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DIVERS FOR THE ENVIRONMENT

WWW.EMIRATESDIVING.COM | MAGAZINE | DECEMBER 2019 | VOLUME 15 | ISSUE 4

TUBBATAHA REEFS
A UNESCO JEWEL

ZAYED'S ANTARCTIC LIGHTS WITH VOX CINEMAS • **CLEANUP ARABIA 2019** • THE ENOS®-SYSTEM
• **COMMERCIAL UNDERWATER ASSIGNMENTS** • BLACKWATER DIVING • **DAN EUROPE**

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Together, every day, we work to develop endless new ways for people to create great moments together.

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GREAT MOMENTS FOR EVERYONE, EVERYDAY.

EDA
جمعية الإمارات للغوص
Emirates Diving Association

REGULARS

NEWS

KIDS CORNER

REEF CHECK

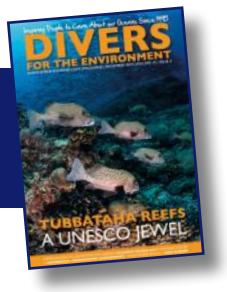
FEATURES

EQUIPMENT REVIEW

UW PHOTOGRAPHY

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's. The magazine is 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 released in March 2020. Send all articles, feedback or comments to: magazine@emiratesdiving.com

COVER
PHOTO BY ANTHONY LEYDET
Tubbataha Reefs, Philippines



REDUCE REUSE RECYCLE

DIVING DESTINATIONS

HEALTH

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

EDITOR & DESIGNER

ALLY LANDES
Ally is EDA's Project Manager, Graphic Designer, Writer, Editor, Photographer & Videographer. She created and introduced 'Divers for the Environment' back in December 2004 as an educational tool to share information by professionals, conservationists, scientists and enthusiasts from all over the world, to better care for and protect our underwater world.

COVER STORY AUTHOR & PHOTOGRAPHER

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Professionally involved in the diving industry since he started diving in the early nineties, Jesper ran a successful Scandinavian divers magazine for many years. His articles and photos have appeared in books, magazines and websites all over the world. Today he lives in Dubai, involved in marketing but finds time to teach diving to Global Underwater Explorers.

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PATRICK VAN HOESERLANDE
Diving opens up a whole new world. Being a writer-diver and co-editor of the Flemish divers magazine, Hippocampus, Patrick personally explores our underwater world and shares his experiences through his articles. You'll find a collection of them on **www.webdiver.be**.

عام التسامح
YEAR OF TOLERANCE

SPIRIT OF THE UNION 2019

IBRAHIM AL-ZU'BI
EDA Executive Director

As we celebrate the 48th UAE National Day this year – the Year of Tolerance, we reflect on the spirit that ties us all together, the Spirit of the Union that enables millions of people to coexist and build lives together. The Spirit of the Union is derived from the vision and leadership of the late Sheikh Zayed Bin Sultan Al Nahyan, EDA's founder, and now lives on through His Highness Sheikh Khalifa Bin Zayed Al Nahyan, President of the UAE and his fellow leaders of the nation's Emirates who are shaping the UAE's future.

It is the spirit that binds the cosmopolitan community of the UAE, connecting us under one banner, one flag. It is the spirit of the union that celebrates our culture and heritage, and yet also shapes our future. The spirit needs to be celebrated and shared by all citizens and residents of the UAE.

I look back at all our events this year, from the rise in EDA members, to all my discussions with the divers that I meet randomly while diving in and out of the UAE, and reading the articles in this issue, the first thing comes to my mind, is that divers are making a difference all over the world. In this last issue of Divers for the Environment 2019, we have some very interesting articles for you. You can read the Reef Check updates where divers make use of their underwater adventures and help protect the underwater world. You will also read about lots of initiatives from the diving community and see the results from our main clean-up campaign – Cleanup Arabia 2019.

Cleanup Arabia 2019 had another great success this year; we had more than a thousand participants helping to clean our beaches and dive sites. I would like to thank our Cleanup Arabia sponsors for their generous support, our partners in the UAE's Ministry of Climate Change and Environment, and Dibba Municipality for their support and most importantly, our EDA members for their dedication and passion to conserve our environment. I have no doubt that all divers want to protect and conserve our marine life – in simple words – we want to enjoy our dives and be responsible at the same time; without healthy corals or fish, dives would be boring!

Making a difference goes beyond protecting the environment, although as you will read in this issue, everyone has been very busy organising clean-ups and awareness campaigns, I am very happy to see more activities for different stakeholders of the community such as social movie nights at VOX Cinemas in the UAE and school awareness sessions.

I would like to wish everyone a happy 48th UAE National Day. I also want to wish you all a Merry Christmas and a Happy New Year. I am looking forward to 2020, which I am sure will be as exciting, fun and rewarding as this year.

"We cherish our environment because it is an integral part of our country, our history and our heritage. On land and in the sea, our forefathers lived and survived in this environment. They were able to do so only because they recognised the need to conserve it, to take from it only what they needed to live, and to preserve it for succeeding generations. With God's will, we shall continue to work to protect our environment and our wildlife, as did our forefathers before us. It is a duty, and, if we fail, our children, rightly, will reproach us for squandering an essential part of their inheritance, and of our heritage." – The late Sheikh Zayed Bin Sultan Al Nahyan

Happy reading and dive safe!

Ibrahim Al-Zu'bi

Ibrahim N. Al-Zu'bi

48 روح الاتحاد
SPIRIT OF THE UNION
NATIONAL DAY اليوم الوطني
UNITED ARAB EMIRATES الإمارات العربية المتحدة

AN EDA MOVIE NIGHT WITH VOX CINEMAS
ZAYED'S ANTARCTIC LIGHTS

EDA and VOX Cinemas, Mercato Mall teamed up for the final EDA Movie Screening of 2019 on Wednesday, 13th of November with the Environment Agency - Abu Dhabi and the Jane Goodall Institute's award winning documentary, 'Zayed's Antarctic Lights'.

A big thank you to Team Zayed's Winston Cowie, and Team Tolerance's Humaid Al Khanji for joining us from Abu Dhabi to do a Q&A with our members.

FILM SYNOPSIS

Zayed's Antarctic Lights, is a documentary that chronicled a two-week expedition to Antarctica by three EAD staff members as they witnessed and studied first-hand the impact of global warming and climate change. The journey was part of the Climate Force International Antarctic Expedition led by Sir Robert Swan, the first explorer to walk to the North and South poles.

The UAE is one of the countries vulnerable to the effects of climate change. With nearly 1,300 kilometres of coastline, it is imperative that the UAE undertakes collaborative efforts to mitigate the risks of rising sea levels.

The film features Rashed Al Zaabi, a mammologist at EAD; Mariam Al Qassimi, Communication Specialist at EAD and the UAE Co-ordinator of Jane Goodall's Roots and Shoots programme; and Winston Cowie, the Agency's Marine Policy Manager – who are part of EAD's 'Team Zayed' – as part of the Climate Force International Antarctic Expedition led by Sir Robert Swan.

During their expedition, 'Team Zayed' lit up the Antarctic sky with 100 solar lights, sending a message of unity, hope and action on climate change to mark the Year of Zayed and celebrate the living legacy of the UAE founding father's environmental stewardship. Each light represented a pledge of commitment to engage in community initiatives that will tackle climate change and global warming.


ANTARCTICA


2041
2041


Environment Agency - ABU DHABI
عام زايد
YEAR OF ZAYED


VOX


VOX
VOX


EDA


VOX
VOX


EDA


EDA


EDA

BOSTON CONSULTING GROUP BEACH CLEAN-UP
AL ZORAH BEACH, AJMAN

PHOTOGRAPHY **ALLY LANDES**

The clean-up season was officially opened for business in October with another very successful beach clean-up with Boston Consulting Group (BCG), 3 years running as part of their driving force for inspiring corporate purpose that maximizes both social and economic value.

On the 3rd of October, the BCG team managed to collect a whopping 204.5 kg of debris with 4,841 items collected from the Al Zohra Beach of Ajman with the support from the Ajman Government and Municipality.

We are now using burlap coffee sacks for our 'Cleanup Arabia' beach clean-ups donated to us by Nightjar Coffee Roasters LLC. Once each bag is filled and weighed, it is emptied out onto our tarpaulin matt so that at the end of the clean-up, the volunteers can team up and count each item collected and record them onto the International Coastal Cleanup (ICC) forms which we send to the Ocean Conservancy, and the rubbish is transferred to refuse bags the municipalities collect at the end of our events.

A big thank you to BCG for their teamwork and continued efforts given to caring for our environment.

TRASH TYPE	TOTAL
MOST LIKELY TO FIND ITEMS	
Cigarette Butts	1259
Food Wrappers	24
Plastic Take-out Containers	28
Foam Take-out Containers	7
Plastic Bottle Caps	2,140
Metal Bottle Caps	26
Plastic Lids	244
Straws/Stirrers	72
Forks/Knives/Spoons	26
Plastic Beverage Bottles	274
Glass Beverage Bottles	80
Beverage Cans	155
Plastic Grocery Bags	20
Other Plastic Bags	64
Paper Bags	15
Paper Cups & Plates	42
Plastic Cups & Plates	45
Foam Cups & Plates	19
FISHING GEAR	
Buoys/Pots/Traps	8
Net & Pieces	28
Rope & Line	35
OTHER TRASH	
Appliances	8
Balloons	2
Cigar Tips	35
Cigarette Lighters	7
Construction Materials	24
Fireworks	5
Tyres	2
PACKAGING MATERIALS	
6-pack Holders	6
Other Plastic/Foam Packaging	18
Other Plastic Bottles	2
Strapping Bands	6
Tobacco Packaging/Wrap	12
PERSONAL HYGIENE	
Condoms	2
Diapers	2
TINY TRASH (< 2.5 cm)	
Foam Pieces	5
Glass Pieces	6
Plastic Pieces	55
DEAD/INJURED ANIMAL	
Fish (Dead)	2
EXTRA ITEMS	
Metal Pieces	2
Razor	1
Childrens' Toys	2
Carpet	1
Traffic Cones	2
Cricket Bat	1
Beach Chair	1
Coat Hangers	2
Shoes	1
Clothing Items	2
GRAND TOTAL:	4,841
TOTAL NO. OF BAGS:	31
TOTAL WEIGHT (KGS):	204.5







MAJID AL FUTTAIM
BEGINS BREAK UP WITH SINGLE USE PLASTICS

DUBAI – 5th NOVEMBER 2019

Yes, you heard it right. Majid Al Futtaim, the much-loved creator of 'Great Moments for Everyone Everyday' has announced its company-wide pledge to phase out single-use plastic by 2025. Starting one country at a time, the company will phase out single use plastic from its operations.

It's a mammoth task for a multi-national organisation operating 26 malls, 13 hotels, 46 VOX Cinemas and more than 285 Carrefour stores across the Middle East, Africa and Asia. Just last year, Majid Al Futtaim's shopping malls welcomed 192 million visitors and it is estimated that if each one of those visitors took home just two Carrefour plastic bags, that would total more than two million kilogrammes of plastic waste.

It's hard to change old habits, so the pledge will help customers reduce their use of plastic by removing freely distributed plastic items from Majid Al Futtaim's supermarkets, cinemas and hotels.

On-shelf merchandise such as garbage bags, detergent bottles and cleaning products will still be available for customers to purchase.

As part of the new pledge, Carrefour stores will take 500 million plastic grocery bags out of circulation each year – a huge step towards a plastic-free future.

Speaking at the launch of the pledge, Ibrahim Al Zu'bi, Chief Sustainability Officer, Majid Al Futtaim – Holding, said, "Our sustainability journey begins with our mission to deliver truly 'Great Moments for Everyone Everyday', and we simply can't do that at the sake of the environment. For business to be sustainable, it must be in harmony with the planet. I believe we need to continue to push the sustainability agenda at a faster pace, and our customers are very much a part of that. We listen to them, and we want to make it easy for them to make smart choices to live a sustainable life – and hopefully to support brands that are making a real difference in the war on plastic."

To help customers get started with their best plastic-free life, they are encouraged to sign up for Majid Al Futtaim's new lifestyle rewards programme, 'SHARE'. Each re-usable bag bought between November 6th and 7th will be credited back in 'SHARE' points. Plans are also underway to introduce an initiative where customers who shop with their reusable bags will receive even greater 'SHARE' rewards. Sounds like the kind of eco-friendly deal everyone loves!

TWO GENERATIONS COLLABORATE TO ADVOCATE ENVIRONMENTAL JUSTICE THROUGH FICTIONAL BOOK ABOUT A PINK DOLPHIN

SHARJAH – 2nd NOVEMBER 2019

Two UAE-based friends, Rouba Zeidan (44) and Dr. Hamed Abuthina (71) launched an educational children's book at the Sharjah International Bookfair this week. Titled 'Boto, the Ocean Environmental Hero', named after the native Portuguese reference for the dolphin species, the book tells an exciting fictional story based on real life environmental challenges seen through the eyes of Boto, a pink dolphin, originally from the Amazon River in Brazil, and a young boy named Luca. Zeidan and Abuthina set out on this journey over a year ago with the aim of encouraging children to seek to protect their planet and the creatures that live in it.

Through storytelling, Zeidan – a corporate reputation consultant, executive coach and jazz & soul singer/songwriter; and Dr. Abuthina – a retired professor of general surgery, use the narrative of the story to raise awareness of the importance of ecological awareness.

They combined their extensive research around the impact of environmental disasters on ocean life with interviews with marine biologists and educators, and their passion for the environment, to create a narrative that blends actual truth with fictional outcomes.

"There were so many causes and so many species we wanted to highlight, and it was really hard to prioritise at first," says co-author Zeidan. "We finally settled on the areas we jointly felt were urgent which started with helping a child in the UAE or Arab world identify with a character all the way on the other side of the planet. The most important mission of all was to weave our messages into the writing while keeping the characters likeable enough to engage with young minds and help them develop a deeper sense of appreciation for the ocean. Since we wanted to submerge children into the world of the sea and make them fall in love with it, who better to front this story than a smart cotton-candy pink dolphin!"

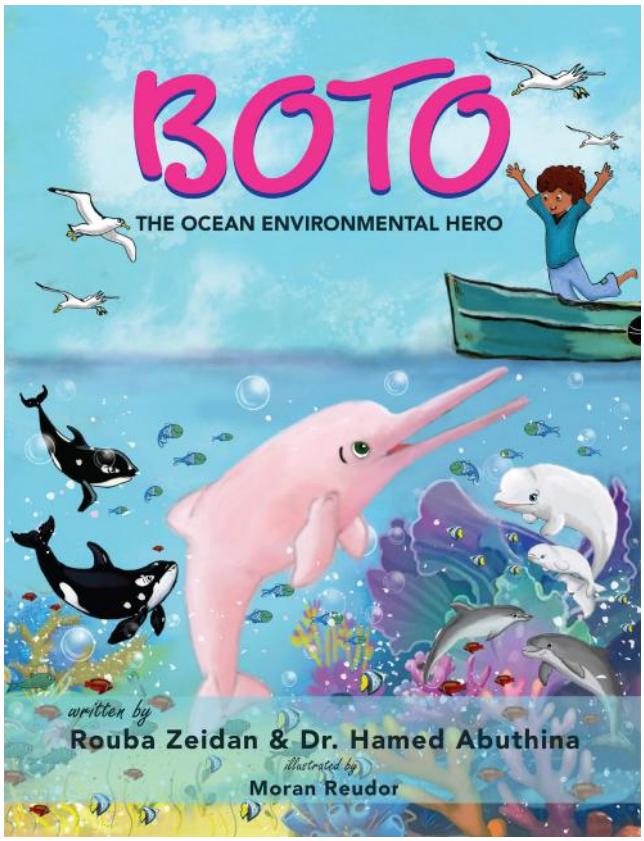
Zeidan says they tested the narrative of the story on family members and close friends, particularly the children in their lives; her two kids and Dr. Abuthina's grandkids.

Dr. Abuthina says the inspiration for him came from his fishing trips at sea. "I see fish caught inside plastic bags, junk floating on the water in the middle of the ocean, and most importantly, the carelessness and disregard for nature. Nature can survive without us; we are the ones who need it and must learn to preserve it; the Economic Forum estimates some 8 million tons of plastic is thrown into the ocean each year.

At this rate, by 2050 there will be more plastic in the ocean than there is fish!" he explains. "I believe the next generation has much more empathy for the world around them and I feel compelled to help nurture and encourage them to make better choices than our generations did."

Following the launch of the English version and the Arabic version, team Boto is set on releasing the book in French and Portuguese in the coming year. "We want to spread the message as wide as possible and use this encounter with these young readers as an opportunity to water the seeds of care in their little hearts and minds."

Dr. Abuthina hopes Boto will be a success and that, "new generations will be inspired to keep their ocean clean and their planet safe; I say ocean in the singular sense because effectively, everything is interconnected and interdependent. Another element which I believe is of extreme importance is overfishing laws. We are fortunate to live in a country that has regulated fishing practices and we commend the UAE for taking such a progressive step in the Middle East, and we hope more countries follow suit to prevent fishing in the wrong seasons. This may be one book in light of the scale and severity of what our Earth is facing, but every step we take towards voicing the message of environmental consciousness gets us one inch closer to possible change."



BOOK SYNOPSIS

Boto is a special creature with a natural intelligence that far surpasses that of humans. His great adventure begins when he bravely enters the salt water ocean environment after getting caught in a large industrial fishing net with all different sizes of fish, including the youngest ones that should not even be fished. As he attempts to find his way back to his friend Luca back in the Amazon River, he is called up on to save his fellow ocean friends from a series of challenges and problems.

On this journey, he encounters a number of different animals: a sea turtle tangled up in a plastic bag, an Albatross in distress, a pod of orcas swimming past an island of garbage in the middle of the sea, an entire community of animals threatened by toxic pollution, and a Beluga whale whose family is trapped in a huge whale prison.

One rescue mission at a time, Boto empowers and leads his new ocean friends to keep their world safe. His bravery creates a global movement that raises the alarm on environmental justice. His bravery reaches people across the seas and his many stories of triumph inspire many. But. As a freshwater fish in the salty ocean, does Boto ever make it back home to the Amazon, where his friend, Luca, passionately awaits his safe return?

Boto is available in English and Arabic around the world through Amazon, Barnes & Noble, and other online stores. It is available in paperback, hardcover and Kindle edition.

A NEW WORLD OF POSSIBILITIES

BY **MAJIDAH HASHIM** – DIVEHEART VOLUNTEER ADAPTIVE DIVER, PADI DIVEMASTER TRAINEE

Who says that people who are differently-abled need to live a life of limitations? The Diveheart Malaysia event, the first of its kind to be hosted by a local private island resort, definitely proved otherwise!

Nestled on the beautiful Perhentian Island Kecil in Terengganu, Mimpi Perhentian Resort was built not only with comfort, but also accessibility in mind – making it the perfect location for the Diveheart event.

According to Resort Manager Mathew Sangilos, when his team sat down to consider what corporate social responsibility activity to organise this year, it was only natural to play their strengths and to do a dive event. When the idea of reaching out to Sekolah Kebangsaan Pendidikan Khas Kuala Besut came about, the wheels were set in motion for a powerful event set to change the lives of these children forever.

Ten differently-abled children from a Hearing Impaired local school participated in the event which included an introduction to scuba diving, quizzes and various beach related activities. While most of the children appeared shy on the first day when they first arrived at the resort, their shyness quickly disappeared when they got into the water with their adaptive scuba buddies.

The children were exposed to basic scuba diving skills such as breathing through a regulator underwater and finning techniques in Mimpi Perhentian Resort's pool, before being introduced to a shore dive by the jetty. The difference in the confidence level of the children was like that of day and night, with a definite confidence boost after the exciting dive experience.

Diveheart is an international non-profit organisation founded in 2001 to provide and support educational scuba diving programmes that are open to differently-abled children, adults and veterans. In opening up the world of scuba diving, Diveheart is on a mission to

build confidence, independence and self-esteem through scuba diving, scuba therapy and related activities.

Diveheart Malaysia Ambassador and Kids Scuba Dive Center founder Syed Abdul Rahman Syed Hussain hopes that this event inspires many others to open their doors to this very special community, "I am thrilled to say that events like this does not only build bridges between us, but it also reinforces our hope in humanity."

The Diveheart Malaysia team spent months training for the event and assembled a diverse team to undertake the responsibility of bringing the experience to the differently-abled community. They even brought in a 'specialist' from the special community. In a heart warming moment that caught everyone in awe, Gary Goh, who is deaf, mute and is a certified divemaster with over 3,000 logged dives, expertly explained to the children open water scuba techniques in sign language, proving to them that their disability does not stand in the way of them becoming dive professionals someday!

To bring gender balance to the event, three young differently-abled women were also invited to participate in the event. They are Nooraishah Arshad who is an amputee, Ereen Pasbullah who is visually impaired and Nurul Fathiah who is paraplegic. All three women experienced multiple boat dives where they were exposed to the variety of marine life that Perhentian Island is world famous for.

In a world that tends to take people who are differently-abled for granted and often underestimate their capabilities, it is certainly an amazing sight to see them have an 'astronaut moment' underwater.

According to Syed Abdul Rahman, "If all of us of different abilities can respect each other like this today, then we can really 'imagine the possibilities' for a better tomorrow."

WHALE SHARKS ON THE MOVE IN SOUTHEAST ASIA BETWEEN THE PHILIPPINES, MALAYSIA AND INDONESIA

HIGHLIGHT THE NEED FOR FURTHER COLLABORATION IN THE CONSERVATION OF THE SPECIES

FEATURE **SALLY SNOW** PHOTOGRAPHY **GONZALO ARAUJO**

Whale sharks are known to travel between locations to feed on a variety of prey, but up until now connectivity within Southeast Asia was limited. Researchers from the Large Marine Vertebrates Research Institute Philippines have tracked whale sharks moving between the Philippines, Malaysia, and Indonesia for the first time using satellite tags, photo-identification and citizen science.

The scientific study published today in Nature's Scientific Reports also highlights Honda Bay in Palawan, Philippines as a globally important site for endangered whale sharks, adding further conservation importance to a country that hosts the second largest known population of whale sharks in the world (**whaleshark.org**). LAMAVE Project Leader Ariana Agustines said, "our results reveal Honda Bay as possibly the largest aggregation site for the endangered whale shark in the region. Through employing several data collection methods – satellite telemetry, dedicated surveys and citizen science, we report the movement within national waters as well as the first international return in Asia."

During April – October 2018, Ariana and the team identified a total of 117 individual whale sharks by comparing the unique spot pattern on a whale sharks skin; a method known as photo identification. These individuals were identified by the team during dedicated research surveys in Honda Bay, Philippines, while a further 66 were identified through data mining citizen science reports – usable photos of whale sharks posted by the public on social media platforms including ©Facebook, ©Instagram and ©YouTube. Citizen science has proved to be a cost-effective method to enhance population data on species such as whale sharks, and in this case, signified the first international whale shark match between the Philippines and Indonesia using photo-ID. A 3-metre juvenile male first identified in East Kalimantan, Indonesia in December 2013 by a citizen scientist and uploaded to Wildbook for Whale Sharks, was re-sighted by the research team whilst on a survey in Honda Bay, Philippines in October 2018. Further photo-ID matches captured by LAMAVE researchers confirmed connectivity between Honda Bay and other sites in the Philippines including: Tubbataha Reefs Natural Park and Oslob, Cebu.

In addition to photo-identification, the research team deployed pop-up archival tags (PAT- tags) to understand regional movements and habitat use. These tags track whale shark movements by recording time, light and depth. Results from successful tracks further highlighted Honda Bay as a hub for whale sharks, both within the Philippines and internationally. One whale shark moved from Honda Bay Philippines, to Sabah Malaysia and back to Honda Bay within a year while another tagged shark showed a similar journey returning to Honda Bay after reaching the Malay-Filipino border. Within the Philippines, tracks showed a whale shark moving northeast of Honda Bay towards Cuyo Island, before returning via Tubbataha Reefs Natural Park.

Protecting whale sharks across their range is vital for the long-term survival of the species. Findings from this study emphasises the need for enhanced management and conservation actions to protect the whale shark through trilateral collaboration. While whale sharks have been protected in the Philippines since 1998, in Malaysia since 1999 and in Indonesia since 2013, and a general understanding that poaching is low, concerns remain regarding illegal take of these animals in the region. A report that contributed to the up-listing of the species from Vulnerable to Endangered on the IUCN Red List of Threatened Species in 2016, uncovered whale shark fisheries (or fisheries that land whale sharks) operating in the south of China where the threat that these activities are encroaching into Malay and Filipino waters was a factor in the cause for this concern.

The connectivity shown between two neighbouring countries, prompts the need for cross-boundary collaboration to manage the conservation of this endangered species and supports the objectives of the Coral Triangle Initiative, the Sulu-Sulawesi Seascape Project, and the Concerted Actions for Whale Sharks under CMS (UNEP/CMS/Concerted Action 12.07.17).

The field research was partly supported by the Rufford Foundation, Fondation Ensemble, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) under its International Climate Initiative, the Department of Agriculture-Bureau of Fisheries and Aquatic Resources and the Palawan Council for Sustainable Development.

The study by Gonzalo Araujo et al., titled 'Citizen Science, Photo-ID and Telemetry, highlights a global whale shark hotspot in Palawan Philippines' was published Open Access in the journal Scientific Reports today and is available here: **www.nature.com/articles/s41598-019-53718-w**

ABOUT LAMAVE

LARGE MARINE VERTEBRATES RESEARCH INSTITUTE PHILIPPINES

Large Marine Vertebrates Research Institute Philippines (LAMAVE) is the largest independent non- profit non-governmental organisation dedicated to the conservation of marine megafauna and their habitats in the Philippines. LAMAVE strives for conservation through scientific research, policy and education.

FOR MORE INFORMATION VISIT:
www.lamave.org
Facebook.com/lamaveproject
Instagram.com/lamaveproject
Twitter.com/lamaveproject

1-3-2-4

STORY BY PATRICK VAN HOESERLANDE ILLUSTRATION PETER BOSTEELS

"Every diver is responsible for his or her own material. That also goes for youth divers," Nella had said. "Your buddy will check your scuba equipment, but you as the diver have to make sure everything is working properly and put it together yourself."

The other youth divers had never heard of this strange 'SCUBA' word before, but Skubba had. It was very similar to his own name.

Fred had looked it up a while ago and had told Skubba what it meant, and he could now explain what the word meant to everyone else.

Of course Nella had already taught them how to assemble their equipment. She had showed them how to do it first, and then they had to do it together. Now, they had to do it alone.

The hardest part was getting the BCD jacket on the tank. For that you had to stand the tank up and then slip the jacket straps over it. Not too low though because your head would bump against the tank during the dive. But not too high either, because the jacket may come loose from the tank. But Skubba couldn't remember what to do after that. First, he had to lie the jacket down on the ground with the tank on top of it and undo the straps to tighten them properly.

Nella had a trick with a number, but he had forgotten it. As always, Fred had neatly noted everything down. It was 1-3-4-2. Start through the first hole, then through the third, then the fourth and finally through number two. Pull and... No matter how he tried, he was always a hole short. How did she do it? Skubba and Fred had a problem. The trick with the number did not seem to work anymore.

They went to ask Nella. When she saw the number, she immediately knew what the problem was.
"It must be 1-3-2-4", she said, and showed them how to do it.
"Then why did it work before?", Skubba asked.
"Because this time, you did it with 2 and 4 in the wrong order."

Weird, Fred thought. He had noted the correct number: 1-3-2-4 in his booklet but he had scratched the wrong one out.

Skubba did it again: first through hole 1, then through number 3, then the 2, and finally, 4. Pull... and success.

The jacket was firmly attached to the tank. Now he had to put the first stage on the tank. Which direction did he have to turn? Left, or right? Fred tried to help, but he too did not know if it was left or right.

Nella saw they were confused and came closer. "Guys, no problem. Many divers don't know it either. But there is a trick to it."
"What trick?"
"Tick-tock, close."
"Tick-tock, close?" they asked in surprise.
"Yes, if you turn in the direction of the arms of a clock, 'tick-tock' then you will screw it in place, or 'close' a valve," she explained.
"Ah," Skubba answered and he tried it. It worked, he could attach the first stage to the tank.
"Now connect the hose and then I will open the valve," Nella said. "How should I turn the valve to open it?" she asked.
"Turning counterclockwise and it will open the valve," Fred said.
"Right! Well done guys."

Skubba and Fred were proud. They could now assemble scuba equipment all by themselves.

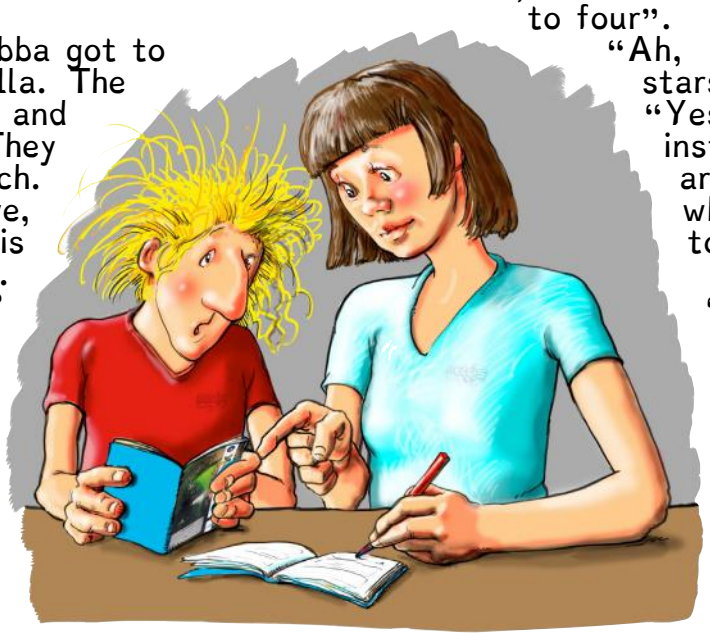
DOL-FUN

STORY BY PATRICK VAN HOESERLANDE ILLUSTRATION PETER BOSTEELS

As the summer progressed, Skubba's number of dives increased. He didn't dive with Nella anymore, at least not every dive. He now dived with other instructors and divemasters.

All his buddies had something special to offer: one always managed to find large fish, the other knew where to find freshwater crayfish, one buddy was able to explain how divers found their way around underwater. Skubba was always learning something new.

Today however, Skubba got to do a dive with Nella. The water had been nice and warm, and clear. They had seen so much. Just like his first dive, Skubba filled out his logbook with Nella. What had they seen?



Fred was happy to look up the fish Skubba had seen in his own book. Pike, carp... all of them were in his book. They were enthusiastic about everything Skubba got to see underwater, as it was something they could share and look over together.

Skubba made a note of everything in his log book that Nella had told him to do underwater, and he also wrote about what he had learned. He also made sure to tell Fred what he had learned during the dive so his friend could be a part of everything.

The icing on the cake was when Nella stuck a nice sticker on his log book page and put a stamp on his card.

He was proud of his book and the dives he had logged.

Suddenly, Skubba's eye caught something Nella had written down in his logbook. "What is that?" he asked. "Look over here," he pointed for Fred to see. "Do you see it?"

It took a while before his friend saw it, but then he said, "What does that mean 2*I?"
Nella had to smile, "That means I'm a two-star Instructor and we write it as 2*I or 2* Instructor".
"Wow!", they shouted together.
"What is a 2* Instructor?"
"In our diving federation, we work with stars. The more stars you have, the more you have learned about diving and the more dives you have done. You start with one star, and then two, and you go on to four".
"Ah, and you have two stars?", asked Skubba.
"Yes, I'm a two-star instructor. Instructors are very good divers who have learned how to train other divers."

"I want a star too," said Skubba.
"That is possible, but it will take time."
"Why?" they asked in unison.
"Youth divers don't get stars, they get dolphins," Nella said.

"I like that..." said Fred, looking for a nice picture of dolphins in his book.

"We use dolphins for youth divers, like we use stars for adults."
"Do I first get one dolphin, then two, then three, and then finally four?"
"You would think so Skubba, but it does not work exactly like that," Nella went on. "You will start with a bronze dolphin, then a silver one, followed by a gold one. A bit like the medals in the Olympic games."

"Do you have to get gold as quickly as possible?", asked Skubba.
"No, it is not a contest. Scuba diving is not a competitive sport. The colour of the dolphin shows how good you are as a youth diver and how much you have learned".

"Ah", Skubba looked doubtful, "but haven't we learned a lot already?"

2019 INTERNATIONAL COASTAL CLEAN-UP HAILED A GREAT SUCCESS

BY **REEF CHECK MALAYSIA**


Photo by Go Green Club


Photo by Javier Deng


Photo by Edmund Lau, RCM


Photo by Coca-Cola

On September 21st, Reef Check Malaysia, Yinson Holdings Berhad and Trash Hero Malaysia, along with other partners joined forces with thousands of people across Malaysia to participate in a nationwide clean-up effort. This was done in conjunction with the 33rd International Coastal Cleanup (ICC) Day 2019, as well as World Cleanup Day (WCD), which fell on the same day this year.

The ICC is the world's biggest annual volunteer effort to protect the oceans. Every year, millions of people around the world gather to collect trash along beaches and record information on the types of trash they collect, which provides insights into ways to tackle the ever-growing problem of marine debris.

In previous years, Reef Check Malaysia (RCM) has conducted clean-ups and educational programmes in conjunction with the ICC on Tioman and Mantanani Islands, but on a much smaller scale. In 2018, RCM organised the first large scale clean-up, which attracted nearly 5,000 volunteers across all states in Malaysia. RCM's Theresa Ng, who coordinated the event, commented: "This year, expected turn-out was even higher than last year, with clean-ups planned in all 13 states plus Labuan Federal Territory. Some locations postponed their events into October due to the haze, so we will have final figures towards the end of October. But this year, 11,900 people participated, so that's already more than last year." According to Faisal Abdur Rani, leader of Trash Hero Kuala Lumpur, most locations had too much trash, which made it difficult for the volunteers to gather and record data.

Staff from our social media partner for this year, Coca-Cola, were also actively involved in the beach clean-ups. "We are glad to be partnering with RCM again for this year's ICC programme. Apart from running beach clean-up events with our associates and partners nationwide, we run social media campaigns with Reef Check Malaysia to invite more Malaysians to be part of this event. Our efforts are in line with our World Without Waste vision, which is to collect and recycle a bottle or can for every one sold by 2030," said Khairul Anwar Bin Ab. Gahani, Head of Public Affairs, Communications & Sustainability, Coca-Cola Malaysia.

These beach clean-ups are part of RCM's long term campaign to reduce marine debris, specifically plastic waste. Ng added, "We are currently part of a multi-stakeholder group that is working to develop a Malaysian Plastics Pact (led by MESTECC) to reduce plastic waste in our landfills and environment. As part of that, we are conducting a recycling pilot project in a neighborhood in Kuala Lumpur to better understand why households are not segregating recyclables from general waste – in accordance with Act 672. We want to find mechanisms to incentivise households to segregate waste so that it can be available for recycling – rather than being dumped into landfills and then escaping into the environment."

The clean-up was conducted at more than 100 locations around Malaysia. Almost 37,000kg of trash were removed from beaches, with the most common items being plastic beverage bottles, food wrappers and cigarette butts. Plastic grocery bags were also listed in the top five most common items found, besides plastic bottle caps. Some organisers have not recorded the number of individual items, as some locations had a lot of trash and it was very difficult to count them. These volunteers had to shovel the trash along the beach into bags instead of picking them up one by one. They reported a net close to 200kg and more than 1,500 polystyrene chips. The amount of trash collected in this location filled a 3-ton skip.

Julian Hyde, General Manager of RCM, added, "It is rewarding to see this event attracting even more people this year than last. Marine debris has widespread impacts on life in the ocean, and much of it is plastic and other trash that we discard without thinking. We would like to thank our sponsors and the thousands of volunteers who participated in the event this year; let's make next year bigger again, raise awareness about the problem to a new level, and make sure that the government takes note – and takes action."

WHAT A DIFFERENCE AN MPA MAKES!

A SUMMARY OF THE 2019 CHANNEL ISLANDS ECOEXPEDITION

BY **SELENA MCMILLAN, SOUTHERN CALIFORNIA REGIONAL MANAGER, REEF CHECK CALIFORNIA**

Photo by Selena McMillan

Photos L-R by Susy Horowitz

Photos L-R by Mike Chiado

This year, twenty Reef Check Volunteers joined the Channel Islands EcoExpedition to survey several sites along California's Northern Channel Islands. We successfully completed six sites at Anacapa and Santa Cruz Islands in two days. Due to high winds and big surf, we were not able to make it to our most remote sites at Santa Rosa Island, but instead managed to get in one day of fun diving at some new places on the back side of Santa Cruz Island.

On the evening of August 4th, everyone boarded the dive charter, the Peace, to sleep through the crossing to Santa Cruz Island. The ride was rather bumpy as the weather had turned, and high winds were creating a large rolling swell. We woke up early the morning of the 5th and after breakfast, coffee, and a thorough briefing of Reef Check protocols and dive plans, we hopped in the water and surveyed our first site, Cueva Valdez. This reef is outside of a Marine Protected Area (MPA) and was devoid of kelp, covered in urchins and mussel shells, but did have a few large sheepshead on the deeper transects. We then heard from Captain Steven that the weather report had changed for the worse, and we should change course to try to survey our sites on Santa Rosa Island. After thirty minutes of pounding the boat against the swell, we had to turn around and return to Santa Cruz, knowing that Santa Rosa was probably not going to happen on this trip.

We completed our second survey at Fry's Anchorage. This site is also not located in an MPA and was similar to Cueva Valdez with very little kelp, but some more variety of invertebrates and fish to count. When we surfaced and found the weather had gotten worse, we hurried back to the boat to move on to the next site, hoping that it was more sheltered from the increasing winds and strong currents.

Our final site of the day, Pelican Anchorage, was an oasis compared to Fry's Anchorage. It was calm, sheltered from the winds, and had more kelp to count. We decided to anchor there for the night and had a wonderful meal of prime rib, halibut and a lovely veggie roast. Some folks did a night dive, while many of us stayed on board watching the bioluminescence, pelagic red crabs, and flying fish feeding and flying around the boat.

The next morning, we completed our sites on Santa Cruz Island by surveying Scorpion Anchorage which is located inside a State Marine Reserve (SMR). This area is filled with pinnacles and shallow reefs. All of those who had nothing to do during kelp surveys the day before, were now busy counting Giant Kelp, Pterygophora, Laminaria, and Southern Sea Palm. We saw tons of invertebrates and lots of fish.

Many of our volunteers commented on the huge difference they observed between the three sites we surveyed the day before that were outside of MPAs compared to this site in an MPA. What a difference an MPA makes!

We then moved to Anacapa Island to complete our last two sites of our survey trip. Goldfish Bowl and Cathedral Cove are both in MPAs and are favourites amongst our volunteers. Both sites have healthy kelp forests and we saw lots of large fish and many species of invertebrates including Pink and Green Abalone. Once those sites were surveyed, we motored around the east side of Anacapa and got a good look at the lighthouse and beautiful arches there. We then went to the backside of Santa Cruz for the night, with the hope of doing a couple of fun dives the next day.

On our final day of the trip, we were able to dive at Gull Island before the winds picked up. This dive was amazing! We found a mixture of Southern and Northern California species, purple hydrocoral, large schools of Sheepshead, many species of rockfish, colonial corals, tons of invertebrates, and a huge stand of giant kelp. We then went to Flame Reef, where we saw lots of brittle stars, keyhole limpets and several species of nudibranchs. A great day of fun diving for everyone on board. We made our way back to the dock in Ventura, getting home early but satisfied after a wonderful trip on board the Peace. Despite not being able to dive Santa Rosa Island, our trip was extremely successful. We are all looking forward to the Channel Islands Expedition 2020!

MY REEF CHECK EXPERIENCE:
DIVING DEEPER INTO CORAL REEF WONDERS

BY **CECILIA VAROTTI, REEF CHECK ECODIVER**

As a marine biology student, I've spent the past two years studying organisms living in the sea and the many threats they are presently facing. Reef ecosystems rapidly became my favourite topic. I hope to spend many years learning as much as possible about them.

I was extremely excited at the idea of taking part in a Reef Check EcoExpedition in Nosy Be, a tiny island nestled between Madagascar and Mozambique: it was going to be my very first experience on a tropical reef and it was going to be amazing.

What I certainly didn't expect was my dominant feeling during our first dive in the Indian Ocean: confusion! Too many colours. Too many animals. Hard corals, soft corals; small fish, large fish; bright purple sponges, stinging hydrozoans; giant clams. It was all beautiful! But despite all my exams and all the studying, I couldn't get my head around all those things: I finally saw with my own eyes what a diversity hotspot looks like. For a brief moment, I had the temptation to shut out all the questions, to stop thinking and just enjoy the reef for its aesthetic value (which was high anyway); but luckily for me (and my future career, one might say) I wasn't there alone.

Thanks to our Reef Check guide, my professors and the staff of the Manta Diving Center of Nosy Be, dive by dive, my colleagues and I began to puzzle the reef out; we applied the Reef Check protocol, starting to recognise some key species and to interpret the meaning of the collected data. We also tried to identify some coral species using the Coral Finder, and eventually we were able to name some of them at first sight – which is not that easy! It might sound trivial, but it's very satisfying and each new piece of information and knowledge makes you want to discover more. You become a better underwater observer and you appreciate all the interactions and peculiarities that a reef can offer.

Even for non-marine biologists, I think Reef Check can be a first step towards a wider and more exciting diving experience; why stop at the surface? There is always a new question to be answered, a new reef to be discovered and explored.

In addition to improving my knowledge on coral reefs, the experience also brought new people into my life, people that share my passion for marine life and care about its conservation, and who made this journey fun; I've added several diving buddies to my contacts.

If you have doubts about the scientific merits of the data collected via the Reef Check protocol, I assure you that these records really have meaning and utility. They're used in many research projects, for example I will use them to write my thesis. With the Reef Check protocol, you really get a chance to be involved in scientific research on coral reefs, often aiming at their conservation. Isn't it exciting?

MY REEF CHECK JOURNEY:
FROM THE MEDITERRANEAN SEA TO THE GREAT BARRIER REEF

BY **SUSANNA PRIMAVESI** PHOTOS **GEMMA MOLINARO**





As an enthusiastic Italian scientific diver, I have been part of the amazing Reef Check family since 2018. My passion for the tropical environment and conservation have taken me to Australia to study the Great Barrier Reef. I took part in several projects, both in Italy and Australia, and found the methodologies are different based on vastly different marine habitats.

Reef Check Italy (RCI) has developed a set of protocols for monitoring the Mediterranean Sea, such as MAC (Coastal Environment Monitoring), Signal fishing nets, Temperature relief, Signal nudibranchs, gorgonians and mass mortality reports. Italy is important for Mediterranean biodiversity; however, this fragile ecosystem is at risk due to human activity and climate change effects such as rising water temperatures and the presence of invasive species.

As Reef Check Italy EcoDiver volunteers, we monitor coastal environments recording the presence and absence of indicator species. The methodology of MAC is based on a visual census in random paths, called "timed swims". Reef Check Australia (RCA) has different protocols, but like RCI, the goal is monitoring and data collection to help manage their underwater habitats. The RCA method is conducted along a transect line where surveyors collect information about substrate, density of invertebrates and fish, and impacts on the reef.

In recent years, the Great Barrier Reef has been subject to climate change and human impacts, such as mass bleaching events, cyclone impacts and Crown of Thorns Seastar outbreaks which have led to coral loss and mortality in some areas.

During September, I participated in RCA's Reef Check Ambassador Training to learn how to educate people about the ocean and empower them to be reef-friendly. One week later, I and other citizen scientists attended a Reef Leadership workshop organised by RCA and Reef Ecologic at the Orpheus Island Research Station. In this workshop, we learned about three different monitoring methods used to gain knowledge about the health of reefs through Coral Watch, RHIS (Great Barrier Reef Marine Park Authority's Citizen Science monitoring method) and Reef Check Australia. We collected RCA survey data at Magnetic Island sites, which are nearshore fringing coral reefs. We found a high presence of macroalgae, diverse coral communities and low visibility due to the proximity to shore.

In contrast to Magnetic Island, John Brewer Reef, an outer reef, had higher coral cover, less macroalgae and amazing visibility. With Reef Ecologic staff we did two surveys with both RHIS and RCA methods. Our next outer reef was Lodestone Reef. We did two surveys and sadly, we saw large areas of coral mortality due to Crown of Thorns and bleaching. Just two years ago, there was a high diversity of coral at this site.

Visiting these two outer reefs and the fringing Magnetic Island reefs, a stark contrast is evident between inshore and offshore reefs. The outer reef is more coral dominated, while the inner reef is algae dominated; however, Crown of Thorns impacts have also transformed sites at outer Lodestone Reef by significantly reducing coral cover. Days later, we participated in a clean-up event as a Reef Check Ambassador, organised by Tangaroa Blue. We collected marine debris from two beaches on Hinchinbrook Island and found just under 2 tons of debris!

One week later, with RCA, I participated in a Reef Clean project at Hook Island. We collected and sorted debris from beach and underwater clean-ups, allowing us to see what is washing up on the beach instead of sinking to the ocean floor. We found mostly debris dropped by tourists. We also did RCA surveys on local fringing reef sites.

Although the Mediterranean Sea and the Great Barrier Reef are two very different ecosystems, with different impacts and threats, Reef Check Worldwide has the same driven and dedicated volunteers helping to collect data and protect the natural environment, empowering people to take care of the ocean so we can have a better future outlook.

NATURE FIGHTING BACK: MALDIVES REEFS SHOWING RESILIENCE

BY **BIOSPHERE EXPEDITIONS**

Biosphere Expeditions, the Marine Conservation Society, Reef Check Maldives and local Maldives environmental group, Save the Beach Maldives have just returned from a 250km expedition around the central Maldives, the ninth annual survey of its kind since 2010. They found, against expectations, that corals are showing some resilience, adaptability and even recovery from climate change effects.

Reefs the world over are dying from rising sea temperatures, ocean acidification, pollution and overexploitation. The situation is much the same in the Maldives, as previous Biosphere Expeditions surveys and a very recent scientific paper have shown.

Expedition scientist (and co-author of the recent paper) Dr. Jean-Luc Solandt, this year expected more dead and dying reefs. But what he and his team of citizen scientists found instead, are signs of hope and recovery. Dr. Solandt said, "We were devastated in 2016 when a global warming event killed off large swathes of the reefs. The reefs showed little recovery in 2017 and 2018, and we expected more bad news in 2019. However, this year we saw many baby (<1 year) and young corals (1-3 years), as well as different species of corals growing vigorously at sites that we expected to be dead or dying. It was surprising and encouraging to see a greater diversity of corals 'pushing through' from the dead layer below. It seems nature is fighting back with a coral diversity explosion. We have seen resilience (of corals that are resistant to bleaching), adaptability (some reefs have other species coming through) and recovery (baby corals are almost everywhere) this year", concludes Solandt.

"It's not all plain sailing though," adds Solandt, "many reefs are still very badly affected and some have died altogether. And another temperature spike would kill many of the new corals we've seen. Also, some small corals that had settled on the reef in the last year, which we thought were resistant to bleaching, were now bleached, but the larger ones seem okay. Finally, the background temperature is still 'hot' at the bleaching threshold of 30 degrees Celsius in very shallow water."

The recent change in government in the Maldives is another cause for some optimism. Hussein Zahir, head of LaMer, one of the expedition's local partner organisations, notes that the government has indicated that it "understands the close link between oceans, climate change and the wellbeing of communities. This is a good start, as is the establishment of a National Research Institute that includes environment, health and social issues – a sort of think-tank and an infrastructure for science-based knowledge and understanding of the issue. And apparently the income from the Green Tax that has been levied on the tourism sector will now be spent exclusively on the environment".

One of the outstanding sites regularly visited by the annual Biosphere Expeditions surveys called 'Rasdhoo Madivaru', has also recently been declared a Marine Protected Area. It is both resilient to the worst bleaching effects, and harbors large megafauna such as sharks, manta rays, turtles and Napoleon wrasse. "Our expeditions have highlighted this site for the past nine years as being of extraordinary biodiversity value", says Solandt.

Dr. Matthias Hammer, Executive Director of Biosphere Expeditions believes that "all those involved in the last nine years of expeditions – from professional to citizen scientists, to local and international partners – can be very proud about the in-depth understanding and description of bleaching patterns we have reached and that we have been involved in the designation of an MPA. This is yet another feather in our cap of achievements through citizen science and community-based conservation, and an important stepping stone for tackling the adverse effects of climate change in the Maldives. It shows how ordinary people and grassroot actions can make a difference".

Further surveys will be carried out by Save the Beach Maldives and Reef Check Maldives. These local organisations, the latter created by graduates of the Biosphere Expeditions placement programme, will "also train more local divers to survey their own reefs in the future, and set up more community-based reef conservation efforts", according to Hassan 'Beybe' Ahmed, a placement programme graduate who runs Save the Beach Maldives and Reef Check Maldives. The Biosphere Expeditions annual survey will return to the Maldives in August next year.

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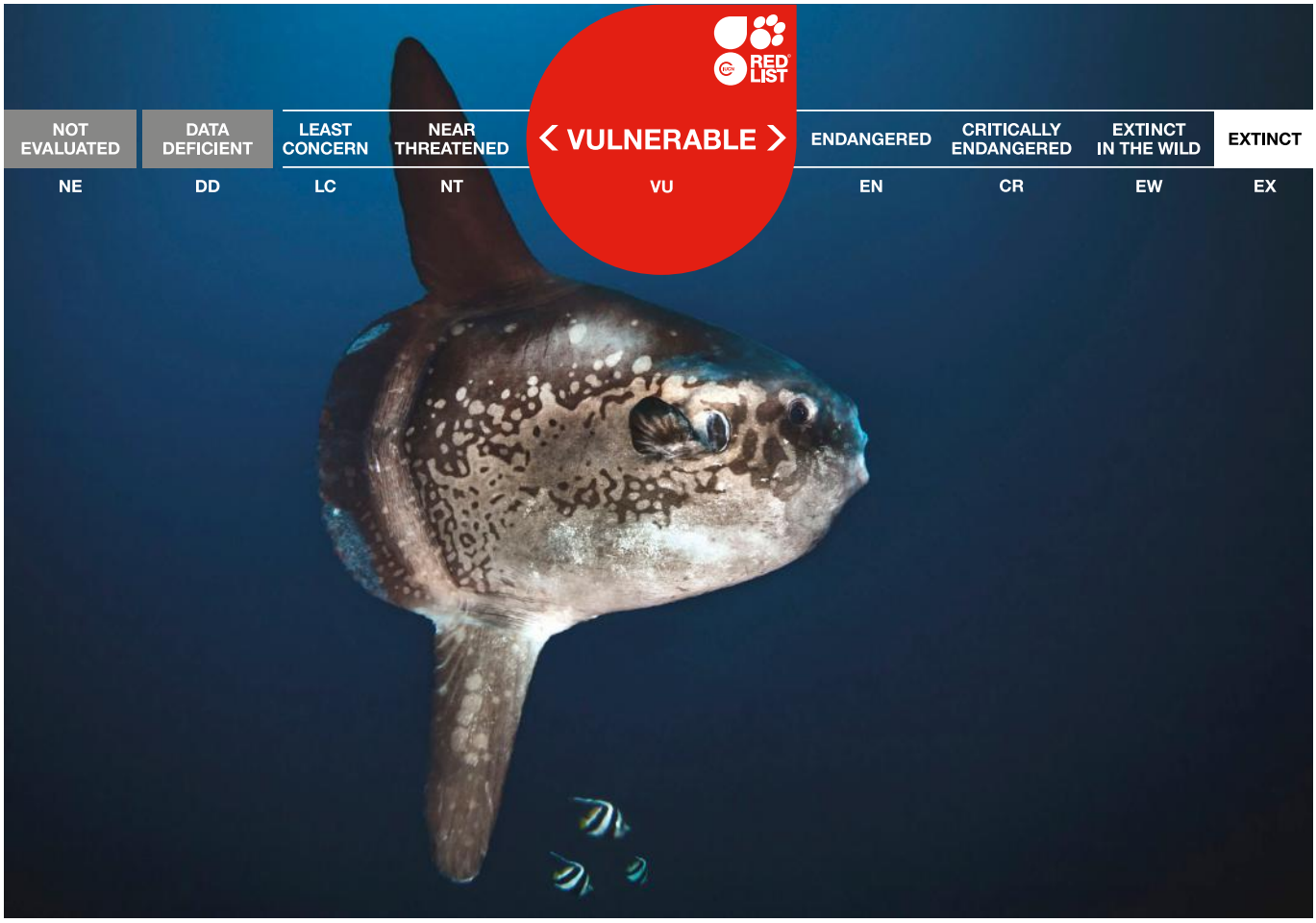
FEATURE CREATURE
OCEAN SUNFISH (*MOLA MOLA*)

FEATURE **IUCN RED LIST 2015** PHOTOGRAPHY **STEVE WOODS | WWW.STEVEWOODSPHOTOGRAPHY.COM**



RED LIST CATEGORY & CRITERIA: VULNERABLE

Scientic Name: *Mola mola*

Synonyms: *Tetraodon mola* Linnaeus, 1758

Common Names:

English: Ocean Sunfish, Giant Sunfish, Headfish, Mola Ocean Sunfish, Moonfish, Sunfish, Sunfish

French: Môle, Môle Commun, Poisson Lune, Poisson-lune

Spanish; Castilian: Mola, Peixe Lua, Pez Cabeza, Pez Luna, Pez Sol

TAXONOMIC NOTES

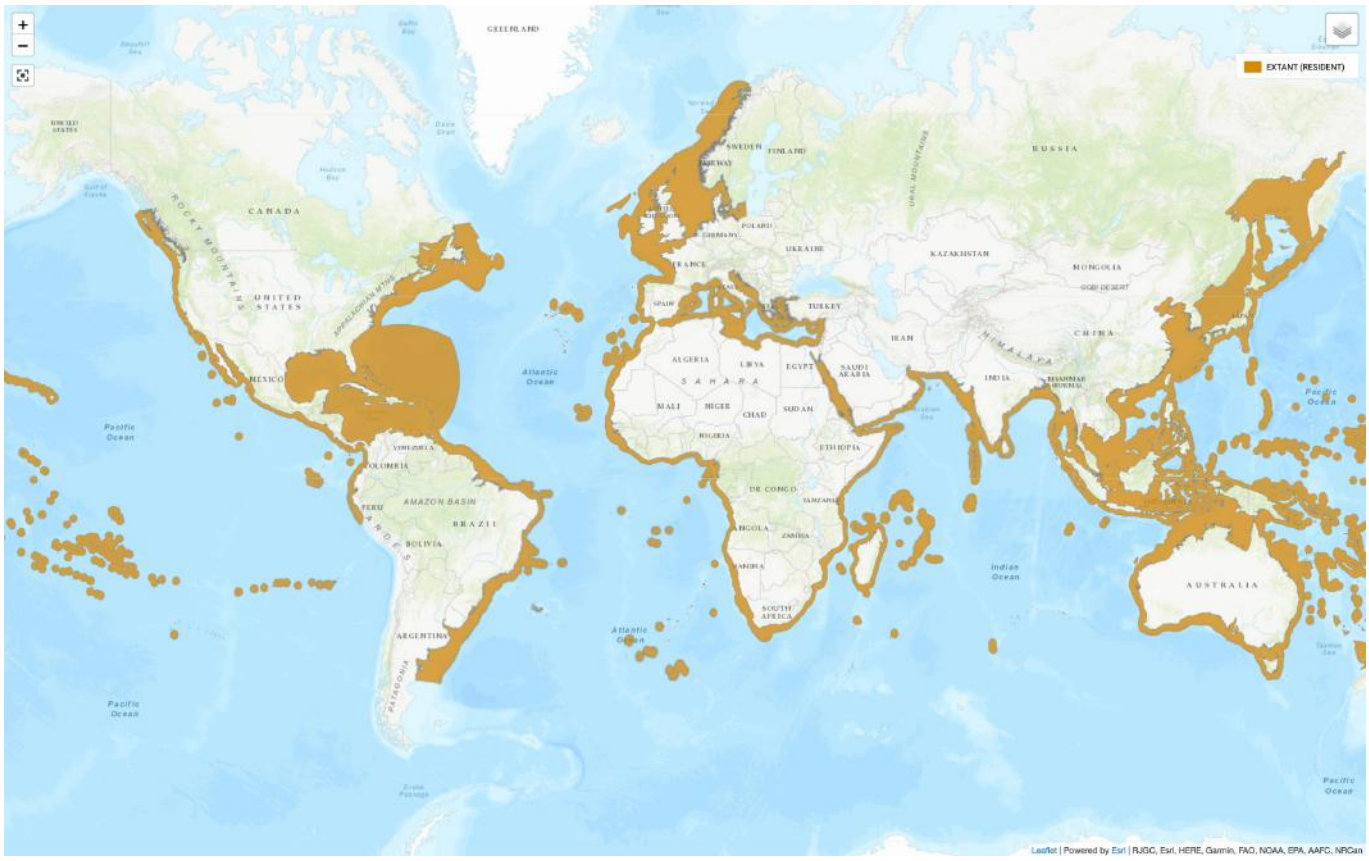
Recent investigations of *M. mola* mitochondrial sequences showed evidence that the genus Mola contains two species: *M. mola* and the southern sunfish, *M. ramsayi* (Bass et al. 2005). Report from Yoshita et al. (2009) concluded that the genus Mola contained three species.

JUSTIFICATION

This species is widely distributed. It is targeted by fishers in the western Pacific and south Atlantic and is captured in large numbers as bycatch in fisheries using long lines, drift gillnets and midwater trawls in a number of widely distributed fisheries. In some fisheries, the catch of *Mola mola* exceeds that of the target species. Preliminary calculations from three of these fisheries (two South African longline fisheries, and the USA Southwest Region drift net fishery), indicate 300, 26,000 and 340,000 individual *M. mola* per fishery are made each year and it is likely that other fisheries using these same methods are taking large, but unreported, bycatch of *M. mola* throughout the majority of its range. In some areas, substantial declines (up to 100%) have been documented, likely driven by the high bycatch. Based on these declines and the likelihood that this species is experiencing high rates of bycatch throughout most of its range, we suspect this species is declining globally by at least 30% over three generation lengths (24-30 years) that includes both the past and the future. Therefore, this species is listed as Vulnerable under A4bd. Future monitoring and research on its basic biological variables such as age at maturity, generation time, etc. is recommended.

GEOGRAPHIC RANGE

Native: Extant (Resident): Albania; Algeria; American Samoa; Angola; Anguilla; Antigua and Barbuda; Argentina; Australia; Bahamas; Bangladesh; Barbados; Belgium; Belize; Benin; Bermuda; Bonaire, Sint Eustatius and Saba; Brazil (Trindade); British Indian Ocean Territory; Cabo Verde; Cambodia; Cameroon; Canada; Cayman Islands; Chile (Easter Is.); China; Christmas Island; Cocos (Keeling) Islands; Colombia; Comoros; Congo, The Democratic Republic of the; Cook Islands; Costa Rica; Croatia; Cuba; Cyprus; Côte d'Ivoire; Denmark; Disputed Territory (Paracel Is., Spratly Is.); Djibouti; Dominica; Dominican Republic; Ecuador (Galápagos); Egypt; El Salvador; Equatorial Guinea; Eritrea; Faroe Islands; Fiji; France (Clipperton I.); French Guiana; French Polynesia; French Southern Territories (Mozambique Channel Is.); Gabon; Gambia; Germany; Ghana; Gibraltar; Greece; Grenada; Guadeloupe; Guam; Guatemala; Guernsey; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; India (Andaman Is., Nicobar Is.); Indonesia; Iran, Islamic Republic



of; Ireland; Israel; Italy; Jamaica; Japan; Jersey; Jordan; Kenya; Kiribati (Phoenix Is., Kiribati Line Is.); Korea, Democratic People's Republic of; Korea, Republic of; Lebanon; Liberia; Libya; Madagascar; Malaysia; Maldives; Malta; Marshall Islands; Martinique; Mauritania; Mauritius; Mayotte; Mexico; Micronesia, Federated States of ; Monaco; Montenegro; Montserrat; Morocco; Mozambique; Myanmar; Namibia; Nauru; Netherlands; New Caledonia; New Zealand; Nicaragua; Nigeria; Niue; Norfolk Island; Northern Mariana Islands; Norway; Oman; Pakistan; Palau; Panama; Papua New Guinea; Peru; Philippines; Pitcairn; Poland; Portugal (Azores, Madeira); Puerto Rico; Russian Federation; Réunion; Saint Helena, Ascension and Tristan da Cunha (Ascension, Saint Helena (main island), Tristan da Cunha); Saint Kitts and Nevis; Saint Lucia; Saint Martin (French part); Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Samoa; Sao Tome and Principe; Saudi Arabia; Senegal; Serbia; Seychelles; Sierra Leone; Singapore; Sint Maarten (Dutch part); Slovenia; Solomon Islands; Somalia; South Africa (Marion-Prince Edward Is.); Spain (Canary Is.); Sri Lanka; Sudan; Suriname; Sweden; Syrian Arab Republic; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Togo; Tokelau; Tonga; Trinidad and Tobago; Tunisia; Turkey; Turks and Caicos Islands; Tuvalu; United Arab Emirates; United Kingdom; United States (Hawaiian Is., Alaska); United States Minor Outlying Islands (Howland-Baker Is., Johnston I., Wake Is.); Uruguay; Vanuatu; Venezuela, Bolivarian Republic of; Viet Nam; Virgin Islands, British; Virgin Islands, U.S.; Wallis and Futuna; Western Sahara; Yemen.

RANGE DESCRIPTION

Mola mola is circumglobally distributed throughout warm and temperate zones of all oceans. In the eastern Pacific it is known from Canada (British Columbia), south to Peru and Chile (Chirichigno 1974, Eschmeyer et al. 1983). In the Indo-Pacific it is known throughout the Indian Ocean including the Red Sea, from Russia and Japan to Australia and New Zealand, and the Hawaiian Islands (Muus 1964, Smith 1965, Ayling and Cox 1982, Sims and Southall 2002, Cartamil and Lowe 2004, Houghton et al. 2006, Konow et al. 2006, Todd and Grove 2010). It is considered a waif in the Arabian Sea. In the eastern Atlantic it is known from Scandinavia to South Africa (and occasionally in the western Baltic, North, and Mediterranean Seas). In the western Atlantic it is known from Canada (Newfoundland) south to Argentina including the Gulf of Mexico and Caribbean Sea (Robins and Ray 1986, Figueiredo and Menezes 2000).

Its depth range is 0-400 m (Cartamil and Lowe 2004).

POPULATION INFORMATION

This species is a common resident of the offshore waters of the northwestern Atlantic during the spring and summer months, with an estimated summer abundance of 18,000 (Kenney 1996 in Potter et al. 2011). Large aggregations of small (<1 m TL) *Mola mola* have been observed in coastal waters (Pope et al. 2010, Syväranta et al. 2012). In Irish and Celtic Seas, a total of 68 were spotted from 2003-2005, or an overall density of 0.98 sunfish per 100 km² (Houghton et al. 2006). According to reports from the National Marine Fisheries Service (NMFS) Southwest Region, between 1990 and 1998, 26.1% of the drift net catch consisted of *M. mola*. This translates to a catch of more than 26,000 individuals (Rand Rasmussen, NMFS Southwest Fisheries Science Center, pers. comm. in Dewar et al. 2010). Off the coast of South Africa, *M. mola* bycatch rates from the tuna and swordfish longline fishery are estimated at 340,000 sunfish annually (Petersen 2005, Sims et al. 2009).

Although estimates of population size are generally lacking, there is evidence of local population declines over short time scales. In Namibia, *Mola mola* showed a peak of catch landings in 2006 (40 metric tonnes), then decreased with only 7 metric tonnes in 2007 (FAO 2014); while CPUE was not available, this represents a decline of 82.5%. Landings have recently been reported from Argentina and are likely to increase (FAO 2014). In Ireland, there was been a decline of about 100% (13 to 0 metric tonnes) in 2 years (2000-2002). There was also a decline in Portugal from 12 metric tonnes in 1999 to about 0 in 2009 (FAO 2014).

Based on localised declines that exceed 80% and the likelihood that this species is experiencing high rates of bycatch throughout most of its range, we suspect this species is declining globally by at least 30% over 3 generation lengths (24-30 years) that includes both the past and the future.

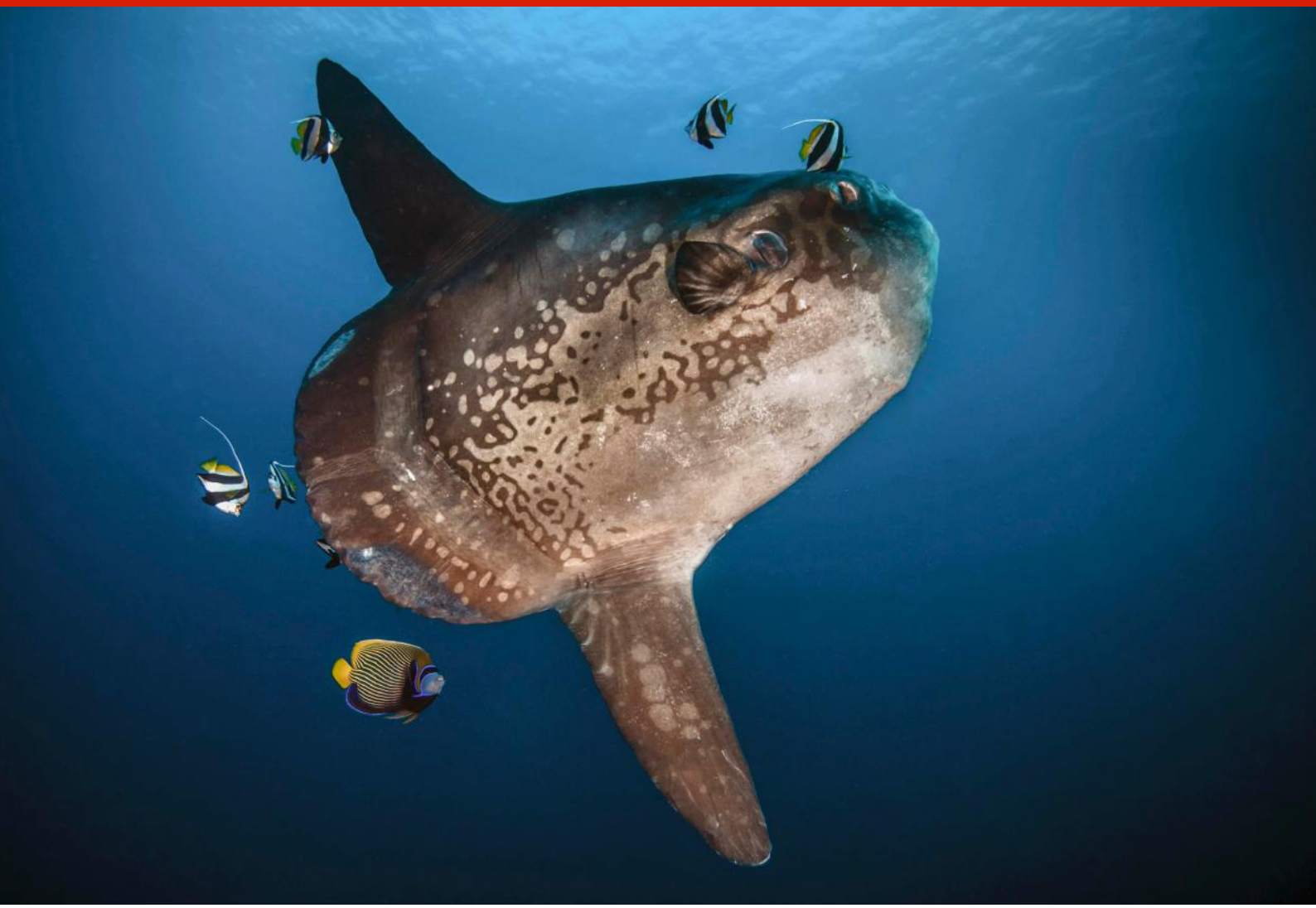
Current Population Trend: Decreasing

HABITAT AND ECOLOGY

Mola mola is an oceanodromous, pelagic-oceanic species that occurs in subtropical waters between depths of 30 and 480 m, but is usually between 30 and 70 m (Powell 2001, Riede 2004, Allen and Erdmann 2012). Adults are found on slopes adjacent to deep water where they come in for shelter and to seek out cleaner fish (Kuiter and Tonozuka 2001). It is an active swimmer capable of highly directional movements and horizontal movements independent of the current (Cartamil and Lowe 2004); it uses its anal and dorsal fins as a pair of wings (Pope et al. 2010). It feeds on fish, molluscs, zooplankton, jellyfish, crustaceans, and brittle stars (Clemens and Wilby 1961, Scott and Scott 1988, Kuiter and Tonozuka 2001). Cartamil and Lowe (2004) observed a diel pattern in depth utilisation, with fish residing in the warmer mixed layer above or within the thermocline at night and repeatedly diving beneath the thermocline into cooler water during the day (Californian waters, July-September 2001). Hays et al. (2009) also noted that although individual sunfish showed a range of preferred depth that altered over time, they were still moving up and down the water column and regularly returning close to the surface. Although its exact function has yet to be resolved, Cartamil and Lowe (2004) proposed that periodic returns to the surface in *M. mola* may imply some form of behavioural thermo-regulation i.e. prolonged time in cold waters necessitates time spent at the surface to re-warm. This may explain the frequent observations of ocean sunfish observed 'basking' or swimming on their sides at the surface during the day (Cartamil and Lowe 2004). Conversely, Sims et al. (2009a) argued that extensive vertical movements may simply reflect a crepuscular searching strategy when prey are descending or ascending, with sunfish attempting to locate maximum prey abundances at this time. It has also been suggested more generally that large amplitude dives or ascents of large pelagic fish and other vertebrates during prey tracking may represent prey searching behaviour (Shepard et al. 2006) characterised by extensive movements to new locations (Sims et al. 2008). It exhibits sexual dimorphism; females are larger than males (Pope et al. 2010).

Maximum total length is 333 cm (Claro 1994); maximum published weight is 2.3 t (Roach 2003); all animals larger than 250 cm TL are female (Nakatsubo 2008). Very few studies have been conducted on the reproductive biology of ocean sunfish (Pope et al. 2010). In Japan,the spawning period is estimated between August and October and the same study also identified asynchronous egg development, suggesting it is a multiple spawner (Nakatsubo et al. 2007). The lifespan or reproductive age of *M. mola* under natural conditions is unknown, although captive animals have been maintained for more than 8 years (Nakatsubo et al. 2007). A growth curve derived from repeated measurements of captive specimens estimated an individual with a total length of 3 m would be about 20 years old (Nakatsubo 2008). Recent work used growth band pairs in vertebrae to age the closely related sharptail mola *M. lanceolatus* caught in the eastern Taiwan fishery (Liu et al. 2009). The age estimates ranged between >2 and >23 years for females and >1 and >16 years for males (Liu et al. 2009). *Mola mola* is famously the most fecund of all vertebrates (Carwardine 1995) with a 137 cm female containing an estimated 300 million eggs (Schmidt 1921). By necessity, these eggs are very small (mean diameter 0.13 cm; Gudger 1936) and so *M. mola* growth is staggering. For the 0.25 cm larva to grow to a 3 m adult requires an increase in mass of 60 million times (Gudger 1936). A more atypical captive growth rates have been found to be between 0.02 and 0.49 kg/day in weight (M. Howard and T. Nakatsubo pers. comm. in Pope et al. 2010) and on average 0.1 cm/day TL (Nakatsubo and Hirose 2007).

Longevity is estimated at between 20 and 23 years old; using a maximum age based estimator with low prediction error ($M = 4.899t^{-0.916}$: Then and Hoenig 2014), the



estimated adult natural mortality rate is 0.28-0.32. Age at first maturity is unknown, but inferred to be between 5 and 7 years (based on the smallest reported ripe female of 137 cm and assuming a linear growth rate to 3 m at 22 years old). Using the estimator for generation length of 1/adult mortality + age at first reproduction results in a generation length of 8-10 years, and thus a time window for calculating population declines of 24-30 years.

System: Marine
Habitat Type: Marine Oceanic
Generation Length (Years): 8-10 years

THREATS

Ocean sunfish populations may be vulnerable to fishing activity because of the high levels of bycatch observed in many fisheries, including long lines, drift gillnets and midwater trawls (Silvani et al. 1999, Cartamil and Lowe 2004, Fulling et al. 2007, Petersen and McDonell 2007). In South Africa, mid-water trawl fishery of the Cape horse mackerel (*Trachurus trachurus capensis*) caught predominantly large individuals and observed a significant decline in ocean sunfish catch rates between 2000 to 2003, with other bycatch species remaining comparatively stable (Petersen and McDonell 2007). Bycatch estimates from the Californian swordfish fishery suggest ocean sunfish make up 29% of all bycatch; far outnumbering the target species (Cartamil and Lowe 2004). *Mola mola* is targeted by fishers in the western Pacific and south Atlantic. *Mola mola* is also captured in large numbers as bycatch in a number of widely distributed fisheries.

USE AND TRADE

Mola mola is not a commercially important fish (Fulling et al. 2007, Silvani et al. 1999), although there is some market for it in Japan (Sagara and Ozawa 2002, Watanabe and Sato 2008) and Taiwan (20.8-49.4 tonnes per annum, Liu et al. 2009). It is targeted by fishers in the western Pacific and south Atlantic. This species is also captured in large numbers as bycatch in long line, drift gillnet and midwater trawl fisheries. For example, the South African longline fishery for tuna and swordfish was estimated to have annually caught between 0.08 and 0.29 sunfish for every 1,000 hooks set (1.6-2.7 million hooks per year) in the 4 years between 2000 and 2003 (Petersen 2005). Furthermore, it was by far the most common bycatch species in the Cape horse mackerel (*Trachurus trachurus capensis*) midwater trawl fishery in the same region (Petersen and McDonell 2007), representing 51% of the total bycatch between 2002 and 2005 (Petersen and McDonell 2007). Similarly, *M. mola* comprised between 70 and 93% of the total fish catch in Spanish drift gillnet fisheries within the Mediterranean between 1992 and 1994 (Silvani et al. 1999); bycatch estimates from the Californian swordfish fishery suggest ocean sunfish make up 29% of all bycatch, far outnumbering the target species (Cartamil and Lowe 2004). A crude calculation using values from a recent study of the Moroccan fleet (Tudela et al. 2005) suggests an annual bycatch of 36,450 ocean sunfish. Whilst the majority of *M. mola* are returned to the water alive (Silvani et al. 1999), they often show varying levels of trauma (Cartamil and Lowe 2004) and post-catch survival data are lacking.

There is little or no fishing effort likely to affect this species in the Gulf of Mexico (H. Perez-España and M.Vega-Cendejas pers. comm. 2015).

CONSERVATION ACTIONS

The Moroccan government passed a law in 2007 to phase out the use of driftnets in which *Mola mola* are often caught as bycatch. Basic biological research and population monitoring of *M. mola* are recommended.

CITATION

Liu, J., Zapfe, G., Shao, K.-T., Leis, J.L., Matsuura, K., Hardy, G., Liu, M., Robertson, R. & Tyler, J. 2015. *Mola mola* (errata version published in 2016). The IUCN Red List of Threatened Species 2015. **www.iucnredlist.org**

CLEANUP ARABIA

FEATURE AND PHOTOGRAPHY **ALLY LANDES**

We have had such a busy series of events for Cleanup Arabia this year, not to mention it was a successful campaign at that. We have our Partners to thank for making this event possible each year with Majid Al Futtaim, our Platinum Sponsor, Dubai Duty Free, our Gold Sponsor, and Emirates NBD and Chalhoub Group, our Silver Sponsors.

IN PARTNERSHIP WITH:

UNITED ARAB EMIRATES
MINISTRY OF CLIMATE CHANGE
& ENVIRONMENT

EVENT ORGANISER:

EDA
جمعية الإمارات للغوص
Emirates Diving Association

We have had such a busy series of events for Cleanup Arabia this year, not to mention it was a successful campaign at that. We have our Partners to thank for making this event possible each year with Majid Al Futtaim, our Platinum Sponsor, Dubai Duty Free, our Gold Sponsor, and Emirates NBD and Chalhoub Group, our Silver Sponsors.

CLEANUP ARABIA 2019

Cleanup Arabia was separated into four events this year with Chalhoub Group opening the campaign, with their dive clean-up on the 11th of October with Freestyle Divers at Dibba Port's Outer Wall. They collected a total of 94.5 kg between them. The second event was in Abu Dhabi on the 8th of November for our two dive clean-ups with Al Mahara Diving Center and Ocean Dive Center, and the Eastern Mangrove clean-up with volunteers from our partner Emirates NBD and EDA members, including members from the European Union's delegation to the UAE. The mangrove clean-up was done on foot and by kayaks, and 248 kg of rubbish was collected. The dives accumulated 274 kg. The third event – the main event – in Dibba, Fujairah, was postponed from the 1st to the 22nd of November due to Cyclone Maha causing some havoc over on the East Coast. Freestyle Divers, Al Boom Diving, Divers Down, Sandy Beach Dive Centre and Extreme Watersports were booked to run the dive clean-ups at 6 separate dive sites and the EDA team led Majid Al Futtaim and Dubai Duty Free, joined by Ithra Dubai down to Sandy Beach's public beach. Then, on the 24th of November, we headed out once again with Emirates NBD for the fourth clean-up event. The dive clean-ups collected 330 kg of rubbish between them and the beach clean-ups (same location) amounted to 292 kg.

HOW CLEANUP ARABIA WORKS

In order to make the rubbish count accurate, each volunteer has to fill their bags and return to the drop point to firstly weigh their bag, and then empty the contents onto our tarpaulin mat for visual reference. Once the clean-up time ends, the volunteers regroup and partner up to count and tally each item listed on the Ocean Conservancy's International Coastal Cleanup form. Not only do we get to see how much rubbish we collect as a group, but we understand where our responsibilities lie.

In the past, we used to count and collect rubbish at the same time, but this proved to be an inaccurate system and once the rubbish was out of sight, it was out of mind. We all take part in dive clean-ups and beach clean-ups to make a difference, and in order to make that difference count, we need to see the whole of the problem we are trying to solve. Although this is more work than the previous system, it is in fact the more accurate method required from us. We need statistics to hand them over to our governments and the industries that create these items. People are the biggest problem of all, as it is because of people our environment is so polluted. Education is instilled in us through imitation at an early age. We are responsible for educating those around us, so lets inspire change in others that are less educated than ourselves, and for this to work, we need to do it together.

IMPROVEMENTS

In 2018, we introduced our sustainable Cleanup Arabia T-shirt design which EDA members keep for all future Cleanup Arabia events they participate in, including this year's clean-up. We no longer have any T-shirts wasted due to out of date branding.

Another accomplishment, which we are especially proud of this year, is having finally banished plastic water bottles from all our events and replaced them with water dispensers. Our members now bring their own refillable water bottles to refill from the drinking water stations. This was a great success at our main event's lunch buffet at the Radisson Blu Resort Fujairah.

THANK YOU

Thank you to everyone who volunteered their time and hard work to making this difference with us, and a big thank you to His Excellency Dr. Thani Ahmed Al Zeyoudi from the Ministry of Climate Change and Environment for attending the event to be with us.


ماجد الفطيم
MAJID AL FUTTAIM


السوق الحرة - دبي
DUBAI DUTY FREE


RadissonBlu


إثراء دبي
ITHRA DUBAI
ENRICHING LIVES


CLEANUP ARABIA

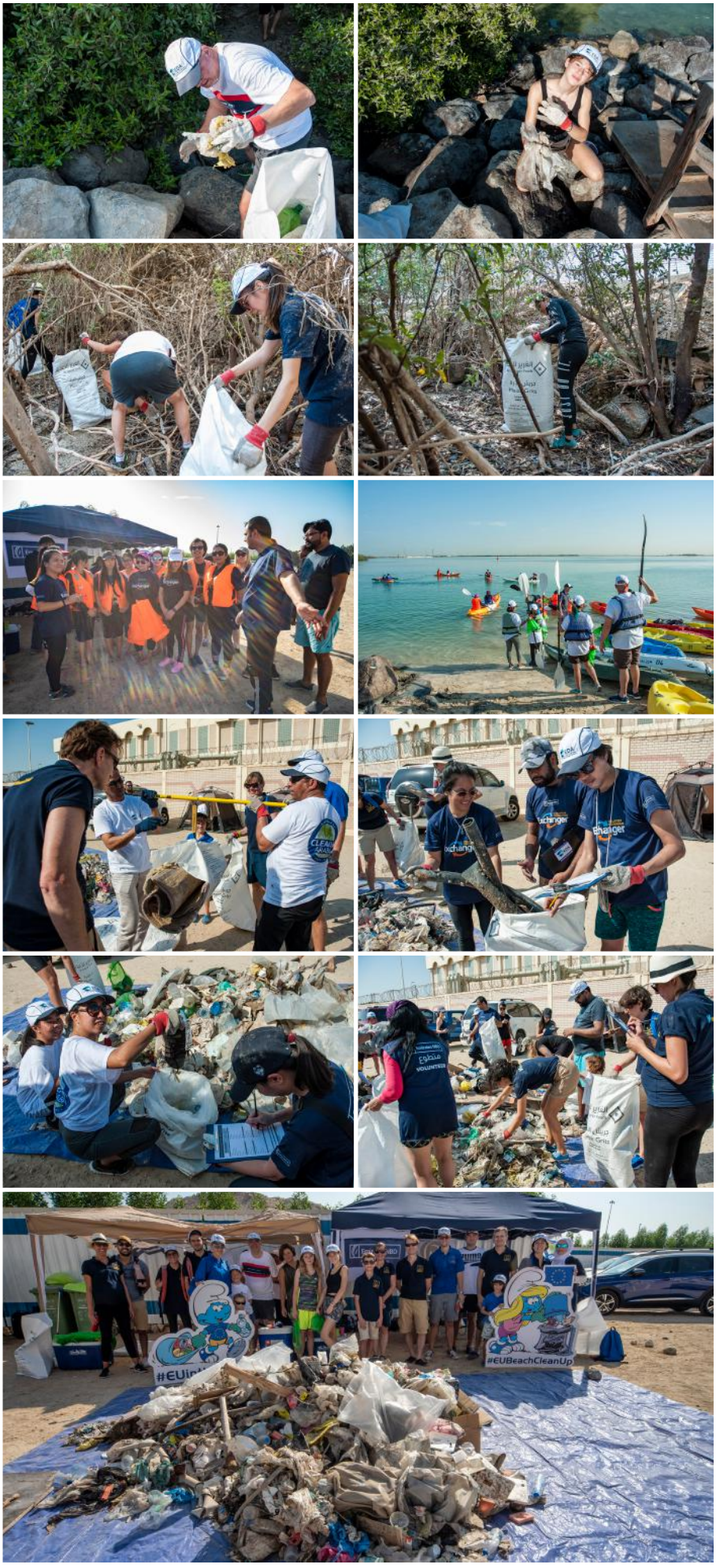

CLEANUP ARABIA


EDA

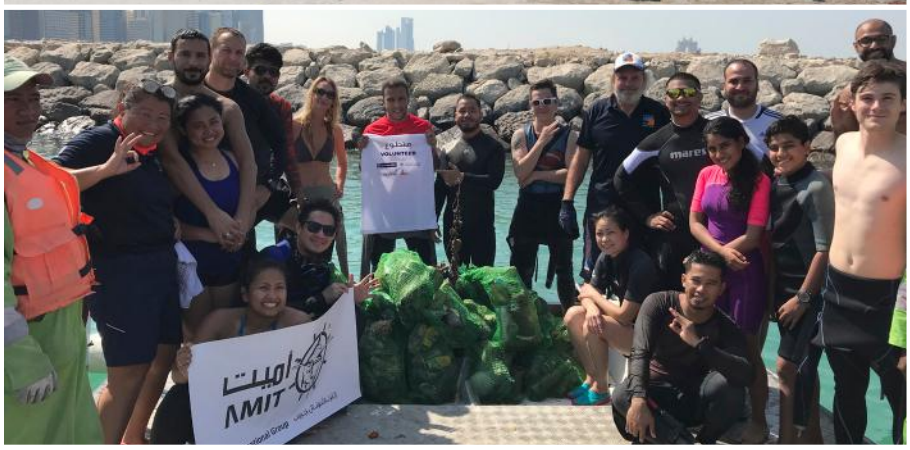
CHALHOUB GROUP

CLEANUP ARABIA SILVER PARTNER: CHALHOUB GROUP	
FUJAIRAH | DIVE CLEAN-UP	
11 October 2019 | Dibba Port, Outer Wall	
MOST LIKELY TO FIND ITEMS	TOTAL
Forks, Knives, Spoons	2
Plastic Beverage Bottles	184
Glass Beverage Bottles	3
Beverage Cans	15
Plastic Bags	10
Foam Cups & Plates	2
Plastic Pieces	40
FISHING GEAR	
Fishing Line (metres)	4
Rope (metres)	3
EXTRAS	
Umbrella	1
Wooden Pallet	1
GRAND TOTAL OF ITEMS	**265**
TOTAL BAGS COLLECTED	**8**
TOTAL WEIGHT (KG)	**94.5**

ABU DHABI | BEACH CLEAN-UP	
8 November 2019 | Eastern Mangroves	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Cigarette Butts	1,687
Food Wrappers	174
Plastic Take-out Containers	96
Foam Take-out Containers	24
Plastic Bottle Caps	355
Metal Bottle Caps	5
Plastic Lids	34
Straws/Stirrers	15
Forks/Knives/Spoons	9
Plastic Beverage Bottles	525
Glass Beverage Bottles	44
Beverage Cans	103
Plastic Grocery Bags	216
Other Plastic Bags	545
Paper Bags	26
Paper Cups & Plates	110
Plastic Cups & Plates	111
Foam Cups & Plates	111
FISHING GEAR	
Buoys/Pots/Traps	4
Net & Pieces	8
Line	33
Rope	42
OTHER TRASH	
Cigar Tips	3
Cigarette Lighters	16
Construction Materials	94
PACKAGING MATERIALS	
6-pack Holders	1
Other Plastic/Foam Packaging	279
Other Plastic Bottles	23
Strapping Bands	9
Tobacco Packaging/Wrap	14
PERSONAL HYGIENE	
Condoms & Syringes	1 each
TINY TRASH (< 2.5 cm)	
Foam Pieces	927
Glass Pieces	10
Plastic Pieces	1,297
EXTRAS	
Lightbulb	4
Cardboard Pieces	42
Cloth Pieces	41
Clothing Items	5
Aluminum Foil	16
Metal Rod	10
Paint Brush	2
Shoes	10
Mask, Plastic Bucket, Aerosol Can, Carpet	2 each
Tissue Box, Tennis Ball, Toothpaste Tube, Construction Hard Hat, Pliers, Glue Stick, Garbage Bin Lid, Electric Cable, Vase	1 each
GRAND TOTAL OF ITEMS	**7,109**
TOTAL BAGS COLLECTED	**35**
TOTAL WEIGHT (KG)	**248**



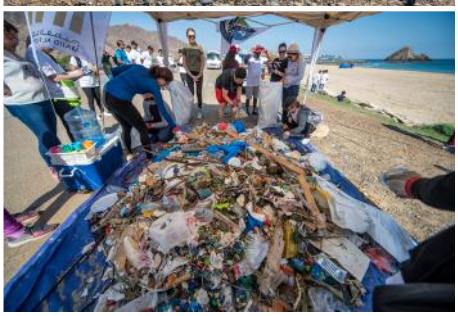
Photos by Ocean Dive Center



Photos by Al Mahara Diving Center

ABU DHABI | UNDERWATER	
8 November 2019 | 2 Dive Sites	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Food Wrappers	5
Plastic Take-out containers	37
Foam Take-out Containers	27
Plastic Bottle Caps	18
Metal Bottle Caps	18
Plastic Lids	5
Forks/Knives/Spoons	1
Plastic Beverage Bottles	461
Glass Beverage Bottles	116
Beverage Cans	114
Plastic Grocery Bags	36
Other Plastic Bags	18
Paper Bags	5
Paper Cups & Plates	20
Plastic Cups & Plates	11
Foam Cups & Plates	35
FISHING GEAR	
Buoys/Pots/Traps	40
Net & Pieces	6
Line	80
Rope	65
OTHER TRASH	
Construction Materials	11
PACKAGING MATERIALS	
6-pack Holders	1
Other Plastic/Foam Packaging	25
Other Plastic Bottles	103
TINY TRASH (< 2.5 cm)	
Foam Pieces	42
Glass Pieces	10
Plastic Pieces	172
EXTRAS	
Shoes	3
Tupperware	1
GRAND TOTAL OF ITEMS	**1,486**
TOTAL BAGS COLLECTED	**88**
TOTAL WEIGHT (KG)	**274**

FUJAIRAH | BEACH CLEAN-UP	
22 November 2019 | Sandy 'Public' Beach	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Cigarette Butts	2334
Food Wrappers	226
Plastic Take-out Containers	38
Plastic Bottle Caps	2591
Metal Bottle Caps	3199
Plastic Lids	218
Straws/Stirrers	42
Forks/Knives/Spoons	119
Plastic Beverage Bottles	556
Glass Beverage Bottles	362
Beverage Cans	332
Plastic Grocery Bags	101
Other Plastic Bags	414
Paper Bags	30
Paper Cups & Plates	7
Plastic Cups & Plates	53
Foam Cups & Plates	22
FISHING GEAR	
Buoys/Pots/Traps	3
Net & Pieces	6
Rope	31
OTHER TRASH	
Cigar Tips	12
Cigarette Lighters	32
Construction Materials	36
PACKAGING MATERIALS	
Other Plastic/Foam Packaging	41
Other Plastic Bottles	3
Strapping Bands	1
Tobacco Packaging/Wrap	39
PERSONAL HYGIENE	
Syringes	3
TINY TRASH (< 2.5 cm)	
Foam pieces	3
Glass pieces	1433
Plastic pieces	649
EXTRAS	
Shot Glass	3
Glove	1
Glass Pieces (>2.5cm)	168
Wooden Skewers	21
Gas Can	1
Aluminum Food Container	8
Clay Pot	1
Metal Fan	1
Clothing Items	1
GRAND TOTAL OF ITEMS	**1536**
TOTAL BAGS COLLECTED	**12**
TOTAL WEIGHT (KG)	**292**



Photos left and right by Al Boom Diving

Photos by Freestyle Divers


Photos by Divers Down

ماجد الفطيم
MAJID AL FUTTAIM

FUJAIRAH | DIVE CLEAN-UPS | 22 NOVEMBER 2019				
MOST LIKELY TO FIND ITEMS	TOTAL	Divers Down Dadna Port	Divers Down Sharm Harbour	Freestyle Divers Dibba Port
Cigarette butts	11	11	–	–
Food Wrappers	80	50	30	–
Plastic Take out containers	29	17	12	–
Plastic Bottle caps	75	30	45	–
Plastic lids	22	14	8	–
Plastic beverage bottles	375	173	78	124
Glass beverage bottles	47	34	12	1
Beverage cans	77	50	16	11
Plastic grocery bags	210	87	43	80
Paper bags	54	–	54	–
FISHING GEAR				
Buoys/pots/traps	6	4	2	–
Net & pieces	3	3	–	–
Line	221	120	100	–
Rope	65	63	–	2
OTHER TRASH				
Construction materials	52	22	30	–
Tires	4	4	–	–
PACKAGING MATERIALS				
Other plastic/foam packaging	23	8	–	15
Other plastic bottles	13	10	3	–
Strapping Bands	9	9	–	–
TINY TRASH (< 2.5 cm)				
Plastic pieces	170	100	70	–
DEAD/INJURED ANIMAL				
Fish (Injured - fishing hook)	1	–	1	–
EXTRA				
Traffic Cone	1	1	–	–
Hose	6	6	–	–
Anchors	3	3	–	–
Buckets	5	3	2	–
GRAND TOTAL OF ITEMS	**1562**	**822**	**506**	**233**
TOTAL BAGS COLLECTED	**47**	**26**	**12**	**9**
TOTAL WEIGHT (KG)	**330**	**200**	**100**	**30**

CLEANUP ARABIA SILVER PARTNER: EMIRATES NBD	
24 November 2019	
Fujairah | Beach Clean-up	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Cigarette Butts	1699
Food Wrappers	70
Plastic Take-out Containers	4
Plastic Bottle Caps	1010
Metal Bottle Caps	2029
Plastic Lids	4
Straws/Stirrers	13
Forks/Knives/Spoons	26
Plastic Beverage Bottles	185
Glass Beverage Bottles	82
Beverage Cans	77
Plastic Grocery Bags	17
Other Plastic Bags	76
Paper Cups & Plates	34
Plastic Cups & Plates	16
Foam Cups & Plates	7
FISHING GEAR	
Buoys/Pots/Traps	1
Net & Pieces	2
Rope	6
OTHER TRASH	
Cigar Tips	3
Cigarette Lighters	16
Fireworks	4
Tires	1
PACKAGING MATERIALS	
Other Plastic/Foam Packaging	6
Tobacco Packaging/Wrap	11
PERSONAL HYGIENE	
Syringes	3
Tampons/Tampon Applicators	1
TINY TRASH (< 2.5 cm)	
Glass Pieces	456
Plastic Pieces	13
EXTRAS	
Lighter Fluid Can	1
Plastic Hanger	3
Wire Hanger	2
Tile Pieces	4
Metal Rods	3
Tissue Pieces	29
Metal Tongs	1
Batteries	4
Glowsticks	2
Plastic Toys	3
Wooden Skewers	12
Jewellery	3
Clothing Items	1

EXTRAS (continued)	
Reusable Shopping Bag	1
Tissue Boxes	2
Basting Brush	1
Aluminum Ring Pulls	67
Razor	1
Glass Pieces (> 2.5cm)	34
Plastic Pieces (> 2.5cm)	6
Mobile Phone Circuit Board	2
Car Side-view Mirror	1
Frying Pan	1
Tent	1
Barbeque Grill	1
Plastic Handheld Fan	1
Shoes	5
GRAND TOTAL OF ITEMS	**6086**
TOTAL BAGS COLLECTED	**8**
TOTAL WEIGHT (KG)	**93**

Photo by Al Boom Diving

CLEANUP ARABIA SILVER PARTNER: EMIRATES NBD	
24 November 2019	
Fujairah | Dive Clean-up	
MOST LIKELY TO FIND ITEMS	TOTAL
Food Wrappers	1
Plastic Bottle Caps	4
Metal bottle Caps	2
Plastic Beverage Bottles	18
Glass Beverage Bottles	3
Beverage Cans	4
Plastic Grocery Bags	3
Paper Cups & Plates	1
FISHING GEAR	
Line	2
PACKAGING MATERIALS	
Other Plastic/Foam Packaging	1
Other Plastic Bottles	2
GRAND TOTAL OF ITEMS	41
TOTAL BAGS COLLECTED	2
TOTAL WEIGHT (KG)	8.5

TACKLING PLASTIC POLLUTION

FEATURE **REBECCA KIERMAN** PHOTOGRAPHY **ALLY LANDES**

"If it can't be reduced, reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, then its should be restricted, redesigned or removed from production" – Pete Seeger.


Melco
ورق المنيوم
٢٥
قدم مربع

ABOVE: Counting individual items from a dive clean-up. **L-R:** First rubbish collection by 120 volunteers on Sandy Beach's public beach on the 22nd of November.

As Cleanup Arabia events are finalised across the UAE, it seems a fitting time to reason the benefit accompanied. If you were an EDA Member who contributed towards this successful nation-wide movement, keep reading to gain a greater understanding of how much you helped and how you can further support worldwide plastic pollution.

Following a beach clean with a large company, when a team member was asked why he was participating in this event – he told us that it was important to look after the planet as though it was your own back garden. This statement should echo true with all citizens, yet some are affected by plastic pollution more severely than others. For some people, plastics are out of sight and out of mind. So if you don't care too much for sea creatures, be it consuming them or looking at them (I prefer the latter) – why should we clean-up debris from coastal and marine habitats?

Plastic pollution has become insurmountable, so unfortunately beach and ocean cleans are no longer the 'solution' to marine debris. However they are an effective educational tool. The solution is to identify where waste prevention is required. This is a simple task, consider simple alternatives such as using reusable water bottles, reusable coffee cups or metal straws. As consumers, we are the ones with the power to control the market, making informed choices is an effective driver for retailers. Drivers belong to society, the producers require us in order to make money.

Linear consumption has been the cause of plastic pollution, we have become acquainted to single-use plastics which have infested oceans. It was recently predicted that on average a single plastic bag is used for 12 minutes only. In addition 95% of plastic packaging is only used once, which highlights the requirement for reuse.

"If it can't be reduced, reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, then its should be restricted, redesigned or removed from production" – Pete Seeger.

One of the many benefits of plastics is its weight and durability, allowing it to flourish for many years. Plastics ability to defeat natural decay can be of grace to its primary chemical – fossil fuels, which are a contributing factor to global warming. Despite the depleting availability of fossil fuels, plastics are often cheaper to produce than to be recycled.

Unfortunately the groups affected are separated in space and time. Many third world countries lie a victim of plastic pollution, as a result of poor waste management and lack of awareness. But for many it lies outside of their circle of interest, with impending poverty. Thus potentially one of the reasons that plastics thrive are its low monetary worth. It's not often you come across gold or metals lacing the E311. As such, if plastic waste was given a net worth, maybe more people would be

ABOVE: All the items collected underwater. **L-R:** Second rubbish collection by 9 volunteers on Sandy Beach's public beach on the 24th of November before being counted.

interested in beach cleans. This could also elevate poverty.

Some companies have sought to give plastics a net worth, through engineering intuition. A particular company that inspired me was 'Race for Water', a Swiss company who has chosen to tackle plastics from all corners of the playing field. This company is harnessing three types (hydrogen, wind and solar) of sustainable energy whilst circumnavigating the world on a 5 year expedition. Most interestingly, a new technology, 'Biogreen', allows the boat to collect plastics from the ocean as they sail, meanwhile the collected debris is superheated in absence of oxygen, which can be transferred into energy. This technology is revolutionary, but they don't stop there, during their travels they stop at countries to spread to word of plastic pollution, thus raising awareness.

When considering which plastic items to boycott, it is essential to be informed of the top 5 marine debris items, inclusive of micro-plastic fragments, plastic bottles, plastic wrappers and fishing line – Project Aware. Ocean clean results can vary, plastic bottles are the number one item found, due to PET's lower density than sea water, allowing it to sink. However the vast majority of plastics have been broken down via UV rays into micro-plastics, which can make re-collection very difficult.

Often micro-plastics are out of sight, but this isn't just a result of their size. Plastic is often concentrated in gyres – large circular currents in the oceans. Consequently plastic gets caught up in this vortex and doesn't escape. Many have heard of the 'plastic island' in the East pacific, which is the 'size of Texas'. When Charles Moore, made this statement, I think many imaginations envisioned a little island, but in actuality 94% of this area is composed of micro-plastics. Furthermore a large majority of debris is associated with fishing. Ghost nets/ discarded fishing gear is often accompanied by the deaths of many marine animals.

It's estimated that 8 million tonnes of plastic enters the ocean each year, 80% of this plastic is from land-based sources. Although new technologies such as above sea surface cleaners are valuably contributing towards a cure, land based prevention is of paramount importance. Beach and ocean cleans themselves can be likened to the importance of CSR events – whom have been the greatest contributors when analysing the latest Cleanup Arabia. CSR is a crucial component of any company and has allowed enterprises to elevate their impact on society. Meanwhile members of the public are becoming more aware about anthropogenic effects on the environment. Events like these could be your opportunity to 'give back' on an individual level.

At Freestyle Divers we pledge to organise regular ocean cleans, so if you're interested in participating in a nationwide clean-up – get in touch via: **info@freestyledivers.me**

SOLUTIONS FOR SUSTAINABLE COASTAL & MARINE DEVELOPMENT

FEATURE **DANA LIPARTS** PHOTOGRAPHY **THE OCEAN CLEANUP**

Cleaning up our marine environment is a multifaceted and complex issue that needs to be approached from a number of angles. Marine pollution is not just caused by plastic, but from a range of activities as a result of development works, such as construction and industrial activities.

Ecobarrier Silt Curtains, Type III.

What is your method in cleaning up oceans and why is it so effective?

Cleaning up our marine environment is a multifaceted and complex issue that needs to be approached from a number of angles. Marine pollution is not just caused by plastic, but from a range of activities as a result of development works, such as construction and industrial activities.

At Ecocoast, we consider the entire lifecycle of any marine or coastal development, from development and infrastructure through to operation and maintenance. At every stage, there is significant risk of detrimentally impacting our marine environment. Our business is based on offering sustainable solutions to protect and support the marine environment and coastline at every stage of the lifecycle of a marine or coastal development.

We are pragmatic enough to accept that the world will continue to build and live on our coastlines. Over 40% of the world's population lives on coastlines, and this number is growing exponentially. We have increased our coastline by over 7% in the past decade. Again, this number is growing exponentially. The Ocean Economy is predicted to be worth over $3 trillion by 2030 and 71% of the earth's surface is covered by oceans.

At Ecocoast, our goal is to make it easy to build, live and operate sustainably on our coastline and marine environments. The key word is "sustainably". We do this by offering a portfolio of pioneering solutions for sustainable coastal and marine developments, to reduce the impact from coastal and marine activities, construction, land reclamation works, infrastructure operations and other activities.

We have been committed to this journey for over a decade. In 2009 when we established Ecocoast, "sustainability" was not the buzzword it is today. We spent the majority of our time convincing clients of the importance of sustainable development. Thankfully today that has changed. We are seeing major projects, such as the Red Sea and Al Jubail developments leading with sustainability as a priority. This has freed up our time to focus on developing the next generation of pioneering solutions for sustainable coastal and marine development. We see this as our duty – to be at the forefront of pioneering marinetech solutions to make it easy for everyone to build and operate sustainably.

Critical to this is ensuring our solutions offer a double bottom line; that is, they are not just good for the environment, but they also offer commercial value. We are obsessive about this. We do not assume a sustainable solution will be chosen over a traditional solution just because it is good for the environment. Particularly in this market, there needs to be more. We always ensure we offer another type of value – generally in the form of a cost-saving or revenue generation. Therefore by taking on our solutions, they are not just doing good for the environment but they are also doing good for the client's business.

Silt curtains, containment booms and sand-filled geosynthetic containers are just a few examples of product solutions that offer protection to the marine environment against particular types of impacts resulting from development projects.

We were a pioneer in designing and manufacturing the strongest silt curtains in the world, under the brand Ecobarrier, which saves

Courtesy of The Ocean Cleanup – Ecocoast Screen.

clients up to USD150,000 per day in downtime, and can be recycled and reused instead of winding up in a landfill after single use.

Silt curtains are used to protect the marine environment during marine construction and coastal reclamation works. In Dubai alone, the coastline has grown by over 6% since 2009 because of dredging and reclamation, making the use of marine protection barriers a very important part of protecting our oceans.

What was your involvement with The Ocean Cleanup?

Our work with The Ocean Cleanup tackles the issue of ridding the world's oceans of plastic. At the end of 2017, we partnered with The Ocean Cleanup to design and manufacture the screen for its marine barrier – System 001 – to clean up the Great Pacific Garbage Patch (GPGP).

The GPGP is an area in the Pacific Ocean, located between San Francisco and Hawaii, where currents converge and collect floating debris, mainly different types of plastic.

The marine barrier is a complex engineered design consisting of a 600-metre-long floating element made of High-Density Polyethylene (HDPE), to which a screen is attached that reaches 3 metres down underwater.

The screen, designed and manufactured by Ecocoast, is made from a tightly constructed, geotextile-inspired material to withstand the harsh conditions in the Pacific Ocean. It passed all rigorous tests in the North Sea to determine final design parameters, measure loads and monitor underwater behaviour. A series of tests also took place in the United States, aimed at investigating the screen's behaviour under tow to the GPGP.

The screen for System 001 was shipped in July 2018 from our production facility in Umm Al Quwain to San Francisco, to be on time for the launch of the world's first ocean cleanup system.

We can proudly say that we were the first to develop a successful screen. Our R&D and Engineering expertise informed the development of this groundbreaking screen. The world's first ocean cleanup system was launched on September 8, 2018.

GPGP stats from a study released by The Ocean Cleanup in 2018:

- Holds ocean plastic concentrations between 10s to 100s kg/km2.
- Measures 1.6 million km2 – 3 times the size of France.
- Contains 80 million kg of floating plastic, equivalent to 500 jumbo jets (about 1.8 trillion pieces).

Tell us some more about the new mooring technology you developed to protect the marine environment.

Earlier this year, we launched Ecomoor, a pioneering, environmentally-friendly mooring system. Thousands of traditional moorings are installed along the UAE's coastline alone. Historically, blocks and chains have mostly been used to secure marine buoys. While this traditional method gets the job done, it also presents several drawbacks that can lead to increased costs, more frequent maintenance and affect the surrounding environment.

Traditional chain mooring systems act as a weight on the seabed. The chains move on the

ABOVE: Courtesy of The Ocean Cleanup – System 001 Launch. **OPPOSITE PAGE:** Ecocoast's Coastal & Marine Development Cycle. | Courtesy of The Ocean Cleanup – System 001 Mission First Plastic. | Ecocoast Founders, Dana Liparts and Lachlan Jackson at The Ocean Cleanup Launch.

seabed when the marine buoys pull and shift due to tidal and/or wind and wave action situations, resulting in destruction of bottom vegetation. The disturbance to the seabed can suspend sediment and increase turbidity, diminishing the level of sunlight and light attenuation critically important to seagrass growth and survival.

Ecomoor is the next-generation of mooring systems; importantly, offering protection to sensitive seabed environments. It promotes low maintenance, reduced manpower resources and sustainability. Because of the neutral buoyancy of the multi-layer mooring line, Ecomoor is always in a floating state and does not drag on the seabed, offering full protection to sensitive marine environments, such as seagrass meadows and coral reefs.

Ecomoor can be used for different applications, from navigation buoys and deep moorings, to floating solar structures and aquaculture parks.

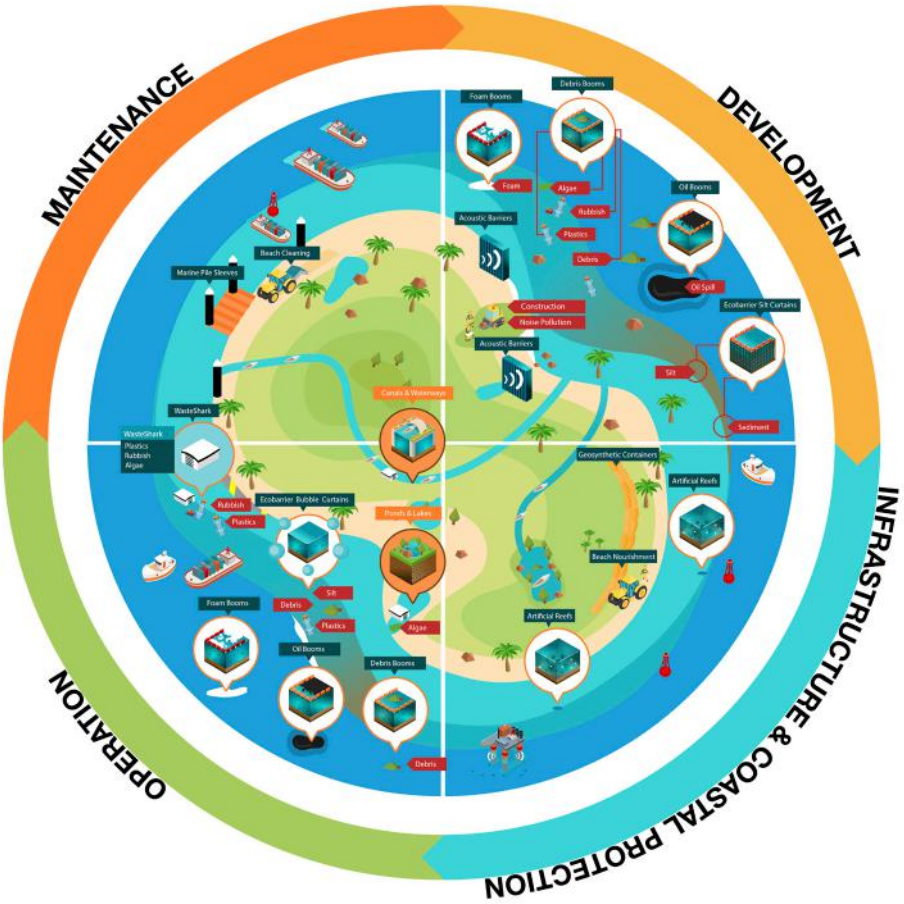
More and more marinas, ports, cities and countries around the world are looking for new solutions that address these issues, prohibiting chain moorings and requiring more environmentally-friendly moorings to help preserve our natural environment.

Why are such methods needed in today's world? How alarming is the current situation?
As the world's population is expanding every year (from 1.65 to 6 billion during the 20th century alone), so does the amount of garbage that people generate. Several studies have proven that the vast majority of garbage is plastic.

According to National Geographic, a trillion plastic bags are used worldwide each year, and they have an average working life of just 15 minutes. It is estimated that 1.15 to 2.41 million tons of plastic are entering the ocean each year from rivers (source: The Ocean Cleanup).

In a time where pollution has become a big issue, sea levels are rising, coastlines are increasing and ports are expanding due to increasing seaborne trade, the industry needs pioneers with innovative, alternative solutions to provide a balance between coastal development and environmental protection.

Ecocoast is committed to solving the world's most pressing marine problems and creating a more pioneering marine industry through developing pioneering solutions for a better marine environment. We have dedicated ourselves to this mission for the past 10 years, and will continue to lead an innovation culture by continuously setting new standards in marine solutions.



ecocoast

ABOUT ECOCOAST:
Ecocoast is the global leader in pioneering solutions for sustainable coastal and marine development. Its core purpose is to pioneer. Everything the business does is either the first to market or an evolution of an existing idea.

The business is built around offering products and services at every stage of the coastal and marine development lifecycle, from development, infrastructure and coastal protection, to operation and maintenance, focusing on sustainable solutions to protect and support our coastline and marine environment.

Through its brand Ecobarrier, the business is at the forefront of designing, manufacturing and distributing globally a range of marine products for coastal and marine protection, demarcation, navigation and pollution management. Early 2019, Ecocoast launched Ecomoor – the next-generation mooring system, designed and manufactured in the United Arab Emirates, and Hyperion – a range of self-contained solar LED marine lanterns for demarcation purposes.

Ecocoast works with clients across the Middle East, Africa, Europe, Asia and the Americas in the commercial and government sectors, primarily general and marine contractors; developers; hotel, port and marina operators; facility managers and governments.

Through developing pioneering solutions for a better marine environment, the business will achieve its mission of solving the world's most pressing marine problems and creating a more pioneering marine industry.

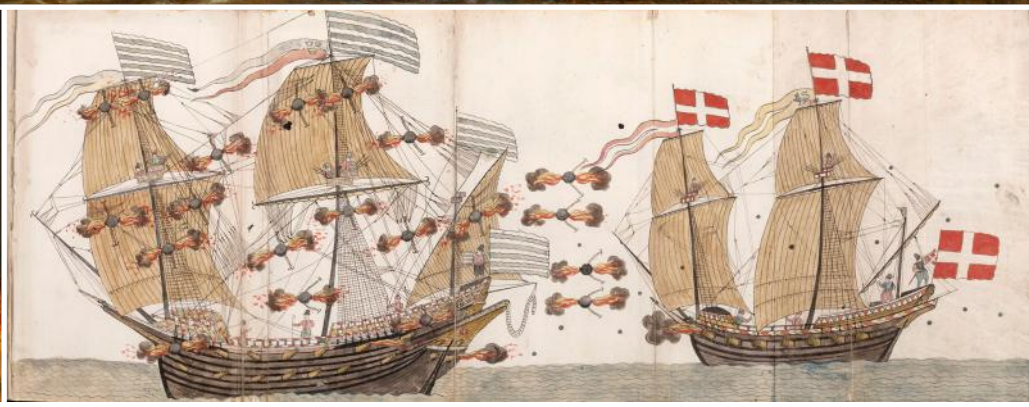
For more information, log on to:
www.ecocoast.com or email us at info@ecocoast.com

Ecomoor, the Next Generation Mooring System.

MARS
STILL MAGNIFICENT

FEATURE **JESPER KJØLLER** AND **RICHARD LUNDGREN**
PHOTOGRAPHY **JESPER KJØLLER, KIRILL EGOROV, KEES BEEMSTER LEVERENZ, OCEAN DISCOVERY AND JULIA GOLOSIY.**

The wreck is spread out over 500 metres and it is actually possible to follow the last hours of the battle step by step following the tracks it has left on the seabed. Cannonballs, parts of the hull and masts, as well as personal artefacts, bear testimony to the brutality of the sea battle. The main wreck itself, including both hull sides, are relatively intact in the middle of the wreck area, where guns of various dimensions and calibres are sprinkled across the seabed in unprecedented quantity.



Why is the discovery of the Swedish warship Mars Makalös, which sank in 1564, one of the most important wreck finds in the world? How did a boy's childhood dream and stubbornness result in the discovery of Mars 447 years after it sank? Through advanced digital archaeological methods, how are technical divers and scientists still exposing Mars' secrets?

PART 1: 1564 – THE LOSS

The smoke from the fire is thick and the stench of gunpowder mixes with reverberations of cries and steel blades striking steel blades. The rumble from muskets and cannons are deafening. The deck of Mars is red with blood and it is hard to get traction on the slippery surface. Brave Swedish sailors and soldiers are fighting for their lives. Wave after wave, they drive the enemy back. It is the 31st of May 1564, and the merciless sea battle rages northeast of Øland in the Baltic Sea.

Mars is now on fire and the air is thick with tangible desperation. It is only a matter of time before the flames reach the gunpowder stores. It is inconceivable to surrender. Only those with noble blood can hope for a pardon from the victors. Ordinary captured soldiers will lose their lives in the cruellest way to deter the enemy. The Danes and their associates, the professional mercenaries from the Hanseatic city of Lübeck, are driven by a burning ambition to capture Mars. It would be a fantastic trophy, so the soldiers don't care about the political goals of the kings – they just want their share of the treasures of war.

A powerful explosion suddenly shakes the mighty ship. The whole deck seems to rise. Both Swedes, Danes and German mercenaries are now desperately trying to leave Mars, which is sinking rapidly. The water is boiling, and a huge cloud of steam climbs like a giant ghost out of the sea. Mars is no longer to be seen. Back on the surface, debris, mutilated and dying sailors are the only ones left.

COURTSHIP

The Swedish King Gustav Vasa's son, Erik XIV's is eagerly touring Europe's royal courts in a quest to find a bride. The Prince is about 30 and he wants to get married.

Gustav Vasa has purposefully built a strong fleet to secure Sweden's trade on the Baltic Sea. Prince Erik often requests these ships as transport on his pursuit to find a suitable bride. It must have been a pretty impressive sight when the Prince of Sweden entered a port, escorted by the Baltic's most modern fleet.

The Swedish military build-up does not escape the attention of the Danish King Frederik II and the political situation is getting tense. Gustav Vasa takes the initiative to build Mars Makalös. She will be the Baltic's largest and most capable warship. Her gigantic keel is laid in Björkenäs off the coast of Kalmar, and the ship will be one-third longer than the largest Swedish warship, The Elephant. Mars is to be equipped with 30 percent of the Swedish Navy's total number of bronze cannons. The exact number of cannons has been forgotten, but it is more than 100 and at least two of them weigh at 42-pounds each, a size that had until now only been used as land artillery. Bronze is a precious metal and it is very expensive to cast these weapons. To the great regret of the clergy, Gustav Vasa commands the impounding of the country's church bells to be converted into cannons.

King Gustav himself never gets to see Mars completed. He dies in 1560, but with the completion, Erik has Europe's most modern fleet and he intends to use it.

NEW STRATEGY

The situation between Denmark and Sweden has worsened during the 1550s and 60s, and battles at sea have become more common. Erik has sent his admiral Jacob Bagge to deliberately provoke the Danes into conflict – this happens next to Borgholm in Øland. The battle is short and the Swedish victory is crushing. Denmark later responds by occupying Elfsborg's fortress on the west coast of Sweden without much difficulty. This allows them to bring large troops into Swedish territory. Erik's situation is beginning to get desperate. The Swedish army, mostly made up of poorly equipped farmers, is no match against the German mercenaries hired by the Danish King. Erik is forced to strike back and he inserts his fleet led by Admiral Bagge.

On May 30, 1564, the Swedish fleet confronts the Danes off the Tjust archipelago and heads down towards the northern tip of the island. The battle rages on for two days and initially things go well for Bagge and the Swedes. With its mighty artillery, Mars sinks the Danish vessel Lange Bark.

In this time, it was unusual for battle ships to be destroyed only by the opponent's artillery. The traditional tactic of a sea battle was to inhibit the opponent's manoeuvrability and kill as many enemies as possible, then board the vessel and take it as a victory trophy. The fact that Lange Bark was shot down, indicates that the Swedes had deployed a new and ground-breaking sea battle strategy. Avoid close combat, but instead use superior artillery force to win the battle.

During the evening after the first day's combat, both fleets retreat into the shelter of darkness.

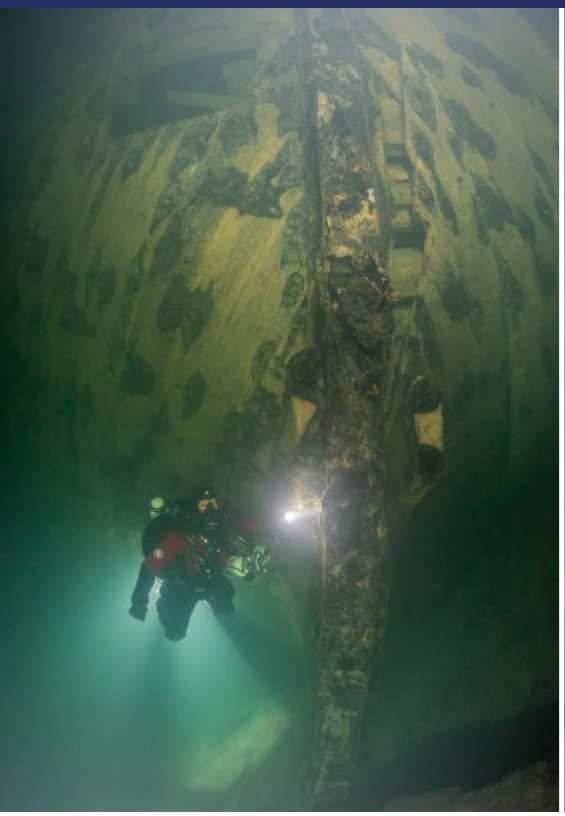
DEADLY BATTLE

As the day dawns on the 31st of May, the wind has picked up and the Swedish fleet has a hard time keeping their formations. To Admiral Bagge's regret, the fleet is now split up into smaller groups. The Danes seize the moment and attack the admiral ship Mars. The rest of the Swedish fleet are just spectators while Mars in her solitary dignity, puts up a heroic battle against the entire Danish fleet.

The fight is fierce and desperate. The Danish vessels repeatedly try to get close enough to enter Mars, but they are repeatedly pushed back. Mars' cannons fire constantly and several Danish vessels are close to collapse. Maybe Mars' helm was damaged during the battle? Maybe the sails were destroyed? We don't know, but for some reason several enemy vessels manage to get close to Mars and latch on to her railing. Danish soldiers board Mars and a desperate final battle ends in a powerful explosion that sinks Mars.

800 Swedish and 300 Danish/German soldiers and sailors go down with her.

Mars lands on the sea floor 72 metres below in the cold and dark Baltic Sea. And here she would probably still lie unnoticed, if it were not for a childhood dream in an exceptionally stubborn and persistent Swedish diver, many centuries later.



PART 2: 2011 – THE DISCOVERY

In 1977 Siegfried Lundgren brought his three young sons to the Vasa Museum in Stockholm. The visit ignited a fire in the then eight-year-old Richard, and soon he and his brothers developed a passionate interest in exploring the wrecks of their native Baltic Sea. They already knew the legends of the Swedish amateur archaeologist Anders Franzén's discovery of the royal ships of Vasa and Kronan, and they knew that Franzén had also been hunting for Mars and Svärdet (The Sword). They set out to do what Franzén had failed to do. They wanted to find Mars and The Sword!

Richard remembers, "We started to evolve as wreck divers, and eventually the usual wrecks lost some of their appeal – we wanted to find something spectacular. We began searching for CF Liljevalch, a cargo vessel torpedoed during World War II. She had previously been found and lost again, but we rediscovered her and were able to explore her effectively for the first time, even though she was down at 70 metres, because in the meantime we had learned to dive with trimix. We were prepared to look for other, and even deeper wrecks."

The three brothers and a shifting cast of like-minded advanced wreck divers started searching the northern tip of Öland as early as the 90s with the help of simple sonar equipment. In short, the ambition was to find and document as many wrecks as possible around Öland, but the principal goal was still to locate the legendary Mars Makalös and Svärdet. The group located and dived lots of wrecks. The highest record was finding six new wrecks all on the same day! But they never found what they were really looking for.

The divers soon became involved in other projects around the globe, making the search for the two proud ships more sporadic over the years. In the end, Richard was the only active diver left, but he never gave up hope on finding Mars.

"In 2010, we gained renewed motivation when a wealthy Swedish contractor invested in a new boat with modern search equipment for us. We could now be more efficient and focused. That year we located about ten new wrecks in the area off the west coast of Gotland. But we didn't find what we were looking for. 2011 started off really well when we discovered new wrecks in an area that had supposedly already been searched. We could clearly see that our new gear provided more possibilities and greater precision", says Richard.

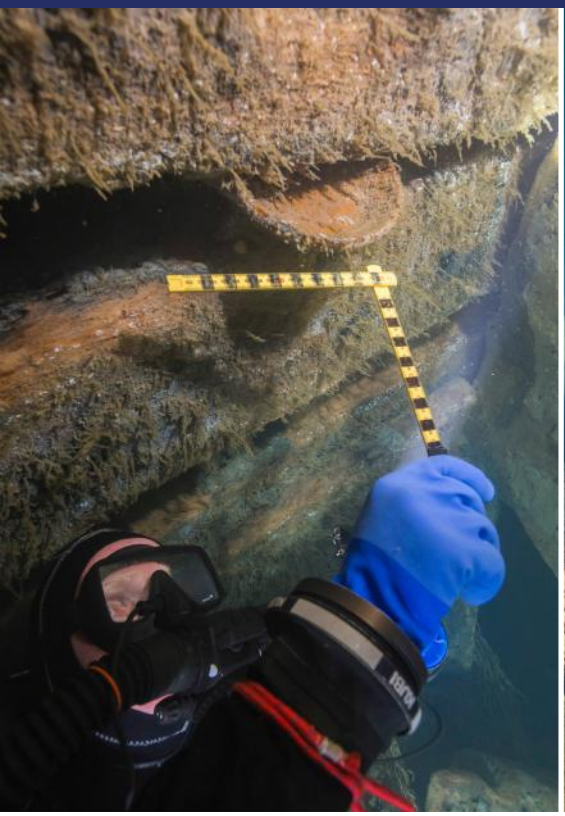
JACKPOT!

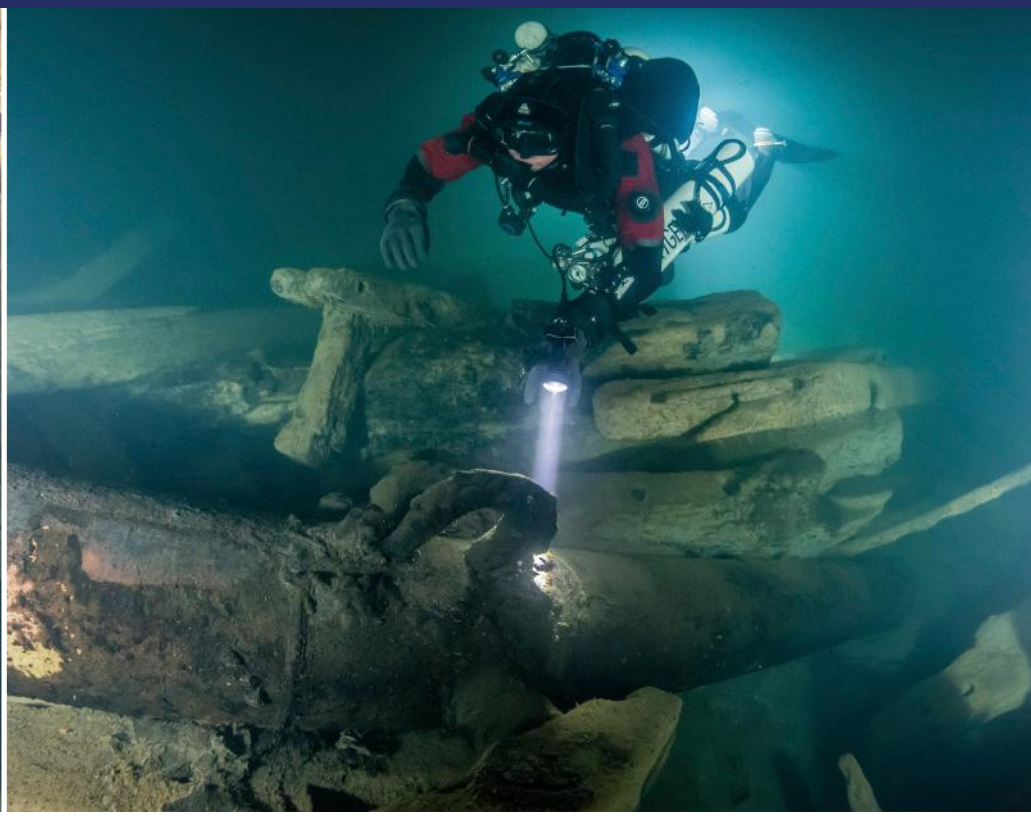
"Guys, check this out", Christofer shouts. He has discovered something unusual on the screens showing the signal from the ship's side scan sonar. It is a long time since the first time Christofer saw a wreck on the sonar screen, so it is surprising that he is so agitated. The team has been following a field of scattered debris for the past twelve hours, but can this really be the ultimate reward? Richard Lundgren need only take a quick look at the screen before he understands why Christofer sounds so excited.

The side scan image does not show an intact wreck, but rather a scattered wreckage with a complete, 40-metre-long hull side and lots of wreckage and ship details.

"What do you think?" Christofer asks.

"We got her! Finally, we have found her!" Richard shouts as he realises that this is a historic moment.





The team plans to dive the wreck to confirm the identity, but they already know that the most important wreck discovery of their generation is a reality. The broad smiles say it all.

FIRST MAN ON MARS

Richard Lundgren clearly remembers the first dive. "Slowly the contours take the form of something big in the water as we sink down to 70 metres. It is dark and very cold. I'm shaking, but I can't tell if that's the cold or the anticipation? It has been a couple of weeks since we saw the exciting sonar image. It was absolutely insane – after 20 years of searching, we had to leave ground zero unprotected and without being able to publish what we had found. Imagine if anyone else stumbled upon Mars! It was a risky business.

But now we're here. Under the light of a powerful lamp, I see something big taking shape under me. These are definitely parts of a wooden hull and soon we realise the size of the wreck – it's huge! We're the first to land on Mars, I think, and can't help giggling into my regulator. In front of us we see an impressive hull side in solid oak, and as we continue forwards, rows of cannon potholes emerge in the dark. The ship's planks have degraded over time, but it is still easy to get an impression of how powerful the ship once was."

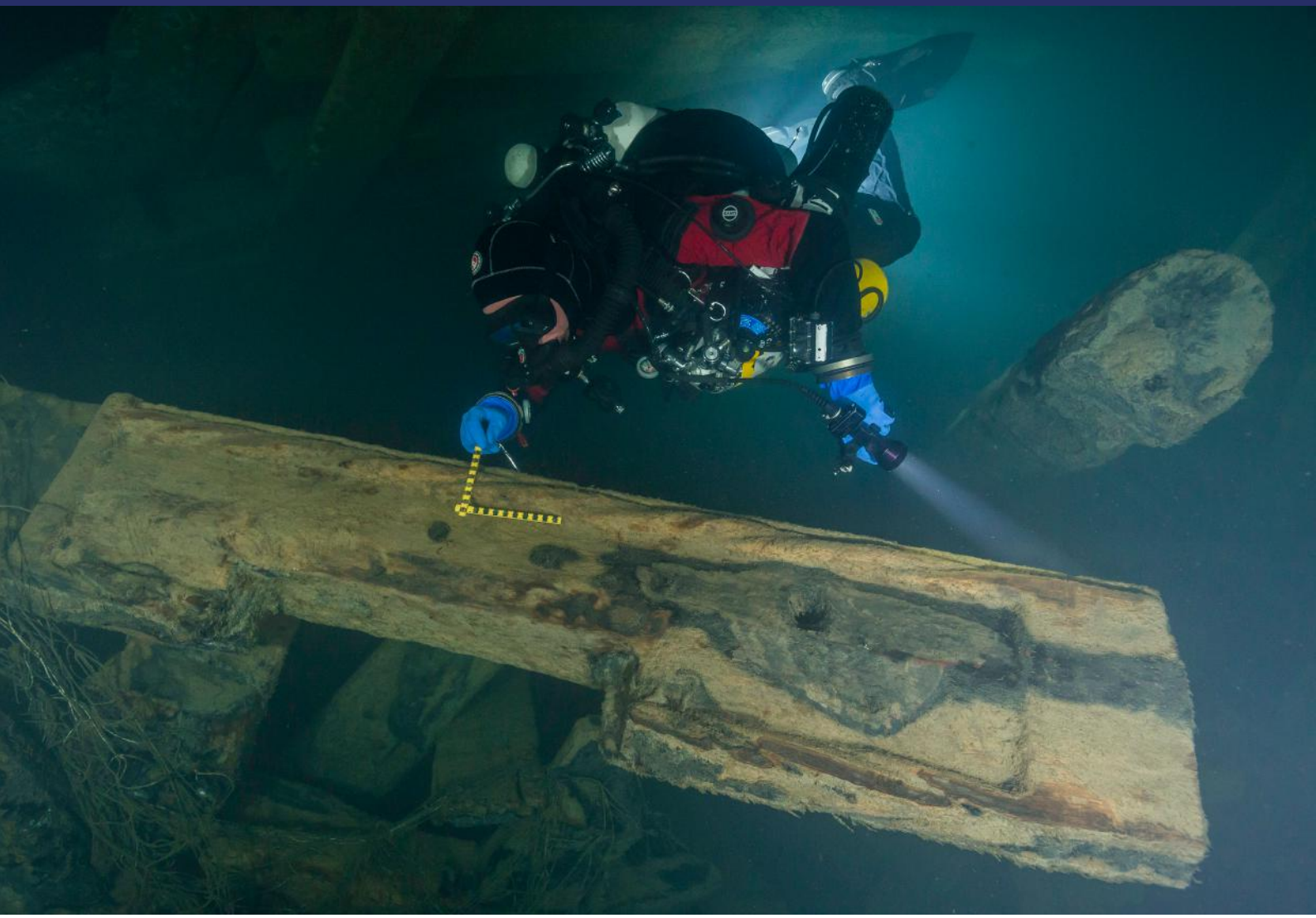
The team continues to swim toward what appears to be the stern, and they are amazed to discover what must have been Admiral Bagge's quarters and they can actually swim into it.

Richard recalls, "We glide into the dark overhead, and I strive to absorb all possible impressions. Is Admiral Bagge's famous treasure hidden here? The silver coins that the Danish-Lübeck attackers sought and the reason why they fought so fiercely. Did they seize the treasure or is it still on board? The historical documents provide no answers, but I have a feeling that future dives might solve the mystery. We continue the dive and go a little deeper."

GUNS GALORE

"As we approach the bottom, the visibility deteriorates from maybe 20 metres to just a few. We tighten up our formation and signal OK with our lights. In the murky visibility I spot something familiar and I swim closer to it. It's a cannon! I can't believe my eyes. It is a bronze cannon nearly five-metres-long. The ghostly green colour of oxidized metal is reflected in the light. "Cannon! Cannon!" I yell loudly in my mouthpiece. I hear echoes and it takes a few seconds before I realise that Fredrik is shouting exactly the same. As I turn to him, I understand why he is yelling and I can hardly comprehend what I am seeing. Fredrik has found a pile of no less than seven cannons, all in different sizes. The dimensions of the dolphin ornaments, the handles and the other details of the larger weapons are remarkable. This is better than what I imagined in my wildest dreams! Gently, I brush some sediment away from one of the cannons. The contours of a coat of arms becomes clearer. I have exposed what becomes indisputable evidence that this is indeed the Mars wreck. I have discovered King Gustav Vasa's emblem – a crossbow made out of grain. This is for sure the wreck of Mars Makalös!"

After more than 20 years of searching and without ever giving up hope, Richard Lundgren and his team had finally found Mars and he had fulfilled his childhood dream. By the way, the Sword was found later that same year by a competing wreck hunting team, but that's a story for another time.



PART 3: 2019 – TWO WEEKS ON MARS

July 2019 is a wet, cold and windy affair on the Swedish Baltic Sea coast. The dive team arrives from different parts of the world over a few days and they immediately begin equipment preparations and set up the tent that makes up the Mars Expedition headquarters.

Gradually, the diving shed is also ready, the compressor is set up, the diluent-cylinders for our JJ-CCR rebreathers are filled with 12/65 trimix, the deco cylinders are labelled and a charging station for the huge amount of batteries needed to feed our lights, cameras and dry suit heating systems are set up. We are ready for the first Mars-dive of the year, but the weather forecast is not promising. The normal daily rhythm – an early morning dive and an afternoon spent preparing for the next day – is disrupted by the weather gods and we simply have to adopt a mindset of constant alertness and be ready to dive at short notice when a sufficiently promising weather window appears in the forecasts. Mars is situated 60 minutes east of the port of Böda at Öland and in a relatively exposed area. A typical Mars dive lasts up to three hours, and with one hour back and forth, we need a five-hour window with fairly calm winds.

The dive team consists of a dozen specially selected divers. Everyone is trained by Global Underwater Explorers on the JJ-CCR rebreathers The team is made up of divers with extensive project experience who can dive under difficult conditions while being productive, efficient and, above all, safe. Most are experienced underwater videographers or photographers.

GIANT MIKADO

I had already been warned that the first dives on Mars can be somewhat confusing. And they are! I am overwhelmed by the grandeur and complex nature of the wreck. At this depth in the Baltic, it is always pitch black and you can only see what you can illuminate with your dive light. At first glance, the wreckage resembles a lumber yard gone berserk, or a giant game of Mikado. The cold Baltic at 4°C, the darkness and the inevitable narcosis add to the challenge. Frankly, I'm a little intimidated by it all. After all, I am the rookie on the team and I would like to be able to contribute positively to this year's expedition. Eventually, I start recognising details and after getting a few reference points, my situational awareness improves.

The wreck is spread out over 500 metres and it is actually possible to follow the last hours of the battle step by step following the tracks it has left on the seabed. Cannonballs, parts of the hull and masts, as well as personal artefacts, bear testimony to the brutality of the sea battle. The main wreck itself, including both hull sides, are relatively intact in the middle of the wreck area, where guns of various dimensions and calibres are sprinkled across the seabed in unprecedented quantity.

THE DEEP FREEZER

After 40 minutes on the bottom, about two hours of decompression awaits. As soon as we rise just a few metres above the wreckage, the visibility suddenly becomes clear as gin. On the other hand, the temperature drops to just two degrees and we can only think about moving quickly through the freezer while spending as little time as possible on the deeper deco stops.

After the first hour in the water, the effect of our heated Santi-suits begins to wear off. There is still some juice in the battery pack, but the body has been cold for a long time. It can be hard to grasp the fact that there are still two hours of decompression time to go. Fortunately, the rebreather technology is on our side. On open scuba, you breathe cold, compressed gas, which is heated in the lungs and then exhaled directly into the water. It's a big waste of heat energy. A rebreather diver, on the other hand, inhales his own warm exhalation gas, which has added heat energy

from the process that takes place when the carbon dioxide in the exhalation gas is purified in the rebreather's scrubber material.

Around 30 metres, the decompression stops begin to get longer and the temperature increases accordingly. On the last shallow stop, the visibility gets worse again and we move closer to the ascent line. It is important not to lose it and have to shoot a bag. The last stop at six metres lasts about an hour and I usually just try to turn my brain off and zone out while the minutes just tick away. Fortunately, the surface water is around 17-18°C, but at this point we are all cold. However, it helps to visualise the barbecue that we will all get to enjoy in a few hours.

PHOTOGRAMMETRY

After the discovery of Mars in 2011, a special law was quickly made to protect the wreck site. It is illegal and impossible to dive Mars without special permits, and the area is monitored 24/7 by the Swedish Coast Guard. It is prohibited to fish, stop or use sonar in a circular area within a diameter of 1 mile.

However, each year a special permit has been granted to a small select group of divers who, in collaboration with international and Swedish researchers and experts during the fourteen days the permit lasts, conduct field studies at the unique archaeological site.

In the first few years, the main focus was to map the wreck site to get an overview. The iconic mosaic image, created from 640 images, which were painstakingly put together in Photoshop, went around the world and was on the cover of several magazines including National Geographic.

The mosaic assembly, which visualised Mars in a way no one would be able to see in reality, introduced a new approach to underwater archaeology. It was clear from the start that salvaging the wreck was out of the question. Bringing it on land and preserving it would be impossible and too costly. In addition, the oxygen-poor, brackish and ice-cold Baltic Sea at a depth of 72 metres is in fact the optimal place to store ancient woodwork. The absence of wood worms in the almost fresh water offers the best possible conditions.

Instead of salvaging objects from Mars, the Lundgren brothers and their team began developing and refining digital documentation techniques, such as 3D scanning and photogrammetry. The Mars exploration began parallel to the maturing of technologies that achieved a precision that supports serious scientific studies. But it is one thing to do photogrammetric documentation of smaller objects in the controlled environment of a photo studio, but something completely different to document large shipwrecks at 72 metre depths in pitch dark conditions. GUE divers are specialised in working efficiently with documentation methods and photogrammetry techniques are now part of the course curriculum.

DIGITAL EXCAVATION

On the basis of the photogrammetric 3D models, the ship can be digitally rebuilt and the models provide a fantastic overview of the entire wreck site and allow researchers from all over the world to participate in the archaeology studies of this battlefield frozen in time. For example, an expert in 15th century weaponry can study the digital models and make measurements with centimetre accuracy. Scientists or experts can discover contexts or details that divers can't see with the naked eye underwater. And the scientist can participate in the research without ever leaving their office. Photogrammetry also makes it possible to reconstruct or 3D-print artefacts such as small guns. Or make scale models of the entire wreck.

It has been claimed that Mars is one of the world's most significant wreck finds and the series of parallel scientific projects focusing



on many different aspects of Mars is proof of that. Life on a warship in the 16th century, shipbuilding techniques, metallurgy studies of cannons and the role of warships in society are just a few examples of these ongoing scientific projects. Mars sank with more than 800 soldiers and sailors on board. They have left many remains and artefacts that allow experts to reconstruct and describe life on board, thus providing an insight into life in the 16th century. Mars is an undisturbed time capsule that can provide many answers to an ever-growing number of questions.

NAT GEO

We know that in a few days, our camp will get a visit from a British production team that is working on an episode for National Geographic's series, Drain The Oceans. Although I usually take still photos while diving, I am tasked with recording video sequences on Mars that Nat Geo can use as material for the show.

Furthermore, I make photogrammetry recordings with macro lenses of, among other things, coins, a mold used to forge small cannonballs and details on bronze cannons. My images are used for photogrammetry renderings and these details have never been documented with such precision and resolution in 3D. Otherwise, the most important result of the 2019 expedition is the expansion of the mapped area around the wreck itself. Many more details are added, but much work remains to be done if we want to cover the entire fallout area around Mars, where numerous effects and their relative placement can provide important information to the researchers. If, at some point, it is decided to salvage more objects, it is also important to document their location and context before moving them. The mapping is done by a photogrammetry diver swimming steadily above the bottom and shooting multiple images with a certain overlap, which is then digitally assembled into a 3D model. But this laborious work could be done far more efficiently with a remote-controlled underwater video robot (ROV) that does not have to decompress after 30-40 minutes on the bottom. However, this is expensive equipment, but efforts are currently underway to obtain funding through sponsorships, so we divers can concentrate on more specialised tasks where it is advantageous to have a human in the water.

I look forward to being part of the team again in 2020, where we hope, among other things, to find answers to the question: where are the remains of the 800+ soldiers that perished in the wreck and where is the missing wreckage located?

DIVE TEAM: MARS 2019

Everyone in the dive team are GUE trained and have hundreds of hours of experience on the JJ-CCR in the GUE configuration:

- Kirill Egorov, Russia
- Jesper Kjøller, Denmark
- Kees Beemster Leverenz, USA
- John Kendall, UK
- Rachael Kendall, UK
- Oleksiy Sverdlov, Ukraine
- Marcus New, UK
- Su Eun Kim, Korea
- Kyungsoo Kim, Korea
- Richard Lundgren, Sweden

FACTS: GUE

Global Underwater Explorers (GUE) was formed in 1998 by a small group of ambitious divers who strived to develop underwater projects that made it possible to explore underwater environments. From the beginning, GUE has been based on three pillars: Education, Exploration and Conservation. Today, GUE has a complete educational programme that covers all areas from the basic course GUE REC1 to instructor trainer. GUE appeals to divers who are prepared to go the extra mile in terms of personal fitness and who generally have an uncompromising approach to diving.

GUE is based on a holistic system that was originally developed to meet the requirements of complex technical dives such as deep wreck dives or extensive cave exploration. But gradually the organisation adapted to include recreational diving in every conceivable environment. Although different dive situations require the addition of specific tools and techniques, there are a number of key components that ensure success and are the same on all platforms. Elements such as precision buoyancy, stability, standardised equipment, swimming techniques, teamwork and a thorough understanding of gas dynamics, are considered fundamental by GUE.

The comprehensive degree of standardisation and alignment of procedures, equipment configuration and dive planning make the GUE diver an extremely effective project participant, since everyone in a GUE project has the same approach to diving and has compatible configurations and procedures.

GUE's standardised and holistic approach to scuba diving has proven its value and has thus accomplished some of the most ambitious and successful exploration projects of the past 20 years, including the discovery and ongoing exploration of Mars.

FACTS: EQUIPMENT

All Mars divers use JJ-CCR rebreathers in the special GUE configuration. The major, compared to the standard unit, is that the GUE version has two seven-litre steel bottles connected with a flexible Lola-manifold. This means that the diver in the GUE configuration can carry a total of 14 litres of diluent compared to the standard three litres. The GUE diver therefore does not need to include a deep diluent gas as a separate bail-out as he has enough on his back. At the same time, there is enough gas to share with an unfortunate team member if need be.

Another difference is that the GUE configuration also features a long hose for open circuit gas sharing and the cylinders are turned upwards so valve shutdowns are done similar to open systems.

Everyone uses electric heated undergarments from Santi. At least a heated vest or a full suit, but most also have heating in their gloves.

Photo by Marcello Di Francesco

IT HAPPENED TO ME!

FEATURE **RANEEM ABUDAQQA**

You never expect to be the victim of a diving incident until it happens to you or a close acquaintance – then you quickly begin to realise quite how easily things can suddenly go wrong, especially when diving in unfamiliar settings and with unfamiliar buddies and equipment.


Photo by DAN Europe

You never expect to be the victim of a diving incident until it happens to you or a close acquaintance – then you quickly begin to realise quite how easily things can suddenly go wrong, especially when diving in unfamiliar settings and with unfamiliar buddies and equipment.

That was the case for me when I went wreck-diving this October in Antalya, where I was the victim of an incident involving a malfunctioning piece of diving rental equipment.

The day of the dive started out fine. I had travelled to Turkey with a family member, but only I was diving, so I headed to the centre, got kitted out, and was buddy paired with a dive instructor. The first dive was a recreational cave dive, and during it I had absolutely no problems with my equipment.

The second dive was a wreck dive to 25 m and everything went fine right up until about 40 minutes in, close to the end of the dive, when we were preparing to make our way back up to the shore. I checked my buoyancy and noticed that I was slightly negatively buoyant, so I reached for my inflator to add just a little air to my BCD, except that it got stuck!

Within seconds, my BCD had fully inflated and I found myself rapidly ascending to the surface from about 25 m. Theoretically, the solution to a stuck inflator is to disconnect the air hose from the BCD; in practice, there is very little time to act in such a scenario, and unless a buddy holds you down, or you move very quickly to vent your dump valves, it can be hard to counteract.

Personally, I have quite small hands and struggle to disconnect a pressurised air hose from a BCD even on the surface under training conditions. Needless to say, it is even harder to perform underwater under extremely stressful conditions.

In the event, I intuitively tried to deflate my BCD by pressing on the top button of the inflator hose, but it did not help. As I ascended, I began to feel lightheaded and lose sensation in my limbs, my vision became blurry and all I could think about was the nitrogen bubbles expanding in my body. I believe I may have briefly blacked out.

At some personal risk, the dive instructor swam after me and managed to grab my ankle when I was almost at the surface to pull me back down to around 6 m for a retroactive safety stop. Underwater, I felt unwell and extremely fatigued and kept signaling up, but the instructor made me stay at depth for the short swim back to shore. I should note at this point that it was not best practice to head back down to depth after missing the safety stop and nearly reaching the surface, but in this instance, being stopped before getting any closer to the surface could have helped, and may have prevented me from worse circumstances, such as a an unconscious diver incident. What followed was less helpful.

When I came out of the water, my body was shivering, and I was extremely lightheaded. At the time, I was convinced that I had decompression sickness. The correct response to this would have been emergency oxygen and to contact the nearest doctor with an understanding of diving-related injuries. The Instructor and Dive Centre Manager pushed back however, and kept saying that this was impossible and simply advised me to drink water, plenty of water. An hour later, I began to regain my strength and I walked back to my hotel, trusting the advice of the dive centre.

A few hours later, I experienced an intense headache in my frontal lobe and I began to feel a strange, numbing sensation in my left arm. I was now convinced at this point that everything was not alright, but when I tried to reach out to the diving centre for a medical contact, they kept pushing back. I did not know what to do. I felt uneasy about my symptoms, but here were professionals telling me that it was not a problem and that the symptoms would go away with time. I decided to take it easy for the rest of my trip and wait it out, and 36 hours later, I flew to Amman and then two days later, on to Dubai.


Photo by DAN Europe

Unfortunately, after the flights to Dubai, the symptoms got noticeably worse and I went straight to the hospital and met with Dr. Mohab Ahmed Shafei, the extremely experienced Specialist General Surgeon at the Hyberbaric Oxygen Treatment (HBOT) at Al Zahra Hospital. He confirmed the diagnosis of decompression sickness and the next day I entered the hospital's decompression chamber for the longest possible session there, based on US Navy Recompression Treatment Table 5.

It has now been more than a month since the incident, and I am still going through the HBOT therapy to help the healing process of what a subsequent MRI scan confirmed to be substantial damage to the cartilage, ligaments and nerves of my left arm, where the damage was worse because I had been tightly gripping the inflator in an effort to dump air as I ascended during the incident.

I am sharing this story because my accident has been a wake-up call for me on the need to never underestimate the potential risks of diving and to improve my own knowledge so that I do not need to rely on the advice of others, even if they are theoretically better trained.

There will be problems that you can prevent, are trained to deal with, or which you are able to adapt to and overcome, but there will also be problems that you cannot prevent and which will be difficult to overcome. All the safety mantras really come flooding home when something like this happens.

The inflator on a regularly and well-maintained BCD should not fail, but if you are diving with rental equipment that is not regularly maintained, has experienced heavy use or is simply old, it can. The BCD inflator that malfunctioned on me looked slightly older and was not the type that I was familiar with, and, in hindsight, as a paying customer, I could have raised this and requested a newer or more familiar type of BCD, or, if this was unavailable, changed my plans to dive with a different dive centre.

The best advice I can give someone reading this who may experience the same or a similar situation, is to not neglect your training or safety, and to make sure you are comfortable with your equipment before you dive. In any case, if something like this does happen to you or a buddy, you may be better prepared or simply more reactive in such a situation than I was, and it may all turn out ok.

However, if you believe that one of you may have decompression sickness, make sure to request emergency oxygen, even if you are not sure – as it can significantly reduce the risk of the resulting symptoms, which can be delayed by up to 24 hours.

TAKE NOTE:

- If you are overseas, make sure friends and family know you are diving and expect to hear back from you.
- Make sure the dive centre is appropriately equipped with emergency oxygen and trained personnel.
- Know the contact details and location of a nearby doctor with experience in diving illness and injuries, and the nearest HBOT facility.
- Get Diver Alert Network insurance.
- Stay within your limits.

MY BUDDY
THE BRONZE YOUTH DIVER

FEATURE **PATRICK VAN HOESERLANDE**

After a lot of nagging, we finally gave in and allowed our daughter, then 10 years old, to go diving. It did not last long before I too was in the pool during the pool training sessions with the rest of the youth divers. Shortly thereafter I followed the youth diving specialisation and established a successful youth diving school. In the meantime, our youngest family member Seighin is heading towards becoming a 14 year old and is about to switch to adult SCUBA diving. This is a good reason to take him on a dive as a buddy and to put youth diving in the spotlight.

The open water season is much shorter for youth divers than for us, adults. Indeed, the metabolism of a young diver is different. Unlike us, they do not feel the cold coming, but their core temperature can suddenly drop, and they can get cold in an instant. Also, they are less resistant to cold itself and can only dive if the water is warmer than it actually is. And even that is on the limit. Usually, we wait until the thermometer passes 15. In short, this means that a youth diver can dive no more than five months a year. Including, the few weeks of mandatory inactivity due to exams. Fortunately, there are three Belgian dive tanks to dive from which slightly stretches the open water season.

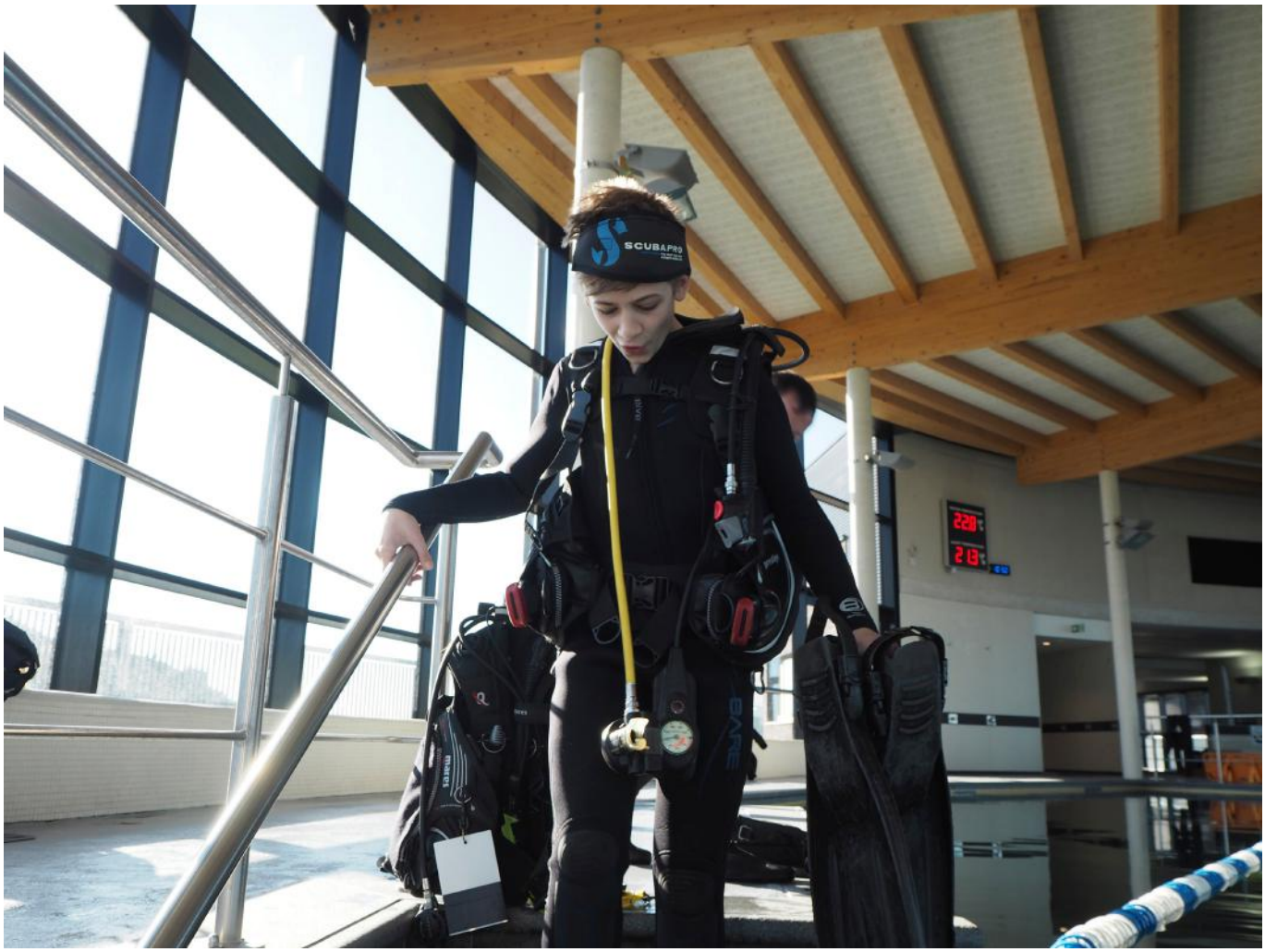
Today we are going to dive in TODI to close the season. The "real" open water is already too cold, so we are diving in the warmer, indoor aquarium. We will not be alone, because this excursion takes place within the framework of the youth diving department of the dive school Amfibie. As always, both the youth divers and the cadre are enthusiastic. Fortunately, as a youth diving school, we do not have to worry about the time limitation. We are exempt from the usual two hour limit for adult divers. Youth diving always happens in a stress-free atmosphere, we avoid time pressure, even in an indoor environment.

It is not the first time that we have dived together, and here too, we were a buddy pair. We don't know all of the dive site, but it is no strange place. Because the buddy is central to this kind of diving, I let Seighin decide what we would do. Not unexpectedly, he asked if we could go 'moon walking'. A few lessons ago we practiced it in full diving gear on the bottom of the pool. This diving method looks very similar to that of astronauts walking on the moon's surface. Now he wanted to try it out in TODI.

Just to be sure, I checked with the safety personnel to see whether this would be accepted. And it was. So, I couldn't refuse his wish, and why whould I? In this case, we needed to take extra weight down with us. I adjusted my briefing accordingly. After all, it is important that my buddy does not drop uncontrollably down to the bottom. We needed to take the extra necessary precautions. Seighin took his action camera with him to film everything.

We prepared ourselves quietly and then excitedly headed out to our starting point. A final check and we were gone. As we made our gradual descent, we motioned that we were going to explore TODI in a large circle with the intention to walk along the bottom. Due to anatomical reasons, clearing ears is not easy for the youth. A quiet descent is an important factor for a relaxing dive. When we touched the bottom, we removed our fins as agreed. During our exploratory round, I discovered a nice place where we could leave our fins without them drifting away.

One last check and off we went. We calmly began our strange walk in this underwater environment. We first tried to walk a few steps until we were feeling comfortable enough to start jumping. It felt as if we were in a strange world. Our perspective of this underwater environment differs a lot from the one as a diver. As a buddy pair, it's as if we were astronauts (or aquanauts), exploring another planet for the first time. We were completely unaware of the fact that we were 'just' divers in a tank. I saw that my buddy felt right at home and was enjoying it, so all was good!



Our locomotive abilities improved by each minute and so we ventured to jump from rock to rock. A few divers swam past giving us some strange looks. In contrast to what I expected, none of them joined in. Did they not see that we were enjoying ourselves? Or was this way of moving underwater outside of their comfort zone? My buddy clearly didn't think that way.

While we attempted to overcome all underwater obstacles, we also tried to approach the fish. However, they made no distinction between a diver with or without fins. We remain temporary large and noisy creatures to them. And of course, they are right about the temporary aspect. The air supply Seighin carries on his back is many times smaller than mine, and he was the first one to give the "half-pressure" signal. That was the sign for us to walk back to the place where we had left our fins. We still had some time left so we didn't have to rush and we continued to enjoy the view. After waving to the spectators behind the glass, we quickly transformed back into 'normal' divers.

We did one more tour of the obstacles along the bottom before we started our return trip to the surface. We swam quietly from one point of interest to another, until we stuck our heads above the water. This was a strange but fun dive. It may be an atypical youth diver profile, but the fun before, during and after the dive is typical. Doing something crazy in a safe way is always fun.

I find youth diving one of the nicest disciplines of diving. There is little that beats transferring knowledge and skills to interested young people. Youth divers are also energetic enthusiasts who turn your diving into unexpected fun. Some of these young divers I consider even better divers than myself, and better than many other adult divers I know. Despite my multitude of dives, I will never feel like a fish in water unlike some of these boys and girls. It's just a bit of a pity that being a youth diving instructor results in a logbook filled with shallow dives.

I cross off diving with a bronze dolphin from my list. I know that there are other facets of youth diving that could lead to an article in this series, but that is for another time. Now I am looking for another surprising discipline in our sport. Where will I dive with my next buddy? And what will I discover? Curious? I am, and a little more with every edition.

Do you know someone with a special interest in diving who would want me as his or her buddy? Are you such a buddy? If so, please contact me via **patrick.vanhoeserlande@nelos.be**. I look forward to your suggestions.

Youth Diver: Seighin Van Hoeserlande
First Dive: 2012, the day after I turned 8
Total Dives: 15
Club: Diving School Amfibie, Turnhout (Belgium)
Certification: Bronze Dolphin (the first level of youth diving).
Other Certifications: Not applicable, omitting the various certifications of youth diving.
Special Equipment: My dive equipment specifically designed for youth divers, an action camera and a rubber duck.
Favourite Dive Site: Ekeren (Belgium)
Favourite Dive Site Abroad: l'Escala (Spain). There are nice places to dive from the shore, but it is also fun to dive from a boat.
Most Spectacular Dive: Playing the part of Skubba in daddy's movie from his stories.

THE ENOS®-SYSTEM

FEATURE **CHRISTIANE LINKENBACH**

Divers are just tiny drops in the ocean. So how does one find a single drop in the ocean when a diver has been swept away by currents? Searching for lost divers is one of the most difficult tasks crew on dive boats have to tackle.

Divers are just tiny drops in the ocean. So how does one find a single drop in the ocean when a diver has been swept away by currents? Searching for lost divers is one of the most difficult tasks crew on dive boats have to tackle.

ONCE UPON A TIME…

In the November afternoon of 1995, in the Red Sea, at Elphinstone Reef.

The reef is famous for its beautiful corals and sharks as well as its (strong) currents. On that day, three divers were swept away at the start of their dive towards the south where no further dive spots exist, in an area of more than a hundred kilometres. This part of the region is not frequented by dive boats.

Their absence was only noticed after more than an hour, when the last divers surfaced.

A search operation was promptly and strategically initiated: despite the short surface interval, the guide jumped into the water to perform a search and recovery dive, the inflatable vessel headed along the reef where the divers were last located from their descent and the mothership cruised in open waters around the "Elphinstone Reef". The crew and 16 divers continued to observe the surface until their eyes burned.

Unsuccessful – the three divers remained lost.

Finally, the captain had to call a stop to the search operation. The sun had already set and darkness had now spread. In order to not endanger the lives of the other divers onboard, the captain looked for a safe place to anchor in the shallow waters.

In the 90s, it was impossible to initiate a search and rescue operation. Liveaboards were small back then and only a few boats were able to get to the far to reach reefs. There were no coastguard stations along the stretch of coast to ask for help. Mobiles weren't properly established and their use was especially limited at sea.

There was no one to inform and send an SOS to about the 3 missing divers. It was left to the boat and its passengers onboard.

54 HOURS DRIFT – 100 KILOMETRES

Two days later, 100 kilometres in the south of "Elphinstone Reef".

Another safari boat headed straight to the dive spots in the very south, close to the Egyptian-Sudanese border. Still in deep waters, with no reefs around in their current location, the captain carried on in high speeds to get to their destination. No other vessels were seen. The captain suddenly paused as he spotted something on the surface with his trained eyes. One of his crew focused on the same point. The two professionals immediately recognised it was a human being drifting on the water's surface.

A VERY LAST MINUTE RESCUE

Just a few minutes later, the crew helps a completely exhausted and dehydrated diver climb aboard. His face was sunburnt, his lips were chapped. When they carefully took his wet suit off, he had open wounds visible on his arms and legs.

Despite his pain, he urged the captain to carry on and look for his two buddies who were hopefully also still drifting.

The crew couldn't believe this diver had drifted from Elphinstone Reef, a hundred kilometres away – together with two buddies!

WHERE ARE THEY?

The diver reported that after having drifted for more than two days in the Red Sea, day and night, his buddies had decided to end it by drinking salt water. The two divers swam out to the open sea to spare their buddy from having to watch them die.

Now the task was to find them both as quickly as possible, with the chance they may still be alive.

They were found, still alive, but in the same poor physical condition as their buddy. They survived and thankfully, their physical wounds have healed completely.

NO EXCEPTION

Although this incident was an absolutely horrendous ordeal, it caused positive interacts: danger caused by currents was finally recognised by divers!

The fact that divers were lost due to currents, and a search and rescue mission had to be performed is nothing new. This has existed for decades in the diving industry, but (almost) no one was reporting these accidents. Not only were some of the search operations unsuccessful causing uncertainty to what really happened to the missing divers, but the tourism industry doesn't like to admit to fatalities, especially during "the busiest weeks of the year".

The international dive media however, covered the story for months, reporting extensively about the three divers in the Red Sea. Then, the movie, 'Open Water', about the story of two divers who were forgotten at the Great Barrier Reef was launched in 2005.

Worldwide divers were concerned. One of these concerned divers was Karl Hansmann, a graduated engineer in electro-technologies and informatics (CMAS "Gold" certified diver), who dived the Red Sea many times. He not only knows Elphinstone Reef, but he also knows the dive centre, the boat, the captain, and the crew because he spent several months in the Red Sea to check and overwork the electricity and electronics of all the dive boats in this fleet.

He spoke a lot about that incident with the staff of the dive centre, as well as with the divers who were onboard the rescue boat, and their eye-witness reports horrified Karl. Although he knew how dangerous currents can be, he could not believe how quickly a diver vanishes at the surface – in spite of the equipment and an SMB.

It would take some time before he would find the solution.

VISIONARY

Approximately one and a half years later, Karl got the visionary idea to locate divers by GPS.

What seems to be "an old hat trick" today, was almost revolutionary in the late 90s because GPS had only recently been allowed for civil use and the first navigation systems had only just entered the market.

"All of sudden, I clearly saw the solution", he says. "If the diver relays his GPS position to the boat, the crew knows where to collect the diver up from in the water."

Sounds simple. He was convinced that such rescue systems already existed on the market, but nevertheless, he began his research. He investigated sea emergency systems and sea emergency frequencies meticulously, the principles of functioning, the demands – to come to the result, that none of the existing devices fulfil the requirements of the diving industry. [See the article in Divers for the Environment's September 2019 issue, pages 50-59 – What You Know Could Save Your Life.]

LIFESAVING FOR SEAFARERS – BUT NOT EFFICIENT FOR DIVERS

"Merchant marine rescue systems are supported by SAR which can be connected via varying radio frequencies", he explains. "But this requires special equipment onboard to send and to receive these radio frequencies. This is expensive and a radio license is necessary – not to speak about the fact that these devices can't be installed on many dive boats," and he draws the attention to the

LEFT: ENOS-Receiver Tablet Screen. **RIGHT:** ENOS-Receiver Integrated Touchscreen. **OPPOSITE PAGE:** ENOS-Beacon Pouch.

different kinds of boats used at dive centres: from luxury liveaboards to inflatable vessels, rustic fisher boats, country-specific boats such as the Maldivian Dohnies, Philippine Bangkas… Furthermore it has to be emphasised that almost no diving instructors are radio certified to use these devices correctly. "It was totally clear to me that I wasn't moving forward in this way," he sums up.

"Additionally, one question came to me each time I imagined a diver surfacing just a little too far away from their boat. Why would I call SAR who is thousands of kilometres away, if my boat is only a few hundred metres away from me? It would be so much faster to rescue the diver with their own boat and their own crew if they could be the ones to call!"

SOUNDS LOGICAL AND CONVINCING

Together with a graduated engineer of communication technology colleague, Karl realised his idea and turned it into a prototype. They developed a system consisting of two units, a receiver and transmitters (beacons), in which both are GPS supported. In case of emergencies, the beacon relays its GPS position directly to the receiver onboard the dive boat.

THE 1st AUTONOMOUS RESCUE SYSTEM FOR DIVERS WAS BORN

At the beginning, they talked about the "electronic rescue and locating system" (in German "Elektronischen Notruf und Ortungs-System"). This is a typically precise and objective formulation to engineers. In time, they branded it ENOS, consisting of the first letters of the German term. Meanwhile, the "ENOS®-System" is a registered trade mark and has been in worldwide operation since 2004.

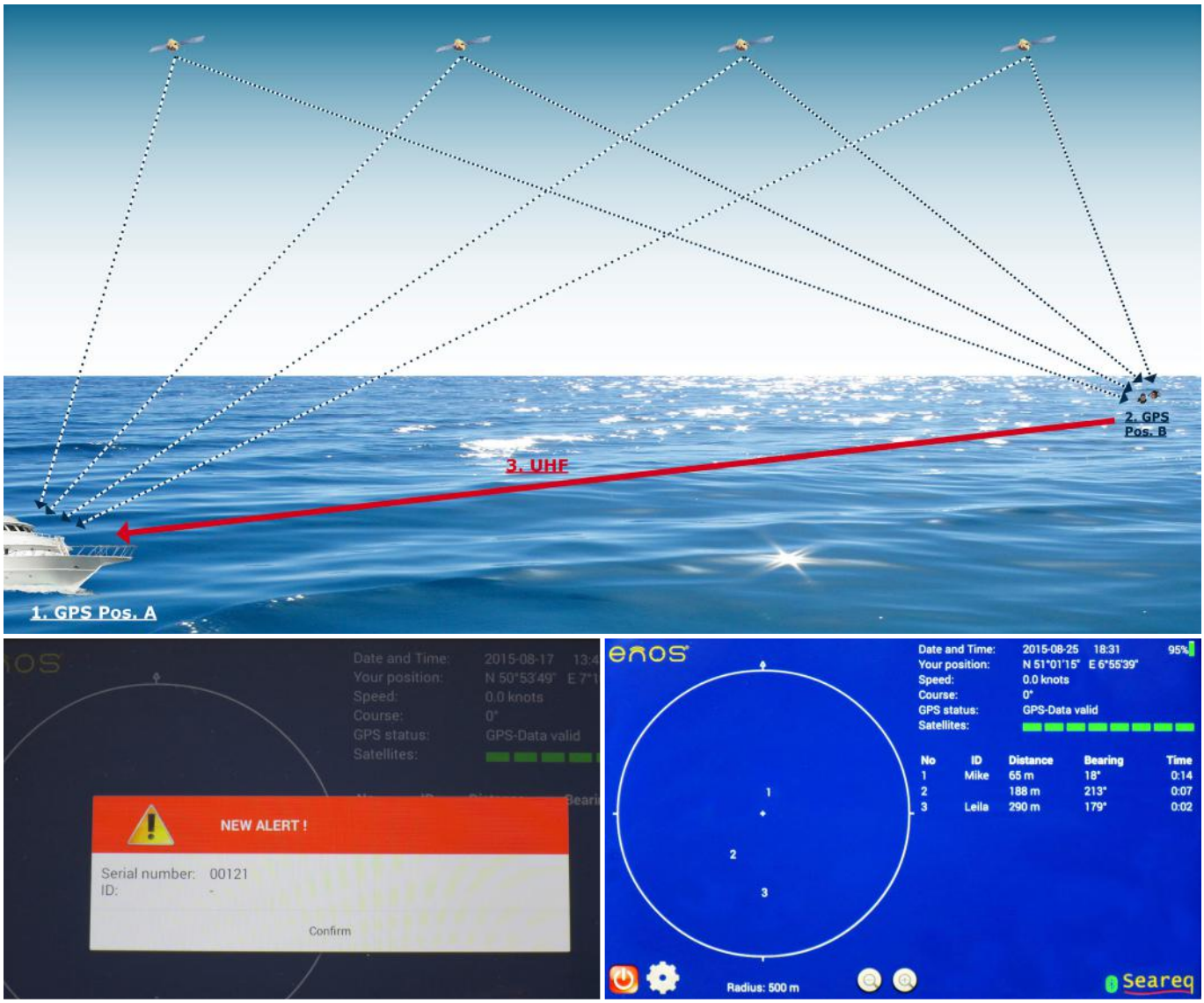
It's remarkable that the device still works with the same function it was developed in. Only the shape of the beacons have changed; to a smaller size – and it became cheaper, much to the delight of the entrepreneurs.

INDEPENDENT AND SELF-CONTAINED

This is the sequence of events of a typical rescue operation with the ENOS®-System:

1. The ENOS®-Receiver is placed onboard and has been switched on prior the dive. It determines its GPS position and is now ready to receive and to evaluate alerts from the ENOS®-Beacons.
2. Every diver gets an ENOS®-Beacon which can easily be attached to the equipment. The Beacon only weighs 220 grammes, (including pouch, rope and snap hook) and is pressure proofed up to 100 metres/330 feet. It is only activated in case of emergencies.
3. If a diver surfaces too far away from the boat, he just has to switch on the beacon by turning the "red foot" 180°. This is very easy to handle even under high stress and with wet cold fingers or thick gloves.
4. Just 5 seconds later, a 1st alert is received onboard: A red warning arises on the display of the receiver and a high-frequency sound informs the crew about the case of emergency. Both, the red window, as well as the audible alert, remains until the alert is confirmed by someone in the crew.
5. Now the crew is informed and searches the surface. If the diver is still visible, the rescue can be initiated promptly, just a few seconds after the beacon was activated. If the diver is not visible (because of dawn, sun reflections, long distance, high swell, etc.) the crew just needs to wait until the position of the diver is displayed on the screen of the receiver.
6. In average, this takes 1 to 1.5 minutes. Immediately after the 1st alert was relayed to the dive boat, the ENOS®-Beacon determines its own GPS position. As soon as the GPS position is identified, the beacon then sends the GPS data directly to the ENOS®-Receiver. Both, the determined GPS position and forwarding this GPS data to the ENOS®-Receiver are performed automatically by the ENOS®-Beacon; no further action is required by the diver other than switching the ENOS®-Beacon on. That's why the ENOS®-Beacon provides only one easy to handle switch instead of several buttons which confuse divers under stress, even if they are in different colours or shapes.
7. Using its own GPS position and the received GPS data from the ENOS®-Beacon, the ENOS®-Receiver then evaluates the precise distance and bearing from the boat to the drifting divers. This lifesaving information is visualised as an easily understandable graph on the receiver's screen.


scos



TOP: ENOS-Functioning Principle. **LEFT & RIGHT:** NOS-Display Alerts.

It's no wonder crew on ENOS®-Boats never have to struggle searching for missing divers, they always see them clearly on the display of the ENOS®-Receiver. If several divers are swept away and call for help at the same time, the ENOS®-Receiver is able to receive, evaluate and show all alerts simultaneously. Even in this exceptional situation, the crew is able to see where the divers are at with just a glance.

The receiving range of the ENOS®-System depends on the height of the radio receiving antenna, as with any device supported by radio frequency. To increase performance and safety, and to find an ideal solution for any kind of boat, the ENOS®-Receiver is available in several varieties. On request, an external radio receiving antenna can be connected to the receiver to receive alerts from distances up to 10 km/5.6 NM.

UNIQUE FEATURES

Reporters should be very careful with exuberant terms such as "unique features" to avoid false advertising and marketing language; particularly when they are writing product reports. Nevertheless, in context to the ENOS®-System, it's reasonable due to the fact that there are several features which are not found on any other rescue system – neither for sailors/boaters, nor for divers: the beacon and receiver are very easy to handle and clear to understand.

The crew is alerted within seconds and the rescue is often initiated in the first minute(s)! Since the ENOS®-System was launched in 2004, no rescue has taken longer than 17 minutes despite divers being swept 3 km/1.7 NM away!

The portable ENOS®-Receiver is recommended for dive centres frequently using different boats – or when the rescue is operated by inflatable vessels. The high-tech electronics are protected in a splash-proof (Peli) case which can also be used in a dinghy, and the ENOS®-Display guides directly to the divers in need. No other maritime electronic receiving device can be carried in an inflatable vessel!

The ENOS®-Beacon transmits an update every 15 seconds of its position (for comparison: the man-over-board-beacons relay an update every 3-5 minutes)! This is high value information for the captain, specifically if he has to choose another direction by having to go around a reef to get to the diver.

Despite the very short updates, the ENOS®-Beacon has an operational time of 170 hours = 1 week! World record. No one has to be concerned about the performance of the batteries when a beacon was used several times during a diving safari because on average, an ENOS®-Rescue takes 7 minutes. Furthermore, it's clearly indicated when the batteries need to be changed.

The ENOS®-Beacon is powered by 2 customary Lithium AAA batteries which are available all over the world and which can be changed by the diving instructors themselves (no need to ship the beacons to the manufacturer).

The system is very robust and withstands the harsh conditions of a dive boat. The ENOS®-Beacon's antennas are inside the housing giving them maximum protection against damage. It's not just clever, but really unique in the world of sea emergency beacons. There have been

no reports of a broken antenna in an ENOS®-Beacon since its inception.

The radio frequency of the ENOS®-System is license free, and free of charge. A radio certificate ("SRC", Short Range Certificate") is not required and has no monthly fees or expenses after use.

From the very first development, it was clear to Karl that his product must be autarkic. It had to be independent of SAR which is located along the coast line and not available in the remote areas where liveaboards cruise, and independent of maritime radio and navigation devices which are not available on all dive boats.

Being robust and pressurised up to 100 metres/330 feet were the 2 easiest conditions to fulfil. Taking all of this into consideration, it is no wonder that the ENOS®-System reflects positivity with divers when they see the slogan, "ENOS® Onboard". Tour operators and travel agents have attested that ENOS®-Boats are more readily booked which is the reason every entrepreneur has reached the break-even earlier than expected – regardless of whether it is in the North Sea, the Red Sea, the Maldives, Indonesia, South Africa…

FROM PASSION TO PROFESSION

Karl founded his company Seareq, Safety and Rescue Equipment in 2003 which is still the manufacturer of the ENOS®-System. Since then, many, many systems have been delivered somewhere, and thousands of Beacons are in worldwide application and have rescued many, many divers' lives.

Over time, the ENOS®-System gained a "little brother", the Man-Over-Board-Operating-System, MOBOS®, specifically developed for boaters, wind and kitesurfers.

It is based on the same reliable and successful technology as ENOS®, with the same robust and unique characteristics, but provides a beacon with a switch which is released automatically by the self-inflation of the automatic lifejacket in case of emergency.

SEAREQ – THE SPECIALIST IN SAFETY AND RESCUE EQUIPMENT :
www.seareq.de

DIGITAL ONLINE 2020

EDA'S UNDERWATER PHOTOGRAPHY AND FILM COMPETITION

SUBMISSIONS OPEN: SUNDAY, 29th MARCH 2020 | **SUBMISSIONS CLOSE:** SUNDAY, 26th APRIL 2020 @ 11:59 PM (GST)

Digital Online 2019's Awards Night and Exhibition Opening at the American University in Dubai (AUD) with guests, winners and prize sponsors.

DIGITAL ONLINE'S MAIN OBJECTIVES ARE:

- To develop the human interaction with the underwater environment and highlight the beauty of its flora and fauna.
- To gather information on the number of underwater photographers in the UAE (both professional and amateur).
- To discover new promising underwater photographers in the UAE.

Digital Online is open to all photographers and videographers of all skill levels with a valid EDA Membership status. EDA membership must be renewed if expired or acquired in order to take part.

DIGITAL ONLINE 2009-2020

Digital Online will be celebrating its 11th Anniversary! The competition was realised in 2009 as there were no other underwater photography competitions existing in the UAE at the time. Digital Online was introduced by EDA for resident photographers to develop a relationship and human interaction amongst those unfamiliar with the underwater world environment. The competition holds both local and international marine life categories to offer variety between our local and international diving enthusiasts.

The film category was introduced as an extension to the competition in 2012 to share our underwater world through motion pictures and deliver a better understanding of the habitats and surroundings.

The event, now going into its 11th year, sees the continuous and steady growth of new underwater photographers taking part and joining our regular yearly participants. The enthusiasm and passion strives on, and the drive to bring our underwater world's conservation to the forefront increases over time. The purpose of Digital Online is to keep our underwater world visible by displaying its hidden beauties and to exemplify its importance to all life on Earth through the powers of its ecosystems.

The event has attained equal success with the non-divers who come to support the participating photographers and videographers at the Awards and Exhibition Opening Night. Whether it's through discussion or articles brought to our readers through our free quarterly magazine, Divers for the Environment, the inspiration the event brings is a success in its own right.

COMPETITION CLAUSE

EDA does not disclose photographers' names during the judging process. The competition is run fairly and without prejudice, professionally adhering to all of Digital Online's rules and guidelines throughout.

DIGITAL ONLINE
جمعية الإمارات للغوص
EMIRATES DIVING ASSOCIATION
PHOTOGRAPHY AND FILM COMPETITION

Digital Online 2019's Overall Winners

THE DIGITAL ONLINE RULES AND GUIDELINES 2020

RULES AND GUIDELINES

- Digital Online is open to all photographers and videographers of all skill levels with a valid EDA membership status. EDA membership must be renewed if expired in order to take part.
- Each competitor can only win one prize or prize package.
- Winners will choose their own prize.
- Participants are obligated to follow environmental conservation regulations and to respect the underwater world during the process of taking their stills and video. Be advised that any damage to the underwater world, including the disruption of the natural habitat of the marine life, provocation through touching, displacing, feeding or annoying, is prohibited and will disqualify the images or the photographer/ videographer.
- By entering the competition, entrants declare that they own copyright of the submitted photographs and films and it entails an automatic acceptance of all the rules. EDA reserves the right to publish images in the 'Divers for the Environment' magazine, EDA's social media pages and on the EDA website. Images will also be used in any future promotional material for EDA events and competitions royalty free, but copyright remains with the photographer. Use of images or video will require no additional written or verbal permission from the photographer or videographer.
- Images (photos or videos) must not have already been submitted to previous Digital Online Competitions.
- Photos and videos must be taken underwater unless specified in a category description.
- Manipulation is restricted to colour correction, brightness, contrast, sharpening and cropping. The Digital Online judges reserve the right to examine untouched images if requested.
- Removing backscatter is allowed to an extent, this does not include the removal of subjects such as fish or divers or cutting and pasting sections of images from one to another.
- The winners will be announced and their work displayed at the exhibition and award ceremony in May 2020 (date TBC) at the American University in Dubai. Participants who do not make it to the evening of the event will be asked to collect their prize from the EDA offices.
- Sponsors' prizes will be announced in the March 2019 magazine issue.
- We pledge to run this photography and video competition ethically and with integrity. Our judges have volunteered their time to help. The photographers' details remain hidden to the judges during the judging process.
- All judges' decisions are final.

REGISTRATION AND UPLOADING ENTRIES

- Submissions can be entered from Sunday, 29th March 2020.
- The entry deadline is Sunday, 26th April 2020, at 11:59pm (GST – Gulf Standard Time).
- The participant must be a valid EDA member. Submit entries via email to **photo@emiratesdiving.com** with the requested category detail information.
- File names should include photographer's name and the category:
  - Name-Macro.jpg
  - Name-WA.jpg
  - Name-UAE.jpg
  - Name-BW.jpg
  - Name-Compact.jpg
- Photo entries must be saved in jpeg format and should be sized between 2000 and 6000 pixels in the longest dimension. Please limit your images to a maximum file size of 5MB. Images will be viewed on a monitor and should be in the Adobe RGB 1998 or sRGB colour space.
- Video submissions must be in mp4 format with the Videographer's name used as the file name.
- The preferred method for photo and video entry is electronically, however, if this method is not possible due to slow internet connection, you are able to submit via memory stick. Please note, media will not be returned.
- You will receive an email to confirm your registration and photo/video upload. If you do not receive one within 24 hours, your email may not have come through and you may need to try again.

Good luck to everyone taking part in Digital Online 2020. Dive safely and have fun!

*NOTE: HOW PRIZES ARE AWARDED

Once the judging is complete, the winners will be able to choose a prize available to them on the list they will receive via email. Digital Online Judges award a 3-way point system to each photograph/video consisting of Technique, Composition and Impact which is added to give the photograph's or video's total grand score.

Best of show with the highest points will get first choice. 1st place winners by highest score will choose a prize before all other winners, 2nd place winners before 3rd place winners, etc. Please note, each individual can only win one prize or prize package.

PHOTOGRAPHY CATEGORIES

Photographers may enter one photo per category.

Details to include with each photo submission:

- Photographer's Name
- Category
- Location
- Story Behind the Shot
- Camera Gear
- Settings

1. **MACRO** (DSLR/MILC ONLY)
   Definition: Photographs taken with close-up equipment, portraying underwater flora and/or fauna. The photographer may not crop the original more than 20%. The original image may be requested.
2. **WIDE ANGLE** (DSLR/MILC & COMPACT)
   Definition: Photographs taken with a wide-angle lens (or adapters that provide an equal field-of-view), with or without human presence, portraying the natural beauty of the underwater environment.
3. **BEST OF THE UAE** (DSLR/MILC & COMPACT)
   Definition: Any underwater subject taken in the UAE and the Musandam.
4. **BLACK & WHITE** (DSLR/MILC & COMPACT)
   Definition: Black & white photography is timeless and elegant. Focus on tonal contrast, shapes and textures and the composition of the shot.
5. **COMPACT CAMERA** (COMPACT ONLY)
   Definition: Point & shoot photographers only.

VIDEO CATEGORY

Videographers may enter one film.

Title: A BLUE VOYAGE

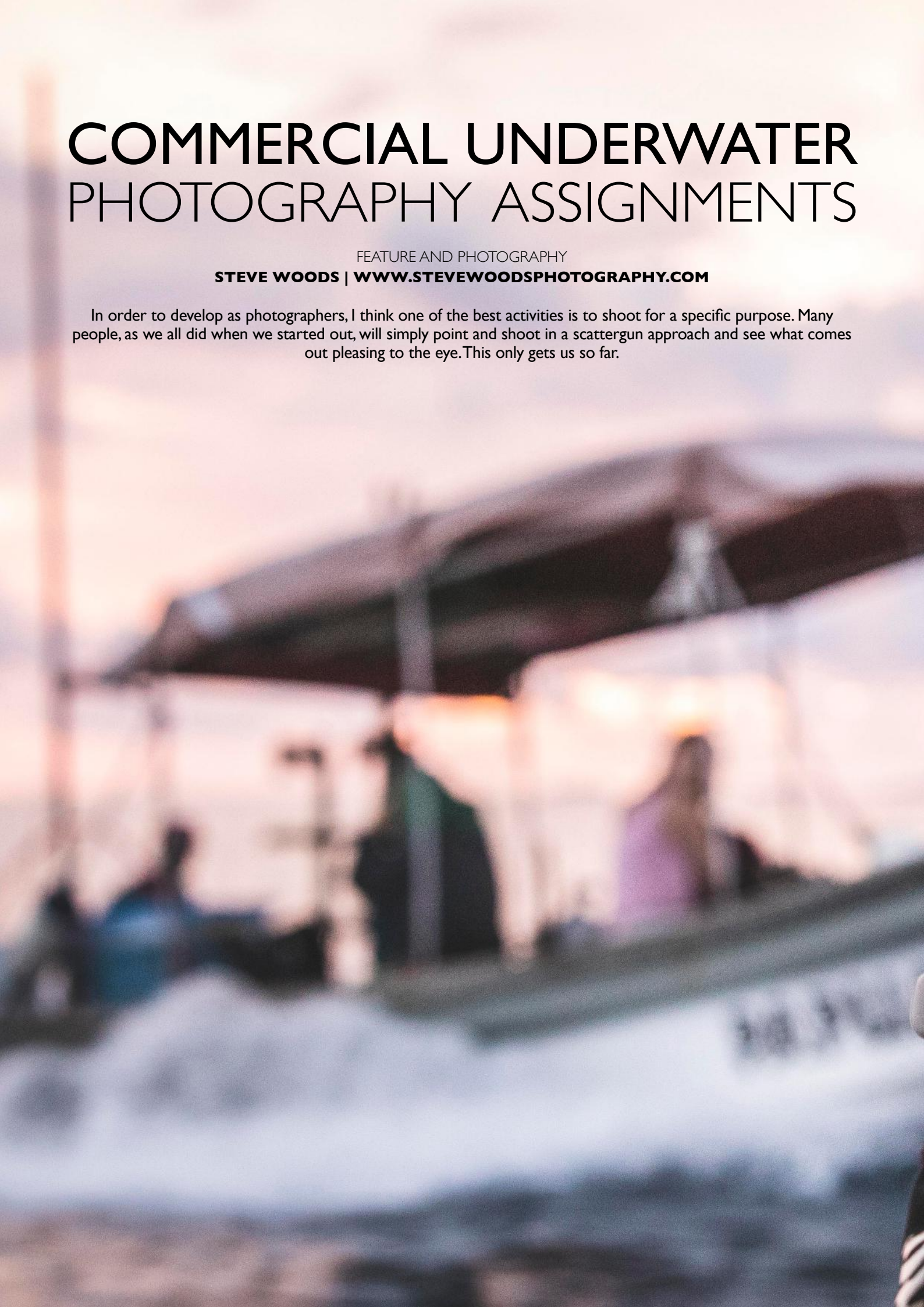
Definition: Looking for films of all genres – documentaries, narratives, shorts and animation films. Film subject must focus on all aspects of our underwater world including but not limited to, ocean exploration, wildlife, environmental, conservation and oceanography.

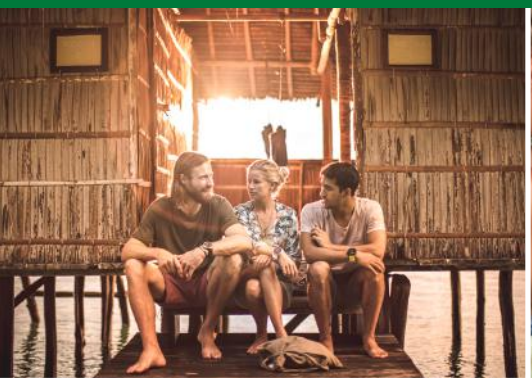
- All film genres will be accepted.
- Content must focus or relate to the ocean.
- Non-English films must have subtitles.
- If music is used, it must be from a public domain or royalty-free.
- Film length should be 5 minutes or less, including credits.
- Winning films will be chosen on the basis of creativity and the ability to tell a story that leaves the audience better informed and/or moved about the ocean.

COMMERCIAL UNDERWATER PHOTOGRAPHY ASSIGNMENTS

FEATURE AND PHOTOGRAPHY
STEVE WOODS | WWW.STEVEWOODSPHOTOGRAPHY.COM

In order to develop as photographers, I think one of the best activities is to shoot for a specific purpose. Many people, as we all did when we started out, will simply point and shoot in a scattergun approach and see what comes out pleasing to the eye. This only gets us so far.







Shooting a commercial assignment underwater is one of the most rewarding things to do. As photographers, we spend a long time developing our own ideas about what looks good in an image and how to achieve it. Much of this is subjective, personal preference, but a lot is also objective. There are unwritten rules in photography underwater, as well as on land, and these matter a lot more when you are shooting for a commercial client.

In order to develop as photographers, I think one of the best activities is to shoot for a specific purpose. Many people, as we all did when we started out, will simply point and shoot in a scattergun approach and see what comes out pleasing to the eye. This only gets us so far. Anyone can have a serendipitous mistake and create a pleasing image, it is much harder to come up with an idea, descend with a plan, shoot it and have the results come out as predicted. This is what will push you further down the line with your photographic ambitions.

I had built up a relationship with Suunto over a few years, having worked on a couple of projects with them and had them use my images to advertise the Eon Steel dive computer when it was released back in early 2015. When they approached me to photograph an as yet "un-named" computer, I jumped at the opportunity.

We had discussed various locations which all came with their pros and cons, when finally we secured Kri Eco Resort in Raja Ampat, West Papua. Raja Ampat is the most biodiverse underwater world on the planet, full of colour and amazing life underwater, as well as on the land. I have previously worked in Raja Ampat as expedition leader/photographer on a marine conservation organisation called Sea Sanctuaries Trust, so I knew the location well and could start planning the shots that I thought would be possible and would satisfy Suunto's needs. As you can imagine, they needed a lot of content. In this digital era, advertisements can vary wildly from physical banners, in store POS displays to digital marketing campaigns for smartphones and computers.

We needed to shoot a lot of content for every type of media.

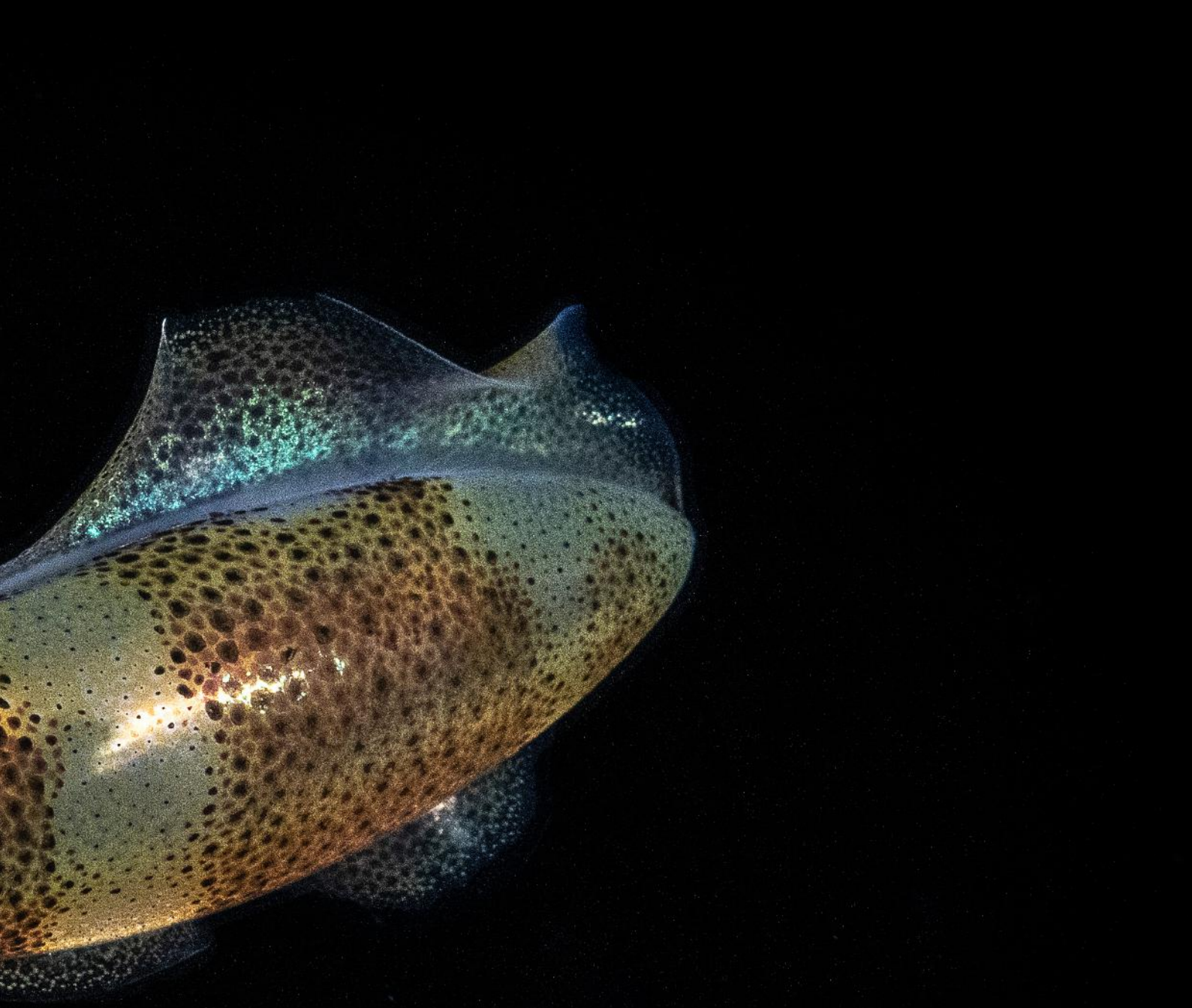
Logistics is always a big deal on assignments like this, though once we arrived in Indonesia, with nearly a ton (literally) of camera and scuba equipment, 2 videographers, 5 models, 3 Suunto representatives, 50+ dive computers, plenty of memory cards and myself, everyone was very happy and keen to get started.

We had a strict schedule to keep as we would do 2/3 dives per day with the models being shared between the videographers and myself. As well as all the underwater photography, I also needed to shoot copious amounts of topside product/lifestyle images. This meant shooting at sunrise and sunset everyday in order to get the best light. Shooting for 12 hrs a day is taxing on anyone. Not only are you trying to organise and guide the photoshoots, but you also have part of your brain working on the next underwater shoot and the sunset shoot that will come after it. Again, having a plan is key here. Once you know what locations you have available to you and which models, you can then build up the scenarios and timings around that.

It really does make a huge difference to work with professionals that know what they are doing, and some very enthusiastic models who managed to perform (with a smile) every time we asked them to. They could be at 40 m in screaming currents, and then be asked to shoot an equipment setup as soon as they resurfaced.

On one of the last evenings, we found a lovely deserted island to make a fire and share a few drinks together at sunset. It was a 'wrap' party, but it was also a fantastic opportunity to shoot yet more content for the assignment. One thing we did find out that evening, was that the new Suunto D5 (as it is now called) is a fantastic bottle opener!

After a hectic 10 days on the water, we all headed back to Sorong, then Jakarta and on to our respective countries. As we were flying for 24 hrs to get back home, this was a great time to start editing the 10k images we shot.



A SHOT IN THE DARK
WHAT IS BLACKWATER DIVING?

FEATURE AND PHOTOGRAPHY **JESPER KJØLLER** ILLUSTRATION **ALEXANDRA HUTH**

Every night a great vertical migration takes place in all the oceans across the globe. This mass movement rises from the depths to the surface of the sea. Most of the lifeforms on this journey are so tiny that they are invisible to the naked eye.

Blackwater diving is a relatively new discipline in underwater photography. Traditionally, divers have primarily studied reef or bottom dwelling life forms while maybe occasionally gazing out in the blue for the random chance of spotting passing pelagic wildlife. But during a blackwater dive, you explore the open ocean at night where the majority of the earth's biomass is concentrated.

Being on a boat during a dark moonless evening could have been serene, but the silence is disturbed by muffled and distant club music from a party somewhere on shore. Deep disco rhythms seem strangely out of place in the black night, but in the Philippines, they rarely miss a chance to have a good fiesta.

The crew on our bangka prepares the blackwater rig – a weighted line with a buoy and strong lights attached. They work methodically – it's apparent that they have done this before. We left the resort around sunset just 20 minutes ago, and we arrive in Moalboal Bay as the tropical night falls.

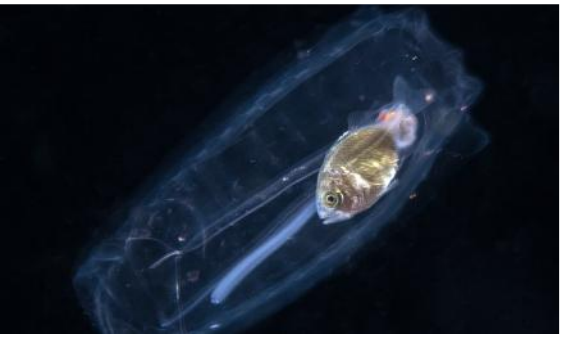
The crew heave the finished rig out in the allegedly 500-metre deep black ocean and we wait. The line needs to "cook" as they say. Leaving the rig in the water for about 30 minutes before we jump in should ensure that the shine attracts the critters.

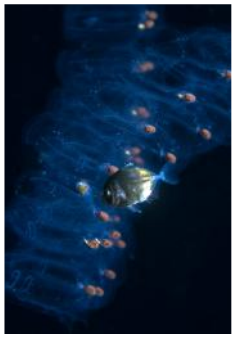
The light rig actually serves three purposes. Firstly, it entices the organisms in the dark ocean. But since there must be loads of plankton and larvae in the water column already – even if we just dived with our own torches – the second purpose is to serve as a reference point for the dive – both for depth and orientation. The third purpose is to make it easy for the boat to follow the floating divers and the line drifting with the current. Since divers are travelling at the same speed, the current is not felt.

SNOWSTORM

After the cooking, the boat slowly approaches the bright pool of light around the buoy supporting the line. We jump in and a crew member hands me my camera. The water is a nice and pleasant 30 degrees, but I was recommended to wear a hood to protect me from stinging hydroids floating around. I'm almost too warm, so I let a little water flow into my suit to cool me down. After exchanging quick OK's and thumbs down, we descend close to the line.

This is my first attempt at blackwater photography, so I don't know what to expect. If a normal night dive gives you the creeps and invokes your inner boogie man, then





blackwater diving is probably not your thing. But for me, the dark and warm water has a strangely soothing effect, and I immediately go into the zone.

I let my eyes adapt to the conditions and I look around to assess the results of the "cooking". I see nothing. Well, I see snow. Lots of snow. The powerful lights on the line creates the same effect as headlights in a snowstorm and I'm worried that I will get nothing but backscatter in my images.

Then I remember my first muck-dive many years ago in Lembeh Strait. I had the same feeling of, "what am I doing here?" and I tell myself to be patient. I look around to orient myself – I swim farther away from the strong glare of the lights on the line and I discover that it is better not to be too close to the light cones on the rig.

After a few minutes, I spot a small jellyfish the size of a coin. All right. Game on! I approach with care and try to take a few pictures. The first few images are completely dark, but after some exposure adjustments and experiments, I begin to get a few acceptable shots, and I feel more confident. I can do this! I look around for more subjects, but after another five minutes there is still nothing but snow.

JEDI (K)NIGHT

Suddenly, Felix, my reliable Filipino guide signals with his light. He is using a strong torch with a very narrow beam. It cuts through the dark like a lightsabre. I imagine the swooshing sound and I can almost hear the glaring fanfares from the Star Wars theme. He beckons me with his torch and points in the direction of… eh – what is that? In the magnification of my viewfinder, I suddenly recognise a well-known character. It is a juvenile Flying Gunnard the size of my little finger. Felix is noticeably excited – after the dive he tells me that this is the first time he sees one. Good start! The Gunnard is difficult to get in focus. It never really stops moving, but keeps descending the water column. I feel the pressure in my ears as I'm sinking with the critter to keep it in the viewfinder. After about 30 exposures, I hope that I have a few good ones and I let it go. I look at my computer. 22 metres. Oops! A little deeper than we agreed before the dive. I swim upwards and reunite with Felix. He does his Skywalker impersonation again and points me in the direction of another interesting subject. And this continues for another hour.

STRATEGY

My blackwater dive is arranged by Kasai Village Dive Resort on Cebu in the Philippines. They usually arrange these dives a of couple times a week. To make optimal use of the preparation

effort, the blackwater experience is a two-dive outing. We are served a delicious, if somewhat primitive meal on the boat in the surface interval between the two dives. The setting is quite pleasant if it wasn't for the booming music still disturbing the calmness of the black, moonless night.

After dinner, I review my images on my camera display and feel better prepared for the next dive. The crew on the boat huddles behind me to get a glimpse of my images. They are surprisingly enthusiastic and I'm happy to be able to share the experience with them – after all, they have done all the heavy lifting to facilitate my blackwater experience. I just press the trigger.

I think back to the good old days before digital when I would be limited to 36 exposures before I would have to get out of the water to change film. And even worse, I had no way of evaluating (or sharing) my images until I picked up the film at the photo lab after coming home. The opportunity to analyse digital photos on the back of the camera while still in the field makes an enormous difference and after reviewing the results of my first dive, I begin to have a good strategy in place for the next one.

FOCUS

It is all about focus. With exposure and framing, you have a little bit of post-production wiggle-room. But you have to nail the focus in the water. As always, if the subject has eyes, they are the most important focus point. Apertures in the middle of the scope of your lens is always a good compromise. Most lenses are sharpest in this range and it is a good balance between depth-of field-and light sensitivity. I use my Nikon 60 mm on f18 for most shots. The shutter speed is 1/125. My strobes are set on fairly low power to minimize backscatter and lower recycle time. The quick recharge allows me to shoot bursts of images in quick succession to hedge my bet.

If the critter is shiny and reflects the light too much, I compensate with a lower ISO, but otherwise I try to keep the rest of the settings fairly constant.

I have my strobes placed almost perpendicular to the lens to reduce backscatter and strong reflections in the shinier fish scales.

As soon as I have established a focus, I pull the trigger and fire a quick burst of shots – maybe five or ten in quick succession. I reframe, adjust focus and fire another round. Most cameras allow you to assign a separate focus button, (look for back-button focus in your camera manual) it is a great advantage not to have focus and shutter assigned to the same button even if this is the default mode most cameras are delivered with.

Most seasoned underwater photographers agree that a full-frame DSLR with a 60 mm lens is the best option for blackwater photos. With a 100 mm or 105 mm lens, it is just too hard to focus. And you can forget about using dioptres or wet-lenses. With a modern full-sensor DSLR camera you can crop the images if necessary to mimic the effect or longer lenses and dioptres, but very often I managed to get very close to enjoy the 60 mm's very short focus-distance.

TRANSPARENT CAMOUFLAGE

Some dive operations tether the divers to the line to prevent them from straying too far away. This is a solution looking for a problem and it would certainly limit my freedom of movement and mobility. If you need to be tied to a line not to lose contact or control, you should probably not be diving in the middle of the open ocean at night anyway. If divers have solid buoyancy skills and a good situational awareness, the tether lines are not necessary and will introduce other potential problems. It is better to increase safety with a limited number of divers in the water, and good and alert dive guides too.

Some creatures will seek the lure of the focus light. Almost like a deer in headlights, they freeze not sure what to think about the approaching flashing lights. Others disappear after the first shots, leaving you to hope you got at least a few acceptable exposures before they dashed away. The most difficult subjects are the transparent or translucent organisms. Unfortunately, a big percentage of the nightly creatures are exactly that and that gives them an advantage. Apparently being transparent is the best camouflage when there is no background. For obvious reasons, these creatures are difficult to get in focus and to light. You basically shoot right through them and your lights are eaten up by the infinite darkness in the background.

You have to be very careful when you approach the critters and not create a shockwave when you move forward. Slow deliberate finning and absolutely no swimming movements with your arms is the name of the game. My angled view finder is also a great advantage as it is ergonomically easier to look through the viewfinder and compose the image while staying in flat trim.

The party noise is slowly disappearing in the distance as we head back to the resort jetty after the second dive. I know one thing for certain. This first attempt at blackwater photography is not going to be my last.

FACTS – THE VERTICAL MIGRATION

Every night a great vertical migration takes place in all the oceans across the globe. This mass movement rises from the depths to the surface of the sea. Most of the life forms on this journey are so tiny that they are invisible to the naked eye. With the zooplankton comes a variety of both pelagic and larval creatures to feed on the plankton and each other. They swim upward – sometimes more than a kilometre to return the same distance in the morning. These animals are helping to offset carbon dioxide, thus reversing some of the damaging CO_2 emissions caused by us humans. By eating the products of photosynthesis in the surface at night and swimming downward before dawn, the migrating life forms move a huge amount of carbon from the surface to the deep.

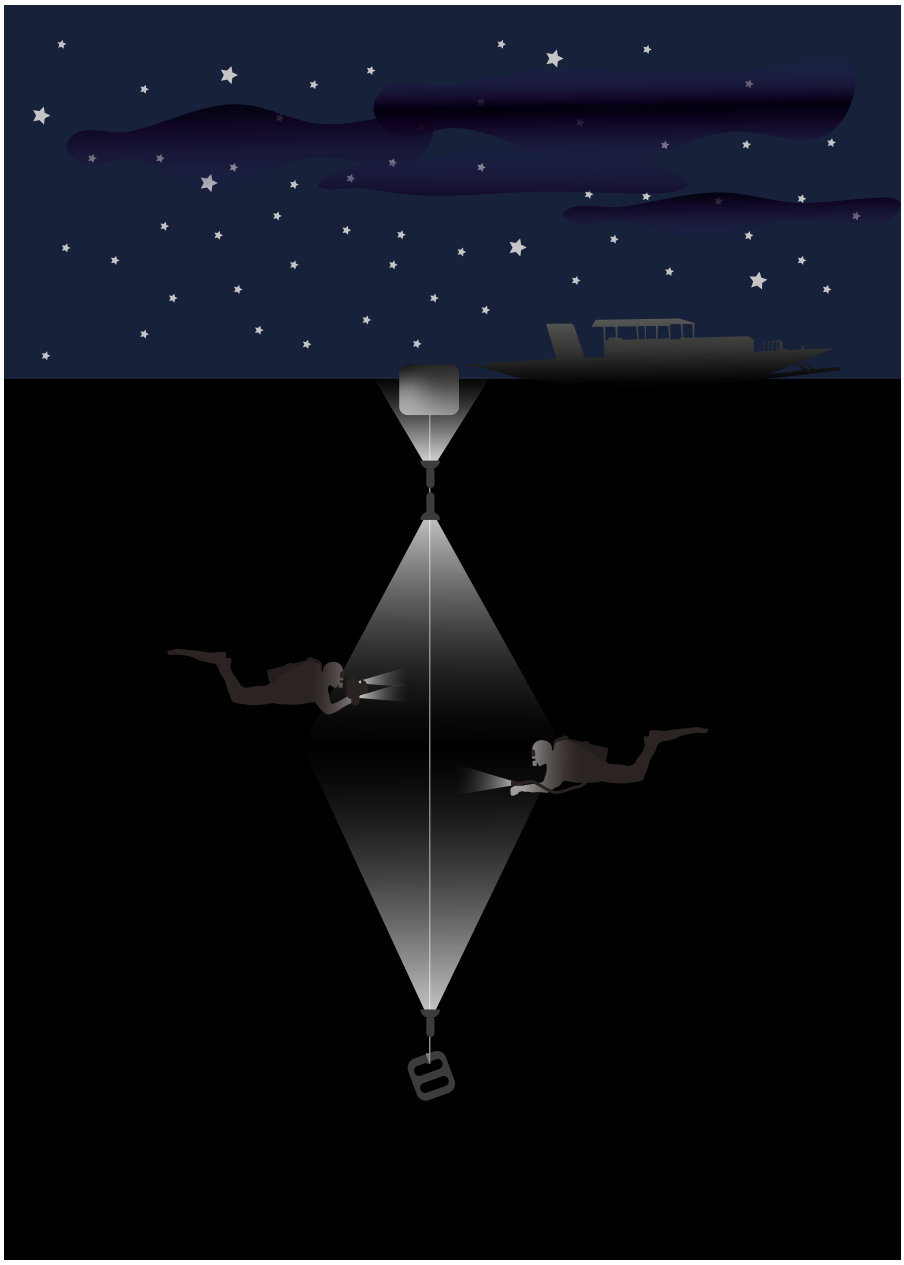
Most of these creatures are small planktonic crustaceans called copepods. But trillions of krill, jellyfish, shrimp, squid and other ocean residents join the voyage.

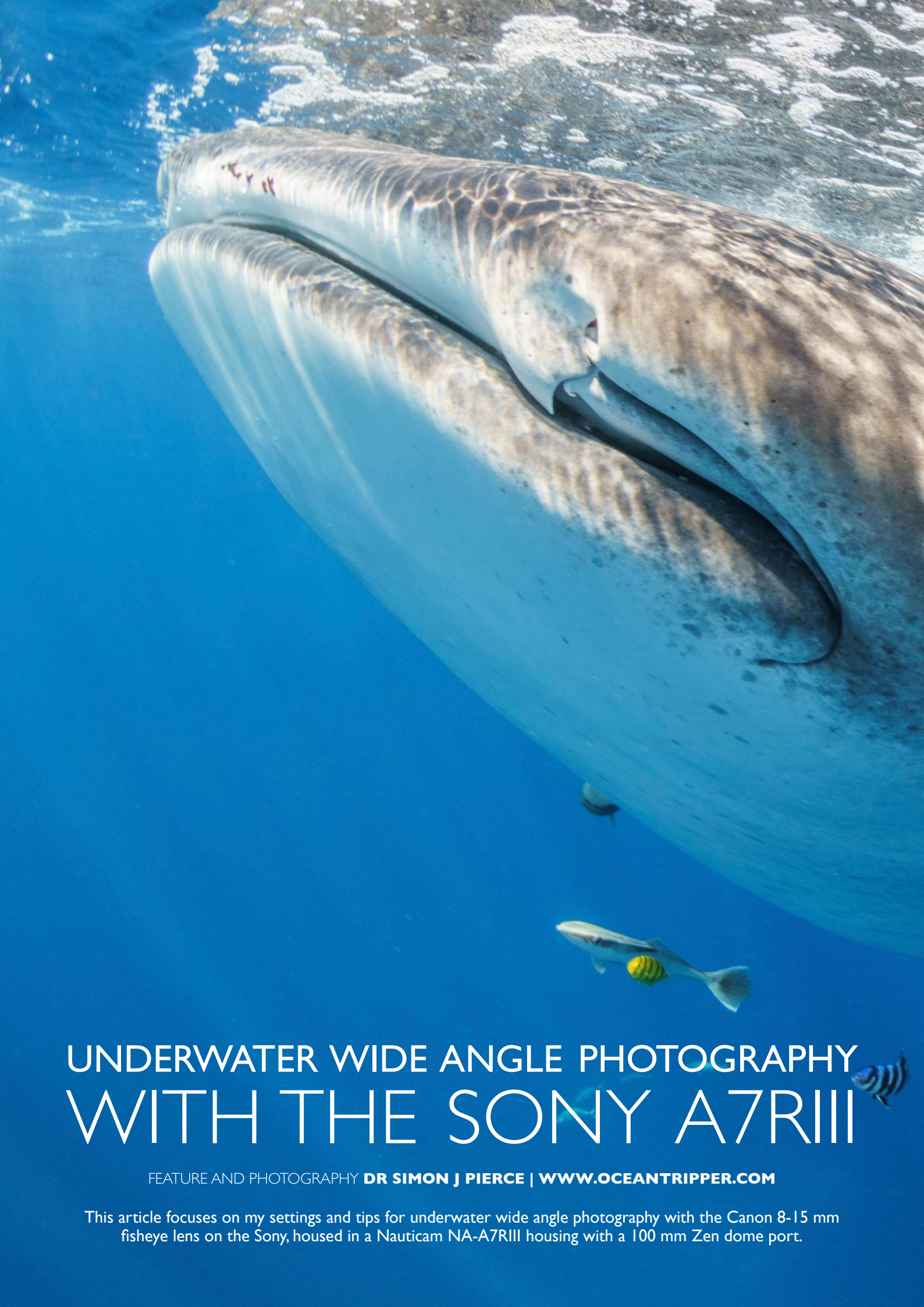
Ichthyoplankton are the eggs and larvae of fish. They are mostly found in the sunlit zone of the water column. The word plankton indicates that they cannot swim effectively under their own powers, but must drift with the ocean currents. Obviously, fish eggs cannot swim at all, and are clearly planktonic. Early stage larvae swim poorly, but later stage larvae swim better and cease to be planktonic as they grow into juveniles. Fish larvae are part of the zooplankton that eat smaller plankton, while fish eggs carry their own food supply. Both eggs and larvae are themselves eaten by larger animals.

Fish can produce high numbers of eggs which are often released into the open water column. The newly hatched young of oviparous fish are called larvae. They are usually poorly formed, carry a large yolk sac (for nourishment) and are very different in appearance from juvenile and adult specimens. The larval period in oviparous fish is relatively short (usually only several weeks), and larvae rapidly grow and change appearance and structure (a process termed metamorphosis) to become juveniles. During this transition, larvae must switch from their yolk sac to feeding on zooplankton prey, a process which depends on typically inadequate zooplankton density, starving many larvae.

KASAI VILLAGE DIVE RESORT

Moalboal on the southwest coast of Cebu is perfectly situated for blackwater dives with easy access to deep nutrient rich waters. Kasai Village Dive Resort is very skilled in organising blackwater dives in a safe and comfortable manner. The knowledgeable and experienced crew makes all the difference.
www.kasaivillage.com





UNDERWATER WIDE ANGLE PHOTOGRAPHY WITH THE SONY A7RIII

FEATURE AND PHOTOGRAPHY **DR SIMON J PIERCE | WWW.OCEANTRIPPER.COM**

This article focuses on my settings and tips for underwater wide angle photography with the Canon 8-15 mm fisheye lens on the Sony, housed in a Nauticam NA-A7RIII housing with a 100 mm Zen dome port.

I recently wrote a post on my updated settings for underwater macro photography with the Sony A7rIII, so I thought I'd kick on and do the same for underwater wide angle too.

For the moment, this article focuses simply on my settings and tips for underwater wide angle photography with the Canon 8-15 mm fisheye lens (using a Metabones V adapter) on the Sony, housed in a Nauticam NA-A7RIII housing with a 100 mm Zen dome port.

CAMERA SETTINGS: FOR ALL OCCASIONS

I've always shot uncompressed raw files so far. I might take a look at compressed raw for situations where I'm constantly hitting buffer limitations in future, though – dusky dolphins, I'm looking at you. The reduced file sizes should help the camera clear the images faster, so I can keep taking photos instead of swearing through my snorkel.

I've got the "Pwr Save Start Time" – i.e., camera sleep time – set to one minute. I don't turn the camera off while I'm in the water, so this conserves battery during lulls.

I'm often shooting one-handed, so I use shutter-linked autofocus to make that easy. I use continuous autofocus (AF-C) so the camera can keep up with a moving subject, and "Lock-on AF: Wide" focus tracking… most of the time. The standard Wide mode may work better with some fast-moving subjects, like sea lions. I've set "Priority Set in AF-C: Balanced Emphasis" so that the camera will try to ensure focus has been achieved.

I set my white balance to "Cloudy". That adds a slight warming effect to underwater images to help counter the blue-green ocean.

I use "Multi" metering so the camera is considering the whole frame. The default setting is for exposure to be locked while the shutter is depressed, so I've switched that off ("AEL w/shutter: Off") so the camera is continuously evaluating even when I'm shooting a burst of images.

The "Creative Style" on the camera, applied to the embedded jpegs in the raw files, is set to Standard. I always post-process my photos in Lightroom (and occasionally Photoshop), so I don't want the camera to be adding its own edits.

I find it all too easy to bump settings in the boat or water, so I disable any buttons that I'm unlikely to use.

SHOOTING IN NATURAL LIGHT

When I'm shooting large, slow marine animals in natural light (like whale sharks) I use a High frame rate (8 shots per second). My standard settings are 1/320 sec and f/9, in manual mode, with Auto ISO (100 base, maximum 3200). I'll increase the shutter speed for fast-swimming animals like dolphins and sea lions where I can get away with it.

Auto ISO is super helpful, particularly with Sony's great sensor, but I'm still working out the best way to use it in practice. I've been diving into the confusing subject of ISO invariance and my understanding is that, above dual gain kicking in at ISO 640, the A7rIII is effectively just increasing brightness. There's a good argument, then, for just setting Auto ISO to 100-640 and adjusting brightness in Lightroom later, thereby optimising data capture while protecting highlights. I haven't actually tried that though. I'll update it on my website when I do…

I rarely change these settings while I'm in the water.

ABOVE: Hawksbill sea turtle (*Eretmochelys imbricata*) eating a jellyfish at Nosy Tanikely, Madagascar, just off Nosy Be and Nosy Komba. **BELOW:** Geared up for wide angle at Nusa Penida, Indonesia. It's my current setup, post-dive.

SHOOTING WITH STROBES

I use dual Sea & Sea YS-D2 strobes (now superceded by the YS-D2J) with Eneloop Pro batteries, a Sony flash trigger, and Nauticam optical sync cables. Note that YS-D2s previously weren't compatible with the flash trigger, but they are with the most recent Nauticam optical sync cables.

To the right is my current setup, post-dive.

That's my Shearwater Perdix AI computer strapped to the Styx floats.

I've got the 120 degrees Sea & Sea diffusers on for wide angle, but I've just started using a couple of dome diffusers. Note that you have to pull the strobes well back – front of the strobe slightly behind the handles – to avoid lighting up the sides of the image. (I'm writing this as a reminder to myself, as they're never back far enough…)

The strobes (and camera) are normally good for about three dives before I have to charge the batteries again.

One of the great things about shooting mirrorless is the "what you see is what you get" when using the EVF or LCD. However, it's helpful to switch this off ("Live View Display: Setting Effect OFF") when shooting with strobes. Otherwise, the screen would be too dark to compose a shot easily.

Of course, you do want to see how your exposure settings are affecting your background, and there's a neat way to accomplish this: program your AF-ON button (accessed via the thumb lever on the Nauticam housing to "AF-ON Button: Shot. Result Preview". That means you can quickly check your ambient light exposure by just pressing your thumb, rather than taking a photo and checking it. Of course, that only works if you're using shutter-linked autofocus.

My starting settings are normally 1/160 sec, f/10 and ISO 200 (in Manual mode). I've set the AEL button to ISO, as it's easily accessible on the housing, and I'll often adjust exposure using ISO until that hits around 800 (see my note on ISO invariance above). At that point, I'll start reducing shutter speed, and aperture if it gets really dark. I quite like the cool motion blur you get from rear sync flash and slow shutter speeds, so I've got flash mode programmed to my C3 button on the left side of the housing. I normally use Fill Flash, with the strobes set to 22 as my initial setting.

I've been playing around with automating my exposure settings more. When we're working with whale sharks in the Galapagos, particularly, we're changing depth and lighting at a speed that I find difficult to deal with manually. I've trialled using Auto ISO (base 100, max 800) and negative exposure compensation – conveniently accessed through a dial on the housing – and that works quite well, as long as I keep an eye on the background exposure (using the thumb lever, as above). I still have to make adjustments, but it does get it approximately right in a hurry. I normally start with -1.0 exposure compensation and adjust it from there.

A few more miscellaneous notes:

- I set Auto Review to 2 Sec, so I can check things by eye when required.
- I've got Drive Mode set to Single Shooting. Otherwise, the strobes can get out of sync, due to minor variation in recycle times.
- It's easy to accidentally hit the movie lever. I might switch that off in future, or reprogramme movie to another button.
- I've set my defaults to the MR 1 dial position, which saves most things, except shutter-linked autofocus and other button customisations.

I hope the above is useful – I'm still working things out as I go, but I do love the functionality and customisation opportunities with the Sony A7rIII, and how the Nauticam housing lets me access key options quickly and easily. Ergonomics count for a lot, peeps.

THE TUBBATAHA REEFS
THE PHILIPPINES' UNESCO JEWELS

FEATURE AND PHOTOGRAPHY **ANTHONY LEYDET | @ANTHONYLEYDET_UW_PHOTOGRAPHY**

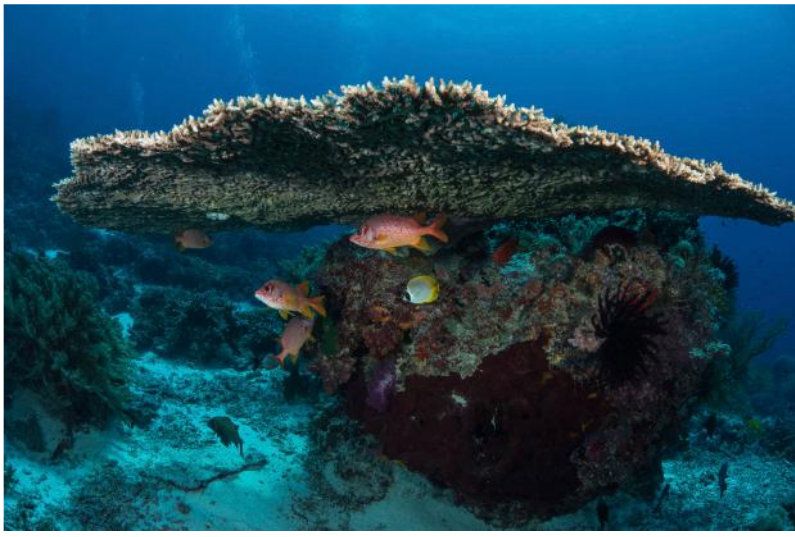
This marine reserve, classified as a UNESCO World Heritage Site and swept by ever-present currents, is home to a multitude of pelagic species. With draconian protection, few divers have the privilege of enjoying this jewel, a true model of marine conservation.

In the heart of the Coral Triangle, the Philippines archipelago is home to some of the richest marine life on the planet. Under protection for more than 30 years, the atolls of Tubbataha – far from everything in the middle of the Sulu Sea – serves as a sanctuary, with pristine and perfectly healthy coral reefs. This marine reserve, classified as a UNESCO World Heritage Site and swept by ever-present currents, is home to a multitude of pelagic species. With draconian protection, few divers have the privilege of enjoying this jewel, a true model of marine conservation.

The Sulu Sea is found almost 150 km from the coast of Palawan. The sun is rising and the sky is already full of sublime colours. The horizon is endless and it just about separates the sky from the sea. You can only just make out the outline of the atolls, offering an azure of blue ribbon that seems to stretch over a distance whose end you cannot see. We arrived here, in the middle of nowhere, after sailing for ten-hours from Puerto Princesa with its sweaty heat and blazing sun upon us.

We have arrived at the Tubbataha Reefs Natural Park. This is a place full of curiosities since they are the only atolls in the Philippines. Two atolls (North atoll and South atoll) are accompanied by Jessie Beazley's reef. They are the result of the Cagayan chain's activity of the now extinct underwater volcanoes. In Sama (spoken in southern Philippines), "Tubbataha" translates to "a long reef exposed at low tide".

Because of their remoteness from the other islands, these coral reefs have long been protected from overfishing as the boats were not advanced enough to make such a crossing. Unfortunately, with the evolution of fishing boats, the first threats of cyanide



and dynamite fishing came, which is incredibly destructive to ecosystems.

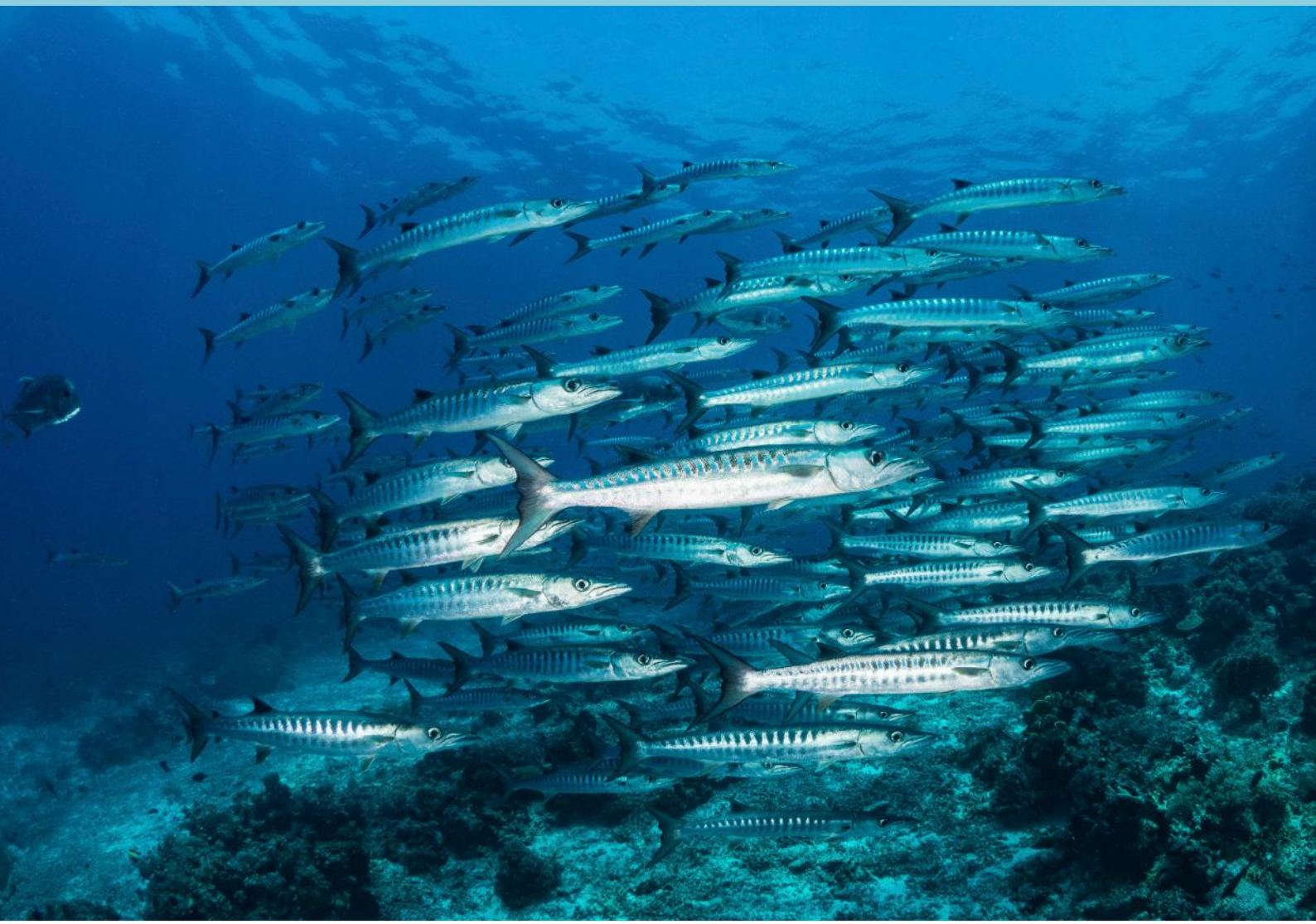
The response to protect the site was swift, and it was classified as a marine reserve in 1988. A few years later, in 1993, the atolls of Tubbataha were listed as a UNESCO World Heritage Site. The Tubbataha Reefs Natural Park is delimited by a triangular area of 970 km², an area almost as large as Hong Kong.

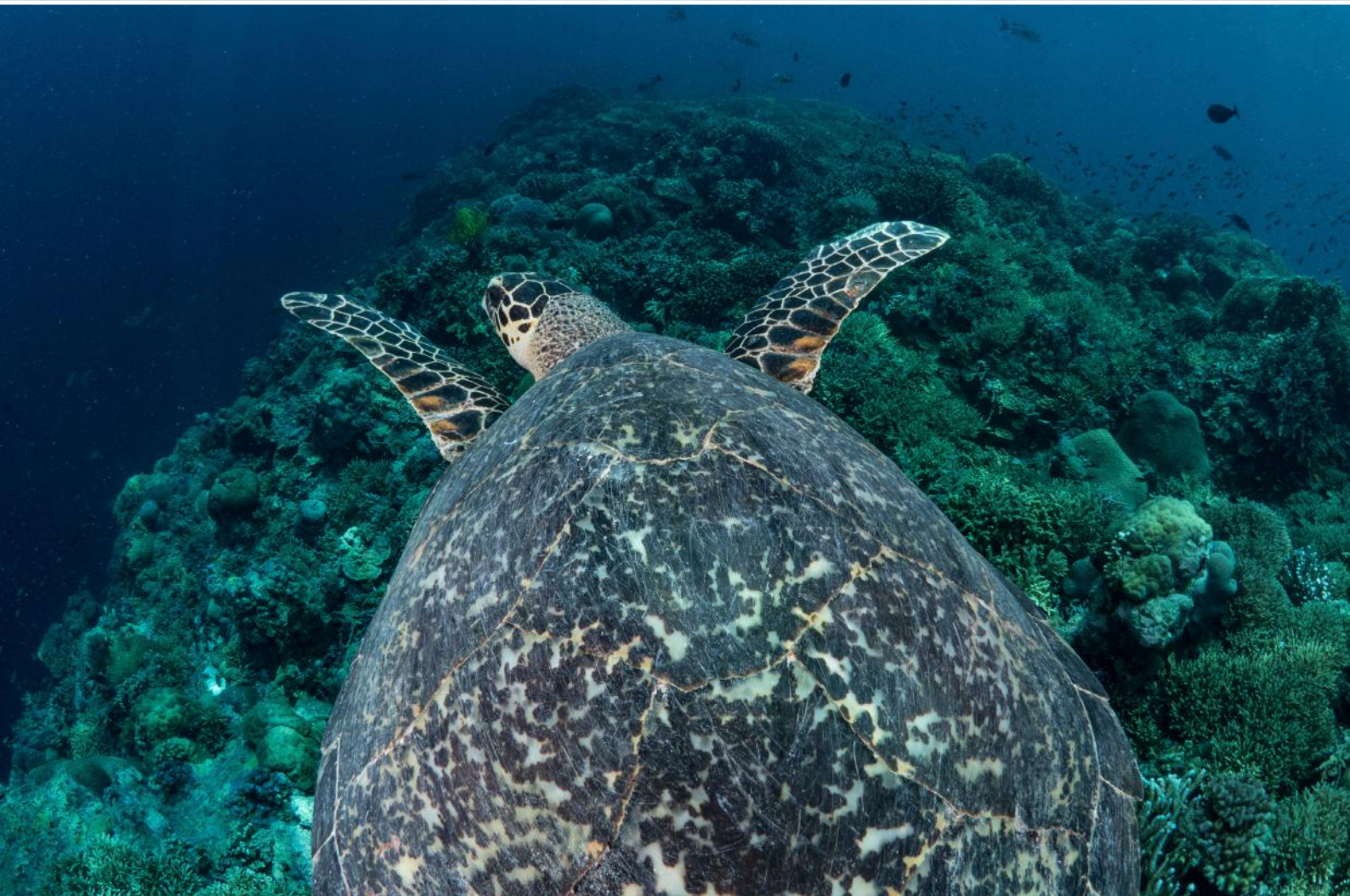
DIVING IN TUBBATAHA IS A PRIVILEGE!

Diving is only permitted during 3 months of the year, from mid-March to mid-June. The conditions are optimal with a sea that generally resembles the conditions of a lake. There are few boats authorised to access these reefs (less than 20).

In 2019, less than 3,500 divers had the joy of immersing themselves in the waters of Tubbataha to experience this underwater world. In other words, operators and divers must respect the rules to the letter! The diving rules are strict here, and everything is done to ensure that divers have as little impact as possible on the environment. On the first evening, during the crossing, a clear and precise briefing is given by the Discovery Adventure team, the boat that welcomed us from the Discovery Fleet.

No touching, disturbing, or collecting is allowed. The diver must only act as a spectator. Common sense that should be applied everywhere in fact. In addition, it goes even further, because our guides also made it clear to us that no one should ground themselves anywhere underwater. In the end we got used to it, because even as a photographer, I would not have put a finger or a knee on Tubbataha's bottom during my 5 days of diving.





Diving in Tubbataha is therefore an incredible opportunity to observe coral reefs in perfect health and balance. This was incredibly obvious from the first immersion. The underwater life is totally protected and seems fully flourished, and for good reason. Almost half of the world's known coral species, or more than 360 species out of 800 are found here, as well as 750 species of fish. This is the Coral Triangle in all its splendour!

Located far from everything and everywhere else, nature takes over here and once beneath the surface, we no longer know where to look. You need to train your eyes to look in every direction, not only on the reefs, but out to the blue, above your head, or below a drop-off. There is always something to see.

A SHARK SANCTUARY

Sharks are everywhere in Tubbataha where a good dozen species have been recorded. This is exceptional! Even if it is difficult to see as many during 5 days of diving, it's not impossible. We saw many whitetip reef sharks, blacktip reef sharks, silvertip sharks, grey reef sharks, and of course, the one that attracts the attention of all divers here, the famous whale shark which is very present around these atolls. We were very fortunate to see one on our last dive. It is also common to encounter tiger sharks, thresher sharks, nurse sharks, and even hammerheads. Rays are also present and we had the pleasure of crossing paths with a beautiful reef manta.

THE RANGERS STATION, TUBBATAHA'S GUARD TOWER

The Tubbataha Natural Park is under the protection of a dozen rangers permanently present on the North atoll. Their base camp is the Rangers Station located on the small sandbank south of the largest atoll.
The Tubbataha team, composed of military personnel, coastguards, employees of the Municipality of Cagayancillo, members of the Tubbataha Management Office and divers, is under the leadership of Angelique M. Songco (nicknamed, "Mama Rangers"). Above all, they play a monitoring and repression role against fishermen and poachers venturing into the park. They also conduct scientific studies and run clean-ups when necessary. Sometimes they carry out actions such as the eradication of Crown-of-thorn starfish, which when they proliferate, can be a real threat to corals.

UNDERWATER MAGIC

Underwater, enchantment is everywhere. The perfectly healthy reefs show all their potential and are full of life. The currents are very present in Tubbataha, and sometimes very strong. Most dives are drift dives, which gives you a view of the entire reef and allows you to see the constant animation. Amidst the corals, or giant gorgonians, the biodiversity is impressive. Fish, in solitary, in small groups or in compact schools, occupy all the spaces for the greatest show we can imagine. The squadrons of jacks or barracudas are a real spectacle. Almost every time we dive, a green turtle or hawksbill turtle peacefully crosses our paths. The presence of a phenomenal amount of juveniles is obvious. Seeing so many napoleon fish or even a gam of sharks of such small sizes is exceptional!

Even if we don't come for the big stuff, macro lovers will get their cherry on the cake too: in the south-east of the northern atoll, some gorgonians are the refuge of tiny pygmy seahorses.

PLANNING YOUR TRIP

Diving for 5 days on the reefs of Tubbataha is an exceptional adventure, and a chance to witness successful conservation carried out by the Tubbataha Management Office. To extend your stay, there are many options in the Philippines, such as Visayas, Coron, Anilao or Busuanga.

GETTING TO TUBBATAHA

Fly to Manila or Cebu International Airport (recommended, smaller, easier for transfers), there are several airlines to choose from, including Cathay Pacific, or Emirates, and then you need to take a domestic flight with Philippines Airlines.

DIVING LEVEL

Due to some strong currents, divers must be perfectly comfortable with their buoyancy.

LANGUAGE

Filipino is the official language, but English is well spoken everywhere.

CURRENCY

1 USD = 52 PHP (Philippine Peso)

ELECTRICITY

Most liveaboard boats are equipped with 220 volts with international plugs. Check with the company before departure.

DIVE OPERATOR

Discovery Fleet Philippines
Tel: +63 2 8 5195674-76 Ext. 328
Message: +63 2 8 4031999
Email: info@discoveryfleet.com
www.discoveryfleet.com

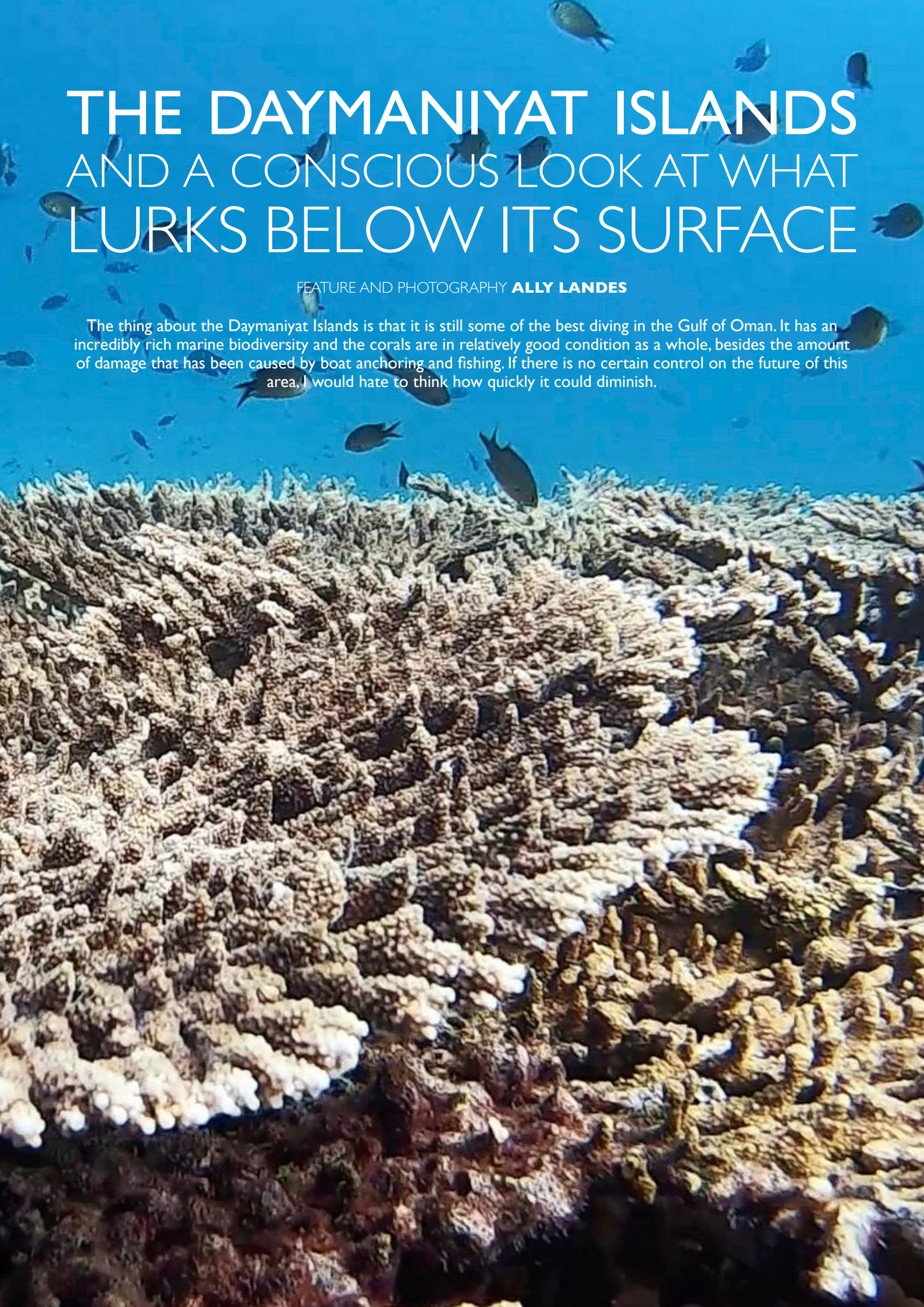
LIST OF ALL THE DIVE OPERATORS

You will find all the dive operators on the Tubbataha Reefs Natural Park website:
www.tubbatahareefs.org/dive-operators/

THE DAYMANIYAT ISLANDS AND A CONSCIOUS LOOK AT WHAT LURKS BELOW ITS SURFACE

FEATURE AND PHOTOGRAPHY **ALLY LANDES**

The thing about the Daymaniyat Islands is that it is still some of the best diving in the Gulf of Oman. It has an incredibly rich marine biodiversity and the corals are in relatively good condition as a whole, besides the amount of damage that has been caused by boat anchoring and fishing. If there is no certain control on the future of this area, I would hate to think how quickly it could diminish.



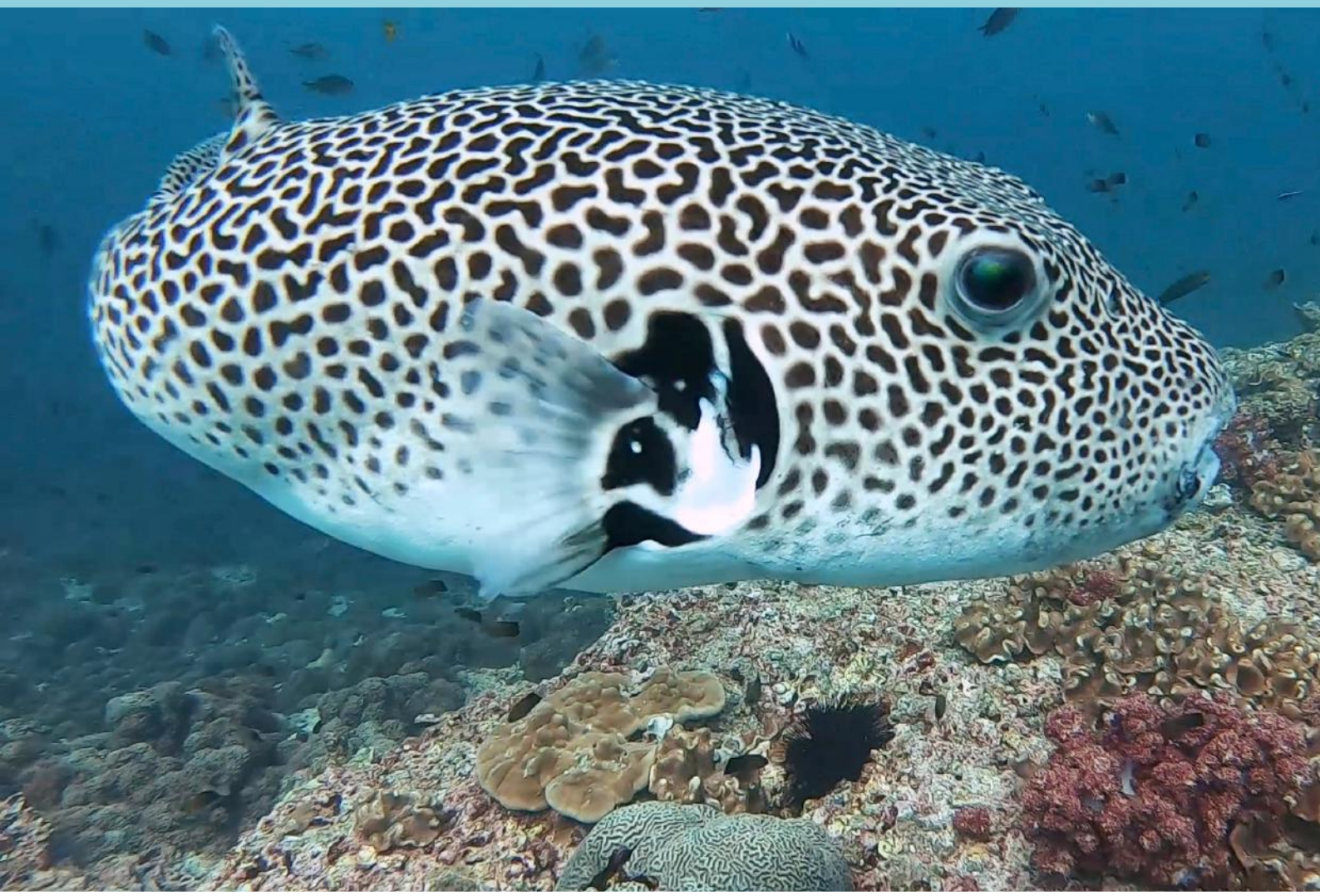
If you want to organise an easy weekend of diving outside of the UAE without the hassle of taking a flight, the Daymaniyat Islands in Oman still offers some of the best diving in the Gulf of Oman. It's a smooth drive along the new Batinah Expressway and you can be in Muscat within 4 or 5 hours, depending on the queues at the borders. The expressway takes you from the Omani border directly into Muscat, and skips the busy coastal road.

One thing which is quite prolific at the Daymaniyat Islands at the moment is the Crown-of-Thorns starfish (*Acanthaster planci*). The 3 dive sites we dived were affected by a number which may be a cause for concern. The permanent damage of bleaching is not yet visible, but if these very large starfish (the largest in the world) are left to their own devices, it will only be a matter of time until they have an epidemic on their hands.

Another monstrosity is the amount of abandoned fishing nets. Most of the fishing nets have been down there for a number of years as some corals have actually grown over them. There were a lot of dead sea urchins trapped in their grasp. Unfortunately, dive centres have been strictly forbidden from removing either of these environmental dangers on order of the Omani Government, which poses a great threat to this gorgeous Nature Reserve.

There are 9 islands in the Daymaniyats in an area of 100 hectares. Sea turtles come to the Daymaniyats to lay their eggs on the islands as well as the large population of migratory birds who also come to nest. The month of October closes public access to the islands, except we were informed you can purchase a permit to camp on the islands overnight for AED200/ person which completely defeats the purpose of running a restricted nature reserve!

The thing about the Daymaniyat Islands is that it is still some of the best diving in the Gulf of Oman. It has an incredibly rich marine biodiversity and the corals are in relatively good condition as a whole, besides the



amount of damage that has been caused by boat anchoring and fishing. If there is no certain control on the future of this area, I would hate to think how quickly it could diminish.

Due to a strange weather front for October, we were unfortunately unable to do our second day's dives, but thankfully had a great day on the Friday. We dived Police Run, Blacktip and Coral Garden, and never came across another boat or group of divers. Descending at Police Run, I came face to face with a Geometric moray (*Gymnothorax griseus*) only to be pulled to turn to my left to be faced with an even larger duo of Honeycomb morays (*Gymnothorax favagineus*) right by my left elbow. I was in the middle of filming at the time, but how I missed them at the sheer size of them is beyond me, but what a great surprise to have two of them intertwined.

Just a few fin kicks away from them, Yellowmouth moray eels (*Gymnothorax nudivomer*) are found scattered about the reef. This is a typically good day at the Daymaniyats. There really is plenty to see. We missed the Whale shark (*Rhincodon typus*) season unfortunately, but for future reference, September is the time to see them, if you're lucky.

Our last dive at Coral Garden was fabulous as there were plenty of mating cuttlefish and we had a blast ending the trip on such a high note. The Cowtail stingray (*Pastinachus sephen*) was an added bonus to the Bluespotted ribbontail rays (*Taeniura lymma*) and some of the group were lucky enough to see a Leopard shark (*Stegostoma fasciatum*). The rest of us tried not to hold a grudge on missing out on seeing this majestic carpet shark.

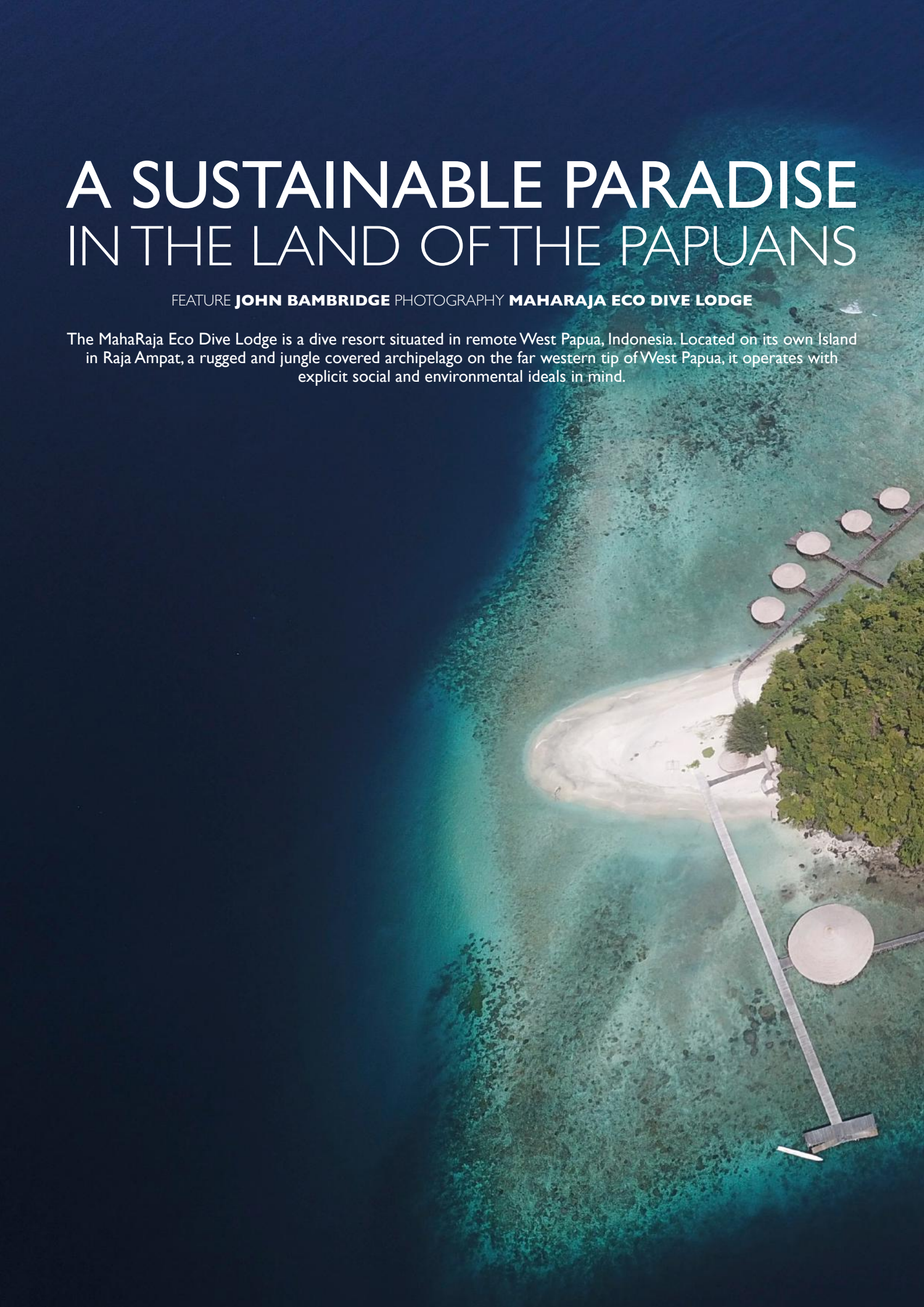
These reefs are always adorned with the frisky yellow/orange and black Arabian butterflyfish (*Chaetodon melapterus*), I had a swim with a friendly Stellate puffer fish (*Arothron stellatus*) and had a little visit with a one-eyed Spot-fin porcupinefish (*Diodon hystrix*). You know all is well on the reef when a Hawksbill turtle (*Eretmochelys imbricate*) tags along with the group. The underwater realm in the Daymaniyat's is still a very special place. Let's hope it stays that way.

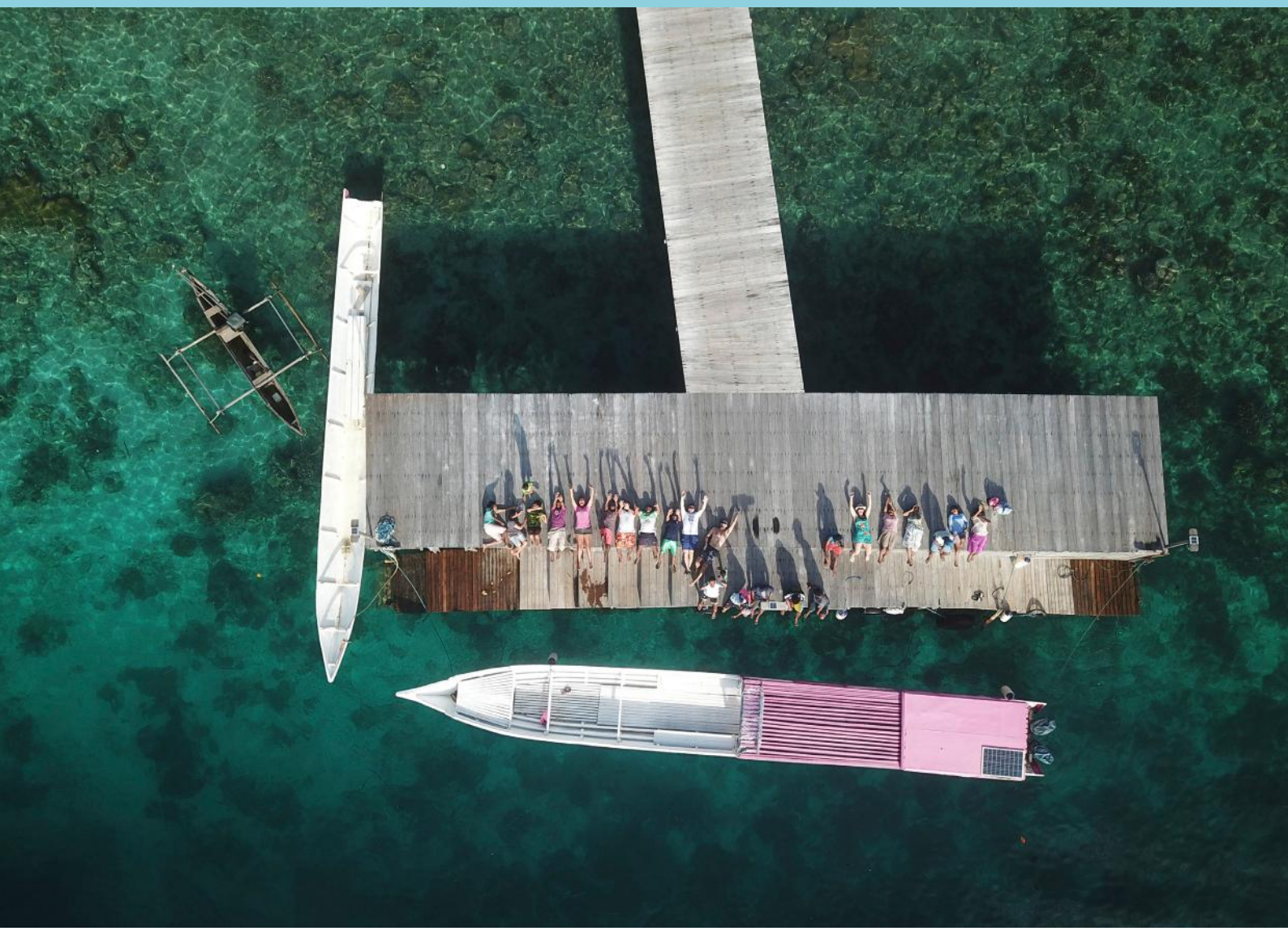
Dive Centre: Mola Mola Diving Center
Location: The Wave, Al Mouj Marina, Muscat, Sultanate of Oman
Email: info@molamoladivingcenter.com
www.molamoladivingcenter.com

A SUSTAINABLE PARADISE IN THE LAND OF THE PAPUANS

FEATURE **JOHN BAMBRIDGE** PHOTOGRAPHY **MAHARAJA ECO DIVE LODGE**

The MahaRaja Eco Dive Lodge is a dive resort situated in remote West Papua, Indonesia. Located on its own Island in Raja Ampat, a rugged and jungle covered archipelago on the far western tip of West Papua, it operates with explicit social and environmental ideals in mind.





The travel industry is increasingly awash with destinations providing a range of eco-tourism experiences on a sliding scale of sustainability. Most eco-tourism destinations endeavour to achieve a lower ecological footprint, and this can often land you in simply maintained lodgings in spectacular locations, where you do indeed feel closer to nature. But eco-tourism experiences can go further – translating, in their best iterations, into much more holistic and socially inclusive projects that seek to proactively engage with the issue of sustainability and the best ways to achieve it locally.

The MahaRaja Eco Dive Lodge is a dive resort situated in remote West Papua, Indonesia that lands firmly in the latter category. Located on its own Island in Raja Ampat, a rugged and jungle covered archipelago on the far western tip of West Papua, it operates with explicit social and environmental ideals in mind.

For the start, the vast majority of the staff at MahaRaja, including the dive guides, are local Papuans, and not just that, but individuals drawn largely from the villages of Arefi and Yensawai, the two settlements in the most immediate vicinity of the resort. Through its dive school, the resort trains its local staff as certified dive masters, teaches them English and conducts classes on ecology, renewable energy and sustainability. This gives its employees past and present access to new opportunities, whether they ultimately stay in Raja Ampat or move further afield.

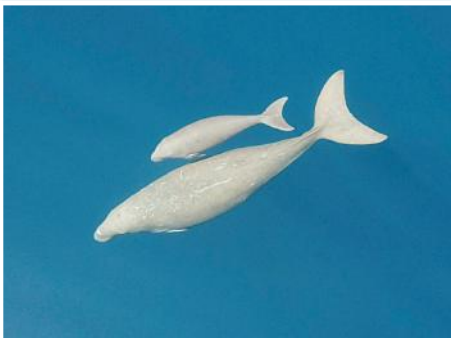
To this day, many Papuans still reside in small villages and derive their living from subsistence agriculture or from work as fishermen, hunters or craftspeople, so the resort has also worked hard to source all that it can from the local communities. This includes everything from wood and other natural building materials, to hand-picked vegetables and plants, coconut oil and local handicrafts. Together with its staffing, this not only ensures that profits are shared with the local community, but that the carbon footprint of the resort's supply chain is as low as practically achievable.

Also, as a result, the majority of the families from Arefi and Yensawai have come to work in one way or another with the MahaRaja resort, which also encourages and assists local enterprises in developing their traditional businesses in sustainable and eco-friendly ways. The resort further provides microcredit to Papuans to pay for schooling, medical care, building homes and starting new businesses.

The resort says that its relationship with the Papuans in the local community is based on mutual respect in which the latter are treated as equal partners in the joint endeavour of working to create a truly sustainable eco-destination. It calls the Papuans "the heart and the soul of Maharaja", and encourages guests to immerse themselves in the world of the Arefi and Yensawai Papuans as part of the experience.

The location itself is breath-taking, with pristine beaches, crystal clear waters and rich coral reefs, and an incredible array of marine life, including 1,500 species of fish and more than 500 species of coral. To the credit of the Indonesian government, the biodiverse environment has also been protected as a Marine Protected Area since 2007, and only 35 islands are inhabited in Raja Ampat by a total of 50,000 people.

To preserve this, every aspect of the way in which MahaRaja operates is designed to minimise its impact on the environment and to help preserve this incredibly pristine part of the earth as it is. Perhaps most importantly, the eco-lodge has taken ownership of the surrounding reef. It has banned fishing in the area to allow coral to heal naturally after years of fish bombing. As a result, the revitalised reef



has become a hotspot for sharks, stingrays, sea turtles, octopus, sea stars and nudibranchs, among others.

As with many other eco-tourism destinations, MahaRaja aspires to have the smallest footprint possible. The property is mostly solar-powered. Its bungalows, which sit out over the water on stilts, were hand-built by local staff using wood from 100 different family farms to limit deforestation. There is no running water, but the resort notes that the experience is far from roughing it. Fresh spring water is used for the western-style showers and toilets and the guest rooms are supplied with biodegradable toiletries, corn-based toothbrushes and eco-friendly sunscreen. On this note, the use of most commercial sunscreen is prohibited at MahaRaja, as the chemicals used in these have been shown to harm corals and other marine life. If you dive regularly near reefs and would like to lower your own impact, there are various certified marine-friendly sunscreens available on the market. Finally, the resort serves vegan versions of traditional Papuan meals made with locally sourced produce – as less meat consumption is obviously now known to be one of the largest parts of the average individual's carbon budget and ecological load.

As Mahasti Motazedi, the French founder of MahaRaja Eco Dive Lodge, explains, "We are nature lovers. As professional divers, we would have loved to have this choice while we were looking for our next dive trip, but we have never found it. So, we have decided to create it. I am sure there are many other divers who would love to dive without polluting the dive sites and the nature in general. We want to demonstrate that it is possible and we want to spread the word. We hope that this will be the first step for a cleaner and more eco-friendly diving all over Raja Ampat and the rest of the world."

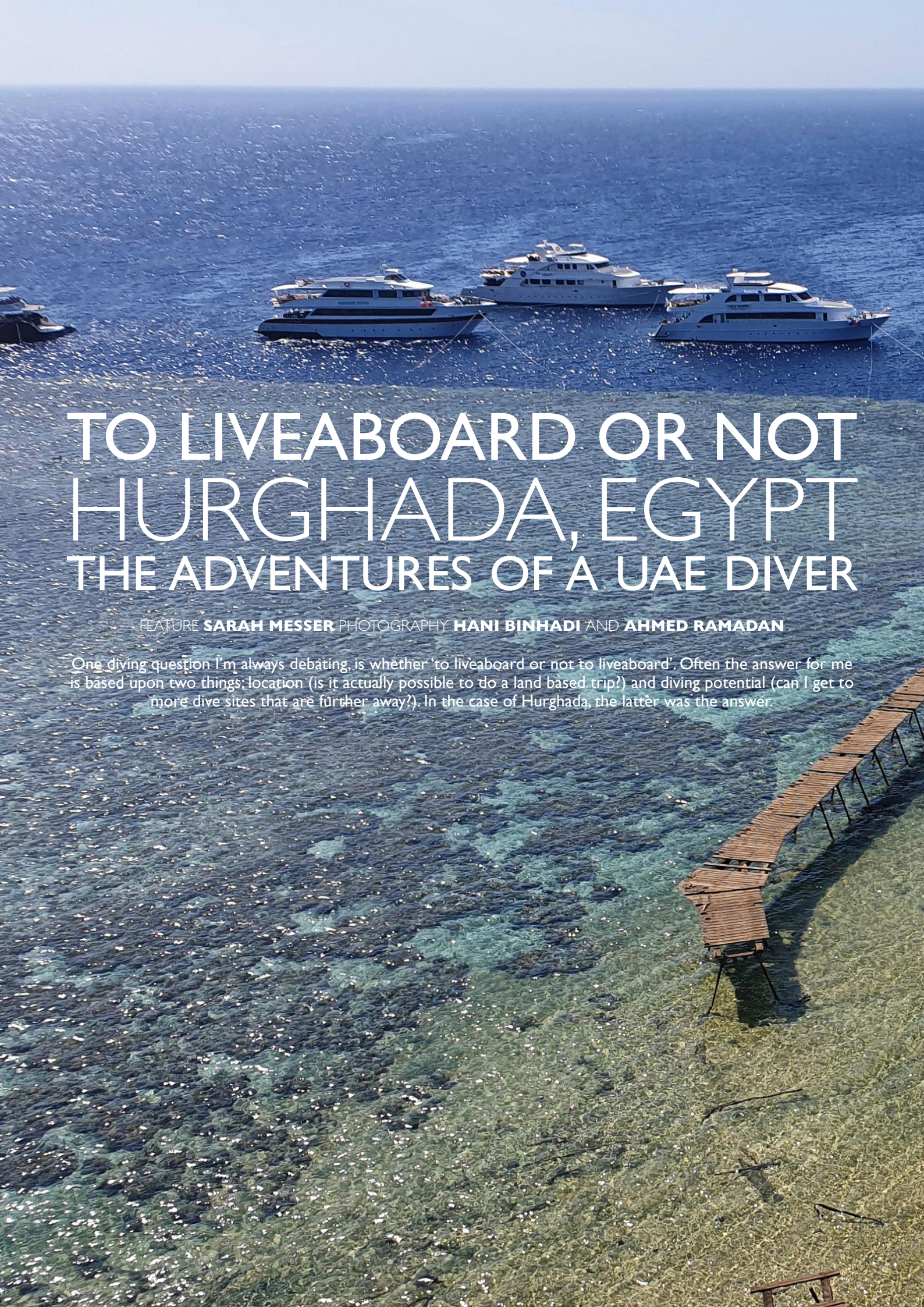
More recently, the resort has also invested in a fleet of battery electric boats that have eliminated one of the final environmental impacts and therefore areas of potential improvement for MahaRaja. Where the staff once used a fleet of petrol-powered boats, they are now trialling a fleet of battery electric boats that not only do not produce carbon emissions, but also emit far less underwater noise pollution, which can otherwise have a significant impact on marine animals – perhaps most notably to dolphins and other cetaceans that use their sensitive hearing organs for underwater communication. For now, the electric Torqeedo-branded engines have been equipped to two Papuan longboats at the resort. The next step, however, will be to find ways in which to share the electric engines with the local Papuan villages to allow them to travel in a better and cleaner way for them and for the environment.

It is for these reasons and more that MahaRaja Eco Dive Lodge has been named by Lonely Planet as the only genuinely eco-friendly dive resort in the world, as well as one of its top eco-friendly destinations.

The only slight hitch in all of this is of course that you still have to fly and generate carbon emissions to reach even the most eco-friendly of eco-tourism destinations. This is hard to avoid, but one way to mitigate this could be to sign yourself up to some sort of carbon offsetting scheme. This is surprisingly affordable: typically, offsetting your flight carbon only costs a small fraction of the overall flight cost.

Regardless, there is huge value in the fact that MahaRaja goes far further than most of the competition, and that it works internally and with the local community to preserve the local reef and environment. It is safe to say that if you ever stay at the resort, you will be contributing to a truly sincere eco-project.

www.maharajaecodivelodge.com



TO LIVEABOARD OR NOT HURGHADA, EGYPT

THE ADVENTURES OF A UAE DIVER

FEATURE **SARAH MESSER** PHOTOGRAPHY **HANI BINHADI** AND **AHMED RAMADAN**

One diving question I'm always debating, is whether 'to liveaboard or not to liveaboard'. Often the answer for me is based upon two things; location (is it actually possible to do a land based trip?) and diving potential (can I get to more dive sites that are further away?). In the case of Hurghada, the latter was the answer.


VITA X
FLORA

As an addicted diver, you probably, like me, eagerly look at the public holidays each year to see where you can extend your vacation time to make the most of days off and feed your underwater habit. 2019 in the UAE was a pretty good year for extended holidays.

In August we were lucky enough to receive three days' holiday for the Eid al-Adha religious period, and with my office closed, it was time to pack up my diving case once more and head to Hurghada in Egypt for 2 weeks.

One diving question I'm always debating, is whether 'to liveaboard or not to liveaboard'. Often the answer for me is based upon two things; location (is it actually possible to do a land based trip?) and diving potential (can I get to more dive sites that are further away?). In the case of Hurghada, the latter was the answer. Only on a liveaboard can you do the legendary trip of Brothers, Daedalus, and Elphinstone, which regularly feature on lists of the top dive sites in the world. And because of the Eid holidays, I chose to do this trip twice in consecutive weeks with different liveaboard operators. Remember, addicted diver here!

When I first thought what to write about for this article, I wanted to mainly tell you about the incredible marine life that we saw, and really, it was incredible, but I will talk about that again towards the end of my story.

LIVEABOARD VERIFICATION LIST

However, I want to highlight a far more serious and important topic first. Since I took my summer trip, there have been two liveaboard disasters, and I don't use the word disaster lightly. Many divers and crew lost their lives in these events – when both the liveaboard in California, USA, and much closer to home, on this very same trip from Hurghada in Egypt caught fire and exploded. Exploded. You can read about the stories in the media for yourselves. For myself, and for the purpose of this article, I want to highlight some of the things that I didn't do before my own trips, and the questions and actions I will now take each and every time before and during a liveaboard vacation:

1. Ask the operator about the service history of the boat. How old it is, when was it last fully serviced, when is the next service due, have there been any major issues with the boat, when was the emergency equipment last tested and certified? You can start to get a picture of the vessels current condition. My experience in Egypt, was there were teething problems on both boats that the crew were doing their best to fix in the moment, but it's the operators duty to ensure they are not recurring and damaging to the long term health of the boat, the people on board, or the reefs and marine life. It doesn't take much for an issue to become a much larger problem if ignored.

2. Read fellow divers' reviews. As I am often a lone traveller, I look for very specific information around safety in the reviews I find. I also try to leave my own honest reviews that will mean other divers can make a good judgement call of their own. Look for photos, you will start to get a visual sense of the health of the ship.

3. Pay close attention to the emergency briefing. It should happen as soon as you are on board, before you even set sail. Listen. Ask questions. Make sure your buddies are listening. In an emergency situation, remembering these details could be the means by which you survive.

4. Ask the crew to show you all the emergency equipment. Exit doors, smoke alarms, locations of fire extinguishers, first aid kit, emergency radio. Physically go to look at them yourself – are the exits clear? Is all the equipment accessible and not locked away? Where are the closest emergency exits to your room? The crew should care about your safety as much as you do.

5. Do what you're told to do. When the crew tell you not to charge any batteries in your room, it's not because they're being difficult. Batteries and chargers can overheat and catch fire. Fact. Only charge your equipment in the designated areas and see it as your duty to act as the Charger Police if you see one of your buddies breaking these rules.

6. Make sure there is a watchman through the night. Every boat should have a member of the crew patrolling the boat all night, no exception. They are the first to spot an issue arising and raise the alarm quickly, both mitigating the risk of a problem even occurring, and maximising the time for reaction and evacuation when one does. Survivor stories from the most recent fire in Egypt suggests that no watchman was awake throughout the trip. I am grateful now, although I didn't know at the time I needed to be, that on both my trips the Captain and/or the Engineer were patrolling the vessel at all hours.

Thankfully, these types of incidents are few and far between. Some simple awareness and action from every one of us will help ensure it stays that way, and perhaps reduce the chances even further.

THE LIVEABOARD EXPERIENCE

OK, so safety tips done, I dedicate the rest of this article to telling you about the fabulous liveaboards I went on, and more importantly, the magnificent marine life we saw.

Week one, I was with Emperor Divers on board the Emperor Asmaa, and week two, I was with JP-Marine on their boat of the same name. I won't lie, both boats had some small issues and needed some love – you get the feeling all the boats are being hammered week-in and week-out at maximum diver and crew capacity, and temporary fixes are being put into place, sticking plasters over the problems. Both boats had experienced engineers on board to deal with anything that could arise; big men with big hearts, loud laughter and lively singing and dancing.

Week one, I travelled as a lone diver with Emperor and found a boat full of lovely divers from Norway and Thailand, and as a result, I have a new set of people to add to my travel list and a new diving and room buddy (who did not snore once – bonus). Week two was with a big group of my UAE divers on JP, and you all know how much fun it is to be with your favourite buddies who know you and your watery behaviours well. My regular buddy gave me new sleep goals after her rather incredible ability for deep sleep regardless of motion or noise.

It's important to mention the crew. Each boat came with some 10+ crew members, each with their own role to play, and all willing to help you out at any time. They work really hard with long hours, and they do it with big smiles. From the chefs in the galley, turning out delicious meals with multiple menu choices 3 times a day, plus post dive freshly cooked snacks (in

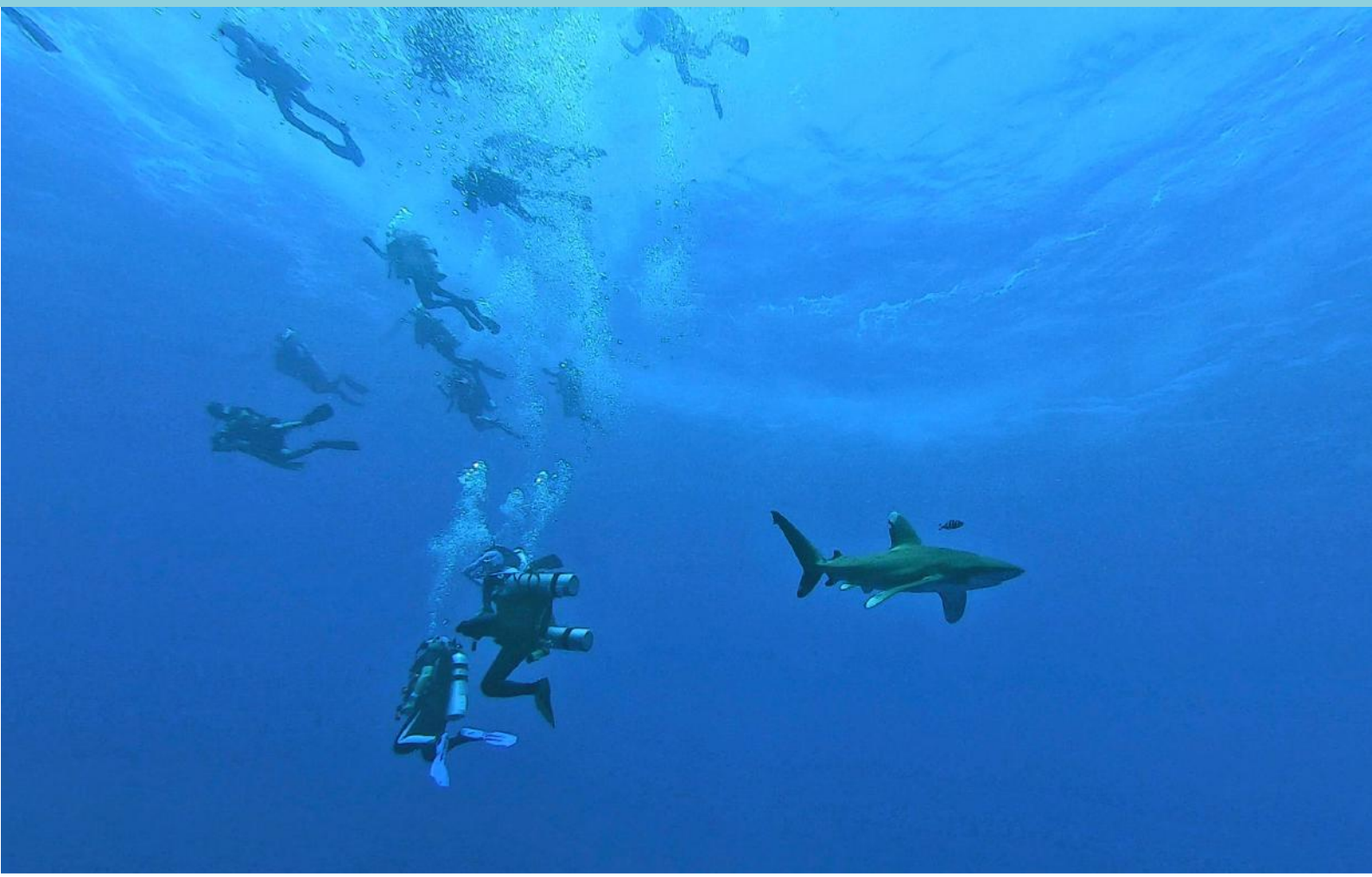
the middle of August, in Egypt, you can imagine the temperature in those tiny kitchens), to the deck hands whose job it is to help you in and out of your kit and make sure all the on-deck equipment is ready and waiting. Both Emperor and JP had a really great team.

It is useful to set the boats apart so you know the differences between them. Personally I was more impressed with the Instructors and Guides on the Emperor; their briefings – if a little long – were excellent. Detailed reef explanations, good visuals and maps, constant reminders of safety instructions and diving signals. This is not saying the Instructors on the JP were bad, in fact they too were very good, there were no safety or briefing lapses. On the Emperor they just went to a higher level. Also with the crew on Emperor, their English was just a little better which made communication easier, and as a whole the crew engaged with us all more.

One benefit of the JP-Marine is space – with a similar number of divers on each boat (JP if at capacity, can hold a few more divers than Emperor), the JP is overall a bigger boat which means it's more comfortable on the dive deck. The upper deck lounging area is more spacious and comfortable for between-dive relaxing (to be fair, mainly post-dive snoozing), and the inside lounge and meal area where dive briefings take place, was also a more convenient size.

THE MARINE LIFE

The addicted diver will have noticed by now that I still haven't mention the marine life. That's because I've saved the best till last. In all my diving dreams, I had never expected to see so much. Be aware, the Brothers-Daedalus-Elphinstone trip is all about the blue. If you prefer to spend your time looking at techni-colour reefs and searching for coral residents, this might not be the trip for



you. With a few exceptions, you're in the blue most of the time, looking at large pelagic passers-by. We were not disappointed. Several whale sharks, sometimes together, often on their own; families of hammerheads on almost every dive in Daedalus; the predatory oceanic whitetips, otherwise known as Longimanus, hanging around waiting for photographic opportunities in Elphinstone; schools of dolphins; the odd thresher or two; some not so shy dugongs. Serious "OMG" on every dive!

On one particularly lucky early morning dive's descent, an enormous oceanic manta drifted past us and decided to turn around, giving us a staggeringly beautiful ten minute dance. As she finally swam off, we turned around to a majestic six metre adult whale shark following our trail, and then further on, hammerheads circling below us and slowly making their way up closer. Probably the best forty minutes of my diving life to date.

From this particular trip, expect a fishy spectacle. Expect the big stuff. Choose either of these liveaboard operators for high standards of safety and professionalism. You won't be disappointed. Till next time, happy diving!

LIVABOARD OPERATORS HURGHADA, EGYPT

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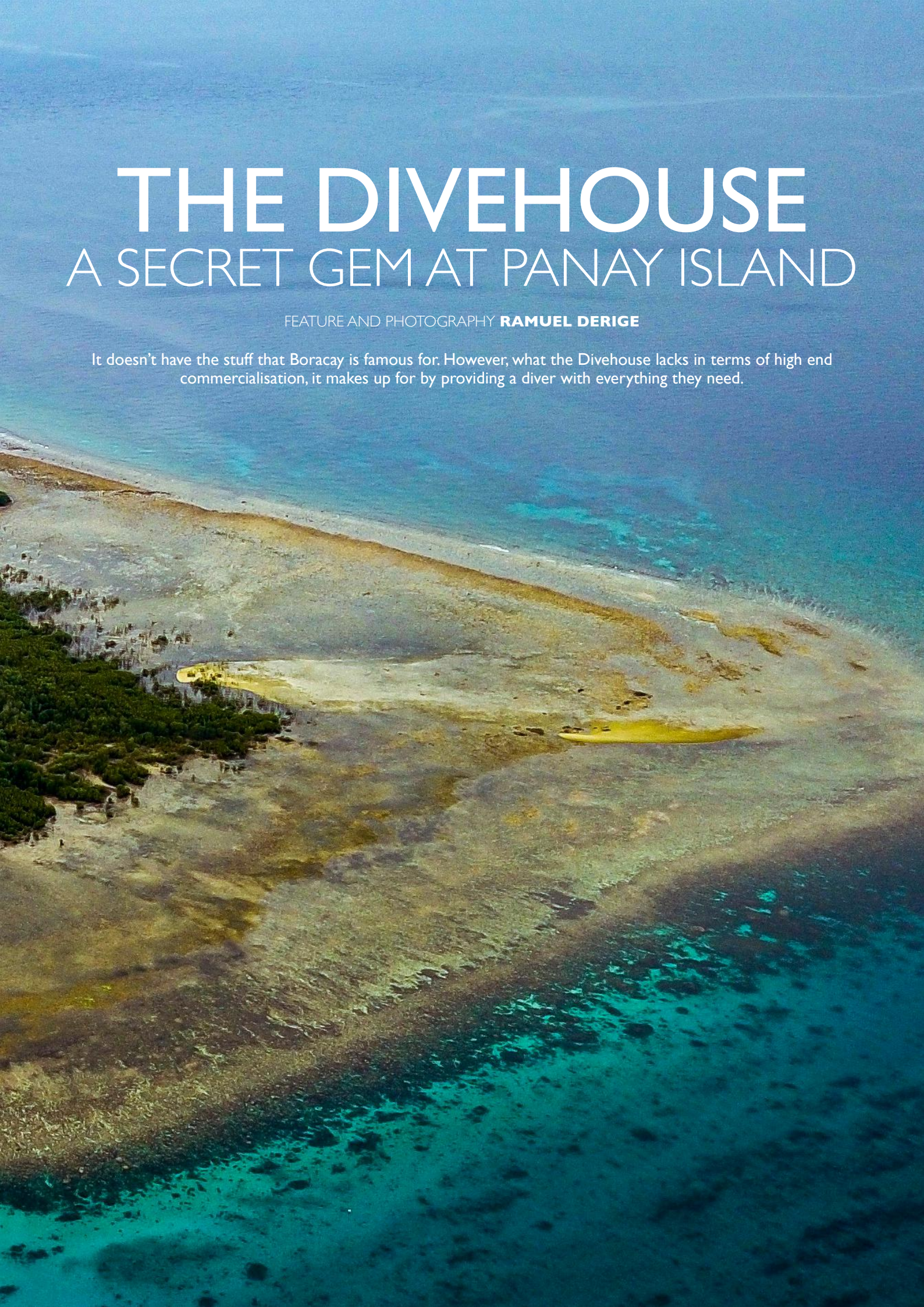
THE DIVEHOUSE
A SECRET GEM AT PANAY ISLAND

FEATURE AND PHOTOGRAPHY **RAMUEL DERIGE**

It doesn't have the stuff that Boracay is famous for. However, what the Divehouse lacks in terms of high end commercialisation, it makes up for by providing a diver with everything they need.



Think about Boracay… Its smooth white beach, luxury accommodation, high costs, high influx of tourists, commercialised environment, and most of all, extremely bad diving.

Now think of the complete opposite, and you've got the place where the Divehouse sits. Sure, it may seem like a sleepy fishing town dotted with only a few resorts and featuring a rocky beach that may not be ideal for sunbathing. It doesn't have five star amenities, not in the standard sense, as it doesn't come with 24/7 on-call service. They don't have housekeeping staff that keeps your room clean every day. There are no restaurants and bars nearby to party in, and the whole town is asleep by 10pm.

No, it doesn't have the stuff that Boracay is famous for. However, what the Divehouse lacks in terms of high end commercialisation, it makes up for by providing a diver with everything they need.

Accessible by a 2-3 hour bus (or UV Express) journey from Iloilo or a 4-hour land trip from Boracay, the Divehouse is located in the town of Anini-y in Antique – the southernmost tip of Panay Island. The only dive resort for miles on end– we checked. The Divehouse features large rooms good enough for groups of 4, and provides comfortable beds, air conditioning, and spacious and clean toilets (hooray for bidets). The centrepiece of the property is the common area where the kitchen is located, and where guests hangout during surface intervals. It's mostly quiet, with only the hum of the engines of local fishing boats passing by, and the sound of children playing to interrupt the moments of peace and silence. No noisy, loud tourists here – guaranteed.

The kitchen is manned by Ate ('Ate' is Tagalog for Older Sister) Bebeng, where she produces delicious home cooked food using local produce. Tell her what you need, and she'll prepare it if it's available. My mom who joined me during my visit, expressed her desire to eat fresh fish when it wasn't initially on the menu, and Ate Bebeng made sure we had one on the table together with the dishes she had already prepared.

See, the deal with the Divehouse is that it's designed solely for divers looking to get an underwater snapshot of that portion of Panay Island. They mostly offer all inclusive packages with food, accommodation and diving. Non-divers get to choose one activity in lieu of diving, such as island hopping or snorkelling, or exploring the adjacent Nogas Island and its instagrammable views that include the lighthouse. Once you reach their place and get settled into your room, there is absolutely nothing else you need to think about except the diving. The rest is taken care of by the wonderful staff at the Divehouse.

For divers who prefer to rent gear instead of lugging their own stuff around, they offer complete sets as rentals – regulators, fins, BCDs, masks, and wetsuits. They also have an in-house compressor which means you can dive as much as you can without worrying about running out of tanks to use. The in-house dive instructor, Sam, is a cool and accommodating guy, offering local hospitality and combining it with the professionalism you can expect from a PADI Instructor. He'll help you with anything you need, from equipment set-up, to loading gear onto the boat. During the time we spent there, he made sure that my mom – a non-diver – was comfortable and offered options to help her enjoy her stay.

Now for the diving. While the beach may be rocky, the diving is excellent. Visibility is at par with other premium dive locations in the Philippines and accesses the Sulu Sea. Nogas Island, a government naval reservation island, is located 4.8 km in front of the resort and is just a 20 minute boat ride away. Dives feature slopes, rocks brimming with coral, and sea life from relaxed turtles to tense anemone fish. Jacks and trevallies are always passing through, as well as groups of barracudas and snappers. I visited three dive sites during my stay. Mamam, featuring three large rocks encrusted with hard and soft corals. Bahama, an area with downward slopes that are perfect for both Open Water and Advanced Open Water divers, and Mama Lou's Rock, a relatively flat area with various rocks that feature juvenile fish, critters for macro photography, and the occasional turtle.

Depending on the time of day, the diving can either be calm and easy, or challenging with currents that may push you out on to Nogas island. Sam made sure that we dove at the easiest time to maximise our air and dive with the least efforts. But if you want a bit of a challenge, hey, by all means you can go for it. Just notify Sam and he'll tailor a suitable dive itinerary for you.

This place is indeed a hidden gem, but judging by the number of divers visiting them from all over the world during peak season, it is getting the recognition it deserves. Anyone looking to go on a dive safari around Panay and the nearby islands must hit Antique and make sure that Divehouse is part of the itinerary. Consider exploring the dive sites around Nogas Island (a necessity) and enjoy the beautiful underwater world that Sulu Sea offers.

Sure, it's not Boracay. And that's why it's perfect.

www.thedivehouse.com

EUSTACHIAN TUBE DYSFUNCTION: THE TREATMENT WITH BALLOON TUBOPLASTY

FEATURE **COSIMO MUSCIANICI**

Eustachian tube dysfunction (ETD) is a common clinical condition of the middle ear that can affect patients of all ages. The causes of ETD are both extrinsic and intrinsic to the Eustachian tube, in particular stemming from the nose, the nasopharynx, or also from inflammation or stenosis of the Eustachian tube itself.

The symptoms are hearing loss, dull hearing, and very rarely, ear pain. These symptoms can occur when carrying out a variety of activities: air travel or travelling on fast trains, mountain hikes, and especially during diving activities, both when free diving or using scuba equipment.

This very important canal that connects the middle ear (tympanic cavity and attached cavities) with the nasopharynx was known as far back as the 16th century. The Eustachian tube is formed by an osseous part and a fibrocartilaginous part. Its function is to provide ventilation, drainage, and protection to the middle ear, as well as maintaining the same pressure present in the external environment (atmospheric pressure) in the tympanic cavity.

It is because of this equalisation function carried out by the Eustachian tube that the system composed of eardrum and ossicular chain can express its functions in the best way possible; furthermore, it prevents the formation of serous or catarrhal secretions in the tympanic cavity.

ETD provokes ventilation problems in the middle ear, resulting in an altered equalisation of the pressure between the middle ear and the environment, and the formation and stagnation of secretions in the tympanic cavity, up until the development of a full-blown barotrauma to the middle ear, which is greatly feared by divers.

If an ETD occurs during a scuba dive, due to the rapid increase of the environmental pressure in the descent phase, it will not be possible to spontaneously equalise (pressure equalisation) the cavities of the middle ear, since the physiological opening of the Eustachian tube will be prevented by the momentary negative tympanic pressure that maintains its walls collapsed.

The diver might then have to resort to special manoeuvres to force equalisation, if regular equalisation does not work. The basic requirement to equalise the middle ear effectively and without any risks when descending, is to promptly start carrying out equalisation manoeuvres, in other words force the opening of the Eustachian tube in the presence of small pressure gradients (from the very first metres).

The diagnosis of ETD can be made after a specialist otorhinolaryngology examination, as well as an instrumental investigation of the auditory functionality, and impedance testing. This way it is possible to clarify the causes of the dysfunction: the presence of adenoid vegetation or neoplasms in the nasopharynx, septal dysmorphisms, hypertrophy of the turbinates, salpingitis, etc.

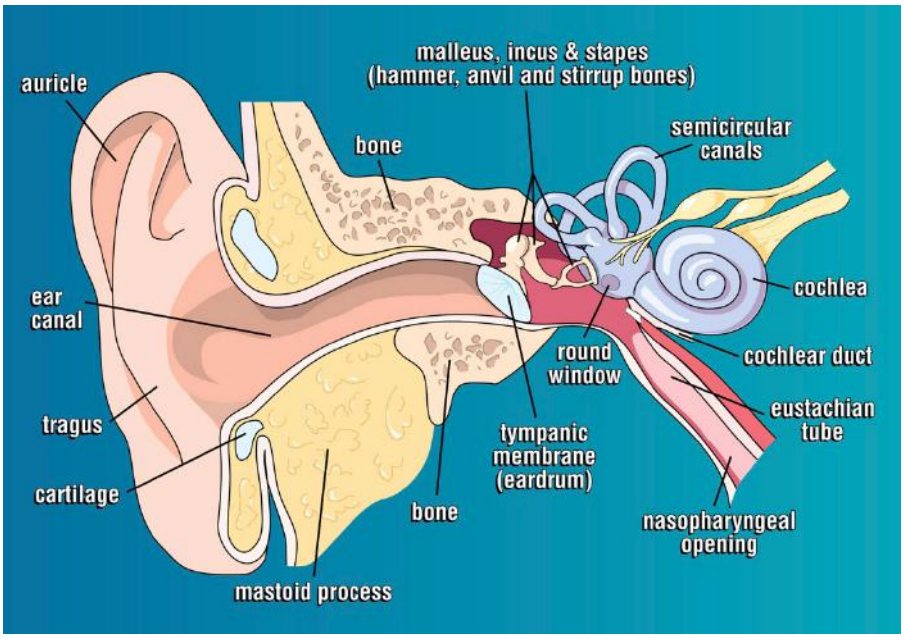
In addition to the treatments already in use (thermal intratympanic insufflation, kinesiotherapy of the ear tube using Otovent, use of the Ear Popper), nowadays a surgical method is available that can cure this clinical

condition: Balloon Tuboplasty.

This procedure uses a modified PTA catheter that is introduced inside the Eustachian tube, using a special microendoscope to allow its delicate and precise positioning. Once the catheter is introduced, the balloon located on its distal end is inflated by introducing saline solution, up until a pressure of 10 bar. This pressure is kept unvaried for two minutes. Then, the balloon is deflated and the catheter is removed under endoscopic vision.

Postoperative results are analysed using a specific scale, identified as ETS, that assesses objective and subjective parameters.

The results of this technique show that the dilation of the Eustachian tube is a safe and simple procedure, and represents a good treatment option to improve stenosis of the ear tube.



WOMEN AND DIVING: HEALTH CONSIDERATIONS

FEATURE **SARAH EGNER**

It may sound obvious, but it's still true: men and women are physically and physiologically different. This is of particular interest when it comes to address specific health concerns in diving activities. Here are some aspects that female divers should consider.

BODY TEMPERATURE

For both sexes, body temperature is affected by factors such as body fat content, fat distribution, and body surface-area-to-mass ratio. Hormonal differences may affect thermoregulation, but body composition and size typically drive responses to cold exposure. Total heat loss may be greater in women because they generally have higher surface-area-to-volume ratios and lower muscle mass compared with men. All divers should wear a suit that fits well and keeps the body warm.

MENSTRUATION

Anxiety, dizziness, feeling cold and the potential for panic may be exaggerated during menstruation or premenstrual syndrome. Women should be aware of how menstruation affects them and consider if associated symptoms might compromise dive safety. Temporary iron deficiency during menstruation may reduce exercise capacity so women should be prepared to modify diving, if necessary. Research suggests there may be a slight increase in risk for decompression illness during the follicular stage of the menstrual cycle. Women might consider reducing their diving during this time.

ORAL CONTRACEPTIVES

Use of oral contraceptives may contribute to clot formation, which can lead to a thromboembolic event such as pulmonary embolism, heart attack or stroke. These events are unmanageable underwater. Quitting smoking, exercising regularly and moving frequently during long trips can help minimise the risk of an emergency due to clot formation.

PREGNANCY

Pregnant women, women who think they may be pregnant or women trying to become pregnant, should avoid diving. A survey of 208 mothers who dived during pregnancy showed higher rates of low birth weight, birth defects, neonatal respiratory difficulties and other problems.[1] A similar survey conducted in 2016 also suggested a strong association between fetal malformations and scuba diving during early pregnancy.[2] Decompression studies conducted on sheep demonstrated that a fetus may develop bubbles before the mother displays clinical symptoms of decompression sickness.[3,4] All sheep studies showed very high rates of fetal loss.

Most data on freediving and pregnancy comes from Japanese ama divers and Korean haenyo divers, for whom freediving for pearls and abalone is a way of life. Many ama divers continue to freedive well into pregnancy without many adverse effects, although profiles are modified. Conservative freediving during pregnancy may be considered a safe activity for enjoyment or relaxation (provided good maternal and fetal health), but it is not an ideal form of exercise.

The recommendations regarding a return to diving after childbirth vary based on the type of delivery. After a normal vaginal delivery, a woman can resume diving in about 21 days. This allows time for the cervix to close, which limits the risk of infection. An uncomplicated cesarean section generally means eight to 12 weeks of not diving to allow the mother to regain cardiovascular fitness. If a woman is put on bed rest due to complications, waiting more than 12 weeks is prudent because of deconditioning and loss of aerobic capacity and muscle mass.

BREASTFEEDING

Diving is considered safe for mothers who are breastfeeding. Nitrogen does not accumulate in breast milk, so there is no risk of the baby absorbing dissolved nitrogen. Diving can be dehydrating and may interfere with milk production; appropriate hydration is important.

COSMETIC AND RECONSTRUCTIVE PROCEDURES

Fitness to dive following plastic surgery depends on the procedure. Botox injections,

for example, typically require little down time. Diving can be considered once there is no risk of infection. Dermal fillers warrant more consideration; the concern is not the ambient pressure in the diving environment but rather displacement of the filler caused by pressure from the diver's mask. Diving after major plastic surgery such as abdominoplasty (a "tummy tuck") or breast implants is deemed safe once the treating physician has released the patient for full and unrestricted activity – six to eight weeks is typical.

AGING AND MENOPAUSE

The symptoms of menopause can be both physical and emotional, including anxiety, decreased energy, hot flashes, sleep disruption and mood changes. Nonetheless, menopause is not a contraindication to diving, assuming symptoms do not compromise dive safety, nor is it the greatest risk for aging female divers. Medical concerns associated with aging – such as hypertension, heart disease and diabetes – require greater attention, as they are more likely to affect diving.

CARDIOVASCULAR HEALTH

DAN fatality reports show that cardiac incidents are among the top three disabling injuries in diving fatalities, regardless of sex.[5,6] Cardiovascular disease can be misdiagnosed as dive-related illnesses, especially in women, because of the increased incidence of ambiguous symptoms such as fatigue, malaise and/or flulike symptoms. In any emergency situation, timely first aid is critical.

OSTEOPOROSIS

Preventative health for women as they age includes awareness of the increased risk of osteoporosis. Compromised bone health is not a contraindication for diving; women who have been diagnosed with osteoporosis or severe bone loss, however, should take precautions such as putting on tanks in the water, avoiding carrying tanks on land and avoiding hazardous shore entries such as rocky beaches.

While male and female divers have more similarities than differences, understanding health considerations of particular relevance to women is useful to all women who dive – and those who dive with them.

Before leaving, make sure your DAN membership is still active. If it isn't, make sure to join DAN or renew your membership at **www.daneurope.org**.

Your DAN membership ensures the services of the biggest international network for assisting divers anywhere, during any emergency.

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DAN | AlertDiver

UPCOMING EVENTS

SHARK GUARDIAN CONSERVATION & EDUCATION

A Presentation with Brendon Sing and Liz Ward-Sing | Venue: TBC
Wednesday 15th January 2020 | 18:30 Registration, 19:00 Presentation Starts

Shark Guardian engages in various international activities and projects for shark conservation and they are coming to present to our EDA Members about their conservation work.

EDA MOVIE NIGHT WITH VOX CINEMAS

SAVING JAWS | VOX Cinemas, Mercato Mall
Wednesday 12th February 2020 | 18:30 Registration, 19:00 Movie Starts

Follow Ocean Ramsey, renowned marine biologist, and Juan Oliphant, award-winning underwater wildlife photographer, on their journey to combat the negative media associated with sharks. Watch them travel the world to uncover the reality of shark behaviour and speak out for sharks' well-being. With the majority of media coverage focusing on the small percentage of negative shark encounters, this team will attempt to change the narrative on sharks for the better. Perception is everything and Saving Jaws has the goal of turning media coverage on sharks in a positive direction.

DID YOU KNOW?

OVERFISHING HAS PUSHED TWO FAMILIES OF RAYS TO THE BRINK OF EXTINCTION

BY **THE IUCN RED LIST** PHOTO **DR. RIMA JABADO | WWW.ELASMOPROJECT.COM**

Smoothnose Wedgefish, (*Rhynchobatus laevis*)

The IUCN Red List of Threatened Species update reveals further evidence of the perilous state of freshwater fish globally. This is shown by high numbers of species threatened by the loss of free flowing rivers, habitat degradation, pollution and invasive species in Japan and Mexico.

The IUCN Red List has broken through the 100,000 species barrier; it now includes assessments for 105,732 species, of which 28,338 species are threatened with extinction.

"With more than 100,000 species now assessed for the IUCN Red List, this update clearly shows how much humans around the world are overexploiting wildlife," said IUCN Acting Director General, Dr Grethel Aguilar. "We must wake up to the fact that conserving nature's diversity is in our interest, and is absolutely fundamental to achieving the Sustainable Development Goals. States, businesses and civil society must urgently act to halt the overexploitation of nature, and must respect and support local communities and Indigenous Peoples in strengthening sustainable livelihoods."

"This Red List update confirms the findings of the recent IPBES Global Biodiversity Assessment: nature is declining at rates unprecedented in human history," said Jane Smart, Global Director of the IUCN Biodiversity Conservation Group. "Both national and international trade are driving the decline of species in the oceans, in freshwater and on land. Decisive action is needed at scale to halt this decline; the timing of this assessment is critical as governments are starting to negotiate a new global biodiversity framework for such action."

RHINO RAYS ON THE BRINK OF EXTINCTION

Wedgefish and giant guitarfish, collectively known as Rhino Rays because of their elongated snouts, **are now the most imperilled marine fish families in the world**, with all but one of the 16 species assessed as Critically Endangered. The False Shark Ray (*Rhynchorhina mauritaniensis*) of Mauritania is very close to extinction, having suffered a population decline of more than 80% in the last 45 years.

Closely related to sharks, with some species growing up to three metres long, Rhino Rays live in shallow waters from the Indian and West Pacific Oceans to the East Atlantic Ocean and Mediterranean Sea. Increasingly intense and essentially unregulated coastal fishing is driving their decline, with most caught incidentally with other fish as "bycatch". Rhino Ray meat is sold locally, while the fins are highly valued and internationally traded for shark fin soup.

"To prevent losing these ray families, it is critical that governments immediately establish and enforce species protections, bycatch mitigation programmes, marine protected areas, and international trade controls. Educational initiatives focused on Rhino Ray identification, status, and safe-release protocols for animals captured incidentally are also urgently needed at the local level to effectively implement protections," said Colin Simpfendorfer, Co-Chair of the IUCN Species Survival Commission Shark Specialist Group.

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