A sea turtle's large, bony shell provides some degree of protection from predation and abrasion, however this does not protect it from some predators such as sharks.

SEXUAL DIMORPHISM

- Male and female sea turtles do not differ externally until they approach full maturity.
- Adult males have longer, thicker tails than females, because the male reproductive organ is housed in the base of the tail. In males, the tail may extend well beyond the hind flippers.
- With the exception of the Leatherback Turtle, the claws on the fore flippers of sea turtle males are elongated and curved, which may help them grasp a female's shell during mating.

SENSES

HEARING

All reptiles, including sea turtles, have a single bone in the middle ear that conducts vibrations to the inner ear. Researchers have found that Sea turtles respond to low frequency sounds and vibrations.

EYESIGHT

- Sea turtles can see well under water but are shortsighted in the air.
- Under experimental conditions, Loggerhead and Green Sea Turtle hatchlings exhibited a preference for near-ultraviolet, violet and blue-green light.

TACTILE

A sea turtle is sensitive to touch on the soft parts of its flippers and on its shell.

TASTE

Little is known about a sea turtle's sense of taste.

SMELL

- Most researchers believe that sea turtles have an acute sense of smell in the water. Experiments show that hatchlings react to the scent of shrimp. This adaptation helps sea turtles to locate food in murky water.
- A Sea Turtle opens its mouth slightly and draws in water through the nose. It then immediately empties the water out again through the mouth. Pulsating movements of the throat are thought to be associated with the act of smelling.

ADAPTIONS

SWIMMING

- Sea turtles are strong swimmers. The cruising speed for Green Sea Turtles is about 1.5 to 2.3kph (0.9-1.4mph). Leatherbacks have been recorded at speeds of 1.5 to 9.3kph (0.9-5.8mph).
- Forelimbs are modified into long, paddle-like flippers for swimming.
- Neck and limbs are non-retractile. The shell adaptations necessary for retractile limbs would impede rapid swimming.

DIVING

- Sea turtles are excellent divers. Leatherbacks routinely dive to more than 305m (1,000ft.). They may reach depths of more than 1,190m (3,900ft.) seeking jellyfish for prey.
- Since they are cold-blooded, sea turtles have a slow metabolic rate. This slowed metabolism allows them to stay submerged for long periods of time.
  - Hawksbill Turtles have been known to remain submerged for 35 to 45 minutes.
  - Green Sea Turtles can stay under water for as long as five hours. Their heart rate slows to conserve oxygen: nine minutes may elapse between heartbeats.
  - In the north-central Gulf of California, Black Sea Turtles return each year to specific areas. They bury themselves in sand or mud underwater and may remain dormant from November to March.
- During long dives, blood is shunted away from tissues tolerant of low oxygen levels toward the heart, brain and central nervous system.
- Leatherbacks have high concentrations of red blood cells; therefore, their blood retains more oxygen. The muscle of Leatherbacks has a high content of the oxygen-binding protein myoglobin. Myoglobin transports and stores oxygen in the muscle tissues allowing them to dive for longer.

Respiration: In studies conducted on Green Sea Turtles, lung capacity exchange in one breath exceeded 50%. That is the transfer of oxygen through the lungs into the tissues. Humans can at the very best manage 20% and that is in a few world class athletes!

SALT SECRETION

- Sea turtles can live in seawater with no need for a freshwater source. They obtain sufficient water from their diet and from metabolising seawater.
- Like other marine reptiles and seabirds, sea turtles have a salt gland to rid their bodies of excess salt. This gland empties into the sea turtles' eyes. The secretion of salt and fluid makes them look as if they are "crying" when they come ashore. These "tears" also help keep the eyes free of sand while females dig their nests.

SEA TURTLES ON LAND

- For the most part, the only time Sea turtles leave the sea is when females haul out to lay eggs. On some uninhabited or sparsely-inhabited beaches, turtles have been observed basking on land.
- Many adaptations that make Sea turtles successful in the sea make them slow and vulnerable on land.
- Sea turtles are slow and vulnerable on the land.

REPRODUCTION

SEXUAL MATURITY

- Estimates of sexual maturity in Sea turtles vary not only among species, but also among different populations of the same species. Maturity may range from as early as three years in Hawksbills, to 12-30 years in Loggerheads, to 20-50 years in Green Sea Turtles.
- Sexual maturity often is related to carapace size. Studies have shown that Hawksbills reach sexual maturity at a carapace size of 60-95cm; Loggerheads reach maturity at a carapace size of 79cm; and Green Sea Turtles reach maturity at 69-79cm.
- Evidence suggests that some turtles continue to grow after reaching sexual maturity, while some stop growing after reaching maturity.

MATING ACTIVITY

- For most species, courtship activity usually occurs several weeks before the nesting season.
- Two or more males may court a single female.
- Male sea turtles of all species except Leatherbacks have enlarged claws on their front flippers. These help grasp the shells of the females during mating.
- Fertilization is internal.
- Copulation takes place in the water, just offshore.

NESTING BEHAVIOUR

- Like other turtles, sea turtles lay eggs.
- Females come ashore on a sandy beach to nest a few weeks after mating.
  - Females usually nest during the warmest months of the year. The exception is the Leatherback Turtle, which nests in fall and winter.
  - Females of most species usually come ashore at night, alone, most often during high tide. A female sea turtle crawls above the high tide line and, using her front flippers, digs out a "body pit". Then using her hind flippers, she digs an egg cavity. The depth of the cavity is determined by the length of the stretched hind flipper.
  - A female deposits 50-200 (depending on the species) ping pong ball shaped-eggs into the egg cavity. The eggs are soft-shelled and are papery to leathery in texture. They do not break when they fall into the egg cavity. The eggs are surrounded by a thick, clear mucus.
  - The female covers the nest with sand



using her hind flippers. Burying the eggs serves three purposes: it helps protect the eggs from surface predators; it helps keep the soft, porous shells moist, thus protecting them from drying out; and it helps the eggs maintain proper temperature. Experts can identify the species of sea turtle by the type of mound left by the nesting female and by her flipper tracks in the sand.
  - Females may spend two or more hours out of the water during the entire nesting process.
  - It is possible that through the storage of sperm from one or several males in the oviducts of the females, all clutches of the current nesting season may be fertilized without repeated mating. A bit like a personal sperm bank really?
- Female Kemp's Ridley and Olive Ridley Sea Turtles form masses called Arribadas (Spanish for "arrival"). Arribadas contain thousands of egg-bearing females that come ashore at the same time to lay eggs.
- Most females return to the same beach where they hatched to nest each year.
  - Recent studies suggest that some females of some species will visit more than one nesting beach (other than the original beach) in a season.
  - Females usually lay between one and nine clutches (groups) of eggs per season.
  - Females may nest only every two or three years.

BEHAVIOUR

SOCIAL BEHAVIOUR

- Sea turtles are not generally considered to be social animals; however, some species do congregate offshore.
- Sea turtles gather together to mate. Members of some species travel together to nesting grounds.
- After hatchlings reach the water they generally remain solitary until they reach maturity and are ready to mate.

INDIVIDUAL BEHAVIOUR

- Little is known about the individual behaviour of sea turtle species.
- In the ocean, Flatback Turtles may spend hours at the surface floating, apparently asleep or basking in the sun. Frequently, seabirds perch on the backs of the Flatbacks.
- Hawksbill Turtles spend some time resting or sleeping wedged in coral or rock ledges.
- Olive Ridleys have been observed basking on beaches, and it is not unusual to see thousands of Olive Ridleys floating in front of the nesting beaches.
- Leatherback Turtles tend to dive in a cycle that follows the daily rising and sinking of the dense layer of plankton and jellyfish. The turtles probably feed in the upper layers of water at night. As dawn approaches, their dives become deeper as the plankton and jellyfish retreat to deeper water, away from the light of day. The turtles bask at the surface at midday when the layer sinks beyond their typical diving range. As dusk approaches, the turtles' dives become shallower as the layer rises.
- Green Sea Turtles are considered solitary, but occasionally form feeding aggregations in shallow waters abundant in seagrass or algae.

FEEDING

One of the major reasons for the success of sea turtles as a species is diversity in the diet of each of the species and the fact that most have adapted to suit their predominant marine environment. Sea turtle feeding classifications range from:

- Herbivores (Green Sea Turtles)
- Carnivores (Loggerheads and Kemp Ridley Turtles)
- Omnivores (Olive Ridley Turtles and Flatback Turtles)
- Spongivores (Hawksbill Turtles)
- Gelatinivores (Leatherback Turtles)

Sea turtle mouths and jaws are also shaped differently depending on their particular diet. Green Sea Turtles have a beak with finely serrated edges, like the teeth of a saw, which enable them to tear seagrasses and scrape algae off of hard surfaces. Loggerheads have strong, massive jaws which enable them to crush hard-shelled prey like conchs and whelks. Leatherbacks have sharp, pointed cusps on their jaws which enable them to pierce and hold onto jellyfish. They also have sharp, downward curving spines called papillae in their mouth and throat which help move prey to their stomach.

The diet of hatchlings across all species varies from that of adults. Hatchlings eat a variety of prey items including things like pelagic molluscs and crustaceans (like larval crabs), hydrozoans (related to jellies and corals such as the Portuguese Man-O-War), fish eggs, seaweed, and jellies. Green Sea Turtle hatchlings, unlike the herbivore adult, also eat a variety of prey such as young turtles.

HABITATS

Sea turtles, like many other marine species, are oceanic travellers exploiting all that the oceans and seas have to offer in order to survive and propagate the species. Sea turtles are dependent on beaches for nesting. Uncontrolled coastal development, vehicle traffic on beaches and other human activities have directly destroyed or disturbed sea turtle nesting beaches around the world. Turtle feeding grounds such as coral reefs and sea grass beds are damaged and destroyed by activities onshore, including sedimentation from clearing of land and nutrient run-off from agriculture. As a species they make every part of the oceans and seas their home.

BEACHES

Coastal Strand: The coastal strand is a thin strip of fragile, woody vegetation that lies between the beach and the maritime hammock. The Coastal strand habitat once formed continuous bands up and down coastlines, but in some areas it is now vanishing quickly due to coastal development and the coastal strand is now severely fragmented.

Maritime Hammock: The maritime hammock community is found just inland from the coastal strand. This community becomes established on older dunes that are stable enough to support the growth of trees. Plant species include live oak, cabbage palms, wild coffee, coral bean and several species of ferns. The maritime hammock provides habitat for many species of animals including tree frogs, squirrels, scrub jays, blue-tailed skinks and both resident and migratory song birds. Unfortunately, these areas are well-suited for development because of the stable, well-drained soil, leading to the rapid decline of maritime hammock habitat. Besides their ecological importance, many maritime hammocks contain shell mounds, or middens.

Barrier Islands: Barrier islands are naturally formed by shifting sands that build upon an existing sandbar to eventually form an island. The sand that has accumulated above the water surface becomes the home for the drifting seeds of beach plants. As the seeds grow and develop, their roots stabilize the soil, allowing the development of coastal strand and maritime hammock communities. Barrier islands support a variety of plant and



animal species that are either rare, threatened or endangered. Barrier islands are greatly affected by the forces of wind and waves and are constantly moving towards or away from the mainland. Because barrier islands provide mainland protection from hurricanes and large storms by absorbing the impact of waves and storm water overflow, entire barrier islands can be severely reshaped or completely destroyed by a major storm.

BRACKISH

Lagoons and Estuaries: Lagoons lie between barrier islands and the mainland, while estuaries are found directly on the coast and are open to the near shore area. Estuaries and lagoons are areas where salt water oceans and fresh water rivers mix together, forming brackish water. Because lagoons receive some protection from a barrier island, they have less tidal flow and more standing water, while estuaries have strong tidal flows and little standing water. Lagoons and estuaries are very important because they support a diversity of plants and wildlife. Lagoons are an important feeding area for juvenile sea turtles, that mainly feed on the large seagrass beds in the lagoon. Unfortunately, marine pollution has caused the health of the lagoon to deteriorate, and wildlife and plant abundance has decreased.

Salt Marshes: Salt marshes are areas of vegetation that are periodically flooded by ocean tides. They contain mostly tall, grassy plants, though the plant cover differs within the marsh according to small changes in elevation. Marshes help stabilize sediments and buffer inland areas from storms. These communities are also very biologically diverse, supporting a wide variety of species ranging from fish to oysters. Salt marshes are also important feeding areas for wading birds, such as herons and egrets. The species that live in salt marshes have adapted to sudden changes in water levels, water and air temperatures and oxygen levels in the water.

Mangrove Swamps and Forests: Mangroves receive an abundant supply of fresh water and perform important functions such as filtering out pollution, holding sediments, protecting the shoreline from erosion and providing habitat for a variety of animals. Mangroves are the most biologically diverse of all the lagoon and estuary communities. They provide habitat for hundreds of fish, reptiles, amphibians, mammals and bird species. Commercial fishermen also depend on mangroves for the production and sustainment of lots of species targeted for commercial fishing. Despite the apparent hardiness of Mangroves, they are in a delicate balance between sea water and fresh water, land and water and can be very susceptible to coastal development and pollution.

Coral Reefs: Numerous species of coral are found worldwide. Each kind lives in a separate colony that is shaped differently from the others. The colonies take on the various hues of the algae that live within them – usually red, green, and brown. Coral reefs are among the most biologically diverse ecosystems on earth. They are second only to tropical rain forests in the number of species they harbour and, indeed, are sometimes called "the rain forests of the sea." Like their terrestrial counterparts, coral communities may contain valuable materials and medicines that may one day be useful to people. Coral reefs across the globe provide important fishery resources for local communities. Reefs also buffer coastal land from the damaging effects of storms and erosion and help to form the sandy beaches and quiet lagoons that are signatures of the state's tourism industry. Coral reefs today face an unintentional, but growing, threat from the very people who prize them most. Boaters frequently run aground or drop anchors on the coral heads, divers and snorkelers step on them and bruise them, and pollution threatens to sully the clear waters that are vital to their survival. The warming of our oceans and seas is also causing "bleaching" – the death of our vitally important coral reefs.

Seagrass Beds: Seagrasses are flowering plants found in shallow coastal marine waters and are different than seaweed (algae). Algae obtains its nutrients directly from the water through diffusion, while seagrasses use their leaves and roots to obtain nutrients from sediment and the water. Seagrass beds are important feeding and breeding habitats for many marine species, including sea turtles. Unfortunately, extent and distribution of seagrass beds have been declining since 1940 and more than one-third of the original seagrass beds across the world are believed to have been lost. For example, along Florida's Gulf Coast, seagrass beds have declined 8% since 1969 alone which may not seem significant but it has affected the population density of sea turtles. Seagrasses are both an indicator of environmental health and an important breeding ground for the lower tier of the marine food chain. Seagrass beds are incredibly important habitats for juvenile and adult fish, crabs and shrimp. They also tend to be relatively sensitive indicators of water quality, and in places where humans are affecting water quality, researchers can look at trends over time in seagrass abundance as a way to indicate whether humans are having more or less of an impact on water quality. In addition to pollution, seagrass beds are declining due to being damaged by boat propellers and anchors.

Nearshore Hard bottom: Nearshore hard bottom habitats are the primary natural reef structures at depth of less than 15 feet and are primarily made up of tube-building polychaete worms or coquina shells. Hard bottom reefs are often centrally located between mid-shelf reefs and barrier island estuarine habitats. The reefs provide habitats to a huge variety and number of marine organisms, including juvenile snappers, grunts, groupers, wrasses, and sea turtles. These reefs help stabilize nearby beaches. Nearshore reefs reduce wave and current energy and protect against coastal erosion. Unfortunately, beach renourishment projects, which involve dredging sand from offshore and pumping it onto the beach, impact nearshore habitats, as well as the Green Turtles for whom this area of ocean is where they find food and shelter. In particular, the artificially wide, man-made beaches bury large sections of nearshore reef and hard-bottom habitats used by sea turtles and many other forms of marine life. The projects can also increase turbidity in the water, which affects the reef algae – the primary food source for juvenile Green Sea Turtles.

Pelagic Oceanic Zone: The pelagic oceanic zone is the area of open water lying over and beyond the continental shelf, while excluding nearshore and estuary areas. The preponderance of organisms associated with the pelagic habitat occurs in the water column either above the sea floor or below the surface and consists of free-swimming creatures also known as nekton and free-floating or less mobile plankton. The open ocean habitat sustains a relatively large number of species of fish, marine mammals, marine turtles, and invertebrates, many of commercial importance (i.e. tuna, sharks, sardines, and mackerel). Species use this pelagic environment as a permanent or transitional phase for spawning, breeding, feeding, or growth to maturity.

HOW CORALS BROUGHT A LODGE, A NUTTY PROFESSOR AND BEACH BUM DIVERS TOGETHER

A CORAL SETTLEMENT PROJECT IN TROPICAL MOZAMBIQUE

FEATURE AND PHOTOGRAPHY **JELLY GELLETICH AND DAVID GLASSOM**

Only a few weeks ago, my Open Water students were making their first tentative fin strokes into a world that they had far more knowledge of than I. The next day I was confronted again by these two passionate and motivated Mozambican marine researchers making their first dives in helping them in their quest to unravel Mozambique's coral settlement mysteries, but, how did this all come about?

This is the story of a group of salty divers: a local lodge's beach bum diving instructor, passionate biologists of a forgotten Mozambican Island research station and a nutty university Professor, all trying to uncover the life secrets of these unique little animals that play the largest role in an essential marine ecosystem, the corals of Mozambique.

To understand this story, you have to back up and understand what corals actually are. Most will usually mistake corals as colourful ocean plants or colourful algae covering rocks, but they are far from this. They are in fact a type of invertebrate, belonging to the group Cnidaria, which secrete a calcium carbonate skeleton under and around each polyp. The animal, or polyp, looks much like a tiny anemone that lives on top as well as inside the small corallite spaces on the surface of the skeleton. As the coral grows, it's these polyps growing and multiplying to eventually form a whole colony that we know and see as often massive coral structures.

These structures are the most vital resource to the health of our oceans, known to carry the greatest biodiversity of all ecosystems, home to over a quarter of the world's marine life, they form a place of shelter, important feeding and breeding habitats for many coral reef dwelling species, as well as juvenile pelagic species. Not only that, their hard structures additionally protect and stabilize coastlines from storm events, in turn protecting humans. For these reasons (among many others), global marine biodiversity and humans depend greatly on each of these tiny little animals to survive, thrive and reproduce. So how are we going to ensure their future?

It all starts with gaining an understanding about their fascinating life-stories.

Most corals reproduce through spawning, by ejecting eggs and sperm into the ocean surrounding them. When the eggs become fertilised, they grow into tiny free swimming larvae that can spend hours to days floating in the ocean before settling and starting to build a new coral colony or reef. Corals are actually very fragile animals, many factors need to be just right for them to strive. The clarity of sea water, how acidic/salty the ocean is and even small temperature fluctuations can have major impacts on the health and survival of these creatures. All of these factors together, leave only a very small margin of life for these corals to thrive in, for this reason you don't find corals in every nook and cranny of the ocean. In some places corals undergo bleaching and many of the corals may die off in a short

period of time. This has been shown to occur when the water temperature remains above a certain temperature for too long, which is currently happening globally as a result of global warming. Intense El Nino events, such as in 1998 and 2016 can aggravate this effect, causing huge coral mortality. Coral polys share a mutualistic relationship with zooxanthillae, tiny symbiotic photosynthetic dinoflagellates, which live inside of them. Corals provide the symbiotic algae with shelter and the ingredients required for photosynthesis and in turn, the algae provide oxygen nutrients and remove waste for the coral polyp. When corals bleach, they lose their colour which indicates that the zooxanthellae are being expelled from their tissues, in effect starving the coral of most of their food source.

Coral reefs can however and miraculously do survive these natural events. If healthy corals are able to reproduce in nearby unaffected areas, then damaged coral reefs under stress can be re-populated and come back to life through the settlement of larvae from natural spawning events occurring at the healthy reefs. However, this is not always the case and that's Mozambique's corals. Cue the University Professor.

Dr David Glassom, passionate scuba diver from the University of Kwazulu-Natal in South Africa, has been studying coral recruitment and their life-cycles in South Africa for many years. He noticed that there is some recorded data for Vamizi Island in northern Mozambique and for its northern neighbours, Tanzania and Kenya, but rarely any data at all for the rest of the Mozambican coastline. An idea was born to try and find out what was happening in Mozambique. At about this time, in stepped two passionate Mozambican marine science students, Abdul Aba and Illario Timba.

Both students work at the University of Eduardo Mondlane Marine Biological Research Station on Inhaca island in Mozambique. This beautiful old station, built in the 1950s, is tucked away behind palm trees and within incredible dune forests unique to the area. All of this not even a stone's throw from the ocean. When you walk along its path, it's as though you've passed through a time capsule and are some place else other than a university research station where both, Abdul and Illario work at. Largely forgotten during the civil wars that hit Mozambique during 1975 till 1992, the Inhaca team is breathing new life into the beautiful historical research station and museum, which houses many beautiful unique collections, many of these by grandfathers of marine biology in the region. Abdul and Illario recognized the importance of the reefs surrounding their station, which provides most of the food to their community as well as work by bringing in tourism. An opportunity presented itself to take part in the ground breaking work on coral reefs, and Abdul requested to take part. From this, the Mozambique Coral Settlement Project came into being. With everything in place for the start of this exciting project, there was just one small problem. Neither Abdul nor Illario had learnt to scuba dive even though the Marine Station was equipped with all the diving equipment needed. Abdul then approached Machangulo Beach Lodge.

Inhaca Island and the surrounding Machangulo Peninsula area is a special place. It's just a short boat ride from the capital city of Mozambique, Maputo. It boasts an incredible amount of biodiversity. Not only can you find tropical beaches, but also mangrove forests with unique bird life, sea grass beds, vast coral reefs, marine mega fauna, unique sand dune forests housing many indigenous species, all in a sleepy island setting. This is what Machangulo Beach Lodge sets out to share. When the lodge was approached, they decided to sponsor Abdul and Illario to do their PADI diving courses through their dive centre. That is when I got to meet and work with this amazing team.

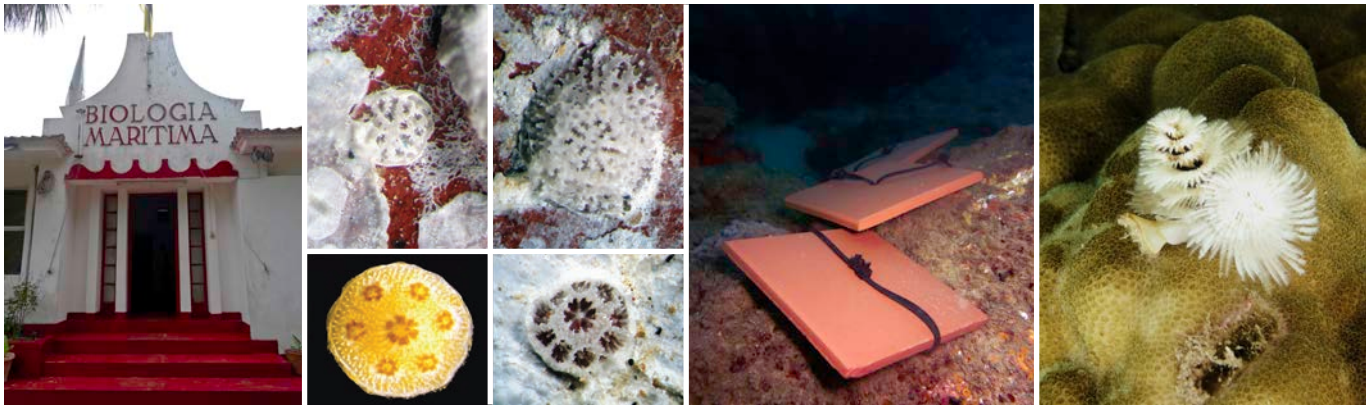
After training up Abdul and Illario, I was able to show them a whole new part of their island that they had just seen from the surface, from what was caught in the fishing nets or just washed up onto the beach. Abdul and Illario flew through their course and Open Water dives, finishing in style. By being able to dive, they were able to help set down the very first recruitment tiles for the study. Even more importantly, these Mozambicans are taking ownership of their reefs in trying to unravel the mysteries of their corals.

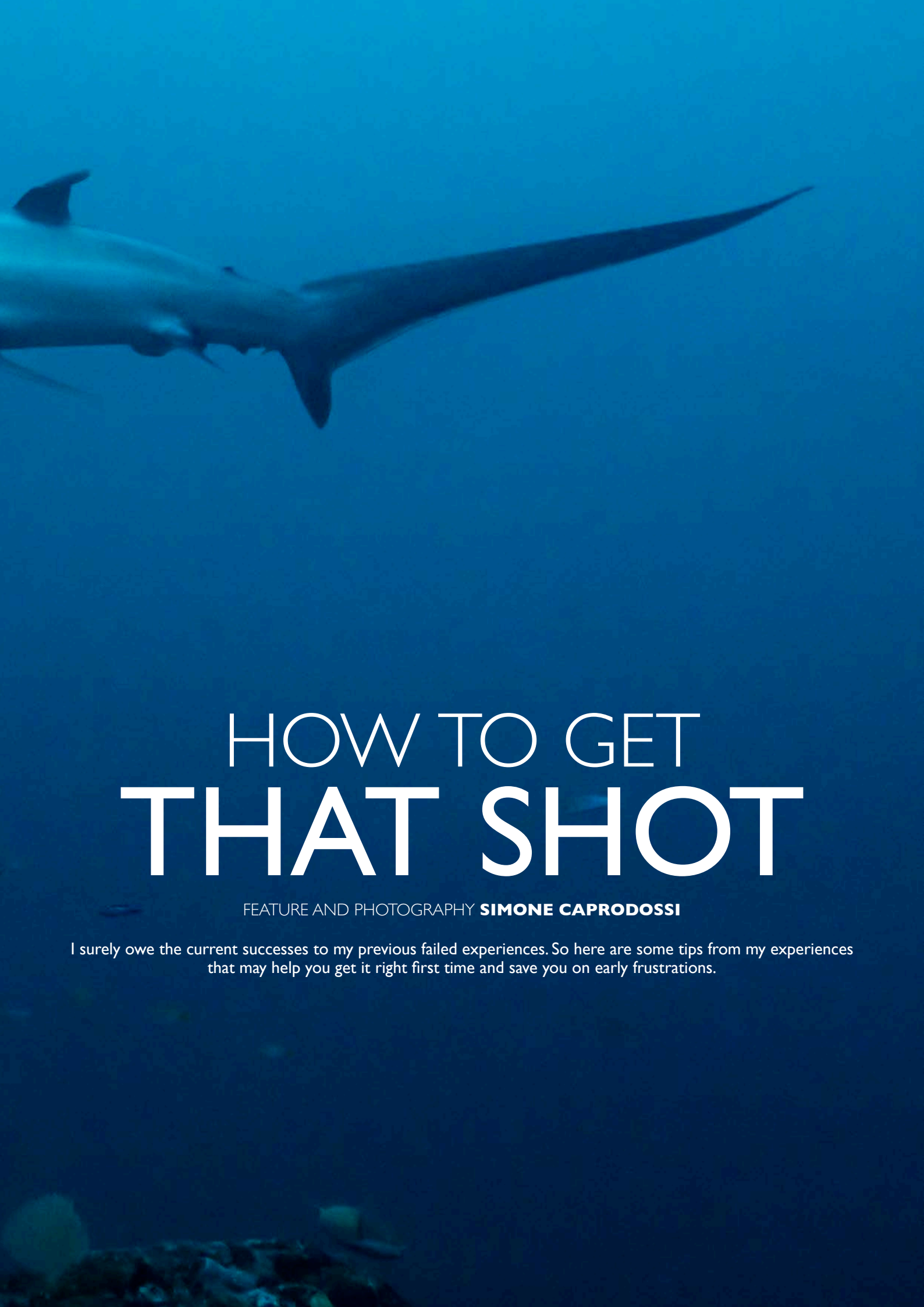
So there we were, floating above open spots of dead coral in between living coral colonies attaching unglazed, rough ceramic tiles to the exposed areas of the reef. This is all in the hope that when the corals spawn, the little animals will decide to settle and some of them will hopefully settle on the ceramic tiles. After 12 weeks, the divers will go back and replace the tiles that were previously attached to the reefs and then carefully study the tiles under a microscope. This is to see if the corals will have spawned and if the small animals had decided to settle onto the tiles and most importantly, where the corals are spawning and if there are barriers that prevent the spread of coral larvae along Mozambique's coast. By running this monitoring programme for just over a year, one would gain a clearer picture into which period of the year corals spawned along the entire Mozambique coastline.

What struck me on that day was the divers, some old, some new, but all passionate individuals from different organizations that decided to make a difference together. Conservation and research are both crucially important, as without knowledge we cannot protect or find ways to conserve reefs. Yet it's the local stakeholders such as divers, dive centres and holiday resorts that recognize the importance for the future of their industries and can provide great assistance by interacting with conservationists and researchers by just saying, "…now that's pretty cool. How can we help?"

Our team has since grown, with more amazing characters joining the team. We have been very lucky to have some dive centres and lodges take part and help further the project in any way possible. Some as simple such as lending us an underwater camera so we could take photographs, others by being able to help out on social media. So the next time you take a sip of your drink at a lodge peering out over the vast beautiful ocean, ask them if they are doing something for the environment. Even better, ask them if you could help. You may be surprised by what they say.

For more information, head over to **www.facebook.com/CORALsettlement**. Even better, get a hold of us and ask us how you can help. It's as simple as just finding out more about these amazing animals or the ocean around you.





HOW TO GET THAT SHOT

FEATURE AND PHOTOGRAPHY **SIMONE CAPRODOSSI**

I surely owe the current successes to my previous failed experiences. So here are some tips from my experiences that may help you get it right first time and save you on early frustrations.

THE THRESHER SHARKS

The Thresher shark dive at Monad Shoal is an absolutely amazing and unique experience like nowhere else in the world where you can see these incredibly beautiful sharks up close, and practically guaranteed on a daily basis.

It happens to also offer some of the worst conditions for photography. The sharks come up from the depth just before sunrise and hang around the cleaning stations for only about an hour after dawn.

That means there is very little natural light at the cleaning stations. As the sharks are used to the deep depths, they have very big eyes, so there is a strict, but fair rule of no flash photography. Monad shoal is a long submerged reef and the main cleaning stations with the most consistent action is at around 25-30 metres. It also means you have a limited bottom time and even less light.

This leads you to take a photo of a moving grey, shiny shark at 30 metres depth, with little light, little time and no flash. But hey, what a cool shark that is!

So here are a few tips from my recent experience. These photos are far from great, but I am quite happy considering the limitations.

1. **GET NITROX:** You will get 5-10 minutes of extra bottom time and they may just be the best light minutes if the sharks linger a bit and the sun comes through.

2. **PUSH YOUR ISO:** Particularly at the beginning of the dive, you'll need to really push it to the max your camera quality can handle with moderate grain. I would try to be above 1200 ISO, ideally up to 2400. Even in post production, you won't be able to brighten the images up enough and get some quality in, unless you push some in camera light.

3. **MAXIMUM APERTURE:** Go for maximum aperture to get most light in. The sharks come relatively close, but very rarely so close that you would need more depth of field. You need extra light more than depth of field.

4. **GO WIDE:** Go wide, but not too wide. A 16-35 zoom lens is around the right focal range. On Simon Pierce's micro 4/3 7-14mm Panasonic, he stayed firmly at the zoom end, which is equivalent to 28mm in full-frame terms.

5. **THINGS TO WATCH FOR:** Watch out for the little photo bombers! There are hundreds of tiny fish at the cleaning stations and you can easily accidentally focus on them, getting little sharp dots with a very blurry shark in the background. Restrict your focus zone so you can target the shark eye and avoid accidentally focusing on the closest small fish.

6. **SHUTTER SPEED:** Bring shutter speed down to 1/100, 1/80. The sharks are quite slow swimming and practically stay still when they get cleaned so you can leverage a slower speed to again get some extra brightness.

7. **FOCUS:** Focus on the big eyes and the tail movement. The images will never have much colour so all the character will come from the unique shape of the sharks and the big black eye contact.

8. **PLANNING:** Plan to have a few days at Monad Shoal, definitely no less than 2. With extra days, you can check your images after the first day and get a good sense of how much you can truly push your ISO. We did 4 Monad dives and we had threshers on 3 days, but it was only on the last day that we had a truly glorious day with closer passes and slightly later in the morning, with better lighting. The best chance of a great photo, is to actually have the sharks at the shallower stations, but that happens less frequently, so either more tries, or better luck. We were not lucky with that, but Simon – whose great images you can see in the Ninja Shark article – did 5 additional dives the previous week and got a magical day of the sharks at one of the shallower stations. You can see his great results.

THE MANDARIN KISS

The mandarin fish kiss is one of those classics that every underwater photographer eventually wants to have in their portfolio. It is possible to witness this unique mandarin fish mating behaviour in most good macro locations in the Indo Pacific. I had the chance to try shooting kissing mandarins a few times in Palau Micronesia, Lembeh Indonesia and Mabul Malaysia and now in Malapascua Philippines on the featured EDA trip.

My first time, I got very frustrated and managed to scramble an unimpressive mandarin fish ID shot. The second time, I got a mediocre frame of them mating and now I seem to have finally cracked it and typically get some nice frames I can be pleased with, like the current cover shot.

I surely owe the current successes to my previous failed experiences and to owning a RED focus light. So here are some tips from my experiences that may help you get it right first time and save you on early frustrations.

1. **GET A RED LIGHT:** Mandarin fish get spooked by light, so if you illuminate them with a regular torch or focus light, they actually do not complete mating. After all, would you have sex with someone shining a torch on you? They are just being discreet. The problem is that they mate at dusk so you don't have enough natural light to focus a macro lens mid water. The lucky solution is a red light as fish do not see the colour red, so they don't feel illuminated, or maybe they just like the coziness of the atmosphere. I have a Sola 1200 Focus light that allows to select a red beam which is ideal. If you don't have one and surely don't want to invest in one for the one mandarin shot, you can simply tape a piece of a red plastic sheet over your buddy's torch or your focus light if you have one, and turn your light red.

2. **FIND THE RIGHT SPOT:** Mandarin fish spend most of the day in the protection of large staghorn coral formations hiding in the intricate inner branches. Towards dusk, I they start coming out to the edge of the coral to find a partner to mate with. So typically your dive guides will take you out about half an hour before dusk and look for the first mandarins that come out. Make sure to find one in a corner of the reef where you can find a good stable position and settle in. You'll have to stay there for a good half hour, so try not to be too suspended or hovering, find a good resting place for your elbows to be able to hold the camera steadily and position your fins away from corals you could break. If you cannot find a good position, move on to look for another mandarin fish in a better spot, there will be many. Also, avoid having others next to you. After getting settled in Malapascua, a big group came in and crammed around us on the mandarins we had found. I just left my spot and went looking for more as far as possible from the crowd. It only took few minutes and I was again in position, but nicely alone. The corals are always typically in a depth of just 5-6 metres, so you can safely be in sight of your buddy/group, but

alone with your mandarin.

3. **GET YOUR SETTINGS RIGHT:** It takes a good 10-15 minutes at least of chasing and courting before mating actually happens, so you have time to get your settings right. Assuming you are looking for the book's cover shot with no movement or special blur effects, you'll probably be set with 1/200 or your max flash sync speed, low ISO for minimum graininess and a high FStop around F22 to get maximum depth of field that will get both fish in focus when they mate. They come into the water column when they mate so you'll always have a good blurring of the background even at a higher fstop. With your settings fixed, your lighting will be entirely based on strobe power and direction. Test your strobe power on a few test shots on the pretty fish while they move around until you are happy with your lighting.

4. **ENJOY THE ACTION AND STUDY THE BEHAVIOUR:** The flirting and courting is a lot of fun to watch. Typically a male will have 2-3 females around and he'll be showing off his beautiful colours by extending all his fins. These are great moments to shoot a mandarin portrait in all his glory. On one occasion, I had two males contending the same area in which case you can witness them facing each other with dorsal fin fully extended to create what looks like a horn above the head. Another excellent photo opportunity before the mating. After a few minutes, a male will have gathered his harem and they start looping around the same area coming back to meet in one spot quite consistently that is normally more open above. That is the spot to watch. You have now identified where they will come up from when they are ready for the kiss.

5. **CARPE DIEM AND GOOD LUCK:** The action is now close to the peak and you just have to be focused and ready as it could happen any time. By now it will also have become darker and here it is crucial to have your red focus light on so you can keep your focus on the starting spot and the time will come. The action is quite sudden and you'll see the male and female raise into the water column and lock their cheeks together for a few seconds. That is your moment. Shoot, shoot, shoot. Normally they repeat this two, three times right after coming down so don't start reviewing your images or you'll miss your second chance. Keep your eyes on the action and be immediately ready for another go. If there are two females, the male may mate with both, so you could maybe get 4 kiss chances. I once witnessed a threesome – blush.

After the kissing, you'll quickly see them disperse and swim back into the corals and it is then time to enjoy a night dive discovering the other creatures that the site has to offer. In Malapascua at Lighthouse Reef, we continued our 6 metre dive for 89 minutes with a blue ring octopus, frogfish, cattle fish and lots of other night critters.

PART TWO

WIDE ANGLE UNDERWATER PHOTOGRAPHY

FEATURE AND PHOTOGRAPHY **LEVENTE ROZSAHEGYI**

Last time we looked at what equipment to use when taking underwater wide angle photos. This time, we'll look at some scenarios and a few recommended settings.

RECAP

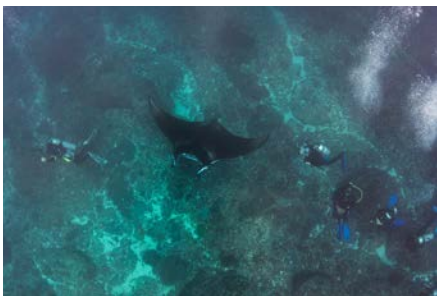
Last time we looked at what equipment to use when taking underwater wide angle photos. This time, we'll look at some scenarios and a few recommended settings.

SHOOTING DOWNWARDS

In most cases, this situation gets quite tricky as you cannot see the object's (the fish) eyes and only see a top view. Depending on the subject, there could be some very good situations when it makes sense for such a shot. For example, the Great Hammerhead shark has such a distinct head (yes, the hammer) that makes it recognizable from either above it or below it. The sun's light comes from above making your object brighter, so you will have to set your camera with a medium f-number, but lower shutter speed (when taking photos against the sun, it's a higher shutter speed or a lower f-number). Remember the higher the f-number, the smaller the aperture gets, allowing less light in. Given that the sun is behind us, it is advisable to allow some more light into the lens and the CCD. You can use the lowest ISO possible for this.

There is no need to use strobes (flash) for this shot as there will be enough light to illuminate your subject.

You may have another diver in your frame, so you may need to position the subject accordingly. As you can see in this shot below, there are divers in the image, with divers each side of the Manta Ray.



SHOOTING HORIZONTALLY

Taking photos horizontally, can be three folded.

1. Depending on the conditions, you could take photos using natural light coming from behind you.
2. Use strobes to light up objects against the sun.
3. When the sun is directly above you, and you happen to be in a cave with some light coming through the cracks, then you are very lucky to see beautiful rays of sunshine. This scenario can be mixed. You can take a photo using natural light, without a strobe, or you can use a combination of the two with a subject (a diver, a fish) in front of you.

When using natural light underwater, the settings really depend on the strength of the light. If you are close to the surface, then you could use a lower ISO, e.g. 100 or 200 and a lower shutter speed. However, when you are a little deeper with less light, you may need to boost your ISO for the conditions, and unfortunately this is a case for a good quality camera with a good range selection. Having higher ISOs without too much "noise" is crucial in this scenario.

To shoot in the same conditions with a subject in front of you, you need to set the camera up to take photos of the background, i.e. the cave and the sunlight. Load up your strobes and start taking photos with strength from the midrange, upwards. You will find that (given enough time) your subject is going to be well lit from above, as well as your background.

SHOOTING UPWARDS

Shooting upwards or against the sun is my favourite. There are so many variations we can play with while shooting.

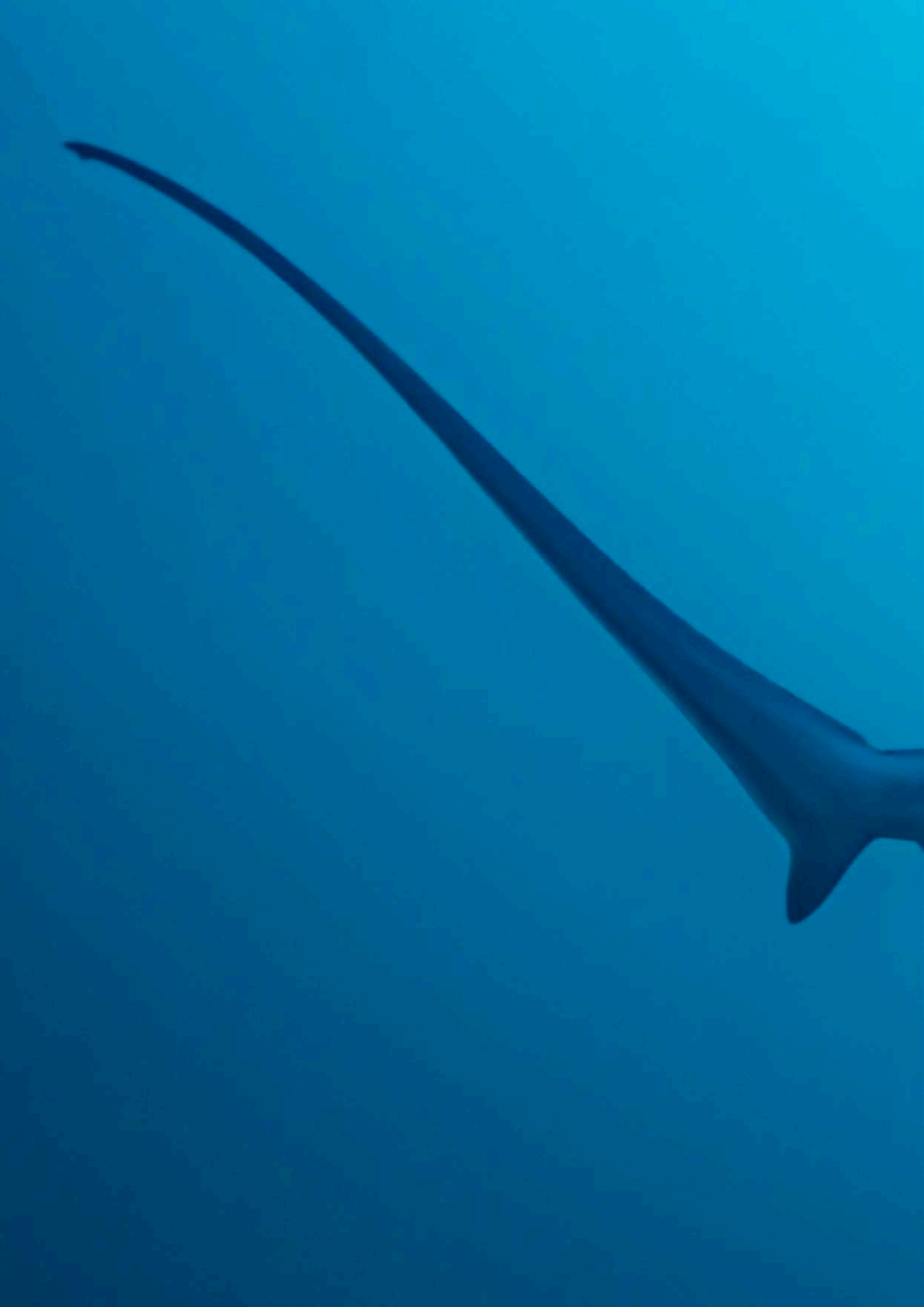
Imagine taking a photo of a sunset on land… beautiful. Now try to put a subject between the camera and the sunset. You may have two options.

One is to create a silhouette, which means the shadow of the subject will be shown in the image.

Two, is to use a flash to light up your subject. Using the first option, you can setup your camera correctly for the sunset and its colours. However, when you take photos with the flash, your camera might be "playing up" with you as it will set itself up for the subject, not the sunset, and that will create an image you don't really need. You need to use manual settings.

Same principle applies underwater. When your camera is facing upwards, you are really facing the light or even the sun itself. Therefore, you have to set the camera up with a high f-number (small aperture size) and higher shutter speed. The ISO should be as low as possible in this case to create a nice sharp image.

Setup the camera for the upward shoot first, when that is done, set your strobes up. The strobes strength should be set to medium and with each shot you take, you have to increase its strength to see what fits the purpose.



DIVING MALAPASCUA
THRESHERS & LITTLE TREASURES

FEATURE AND LAND PHOTOGRAPHY **ALLY LANDES**
UNDERWATER PHOTOGRAPHY **SIMONE CAPRODOSSI**
DRONE PHOTOGRAPHY **SIMON PIERCE**

They are impressive sharks with huge eyes for hunting at deep depths, their pectoral fins are much longer than those of other sharks which give them incredible manoeuvrability and speed, and their tails!!! Their ribbon-like shaped tail is the Roll-Royce of all tails and can whip fish into a motionless and stunned state, making them an easy morsel.

If seeing Thresher Sharks (*Alopias pelagicus*) are on your bucket list, then Monad Shoal in the Malapascua area in the Philippines is the perfect place for you. The Monad Shoal cleaning stations are known worldwide as the one place in which divers can consistently see the unusual and rare Pelagic Thresher Sharks. They can grow to 3m, with their tails making up 50% of their body. They can be seen circling the cleaning stations in twos or threes, but remain solitary.

They are impressive sharks with huge eyes for hunting at deep depths, their pectoral fins are much longer than those of other sharks which give them incredible manoeuvrability and speed, and their tails!!! Their ribbon-like shaped tail is the Rolls-Royce of all tails and can whip fish into a motionless and stunned state, making them an easy morsel.

We received an invitation from the Philippine's Tourism Board to go on over in July and discover some of their dive sites' treasure troves. Malapascua came up on the list of destinations to choose from and threshers were on the top of our 'Must See' list. Our direct flight over to Mactan-Cebu International Airport with Emirates was redirected to Clark International Airport due to an unforeseen bout of bad weather, making it impossible to land safely in Cebu. With a slight delay of 1.5 hours, the weather subsided and we were able to get back on track and fly back to our point of destination. Going over during the wet season does not change much, but we ended up going on a day a strong storm hit and instead of carrying on with the drive over to Malapascua as originally planned, we had to stay overnight in a hotel in Cebu to avoid the heavy traffic delays caused by flooded roads. All it meant was an early morning start the following day, sadly missing the first thresher shark dive on our itinerary, but it got us even more excited about getting there and diving to make new discoveries.

With the sun shining, a good night's sleep and a hearty breakfast, we were greeted by our driver from Fun and Sun Dive and Travel, and made the 3 hour journey by road to the boat port. From there, we climbed aboard a traditional Filipino Banca boat for a 30 minute journey over to Malapascua Island.

Malapascua Island's white sandy beaches offer an array of accommodation, from beach front cabins, guest houses and boutique hotels. There are plenty of beach bars and restaurants, and many walkways to explore around the island that lead to food stalls, and artisans' stands selling handmade wooden sculptures. The mornings start at 5am on the island for those off to dive Monad Shoal, a pace one gets used to fairly quickly.

BANCA DIVE BOATS

The dive boats are wide and spacious customised Filipino Banca boats. They are designed with a deep V-hull and are fitted with outriggers to keep them steady which gives them low drag, and makes them fuel efficient. Car or truck engines are used to operate them. Ours was equipped with a large and very comfortable cushioned day bed in the centre and long cushioned benches along the port and starboard sides. Giant strides are made at the bow of the boat from the large dive platform. There is a small kitchen area at the stern where teas and coffees are made and brought to you once you come up from a dive. There is also a toilet cabin. All the boats are shaded and have plenty of storage spaces keeping floors clear at all times.

THE DIVING

We were very fortunate to have Danilo and Leo, two pro critter spotters as our dive guides. Malapascua turned out to be quite the macro location. Apart from seeing Thresher Sharks at Monad Shoal (and sometimes Oceanic Mantas (*Manta birostris*), the rest of the dive sites really are more about macro than anything else.

Bobtail Hummingbird Squid (Euprymna berryi)

The very large and scary Ringed Sea Snake (*Laticauda colubrina*) at Ka Osting

DAY ONE 2nd JULY | **DIVE 1**
CHOCOLATE ISLAND ★★★★
Time In: 15:51 **Depths:** 12.8m
Temp: 29°C **Total Time:** 67mins
Chocolate Island is labelled as the most amazing macro site in the Malapascua area. It certainly started our first dive off with a big bang.

- Nudibranch (*Nembrotha kubaryana*)
- Nose Spotted Lizardfish (*Synodus binotatus*)
- Painted Frogfish (*Antennarius pictus*)
- Reaper Cuttlefish (*Sepia cf mestus*)
- Nudibranch (*Nembrotha milleri*)
- Banded Pipefish (*Doryrhamphus dactyliophorus*)
- Striped Catfish (*Plotosus lineatus*)

Frogfish – also known as Anglerfish – are just such a joy to come across. No two of the same species are ever alike and we're looking forward to seeing plenty more of these guys on the rest of our dives. Their rather shapeless and incredibly camouflaged bodies with webbed feet, can make them incredibly hard to spot. One of the coolest things about Frogfish, are their humongous mouths and expandable stomachs in which they are able to swallow prey even bigger than themselves.

DAY ONE 2nd JULY | **DIVE 2**
KA OSTING ★★★★★
Time In: 19:10 **Depths:** 10.3m
Temp: 29°C **Total Time:** 73mins
This was such a fun night dive and a great way to end the first day. There is just so much to look at on a night dive. Creatures come out of nowhere and can give you quite a fright like the very large Ringed Sea Snake did to me when it popped up through my view finder while I was busily focusing on something else, to then watch it swim directly under my nose and past my legs. Keep your wits about you.

- Day Octopus (*Octopus cyanea*)
- Peacock Sole (*Pardachirus pavoninus*)
- Bobtail Hummingbird Squid (*Euprymna berryi*)
- Dwarf Lionfish (*Dendrochirus brachypterus*)
- Ringed Sea Snake (*Laticauda colubrina*)
- Reaper Cuttlefish (*Sepia cf mestus*)
- Robust Ghostpipefish (*Solenostomus cyanopterus*)
- Side-Gill Sea Slug (*Pleurobranchus forskalii*)

The Bobtail Squid is so small and incredibly hard to spot, unless you know how to look to find them. They are nocturnal and Danilo was quick to spot this one's bioluminescent light and Simon Pierce and Simone Caprodossi each got to spend quality time photographing this little one. The males grow to no bigger than 3cm and the females to 5cm, making us believe this one was most probably a female. With their gorgeous peacock colours of small dark, electric blue and green dots, you can't help but be marvelled by them. Their tiny eight arms and two tentacles, are just too cute.

DAY TWO 3rd JULY | **DIVE 1**
MONAD SHOAL
Time In: 5:57 **Depths:** 24.3m
Temp: 29°C **Total Time:** 54mins
Monad Shoal is done by visiting cleaning stations and patiently waiting behind designated diver zones to watch threshers suddenly appear from out of the blue. It's incredibly well organised and divers are made to kneel behind the rope barriers. The dive masters will move you on to the next station if need be. Nitrox is definitely the way to go on this dive, so make sure to ask for it. Photographers and videographers are prohibited from using light as they disturb the sharks. Unfortunately, we did not see a single thresher shark on this dive. Simon Pierce had been here 10 days by this point and this was a first. This is not a common thing to happen and we were obviously very unlucky, but not in the least bit disappointed. We knew there were good things to come from this dive site. This was just a tease.

DAY TWO 3rd JULY | **DIVE 2**
TIP SLOPE ★★★★
Time In: 9:53 **Depths:** 25.6m
Temp: 27°C **Total Time:** 43mins
Tip Slope is a deep dive and has much to offer the macro photographer.

- Pink Pygmy Seahorse (*Hippocampus bargibanti*)
- Sea Moth (*Eurypegasus draconis*)
- Thorny Seahorse (*Hippocampus histrix)*

Without Danilo, we would never have spotted the tiny Pink Pygmy Seahorse. They only grow up to 2cm.

The Sea Moth is one of my favourites and is most strange. They are found along the

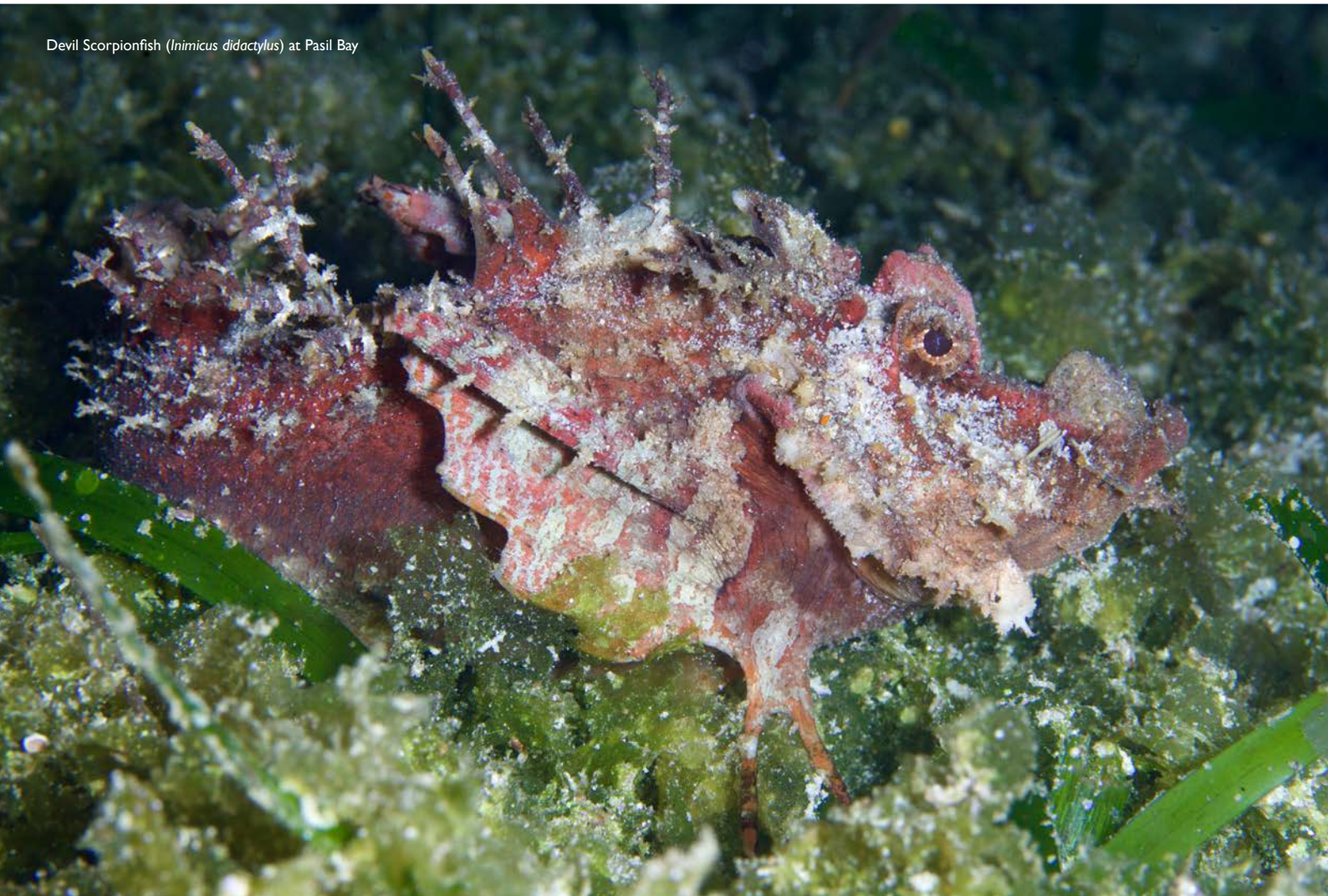
Painted Frogfish (*Antennarius pictus*) at Chocolate Island

Reaper Cuttlefish (*Sepia cf mestus*) at Chocolate Island

Painted Frogfish (*Antennarius pictus*) at Chocolate Island

Nudibranch (*Nembrotha kubaryana*) at Chocolate Island

Hairy Frogfish (*Antennarius striatus*) at Pasil Bay



Devil Scorpionfish (*Inimicus didactylus*) at Pasil Bay

Greater Blue-ringed Octopus (*Hapalochlaena lunulata*) at Lighthouse

bottom with their small bony plated, winged bodies and eat tiny crustaceans with their long snouted and toothless mouth. They are best photographed or filmed from above to see their peculiar body shape as they never leave the bottom on which they only crawl.

DAY TWO 3rd JULY | **DIVE 3**
PASIL BAY ★★★★
Time In: 11:50 **Depths:** 18.3m
Temp: 27°C **Total Time:** 55mins

This dive site's topography has unique characteristics compared to those of the others and is covered in a carpet of green algae and dotted with lots of pretty Long-spined Sea Urchins (*Astropyga radiata*).

- Panda Anemonefish (*Amphiprion polymnus*)
- Shrimp (*Periclemenes venustus*)
- Black-Pitted Snake-Eel (*Pisonophis cancrivorus*)
- Hairy Frogfish (*Antennarius striatus*)
- Porcelain Crab (*Neopetrolisthes maculatus*)
- Ringed Sea Snake (*Laticauda colubrine*)
- Devil Scorpionfish (*Inimicus didactylus*)

The highlight here was the small Hairy Frogfish perched in motion with the algae and the Black-Pitted Snake-Eel protruding from the sand it had buried itself in. Known to scarper deeper in the sand from sudden movements made close to it, this snake-eel seemed quite relaxed as it stared back at us with its large golden eye.

DAY TWO 3rd JULY | **DIVE 4**
LIGHTHOUSE ★★★★
Time In: 17:35 **Depths:** 9.6m
Temp: 29°C **Total Time:** 88mins

The shallow dusk dive in search of the famous Mandarin Fish always extends into a night dive, doubling your dive time. The dive site here, although not a pretty one, is loaded with nooks and crannies for a variety of critters to play hide and seek in the rubbled bottom.

- Mandarin Fish (*Synchiropus spendidus*)
- Banded Pipefish (*Doryrhamphus dactiophurus*)
- Estuary Seahorse (*Hippocampus kuda*)
- Greater Blue-ringed Octopus (*Hapalochlaena lunulata*)

It oddly felt as if all the divers on Malapascua had come to join us on our dusk dive to find the Mandarin Fish. Once everyone settles on the first lot of Mandarin fish you find, move on to find another couple as you know they won't move to follow you, and you can then get your shots from all angles. You cannot use regular lights when photographing the Mandarin Fish as it disturbs their mating ritual, so make sure to have red filters over your lights or else you won't get them.

The very small Greater Blue-ringed Octopus – up to 7cm – is an elusive specimen and Danilo hit the jackpot. This dive site is the perfect location for this little guy with all the rubble around. This stunning and colourful little tentacled being of poisonous life, is an incredible find and one to be observed from a safe distance to avoid its venomous and possibly deadly bite.

DAY THREE 4th JULY | **DIVE 1**
MONAD SHOAL ★★★★
Time In: 5:50 **Depths:** 29.4m
Temp: 28°C **Total Time:** 44mins

We have Thresher Sharks Ladies and Gentlemen! What a breath taking sight. They are much larger in scale than one imagines and they swim with such grace. This moment makes this whole trip all the more worth it! They come in alone from the blue and they exit alone, but you can easily see 2-3 at a time.

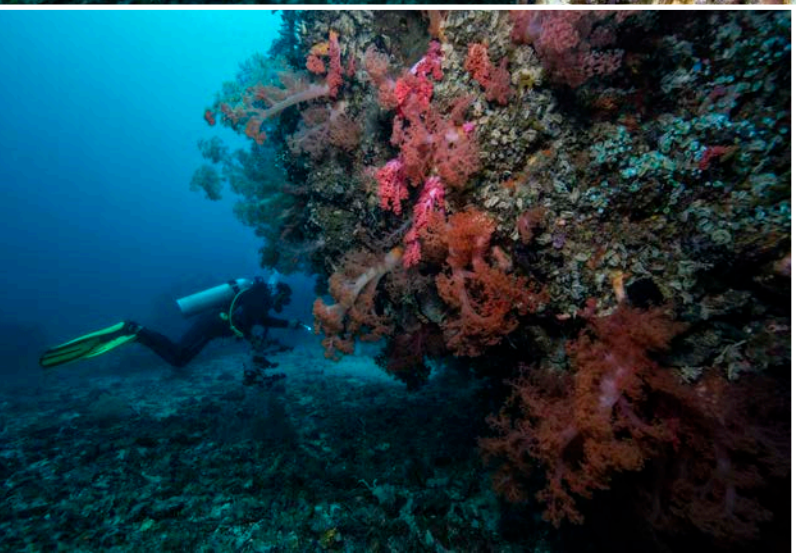
- Pelagic Thresher Sharks (*Alopias pelagicus*)

DAY THREE 4th JULY | **DIVE 2**
GATO SOUTH WALL ★★★★
Time In: 11:04 **Depths:** 21.6m
Temp: 29°C **Total Time:** 53mins

Gato Island is a popular all day destination and 2 dives are normally done here, with 5 dive sites to choose from. The island is a marine reserve and its unique feature is the tunnel which runs through the entire island. It's a very popular location though and it can get packed with divers.

- Painted Frogfish (*Antennarius pictus*)
- Ringed Sea Snake (*Laticauda colubrine*)

Painted Frogfish (*Antennarius pictus*) at Gato South Wall



- Zebra Lionfish (*Dendrochirus zebra*)
- Blackfin Sandperch (*Parapercis snyderi*)
- Spotfin Lionfish (*Pterois antennata*)
- Big-Fin Reef Squid (*Sepioteuthis lessoniana*)

We had a very interactive moment with a small swimming Painted Frogfish – which rapidly grabbed the attention of every other diver in a matter of seconds. You may have to be quick in getting your shots.

DAY THREE 4th JULY | **DIVE 3**
GATO TUNNEL ★★★★

Time In: 13:18 **Depths:** 21.5m
Temp: 29°C **Total Time:** 63mins

After a lovely lunch and relaxing surface interval on our Banca dive boat, we did our second Gato Island dive. The 30m tunnel is usually home to Whitetip Reef Sharks (*Triaenodon obesus*), but with the number of divers on this day, it was no wonder we didn't see any. This is a great dive site with much to explore. It also makes some great photos with your dive group in the background with the surface light visible at either of the tunnel openings.

- Coral Polyps (*Tubastrea faulkneri*)
- Robust Ghostpipefish (*Solenostomus cyanopterus*)
- Harlequin Shrimp (*Hymenocera elegans*)

The Robust Ghostpipefish and Harlequin Shrimps make great macro subjects and there are plenty of other things to photograph here, it's a matter of being at the right place and the right time as it's a large area to cover.

DAY FOUR 5th JULY | **DIVE 1**
MONAD SHOAL ★★★★

Time In: 5:54 **Depths:** 28.6
Temp: 29°C **Total Time:** 38mins

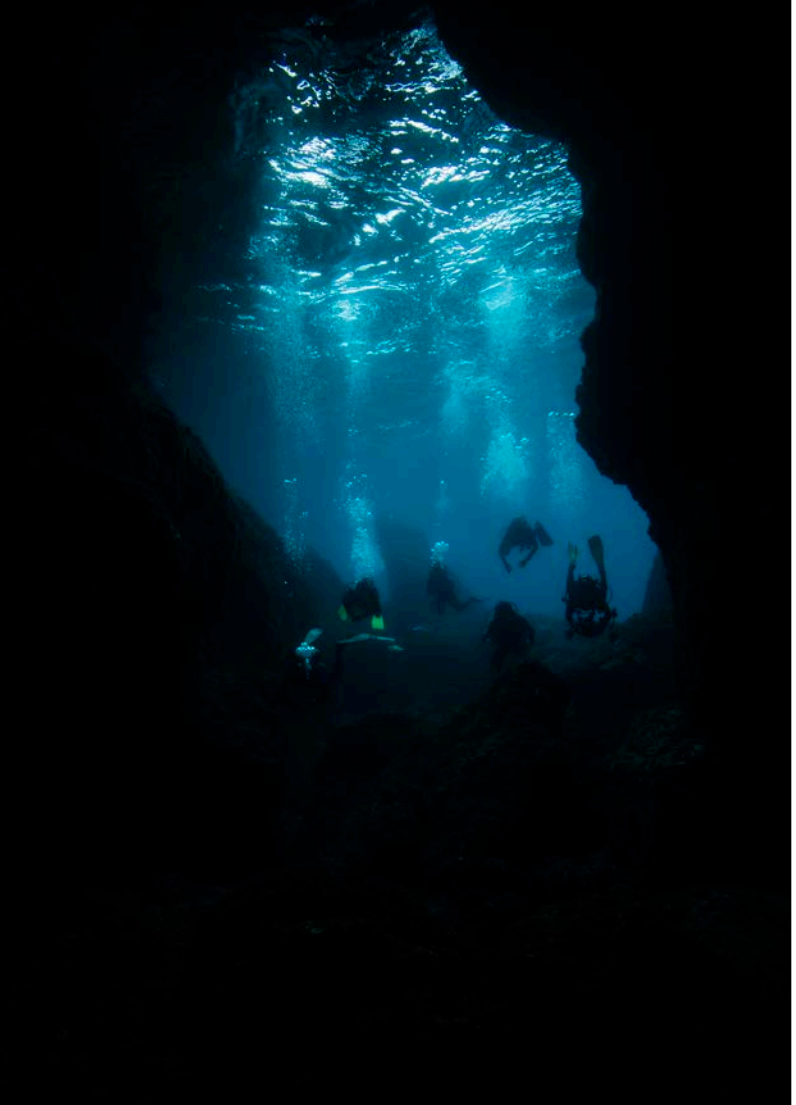
There was a very strong current on this dive, making it a short one, but just as exciting to see some threshers, even just briefly.

- White-spotted Eagle Ray (*Aetobatus ocellatus*)
- Pelagic Thresher Sharks (*Alopias pelagicus*)

The single White-spotted Eagle Ray appeared on our descent along the anchor line and flew past us just as quickly as it had made its entrance. A pleasant surprise to see. It is known to also spot Oceanic Mantas (*Manta birostris*) here from time to time. We didn't, but who's to say you won't on your trip over.

Gato Tunnel's exit

The entrance to Gato Tunnel



Flatworm (*Pseudobiceros bedfordi*) at Ka Osting

Coleman's Shrimp (*Periclemenes colemani*) on Fire Urchin (*Asthenosoma varium*) at Quillano


Ascidian or Sea Squirt (*Atriolum robustum*) accompanied by unknown Blenny at Ka Osting


Leopard Flounder (*Bothus pantherinus*) at Quillano


Harlequin Shrimps (*Hymenocera picta*) at Gato South Wall


Decorator Crab (*Camposcia retusa*) at Ka Osting

DAY FOUR 5th JULY | **DIVE 3**
QUILLANO ★★★★
Time In: 12:15 **Depths:** 23.1m
Temp: 27°C **Total Time:** 42mins

This is a very sweet little dive site and easy to do. You need to be very careful on hand placement during slight currents, as one of the other divers on our boat accidently brushed her hand against a bubble anemone, and it quickly blew up like a balloon and then went numb for several hours. Good to have vinegar on standby for such incidents. To add, her discomfort did not put her off continuing with her next dive.

- Leopard Flounder (*Bothus pantherinus*)
- Clark's Anemonefish (*Amphiprion clarkii*)
- Anemone-like Animal (*Cerianthus sp.*)
- Coleman's Shrimp (*Periclemenes colemani*) on Fire Urchin (*Asthenosoma varium*)
- Striped Catfish (*Plotosus lineatus*)

The venomous Fire Urchin and its Coleman's Shrimp habitants are a feast for the eyes. The Fire Urchin's display of magnificent neon-like colours is a stunning backdrop against the shrimps' white bodies. Most commonly found in pairs, the female is the larger of the two and they grow up to 2cm.

DAY FOUR 5th JULY | **DIVE 4**
KA OSTING ★★★★★
Time In: 18:34 **Depths:** 9.9m
Temp: 29°C **Total Time:** 74mins

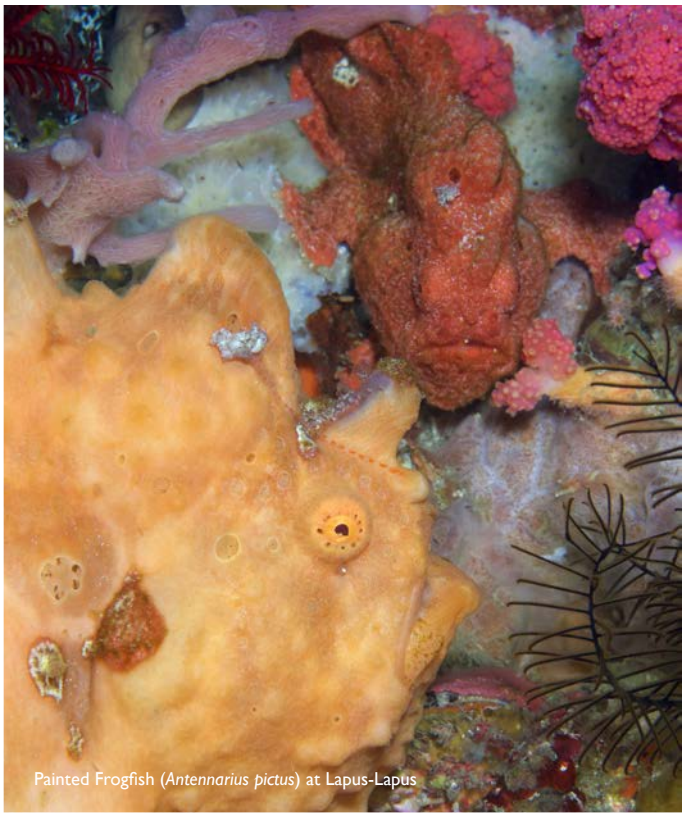
Another fun, busy and fulfilling shallow night dive. There is a slight slope on this dive and divers seem to disappear from sight a lot quicker than usual. From concentrating on a specimen for what seemed like only a couple of minutes, turned out to be enough time to find myself completely alone and without a light in sight. I hid my light and did a twirl around in the darkness thinking I would see the direction of light to follow, to eventually have to surface to get back to the group. They had moved quite a way away! Thankfully, no snakes popped out to spook me this time.

- Ascidian or Sea Squirt (*Atriolum robustum*) accompanied by unknown Blenny
- Decorator Crab (*Camposcia retusa*)
- Dwarf Lionfish (*Dendrochirus brachypterus*)
- Saddled Toby (*Canthigaster valentine*)
- Sea Moth (*Eurypegasus draconis*)
- Devil Scorpionfish (*Inimicus didactylus*) also known as Indian Ocean Walkman, Demon Stinger Fish, Devil Stinger Fish or Bearded Ghoul.
- Flatworm (*Pseudobiceros bedfordi*)
- Banded Sole (*Soleichthys heterorhinos*)
- Banded Boxer Shrimp (*Stenopus hispidus*)
- Porcelain Crab (*Neopetrolisthes maculatus*)
- Clark's Anemonefish (*Amphiprion clarkii*)
- Vomer Conch (*Strombus vomer vomer*)

There was such a variety of amazing things to see on this dive, it all seemed to have ended far too quickly and eyes at the back of the head would have been useful. The green and white ascidian paired with blenny could have easily been missed, but once it had caught my

Striped Catfish (*Plotosus lineatus*) at Quillano


Yellow Pygmy Seahorse (*Hippocampus bargibanti*) at Lapus-Lapus


Painted Frogfish (*Antennarius pictus*) at Lapus-Lapus


Vomer Conch (*Strombus vomer vomer*) at Ka Osting

eye, I couldn't take my eye off it and persisted to get Simone's attention to come over and photograph the setting. Below that, the highly adorned Decorator Crab crawled over the base of rubble and the Saddled Toby came into view.

As I came across to film the Sea Moth, it crawled over, crossing paths with the Devil Scorpionfish and its odd looking and out of place chicken feet, making the choice of who to concentrate on filming nearly impossible. The Sea Moth, on a frenzied crawling mission to feast, just wouldn't stay put long enough to come back to after setting up on the Devil. Moving on straight from this scene, the dancing, whimsical Flatworm springs into lit view and its hypnotic flutter highlights its pretty, and almost neon coloured pattern.

And, and, and! So much to see.

DAY FIVE 6th JULY **| DIVE 1**

MONAD SHOAL ★★★★★

Time In: 6:04 **Depths:** 29.8m
Temp: 28°C **Total Time:** 35mins

This was the best day we had had with the threshers. Although the water was a little murky, we had a continuous repertoire of sharks coming in and out throughout the dive all at one cleaning station. It was an absolutely thrilling show!

- Pelagic Thresher Sharks (*Alopias pelagicus*)

DAY FIVE 6th JULY **| DIVE 2**

LAPUS-LAPUS ★★★★

Time In: 9:36 **Depths:** 29.8m
Temp: 29°C **Total Time:** 39mins

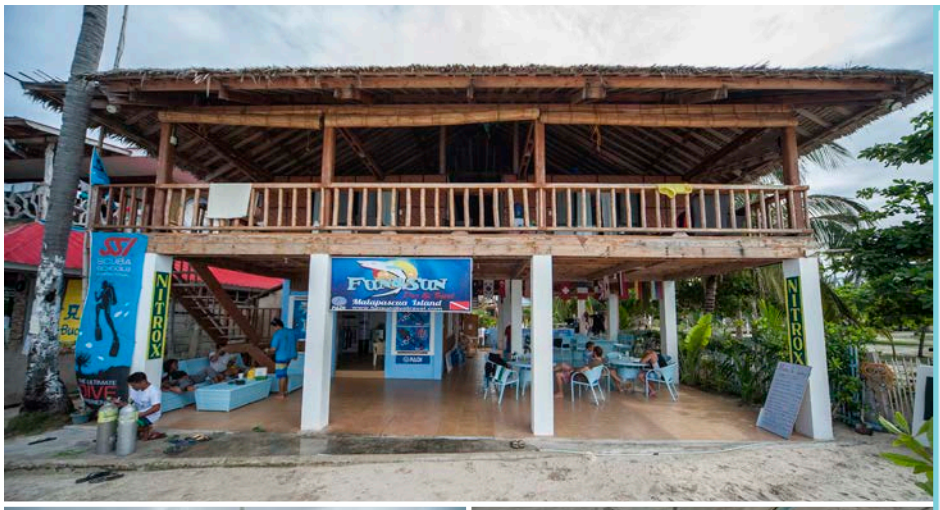
This is an incredibly colourful reef, covered in soft corals, wire and whip corals and small fans, and has a very strong permanent current that brings everything to life. Unfortunately, I had not taken the current into account and did not make the most of all the things to see on this dive. The cracks and crevices along the wall have lots to explore and I had to give the pair of frogfish a miss as I was on the last reserves of my air and needed to make the safety stop.

- Yellow Pygmy Seahorse (*Hippocampus bargibanti*)
- Painted Frogfish (*Antennarius pictus*)

The Yellow Pygmy is a rare find and although I did not see it with the naked eye, Simone got it with his super macro lens. I was there and in my opinion, it counts as a check off my list.

VERDICT: ★★★★★

We took 7 days with travel time taken into account to get a full 5 days of diving done. With an average of 4 dives per day, you get to see a huge variety of rich marine life that you don't get to see in many other places. Malapascua surpassed our expectations and the Philippines has a lot more underwater exploring to offer. The 5am dives with Thresher Sharks is a top start to each day. Whatever you do, don't miss out on those!



It's more fun in the Philippines

Planning your Trip:
WEATHER
There are 2 seasons in the Philippines. The wet season, July-October and the dry season, November-June.

The weather is generally warm and tropical so you can pack light, remembering to bring a rain jacket or umbrella if going in the wet. You will need it. The great thing is, come rain or shine, you can dive year-round in the Philippines.

Breaking the seasons down further, December through March is the northeast monsoon that can bring strong winds. April through June is usually dry with warm days and little wind. July through November is the southwest monsoon, which is wet, but the water is warm. Air temperatures average 25-32°C with high relative humidity. We went in July and we had only one wet day out of 7, and that did not deter us from the diving.

FUN&SUN Dive & Travel

Who to Dive with and find Accommodation:
FUN & SUN DIVE & TRAVEL
Head Office, Unit E Bridges Town Square,
Plaridel Street, Alang Mandaue City, Philippines
+63 32 343 3410 | +63 32 343 3409
info@funsundivetravel.com

Malapascua: +63 917 623 5520
malapascua@funsundivetravel.com
www.funsundivetravel.com
www.facebook.com/funsundivetravel

There is accommodation to fit everyone's budget on the island which Fun and Sun Dive and Travel, can help you with. They will also take care of airport transfers.

Where to Eat:
One of the best Italian Restaurants outside of Italy! No word of a lie!
ANGELINA
Pizzeria Ristorante Italiano
www.angelinabeach.com

Where to get a Handmade Wooden Sculpture:
THRESHER SHARK SCULPTURES
By Bryan Barcenas. He has a stand along one of the lanes. It's about a 7 minute walk left, after the lane behind the Fun & Sun Dive Centre. Someone can direct you to him.

Things to Bring:
A universal travel power plug adapter converter and a 6 way plug extension lead as we had so many different things to charge overnight with all the different camera batteries, lights, tablet, laptop, etc.

Currency and Tipping:
The Philippines currency is the Philippine Peso (PHP). The US dollar is the most recognised foreign currency. Tips of 10% of the billing amount are common practice if service charge is not included.

Airline of Choice:
Emirates fly to Cebu direct.

Tourist Visa:
156 countries get tourist visas upon arrival, but best to double check before making the trip.

MAURITIUS

A PEARL AMONGST THE INDIAN OCEAN

FEATURE AND PHOTOGRAPHY **PHILIPPE LECOMTE – WWW.PLONGEE-PASSION-PHOTO.COM**
TRANSLATED FROM FRENCH **ALLY LANDES**

Mauritius Island is an island with character found nowhere else.

With the summer upon us, it becomes a time for some of us to go off in search of adventures and make new discoveries. I decided to head south for my break to a destination with unique character. Mauritius Island is in the same time zone and only a 6 hour flight from the UAE. With it being in the southern hemisphere, I figured I could beat the summer heat with it being the winter season there. With 3 or 4 flights a day, you get the choice to travel overnight or during the day.

This small island is found in the middle of the Indian Ocean, 65km long and 45km wide. Mauritius is formed by several peaks, lagoons and luxurious forests.

Mauritius is well known as a honeymoon destination, for its 5-star hotels, and for its traditional rum distilleries. It has been an independent republic since 1968. With its diverse population, this island possesses a cosmopolitan atmosphere with a unique mix of Hindus, Creoles, and Asians. The people are very welcoming and friendly, and don't hesitate to guide you if you ask for information.

The island has numerous lagoons which protects the coast from waves and winds. Because of this, there are plenty of sheltered beaches. The lagoons are not exploited by divers because they are not deep enough, but are very rich with fish life and corals and are easy to explore snorkelling.

I chose to dive with the very organised and professional dive centre, Sundivers which is found at La Pirogue hotel on the west of the island. Gérald Rambert, the manager, has run the dive centre since 2002 which he manages with his wife and with the help of 10 employees. There are 2 boats that take you from the pontoon to 24 dive sites all located within 5-10 minutes from the dive centre, varying between 15 and 40 metre depths. They are all relatively easy dives, making them accessible to divers of all levels. There are different types of dives to be explored such as wall dives, plateau reefs, rocks and boulders and 4 wrecks. The dive centre offers Nitrox for those certified and does 2 dives in the mornings and one in the afternoons.

I found Gérald online during my trip's research as he showed up as a professional photographer. Gérald can organise guided group tours for photographers looking to be led by a connoisseur. Fascinated by photography for a long time, Gérald has won several photography competitions and has written a book on the marine fauna of Mauritius Island. Undoubtedly, he is the man to talk to about underwater photography on this paradisiacal island.

During my first few days, I chose to take a standard lens such as my 17-70mm. It allowed me to take wide angle photos when needed, but also portraits of fish.





The water is a deep blue in Mauritius with good visibility all year round, between 20 and 40 metres. These conditions are especially great for photographers.

THE DIVE SITES

L'EVEILLE

This plateau of coral and rock lies at 18 metres with a drop down to 30-35 metres. A chimney leads to a very wide archway where divers can pass underneath with ease. Along the chimney, black corals slowly grow shielded from water swirls. Squirrelfish have taken up residence on both sides of the drop as you make the descent down to a sandbank and you can then look back up and contemplate the large archway which acts as a roof. Care needs to be taken not to stir the sand and disrupt the visibility with your fins as you move on forward.

A big fish swimming quietly in circles takes no notice of the divers and is easily approached. Suddenly, a big jackfish arises from the slightly darker environment; maybe in anticipation to surprise other fish for its lunch. On leaving the archway, Stéphane, my guide, shows me a large black cavity. At first sight, it does not seem to be anything special except a black hole, but shining my light into the entrance, I notice that it's a small tunnel where dozens of spiny lobsters have taken up residence.

By slowly going back up to the plateau, we cross paths with a nudibranch. Once back on the plateau, a moorish idol – very common in Mauritius – hunts in search of food amongst the rocks, revealing a camouflaged grouper trying to hide from us. To finish our dive we are greeted by butterflyfish, red groupers, unicornfish and other fish scattering around our fins as we ascend.

CATHEDRAL

This site is one of the most popular dive sites on the island. It had previously been classified amongst one of the most beautiful dive sites of the world. It is an enormous cave with archway that drops down to a depth of 30 metres. When you penetrate inside, do not forget to switch your light on. Even if the cave's opening appears to give enough natural light, there are plenty of fish to see hiding in the nooks and crannies which you would otherwise miss. At the bottom of this cave, there is a statue which was placed down there by divers, but it is not known why.

On going back up towards the fault which acts as the exit, I crossed paths with a large squirrelfish. His long spine could easily dissuade several predators. When you exit Cathedral, another fault, the size of a window distinguishes itself straight ahead of you where 2 divers easily fit to look inside. There, I spot 4 or 5 whitetip reef sharks. They lay resting their heads in a source of flowing warm water which comes from the bottom of the fault. These sharks, along with nurse sharks and

carpet sharks, are the only other sharks able to stop swimming. As we leave the area, a school of blue and yellow anthias rise up into the blue to feed on plankton and other microscopic animals.

Having explored the inside of Cathedral and having passed under its archway and its chimney, the second part of the dive is done by going back up the wall of the reef to the plateau between 20 and 12 metres. There, at the foot of a small cave, a carpet anemone moves in motion with the light current. In its dressage, two shrimps with peacock-like tails walk through its short tentacles.

On the reef, undercover in its hole, a black moray eel with a white mouth watches us crossing over. Once we're at the highest point of the reef to end our dive, we are suddenly surrounded by a shoal of racoon butterflyfish casually swimming into the blue. These fish normally swim in a pair, and so I took the opportunity to take some photos of them in such a large group. These butterflyfish with their dominant yellow colouring are easily recognized by their black and white masks.

AQUARIUM

This site is located just in front of the Cop Splash beach. The reef starts from 10 metres and slowly heads down to 25 metres. This dive site is usually done as the second dive. It is made up of large rocks with some patches of sand. In the deepest part, an enormous rock is raised up in front of us with its summit covered in an enormous green coral. Some scorpionfish and damselfish hide within its green branches. At the beginning of the reef, a large plateau of fire corals serve as shelters to a number of other fish. Make sure to stay clear of fire coral, don't touch or brush against them or you will feel an intense pain that can last an undesirably long time. Fish use it as cover and are not affected by the burn it can inflict as they clearly show you!

As we move on, a feeling of being watched takes over. Hawkfish actively glare at you from the various coral branches, they are rested upon. These fish are very common here and they make good models for photographers. You can easily approach them and guaranteed they won't hesitate to give you their best profile. If you try to get too close though, they will disappear deeper into the corals. In some of these corals, you may also find the yellow scorpionfish. It too, uses the coral for its home.

Do not hesitate to inspect several corals, because you may just get lucky and see the very shy spotted coral croucher. This fish knows exactly how to be discreet within the intricate branches of the coral and it is almost impossible to spot one. While following the bed of fire corals, I suddenly came across a peacock mantis shrimp cleaning up in front of its hole. This very fast shellfish does not often allow to be approached. During this particular encounter, I was able to have a few minutes with it to observe its beautiful colours. A little farther along, mixed in with the fire coral, an enormous bubble coral steals the limelight. This coral is magnificent but very fragile, so care must be taken not to damage it, especially with fins.

During our swim over the reef, I caught glimpse of an octopus moving slowly over a coral. By the time I had signalled my buddy over, it had already squeezed into a hole, revealing only a small part of its head.

BAMBOO

There is a big archway at 20 metres and the site continues down to 30 metres to a mass of fallen rocks. Within the rocks' nooks and crannies, fish with big eyes hide. We stop for a moment to observe a titan triggerfish in search of shellfish and other shells for its meal. In one fine swoop it easily finds its prey which often hides in the sand or among the small pebbles.

Far off in the distance settled on the sand is an enormous rock with a large crack in its centre filled with semi-opened shells filtering the water to feed. On the top, an anemone and her orange and white occupants allow us to observe them peacefully. A porcelain crab holds on tightly in her protection.

The dive comes to an end and we slowly make our way back up along the rock to make our way back to the surface.

SNAKE REEF

This reef is displayed over 30 metres long by 10 metres wide and sits on a white sandy bottom at 25 metres deep. It is strewn with pebbles on white sand made from the coral. This site may look poor at first sight, but when one looks more closely, it's a small paradise filled with so many fish and shellfish. Before we had got into the water, Gérald turned to me and said, "It is my favourite dive site". On every dive, he comes across something new. Gérald warned us beforehand to keep an eye out at all times as there is a dense population of camouflaged venomous species such as the red lionfish and the flathead scorpionfish. Indeed, we had barely reached 5 metres and we had already spotted 4 or 5 red lionfish swimming between rocks. I was quite intent on avoiding getting stung, especially equipped with my macro lens, where I often have to lean against a rock or on the sand to take a photo.

During my search between the various pebbles, I came face to face with a spiny red lobster. This very shy shellfish, normally only comes out in the dark, but on this particular day, this one seemed to want the attention.

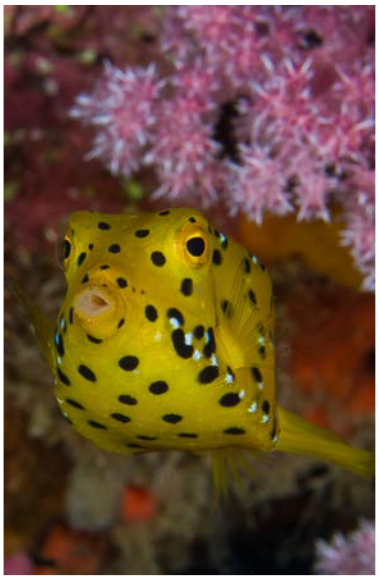
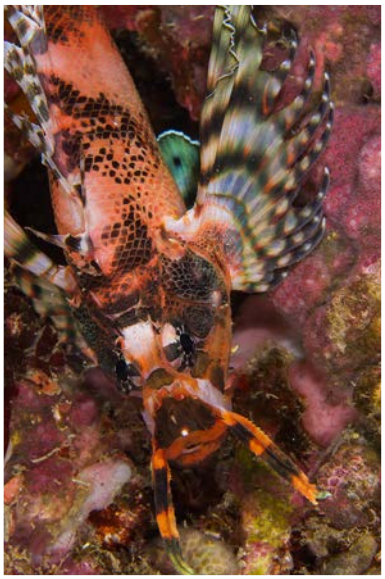
Not far from there, Gérald pointed out 2 leaf fish hitched side by side being gently rocked by the light current. I was also able to add a twinspot lionfish, giant moray, marbled eel, a nudibranches, flange blennie and a peacock flounder to name just a few, to my photography archive.

Accompanied by Stéphane, a former Mauritian dive guide, we lingered over a rock on which we observed a shy midas blennie. This is a blennie with a strong yellow coloured dominance that likes to hide in small holes in









rocks. Its tail is V-shaped but it does not often allow us to see it because it prefers to stay in the comforts and safety of its hole.

During the safety stop, we heard a very sudden and sharp noise. It is simply that of the dolphins swimming along the surface most probably followed by the tourists' boats. Indeed, along the coast, one or two groups of dolphins are generally seen and tour operators don't miss the opportunity to get the tourists out to swim with them.

WRECK KEI CEI 113

This wreck lies on the bottom at 35 metres and peaks at 28-30 metres. This wreck was previously a boat restaurant. Following bankruptcy, the owner decided to give his boat to the State to create a wreck for divers. It was sunk on October 11th, 1987.

Take a step backwards and we're back in the underwater environment. Guided down by the anchor's rope, we can make out the outlines of the wreck on our descent. The boat is not very big, but big enough to shelter a large quantity of fish such as snappers, soldierfish, goatfish, lionfish, cardinals and other fusiliers. Inside the wreck, 2 enormous giant morays have taken up residence. On this day, we are lucky enough to have seen only one of them. The other one was most probably hiding in a hole. Having made the small tour around the wreck, Gérald signals us to follow him. Followed by 4 other divers, Gérald guides us towards a small reef approximately 38 metres deep. There, again, the underwater world shows us its glorious colours. On the right, schools of snappers with yellow stripes mix with the squirrelfish of lively red. To the left, fusiliers with yellow bands show us their synchronized ballet. In front of them, a yellow trumpetfish rests for a photo. In masses of fallen rocks, surgeonfish sneak between the small cracks.

Try not to forget and make sure to check your dive computer often, especially when at such a depths. Gérald signals the group to begin the ascent back up towards the boat.

As you can clearly see, Mauritius possesses many diving marvels to be discovered! But it also offers hikes in beautiful forests, over hilly landscapes, there are distilleries of dark rum to be visited and Port Louis, the capital, with the botanical park and walks by the sea. More still waits to be discovered on this island which, I think, will satisfy all the family.

I would like to thank Gérald and his wife Estée again who were very professional and very helpful as were the rest of their team. It was a pleasure to have dived in their company. Their knowledge of the reefs and the marine life inhabitants was very appreciated.

Mauritius Island is an island with character found nowhere else.

SUNDIVERS

GERALD RAMBERT UW PHOTOGRAPHY

HYDROCEPHALUS, SHUNTS, AND SCUBA DIVING
CAN THIS BE SAFE?

FEATURE **CAREN LIEBSCHER**

NEUROLOGICAL ASPECTS AND SCUBA DIVING

Can someone with a shunt go scuba diving?

The answer to this question is not an easy one and a bit complex. In general, a shunt is a system that shifts fluids. In this specific case a shunt is an artificial pathway made of fine tubes, a catheter, and a valve. The fluid to be shifted is from the brain to the body's periphery because the person has been diagnosed with a hydrocephalus (from Greek "hydro" for "water" and "cephalus" for "head").

Our brain and spinal cord swim in a so-called cerebrospinal fluid (CSF) that buffers it against concussions and also protects it otherwise. Scientifically it's called Liquor cerebrospinalis. The CSF fills cavities, so-called ventricles in the brain. Usually the CSF is produced and then absorbed by the brain and its adjacent layers in a balanced way. A hydrocephalus is caused by a deficiency regarding the absorption of the brain's fluid which can evolve from a bleeding in the brain caused by a previous stroke or ruptured aneurysm, or can just be a birth defect. It is a very serious, life-threatening neurological condition and jeopardizes all vital functions since it puts the brain under increasing pressure. The pressure cannot go anywhere because the skull is a bony and solid structure which cannot expand.

The symptoms of a hydrocephalus may be low blood pressure, bradycardia, slurred speech, inability to walk, speak, think, eat, drink or act in any way, extremely slow movements, comatose tiredness and, finally unconsciousness. A person with these symptoms needs immediate help and medical attention. In an emergency situation like this, a neurosurgeon will drill a hole in the skull and release the fluid and the pressure. If the hydrocephalus is a permanent condition, the insertion of a shunt system is indicated as a permanent solution to continuously release the superfluous fluid from the brain. People can live a normal – terrestrial – life with a shunt.

The shunt's catheter is positioned centrally in the brain's ventricular system and connects to the tube via an adjustable unidirectional overpressure valve. The tube runs subcutaneously, i.e. under the skin, along one side of the body and leads either into the abdominal cavity or to the atrium of the heart. Fluid will be shifted from the brain to the periphery of the body when the pressure in the head overcomes the pressure setting of the valve.

Those shunts are called either VP shunt or VA shunt. VP stands for ventricular-peritoneal and VA for ventricular-atrial. "Peritoneal" means the abdominal cavity (peritoneal cavity), "home" to our inner organs and intestines, while "atrial" refers to the atrium of the heart. Both peritoneal cavity and atrium have the capacity of taking up the additional fluid which can be absorbed and finally be excreted via the kidneys. Which shunt system is inserted lies mainly upon the discretion of the operating neurosurgeon.

Shunts shift fluids and under normal circumstances there would be no air involved. Therefore, pressure differentials are not necessarily expected from the changes in pressures of diving. Ventriculo-peritoneal (VP) shunts are considered less likely to cause problems when diving whereas ventriculo-atrial

shunts (VA) bear an increased risk of bubble formation at the point of shunt insertion, shunt malfunction due to high pressure or extreme pressure changes, and an increased risk of epilepsy following the insertion. In case of such epileptic seizures a seizure-free and anticonvulsant-free period of at least 5 years would be required before considering diving or going back to diving again.

Studies have shown that a person with a VP shunt is assumed to be able to dive safely up to four atmospheres of pressure. This means that it is most likely safe to dive down to 100 feet (33m), as was demonstrated in hyperbaric chambers where normal functioning of the shunts up to this pressure was shown. Specialists believe a VP shunt will drain normally because the ventricles in the brain as well as the abdomen will be equally affected by the increased ambient pressure of the deeper water. VA shunts, however, are affected by the blood stream in which nitrogen bubbles may form while surfacing from a dive. These bubbles have the potential to interfere with the well-functioning of the shunt. VA shunts are therefore not allowed by most diving certification agencies.

Clearly, diving should be suspended if there are any problems with breathing, headaches or neurological disorders (like spasticity). People with shunts should be warned about the risk that there is poor functional reserve in case of either any problem with the shunt or any problem with DCI. Regarding DCI, as long as the hydrocephalus is managed well and the ventricles are not enlarged, it is not assumed that there is an increased risk of DCI in VP shunt carriers.

Another real threat can be infections. Surgery sutures after shunt insertion should be healed completely before any water – fresh or sea water – comes in contact with them. The catheter reaches into the brain's ventricular system but its other end is just below the skin of the skull. If there is a wound on the scalp close to the top ending of the catheter and the area gets infected, it could quickly reach the brain – and a brain infection is a life-threatening scenario.

Generally, a person with a shunt should think twice whether traveling abroad and diving in remote locations are both activities worth considering. In order to make an informed decision about it, it is advisable to consult a neurosurgeon specialized in shunt systems and a dive physician knowledgeable in the same field. Both neurosurgeon and diving physician need to know the entire medical history, the pre-existing condition that led to the insertion of the shunt, and the person's current health status before they can give a complete answer.

In most cases, a person with a hydrocephalus has experienced serious, life-threatening temporary brain deficiency. Only quick diagnosing and immediate insertion of a shunt system have probably saved the normal brain function. A shunt system is an artificial and technically complicated system. Material damages or defects can occur – as in any artificial system. Such dysfunctions or malfunctions require immediate intervention. Only a clinic with a neurosurgical department can help in this situation. Determining a shunt dysfunction or malfunction usually requires brain imaging with a CT (computer tomography). After locating the defect and determining its severity, it will require immediate brain surgery and probably a replacement or partly revision of the shunt system. In some cases, only the valve may need adjustment. Not every clinic has this special technical equipment. Some valves can be adjusted by magnets from the outside and surgery will not be necessary but you need to find a hospital with this specific magnetic system. Since there are several valve and shunt systems on the market, you are lucky to find one that has exactly yours, and really unlucky if you don't. In many dive spots such state-of-the-art medicine and higher standard health care might not be easily available.

TAKE HOME MESSAGE:

Divers with a shunt should watch out for neurological disabilities, numbness of extremities and "autonomic" instabilities (e.g., postural hypotension, blood pressure changes and disability to react to cold water immersion). Neurological deficits should be documented for any diving physician in case of an accident. A copy (or the original) of the valve pass should be carried. The shunt should be fully functional and have no dysfunction.

You should get information to what kind of restrictions you have to follow while diving with a shunt. Neurosurgeons and dive physicians should well explain the involved risks. It is advised to arrange dives with specially trained dive instructors and to inform dive buddies about the implanted shunt system.

Be a responsible diver! Good luck and good health to you!

DAN | AlertDiver

STICK TO YOUR MAXIMUM OPERATING DEPTH

FEATURE **NEAL POLLOCK, PH.D.**

Question: On a recent dive trip, my buddies and I dived using 30 percent nitrox. Beyond our maximum operating depth was a big turtle that my buddies wanted to photograph. They decided to take deep breaths and hold them to prevent breathing in oxygen at the deeper depth. Besides the obvious concerns regarding breath-holding and exceeding maximum operating depth, I thought the oxygen in a diver's system would be compressed to ambient pressure regardless of whether or not he breathed. Can you please clarify?

Answer: As you surmise, the logic employed by the other divers was not valid. The gas in their lungs would be compressed as they descend, whether or not they breath-hold. Descent produces an increase in the gradient that drives oxygen into the blood, and the volume of gas in the lungs is substantial enough that constant breathing is not required for the effect to be meaningful.

The risk of oxygen toxicity also increases with increasing exercise intensity and carbon dioxide (CO_2) levels. Thus, not only did these divers fail to eliminate the elevated oxygen exposure, but also the breath-hold would have created rising CO_2 levels to further increase the risk of toxicity if sustained for a substantial period of time.

The question of what is an appropriate maximum partial pressure of oxygen (PO_2) has evolved recently. The old limit of 1.6 ATA has largely been replaced with 1.4 ATA, particularly for depths where the complication of a seizure would be much more difficult to survive. One of the most challenging realities to understand in diving physiology is that getting away with something once, twice or 10 times is not a guarantee of future safety. Respecting maximum operating depths to limit PO_2 to no more than 1.4 ATA and keeping exercise intensity at depth as low as possible should be the baseline for safe practice. Creative alternatives may be enticing right up to the point where they fail. The best way to prioritize safety is to adopt more conservative limits wherever feasible, and bear in mind, in real time, that the worst possible outcomes really can happen. Our diving fatality databases make this unhappy truth very clear.

DAN | AlertDiver

THE WEDDING RING STORY

FEATURE **CAREN LIEBSCHER**

Watch your fingers when you go diving!
Wearing a wedding ring is clearly a statement, yes, but, Ladies and Gentlemen, do you really need to wear a ring while scuba diving? Read our story and think about it.

It was around Christmas time, the Holiday season 2014/2015, when DAN Europe were reported two similar cases. Two DAN members in different places of the world – the Maldives and Brazil – almost lost their ring fingers while diving.

Who wouldn't hold on to some railing on a shaky boat because another boat passed by too close or sea conditions were a bit rough? That's what the men did while getting ready for the giant stride to start their dives. However, watch out for screws, hooks or other tiny metal pieces sticking out of such a railing! For example, hurricane cover screws can be quite deceitful. If a wedding ring gets caught on it, holding the weight of the diver, his equipment as well as the force of the jump, is just impossible. A little finger cannot withstand for long and will momentarily be parted of the rest of the body. This happened to both men.

While one of the divers dove into the water beneath him his finger stayed hanging on the screw, attached by the ring. An awkward scene but good in a way, because the crew could collect the finger – or what was left of it. They then saved it on some ice for re-attachment to the hand.

In the other man's case the finger was ripped off and fell into the sea! Fortunately, his wife recovered it – she was already in the water.

In both cases, it truly was a shock for everyone and very painful for the victims. However, the boat's crew was extremely helpful, called EMS immediately and gave first aid to stop the bleeding and calm the men down.

In one of the cases, they were able to call a helicopter – because, luckily, the victim's friend was a pilot – so, he was quickly evacuated to a clinic in Sao Paolo, including his finger. The other member in the Maldives was brought by boat to the nearest clinic in Male but had to be further evacuated to Singapore for sophisticated hand surgery. Reconnecting nerves, tendons, muscles, bones, cartilage, blood vessels, and skin is a very sophisticated task while trying to keep full functionality. It is a miracle when you see it – a miracle that took 7 hours in the operating theatre to happen.

After an injury and surgery like this, it is no surprise that there is necrosis, dying surrounding tissue, during the wound healing process. The Brazilian doctors fought it off by hyperbaric oxygen treatment (HBOT) in a recompression chamber. HBOT chamber sessions are also being successfully used for effective wound healing in bacterial streptococcal or staphylococcal skin infections and diabetic foot disease. Thus, recompression chambers are not only good for treating decompression symptoms.

Not only was the surgery extensive but the recovery also took an extremely long time – and it still does. Eight months later, the one man's finger has not regained full sensitivity yet. Six more months of physiotherapy are still in front of him.

The costs for evacuation, the hand surgery, hospitalizing and hyperbaric treatment amounted in one case to around €100,000.

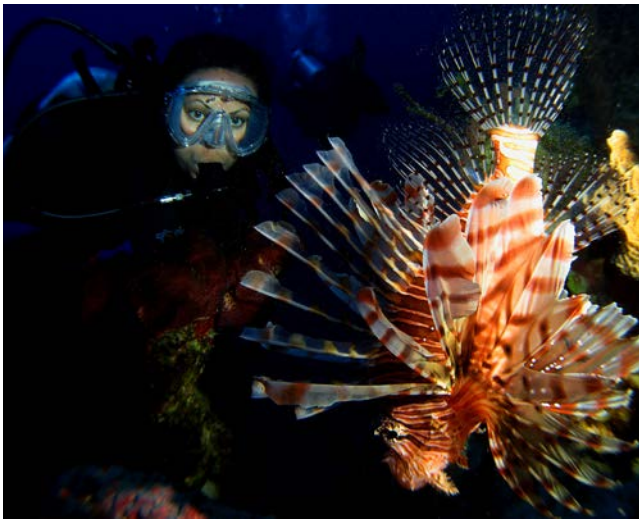
We at DAN Europe thought this was a story to share. You may spare yourself a lot of trouble when you consider leaving your jewelry, especially rings, but also earrings and piercings, at home before you go diving.

Make your choice!

WOMEN AND SCUBA DIVING

FEATURE **BARBARA KARIN VELA, MD** PHOTOGRAPHY **GEORGE CATHCART/MARINE PHOTOBANK**

"The only difference between men and women divers, is that during pregnancy, women should not dive – everything else is trivia and misinformation."
Lt Col R Kelly Hill, MD



From the beginning, diving has been considered a man's sport, mostly because it was part of the armed forces. The first female divers had a very challenging task to get all the equipment to fit so they could enroll in diving activities. It was difficult to find a well fitting mask, so female divers had a lot of leaking at the sides of the mask; scuba cylinders and buoyancy compensators were generally too large which would give excessive drag; fins were too large so it was easy to lose them and hard to swim; ill fitting wet suits would give female divers thermal discomfort. There is however, a long history of female divers, starting with Amas divers of Korea and Japan. Amas are female breath hold divers, famous for their pearl diving. Initially, there were both male and female breath-hold divers in Asia, which changed only four to five hundred years ago. It is believed that female divers prevailed because they adapted to cold better than the males. Diving was also believed to affect male virility. In literature, James Bond became involved with the Ama diver, Kissy Suzuki from the novel, You Only Live Twice by Ian Fleming.

In the 1940s Simone Cousteau, the wife of the famous underwater researcher Jacques Cousteau, joined her husband in using scuba apparatus by Aqualung and Lottie Haas provided her expertise in diving and underwater photography. Valerie Taylor and Eugenie Clark known as the "shark ladies" were scientific divers in the 1960s, and in 1973 Kati Garner was the first woman to graduate from the US Navy Diving School. Women account for some 35% of all recreational diving certifications issued, and perhaps the most important contribution of women to diving is in the instructional area.

There are a few important differences between male and female divers: body dimensions and muscular force, mental factors, subcutaneous fat and body composition, hormones/menstruation and pregnancy.

Women have higher percentages of body fat and men have more muscle mass (40%) compared to comparatively fit women (23%), which means that women can find it more difficult to swim against currents and get tired more easily than their male counterparts. Women are smaller, and have smaller lungs therefore they utilize less air while diving so air cylinders last longer than that of a male buddy. Women are more sensitive to cold water than men due to an increased thermal heat loss, because they have larger surfaces and smaller body volumes. More fat tissue than muscles, generate heat just by being active, which means that women will feel cold sooner than men.

When it comes to menstruation, there is one simple rule: if there are no problems on land, there are no problems in water. The average blood loss during 3-5 days of menstruation is 50-150ml, which is not a significant amount of blood lost. A lot of women are afraid that they will attract sharks while menstruating; however, there is no support for that belief. In fact, female divers experience less shark attacks than male divers. It is believed that the menstruation blood, which consists of ruptured red blood cells and cellular debris, serve to actually deter sharks, not the opposite.

Some women have reported an increased number of migraines in the menstrual cycle, so, if a diver suffers from it, it is advisable either to avoid diving or to avoid the known triggers for the migraine attacks (certain foods, cold, tension/anxiety). If the migraine attack happens underwater, with its typically associated symptoms (nausea, vomiting, vertigo, numbness, etc) it can be easily confused with cerebral decompression sickness or an air embolism. Women reported most problems during diving in the week just before the period in the study conducted by Marguerite St. Leger Dowse, another famous female diver and researcher.

Possible fluid retention and swelling of mucosal membranes, happening due to the hormonal changes in the premenstrual period, can make it more difficult to equalize ears and make female divers more susceptible to sinus and ear barotraumas. Some women experience severe premenstrual tension, with psychological and physiological symptoms like anxiety, tension, irritability, mood swings, fatigue and muscle cramps. They should refrain from diving during that time because this can be dangerous for themselves and their buddy.

During pregnancy, women should not dive, because there are risks for both, the pregnant woman and the fetus. A lot of women experience morning sickness during pregnancy, which can be a significant problem for diving. Due to the pressure of organs from abdomen on the lungs, there is reduced lung capacity and impaired peripheral circulation, reduced fitness level, ill fitting equipment and fluid retention which can increase a risk of DCI and swelling of mucosal membranes (leading to problems with equalization of the pressure in the ears). During a dive, it is the fetus, not the mother who would be exposed to more potential risks like increased nitrogen and oxygen pressures which can disturb their growth and development by causing malformations, whereas "bubbles" from maternal blood can block the fetal circulation and cause the death of the tissue or the fetus.

Following the delivery, it is recommended that women do not dive until 6 weeks post partum to avoid intrauterine infection, and there are no contraindications to diving while breastfeeding.

Last but not least, there are female divers with breast implants. Dr. Richard Vann conducted a study where breast implants were placed in the hyperbaric chamber and tested if the bubble formation in the implants will cause any changes in the size of the implant, and induce tissue damage. It was found that bubbles form in three types of tested implants (saline, silicone and combined) due to the pressure changes, but they can resolve over time and do not cause any damage to surrounding tissue or implant. Having breast implants is not a contraindication for recreational scuba diving, however a diver should be aware of possible buoyancy problems and should have appropriate training and appropriate weight adjustment.

Dr. Karin Vela is a Diving Medicine physician EDTC/ECHM IIa and works in Dubai London Specialty Hospital.

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UPCOMING EVENTS

CLEAN UP ARABIA

Friday 30th September | East Coast from Le Meridien Al Aqah Beach Resort
Registration 08:00 | Clean Up Begins 9:00

Join this year's Clean Up Arabia happening on the East Coast for dive clean ups and beach clean ups.

IMPORTANT FOR DIVERS: Please make sure to rent your diving equipment ahead of time with your local dive centre in order to not be disappointed or contact Al Boom Diving at Le Méridien Al Aqah Beach Resort directly.

Register by email to Ioline at projects@emiratesdiving.com or call 04 393 9390.

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OF SHARK AND MAN MOVIE SCREENING WITH DIRECTOR

Wednesday 16th November | VOX Cinemas Mercato
Screening and Q&A with the Writer, Producer & Directer, David Diley

Of Shark and Man is an independent movie that follows the journey of David Diley, an ordinary man as he pursues his childhood love of sharks, uncovering one of the greatest conservation success stories of all time in the process.

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Emirates Diving Association

MISSION STATEMENT

To conserve, protect and restore the UAE marine resources by understanding and promoting the marine environment and promote environmental diving.

LEGISLATION

Emirates Diving Association (EDA) was established by a Federal Decree, No. (23) for the year 1995 article No. (21) on 23/02/1995 and chose Dubai as its base. The Decree stipulates the following responsibilities for EDA.

- To legislate and regulate all diving activities in the UAE.
- Ensure environmentally respectful diving practices in all EDA members.
- Promote and support the diving industry within the UAE by coordinating the efforts of the diving community.
- Promote diving safety in the commercial and recreational diving fields through standardization of practices.
- Promote and preserve historical aspects of diving within the gulf region and enhance environmental education to diving and non diving communities through EDA activities.

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