



GLOBAL EDITION
May 2023
Number 118

Taiwan
Orchid Island

The Maldives
Addu Atoll

Tech
Komati Springs

Ecology
Splendid Toadfish

The Early Days
Rebreathers

Contributors' Picks
Epic Photos

NORWAY

Oldenburg

COVER PHOTO BY RENÉ B. ANDERSEN

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COVER PHOTO: *Diver on Oldenburg wreck, Sognefjorden, Norway*
Photo by René B. Andersen

School of powder blue tang and surgeonfish, Fuvahmulah, Maldives. Photo by Raf Jah



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Getting All the Wiser

I have done a fair deal of dive training over the years—mostly out of simple curiosity, professional interest, a desire to acquire more skills, and to be all the wiser.

Most of the acquired skills, I never or rarely use in regular diving, most of which is the plain vanilla variety anyway—that is, no-decompression, open circuit and no fancy gasses, except for the occasional use of nitrox. Keeping it simple has its virtues.

I do have some technical training, including closed-circuit certification on a couple of rebreather units. I really enjoy diving rebreathers; I love the quietness and the almost Zen-line experience of becoming one with the environment, part of the ocean—and not just in it, like an alien object. But I digress...

The point I am trying to make is that the advanced training I have gone through benefits me in so many ways, even on a “simple dive” (if there is such a thing). Not only has it made my basic technique and execution (did I mention fine-tuned buoyancy, posture and streamlining?) much more fluid and effortless, and dare I say, relaxed, I also feel more competent and comfortable, knowing I have the skills and insights to deal with a long list of contingencies, should any

arise. This is the result of the dive training exercises and drills I have been put through, practicing how to deal with various scenarios.

Some of the drills were on the strenuous side (I am not going to sugar-coat it), and I do not look back on them with much fondness. One, in particular, involved a drill during an advanced nitrox and decompression dive course. We were practicing in a flooded dry dock, and we had to swim underwater from one end to the other, some 25 to 30m, while holding our breath and not wearing masks, wearing drysuits and carrying twinsets (which was not exactly the epitome of being streamlined), simulating being out of air and not having our buddy close by. But it was probably the most valuable exercise I have ever done, because it taught me that one has much greater reserves to cope with situations than one would otherwise assume, if only one kept a cool head and did not panic.

On every dive, even a shallow dive in sea grass banks on a calm summer day, I always run through a lot of “what-if” scenarios in my mind, so that I am prepared. It has just become second nature to me. Like airline pilots prepare mentally, so that they can put the plane down on short notice, and professional driv-

ers are able to sense potential accidents in the making and take preventative action in a timely manner.

I am never anxious or fretful; I just feel focused and prepared, equipped and confident that I can handle situations and procedures to pull me safely out of a pickle.

It is therefore OK—I would even say, recommendable—to take courses that qualify you further than the dives you actually plan to conduct, so you have that extra buffer and added layer of competence. You may never need it, nor intend to use it, but that is not my point.

We may never need our first-aid training either; no sane person would hope that these skills would ever be needed. But once we have obtained such training, we will be glad that we are able to react appropriately, should the unfortunate situation arise in which we find ourselves on the scene of an accident—we might even save some lives or limbs. The same principle applies to diving in general.

Better be safe than sorry. Safer diving is also more enjoyable.

I rest my case.

— Peter Symes
Publisher & Editor-in-Chief

NEWS

from the deep

Edited by G. Symes

Humpbacks in the South Pacific (right). Home to some of the largest reservoirs of biodiversity on the planet, which support abundant fisheries, marvelous deep-water coral ecosystems and diverse marine life, the high seas are also throughways for whales, sharks and other migratory species.

Historic agreement to protect international waters reached at UN after 20 years of negotiations

After nearly two decades of talks, UN member states finally agreed in March 2023 on a legal framework to protect the high seas beyond national boundaries.

The legal framework provides a crucial mechanism in setting up vast marine protected areas (MPAs) in the high seas. The historic treaty plays a critical role in the enforcement of the 30x30 pledge that countries had made in December 2022 at the United Nations Biodiversity Conference (COP15) in Montreal, Canada. The 30x30 target aims to protect a third of the sea (and land) by 2030.

The announcement by conference president, Rena Lee of Singapore, was met by a standing ovation from delegates, who had worked long days and nights to finalize the deal.

Vital and urgent

Two-thirds of the ocean that lies outside national boundaries are covered by the treaty. The establishment of new MPAs in these areas will

protect against the loss of wildlife as well as share out genetic resources. Through a conference of the parties (COP) created by the agreement, member nations can be held accountable in matters regarding governance and biodiversity.

As oceans produce half the oxygen we breathe, houses 95 percent of the planet's biosphere, and provides a critical carbon sink, the role of the treaty in bringing nations together to organize what has up until now been a fragmented system, with loosely enforced rules governing the high seas, is vital and urgent.

Momentous achievement

With 193 nations involved, the treaty was a huge achievement. It was the third time in less than a year that member states had come together to thrash out a final agreement. Brokering the deal were key players in the High Ambition Coalition, which included the European Union, United States, United Kingdom and China, who helped build coalitions rather than stoke division, demonstrating a willingness to compromise in the last

few days of negotiations.

It was a "historic moment for the ocean" and the culmination of over a decade of work and international negotiations, according to Virginijus Sinkevicius, the European commissioner for the environment, ocean and fisheries.

"With the agreement on the UN High Seas Treaty, we take a crucial step forward to preserve the marine life and biodiversity that are essential for us and the generations to come," said Sinkevicius. "It is also a proof of strengthened multilateral cooperation with our partners and a major asset to implement our COP15 goal for 30% ocean protection. I am very proud of our outcome."

While it has been hailed as a momentous achievement, there is

more to be done, according to conservationists. Specifically, under the agreement, existing bodies already in charge of regulating fishing, shipping and deep-sea mining would continue doing so, without being required to make environmental impact assessments, which were laid out by the treaty.

Sticking points

During negotiations, sticking points that divided developing and developed nations included the procedure for creating MPAs, fair sharing of marine genetic resources (such as krill, corals, seaweeds, bacteria and deep-sea sponges) for possible use in medicines and cosmetics, and the model for environmental impact studies.

To facilitate the ratification and early implementation of the treaty,

the European Union pledged €40m (US\$42m) in a move that was seen as a bid to build trust between rich and poor nations.

Coordinated effort

The US assistant secretary for oceans, international environment and scientific affairs, Monica Medina, who was present during the negotiations in New York, said the United States was pleased to agree on the strong, coordinated effort to establish MPAs, which was a major element of the treaty.

"We leave here with the ability to create protected areas in the high seas and achieve the ambitious goal of conserving 30 percent of the ocean by 2030," said Medina. "And the time to start is now." ■ SOURCES: THE GUARDIAN, WIKIPEDIA.ORG, PEWTRUSTS.ORG



High Seas Treaty

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Edited by G. Symes



Capo Carbonara Marine Protected Area in Sardinia, Italy

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EU countries to establish large marine protected area in the Mediterranean

In order to comply with EU targets on the protection of the sea and biodiversity, Italy's environment minister said that an agreement is in the works to establish a large marine protected area (MPA) in the Mediterranean.

term plan aims to conserve nature and reverse the deterioration of ecosystems.

Even though the 30x30 target was established in December 2022 at COP15 in Montreal and is part of the 2030 Biodiversity Strategy introduced by the European Union, governments have not done much to date. The goal is to protect 30 per cent of land and seas by 2030.

system of marine protected areas will include a simplification of bureaucratic procedures, making them less difficult to navigate.

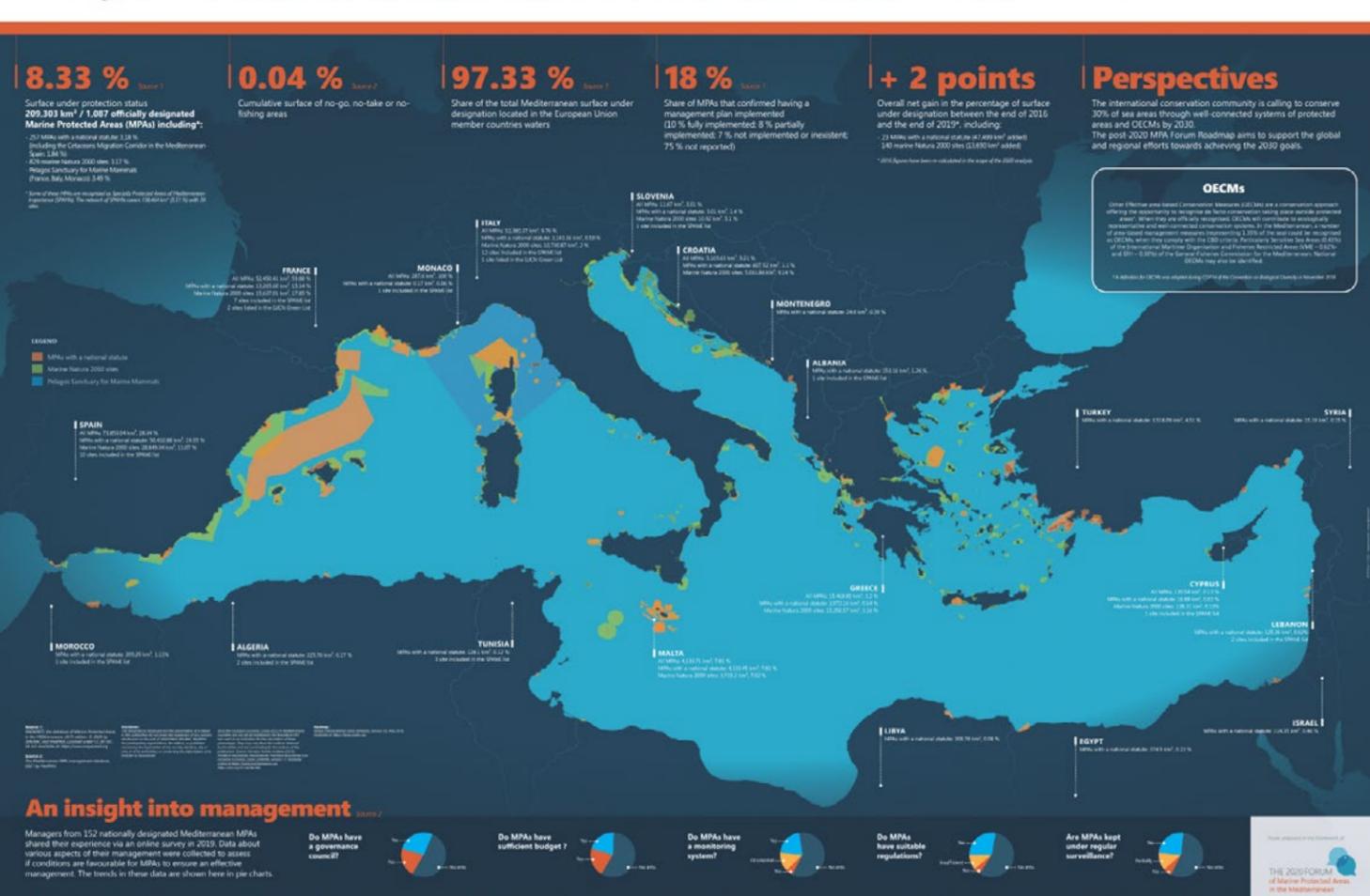
Sense of urgency
The minister's involvement follows requests for action by environmental groups that have highlighted the urgent need to curb overfishing and pollution.

Back in 2022, Italy amended articles in its Constitution to include the protection of biodiversity and ecosystems in its general principles. Currently, there are 29 MPAs and two underwater parks in Italy. However, with the current slow rate of change, there are doubts that targets can be met by the 2030 deadline.

"It is essential to protect our nature, our sea and our well-being," said Luciano Di Tizio, president of WWF Italy. "We need an extraordinary commitment, which citizens are asking for and which must see the institutions play a leading role." ■

SOURCE: EURACTIV

The system of Mediterranean Marine Protected Areas in 2020



The system of Mediterranean marine protected areas in 2020

MEDPAN AND UNEP / MAP-SPA/RAC, NOVEMBER 2021

Edited by
G. Symes

\$20 billion in marine biodiversity commitments announced at ocean conference

A UNESCO World Heritage Site and marine reserve, Coiba National Park is found in the Gulf of Chiriqui in the western region of Panama. Situated in the Tropical Eastern Pacific, it forms part of the Eastern Tropical Pacific Marine Corridor (CMAR).

At the eighth annual Our Ocean Conference, which took place in Panama on 2 to 3 March, participating countries and organizations made 341 commitments totaling ca. US\$20 billion, including funds for the expansion and improvement of marine protected areas and biodiversity corridors.

At the start of the event, US White House climate envoy and former secretary of state John Kerry said that the meeting was "so incredibly important because it is a conference that is focused on action, not on talk. It's about real commitments and real solutions."

Huge sums

Nearly US\$6 billion in US commitments spread across 77 projects to protect the high seas in 2023 was announced by Kerry, including technical collaboration to foster "green shipping corridors."

The European Union announced it would direct €816.5 million to ocean-related projects in 2023, with €320 million going towards research on how to protect marine

biodiversity and address the effects of climate change on the seas, and €250 million going towards the launch of the Sentinel-1C satellite, which will monitor melting ice and impacts of climate change.

Panama, which was the first Latin American country to host the conference, announced it would add protections for more than 54 percent of its marine territory, by adding 36,058 sq mi to its existing Banco Volcán marine protected area (MPA) in the Caribbean Sea, an area of high biodiversity and deep-sea mountain ranges.

As described by the president of Panama, Laurentino Cortizo Cohen, who inaugurated the event, the conference was a chance for "countries of the world to hold frank conversations with the purpose of committing ourselves to actions for the preservation and strengthening of life in the ocean."

He added in a statement, "As Panamanians we inhabit a narrow strip surrounded by blue. To protect it, we should all think of the ocean as a source of life and recognize it as a great ally in our fight against the climate and biodiversity crises."

In addition, the country intends to stop the import and consump-

tion of more than 160,000 tons of plastic, eliminating plastic packaging, single-use plastics and virgin plastic, according to the Ministry of Environment.

Charitable organizations

To encourage the improvement and expansion of marine protection, Bloomberg Philanthropies and Arcadia announced the establishment of a fund of US\$51 million to assist governments, NGOs, local communities and indigenous peoples in their efforts to meet the goal of protecting 30 percent of the oceans by 2030—the aim of the Kunming-Montreal Global Biodiversity Framework, which was agreed at the UN COP15 in December 2022.

To shore up marine protections for the Eastern Tropical Pacific Marine Corridor (CMAR), which encompasses over 500,000 sq km (193,000 sq mi) of highly biodiverse and productive waters around Colombia, Costa Rica, Ecuador and Panama, the Connect to Protect Eastern Tropical Pacific Coalition (an alliance of several groups) announced a recent commitment of US\$118.5 million of public and private funding.

From commitments to action

Oceans and climate director at the NGO Blue Marine Foundation, Dan Crockett, who attended the event, remarked on the impressive sums in commitments announced at the conference and felt encouraged seeing countries working together to establish marine protected areas that stretch over political boundaries. "There was a strength to the amount of money being put on the table," Crockett told *Mongabay*. "And that's one of the biggest challenges that we face in this space."

Crockett added, "If environment ministers can set down their differences and come together around ambitious ocean conservation, it provides a lot of hope for the potential for 30 by 30."

Chief executive officer of the platform Global Fishing Watch, Tony Long, who was also in attendance, said that while conference participants demonstrated a "clear commitment to providing ocean sustainability," the crucial next step was putting these commitments into action. He added, "The more we see the community come together to drive those actions forward, the quicker the health of our ocean will be maintained." ■ SOURCE: MONGABAY, UNESCO

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Edited by
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INSAPICTURES / PIXABAY

Octopus and squid sensing capabilities

Octopus explores the marine environment with sensing features that are evolutionarily related to human brain receptors.

By looking at the way octopuses and squids sense their marine environments, researchers from the University of California San Diego and Harvard University discovered new sensory receptor families and determined how they drive distinct behaviours in the environment.

Taste-by-touch

Along their arms, octopuses have highly sensitive suckers that allow methodical exploration of the seafloor as they search for food. In one *Nature* study, the research teams described for the first time the structure of an octopus chemotactile (meaning chemical and touch) receptor, which is involved in taste-by-touch explo-

ration by the arms.

Both octopus and squid use cephalopod-specific chemotactile receptors (CRs) to sense their respective marine environments, and structural adaptations in these receptors support the sensation of specific molecules suited to distinct physiological roles.

Links to human brain receptors

"We discovered a new family of cell surface receptors that offer a rare lens into the evolution of sensation because they represent the most recent and only functionally tractable transition from neurotransmitter to environmental receptors across the entire animal kingdom," said Ryan Hibbs, a professor in the Department of Neurobiology at UC San Diego. As such, the studies also cast a light on the evolution of human brain receptors. See the **video >>>** ■ SOURCE: NATURE

Blue crabs attack at low tide

Blue crabs ambush fiddler crabs from shallow, water-filled pits.

Last September, ecologist David Johnson and his colleagues were at a Virginia salt marsh at low tide. There, they observed some unexpected behaviour by an aquatic predator.

They witnessed blue crabs waiting in shallow, water-filled pits, stalking and ambushing fiddler crabs above land, at low tide.

After capturing their prey, they would carry it back to the pit to consume it, then discard the large claws of the fiddler crab at the edge of the pit.

"It was amazing because here was an aquatic predator—one that lives, eats, breathes, and breeds under water—feeding out of the water," said Johnson, who is from William & Mary's Virginia Institute of Marine Science.

He and his team published their findings

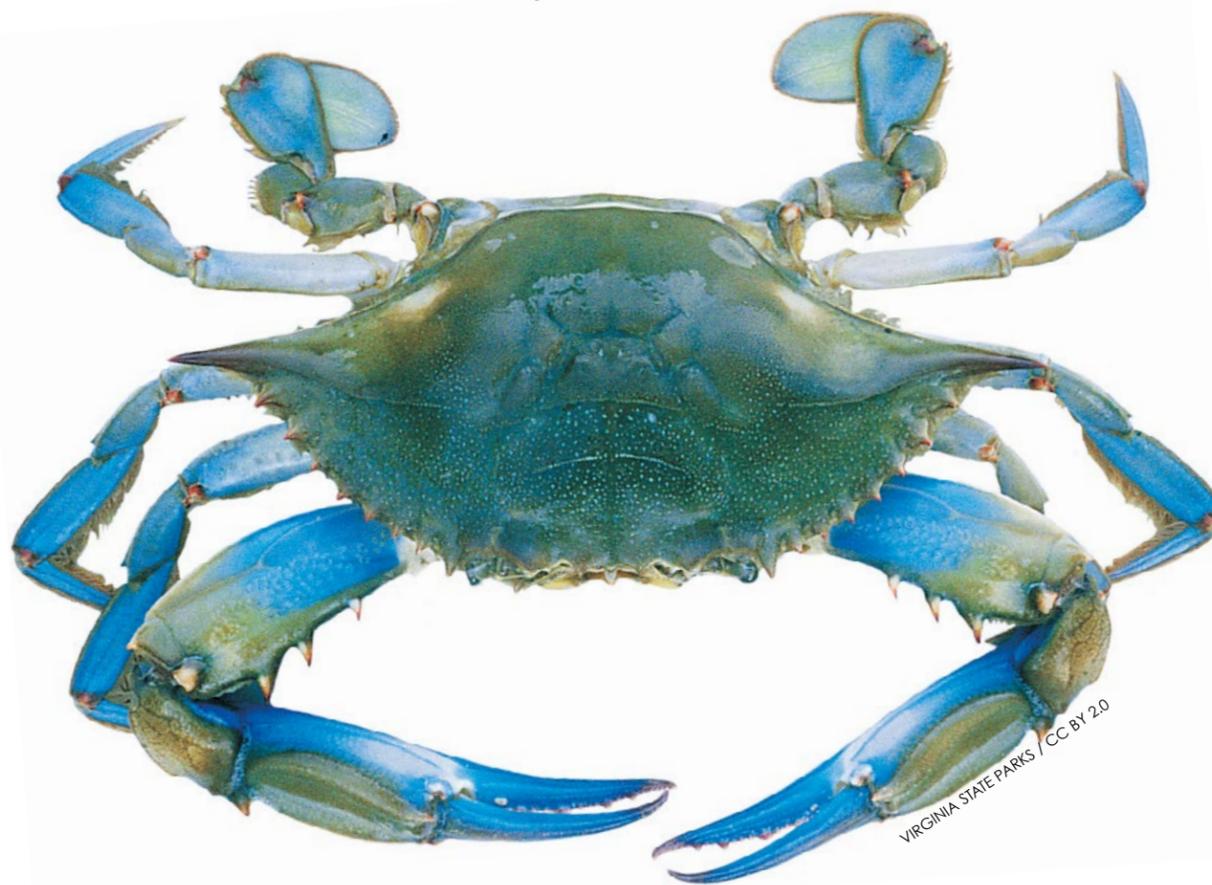
in the September issue of *Ecology* journal.

At a follow-up visit to the same marsh a fortnight later, Johnson observed more instances of such behaviour. He observed that 83 percent of the blue crabs were juveniles. It was believed that the pits were dug by the crabs themselves, as they were about the crabs' size, and there was video footage showing them scooping out mud with their claws.

In addition, they did not always stick to the same pit, and would move to an empty one if available, or even evict another blue crab from their own pit.

Based on 37 hours of video footage, the success rate of the attacks were 33 percent (11 out of 33).

"Our observations underscore how vital salt marshes are to blue crab production and the blue crab fishery," said Johnson. He plans further research with more video studies and future tethering to test his hypothesis. ■ SOURCE: ECOLOGY



Atlantic blue crab, or regionally, the Chesapeake blue crab, is a species of crab native to the waters of the western Atlantic Ocean and the Gulf of Mexico, and introduced internationally.



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Edited by
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A research team has demonstrated that fish think, "It's me," when they see themselves in a mirror or picture.

Fish recognises itself in photographs

Cleaner fish, *Labroides dimidiatus*, likely recognize their own mirror image using a mental image of the self-face comparable to humans.

A new study demonstrates how animals recognize self-images.

Some animals have the remarkable capacity for mirror self-recognition (MSR), yet any implications for self-awareness remain uncertain.

In a test of MSR ability in cleaner fish, mirror-naïve fish initially attacked photograph models of both themselves and unfamiliar strangers. In contrast, after all fish had passed the mirror mark test, fish did not attack their own (motionless) images,

but still frequently attacked those of unfamiliar individuals.

Recognising self in photographs

Furthermore, when fish were exposed to composite photographs, the self-face/unfamiliar body was not attacked, but photographs of unfamiliar face/self-body were attacked, demonstrating that cleaner fish with MSR capacity recognize their own facial characteristics in photographs.

Additionally, when presented with self-photographs with a mark placed on the throat, unmarked mirror-experienced cleaner fish demonstrated throat-scraping behaviours. Six of the eight individuals that saw the photograph of themselves with a parasite

mark were observed to rub their throats to clean it off. While showing those same fish pictures of themselves without parasite marks or of a familiar cleaner fish with parasite marks did not cause them to rub their throats.

Face recognition

The results indicate that the cleaner fish determined who was in the photograph based on the face in the photo but not the body in a similar way humans do.

Combining mirror test experiments with photographs has enormous potential to further our understanding of the evolution of cognitive processes and private self-awareness across nonhuman animals. ■ SOURCE: PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

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View of Valletta's old harbour (far right); Entrance to the University of Malta, Valletta Campus, in the old centre of Malta's capital (right); Breaks in the yard (centre); Evening ambience in downtown Valletta (lower far right)



Report: Rebreather Forum 4 (RF4)

Text and photos by Peter Symes

In the jungle of dive shows, events and conferences, Rebreathers Forums are rare and exclusive creatures held decades apart and attended by the core of technical diving practitioners, explorers, manufacturers, and hyperbaric researchers.

Each forum presents and summarises the state and forefront of technological advances and current research since the previous one and its findings and recommendations formulated in the closing session of the conference sets the stage for technological developments, improvements in training and operation, and areas of further research in the upcoming years.

The previous Rebreather Forum (also known as RF3) was held in May 2012 in Orlando, USA, making it close to 11 years since the last one. During this period, technology has evolved significantly, and frontiers of research have taken significant steps forward.

As a nice change from previous events, which were all held in the United States, RF4 took place in Europe—more specifically, at the University of Malta, Valletta Campus, which is right in the old centre of Malta's capital. The setting was thus classical in nature, and it was a real pleasure making the walks to and from the hotel, down through the cobbled streets between ancient buildings, to the conference.

Placing it in Europe this time surely also attracted a different audience. As a European,

I enjoyed not having to contend with long-distance travel and jetlag. Food is also much better on this side of the Atlantic and waking up with a view of Valetta's old harbour, rather than a nondescript parking lot in Orlando, also made it more pleasurable.

From a delegate's perspective, the event was very pleasant, well-organised and went without a hitch. So, hat's off to the organisers, and in particular, Michael Menduno, who surely lost some sleep over putting the event together, contending with numerous obstacles, delays and hiccups in the process. In the end, it all paid off.

Preceding the conference, a string of other events was held from 17 April and onwards, including some shipwreck and recreational diving, some try-dives with various manufacturers, and Gareth Lock held some courses that, in conjunction with the core conference, made for more of a rebreather festival. Several presenters and delegates also stayed on to do some diving after the conference.

On the evening before the conference, a "non-caustic cocktail" event was held in the main conference hotel, which was a great opportunity to

catch up and socialise with fellow dive-industry professionals and colleagues. The classical quartet, which provided live music during the evening, was a really nice touch.

Highlights

The forum schedule was jam-packed with top-notch presenters. It is impossible to highlight just a few without doing injustice to many others, but I will have to give it a shot. Hyperbaric doctors and tech event regulars Neal Pollock and Simon Mitchell each gave several presentations as well as coordinated the talks, keeping the schedule on track.

They were joined by fellow doctors David Doolette and Richard Harris. The latter, who is widely known for his role in the Tham Luang cave rescue in 2018, also gave the keynote presentation on hydrogen diving at the banquet dinner, which was a highlight. Various other presenters, such as Dr Frauke Tillmans of DAN, Gareth Lock, and Pete Mesley, spoke about aspects of safety and mitigation through improved training and practices.



Blue hour ambience in Valletta's old city centre



Dr Neal Pollock and Dr Simon Mitchell coordinated the talks.

Dr Neal Pollock fields questions during his talk, "Hazards in rebreather diving" (right)



CONCLUSIONS

- Rebreathers represent a demanding platform in design, training, operation, range of use
- Engineering solutions are a laudable priority but these have clear limitations
 - human factors
 - knowledge gaps
- Risk management is key
 - frequently balancing risk-reward-trade off relationships
 - note: an inability to quantify does not equate to an absence of knowledge



BREATH SOUNDS

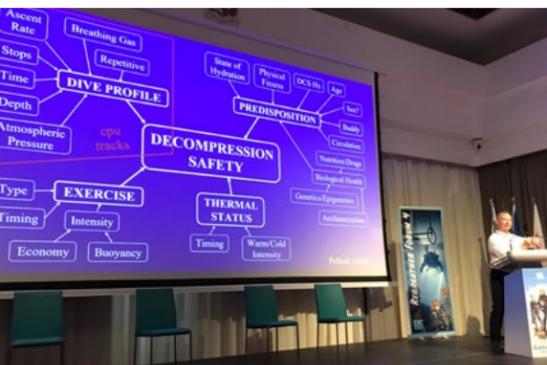
- Machine learning algorithm
- Detects respiratory distress via sounds of breathing

Dr Rachel Lance presents, "Near future of physiological monitoring" (left); Phil Short and Kevin Gurr (centre); Dr Frauke Tillmans, "Rebreather market and training is actually growing." (centre left); Pete Mesley (far left); Pollock's mastery of slide composition (far lower left)

alarms in the rebreather interface. Moreover, the forum recommended the display of safety-critical

Other recommendations were made regarding health checks, dive planning, emergency planning in remote locations, in-water recompression, and collection and analysis of rebreather incident data. What is mentioned here is by no means exhaustive, and the full list of findings, recommendations and observations will be published in the upcoming proceedings.

Thanks go to the organisers for a well-executed, informative and pleasant event, and to all the sponsors for making it possible. ■



and concluding remarks, which will result in the forum's consensus statements, which will be published at a later date. The statements will cover themes identified from presentations

information, such as loop oxygen status on a heads-up display (HUD).

Furthermore, regarding equipment, the forum recognised the advantage of a bail-out valve for transitioning from closed to open circuit in the event of a bailout being required. This advantage requires a high-performance open-circuit breathing system.

no less than six emerging technologies, which can monitor our physiological state and response in relation to diving and decompression stress. How about detecting respiratory distress via the sounds of breathing, using a machine-learning algorithm? Or by tracking eye movements? Or measuring certain brain activity, using near-infrared spectroscopy? It felt as if we were witnessing the transition from science fiction to reality.

By comparison, pulse oximetry, which is commonly known for its use in hospitals where you get this little clip on your finger to measure blood oxygenation levels, seems almost down to earth, but miniaturising and "ruggedising" it for diving requires some further technological

developments. Pulse oximetry can independently detect hypoxia in a rebreather diver.

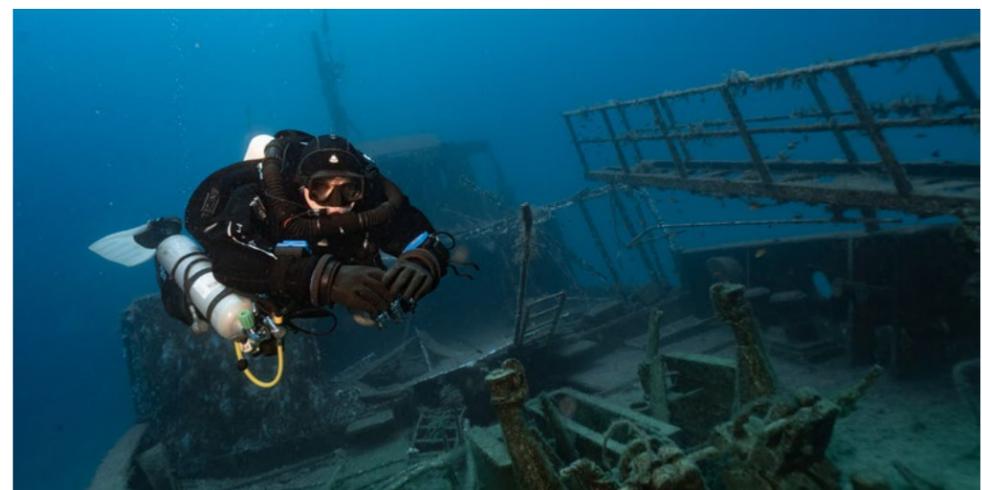
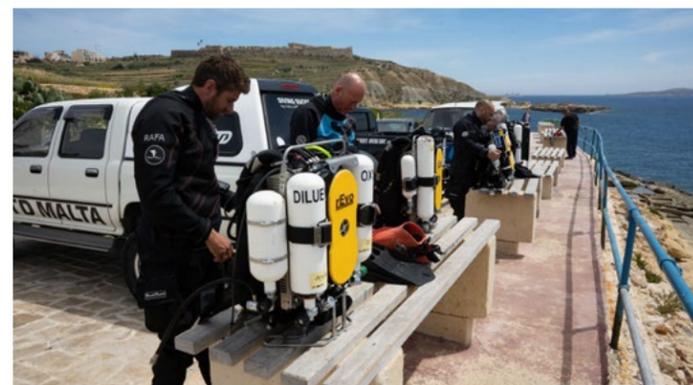
The next topic was the use of Doppler ultrasound for imaging of microbubbles in real-time and a new decompression procedure validation to minimize decompression sickness risk. Venous gas emboli (VGE) are common after diving and are usually only present in small numbers. Greater VGE numbers are an indication of decompression stress, which can be reliably detected using ultrasound imaging. A technology known as CMUT (Capacitive Micromachined Ultrasonic Transducers) makes possible the real-time control of decompression procedures, by using a small wearable device.

The last afternoon of the conference was dedicated to the consensus list discussion

or topics mentioned by presenters, which will be compiled to reflect a consensus of participants. Statements will be subdivided into the following main areas: Education and Training, Engineering, Operational Matters, Safety and Research.

Some select recommendations

Among the forum's recommendations was the use of a pre-dive checklist administered just prior to diving and the use of retaining straps to avoid loss of mouthpiece in the event of loss of unconsciousness underwater. The forum also recommended that manufacturers consider incorporating sensor replacement warnings in rebreather operating systems and gas density displays or



Post-event chillin': Enough said, time to dive! Dr Neal Pollock actually goes diving (upper right).

Text and photos by René B. Andersen

The *Oldenburg*, which was originally named *Pungo*, was built in 1914 to carry bananas between Cameron and Germany. It was drawn into World War I in 1915, put in German service and rebuilt as a raider ship. René B. Andersen shares the story of the ship and takes us on a dive to the wreck.



Historical photo of *Oldenburg* in Gdynia

WWI raider ships were merchant vessels and preferably refrigerator ships because they were faster than regular ships. They were equipped with hidden cannons and mines and sailed under false names and flags, with camouflaged armaments and crew. Cloaked in this manner, the raiders were able

to get past the English blockade, after which they were free to lay mines or approach enemy cargo ships in order to raid or sink them.

When *Pungo* was rebuilt as a raider ship, it was fitted with four 15cm cannons and a 10.5cm cannon, along with two torpedo tubes and 500

mines. The raider then undertook several raids in the Atlantic Ocean and the Kattegat, Skagerrak and Baltic seas from 1915 to 1919, during which the vessel switched names several times, from *Pungo* to *Möve* to *Vineta*.

During this period, the ship captured and sank 42 ships. Among its

many victims was the British battleship *HMS King Edward*, which was sunk by one of its mines. Two other casualties were the English ship *Georgic*, which was sunk with 1,200 horses on board, and the cargo ship *Otaki*, which was armed and resisted but could not match its opponent, *Möve*. This made

Oldenburg Wreck

German Raider & Cargo Ship Through Two World Wars





The stern at 75m (left); One of the many gun turrets fallen from the wreck (above); There are still portholes on the wreck (right). Before the *Oldenburg* sank, it was badly burnt, leaving open spaces that now allow access inside.



Air attack on *Oldenburg* in Vadheim in 1945 during World War II

Möve the most successful raider ship. But the war ended for Germany in 1918, and after the Treaty of Versailles, the ship was handed over to English ownership as a war reparation. Now renamed *Greenbrier*, it once again freighted bananas. Then, in 1933, a German shipping company bought the ship and named it *Oldenburg*.

WWII cargo ship

During WWII, *Oldenburg* was enlisted into marine service once again but with a quieter assignment as a cargo ship sailing between Germany and Norway for the German occupiers. But before entering service, the vessel was outfitted with anti-aircraft and ship guns. It looked like the ship would make it through the war, until one

fateful day on 7 April 1945, when it was at anchor on the western side of Vadheim in Norway's Sognefjorden, with a cargo of fish destined for Germany. *Oldenburg* was part of a convoy with another merchant vessel and two outpost ships, V-5301 and V-5302, which were old whaling boats that were armed.

In the morning, they came under attack from 21 English Beaufighters (which were heavily armed with machine cannons and rockets) and their escort of 16 Mustang fighter aircraft. If the crews of the convoy vessels thought that the high mountains around the fjord would offer them some protection, they were mistaken. The ship's anti-aircraft guns started firing but in vain, and several rockets hit

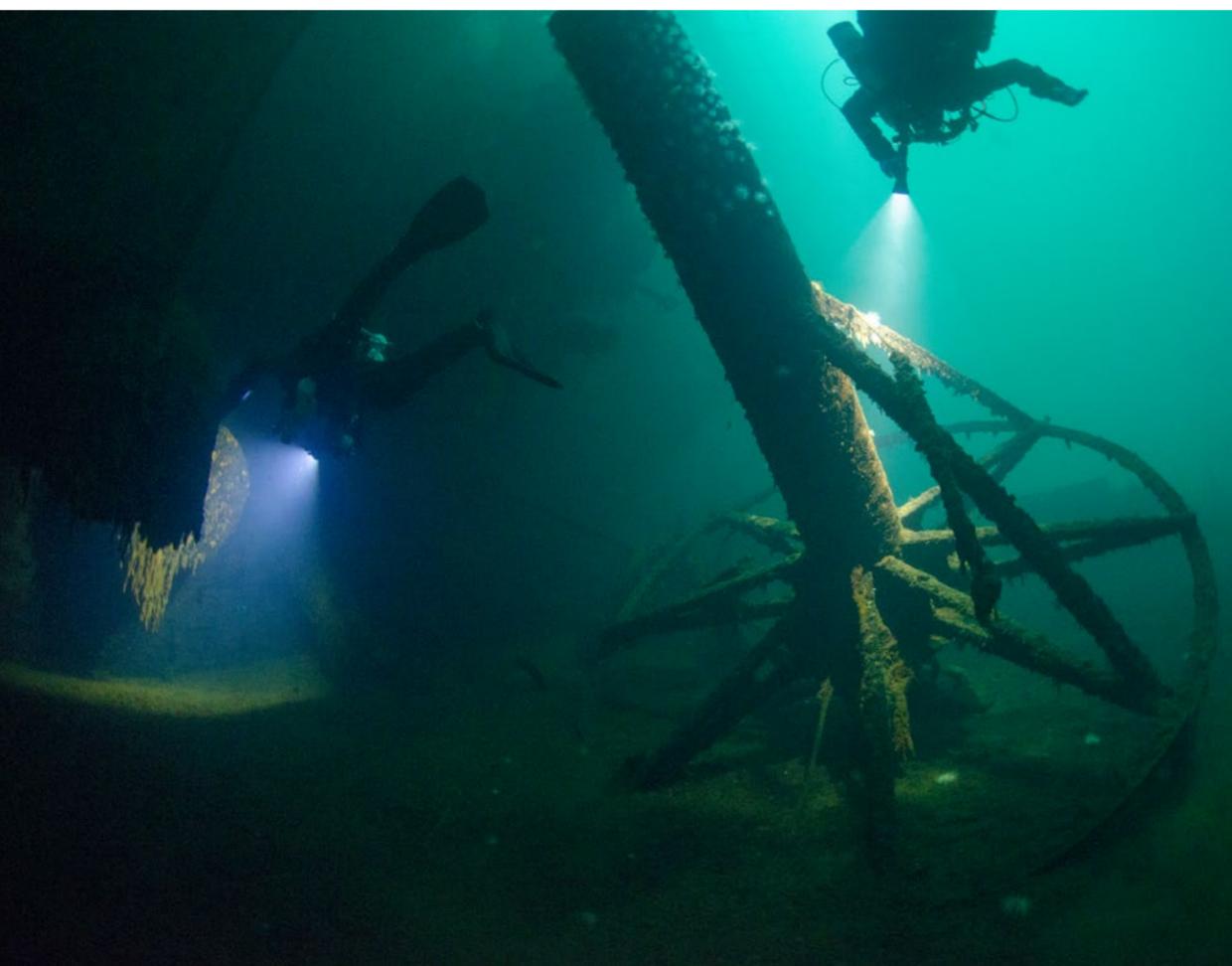
Oldenburg under the waterline, after which the ship took on water and began to sink.

There is an old picture in which *Oldenburg* is shown lopsided and burning. Seven anti-aircraft personnel and only one of the ship's crew were wounded in the attack. Albert Carr, a former pilot in the 489th squadron, who took part in the attack, visited Vadheim in 1987. He recalled that he expected a warm welcome and that was exactly what he got. German ships were generally well-armed, and although his own aircraft was hit, he still managed to fly it back to base.

Afterwards, the English aircraft came into battle with German aircraft in the outer part of Sognefjorden. The German aircraft came from a base



Diver at Oldenburg's stern at 27m (right); In Vadheim, a small road leads to a parking lot with shore access to the wreck. The buoy in the background marks Oldenburg's location (below).



Divers at the crow's nest, which has fallen to the sea floor (above)



near the city of Bergen. Both sides suffered losses. The other cargo ship, *MS Wolfgang L.M. Russ*, survived the attack, with one fatality and three wounded. It was later sunk on the 4th of May in Danish waters around Århus, while it was on the way to Germany with ammunition.

Vadheim

To get closer to the wreck (which lies on the western side of the fjord, if you are driving on E39), one can take the small road (50m before or after the river on the western side of the city) that goes down to a red house and a larger parking area. It is on private property, but the owner does not mind at all if you park there, as long as you put money in the mailbox,

which is placed near the staircase. It is a fair arrangement, and in return, he has put up a staircase, so it is easy to get into the water. I have spoken with the owner a few times about his plans, which is to build a rental house that would be perfect for divers.

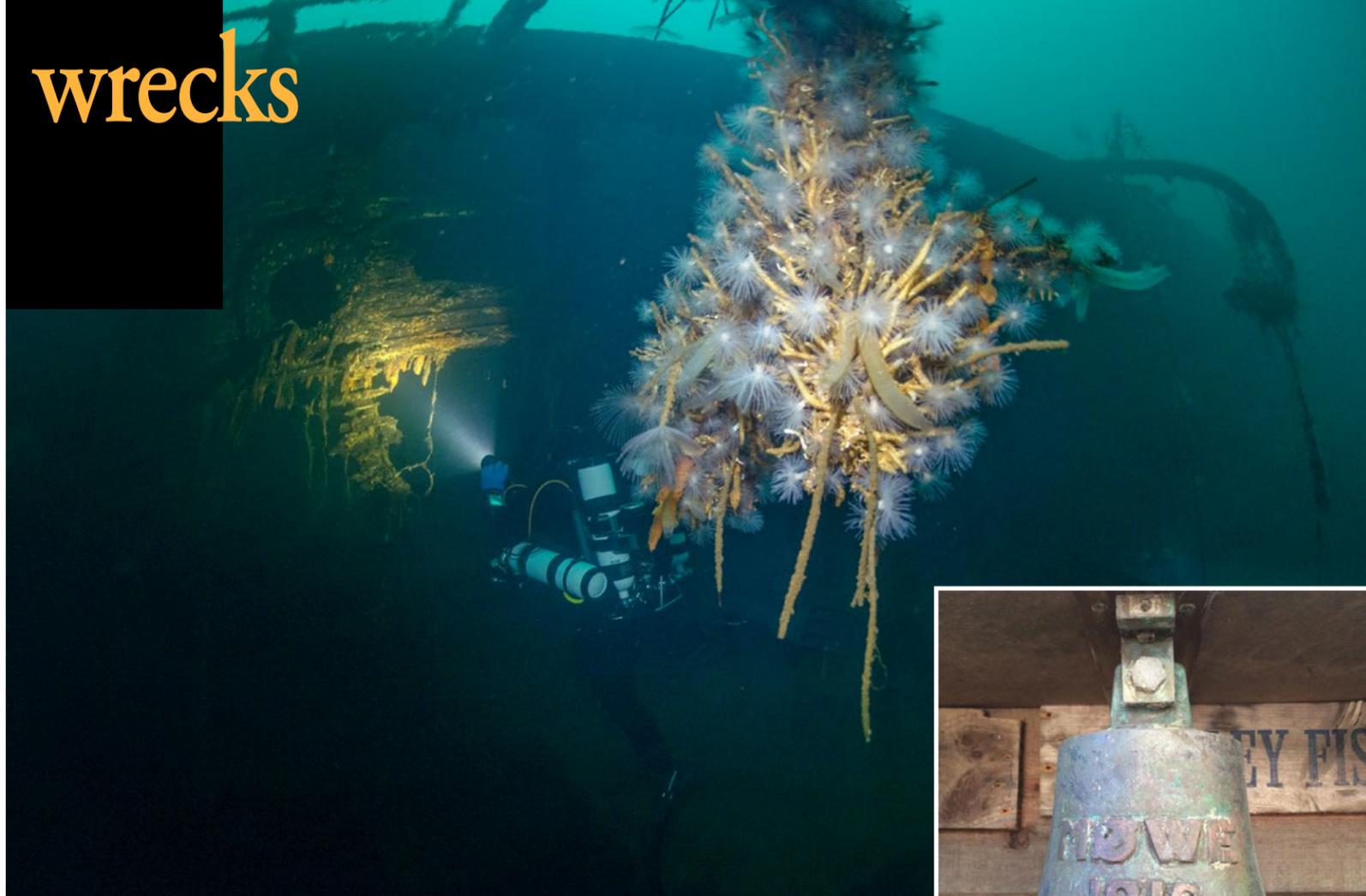
From the parking area, you can see the 80m out to where the wreck is located, and there is normally a buoy on it. Otherwise, check norgebilder.no. Zoom in and you can see the buoy.

Diving

Descending to the wreck, the first thing you will notice is the stern, at a depth of 27m, and it is clear to see how the ship is resting on its starboard side. The stern, with its big hawse-pipes, rises some metres above the

sea bottom, and it appears the wreck has slid down the slope. The anchor and chain are gone, but the anchor winch is still on the deck.

A little farther down lies a platform for anti-aircraft cannons, and possibly a 20mm flak gun. There is steel plating around the edge, but it lies upside-down in the mud, and it appears as though the gun is still there. After the first cargo hold, one comes to the mast and crane arms, which have fallen down to the sea floor with some cables still connected to the railing. It looks interesting the way the cables appear as if they are overgrown. The crow's nest still hangs on the mast. It was probably where crew members stood on the lookout, scouting for ships during raids.



A lifeboat davit festooned with peacock worms and sealoch anemones (above); The ship's bell was salvaged in the '80s, with its old name *Möve* (right).



COURTESY OF MORTEN STRIDH

The bell was salvaged in the late '80s, although it was hard to find because it was located above the crow's nest where no one had thought to look for it.

The superstructure is at a depth of around 45m and is still in good condition, with its two levels with railings around the rim. There is even glass in some of the windows, but the bridge is missing, or rather, it is lying in a pile on the sea bottom, because it was just made of wood. You can still see the bolt holes, after the steering wheel console, which was salvaged in the early '90s. This could not have been an easy task, considering its 240kg weight. By coincidence, I got in contact with wreck expert Morten Stridh, who

was nice enough to send me a photo of the steering wheel console in perfect condition, as well as a photo of the ship's bell, with the ship's old name *Möve* on it.

Part of the wooden deck has rotted and has large holes through which one can swim. But with the wreck's age and the silty bottom, one must be very careful. In 1990, a diver lost his life doing this. Behind the bridge, I saw a milky-white fog that continued downward, limiting the visibility. Maybe it had something to do with the fresh water from rivers in the surrounding area.

There were several davits for the lifeboats, which were nicely overgrown with peacock worms and sealoch anemone. There

was also some sort of structure, but when I looked at the old photos of the ship, I saw that this was where the ship's funnel once stood. I must admit I did not look for it on the seabed.

Sunlight streamed down into the engine room. There was still glass in some of the portholes and some of the covers were open. Here, it is possible to look down and see inside the ship, but I did not get to do so, because I was occupied with photographing the wreck.

Farther down, there was one more structure, and in front of it stood what looked like a pressure





Diver at the wreck's propeller (above, top right and right); The ship's wheel was salvaged in the early '90s and restored with great result (left). The only thing that is not original is the woodwork on the wheel and manometer discs. Restoration has taken ca. 100 hours and cost over NOK 15,000 (US\$1,438), according to wreck expert Morten Stridh.

in the turrets. I will definitely take a closer look next time.

The second mast also had a nicely decorated deck with lots of tube-worms, but now the depth was around 60m. Down towards the stern, there was a walkway that led out to both sides of the railing. Behind the stern, there were some more superstructures that I would look at the next time.

The bottom was covered with a lot of debris, which probably came from the superstructure and cabins as they rusted away. Going around to the bottom of the ship, one could see the propeller and rudder a little farther up. They were both in perfect condition, and it was a beautiful sight. With the way the wreck lay, the propeller stood completely free of the seafloor,

in open water. One could swim under it. But one thing caught my eye—the large rocks located on the rudder. How did they end up there?

The depth here was 75m, so dive time was passing by quickly. After seven minutes, my computer told me it would take 30 minutes to surface with a deco stop. But there were still things that we needed to look at on the way up.

If you follow the wreck upwards and up to the bow, just keep going in that direction. There is a lead line, which goes up to 6 to 8 metres, which you can follow right up to the stairs where you can also place your stage bottles. There is no need to strain the body to lift them all up at once after deco. Instead of making a free ascent, you

have the advantage of being able to swim along the edge. When you have 30 to 40 minutes of deco to pass, time goes a little faster when you have things that have been tossed to the

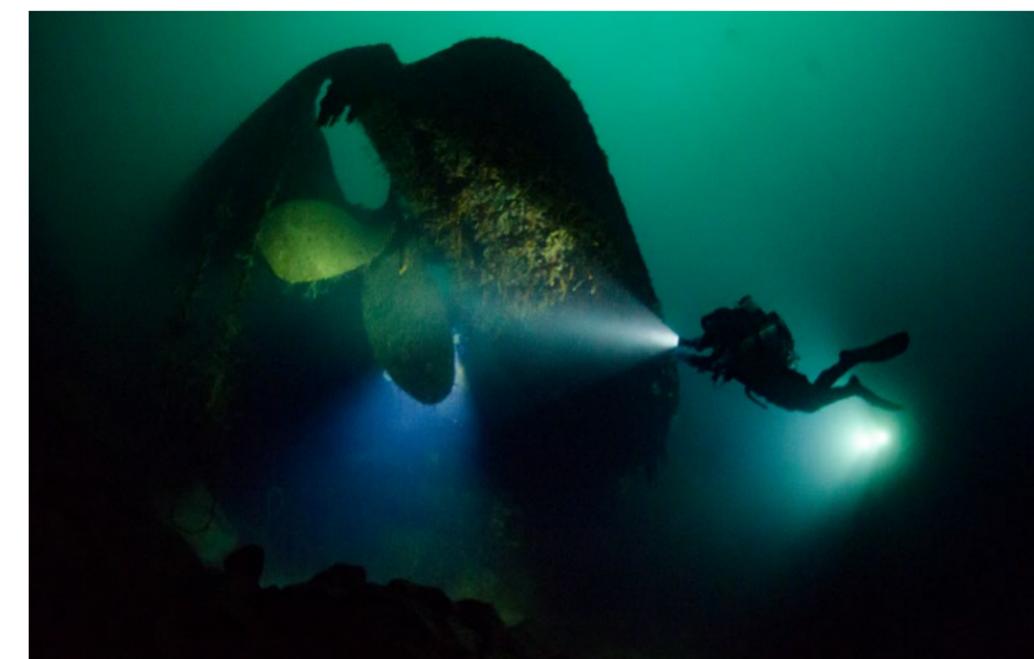
sea bottom to look at. I also managed to find a few nudibranchs.

I previously dived the *Oldenburg* wreck back in 2010 on air, which limited the depth to 40m. This time, I was

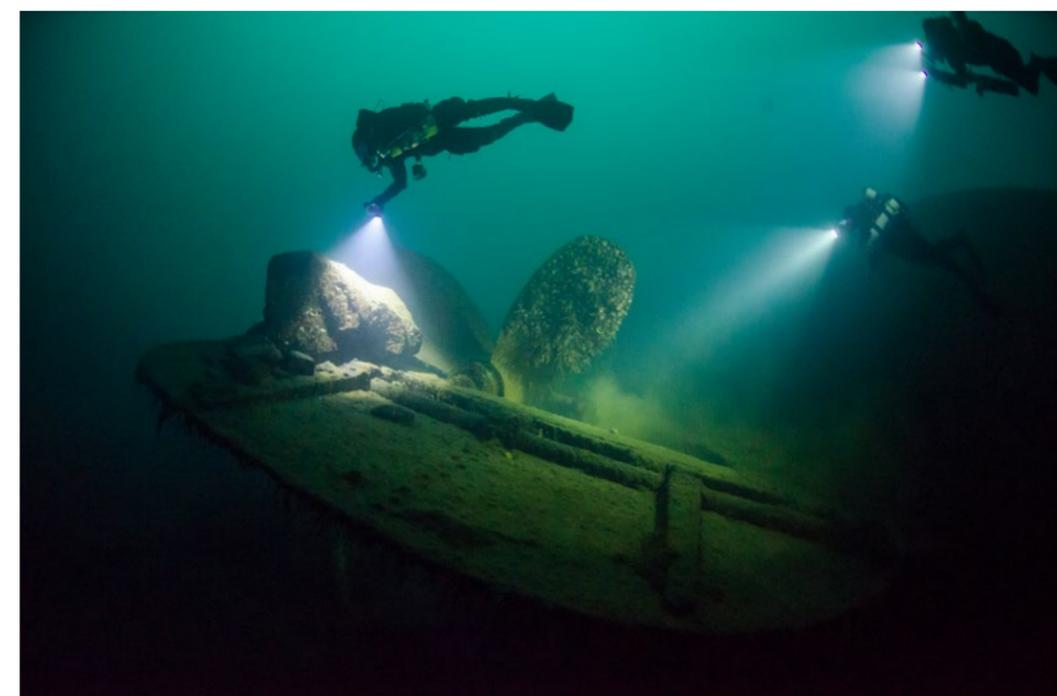


tank. From this section of the wreck and towards the bridge, I saw several gun turrets. The ship had been heavily armed with anti-aircraft guns. Unfortunately, there were no cannons

COURTESY OF MORTEN STRIDH



Diver at propeller (left); Marine growth on the superstructure (above left and right); How did rocks and a boulder end up on the rudder? (right)



on a rebreather which enabled me to see the whole wreck down to 75m. But there were many details that I need to look

closer at next time—for example, the engine room, the stern with its superstructures, the guns on the bottom, and the super-

structure at the wheelhouse, to name a few. Perhaps, I could also penetrate some of the holes in the wreck. The interior would make for a beautiful photo motif.

We got three dives on the *Oldenburg* on this trip, but we would definitely plan for more dives on the next trip. There is also the wreck of the steamship *Ingerseks* in Sognefjord (of almost the same size as *Oldenburg*), which I have not explored yet. But that is a story for another time...

I think it is impressive to find such a great wreck as the *Oldenburg* at a depth that can

be dived from the shore. When you read the stories about it, you too would want to dive it. ■

See wreck location on map here: dykkepedia.com/wiki/Oldenburg

Danish technical diver and author René B. Andersen is an award-winning underwater photographer who won the Photographer of the Year Award in 2019, in the wrecks category. He focuses primarily on technical wreck diving and recently published a book on wrecks in Scandinavia entitled, *Legends Beneath the Waves:*

Scandinavia, Volume 1 & 2. For more information, please visit: vvgalleri.dk

SOURCE: TOFT, M. (2003). HAVET TOK. SELJA FORLAG

Edited by Peter Symes

The Arado Ar 196 wreck in the bay of Kalathas, Crete



NIKOLAS GIANNOULAKIS

Wreck of Arado Ar 196 found in Greece

A mostly intact wreck of a WWII-era German floatplane, an Arado Ar 196, has been found off Crete by technical divers from Chania Diving Center.

Greek portal ScubaHellas reported that the German plane was located and identified by the technical diver and explorer Nikolas Giannoulakis, who also happens to be the owner of Chania Diving Center.

Giannoulakis had been informed about an "anomaly" on the

seabed and decided to investigate, which led to the discovery of the airplane that had lain on the seabed for some 80 years.

The airplane wreck, which is understood to be in quite a good condition, was found at a depth of 64m in the bay of Kalathas in northern Crete.

The Arado Ar 196 was a ship-board reconnaissance floatplane that was much

loved by its pilots, as it was found to handle well both in the air and on the water. Although it was no match for a fighter, it was considerably better than its Allied counterparts, and generally considered the best of its class. ■ SOURCE: SCUBAHELLAS



GONZOSFT / WIKIMEDIA / CC BY 3.0

Arado Ar 196 naval reconnaissance floatplane in the collection of the Bulgarian Air Force Museum at the airport in Plovdiv



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Lost wreck of Montevideo Maru found after 80 years

The Japanese transport ship *Montevideo Maru*, which was found at 4,000m in the South China Sea off the coast of the Philippines, was sunk during WWII on 1 July 1942 by a torpedo launched by the Salmon-class submarine *USS Sturgeon*, not knowing that the vessel was carrying prisoners of war and captured civilians.

It was Australia's worst maritime disaster, with 1,060 WWII prisoners lost, ranging from a boy of 15 to men in their 60s, who months earlier had been captured in the fall of Rabaul, then in the Australian Mandated Territory of New Guinea (now Papua New Guinea). People from many countries were on board, including 980 Australian troops and civilians. Nearly twice as many Australians perished in this one event than during the Vietnam War.

Discovery expedition

In April, a team of researchers, who set out to find the wreck in the South China Sea, discovered its resting place northwest of Luzon on the

twelfth day of the expedition, with the help of state-of-the-art technology, including an autonomous underwater vehicle. The *Montevideo Maru* was found at a depth deeper than the *Titanic*.

Verification that the wreck was indeed the *Montevideo Maru* was done over several days by a group of maritime archaeologists, conservators, research and operations specialists, and ex-naval officers.

The Australian prime minister, Anthony Albanese, said in a Twitter post that the discovery would bring closure to the families of those lost. "At long last, the resting place of the lost souls of the *Montevideo Maru* has been found," he wrote. "Among the 1,060 prisoners on board were 850 Australian service members – their lives cut short. We hope today's news brings a measure of comfort to loved ones who have kept a long vigil."

The expedition

The Sydney-based Silentworld Foundation, a non-profit organization dedicated to maritime archaeology and history, arranged the mission in collaboration with Dutch deep-sea



survey specialists Fugro. The project to find the wreck, which took five years to plan, was also supported by the Department of Defense.

Silentworld director John Mullen, a maritime history philanthropist and explorer, said that the finding of the wreck closed a "terrible chapter in Australian military and maritime history." He added, "Families waited years for news of their missing loved ones, before learning of the tragic outcome of the sinking. Some never fully came to accept that their loved ones were among the victims. Today, by finding the vessel, we hope to bring closure to the many families devastated by this terrible disaster."

Aboard the expedition ship when the wreck was discovered was Andrea Williams, an Australian whose grandfather and great uncle perished in the *Montevideo Maru* disaster. Williams is a founding member of the Rabaul and Montevideo Maru Society, which was formed in 2009 to represent the interests of descendants. For those connected with the disaster, she said the discovery was an "extraordinarily momentous day."

"Having had a grandfather and great-uncle as civilian internees on *Montevideo Maru* always meant the story was important to me, as it is to so many generations of families whose men perished," she said. "I could never understand why it

was not a more powerful part of our Australian WWII history."

Australian army chief Lieutenant General Simon Stuart remarked that soldiers, who had fought in defense of Rabaul, had met a tragic end on the *Montevideo Maru*. "Today we remember their service, and the loss of all those aboard, including the 20 Japanese guards and crew, the Norwegian sailors and the hundreds of civilians from many nations," he said.

Out of respect for families, the wreck will be left undisturbed. No human remains or artifacts will be removed from the site, which has been recorded for research purposes. ■

SOURCE: THE GUARDIAN, WIKIPEDIA.ORG

Malware alert: Don't use public charging stations to recharge your phone, warns FBI

Hackers can gain access to sensitive information, including credit card information, through "juice jacking" of USB charging ports in airports, hotels and malls.

The US Federal Bureau of Investigations (FBI) has issued an alert on Twitter to consumers that fraudsters can infect public USB ports with malware and monitoring software in order to steal data.

Avoid using free charging stations in airports, hotels or shopping centers. Bad actors have figured out ways to use public USB ports to introduce malware and monitoring software onto devices. Carry your own charger and USB cord and use an electrical outlet instead. pic.twitter.com/9T62SYen9T

— FBI Denver (@FBI Denver)
April 6, 2023

The FBI and Federal Communications Commission (FCC)

issued similar warnings of "juice jacking" in 2021, a term which was first coined in 2011 after a charging station was created by researchers to demonstrate the potential for hacking these types of kiosks, according to the *Washington Post*.

However, there have been few instances publicly reported of this malware theft tactic, so it is not known how common the practice is. Officials told Axios that the recent updates were part of a regular reminder of the problem.

The FCC website warned, "Don't let a free USB charge wind up draining your bank account."

Instead, bring your own USB cord and plug it into a port-

able charger or an electrical outlet. Other more secure options include using USB-C cables and wireless chargers. If you must use a public USB charging port, be on the lookout for phone tampering, such as the phone's battery quickly losing power, overheating or settings being changed.

Think of your phone as a credit card and protect it, say experts. Executive director of the Cybersecurity Center at California State University at San Bernardino, Tony Coulson, told the *Post*, "You don't just go anywhere and start plopping your debit card in." ■

SOURCE: THE GUARDIAN



MARCO VERCH / FLICKR / CC BY 2.0

A wireless charger or USB-C cable is recommended

DIVING IN RED SEA PARADISE

SHIPWRECKS

SUNKEN TANKS

THE JAPANESE GARDENS

aqaba
RED SEA WADI RUM-PETRA

JEREMY SEGROIT / FLICKR / CC BY 2.0



MSDA FOOD DRIVE

DONATE & HELP - DIVE COMMUNITY

Malaysia Scuba Diving Association (MSDA) has initiated a Food Drive Campaign to provide support to diver friends who have lost work, business or have no source of income. We are hoping to collect much-needed donations to help the struggling dive community.

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Addu Atoll

— *Diving the Southernmost of the Maldive Islands*

Text and photos by Raf Jah

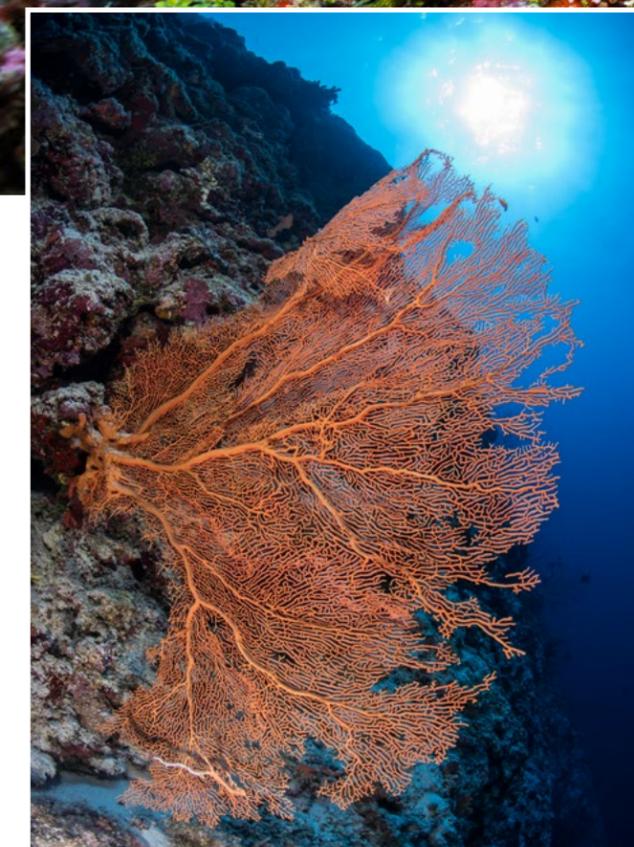




Divers swim over lush coral reef garden at Fuvahmulah Island in the Maldives (left); Sea turtle on reef at Fuvamulah (above)



Photographer with tiger shark at Fuvahmulah



Huge sea fan on wall at Fuvahmulah Island (above); Giant manta ray at Addu Atoll (previous page)

In the southern end of the Maldives lies the Addu Atoll, which hosts beautiful reefs, plentiful marine life, giant manta rays, sea turtles and crystal-clear waters. Raf Jah takes us on a journey to this diving haven, with a stop along the way to dive with tiger sharks at Fuvahmulah Island.

The morning of departure dragged on. I looked out again at the Indian Ocean and sweated some more. It really was an azure blue, but it was also humid, and I had been sitting for hours. The view from the pavement outside Malé's airport has to

be one of the most beautiful, but after an overnight flight and six hours on a hard bench, it was getting very old very fast.

Eventually, our check-in desk opened, and we were processed in that relaxed way that you will only find on Oceanic islands. We sat some more on slightly padded seats, sweated some more and then were crammed onto a bus that was far too small for all of us. We drove around the apron and boarded a battered 20-year-old Dash 8-300.

We taxied out, passed a row of incoming intercontinental jetliners, and then turned south. I finally managed to sleep, waking to see the most stunning coral reefs around

the atolls below. A few minutes later, we circled a standalone island that had no lagoon. Descending over the sea, we bumped down on a short concrete runway, the propellers reversed their pitch, and we stopped outside a tiny hut. This was Fuvahmulah Airport.

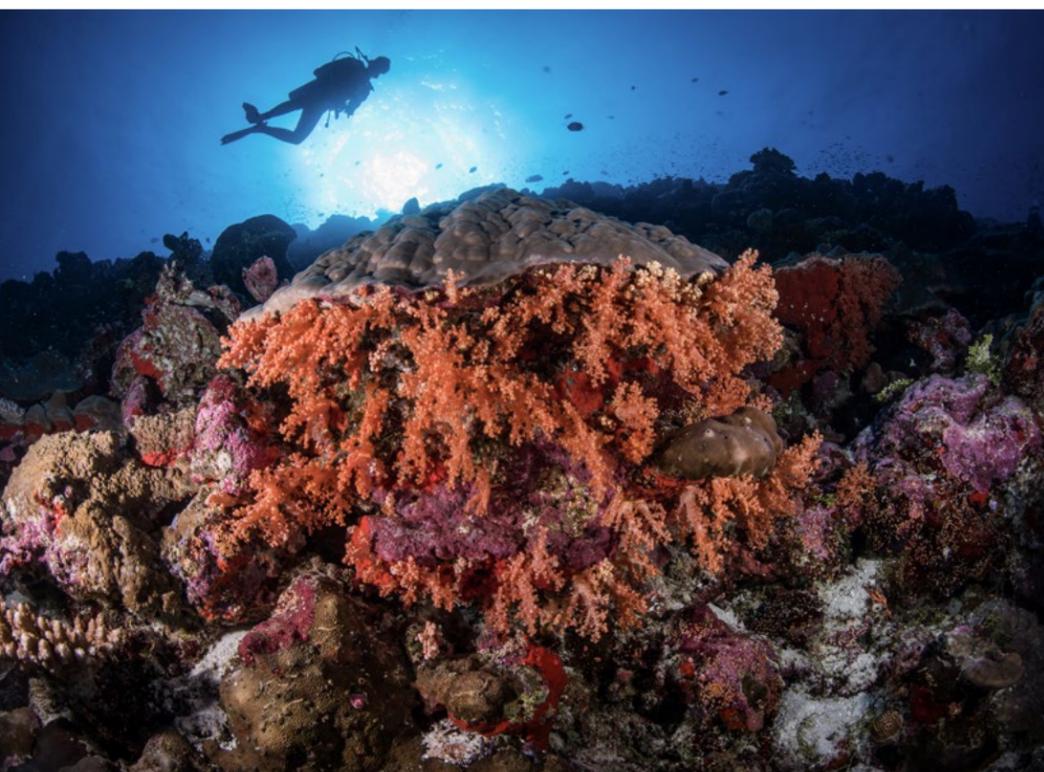
The crew from Dive Point picked us up in their pickup and took us to the dive shop. All we wanted to do was sleep, but they insisted that we unpack and assemble our equipment. We did this, and then they told us our first dive would be in an hour. We protested and were taken to the hotel. We ended up diving a few hours later—just outside the harbour. This would be a baited tiger shark dive.



Royal angelfish shelters under hard corals on reef at Fuvahmulah (left)

Maldives

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School of goldspot seabream with powder blue surgeonfish (left) and diver over soft and hard corals (far left) at Fuvahmulah



Tiger shark at Fuvahmulah Island in the Maldives (above and top left)

Diving at Fuvahmulah

The diving in Fuvahmulah was pleasant enough. With the exception of the shallow tiger shark dives, it revolved around "hunting" to catch sight of other species of sharks. This involved a great deal of blue-water swimming, spending a long time at a depth of 30m to avoid the ripping currents, and in the cases of some dive centres, dropping well below this

legal maximum.

One German diver proudly showed me his computer reading of 50m.

"Did you see anything?" I asked.

"The shark swam away," he replied, in a disappointed manner.

I would say that the tiger sharks were impressive, but the rest of Fuvahmulah's diving felt a bit insipid. The island itself was stunning, with an inland lake and wonderful people and

beaches, but it too lacked the tourist infrastructure needed for groups of divers. Simply getting a meal with hot food or a meal on time was a struggle. The Dive Point staff were extremely professional and had plans to open a guest house on the island to negate all of these issues. I would return to Fuvahmulah, but more for its charm and beauty than for the elusive deep-water shark diving.



Blackwedge butterflyfish shelters under hard corals on reef at Addu Atoll.

Getting to Addu Atoll

A few days later, we boarded a speedboat, which bounded its way out of Fuvahmulah's harbour and set a course southwest. An hour and a half later, we entered the outer sandbanks of Addu Atoll and stopped at a distant jetty. Some passengers got off, but we continued on our way to the main harbour at Feydhoo. This was the main terminus for people arriving on Addu Atoll by sea.

A minibus was waiting to take us to the Equator Village Maldives hotel. This was a comfortable but utterly unpretentious lodge by the sea. It had a quaint colonial feel to it. Our group of friends checked in and met the divers who had flown to Gan Island directly.

The group consisted of British divers from the Arabian Gulf, a

contingent of three Canadians, two Americans and three divers from the United Kingdom. We all knew one another well. As my usual buddy, Francisca, was developing an ear infection and had to stay topside, I dived either with Godwin, the laconic doctor from Toronto, or with Paul, a down-to-earth computer engineer from South East London.

About Addu Atoll

Addu Atoll is a series of slightly larger islands (by Maldivian standards) that lie 620 nautical miles southwest of Colombo, 300 nautical miles south of Malé, and only 200 nautical miles north of the British Indian Ocean Territory. The heart-shaped atoll is made up of three large islands: Hithadhoo, Maradhoo-Feydhoo and Gan. To the east, smaller and thinner

islands make up the right side of the atoll, offering a substantial and protected but deep lagoon. The islands of Addu Atoll lie just below the equator, with Gan Airfield at 0.69°S and 73°E. The southern tip of Gan is also the southernmost point of the entire Maldives.

Addu Atoll was different from the start. The hotel turned out to be the former sergeants' mess of a Royal Air Force station. In the waning years of the British military presence in the Far East, India and Sri Lanka allied themselves with the Russians and Chinese respectively. They started to close doors to the Royal Air Force, and a new refuelling stop between the Middle East and Singapore was needed. The British Government chose the island of Gan. When the RAF left the tiny island in 1976,



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Red Sea BLUE FORCE 2



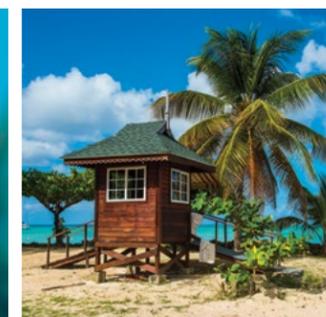
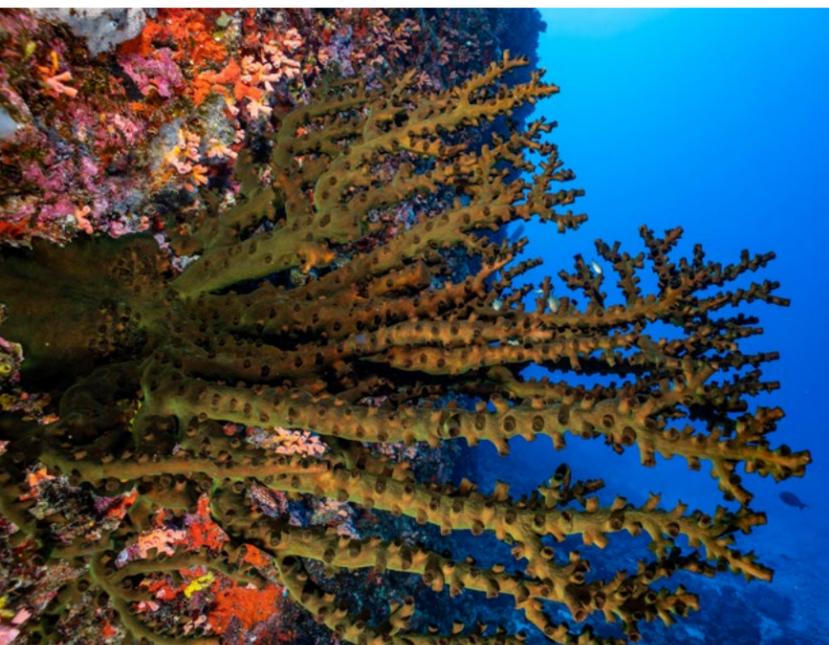
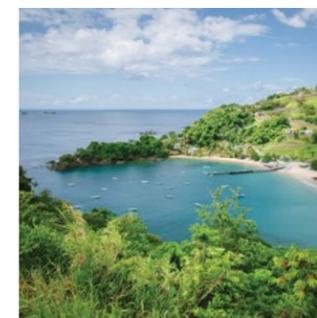
Maldives BLUE FORCE 3

www.blueforcefleet.com





School of yellowback fusilier (left), view from under a big table coral (above) with divers behind it, and black coral with brightly coloured sponges (bottom left) at Addu Atoll; School of oriental sweetlips, snapper and butterflyfish at South Gan Reef (below)



ONE ISLAND, TWO OCEANS, LIMITLESS DIVING POSSIBILITIES

Sitting at the junction of the Atlantic Ocean and the Caribbean Sea, Tobago offers a rich and varied mix of underwater experiences and landscapes. On **Atlantic coastlines**, reefs washed by the nutrient-rich waters of the Guyana Current nurture some of the healthiest and most diverse marine ecosystems in the western hemisphere. Here on the island's northeastern coast, the **Speyside Region** is the place for drift diving adventures. To the south end of the island, the **Crown Point region** faces calm Caribbean shores where divers enjoy relaxing but no less rewarding underwater experiences that include reefs, wrecks and a wealth of marine life. Tobago is also known as one of the best places in the Caribbean for encounters with manta rays.

For more information on Hotel Stay & Dive Packages in Tobago, contact Caradonna Adventures to get in touch with one of our experienced Dive Travel Specialists.

they handed over the only other concrete runway in the Maldives and a first-class working airport. As Gan was a commercial island and had no villages within its boundaries, the hotel was allowed to serve alcohol.

Diving

The next morning, we tipped out of the minibus at Aquaventure

Dive Centre. We quickly sorted our equipment and boarded our dive centre owner and master instructor Marc Kouwenberg's *dhoni* (traditional wooden boat). Sailing out of the breakwater, we headed north to the nearest channel. The captain held the *dhoni* over the edge of the reef, and we clambered into our gear.

We entered the water with a giant stride and headed down to around 25m. Here, Marc started patrolling in a box-shape in the blue water. When he was satisfied, we dropped down and swam into one of the sides of the channel.

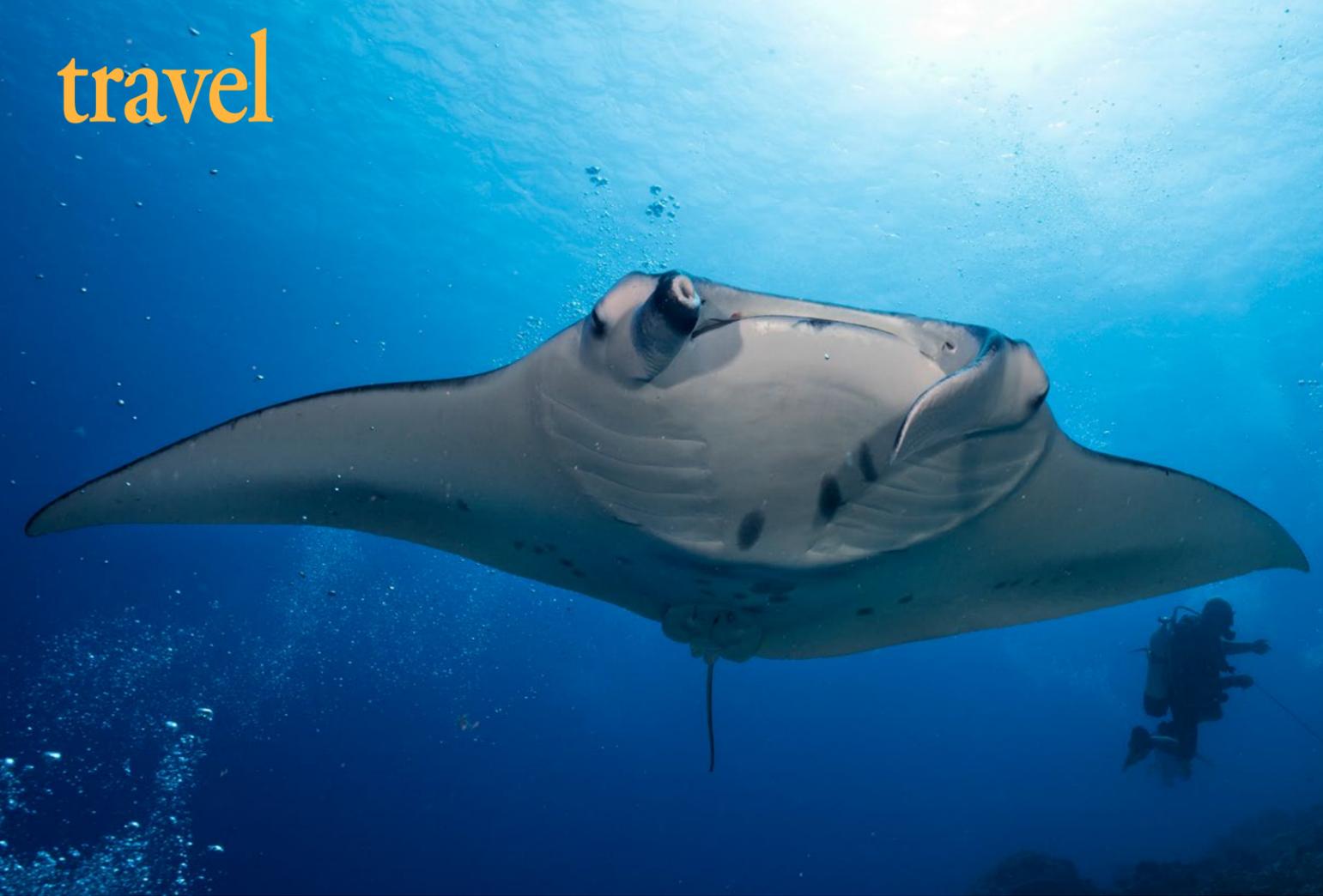
The visibility was 50m, and we could clearly see the school of sharks swirling around the far

wall. We advanced on them gently until they were all around us. Then, after a few minutes, they disappeared—so we continued along the channel into the lagoon.

The current picked us up and spat us into a sandy patch. Marc signalled us to "hook on," and we arrested our headlong flight into the enormous lagoon.



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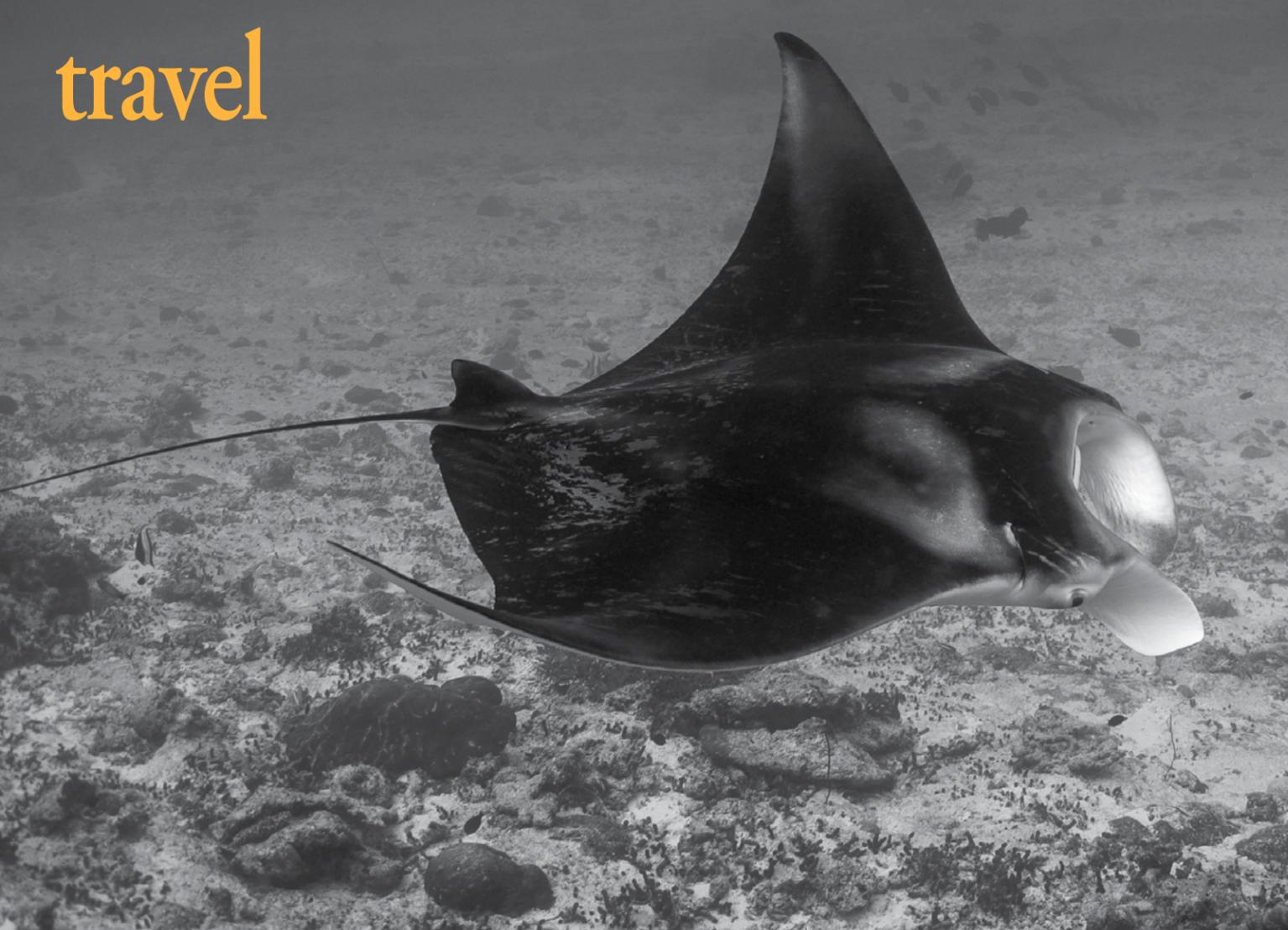
THIS PAGE: Giant manta rays gather at a cleaning station at Addu Atoll.

Within a minute, a giant manta ray appeared and hovered over a large patch of coral. A fish came out and started cleaning the gills of the manta. Within a few minutes, there were seven manta rays taking turns in being cleaned. Our bottom time ran out and it was time to ascend.

Our next dive was along a stunning coral reef that started at 10 metres and sloped gently down to 35 metres. We swam along midreef and took photos of schools of oriental grunts.

The next few days of diving were a combination of channel experiences with sharks and ultra-steep walls in the northwest. The dives could be long, slow and relaxed, or sometimes deeper and more exciting. What made every dive so special was that we had no idea what we would see. We





Chevron manta ray (top left) at Addu Atoll; Bluefin trevally and sponges on wall at Gan (top right)



Hawksbill sea turtle at Addu Atoll

could be on a wall and then a 300lb tuna and its two mates would swim by lazily. On every safety stop, we had something special come by—be it a barracuda, turtles or eagle rays swimming past us.

“I don’t believe this place,” said Paul. “It’s like nowhere else on earth... You think the dive is over, but you still have to keep your eyes open to see what else is coming!”

Topside excursions

Between dives, we explored Addu. It felt as though we had stepped back in time, to an uncomplicated world, and perhaps a real view of the Maldives. The streets of Addu were spotless with its people polite and kind. When we went for a walk, we walked on streets of crushed coral. The people were welcoming and, as they were used to the occasional tourist, they had opened coffee

shops, cafés and restaurants. Service was swift and the food excellent.

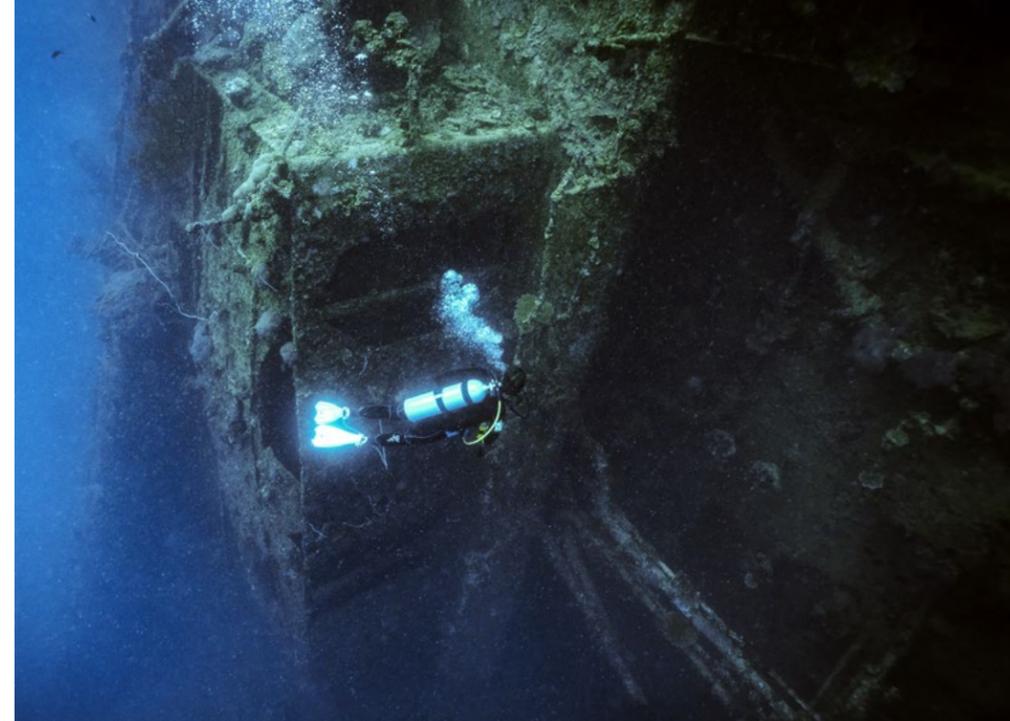
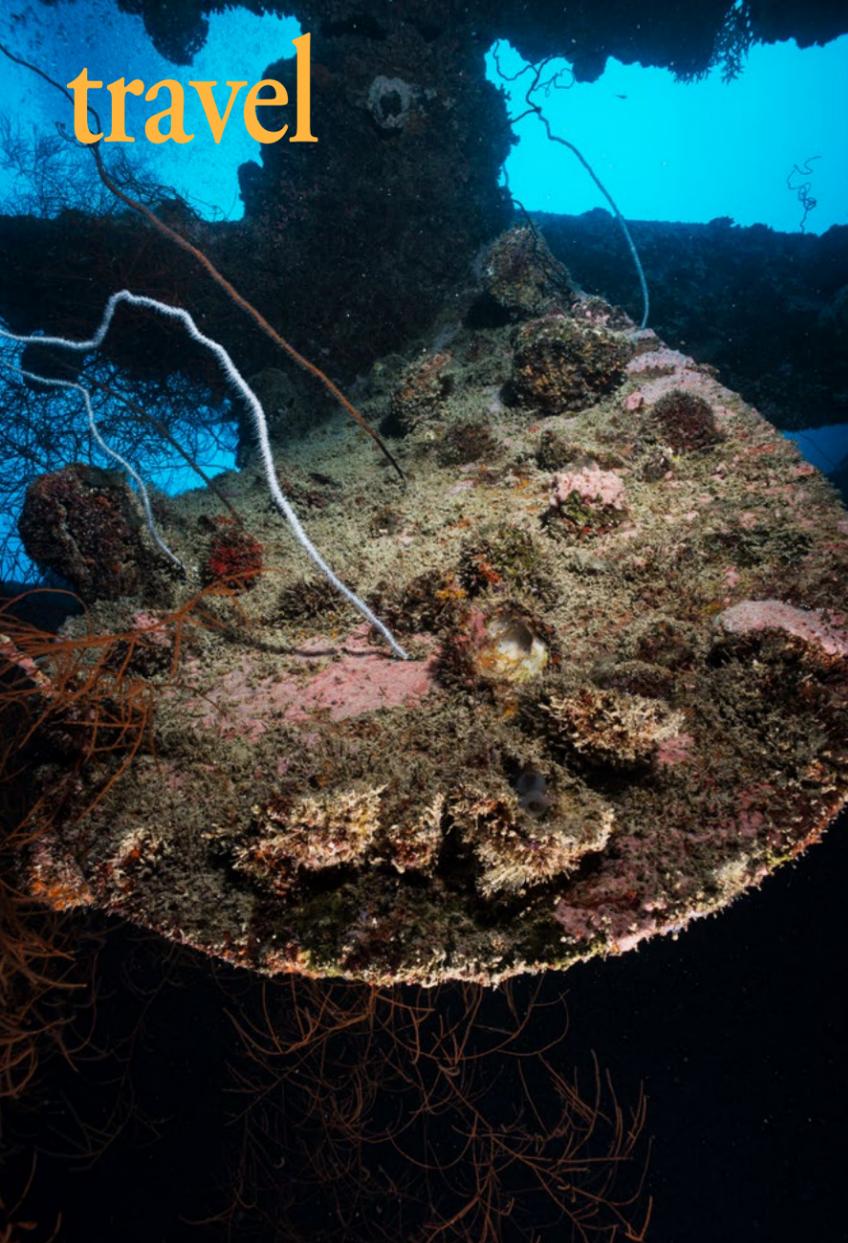
We strolled through the narrow backstreets in-between palm fronds and small cultivated gardens. If we took a wrong turn, we popped out onto even smaller dreamy lagoons, tiny clean beaches and fishing boats. On the eastern coast of Maradhoo and Feydhoo, there were impressive but small harbours. Cargo carrying landing craft and fishing vessels were tied up at the jetty. Now and again, one would trundle out of the breakwater to go about its business.

Uncluttered with concrete and with a truly relaxed atmosphere, Addu was quietly so much more efficient than Fuvahmulah. To me, the culture was reminiscent of the Arabian Gulf combined with a South Pacific Island.



Giant manta ray at cleaning station in Addu Atoll





Diver explores the wreck of the MT *British Loyalty* (left); Diver inspects rudder of the wreck (right); Divers on the superstructure of *British Loyalty* (bottom right); School of bluestripe snapper shelter on the wreck (below); Marine growth on a propeller blade of the *British Loyalty* (far left)

out into the lagoon and rather ignominiously sunk by the Royal Navy.

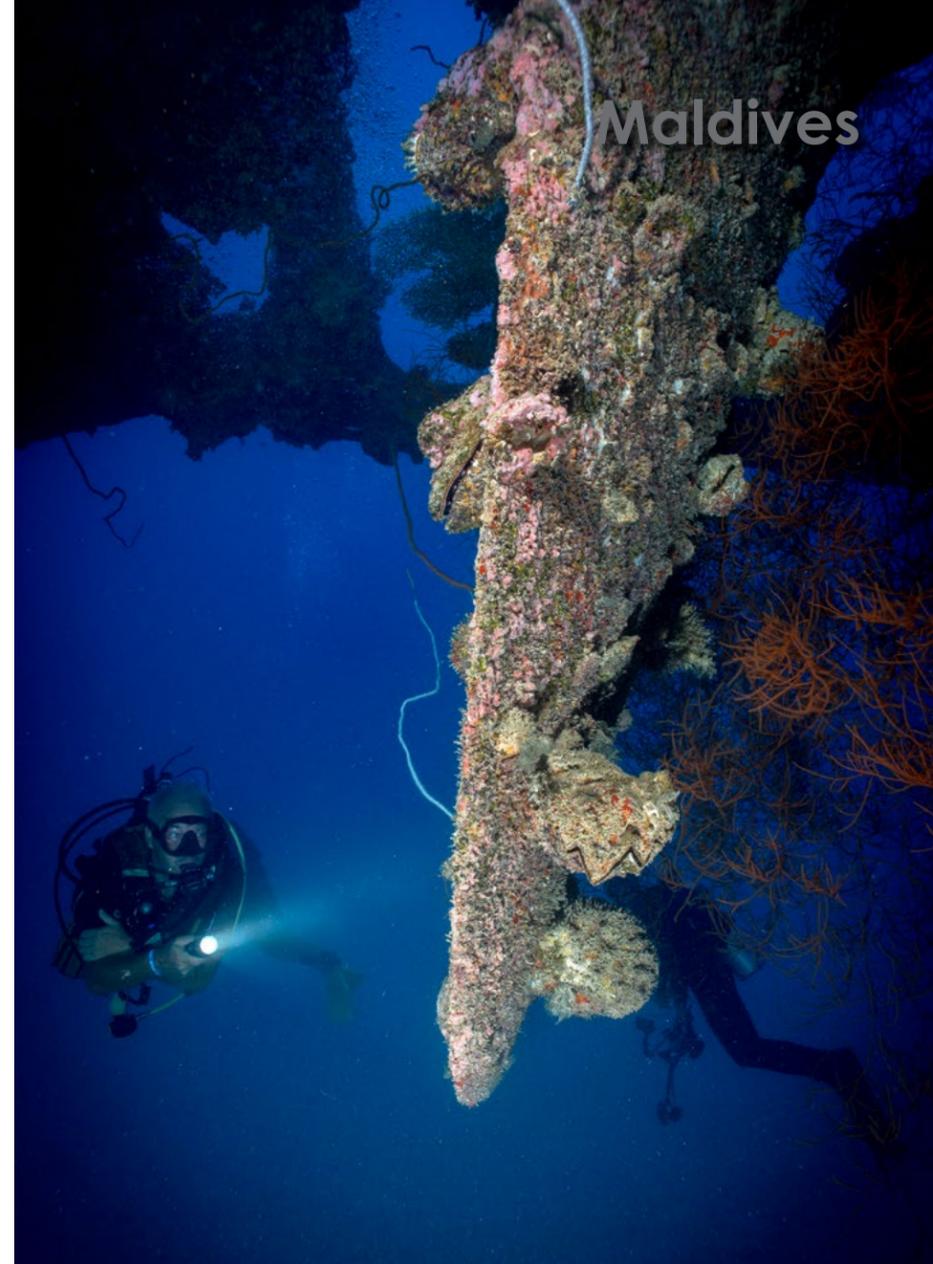
At 140m long and lying on its side, in 32m of water, with its hull a mere 14m from the surface, the *British Loyalty* is a magnificent dive. The hull has become a giant coral reef covered in hard corals and inhabited by schools of fish.

We descended slowly on its midships before making our way to the stern. Visibility here was around 10 to 15m. We

finned along the lines of oil pipes, setting the depth that we were comfortable with, and taking care to avoid becoming snagged on anything.

The engine room had been completely blown open, and we all swam into the cavernous area. A huge Sulzer engine was covered in something. Paul and I swam deeper into the wreck and switched our lights to full power. There was a degree of rust particulate coming down on us, dislodged by our bubbles, but we could clearly see hundreds of yellow snapper swarming all over the engine.

We moved slowly around the room, with our lights illuminating the bent pipes, companionways and gauges. We had to descend to exit out of the great hole and



MT *British Loyalty*

Perhaps the most intriguing of the dive sites around Addu was the motor tanker *MT British Loyalty*. It had been sunk by a Japanese mini submarine in Diego Suarez in Madagascar. The Royal Navy had stubbornly refloated it and pressed it back into service. In Addu, it remained the fuel depot for the Royal Navy Air station.

One night, a German U-boat found a way to fire torpedoes into the lagoon around the submarine nets. *British Loyalty* was hit and started to sink. The crew, assisted by the Royal Navy, managed to pump the water out of the vessel and keep it afloat. It served until the end of the war in Addu. Then, in 1946, surplus to requirements, *British Loyalty* was towed



Colony of hard corals at South Gan Reef (above); Hawksbill sea turtle (left)

and down the length of the vessel before surfacing.

Bodu Hola Wall
Francisca and I managed another dive

turned towards the stern. Here, at around 28m, we found the huge propellor sitting sedately in front of the rudder. I looked down and saw a small debris field.

Then, with our bottom time running low, we made our way towards the top of the hull. At this point, at the “bottom” of the hull, it felt as if we were on a large coral wall, not a wreck. We did a safety stop at 6m, staring up

on Bodu Hola Wall. We meandered along at 25m and nipped into a cave overhang to have a look. As we ascended, the usual massive kingfish came by and swam lazily off. Then, three huge tuna visited us. We started ascending to find ourselves amongst a dozen large sea turtles. We sat in the blue and watched them from a distance. As we surfaced, we told Marc

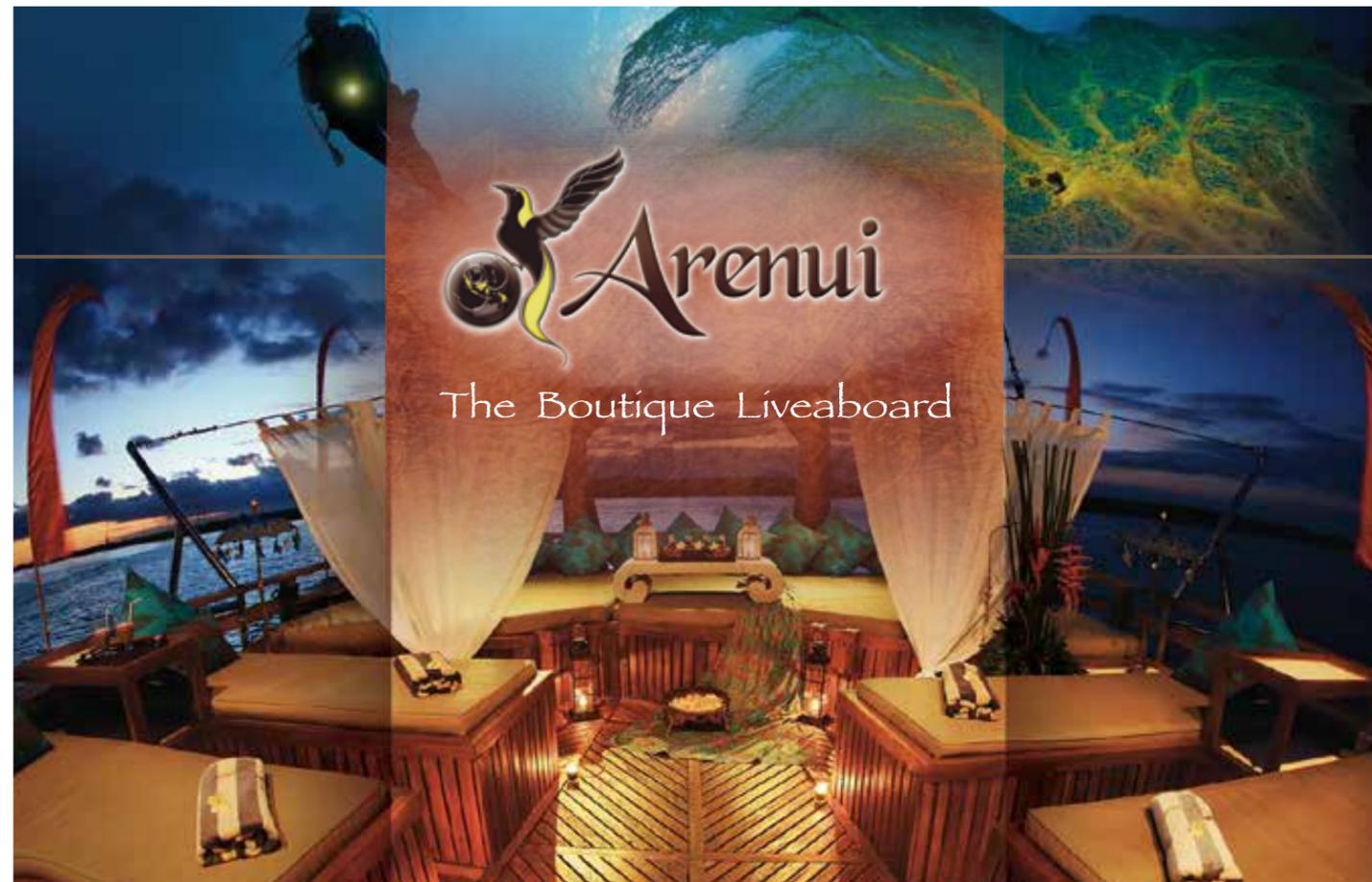
what we saw. “Oh, so you found Turtle Point,” he said, chuckling. “Sometimes, the current allows you to do that. It’s great, isn’t it?”

Soon enough, it was our last evening after our last dive. We sat around drinking coffee and eating cake provided by the Equator Village hotel and recounted our experiences.

“This is one of the world’s final frontiers of scuba diving,” I said. “It is not Papua New Guinea, but it has less dive boats, and it is literally boiling with fish.”

“I’ve never seen anything like it,” said Paul, in agreement.

“And thankfully, it should not get too crowded; there is only a couple of 40-seat planes a day and Air Lanka on the weekend,” I muttered.



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Anthias and damselfish on staghorn coral (above) and leather coral and sponges on reef (top right) at Gan

and if you dive on the edge, you can see the best here in Addu." His broad Dutch accent had a softness to it. He was not talking about the best of Addu, but the very best of diving—for he had found it here. He smiled and looked at me and said, "I love diving on the edge."

Departing thoughts

The next morning, a 16-year-old Sri Lankan Airbus squeaked down on the concrete runway at Gan. This weekly flight brought a few more divers to Gan. Five of our party walked across the tarmac. I stared around at the almost deserted airfield. I wondered what the last RAF servicemen thought when they boarded their VC10 back to the Persian Gulf in 1973.

Inside the cabin, we were greeted by perhaps the tattiest, most uncom-

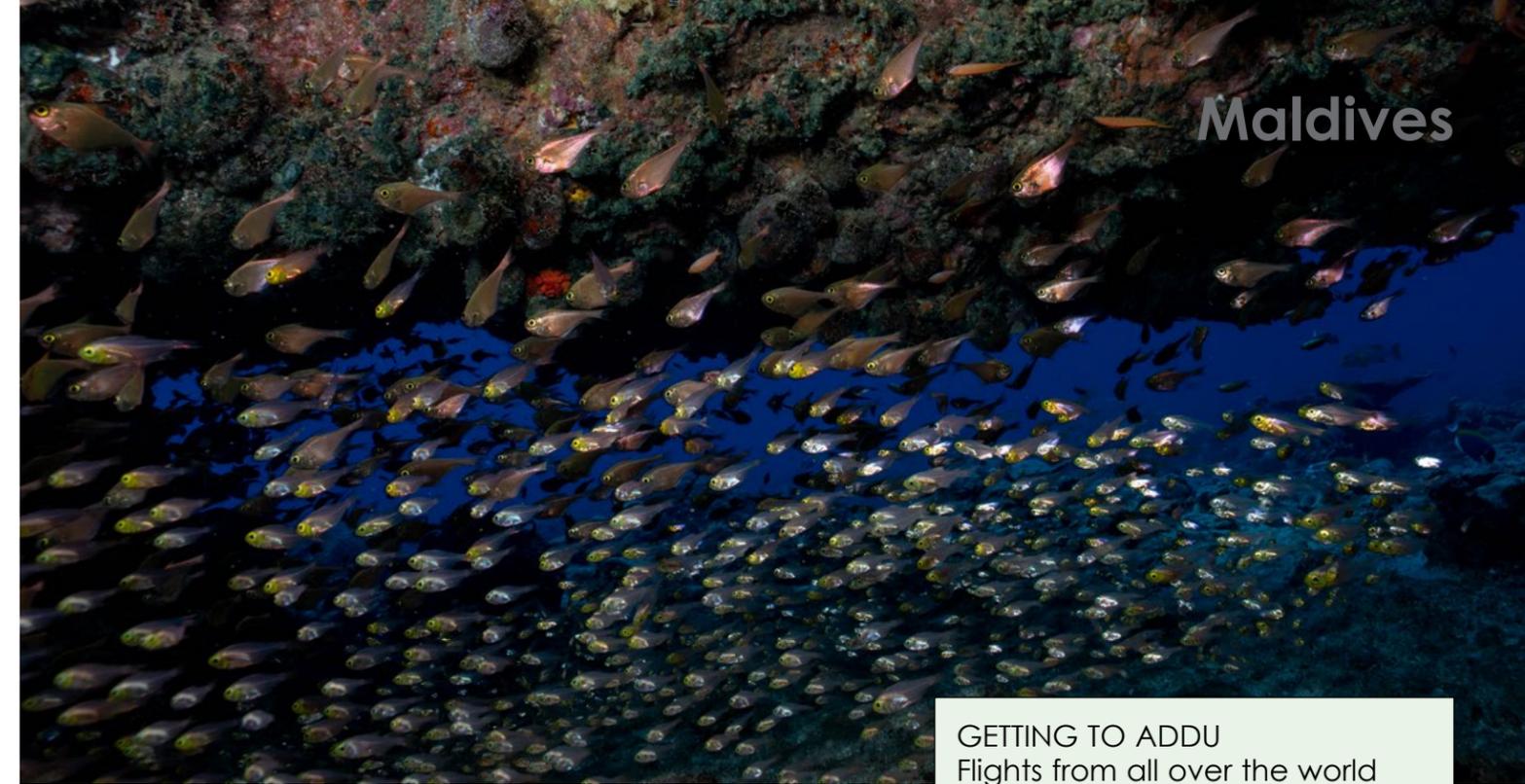


Oriental sweetlips and masked butterflyfish (above); Emperor angelfish and anthias (left)

What made Addu so unique were the positions of its channels. Oriented north-south, they created unpredictable currents, and this brought in the pelagics. Addu also had the best manta cleaning station I had ever seen, and was blessed with calm reefs, macro dives, very steep walls and 50m visibility outside the reef.

That evening, Marc and his partner, Jiji, joined us for dinner. Later in the night, he sat next to me, and leant over. "I love diving, and for me, this is it," he said. His passion for diving was clearly palpable. He sipped his rum and Coke, and stared out into the darkness. "I want to show everyone the very best,





GETTING TO ADDU
 Flights from all over the world land at Malé International Airport. Gan is a short 90-minute hop from Malé in a Dash 8 Propjet. Once a week, Air Lanka flies down from Colombo. Fly Dubai are talking of linking Dubai with Gan in a once-a-week flight.

BOOKING & LODGING: GAN
 The African and Oriental Travel Company has special rates with the Equator Village hotel, with guest houses in town, and with Aquaventure. Combined, these make for a stunning holiday. See: orientafricatravel.com. If you would like to talk to Marc directly, he is always available at: aquaventure-maldives.com.



portable aircraft that I have ever seen. The seat covers hung off, plastic panelling was hanging on by a thread, and worst of all, the seat in front was so close that it dug into my knees. But the airbus worked. We thundered down the runway, took off in an easterly direction, and banked over the eastern walls of Viligili. I looked back at Gan and

saw the runway dominating the island, the palm trees and the reefs. That view stayed with me for 105 minutes until we descended into cloud and crossed the Negombo Lagoon to land at Colombo, Sri Lanka. It was ironic that the closure of RAF Negombo created the Air Station in Gan. We had crossed 620 nautical miles over the Indian

Ocean, from one point in history to another. ■
Expedition leader and underwater photographer Farhat "Raf" Jah runs the African & Oriental Travel company in the United Kingdom, with his wife, Francisca, who is a marine anthropologist. Learn more at: orientafricatravel.com

Lounging by the pool at the dive resort on Gan Island (above); Yellowback anthias at Mark's Reef (top left); Sweepers in cavern at South Gan Reef (top right); Raccoon and masked butterflyfish, snapper and oriental sweetlips at Gan (centre)

Orchid Island

Dive into Taiwan, Part 5

Text and land photos by Simon Pridmore
Underwater photos by Kyo Liu & Willy Hsieh





KYO LIU

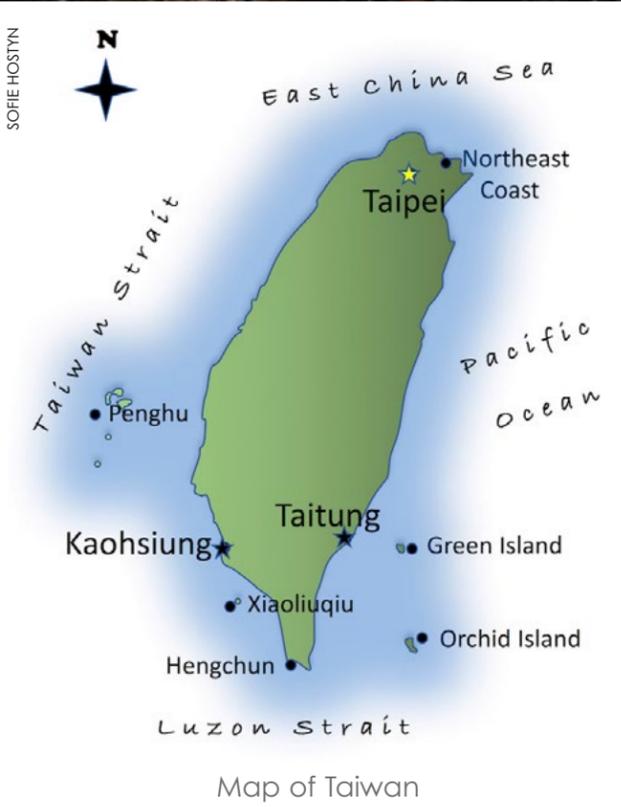


SIMON PRIDMORE

Pinnacle top at Lady Rock (left); Lush green Orchid Island topside scenery (above); Simon Pridmore and wife Sofie en route to the Badai Bay Wreck (right); Terrace of sea fans on Warship (previous page)



WILLY HSIEH



SOFIE HOSTYN

Known only to few divers, a hidden treasure in Taiwan is Orchid Island, a remote and rugged outpost of volcanic origins located far from the tourist crowd, offering sublime diving for the curious adventurer who is not afraid to go off the beaten path. Simon Pridmore has the story.

Taiwan is a group of Pacific islands surrounded by warm tropical seas. It is easy to get to and get around and it is a first-world society with outgoing, friendly, laid-back people. Taiwan has some very good scuba diving and a network of dive centres and resorts with first-class professional staff, equipment and services. They offer scuba experiences, basic training courses and fun

diving for a young, enthusiastic first generation of Taiwanese divers. Yet, when divers elsewhere in the world think about diving destinations, Taiwan is unlikely even to be a blip on their radar screen. Very few people outside Taiwan have ever thought to enquire about the diving there, and very few people inside Taiwan have ever thought to tell anyone about it. Until a couple of years ago, that is, when some far-sighted folks asked me and Taiwanese underwater photographer Kyo Liu to write a book. The book is called *Dive into Taiwan*, and this is the fifth in a series of six articles, each covering one of Taiwan's diving regions, designed to give you a flavour of what to expect from a Taiwan dive trip. The book covers much more than diving. It talks about the people, culture, countryside, cit-

ies, food and lifestyle to give readers a fully immersive experience—diving into Taiwan in every way. But in this series, I will just focus on the underwater attractions, with the help of Kyo's amazing photographs. **The island** Orchid Island or Lanyu is the jagged, battered remnant of a long-extinct volcano and the sole homeland of the Tao people. It is a wild place: a land of coastal volcanic plains, tall, windswept, emerald-green cliffs, and an almost impassable highland interior. Ancient lava flows slope down towards the ocean, where they

merge with fringing coral reefs to create the topography that so fascinates visiting divers. The scenery is reminiscent of other geologically turbulent, edge-of-the-world places like Iceland. But this is indubitably a Pacific Island, and the Tao are Pacific islanders. The men fish and build houses and boats, while the women plant taro and weave, just as they do throughout Micronesia and beyond. Like many island peoples, they have developed a unique, fascinating cul-



Rugged, wild and beautiful Orchid Island (left); Traditional Tao village with "underground" houses (above); Traditional Tao flying fish canoes (right)



Map of Orchid Island in Taiwan

ture based on the world around them. The surrounding seas are the hub of the Tao universe and the most important creatures in the ocean and the focus of the Tao religion are flying fish.

Orchid Island is a far-flung frontier even for the Taiwanese, and it sees far fewer divers than Taiwan's other scuba hotspots, with the exception of South Penghu. There are two main reasons for this. First, the diving infrastructure here is less well-developed than on Green Island (60km to the north). Second, the island's remoteness makes coming here for a diving weekend more difficult and expensive than easily accessible options like Hengchun and the Northeast Coast.

Few divers outside Taiwan know of Orchid Island and many of those that have dived here over the

years just discovered it by chance. They came to the island to see the Tao culture and decided to add a little diving to their holiday activity mix when they saw how clear and blue the ocean was.

Key dive sites

The best dives on Orchid Island are the Badai Bay Wreck and Airport Perimeter Reef, two sites close to each other off the southwestern coast. Boats to these sites usually leave from Longmen Port in the south. The ride takes you past jagged black lava walls where goats pose perilously poised, peering down at the surf below. Behind, the green mountains rise through drifting wisps of morning mist.

Badai Bay Wreck. The wreck, named after the bay where it

now lies in three pieces at 40m, was a Korean freighter that broke up and sank in bad weather in 1983. It is now completely covered in corals, including some large sea fans, and is home to many fish. A fixed line runs from surface buoys to the stern, the largest and most entertaining

section of the wreck. It sits at an acute angle to the seabed and its tall loading mast is the wreck's shallowest point at 20m.

The visibility is usually good enough here to allow you to see the entire wreck laid out below as soon as you begin your descent. There is often a current running,

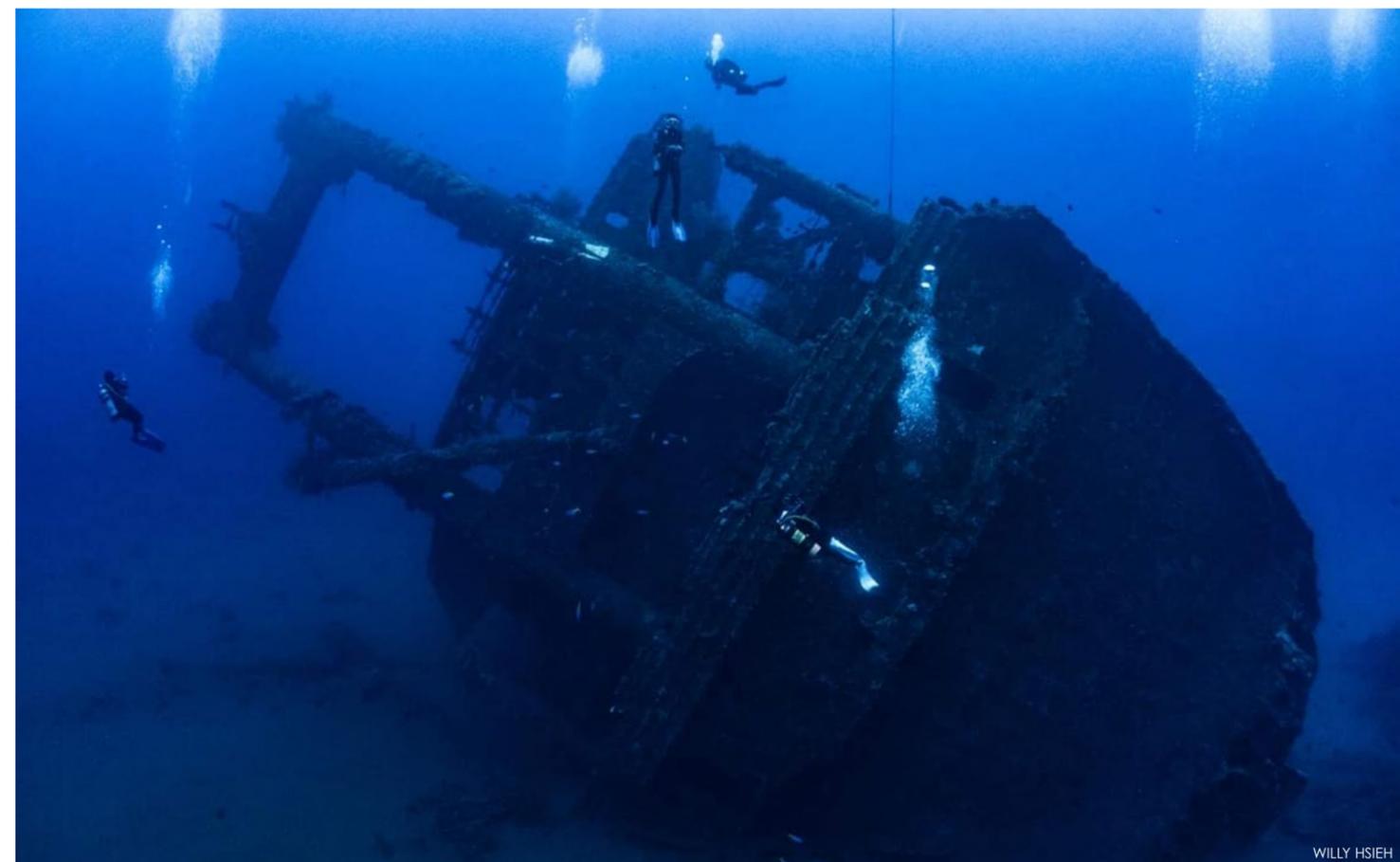
SIMON FRIDMORE

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Colorful corals and anthias on the wreck (top left); Inside Badai Bay wreck (top right); Badai Bay Wreck (right)

so be prepared to use the fixed line to get up and down. The stern and its superstructure are quite open and there are some easy swim-throughs that take you inside the ship, among the swarming glassfish and groups of larger inhabitants that lurk in the semi-darkness, such as yellow goatfish, yellow snapper, batfish and squirrelfish. There are some big yellow sweetlips and spotted sweetlips skulking in there too.

The other two sections of the wreck are the main freight deck and the bow section. The deck is flat on the seabed and there is not much there, except a little

turtle that lives underneath it. The bow section sticks straight up from the sand and there are a few fish hanging around, but nothing like the population that lives on and inside the stern. The view from the bow of the entire vessel laid out before you is quite spectacular though.

Airport Perimeter Reef. Not far away, at the northern end of Badai Bay, is Airport Perimeter Reef. Expect stunning visibility here too. The entry point is the pinnacle that breaks the surface just offshore from the airport runway. This is an especially fishy site with

plenty of fusiliers, surgeonfish and barracuda in particular. When the current is running here, as it often does, the water movement encourages the schools of fish to assemble in tighter groups, which is perfect for photographers looking for wide-angle shots.

Large, perfectly formed gorgonian sea fans of various hues and carpets of luxuriant yellow soft corals adorn the tumble of underwater pinnacles and bommies. The fusiliers zip around your head as you peek down into fan-filled crevices, red soldierfish dip in and out of cracks in the rocks and there are angelfish

The descent at Airport Perimeter (left);
Sea snake on sandy bottom (below);
Diver at lava cave (bottom right)



all over the place, adding even more colour to the scene. On the seabed at around 30m are several copses of tall, pale sea whips, giving the site an otherworldly look. Look out also for pufferfish, porcupinefish and several different types of sweetlips. It is a fine dive and, together with the Badai Bay shipwreck, gives divers a two-tank dive to rival anything found in far more celebrated diving destinations elsewhere.

Warship. For some of the best diving in the north, take a boat out of Dongqing Port and head for the northeastern corner of the island, where massive chunks of lava jut

up from the ocean. One of these rocks is called Warship, apparently because, during World War Two, the row of jagged pinnacles and spires looked enough like a large boat from the air for American aircraft hunting for Japanese ships to drop bombs on it.

As you leave Dongqing, massive central cliffs loom over the coastal plain of lava behind you. Ahead lies the vast Pacific. The topside topography of the Warship rocks is repeated underwater, with a pattern of pinnacles and spires. You descend and swim out to sea and back again, making the transition from peak to peak, the excellent visibility allowing you always

to perceive the next mountain in the series from the previous one. Each one is initially just a vague shape in the distance but, as you approach, it looms into clearer view, the definition improves and then, suddenly you are upon it. The experience is just as dramatic as it sounds.

The best way to dive the site is to go deep as you head out along the line of pinnacles, staying close to the sand and exploring canyons and smaller bommies on the seabed along the way. You should not dawdle on the way, as your aim is to reach the highlight of the Warship dive before you run out of no-decom-

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pression time. This highlight is a mass of fabulous sea fans, yellow to the naked eye but orange in the glare of a video light, which have grown in profusion in a narrow crevice between two bommies at a depth of around 30 to 36m. The sand here is at 40m, which is where you need to be to get the shot from below the fans growing in terraces up the side of the cliff.

At this point, your guide will usually turn the dive and take you back the way you came but via the “mountain tops” this time. This will involve you

making jumps through blue water between the pretty reefs that have colonised the sections of pinnacle that receive the most sunlight. On a blue-sky day, from mid-morning onwards, these coral gardens will be glowing with clouds of small reef fish milling about and sparkling and shimmering in the sun.

Lady Rock. At Lady Rock on the northwestern coast, there is another “mountain hopping” dive, similar to Warship, but shallower. This is a shore dive at the end of a short path that leads down from the road. Underwater, the series of pinnacles heading out to sea is riddled with a maze of canyons. One of the highlights of the dive comes early, with a long sea cave full of copper sweepers swarming around in the near-total

darkness. You will need a dive light to get the most out of this site, even in the daytime.

At depth, inside the canyons, sea snakes are abundant, and they are the major attraction. The final pinnacle in the line-up bottoms out at 30m and this is usually where you will turn the dive. As at Warship, the best way to go back is to swim slowly up to the top of this last mini-mountain and then “island hop” your way back across the others, stopping at each to watch the wonderful collection of marine animals that has assembled at the top of each pinnacle. This is where most of the life is: anemones, schooling reef fish, hawkfish poised on coral stands and cleaner wrasse working hard to service a never-ending queue of customers. With the excellent visibility, if you look down as

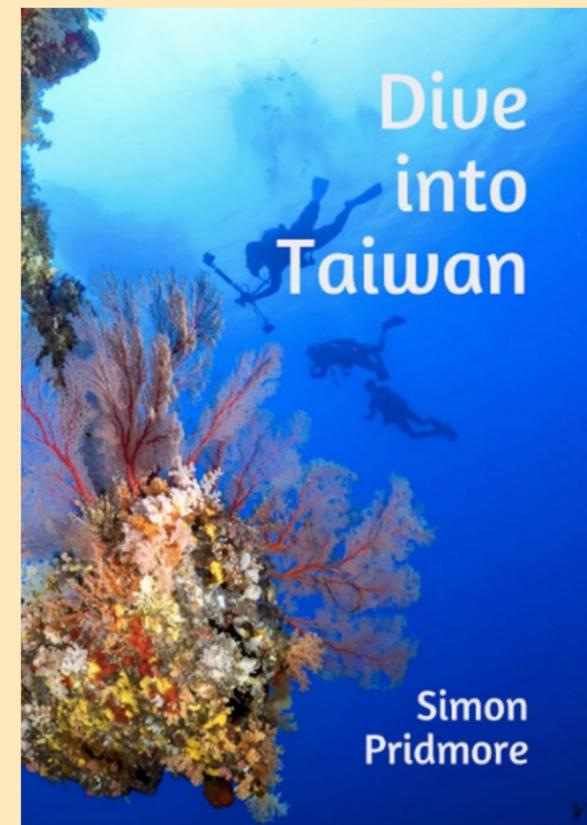
Dive into Taiwan by Simon Pridmore

“In this book, Simon Pridmore takes the reader beyond the beaches and into the waters of six regions of excellent and exciting diving and snorkelling that the Taiwanese have enjoyed for some time—while the rest of the world has not had much of a clue. The beauty of this book is that the author intends it to be an immersive experience in more ways than one. He really wants you to dive not only into the waters, but the people, the food, the lifestyle... the entire Taiwan experience.”

— Lonely Planet author Tim Rock

“This is the first comprehensive guide to scuba diving in Taiwan ever published, and it has the feel of an instant classic. Huge praise goes to photographer Kyo Liu. Almost all the underwater photos are his, and they’re invariably superb.”

— Taipei Times



Dive into Taiwan is available via Amazon, Apple, Kobo and other online bookshops worldwide.

Sea snake on coral reef (left) and swimming in blue water (lower left inset)

you pass from peak to peak, you will see the sand far below and feel like you are flying.

Dive operators

Blue Ocean House (BOH) Resort in Hongtuo village began life as a guesthouse 20 years ago. In those days, owner Chan Ge would take people diving as a freelance operator but, 10 years ago, he opened a well-equipped, full-service dive centre and expanded the accommodation. Find them online at boh.com.tw and facebook.com/LANYUBOH.

Harry Lin worked in diving in Palau for 15 years before coming to Orchid Island and runs Tec Only in Langdao on the northern coast. Contact Harry on +886-921345376. He works with Langdao guesthouses MingMing and Among. ■

Simon Pridmore is the author of the international bestsellers Scuba Fundamental: Start Diving the Right Way, Scuba Confidential: An Insider's Guide to Becoming a Better Diver, Scuba Exceptional: Become the Best Diver You Can Be, and Scuba Professional: Insights into Sport Diver Training & Operations, which are now available in a compendium. He is also the co-author of the Diving & Snorkeling Guide to Bali and the Diving & Snorkeling Guide to Raja Ampat & Northeast Indonesia. His recent published books include The Diver Who Fell From The Sky, Dive into Taiwan, Scuba Physiological: Think You Know All About Scuba Medicine? Think Again! and the Dining with Divers series of cookbooks. For more information, please see his website at: SimonPridmore.com.



A diver is seen from behind, swimming through a narrow, dimly lit underwater cave. The diver's headlamp illuminates the rocky walls and ceiling, creating a dramatic play of light and shadow. The water is dark, and the overall atmosphere is mysterious and adventurous.

Contributors' Picks

Epic

UW Photography

Text and photos by John A. Ares, Rico Besserlich, Sheryl Checkman, Larry Cohen, Anita George-Ares, Kate Jonker, Matthew Meier, Brandi Mueller, Gary Rose and Olga Torrey

We asked our contributors what their favorite epic underwater images were and they returned with a diverse selection of photos capturing epic adventures and interactions with marine life in the underwater world. Here, *X-Ray Mag* contributors share their favorite images from the tropical waters of French Polynesia, Pulau, the Philippines, Indonesia, Malaysia, the Maldives, the Egyptian Red Sea, Mozambique, Bonaire, Dominican Republic, Turks and Caicos Islands, the Bahamas, Cayman Islands, Costa Rica, Mexico and Hawaii, to the temperate waters of South Africa and the US East Coast.



Photo 1. (left) A pod of dolphins trying to outswim orcas. South Africa. Gear: Nikon D90 camera, Nikon 24mm lens, Ikelite housing, dual Ikelite DS161 strobes. Exposure: ISO 500, f/9, 1/640s

Photo 4. (right) A cave diver uses a DPV to explore the dream-like scene inside a cave. Mexico. Gear: Nikon Z 7II camera, Nikon 14-30mm lens, Ikelite housing, Kraken lights. Exposure: ISO 2500, f/6.3, 1/30s

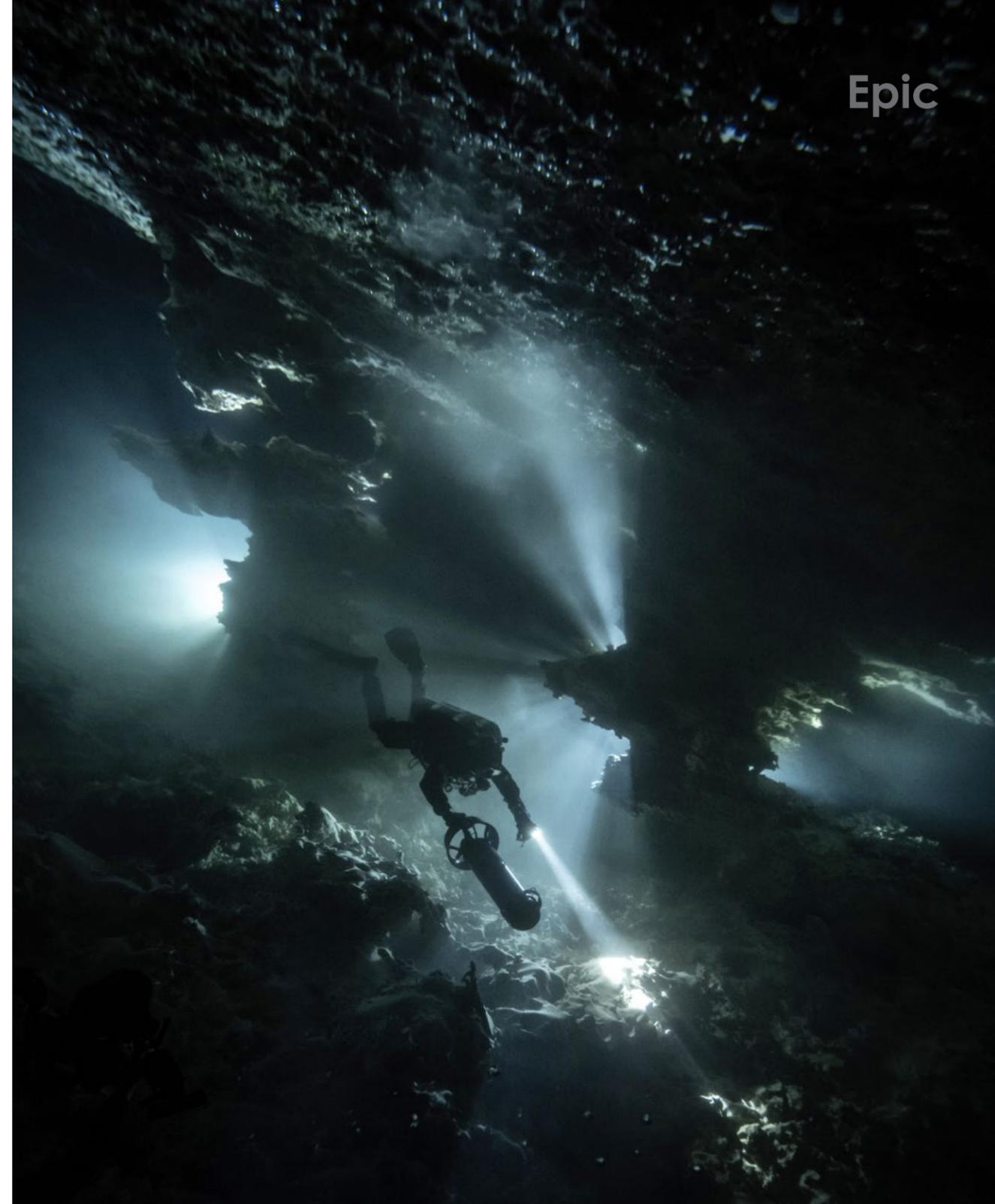


Photo 2. (right) Snorkeler with an orca. South Africa. Nikon D90 camera, Tokina 10-17mm fisheye lens, Ikelite housing, dual Ikelite DS161 strobes. Exposure: ISO 400, f/9, 1/125s



Photo 3. (previous page) A cave diver swims through a tunnel with smoothed walls on all sides. Mexico. Gear: Nikon Z 7II camera, Ikelite housing, Kraken lights. Exposure: ISO 2500, f/7.1, 1/60s

Unexpected Experiences

Text and photos by Brandi Mueller

When I think about epic shots, my mind immediately starts searching my memory bank for impressive and often unexpected underwater experi-

ences or images that came from a unique environment.

One of my favorite moments in the ocean took place on a trip to South Africa where I was in a skiff of divers, following a massive pod of dolphins, which turned out to be pursued by killer whales (Photo 1). We

watched seven orcas isolate one of the slower-swimming dolphins and play with it before eating it. After that, we jumped in the water for a quick snorkel with the orcas and could hear their loud echolocation as they scanned us with sound (Photo 2).

I also think about images taken in

the most epic underwater environment I have ever been in: caves. These shots (Photo 3 and 4) required dives without a camera to find a spot to shoot; followed by above-water drawings and discussions with a team of divers willing to spend an entire dive in an attempt to make

one image; and then carrying a lot of lights and other equipment into the cave to light the scene. Not to mention, it also required amazing models who were willing to hover for over an hour to get the shot. I have some pretty “epic” dive buddies. Visit: brandiunderwater.com



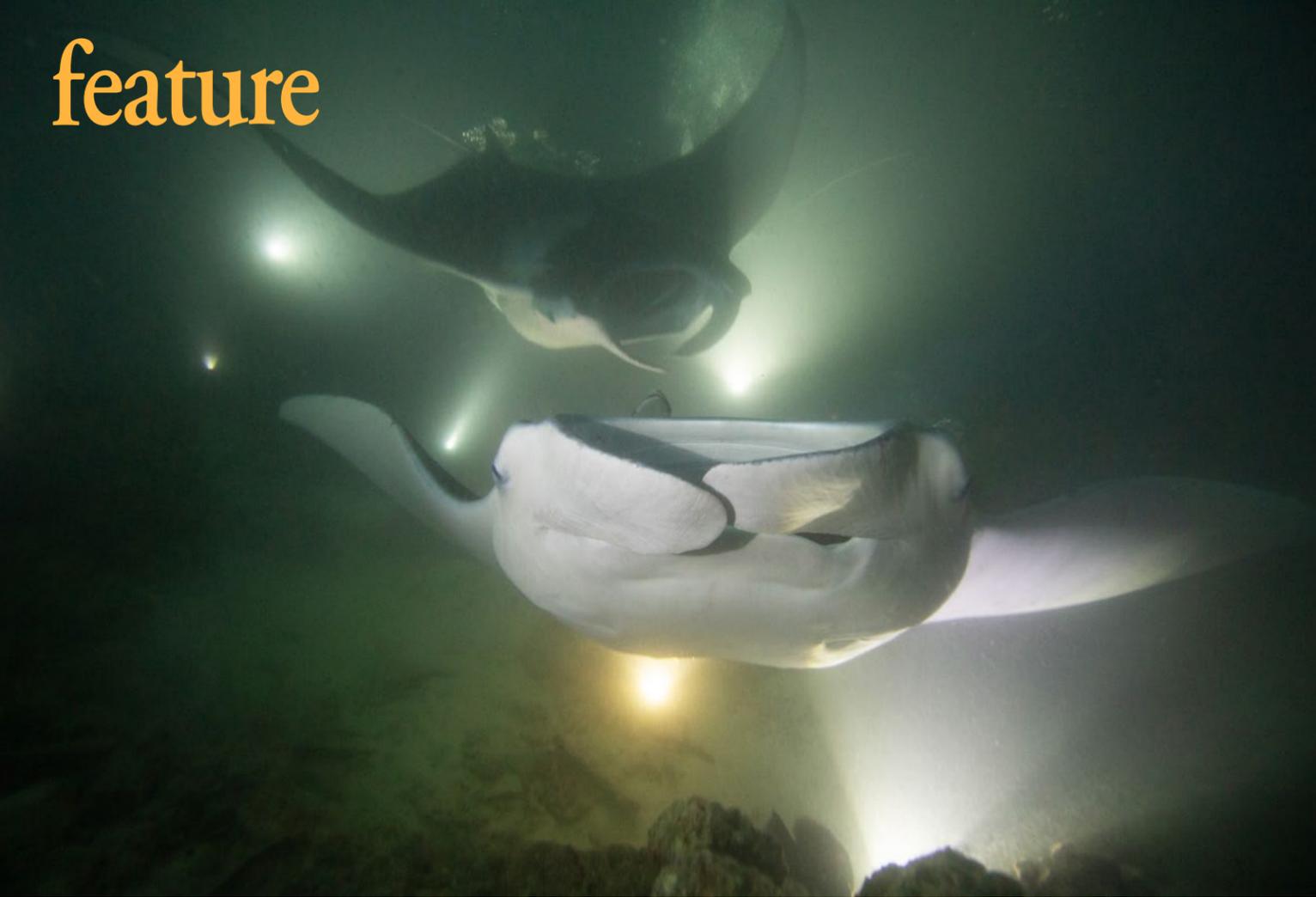


Photo 1. (top left) Manta rays at night, Maldives. Gear: Canon Rebel SL1 camera, Canon EF-S 10-18mm f/4.5-5.6 IS STM lens at 10mm, Ikelite housing, twin Ikelite DS161 strobes. Exposure: ISO 1600, f/4.5, 1/60s; Photo 3. (top right) Humpback whales with snorkeler, Silver Bank, Dominican Republic. Gear: Canon F1 camera, Canon 15mm EF f/2.8 lens, Ikelite housing, available light. Exposure: ISO 100, f/11, 1/160s

Big Animals

Text and photos by John A. Ares

When I think about the word “epic” in respect to underwater subjects, I think of both shipwrecks and big animals. Big animals won out for this article.

Photo 1 depicts an epic night dive with several manta rays in the Maldives. While two rays are clearly visible, there is the tail of a third ray on the right side of the top manta. Epic.

Photo 2 is also from the Maldives, where I was “adopted” by a six-foot-long tawny nurse shark. The sharks gather here in groups of one to three dozen, as they are routinely fed scraps

by a local restaurant. Tawny nurse sharks are very docile. This shark posed for its portrait for about ten minutes.

The humpback whales in Photo 3 were photographed in Silver Bank, halfway between the Turks and Caicos Islands and the Dominican Republic. The snorkeler shows the scale in relation to the 15ft-long calf and its 45ft-long mother below.

Few experiences underwater are as attention-grabbing as coming face-to-face with a great white shark. Photo 4 was shot from a cage at Guadalupe Island in Mexico. The photo was converted to black and white using Nik Silver Efex Pro 2 software. Visit: JohnAres.com



Photo 2. Tawny nurse shark, Maldives. Gear: Canon Rebel SL1 camera, Canon EF-S 10-18mm f/4.5-5.6 IS STM lens at 18mm, Ikelite housing, twin Ikelite DS161 strobes. Exposure: ISO 400, f/11, 1/80s

Photo 4. Great white shark, Guadalupe Island, Mexico. Gear: Canon 10D camera, Sigma 11-18mm lens at 18mm, Ikelite housing, available light. Exposure: ISO 100, f/5.6, 1/60s



The Dakota. This is a sunken Douglas DC3 aircraft. In the 13th-century epic poem *Song of the Nibelungs*, the character Siegfried suffered, and so did I. It took me 72 dives at the same place to nail this one shot. Gear: Canon 40D camera, Sigma 10-20mm lens (at the 10mm end), Ikelite housing, ambient light (no strobes), with a “magic filter” attached to the lens. Exposure: ISO 800, f/8, 1/100s



The Skydiver. A juvenile squid hovers just centimetres below the water's surface, looking at me while the sky and the clouds form a unique, almost “epic” background. The sky is reflected in the eyes of the squid. Gear: Canon 40D camera, Canon 60mm macro lens, Ikelite housing, one Ikelite DS125 strobe. Exposure: ISO 200, f/8, 1/125s

Epic Shots

Text and photos by Rico Besserlich

The request to deliver “epic” shots made me think a lot about what “epic” actually means and how it could (or should not) be used in the world of photography. The *Oxford English Dictionary* states: “Epic: A long poem, typically one derived from ancient oral tradition, narrating the deeds and adventures of heroic or legendary figures or the past history of a nation.”

Hmm... is a squid a heroic figure? As I understood it, the *Iliad* and the *Nibelungenlied* (*The Song*

of the Nibelungs) are epic works, but my images are not. My search continued...

Looking at the lingo of the “whas-sup?”, “bb!” and “lol!” generation—and let’s not forget ROFL (or “rolling on the floor laughing”)—the Merriam-Webster dictionary then explained to me that the term “epic” has been found used in a highly colloquial fashion, in a manner that is largely synonymous with *outstanding*, *fabulous*, or *impressive*.”

Aha. *Outstanding*, *fabulous*, *impressive*. We are getting closer. However, what is “fabulous” to one may be perceived entirely differently by someone else. *ROFL!*

For me (if I could even dare to place a definition on it), an “epic” image is an image that impresses viewers for longer than just a few seconds, making them think and wonder. Most of all, it should be a visual work that cannot be reproduced, meaning it is special and unique, and thus stands as a powerful milestone of imaging artwork, well beyond the classic notion that an image should “entertain for just five seconds.” To me, something epic is also something timeless... something a photographer can hope to be remembered for. Visit:

mavipho.com



Photo 1. (top left) Jellyfish, Jellyfish Lake, Palau. Gear: Olympus OM-D E-M5 Mark II camera, Olympus M.9-18mm f/4.0-5.6 at 9mm. Exposure: ISO 250, f/9, 1/125s

Wide-Angle Proportions

Text and photos by Sheryl Checkman

What makes an image epic? It could be the unique perspective that super wide-angle or close-focus wide-angle can give to a subject or landscape, or the way a leading line brings you into an image so that you feel a part of it.

When I went to Jellyfish Lake in Palau, I was blown away by the sheer number of stingless jellyfish that surrounded me. I had so much fun with the endless possibilities for photographing them that I did not want to get out of the water! For this article, I chose a close-focus wide-angle shot of a single jellyfish in the foreground (Photo 1), its epic proportions in relation to the background makes it look like a spaceship flying through space.

Photo 3. Spearfisher, Blue House, Alor. Gear: Olympus OM-D E-M5 Mark II camera, Olympus M.9-18mm f/4.0-5.6 at 13mm, Olympus PT-EP13 housing, Sea&Sea YS D-1 strobes. Exposure: ISO 200, f/11, 1/80s

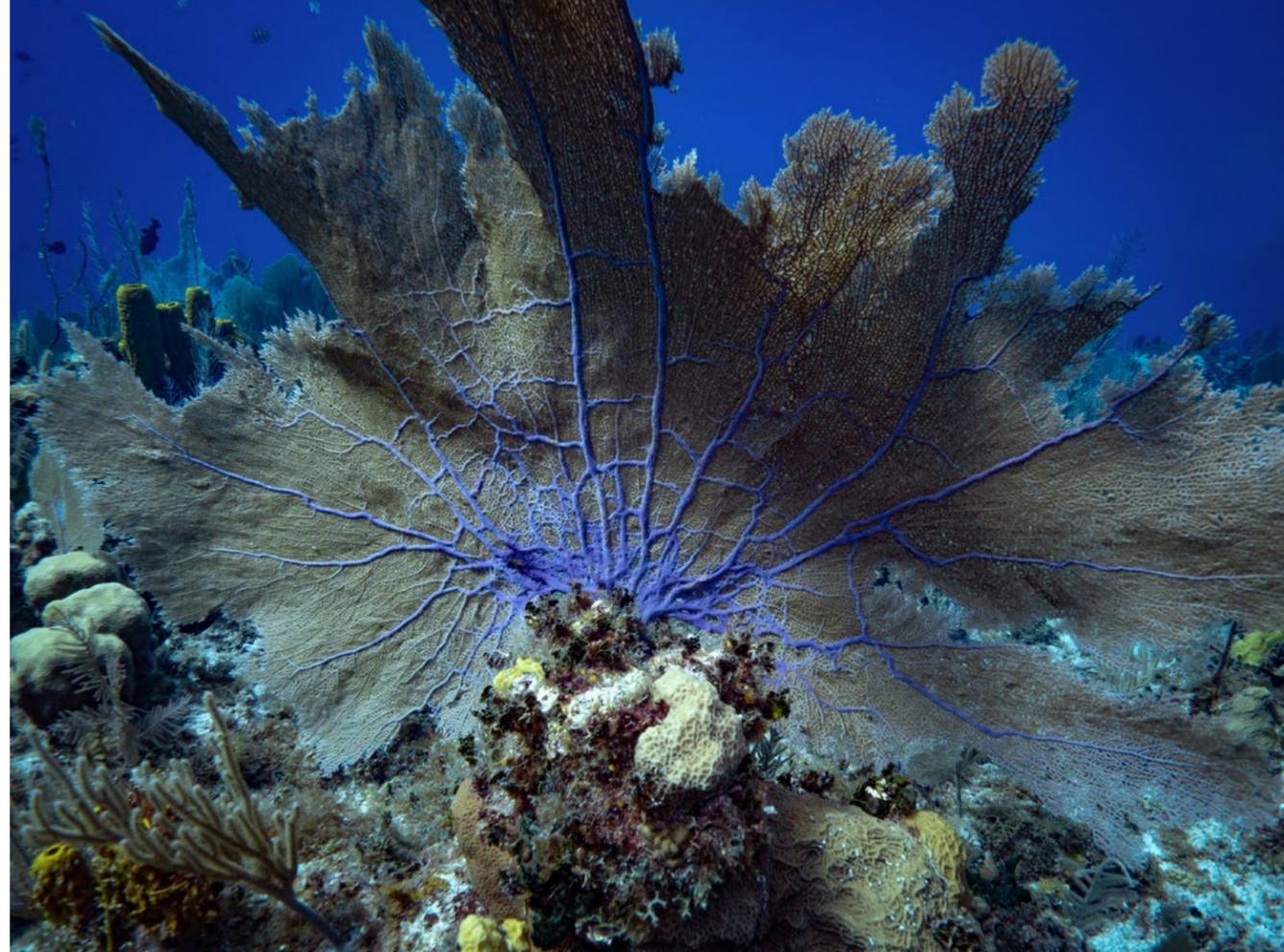


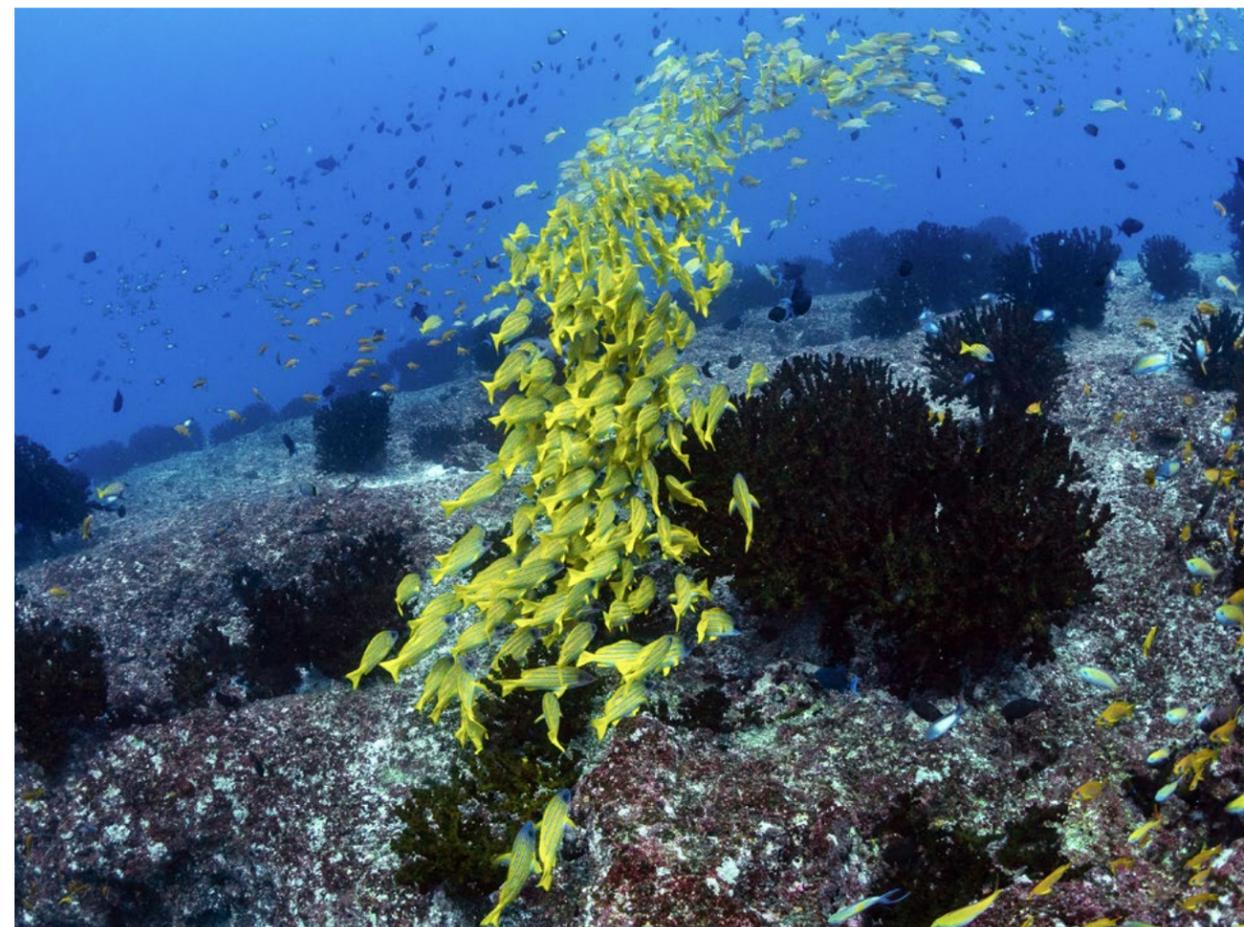
Photo 2. (left) Sea fan, Joy's Joy, Little Cayman. Gear: Olympus OM-D E-M5 Mark II camera, Olympus 8mm f/1.8 at 12mm, Olympus PT-EP13 housing, Sea&Sea YS D-1 strobes. Exposure: ISO 200, f/5.6, 1/200s

Photo 4. (below) Bluestripe snapper, Sherwood Forest, Mozambique. Gear: Olympus OM-D E-M5 Mark II camera, Olympus 8mm f/1.8 at 12mm, Olympus PT-EP13 housing, Sea&Sea YS D-1 strobes. Exposure: ISO 200, f/6.3, 1/125s

The sea fan (Photo 2) that I shot on the Joy's Joy dive site in Little Cayman was shot super wide-angle with my 8mm fisheye lens, making it appear larger than life.

At the beginning of a dive on the Blue House site in Alor, Indonesia, I looked up to see a freediving spearfisher suspended in the water (Photo 3). Another diver, on scuba, looked up at him from the depths below. To me, the juxtaposition of these two divers, from my perspective, makes this an epic photo.

The curved line of bluestripe snappers (Photo 4) schooling through Sherwood Forest in Mozambique was a truly magical sight, as they weaved their way through the "forest" of green, tree-like coral. This super wide-angle view leads the viewer right into the entire scene. Visit: [Instagram.com/sherylcheckman](https://www.instagram.com/sherylcheckman)





Bernadette Carrion entering a restriction at Minotauro (above). Gear: Olympus OM-D E-M1 Mark II camera, Olympus 9-18mm lens, Aquatica housing, Sea&Sea YS-D1 strobes. Exposure: ISO 400, f/4.0, 1/80s; Michael Netto entering Cenote Carwash (top right). Gear: Olympus OM-D E-M1 Mark II camera, Olympus 9-18mm lens, Aquatica housing, Sea&Sea YS-D1 strobes. Exposure: ISO 1250, f/5.0, 1/40s

Magical Cenotes

Text and photos by Larry Cohen

Diving in one of the flooded caves in the Mexican Yucatán is as close as one can get to being on a different planet while still on Earth. As a photographer, capturing images in the dark is challenging, but capturing nature's light show in the cenotes offers many possibilities.

A cenote is formed when a cave ceiling collapses. When this happens, a pool is created that becomes an entrance to the underworld. Tourists

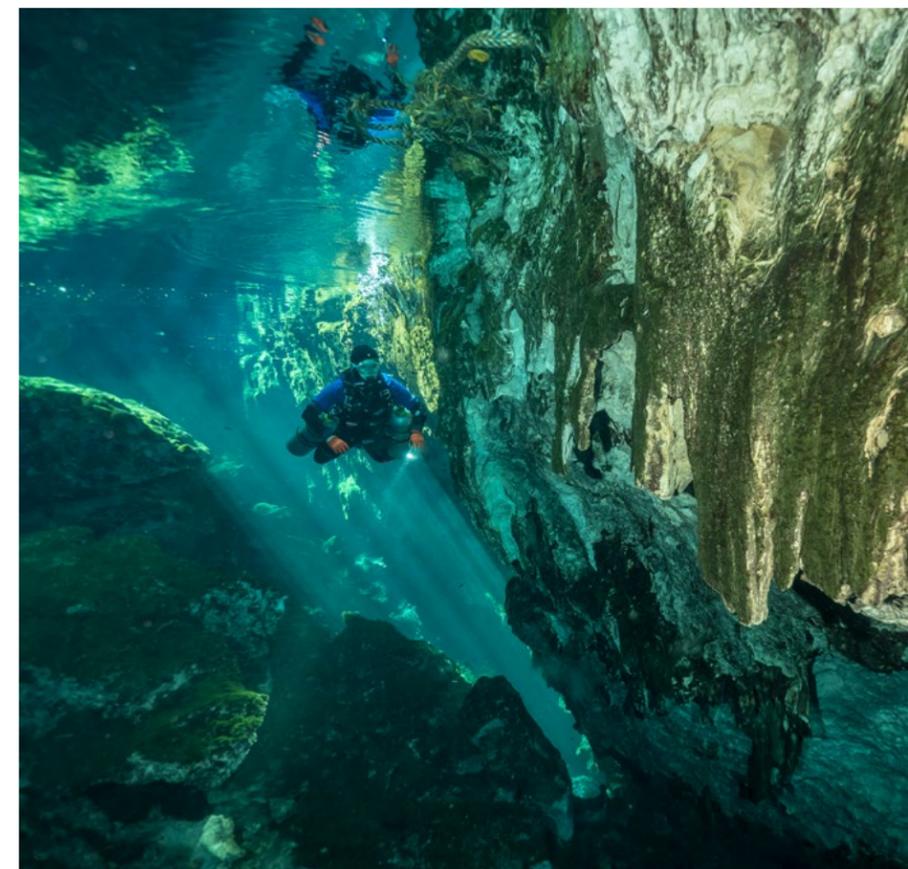
and locals use these pools to escape the heat; for cave divers, it is the entrance to an adventure.

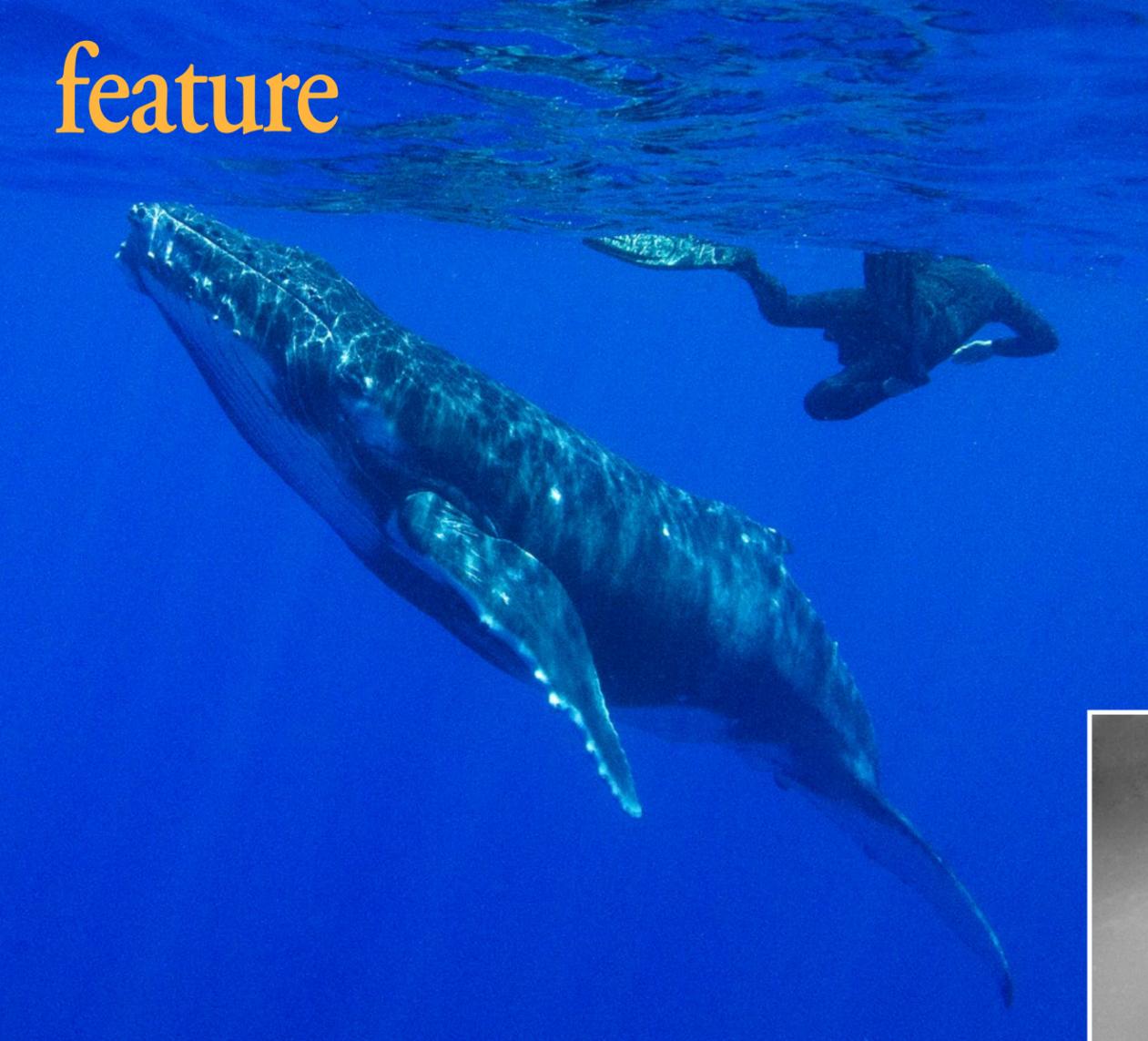
On sunny days, light streams into the dark area of the caverns, creating patterns and sunbeams that are breathtaking to the eye. Capturing this light can produce an epic photograph.

It is good to have a diver model in the image and use just enough strobe light to open up the shadows and capture details in the subject. It is essential not to use too much artificial light, so that the ambient light effects are not overpowered. Visit: liquidimagesuw.com



Olga Torrey photographing Aydin Dinc at Garden Eden (above). Gear: Olympus OM-D E-M1 Mark II camera, Olympus 9-18mm lens, Aquatica housing, Sea&Sea YS-D1 strobes. Exposure: ISO 1000, f/4.0, 1/13s; Olga Torrey entering Minotauro (right). Gear: Olympus OM-D E-M1 Mark II camera, Olympus 9-18mm lens, Aquatica housing, Sea&Sea YS-D1 strobes. Exposure: ISO 1000, f/4.0, 1/80s





ANITA GEORGE-ARES

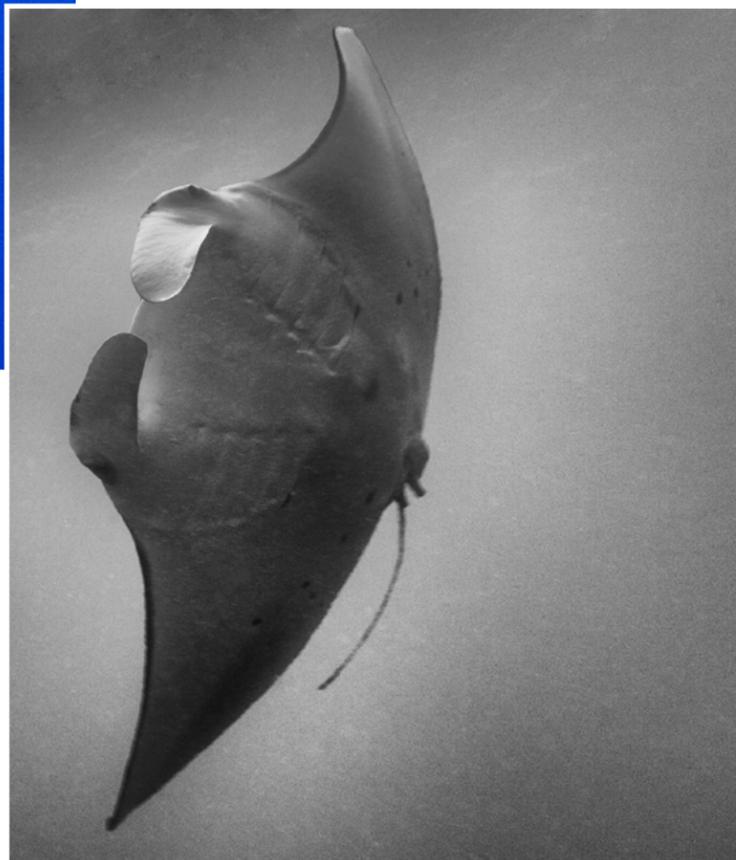


ANITA GEORGE-ARES

Photo 1. (left) Great white shark, Guadalupe Island, Mexico. Gear: Canon EOS Digital Rebel XTi camera, Canon EF-S 10-22mm f/3.5-4.5 USM lens, Ikelite housing, available light. Exposure: ISO 400, f/8, 1/80s

Photo 2. (far left) John Ares and humpback whale calf, Moorea, French Polynesia. Gear: Canon EOS Rebel SL1 camera, EF-S 10-18mm f/4.5-5.6 IS STM lens, Ikelite housing, available light. Exposure: ISO 1600, f/20, 1/200s

Photo 4. (center) Manta ray, Maldives. Gear: Canon EOS Rebel SL1 camera, EF-S 10-18mm f/4.5-5.6 IS STM lens, Ikelite housing, two Ikelite DS161 strobes. Exposure: ISO 200, f/8, 1/60s



ANITA GEORGE-ARES



ANITA GEORGE-ARES

Photo 3. John Ares and whale shark, Oslob, Cebu, Philippines. Gear: Canon EOS Digital Rebel XTi camera, Canon EF-S 10-18mm f/4.5-5.6 IS STM lens, Ikelite housing, available light. Exposure: ISO 400, f/4.5, 1/1250s

Epic Encounters

Text & photos by Anita George-Ares, PhD

For me, “epic” means experiencing an awesome encounter up close with a big marine animal. The image of the great white shark in Photo 1 was shot from a cage. It was easier to shoot with available light than to use my big Ikelite strobes in a cage with several divers all on hookah rigs.

Strobes and scuba are not permitted when shooting whale sharks in Oslob and humpback whales in Moorea. In order to take the image of the calf in Photo 2, I slipped into the water quietly from the boat, then snorkeled on the surface for 300 yards. Government rules prevent boats from approaching closer than 300 yards to mothers with calves.

Freediving and the wearing of weight belts are not permitted. Calves need to frequently come to the surface to breathe, so there are still plenty of opportunities to take images.

The whale shark in Photo 3 was in a vertical position as it was surface feeding. This behavior occurs as the whale sharks at Oslob are fed shrimp by the local fishermen. In recent years, Oslob has become overcrowded with tourists. This image was taken in 2013 when there was not such a high density of tourists in the water.

The Maldives are known for their reef manta rays and manta cleaning stations. Mantas continually circle a reef area in order to be cleaned by small

fish. I like the diagonal composition and feeling of motion that this manta ray image (Photo 4) conveys.

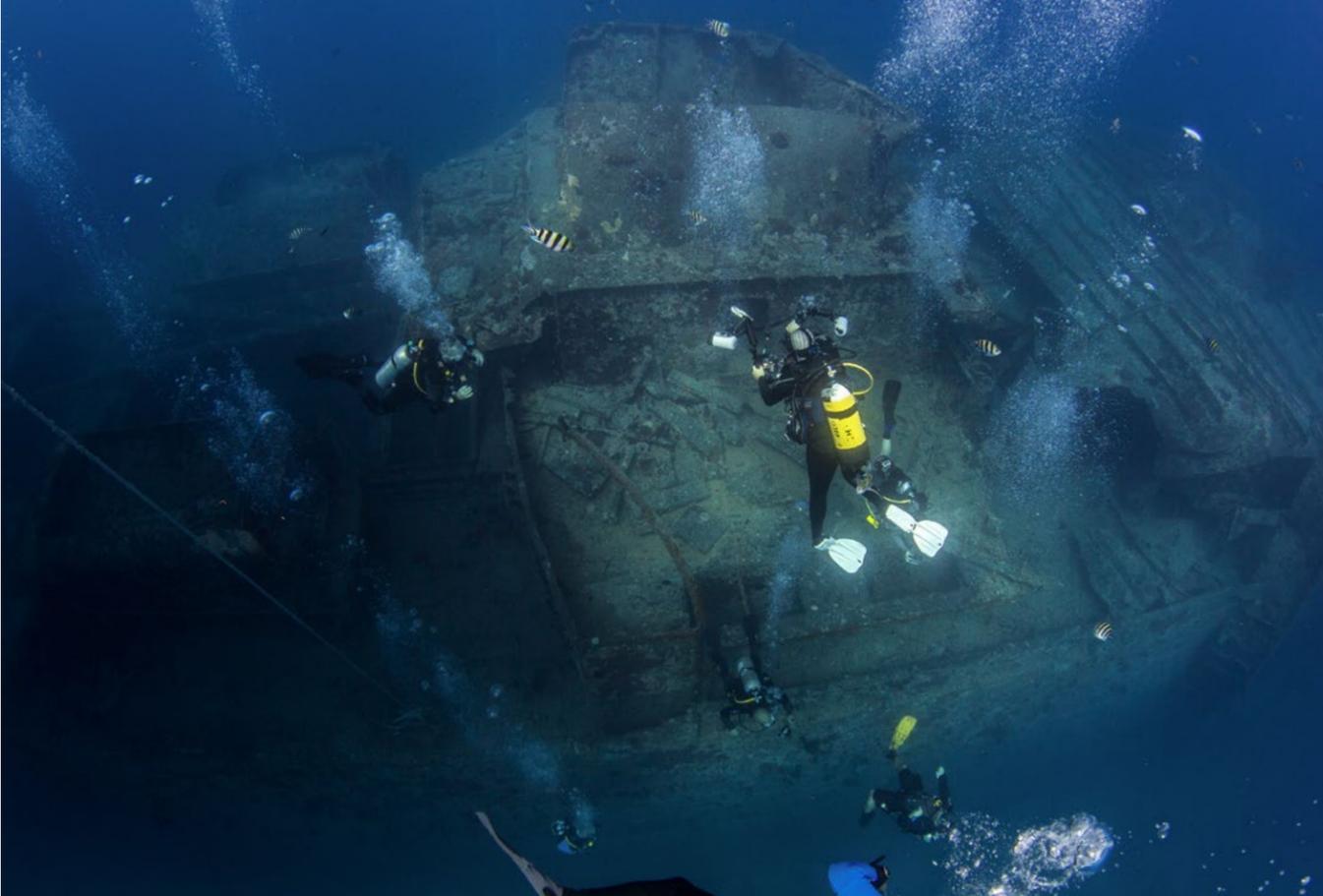
Images were converted to black and white using Nik Silver Efex Pro 2. Please visit: [facebook.com/profile.php?id=100016947967639](https://www.facebook.com/profile.php?id=100016947967639)



On clear days, capturing the underwater landscape's horizon adds a sense of depth, and including the surface texture adds to the dimension of the scene. Sodwana Bay, KwaZulu-Natal, South Africa (below). Gear: Canon EOS 7D Mark II camera, Tokina 10-17mm fisheye lens, Sea&Sea housing, dual Inon Z240 strobes. Exposure: ISO 320, f/11, 1/160s



Adding layers of interest, such as the profile of a reef, a school of fish or the surface of the water can highlight the vastness of a reef. Shark Reef, Ras Mohammed, Northern Red Sea, Egypt. Gear: Canon EOS 7D Mark II camera, Tokina 10-17mm fisheye lens, Sea&Sea housing, dual Inon Z240 strobes. Exposure: ISO 160, f/10, 1/160s



The sheer magnitude of a wreck can be captured by looking down at it and adding divers in the frame to give a sense of perspective (above). This is just a tiny section of the mighty SS *Thistlegorm*, Northern Red Sea, Egypt. Gear: Canon EOS 600D camera, Tokina 10-17mm fisheye lens, Sea&Sea housing, natural light. Exposure: ISO 100, f/6.3, 1/100s; A diver is dwarfed inside the huge cargo hold of the *Salem Express* wreck, Northern Red Sea, Egypt (right). Gear: Canon EOS 600D camera, Tokina 10-17mm fisheye lens, Sea&Sea housing, dual Inon Z240 strobes. Exposure: ISO 800, f/5.6, 1/40s

Vast Scale & Perspective

Text and photos by Kate Jonker

Epic underwater photography captures the awe-inspiring beauty of the vast underwater landscape. It is about exploring magnificent towering reefs and giant shipwrecks in crystal-clear waters, and conveying their "epic-ness" through the lens of a camera.

Traditionally, underwater photographers are taught to "shoot up," but breaking this mould can create stunning images that truly convey the scale and magnitude of shipwrecks. Shooting from high above the wreck using a wide-angle lens and natural light to illuminate as much of the wreck as possi-

ble can give viewers an eagle-eye view, making them feel as if they are flying above it.

When photographing reefs, using a wide-angle lens can help capture the grand scale of larger portions of the reef, going beyond what the human eye would normally see. Adding a school of fish or a diver in the frame, with the dark profile of the reef in the background, can add depth and a sense of magnitude.

Including a diver in the shot can give the viewer a sense of perspective, highlighting the immense size of the reef or wreck. The sheer size of many wrecks with a tiny diver next to them can create a feeling of solitude, making a diver seem

small and insignificant in comparison.

On clear days, capturing the underwater landscape's epic proportions is easier. Adding the surface of the water, and possibly even the dive boat above, can help add an extra dimension to the shot.

In the end, the key to capturing epic underwater images is to think beyond traditional photography techniques and experiment with creative angles and lighting. With practice and patience, you can capture the majesty of the underwater world and create images that will leave your viewers in awe. Visit: katejonker.com

Epic

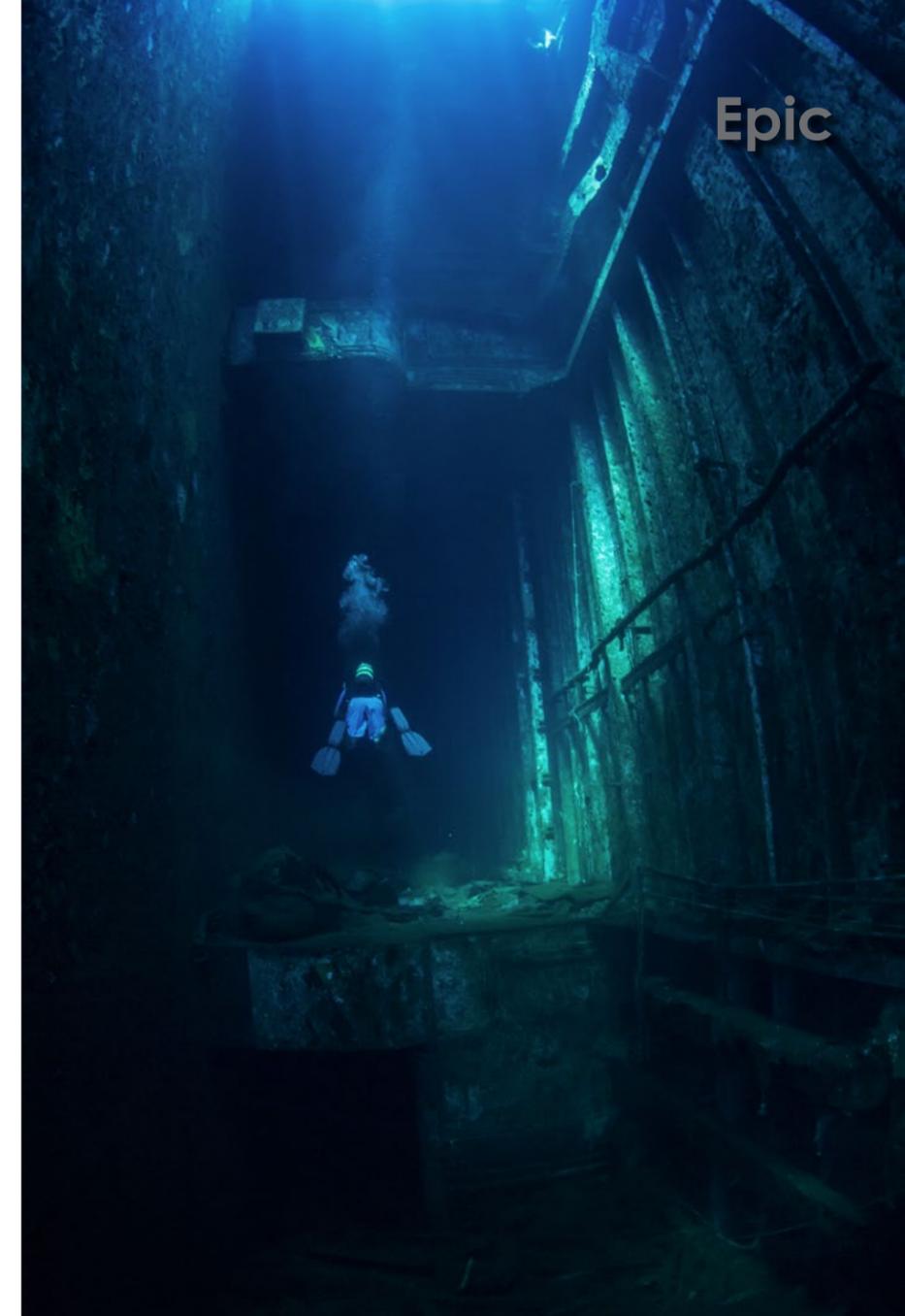




Photo 1. (right) Polarized school of creole wrasse, Bonaire, Netherlands Antilles. Gear: Nikon D3 camera, Nikon 24-85mm lens at 40mm, Subal housing, two Sea&Sea YS-250 strobes. Exposure: ISO 200, f/7.1, 1/40s; Photo 2. (top left) School of blue and gold snapper, whipper snapper and burrito grunts fill the opening of a large underwater cave, Cocos Island, Costa Rica. Gear: Nikon D3 camera, Nikon 24-70mm lens at 28mm, Subal housing, two Sea&Sea YS-250 strobes. Exposure: ISO 400, f/6.3, 1/60s; Photo 4. (top right) Schools of golden sweeper and glassfish swimming amongst the coral reef, Tanjung Papisoi, Indonesia. Gear: Nikon D3 camera, Nikon 17-35mm lens at 22mm, Subal housing, two Sea&Sea YS-250 strobes. Exposure: ISO 200, f/5.6, 1/160s

Epic Fish Encounters

Text and photos by Matthew Meier

With so many ways to interpret the word “epic,” I decided to relive a few of my awe-inspiring interactions with massive schools of fish. On my first trip to Bonaire, I happened upon what I now realize was likely a spawning migration of creole wrasse (Photo 1). For over 20 minutes, I watched as a constant stream of fish swam past a deep portion of the reef heading for destinations unknown.

A few years later, I had two very memorable moments at Cocos Island. The first

involved hundreds of snappers and grunts, pulsing in the opening of an underwater cavern, as the heavy surge pushed us 10 to 15 feet in either direction (Photo 2). Then, later in the trip, I swam out into the blue, chasing a huge shadow off the pinnacle at Dirty Rock, to find a gigantic tornado of bigeye jacks twisting nearly to the surface from 60 feet down (Photo 3).

I had another two experiences with large schools of fish during a trip through Raja Ampat and Triton Bay. While shooting a colorful section of reef near Misool, I was overrun by a monstrous aggregation of fusiliers, dam-

sels and anthias, which nearly blotted out the sun. I only wish I had been shooting with a fisheye lens to capture the full spectacle. Finally, near Tanjung Papisoi in Indonesia, I came across the largest schools of golden sweepers and glass fish I had ever seen (Photo 4). They filled a huge gap in the reef, moving in unison with frenetic energy, and I spent a large portion of that dive observing and photographing the spectacle. Visit: MatthewMeierphoto.com

Photo 3. Massive school of bigeye jacks form a swirling tornado, Cocos Island, Costa Rica. Gear: Nikon D3 camera, Nikon 17-35mm lens at 17mm, Subal housing, two Sea&Sea YS-250 strobes. Exposure: ISO 800, f/7.1, 1/160s





Gear used for all photos: Nikon D500 camera, Tokina 10-17mm lens, Nauticam housing, Inon Z330 strobes. Photo 1. (left) Tiger shark, captured while shooting straight down with a wide-angle lens, demonstrates isolation and size. Exposure: ISO 200, f/11, 1/125s; Photo 2. (right) Great white shark, with deep blue negative space, demonstrates dramatic movement and depth. Exposure: ISO 320, f/11, 1/125s; Photo 3. (top right) Great hammerhead shark. The “sfumato” effect emphasizes the solitary subject. Exposure: ISO 200, f/11, 1/125s; Photo 4. (top center) Diver and sandbar shark. Color, contrast, perspective and lighting combine to enhance a haunting beauty. Exposure: ISO 200, f/11, 1/125s



Why Epic?

Text and photos by Gary Rose, MD

The word “epic,” as a noun, refers to “a long poem, typically one derived from ancient oral tradition... or the history of a nation.” As an adjective in underwater photography, “epic” refers to shooting to the extreme and using techniques that emphasize the subject—such as wide-angle, extreme perspective, sfumato and isolation. My definition of an epic photo is one that evokes strong emotion upon viewing, and then lingers in the mind for hours or days. These are some of my favorite techniques to use for creating dramatic photos, which are the images that I often exhibit in galleries and shows.

Sharks are my favorite subjects for epic photographs. Just the very subject—sharks—inspires me to create.

The tiger shark is easily recognized (by most viewers) by its gorgeous markings and inherently huge size. Photo 1 demonstrates isolation and size. Viewers always ask me, “How did you get this photo?” Well, I used a very wide-angle lens and literally shot straight down between my legs as they straddled her in the frame. If my legs were not stretched to the max, you would be able to see my diving fins. It is Epic.

Photo 2 is a close-up of a great white shark, taken at an angle that emphasizes size, strength and movement. Most viewers are used to only seeing photos of great whites from cages or on the surface of the sea. The beauty of this photo is that it was not from within a cage (implying hidden danger), but in open water, against a salutary deep blue negative space, which highlights the magnificent coloring of the great white shark. When I display this photo,

I cut it into a triptic (in homage to Damien Hirst), which further emphasizes dramatic movement and depth—Epic.

I love great hammerhead sharks. I get excited every time I see them and photograph them. They are unusual and exceptionally photogenic. As demonstrated in Photo 3, I used an Italian Renaissance technique called “sfumato.” As you can easily see, the lighting is very soft, and all is out of focus except for the subject—the great hammerhead. This is also an extremely close-up wide-angle photo, which enhances the beauty of the sfumato effect. This is one of my favorite photos and is prominently displayed in my home.

Photo 3 appeared in my article on minimalist photography in issue #117. In the minimalist version, the stark white background produces tension, creating an effect where the great hammerhead appears to nearly pop

right out of the photo. In contrast, as an epic photo in full color, using sfumato, the lighting is very soft and out of focus, except for the subject, engendering a feeling of peace and calm.

The color, lighting and unusual perspective of Photo 4, as well as the subject of an encounter between diver and shark, propel this photo into the realm of Epic. The contrast of dark and light, with the shark at the transition, emphasizes the ageless story of human-animal encounters. The cathedral lighting also enhances the symbolism of this encounter. I consider this encounter as a hauntingly beautiful epic.

Photo 4 previously appeared in my

article featuring black-and-white photography in issue #110. As a black-and-white photo, the emphasis was on the play of light—the sunburst and corona encircling the shark. In contrast, as an epic photo in full color, it draws the viewer’s attention to the subject—the extraordinary encounter of diver and shark.

Whenever I look at my raw photos, I try to “feel” what I am seeing. I shift from left brain to right brain, or hover in the middle. Then, the magic happens. Visit: garyrosephotos.com





Photo 1. (left) Corals and sponges form an underwater arch in Cozumel, Mexico. Gear: Olympus OM-D E-M5 camera, Panasonic 8mm fisheye lens, Nauticam housing, dual Sea&Sea strobes. Exposure: ISO 250, f/6.3, 1/50s

Photo 2. (right) Night dive with giant Pacific Ocean manta rays. Big Island, Hawaii, USA. Gear: Olympus OM-D E-M5 camera, Panasonic 8mm fisheye lens, Nauticam housing, dual Sea&Sea strobes. Exposure: ISO 1250, f/6.3, 1/250s

Photo 3. (bottom left) Face-to-face with a sand tiger shark, North Carolina, USA. Gear: Olympus XZ-1 camera, wide-angle conversion lens, Olympus PT-050 housing, dual Sea & Sea YS-01 strobes. Exposure: ISO 100, f/4.5, 1/30s

Photo 4. (bottom right) *Phyllodesmium magnum* is a type of aeolid nudibranch in Malaysia. Gear: Olympus OM-D E-M5 camera, Olympus M. 12-50mm lens, Nauticam housing, dual Sea&Sea strobes. Exposure: ISO 250, f/11, 1/80s



Grand Impressions

Text and photos by Olga Torrey

In Cozumel, Mexico, I dived sites with grand underwater arches formed by corals and sponges. I swam among these healthy reef walls, pinnacles and beautiful tunnels and had to use a fish-eye lens to show the enormous size of the arches (Photo 1).

When I first visited Kailua-Kona Island, Hawaii, in October 2019, I went night diving with giant manta rays. I settled on the bottom with a group of divers in a large circle. Inside the circle were bright lights that cut through the water with powerful beams. The light attracted the plankton, and the plankton attracted several giant mantas gliding through the water, making graceful turns and flips (Photo 2). The mantas provided a mesmerizing experience and showed Kona's nightlife at its best!

In July 2013, I dived on the *Aeolus* shipwreck for the first time. The vessel was part of an artificial reef in North Carolina, USA.¹ The dive was enjoyable because of the many sand tiger sharks inside the wreckage. These animals look ferocious with their jagged teeth to help with their big appetite! Sand tiger sharks are not aggressive towards people but should not be provoked. I descended on the wreck and faced the giant fish with curiosity and admiration. The sharks did not disappoint me and made excellent photo subjects (Photo 3).

The *Phyllodesmium magnum* is a type of aeolid nudibranch with a sophisticated arrangement of densely branched digestive glands perfectly positioned toward sunlight (Photo 4). The shape of the glands reminds me of the artwork of Columbian artist Fernando Botero whose signature style is exaggerated and voluptuous. Visit: fitimage.nyc

¹ WIKIPEDIA.ORG

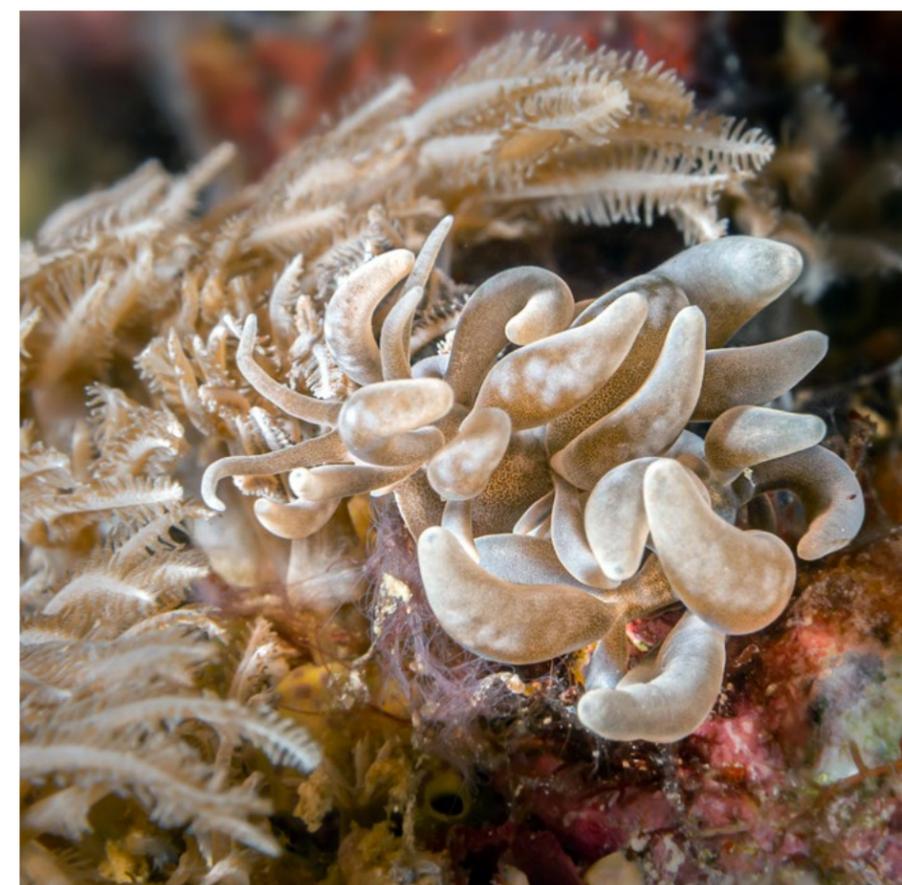


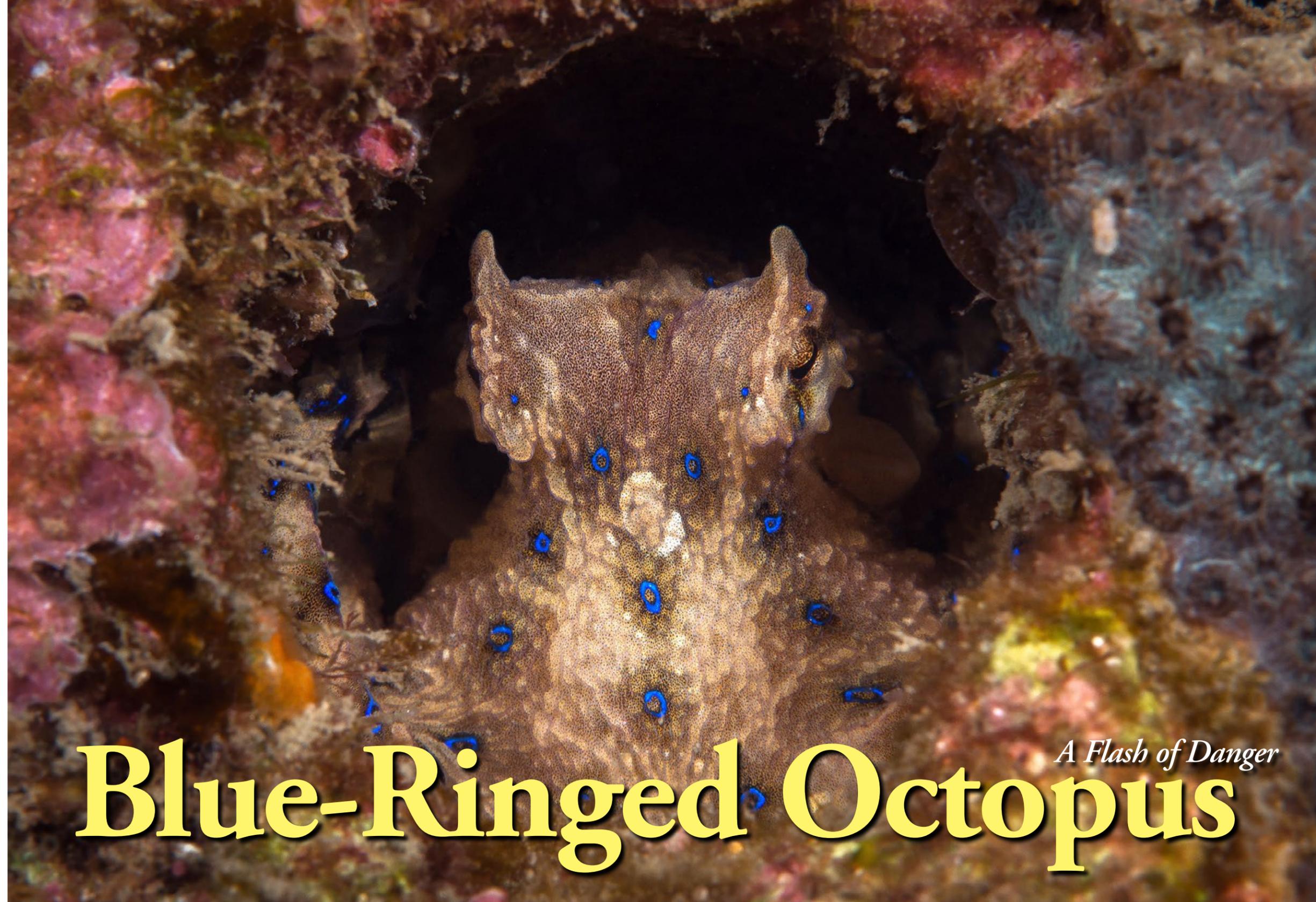
Photo 2. A blue-ringed octopus in its den displays bright blue rings to warn off aggressors.

Text and photos by Wesley Oosthuizen

Say hello to one of the most venomous marine animals—the blue-ringed octopus. Underwater photographer Wesley Oosthuizen takes a closer look at this small but lethal cephalopod.



Photo 1. Blue-ringed octopus of 6 cm



Blue-Ringed Octopus

A Flash of Danger

Although this shoulder-shrugging octopus of the *Hapalochlaena* genus only ranges from about 5-10cm (the one in Photo 1 was roughly 6 cm) and, even though they are relatively docile, their venom, tetrodotoxin (a neurotoxin),

is powerful enough to damn near kill anything that goes too far with this tiny giant. Suffice it to say, it gets a pretty decent berth of personal space from other animals.

"But, come on! How quickly does

the venom take effect?" you think, but don't ask.

And to that, I give you the answer (that you did not ask for): only a few minutes. This, of course, varies from person to person, but it can be as

quick as 90 seconds.

"And what happens when it takes effect?" you again think, but do not ask, because you know... I like to share.

Well, as the tetrodotoxin courses through your veins, you will start feel-



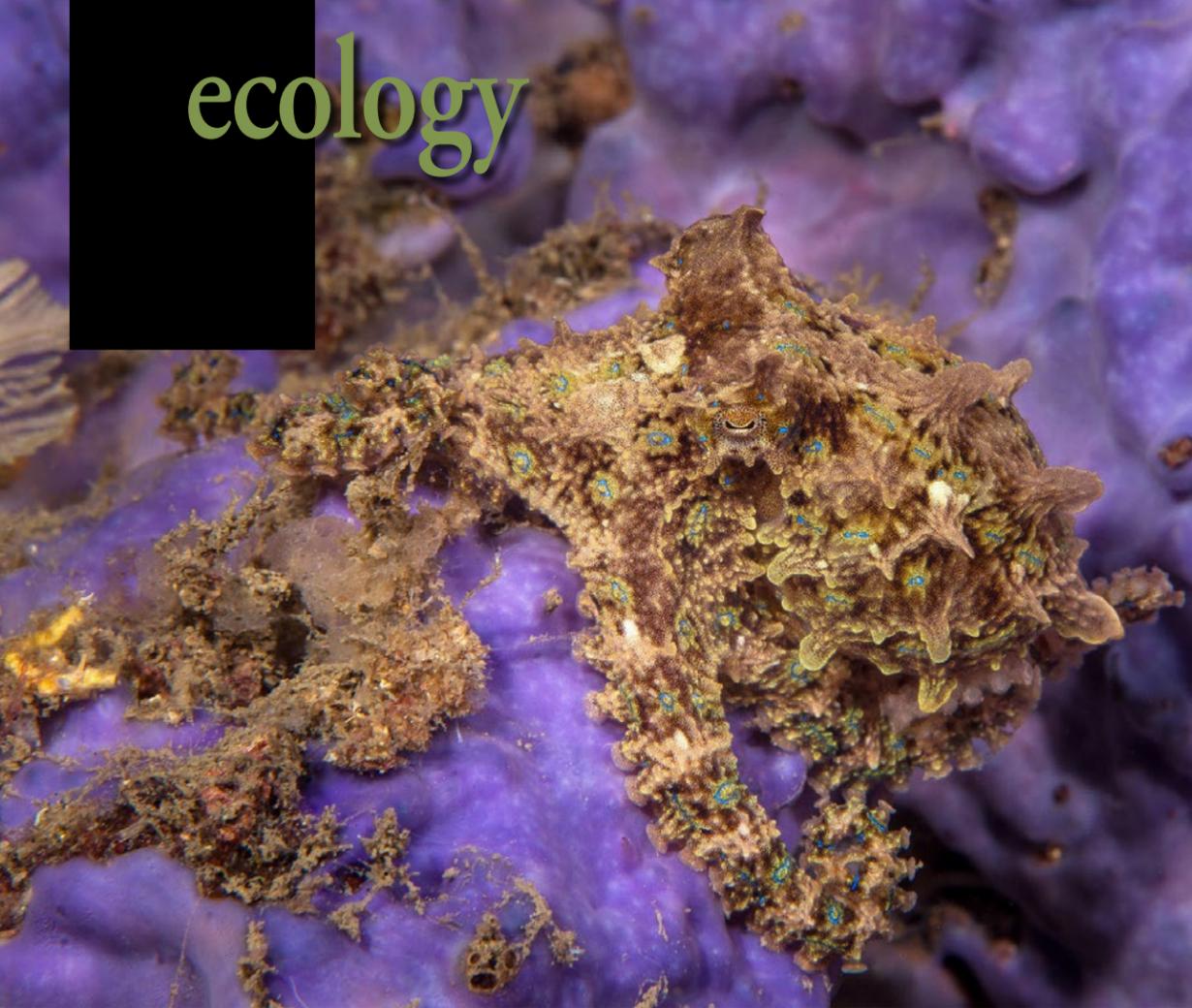


Photo 3. Blue-ringed octopus on purple sponge. This tiny octopus carries enough venom to kill 10 men. It is tetrodotoxin, a neurotoxin that can paralyze your diaphragm.

not hiding under their beds at this stage.

A single blue-ringed octopus has enough tetrodotoxin to end 10 fully grown men's lives. Like jock-sized guys, not weedy dudes. So probably more than 10 averaged-sized guys.

How to spot an angry octopus

So, if you are still with us, then I am guessing (if you have not figured it out already) that you are wondering how to know if a blue-ring octopus is angry?

Example. This image (below). This is an angry blue-ring. It is certainly not happy with me and is not afraid to show it. Ordinarily, they are just a brown mucky-looking colour, but when a potential threat gets too close, they will flash these blue-rings as a warning to back right off or else!

Coming across something like a blue-ring octopus will make one realize that it is not the size of the creature, but the tetrodotoxin contained within its venom sack that counts. ■

Thanks go out to Yuan Yu (OM Digital Solutions), AOI, OrcaTorch, Atmos.

Wesley Oosthuizen is an internationally published professional underwater photographer, originally from East London, South Africa, who is now based in Taiwan, where he founded a production company. For more information, visit: [facebook.com/WJOart](https://www.facebook.com/WJOart)

SOURCES: BIOLOGYDICTIONARY.NET, NHM.AC.UK, PBS.ORG, PASSPORTOCEAN.COM, TREEHUGGER.COM



Photo 4. An angry blue-ringed octopus flashes its bright blue rings as a warning.

ing kind of funny. At this stage you are probably just thinking you are suffering from a bit of nitrogen narcosis, but very soon the toxins will paralyze your diaphragm. On the plus side though, your heart will keep beating until it runs out of oxygen, so don't worry. It's ok. At this point you are basically dead. Phew, it's over.

However, on the small chance that you should be able to call emergency services, have someone do CPR on you until they arrive, and then get you put on a ventilator (until paralysis ends), you have about a 90 percent chance of survival! Easy-peasy.

Impact of the venom

"But, erm... just how long does the venom last?" you say at this point, with perhaps a little sweat on your brow and after gulping once or twice.

There is no real easy way to rip off this band-aid, so here it is: It takes

about 15 hours until your muscles start working again and you are able to breathe without any assistance.

So, let's say (hypothetically) that everything somehow fell into place, and you had everything you needed to survive a bite from one of these critters. Firstly, you lucky sod, you. Secondly, once the toxins have completely worn off, you can pretty much go home. Yip. Pretty much as if nothing happened. Aren't you glad to be you?

But—those dang pesky "buts"—if you were not so lucky in getting enough oxygen to your brain, well then my friends, I am sad to say you will suffer permanent brain damage due to a lack of oxygen, and you probably will not be the person people knew you to be before, and in that case, I am so sorry to hear that.

"How much venom does a single bite contain?" ask the ones who are

BLUE-RINGED OCTOPUS FACTS

- They are considered one of the most aggressive octopuses, but only a few cases, involving humans, have ever been reported.
- They have a relatively short lifespan of only two years. After mating, both the male and the female die.
- Despite its tiny size, the blue-ring octopus is extremely intelligent; it has a brain inside its head, but each arm (equipped with many suckers, which act like fingers) is also a brain that can think pretty much independently from the main one.
- They use their arms and suckers not only to think and act, but also to smell, taste and see.
- Like all octopuses, the blue-ring octopus has three hearts and blue blood.
- They can regenerate lost limbs.
- The blue-ring octopus is only visible if it feels agitated by a potential threat.
- Prefers shallow waters but can be found at up to 20m deep.
- Grows to a maximum length of 12 to 22cm, depending on the species.
- There are only four scientifically-named species (*H. lunulata*, *H. maculosa*, *H. fasciata*, *H. nierstraszi*). It is believed, however, that there are more than 10 different kinds.
- The average clutch of eggs is around 50, but they can have up to 100.
- Incubation of eggs takes around six months; during this time, the mother will not feed, nor will she leave the brood.
- They often secure their dens by piling up rocks to block intruders from entering. ■



Interview by Don Silcock
Photos courtesy of Dr Simon Pierce

In a world-first, underwater ultrasound and blood sampling have been used successfully on wild free-swimming whale sharks in the Galapagos to observe their reproductive states. Don Silcock interviews Dr Simon Pierce of the Marine Megafauna Foundation to learn more about this ground-breaking research.

DS: What were some of the challenges encountered when doing underwater ultrasounds? How did the team overcome them?

SP: These techniques were quite challenging to apply. First of all, we were working at 10 to 30m beneath the surface, often in strong currents. Secondly, whale sharks are wonderfully placid, but they are a lot faster than us, and emerge from the blue with little warning; we only got a short time to work with each animal. The ultrasound unit was the size of a large briefcase, so it was far from hydrodynamic. Rui Matsumoto, the lead author of the study, was using

a “jetpack” (actually an underwater propeller mounted on his air tank) to keep up with the sharks and scan them with the ultrasound wand. I felt cool by general association.

Interpretation of the scans requires a lot of experience, too. Rui was filming the process with a GoPro so that we could synchronise the ultrasound

imagery with the position on the shark. Kiyomi Murakumo has been examining underwater ultrasound imagery in captive sharks and rays in the Okinawa Churaumi Aquarium for years now, monitoring pregnancy in species from nurse sharks to manta rays, and she was able to discern the developing follicles in these greyscale

images that prove that these female whale sharks were indeed adults—something that was previously only possible through dissections.

Collecting blood samples from free-swimming sharks was, similarly, something that had taken a lot of trial and error to get right. Whale sharks have extremely thick skin,

so we could not reach their actual veins—instead, we were trying to draw blood from vascularised tissue on their fins. That generally only works on relaxed sharks, and required a large dose of luck! We also had to avoid contamination from seawater, which necessitated the development of a two-syringe system, with one

Studying

Wild Whale Sharks

in the Galapagos with Underwater Ultrasound & Blood Sampling





Whale Sharks

Rui Matsumoto, et al, at: int-res.com/prepress/n01226.html

Dr Simon Pierce is a co-founder of the Marine Megafauna Foundation (MMF) and leads its flagship global research program on whale sharks. His work on the population ecology and management of this iconic species has made him the world's top whale shark conservation biologist.

MMF's mission is to save threatened marine life using pioneering research, education, and sustainable conservation solutions. Their goal is a world in which marine life and humans thrive together.

Don Silcock is an underwater photographer and photojournalist based on the island of Bali in Indonesia. His website has extensive location guides, articles and images on some of the best diving locations in the Indo-Pacific region. Go to: indopacificimages.com

in their populations, which really improves our understanding of their conservation needs.

Whale sharks are gentle giants, so they are lovely animals to work with, and have become a bit of a "poster species" for the use of new techniques, like photo-identification and laser photogrammetry, that are then adapted for other endangered sharks and rays. Other groups are already starting to use underwater ultrasound wands on poles to scan tiger sharks while they swim by. It is going to unlock a lot of new opportunities for minimally invasive research that can give us a wealth of information while avoiding any harm to the animals. It has been a super exciting project to be part of! ■

For more information, see the paper, "Underwater ultrasonography and blood sampling provide the first observations of reproductive biology in free-swimming whale sharks," by

was a great opportunity to test and refine these new techniques.

DS: How does this technological technique help scientists understand the physiology of whale sharks—and can it help other vulnerable shark species?

SP: Shark biology studies used to be based on dissections. For endangered species like the whale shark, where we are doing everything possible to keep them alive, that has made us quite creative in the development and application of new techniques, such as underwater ultrasound and in-water blood sampling. Now, we can start investigating their reproduction while they are in the wild—and it will allow for other studies too, such as looking at stress or pollution levels

creating an initial vacuum, enabling the second to draw pure blood.

DS: Why do we know so little about whale shark reproduction when they have been kept in captivity for a while now and are considered an "iconic" shark species?

SP: Whale sharks are a relatively well-studied shark, but "relative" is still the key word here. Only one pregnant female, caught in a Taiwanese fishery way back in 1995, has ever been examined by scientists—and we don't know where the babies live, either. It is mostly juvenile male sharks that frequent coastal areas and tourist sites. Females, both juveniles and adults, probably live offshore, where they are difficult to find, let alone study.

There are a few whale sharks in some large aquaria such as the

Okinawa Churaumi Aquarium and Georgia Aquarium, but no adult females. The Okinawa aquarium has a very sexually frustrated adult male whale shark, which matured in their facility, but females probably do not become adults until they are over 30 years old, so it might have to continue waiting for a while longer.

DS: Why did the team choose the Galapagos to do this research over other whale shark hot spots?

SP: Darwin Island in the Galapagos, where this research was conducted, is one of the only places where adult female whale sharks are consistently seen. Between June and October each year, there is a good chance to see them swimming by. The Galapagos Whale Shark Project team have huge expertise in this area, so it



Tracing Mediterranean great white sharks with DNA

In the Mediterranean Sea, where white shark catches and sightings are limited and unpredictable, the analysis of genetic material shed from white sharks as they move through the water provides novel insights into their distribution and abundance.

As fans of crime series will know, every living creature sheds DNA through skin cells, hair, scales and other bodily secretions as they move. This leaves behind a trace in whatever environment they were in, thus becoming environmental DNA (eDNA).

An emerging molecular technique called eDNA analysis enables researchers to scan samples of water, air or soil for tiny remnants of DNA and identify organisms it came from.

The most common method of collecting eDNA is to use a special kit that filters water and traps biological materials. After capturing the material on the filter, DNA can be extracted in a laboratory.

Shark researchers have been using eDNA techniques for years, testing waters worldwide to find out what shark species are in a particular area—even if they have not been physically seen!

Great whites in the Med

One area of particular interest is the Mediterranean Sea where sharks are rarely seen even though it is home to 47 species, including the great white shark. The Mediterranean white shark is one of the least known and most endangered populations in the world.

Despite living in the area for centuries, great white shark numbers rapidly declined in the Mediterranean Sea, research con-

ducted in 2020 found. Recent analyses suggest that the population has declined by 52 to 96 percent from historical levels in different Mediterranean sectors.

“Looking for white sharks in the Mediterranean Sea is like finding a needle in a haystack. It is a challenging task and thus we used eDNA—an approach notably expanding in the marine world and extremely efficient for detecting cryptic animals—to sniff the tracks of

these elusive sharks,” explained Professor Francesco Ferretti, Virginia Tech.

In June 2021, Ferretti’s team obtained environmental water samples from 16 sites within the Sicilian Channel in which they found four samples (out of 69) with unique gene fragments, meaning great white sharks had recently been there.

Citizen scientists can help
In order to learn more about

the Mediterranean Sea, citizen scientists can be integrated into eDNA surveys to maximise sampling efforts and reduce ship-time costs. Any boat owner and ocean goer can help collect eDNA samples around the Mediterranean, which is one of the most trafficked bodies of water on the planet.

Scientists have developed cost-efficient and easy-to-use kits for sampling and filtering surface water and preserving eDNA to

be shipped back to their laboratory for processing. The team has already partnered with the International Seakeeper’s Society to launch the sailing partners initiative in the Mediterranean Sea and, with the support of the Augmentum Foundation and Yachts for Science, the team aims to expand the sampling range from Malta to the coasts of Tunisia. ■

SOURCES: FISH AND FISHERIES, CONSERVATION BIOLOGY



ELIAS LEVY / CC-BY-2.0

Edited by Peter Symes



FACT FILE

Heterozygous means that an organism has two different alleles of a gene: one version inherited from the mother and one inherited from the father. Gene diversity, or expected heterozygosity (H), is a common statistic for assessing genetic variation within populations. When individuals are closely related or inbred, the estimation of this statistic is less accurate and precise due to the sample's allele copies' increased dependence on one another. Which traits are expressed depends on how the two alleles are related. ■

Great hammerhead has low genetic variation

DNA analysis reveals that great hammerheads have low genetic variation, which makes them less resilient to adapt to a rapidly changing world.

Genomic data reveals historical population declines and high levels of inbreeding in great hammerhead sharks.

In a recent report by the IUCN Red List of Threatened Species, 31 percent of all shark species are threatened (Critically Endangered, Endangered or Vulnerable). In 1980, only nine species of oceanic sharks and rays were listed as threatened.

The great hammerhead's critically endangered status is primarily due to heavy fishing for its large fins, which are highly valued in the shark fin trade. Current estimates of population decline in great hammerheads are dramatic; global population reduction was recently

estimated at more than 80 percent over the last three generations.

Conservation genomics

Conservation genomics is a field increasing in importance with the continuous improvement in sequencing technologies that afford the ability to assemble high-quality reference genomes. From such single genomes, it is possible to derive estimates of heterozygosity, inbreeding and demographic history.

Levels of recent inbreeding can also be inferred from runs of homozygosity (ROH) manifested in the genome sequence, and this has emerged as a valuable component in conservation genomic analyses for a wide range of species.

The low heterozygosity, which was measured in the hammerhead genome, was accompanied by a large number of ROH. The length and number of ROH reflect levels of individual inbreeding, with longer ROH

indicative of recent inbreeding and shorter ROH suggestive of more historical events.

Most inbred species

Genome-wide heterozygosity estimates for white shark, whale shark and hammerheads were at the bottom of those of a broad list of fish species and the hammerhead was below the majority of all but a selected few endangered species of mammals.

Heterozygosity reflects long-term processes whereas inbreeding coefficients are indicative of more recent demographic processes, and thus may be more directly informative of contemporary conservation status.

The inbreeding coefficient for hammerhead was almost 9 percent, comparable to or exceeding other examples of critically endangered taxa such as Malayan and Chinese pangolins, South Asian tigers, pumas, and several species and subspecies of wolves. ■ SOURCE: ISCIENCE

An advertisement for DEMA membership. The background is a photograph of three men in a trade show setting. One man on the left is wearing a black t-shirt with 'NDAN' on it. The man in the center has a beard and is wearing a black t-shirt with 'WATER SOLUTIONS' on it. The man on the right has a grey beard and is wearing a green plaid shirt. The DEMA logo is in the top right corner, with the tagline 'Diving. Explore The Rest Of Your World.' Below the photo, the text reads: 'HARNESS THE POWER OF BEING A DEMA MEMBER'. Below this, four red boxes contain the following text: 'GROW your business.', 'GET INVOLVED and have an impact.', 'SAVE on DEMA Show 2023.', and 'CONNECT & COLLABORATE with other dive industry professionals.' A QR code is in the bottom right corner. At the bottom, it says 'Learn more about the benefits of being a DEMA Member at www.DEMA.org or scan the QR code.'

Great whites are cousins not descendants of Megalodon

Text by David McGuire

The megalodon (*Otodus megalodon*), the largest shark ever to live, could grow up to 20m or 60ft long. This magnificent shark was the apex predator of the sea, until it went extinct about 2.6 million years ago.

Imagine witnessing a white spot moving quickly up from below. From a

blur of white and gray, it turns into an open mouth, two black eyes and large wing-like fins. In three seconds, the image transforms from a vague spot to a great white grin. Five rows (with two protruding rows) of around 300 triangular serrated teeth line a jaw of cartilage around one meter (three feet) wide in a mature great white shark sized around 5 to 6m (16.5 to 20ft). Now, imagine a shark three to four times larger with a mouth 2.9 to 3.7 meters (9.5 to 12.1ft) wide, with

teeth 18cm (9.1in) long and with distinct serrations.

Based on descriptions from the fossil record, the megalodon (Greek for “big tooth”) had six to seven rows of teeth. The front row of teeth numbered around 46, with 24 in the upper jaw and 22 in the lower, with a total of about 276 teeth.

Why did it go extinct?

Scientists are uncertain as to what caused the megalodon to go extinct, but the demise of this shark occurred during a period of cooling and drying in many parts of the world at the end of the Pliocene—this perhaps impacted its range and the availability of prey species. Some scientists have proposed that competition for the same food source may have been a contributing factor.

The truth is in the tooth.

A 2019 study suggested the possibility that the evolution of the great white shark (*Carcharodon carcharias*) may have contributed to the extinction of megalodon.

Now, a new study published in the journal *Nature Communications* has added to the theory that great white sharks may have helped push their larger cousins forever into the fossilized record.

Teeth fossilize well

Shark teeth are heavily mineralized and preserved well as fossils. Given that sharks can shed thousands of teeth over their lifetimes, they provide unique clues into the past.

The team led by researchers at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, measured zinc isotopes in fossilized teeth from both megalodon and white sharks.

Using teeth from more than a hundred sharks, drawing from species alive today and fossilized, the researchers confirmed that the zinc isotope values of sharks living today reflect their place in the ecosystem.

This work is based on a previous study showing zinc isotope ratios as indicators of diet and trophic levels in arctic marine mammals.

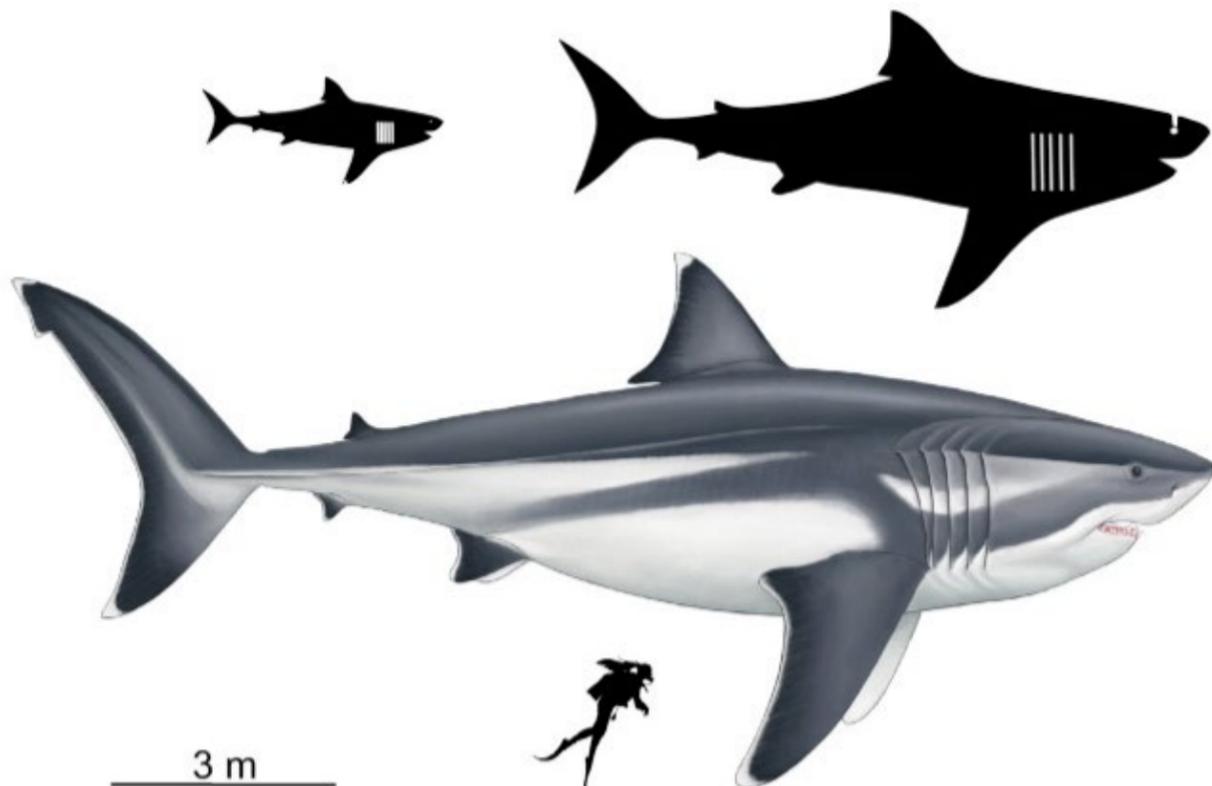
The zinc isotope levels in the teeth of present-day mammals correlate with

where they are in the food chain. The higher up the food chain an animal is, the lower the zinc isotope values they show. For example, sharks that eat small fish have higher values of zinc than sharks that are higher in the food chain that eat whales.

Based on mineral analysis, the authors suggest that ancient great white sharks consumed the same kinds of prey that the much larger shark did. If the great white was eating the same kinds of prey, then the smaller sharks may have competed with the megalodon for food. If so, they might have contributed to its eventual demise, alongside potential changes in other aspects of the ecosystem, like climate.



Reconstruction of megalodon jaws



Visualization of megalodon body dimensions as compared to present-day shark species (adapted from an Oliver E. Demuth illustration)



PIXABAY

This evidence helps to support the theory that competition with the great white shark might have been one factor that removed the mighty megalodon forever from the high seas.

Cousins, not descendants

The similarity in shape and design of teeth between white sharks and megalodons has led to the perception that modern-day white sharks are the smaller counterparts that evolved from megalodons. Given the absence of a complete fossil record, scientists built the megalodon image into a great white shark on steroids. This image of a ferocious, ship-swallowing

super-predator has intrigued many, and fueled many a *Shark Week* episode and films like *The Meg*.

The relationship between white sharks

and megalodon was first formalized by the Swiss naturalist Louis Agassiz who first named the megalodon (*Carcharodon megalodon*) in 1843. Agassiz observed that great white shark teeth and the fossil megalodon teeth were both serrated, and placed megalodon into the same genus as white sharks, *Carcharodon*.

However, new data analyzing tooth morphology and root type confirmed that the megalodon is *not* ancestral to the great white shark. Hence, megalodon was placed into a new genus, *Carcharocles*. Further investigation and analysis of dentition led scientists to again reclassify megalodon into the genus *Otodon*, more closely related to the extinct *O. obliquus* and represents a separate lineage from the great white shark.

White sharks & makos are closer

Instead, it is believed that white sharks are more closely related to mako sharks, both in the family Lamnidae. Fossils of a newfound species of shark,



KAREN CARR / CC BY 3.0

Artistic impression of a megalodon pursuing two *Eobalaenoptera* whales

Carcharodon hubbelli, suggest the modern great white shark actually may have descended from broad-toothed mako sharks.

Using computer-assisted imaging and measurement methods, Kevin Nyberg and Gregory Allan Wray of Duke University and Charles Ciampaglio of Wright State University examined the similarities and differences among great white, megalodon and extinct mako teeth. They determined that the extinct mako and great white teeth and roots were similar in shape and were clearly distinct from megalodon. On the other hand, white sharks

evolved from a more moderate-size, smooth-toothed relative of mako sharks.

So much attention is given to great white sharks, much of it negative. As we discover the relationships of sharks over time and their role in marine ecosystems, we cannot overlook the current crisis facing many species of sharks.

Over one-third of shark species are threatened with extinction largely due to overfishing. If we do not act now, many modern-day sharks will follow the megalodon, and within a far shorter time span. ■



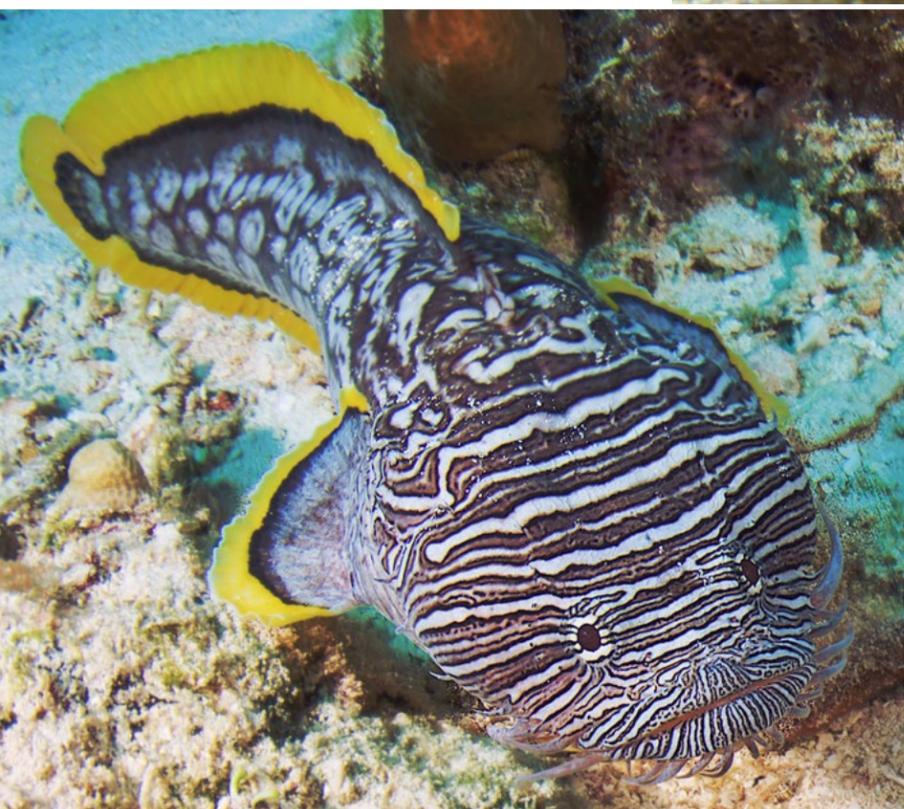
JIDANCHAOMIAN / CC BY-SA 2.0

Shortfin mako shark, *Isurus oxyrinchus*, off Catalina Island, California, in the eastern Pacific Ocean

The unique, striped and flat face of a splendid toadfish. Look a bit closer to see that this toadfish is being cleaned by a cleaner shrimp.

Text and photos by Steve Rosenberg

The wide and flat-faced, striped critter known as the splendid toadfish is just that—splendid! Underwater photographer and author Steve Rosenberg takes a closer look at what makes this lovable fish so special.



The splendid toadfish can be spotted in Cozumel, Mexico.

The Amazing **Splendid Toadfish** *Unveiled*

I had my initial encounter with a splendid toadfish on my very first trip to Cozumel in 1978. I remember my dive guide excitedly motioning me over, gesturing enthusiastically toward the edge of a small sandy area, where it abutted against the bot-

tom edge of the reef. I swam over to take a look, getting low as he directed. I kept scanning the general area where he was pointing, but saw nothing of particular interest. I finally realized what he had spotted, when I was no more than a foot away from a

very strange little fish.

Protruding ever so slightly from the mouth of a small cave was a wide, flattened face with horizontal black and grey stripes. I recall being fascinated by the row of thick blue/grey whisker-like appendages extending outward

from its jawline. I gave my guide a big thumbs-up, and settled in to take a few shots with my Nikons. I was using a macro rig, and gingerly placed my framer around the oddly shaped little face.

There are many species of toadfish around the world, all



Splendid toadfish are named so for the flamboyant stripes and blotchy markings on their bodies. They come out at night to hunt (right).



help them hide from potential prey, even when they are out in the open.

Characteristics

I had a difficult time imagining that the splendid toadfish would be capable of hiding from anything. Cozumel's resident toadfish is called a "splendid" toadfish for a reason. It has a rather gaudy

dorsal fins, two pectoral fins, two pelvic fins, a caudal fin and an anal fin—all of which are bordered with a strip of bright yellow.

An adult splendid toadfish can grow to be about 10 inches (25cm) long, with a large head and a long body that tapers down to a point. Its relatively good size and flamboyant colors would certainly make it eye-catching... except for the fact that this fish lives mostly sequestered in small, protected dens, with only its head visible. One of the most distinctive features of the splendid toadfish is its wide compressed head and jaw, edged with blue fleshy whisker-like appendages called "barbels."

Toadfishes have very powerful jaws. It would probably be advisable to be careful not to get your fingers too close to their mouths. Toadfish may try to bite as a defensive action. Their strong jaws are lined with small, sharp teeth. They have deep-set eyes that are located

on the top of their heads, and positioned to look upwards. As with many species that live close to the sand, they do not need forward vision.

Distribution

The splendid toadfish was thought by many to be strictly endemic to Cozumel, a small island located off the coast of Mexico's Yucatán peninsula. However, over the course of the last thirty years, it has been spotted in various nearby locations. I have seen and photographed them along the shoreline in Honduras and in the shallows off the coast of the Yucatán near Playa Del Carmen. They have also recently been encountered around the island of Isla Mujeres, located to the north of Cozumel off Cancun, and on a reef in Belize.

Behavior

As an ambush predator, this toadfish hides within small crevasses and cracks along Cozumel's shallow coral reefs with just the forward end of its face peeking out, making it somewhat difficult to spot. They are not called toadfish because they look like toads. The name originates from the fact that they produce a repetitive, audible croak that is associated with mating behavior.

If you hear their croak during a

of which have solid colors of brown, olive and gray, allowing them to easily blend in with their surroundings. Toadfish are ambush predators, and they normally use their drab coloration as camouflage, which would

color pattern. Its face and upper body has horizontal stripes of black, blue and grey, while the long, rear body area has larger, blotchy-black to charcoal or blue markings. This species of toadfish has a total of eight fins: two

While it was previously thought that splendid toadfish were only found in Cozumel, they have in fact been spotted along the Yucatán coast at Playa del Carmen, as well as north at Isla Mujeres (off Cancun), and even in Belize and Honduras. To find and photograph them, listen for the tell-tale croaks or grunts they emit and swim slowly along the sandy bottom to peer under ledges.

dive, start looking around the edges of the flat, sandy areas adjacent to the lower edges of the reef. Scan the edges of the sand flats where they border the bottom of the reef slopes, specifically looking for small recesses or caves. The toadfish can often be found inside low cave openings. Usually, only their bewhiskered faces will be visible.

Get as low as possible and follow the bottom edge of the reef until you find a low cave opening. Peer inside. If a toadfish is present, it will initially hold its ground. Approach slowly, so you will not startle the fish, causing it to withdraw farther into the interior of the reef.

Photographing toadfish

Dive guides sometimes use commercial lures resembling squid to entice them out. Recently, some divers have been able to tempt toadfish out of their dens or caves by offering free meals of freshly speared lionfish. On occasion, I have been able to draw them out by mimicking the grunting sounds that they make.

If you are able to get a toadfish out in the open, move very slowly so you will not scare them. I like to take a test shot before I start looking for them, so that I will be pretty confident of my camera settings before approaching the toadfish. I like to shoot on manual



settings, so I will usually do this for any type of shot of a possibly skittish subject.

Divers who want to find splendid toadfish to photograph, video or just observe for a while should talk to their guide before the dive, to get the guide to help find them. Toadfish can usually be found on many of the shallow reefs in Cozumel, including Paradise, Yucab and San Francisco Reefs. They are most often found on the western sides of these reefs.

Use the current to push you along as you listen for the tell-tale croaks or grunts they emit. Once you hear them and know they are present, get close to the sandy bottom, swim slowly and peer under ledges to look for the fish. Stay a foot or two from the sand, maintaining neutral buoyancy, and most importantly, slow down.

I like to use a reef stick to hold my position and examine an area more closely. The reef sticks also can be used as portable tripods. If you find a subject sitting on its doorstep, con-

centrate on getting a good image or two of the toadfish perched at the front of its cave, before you start thinking about ways of trying to entice it to come out in the open. Your guide may be able to coax one out, but remember that they are usually not too enthusiastic about leaving the safety of their dens.

At night, they can occasionally be found hunting out in the open. Since the fish is a nocturnal hunter, night dives improve your chances. Look for toadfish prowling the reef in search of small fishes, snails and polychaete worms. Remember to take your time on your dive, and enjoy the experience. The splendid toadfish is definitely one of my favorite fish to photograph in Cozumel. It is always a challenge to improve upon your previous shots. ■

Since 1980, Steve Rosenberg has worked as a professional photojournalist and underwater photographer. In addition to writing hundreds of

articles on dive destinations, underwater photography and marine biology for various US publications, he has produced eight travel guides for dive destinations, including the Hawaiian Islands, Cozumel, the Turks & Caicos Islands, the Galápagos Islands, the Bahamas and Northern California. In addition, he has written many coffee-table books on diverse locations. Thousands of his photographs have been published in numerous publications, periodicals, posters, stamps, advertisements and works of art around the world. He has received more than 250 national and international awards for his photography, including the coveted First Prize Award at the Han Hass Competition in Austria. With 5,000 dives, he earned the SSI Platinum Pro Certification. He participates in Society of American Travel Writers activities (SATW) and serves as a contributing editor and senior board member at **ReefID.org**.

marine mammals

Text edited by Peter Symes



Whales are bothered by drones getting too close

Drones have become an important research tool for studies of cetaceans and a popular among many dive travellers who are keen photographers. However, drones can also be a disturbance to cetaceans, particularly when flown at low altitudes.

Drone footage of marine mammals helps us better understand their behaviour and social structure or simply provides us with some stunning footage we could not obtain otherwise. However, drones can also affect whales, dolphins and other mammals if flown too close. So, what is too close and

what are safe distances?

While using drones to conduct research on the behaviour of beluga whales (*Delphinapterus leucas*) in the St. Lawrence Estuary, Jaclyn A. Aubin, a PhD student at the University of Windsor, soon noticed that the drones they flew sometimes seemed to disturb the belugas.

Her colleagues also observed sudden dives, where most of the animals below the drone suddenly dove, often with considerable splashing. These responses appeared to be particularly common when the drone was flown at low altitudes, around 20 metres above the water.

Further research into these observations was conducted, which examined the impact of drones on endangered St Lawrence belugas

and reviewed drone studies of cetaceans to identify altitude thresholds linked to disturbance.

Not closer than 25m

It is recommended that an altitude of minimum 25m is maintained during drone-assisted studies of belugas, and larger groups should be approached with caution. The findings are in line with the literature review, which indicates that drone flights above 30m are unlikely to provoke disturbance among cetaceans.

Small drones (less than five kilogrammes) were also found to be much more discrete than the large, over 10-kilogramme drone models that are frequently used in modern research programmes.

Recommended practices

The findings prompted researchers to make seven recommendations for future drone studies of whales and dolphins:

1. Drone studies should maintain an altitude of 25 metres or more.
2. Researchers using drones to study whales and dolphins should weigh the conservation benefit of low-altitude flights against the potential for disturbance.
3. Pilots should use special caution when flying over large groups.
4. Pilots should use special caution when first approaching a group.
5. Pilots using large drones (those weighing more than 10kg) should be particularly vigilant to drone disturbance and should report on the effects of large drones on whales and dolphins.
6. Future drone studies should clearly define the disturbance behaviours they will watch for.
7. Using a precautionary approach, drone pilots should avoid sudden accelerations, avoid approaching animals head-on and maintain special caution in low wind conditions.

By reducing the disturbance impact of research on whales and dolphins, we can help protect these amazing animals. ■

SOURCES: MARINE MAMMAL SCIENCE



Not that close, please. Drone flights should be kept above 30m where they are unlikely to provoke disturbance among cetaceans.

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For more information, contact Mark Caney, the author:
mark@dolphin-way.com

From the first moment I opened "Dolphin Way", I was instantaneously captivated by the story. I indulged and read through the night till the final page. Though a novel, Mark has unravelled both facts and mysteries surrounding these fascinating, endearing animals. As a fellow marine mammal and ocean aficionado, I loved the book.
 – Ocean Geographic Magazine

A superbly plotted, accomplished and entertaining novel with a powerful environmental message describing the intolerable pressure from human destruction of the dolphins' world.
 – Whale and Dolphin Conservation

Equipment

Edited by
P. & G. Symes

Dive Rite Nomad Ray

The US-made, flat, streamlined and ergonomically shaped Nomad Ray side-mount system is suitable for entry-level to technical dives, warm or cold water, aluminum or steel tanks. With 42lb lift capacity, it provides buoyancy needed for multiple stage/deco bottles and heavy steel tanks. Features include abrasion-resistant "skid plate"; fast-drying, durable, slash-resistant SuperFabric material; independently adjustable harness design and replaceable shoulder and waist webbing; fast, tool-free bungee length adjustment system; quick-adjust belly band with custom molded bungee hook; custom-designed marine-grade stainless hardware; three integrated weight pockets with zipper access; and two pull dumps/OPVs. Weighs 5.7lbs (2.6kg). Comes in black, blue, pink, red and OD green. DiveRite.com



Osprey Transporter Waterproof Duffel 100

With an IPX7 fully submersible waterproof rating, this massive, rugged 100-liter, travel-ready duffel dry bag with easy-to-operate zip closure, ample lash points and padded shoulder straps will store and keep everything you need high and dry even in the worst conditions, states the manufacturer. Made of Bluesign-approved 630D recycled diamond ripstop, high-tenacity nylon fabric, which is double TPU-coated for extreme abrasion resistance, it has fully removable backpack straps/carry handles and durable non-corroding aluminum hardware. Weighs 1.4kg and measures 85 x 46 x 32cm. OspreyEurope.com



AP Rebreather Mouthpiece

Designed with true single-handed lever operation with easy-to-find raised grips, which is also visible to a dive buddy, the new and improved RB160 Rebreather Mouthpiece allows you to switch easily between open and closed positions. Features include tactile feedback when switching; increased field-of-view and easier camera viewport access with a mouthpiece outlet offset to the top; comfortable and secure position in the mouth, with full compatibility with AP REBSM Headstrap; easy clearing, with optimization of the water channel size; deep ty-rap channel for secure mouthpiece attachment; and robust injection-molded construction of Acetal with PTFE, with strengthening ribs. It has a 15% improvement in work-of-breathing over its previous design and in-built one-way silicone valves, which lower CO₂ dead space in the chamber. APDiving.eu



Dynamic Nord SP-72 Wetsuit

Designed with the most demanding divers in mind, this German-engineered wetsuit is easily donned and doffed, with zippers and seals at wrists and ankles, and has shoulder and knee protectors integrated into the suit, which do not hinder flexibility, states the manufacturer. It has a sealed back zipper, which prevents water circulation, and wrists that are sealed with the sleeves. The sleeves and legs have a preformed, three-dimensional design for relaxed comfort underwater. The suit comes in both 5mm and 7mm versions, with the latter rated Class A for thermal protection capability. It is constructed of neoprene, made with earth-mined limestone instead of petrochemicals, with reduced energy consumption and CO₂ emissions, using Eco Carbon Black (sourced from recycled rubber tires), and a fabric dyeing machine that saves up to 60% in water and energy use. DynamicNord.com



Geneinno S1

Compactly designed, this underwater scooter can fit into a carry-on bag and offers propulsion and stability with speeds up to 1.8m/s, at depths up to 50m, and a quick-change battery that can be replaced in 10 seconds, allowing for longer travel time. A detachable floater helps maintain positive buoyancy. It has a universal action-camera mount compatible with most models. Features include user-friendly controls; up to 60 minutes of running time; 26lbs (12kg) of thrust; two variable speeds of 3.6 and 6.5 km/h; built-in low-power chip; rechargeable lithium battery included; anti-lost rope; and child safety lock. Weighs 8.2lbs (3.7kg) and measures 19.68 x 8.2 x 8.89in.

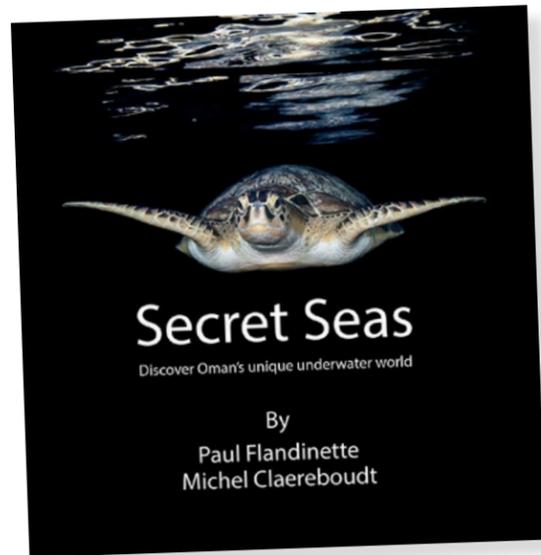
Geneinno.us



Electric diveboat anyone?

Up to 12 passengers can experience electric hydrofoiling in the Candela P-8. It has one electric pod motor, which allows the P-8 to cruise in almost complete silence, so it does not disturb marine wildlife or contribute to sound pollution. While the P-8 is being branded as a "water taxi," its size appears to be ideal for divers as well. Energy consumption is reduced by 80% when the computer-controlled hydrofoils lift the hull above the surface, so it can cruise for 40 nautical miles at 20 knots. At 30 knots, passengers still get a smooth yet thrilling ride even in choppy seas, as it flies above wave crests, without noise or slamming. Designed for panoramic views, the climate shell ensures passenger comfort even in sub-zero temperatures or tropical heat. Consuming less energy per rider than a car, it is cheaper to run than vessels with combustion engines. Candela.com

Edited by
Catherine GS Lim



Oman

Secret Seas: Discover Oman's Unique Underwater World, by Paul Flandinette and Michel Claereboudt

A powerful weather system, the Khareef periodically transforms Dhofar's barren landscapes into a lush landscape full of wildlife and plants. This significantly affects Southern Oman's underwater world too. This book examines the diversity of Oman's marine life, from sea turtles to whale sharks, and explores the unique ecosystem where tropical and temperate species live side by side. The coral communities here are home to over 1,600 species of fish and nearly 200 coral species. This book is indeed a window into the depths of Oman's underwater world—a world of stunning images and fascinating insights.

Publisher: Mazoon
Date: July 2021
Hardcover: 240 pages
ISBN: 978-99969-849-0-7

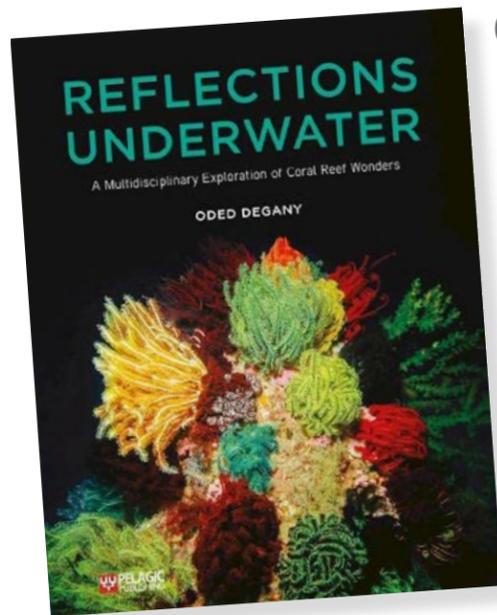


Cave Diving

Hidden Realms: A Celebration of 100 of the Finest Caves and Mines in Great Britain and Ireland, by Martyn Farr

From as early as the front cover, this book promises to be a visual treat (and tribute) to 100 of the most outstanding caves and mines in Great Britain and Ireland. Written by world-renowned caver Martin Farr, this book showcases his vast experience and passion for caving, as he invites readers to explore alongside him the secret and wold places in the British Isles.

Publisher: Vertebrate Publishing
Date: May 2023
Hardcover: 224 pages
ISBN: 978-1-83981-081-7



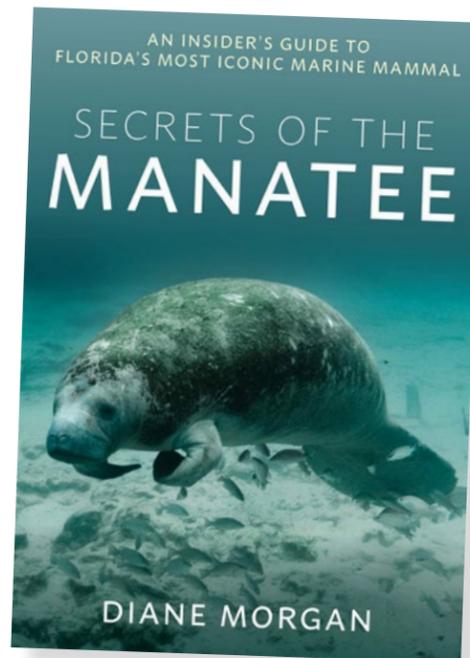
Coral Reefs

Reflections Underwater: A Multidisciplinary Exploration of Coral Reef Wonders, by Oded Degany

This book presents a unique and enlightening perspective on coral reefs. It adopts a multidisciplinary approach to the

topic, weaving together scientific and humanistic ideas, including evolution, psychology, philosophy, art, mathematics, physics, zoology, etc. Illustrated with photographs by the writer, readers are offered a captivating angle on these vulnerable habitats. It is meticulously researched and elegantly argued, making it an essential read for all.

Publisher: Pelagic Publishing
Date: 30 March 2023
Hardcover: 288 pages
ISBN-10: 1784274135
ISBN-13: 978-1784274139

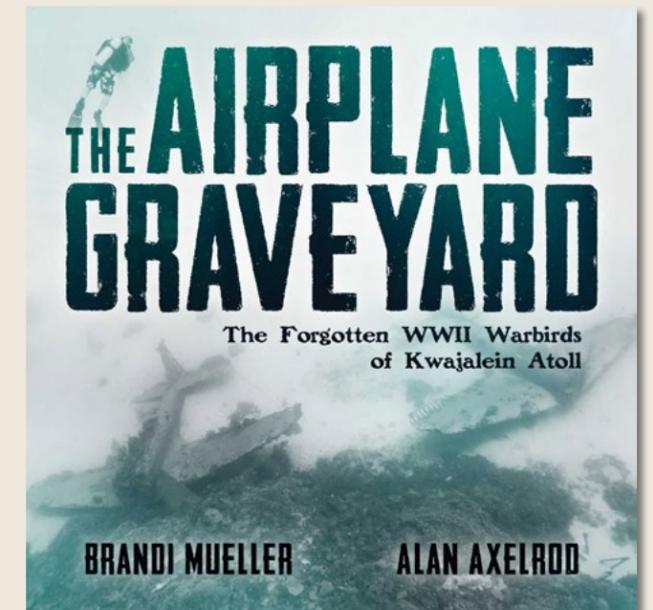


Manatees

Secrets of the Manatee: An Insider's Guide to Florida's Most Iconic Marine Mammal, by Diane Morgan

This book is all about the manatee, its behaviour, biology and evolutionary history. Author Diane Morgan explains in detail how it stays warm, swims, feels, sees, hears, communicates, reproduces, etc. This book will prove to be an interesting read for people who care about this intriguing animal, those who want to learn about them, as well as those who want to save them.

Publisher: Pineapple Press
Date: 1 April 2023
Paperback: 136 pages
ISBN-10: 1683343484
ISBN-13: 978-1683343486



Never before published in book form, see extraordinary images of the forgotten American WWII airplanes resting on the bottom of the Kwajalein Atoll lagoon, from award-winning underwater photographer Brandi Mueller. Available on: **Amazon.com**

REVIEW

Review by Peter Symes

An enlightening trip down memory lane and into the annals of early technical diving is Simon Pridmore's latest opus, *Technically Speaking: Talks on Technical Diving Volume 1: Genesis and Exodus*.

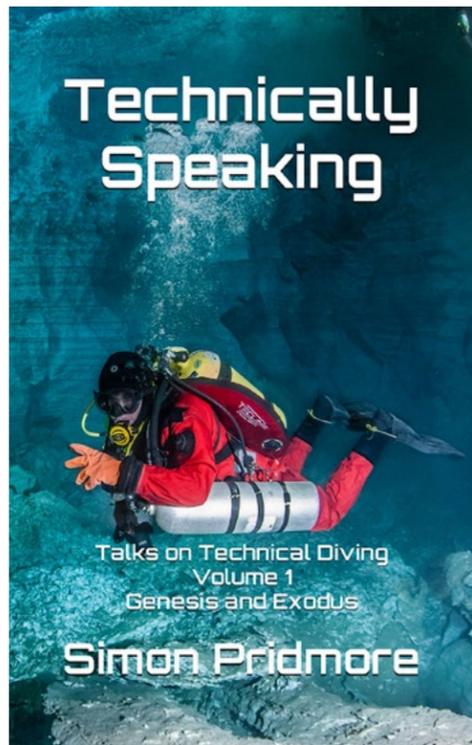
Yes, it is about technical diving but more about crucial events and turning points that have profoundly affected how we teach and practise both recreational and technical diving today. As such, it puts our current practices into a historical context, and teaching and procedures that we now take for granted or are self-evident often only came about after a long and often twisted evolution.

As Pridmore points out, "When you execute planned decompression-stop dives using mixed gas and multiple gases, with open-circuit or closed-circuit hardware ... whichever of the alphabet soup of agencies trained you in this kind of diving—you will be carrying the same equipment, configured

in one of a few recognised, accepted and well-tried ways, and using similar combinations of gases, decompression tables and procedures. These methods and technologies were born among individuals and groups of sport divers in the USA several decades ago."

As such, this is a book every diver should read. Not only is it educational, but it does not hurt that it is also quite entertaining, like a documentary, which could just as well play out on the *National Geographic* or *Discovery* channels, only in book form. The chapters are self-contained and stand on their own, like episodes in a series—or what is termed "Talks."

People, whose actions laid the foundations for change, are the core subjects of these talks. All were pioneers, all had unconventional methods, and none could be easily confined or defined, as Pridmore puts it. They would be the savvy entrepreneurs, inventors and engineers, charismatic prophets, tireless trainers, cosmopolitan



travellers, gifted writers and natural marketers within the dive community who would carry the torch forward.

In-depth and insightful, the book is a must-read for divers who want to learn more about technical diving. With this new book, "EnSimonlopedia" Pridmore has done it again. ■

Available in hardback, paperback and ebook at Amazon Worldwide, Apple, Kobo, and Tolino. For more information, visit: SimonPridmore.com

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Text by Simon Pridmore
Photos by Andrey Bizyukin,
Larry Cohen and Olga Torrey
Historical photos courtesy of David Strke

How did some of the advanced technologies we use as divers today come to be? Simon Pridmore takes an intriguing look into the early days of rebreathers with an excerpt from his new book, *Technically Speaking—Talks on Technical Diving, Volume 1: Genesis and Exodus*.



The Early Days

Rebreathers in Sport Diving

ANDREY BIZYUKIN



WWII Sub-Lieutenants Henty-Creer and Shean with O₂ rebreathers, ca. 1942

It took a while for sport divers to start using rebreathers, although if you look back far enough, you can see that people were using them to go underwater for sport well before the Aqua-Lung came along. In his excellent book, *The Darkness Beckons*, Martyn Farr wrote that UK amateur cavers were using ex-government/military

oxygen rebreathers in 1945. Farr also reported that the first sport diving rebreather fatality took place on a British sump dive in 1949.

However, generally speaking, up until the late 1960s, rebreathers were the tools of professional divers, and the flourishing new sport of scuba was all about air diving on open circuit.

The marine biologists

Then, as the 1970s loomed, *Skin Diver* magazine—the Bible of US sport diving at the time—started getting interested in closed-circuit technology. An article in July 1970 about a “cryogenic” rebreather using frozen oxygen as the breathing medium was followed up the following month

by a short article announcing a new machine called the Electrolung.

This was a mixed gas rebreather designed and built by two marine biologists, Walter Starck and John Kanwisher, both of whom had significant skills beyond their primary field of work. Starck was an inventor—he developed dome ports for camera



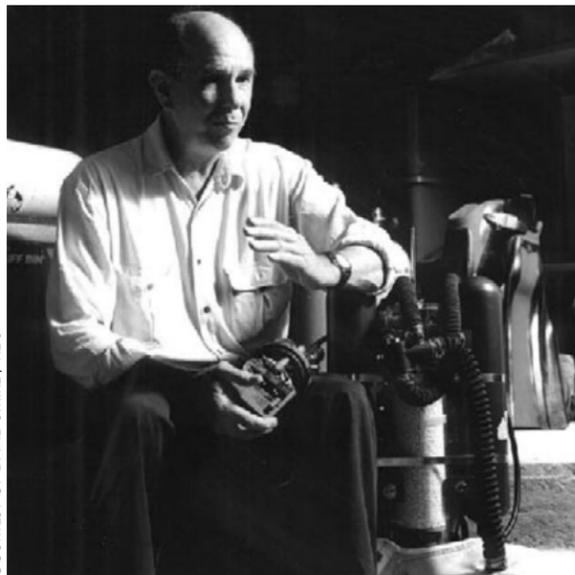


OLGA TORREY



COURTESY OF DAVID STRIKE / HDS

housings, among other things—while Kanwisher was a wizard with electronics. They met on an expedition in the



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Dr Walter Stark with Electrolung rebreather (above); East German O₂ rebreather from the Cold War era (upper left inset)

mid-1960s and discovered that they had a shared dream of constructing a machine that would allow them to go deeper and spend more time underwater doing their research. Alone, they did not have the wherewithal to turn this dream into reality, but together, they did. They combined their resources, sold the concept to the Beckman Instruments Company, and began development in 1968.

By the time *Skin Diver* revealed the Electrolung to the sport diving world, there were 30 units in use and in the subsequent issue of the magazine, editor Paul Tzimoulis showed he had done more than just regurgitate a press release, he had actually gone diving on an Electrolung. His story was entitled, “300 Feet on Computerized Scuba,” and described in detail a course he had taken with Starck

that had culminated in a dive to that depth off Andros Island in the Bahamas. Tzimoulis was completely enthralled by the experience and declared that the Electrolung “will undoubtedly revolutionise deep diving technique.”

At that time, if you had wanted to buy an Electrolung, it would have cost you US\$2,975, which was about the same price as a new Chevrolet pick-up truck.

Tzimoulis was right about the technology, but his prediction would take 30 years to materialise, and it would not be the Electrolung that led sport diving into the future. In 1969, a diver died using an early version of the unit and, over the following three years, there were three more deaths, including a diver who was harvesting black coral in May 1972. This was the last straw.

A New Dive Book from Simon Pridmore

“Simon Pridmore's new book, *Technically Speaking* is an outstanding tour de force from one of modern diving's most accomplished practitioners and best-selling authors.”

— David Strike, Oztek & Tekdive Convenor

“Simon has completed a complex task with consummate skill and has accurately unravelled the when's, the who's and some of the why's, much of which would have been unjustifiably lost in the mists of time if not for this work.”

— Kevin Gurr, Technical Diving Inventor & Innovator

“It will take some doing to better this account of tech's first steps... as no matter how much you know or think you know; you will still find many obscure historical gems...”

— Kevin Denlay, Early Adopter & Wreck Finder

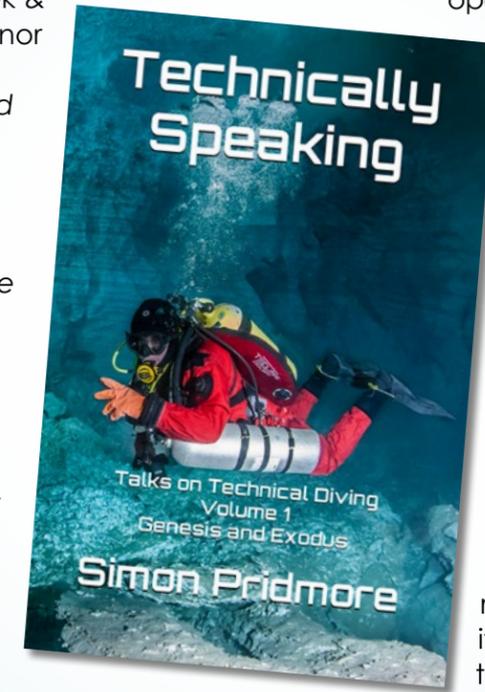
Technically Speaking is the latest book from best-selling Scuba series author Simon Pridmore. It is a selection of themed talks telling the early history of technical diving—where it came from, how it developed, how it expanded across

the world, who the important movers were and how, in the decade from 1989 to 1999, the efforts of a few determined people changed scuba diving forever.

These ten years saw the greatest shake-up the sport has ever seen but technical diving's road to universal acceptance was anything but smooth, many obstacles had to be overcome and there were times when even viewed in retrospect, it seemed that its advocates might fail in their mission. Ultimately, success came down to perse-

verance, people power, good timing and more than a little luck.

Available in hardback, paperback and ebook at **Amazon Worldwide, Apple, Kobo, and Tolino.** See **SimonPridmore.com**



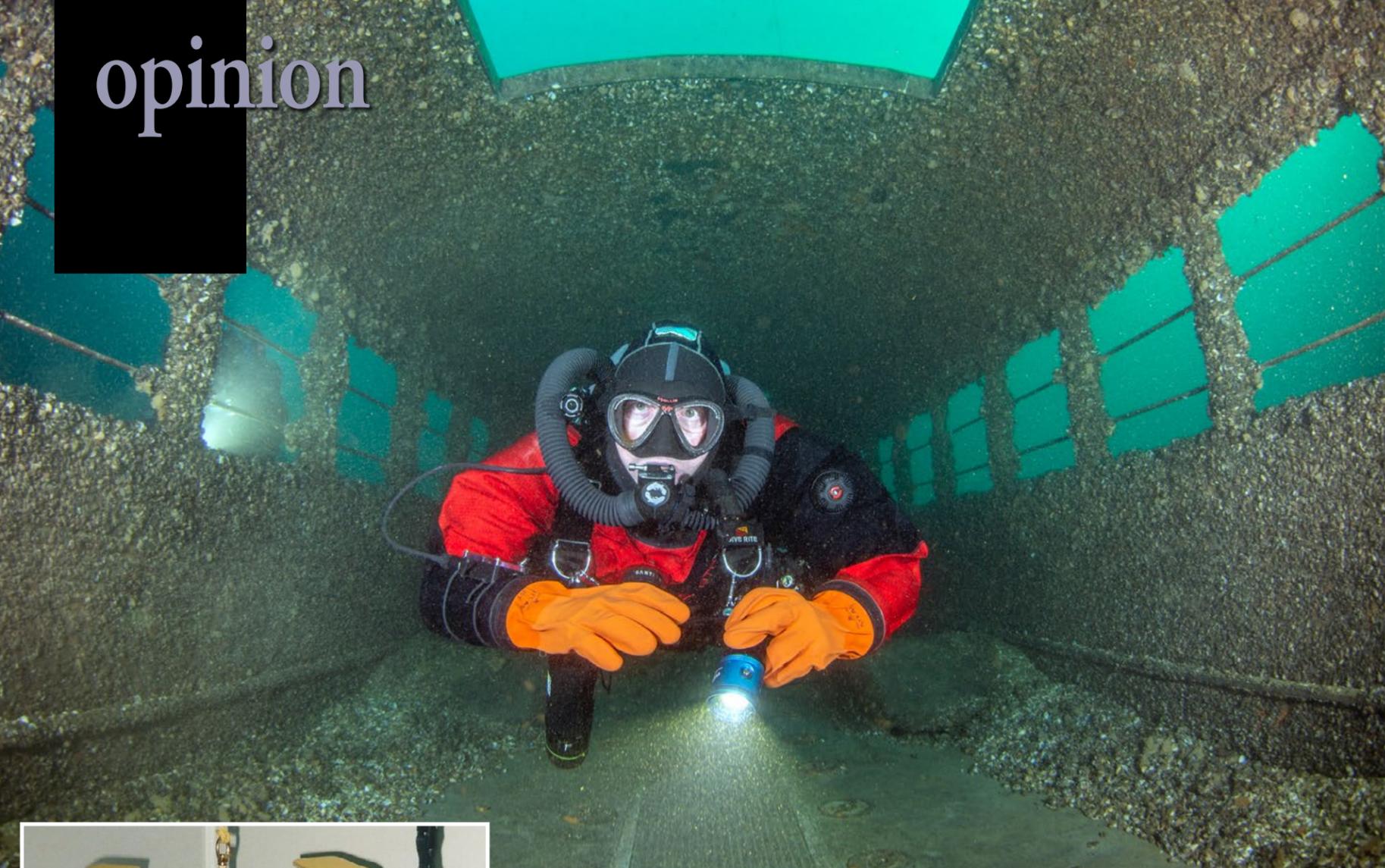
Scuba diving is an adventure sport and accidents are inevitable, but with so few units in use, even one death a year was commercially intolerable.

Beckman pulled the plug, and the production plant was closed. In fact, the company shut down its entire marine division. The rights to the Electrolung reverted to Starck. He headed off to live in the South Pacific, and his machine became a historical footnote. He had shown what was possible, but also what the risks were. The echoes of the Electrolung story would resound through US sport diving over the following decades and any inventors

and investors thinking of following in Starck and Kanwisher's footsteps would always keep their cautionary tale in mind.

The 1980s cavers

Several years later, when sport divers started toying with the idea of mixed gas rebreathers again, it was those dwelling in the outer reaches of the sport diving universe who started the ball rolling. In the 1980s, cave divers in both Europe and the United States found they needed to go farther underwater underground than conventional sport diving equipment could take them. They concluded



OLGA TORREY

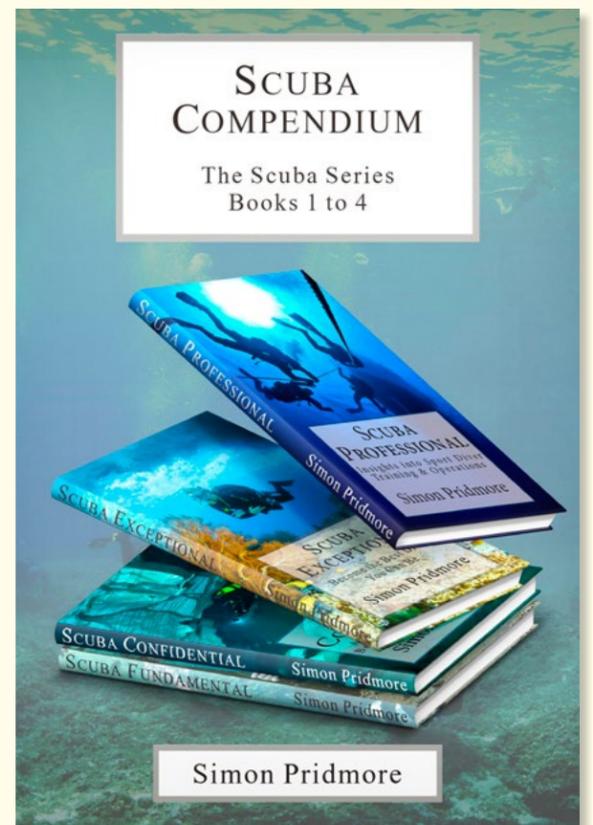
NEW 4 in 1!

Simon Pridmore has released a new single-volume e-book, bringing together four books in his bestselling Scuba series:

- *Scuba Fundamental – Start Diving the Right Way*
- *Scuba Confidential – An Insider's Guide to Becoming a Better Diver*
- *Scuba Exceptional – Become the Best Diver You Can Be, and*
- *Scuba Professional – Insights into Sport Diver Training & Operations*

As Simon puts it, this is "a remastering and repackaging of the original albums rather than a greatest hits." Nothing is missing. *Scuba Compendium* gives e-book readers the advantage of being able to access all the knowledge contained in the four books in one place, making this a unique and easily searchable work of reference for divers at every level.

Simon has always promoted the idea of safer diving through the acquisition of knowledge, which is why he has chosen to release this highly accessible version. If you have read his work before, you will know that he provides divers with extremely useful advice and information, much



of it unavailable elsewhere; his points often illustrated by real life experiences and cautionary tales. He examines familiar issues from new angles, looks at the wider picture and borrows techniques and procedures from other areas of human activity.

E-book File Size: 5298 KB
Published by Sandsmedia
Sold by: **Amazon, Kobo, Tolino** & others
ASIN: B09DBGHJSC

simonpridmore.com

purpose was to enable him to negotiate a sump, which lay at the end of several miles of very difficult dry cave in Huautla, Mexico, and it would have to arrive at the sump still functioning.

Three years later, in 1987, Stone's prototype, the Mark I—nicknamed FRED (Failsafe Rebreather for Exploration Diving) and weighing in at 93kg—was finally ready for testing. Stone carried out a 24-hour dive on it at Florida's Wakulla Springs, breaking

a number of records in the process and managing the entire dive using only one of the unit's two rebreather systems. The other one remained unneeded and untouched.

The previous year, British caver Rob Palmer had asked if he could use Stone's Cis-Lunar to explore the Blue Holes of Andros Island in the Bahamas, but it was not yet ready. So, instead, he used mixed gas rebreathers provided by Stuart Clough's Carmellan

underwater for several hours depending on the depth—the deeper, the shorter—but with the new 'double-circulation' equipment I was able to stay up to 48 hours underwater irrespective of the depth."

His achievements with both the STR-80 as well as with open-circuit mixed gas extended the concept of what was possible and opened minds elsewhere in the sport.

Hasenmayer was notoriously secretive. He told very few people about the STR-80 and what he had achieved with it. He was the "lone-est" of lone wolves in a field of activity where lone wolves were very common. On 9 September 1982, at Fontaine-de-Vaucluse in France, he became the first sport diver to reach a depth of 200m, descending alone after dark with no dive team

or surface support; the only person who knew about this was his wife, who stayed in their lodgings in a nearby village, no doubt sitting sleepless through the long night, awaiting his return.

So, it is unlikely that US extreme caver Bill Stone had heard of Hasenmayer's STR-80 when he started building the first version of his Cis-Lunar rebreather in 1984, but in drawing up his design, he followed a similar thought process, prioritising safety and, like Hasenmayer, built a unit that consisted of two complete and separate rebreathers. At this point, Stone was unconcerned about considerations of size or weight. His machine also needed to be as indestructible as he could make it. He would not be putting it on in the open air by the side of a French river. Its primary



Cis-Lunar rebreather, DEMA Show, 1996

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LARRY COHEN

Research in the United Kingdom. These were modified biomarine military units that Clough called CR155s.

Around the same time, Swiss cave diver Olivier Isler and French electronics engineer Alain Ronjat were busy

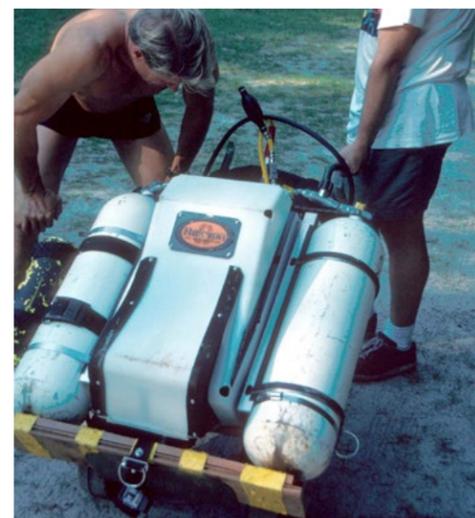
designing a triple semi-closed rebreather to extend the penetration of La Doux de Coly in the Dordogne, France. Earlier, in 1984, Isler had completed a 3,100m dive there on open circuit, but he knew the cave went on much farther. He just

George Irvine
with Halcyon
rebreather

lacked the means to get there.

"[The 1984 dive was] accomplished with an enormous back mounted aqualung [five 20 litre cylinders, or 23 cubic metres of gas—about 812 cf.], along with many more cylinders for back-up and emergency. I could have continued the push, but it would have required a massive investment of energy. Very long dives would be necessary to place and retrieve the necessary stage cylinders before and after the main exploration push. These would have called for a formidable team of assistants serving a single exploration diver, much like the early Himalayas expeditions.

"Instead, I wanted to bring a measure of elegance to the way La Doux De Coly and other underwater caves are explored. La Doux De Coly provided the needed impetus to develop a unique type of self-contained aqualung. I had the good fortune to meet Alain



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Ronjat, an electronics engineer who was fascinated by the intricacies of breathing apparatus. Between us, with just over 5,000 hours of hard labour, we designed the Ronjat Isler semiclosed system, which we named the RI2000."

On 31 December 1989, Isler completed a major dive in La Doux de Coly using the RI2000 and announced it as a technological breakthrough, only to learn that Hasenmayer had accomplished similar dives nine years earlier using his STR-80. Despite the fact that he and Hasenmayer were two of very, very few people doing this sort of diving, Isler had no idea.

Such was the world before the Internet.

Isler did not care. Being first with the technology was not his goal and the RI2000 would turn out to be everything he wanted. In 1991, he reached 4,055m in La Doux de Coly, which gave the



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Stuart Clough and UT240 rebreather, TekAsia, 1996



LARRY COHEN

cave the status of being the longest siphon in the world—at least the longest one anybody knew about at that time. In 1998, his RI2000 took him even farther—4,250m into the cave—on a 12-hour dive at an average depth of 45m, just using the box on his back.

Isler was the inspiration for German cave explorers Dr Reinhard Buchaly and Michael Waldbrenner of the European Karst Plains Project (EKPP) to build a semi-closed rebreather called the RB2000 for further Doux de Coly pushes. The RB2000 subsequently became the exploration rebreather of choice for the Woodville Karst Plain Project (WKPP), replacing its unwieldy PVR-BASR unit, which was nicknamed "The Fridge."

In 1999, Halcyon began marketing the RB80, a US version of the RB2000.

A sport diving revolution

In developing and deploying various applications of closed-circuit rebreather technology,

these cave explorers all had specific personal ambitions in mind. They certainly did not see themselves as leading a sport diving revolution.

In Hasenmayer's case, it probably never crossed his mind, any more than he ever considered advertising his achievements and becoming famous. As for Isler, this was what he thought: "With regard to the future prospects of rebreathers for sport diving applications, I believe their widespread adoption is unlikely. Indeed, it seems that only extreme situations fully justify their use."

Stone and Clough were certainly well aware of the potential for commercial development, but in Stone's case, his primary focus was always on the cave and, by the time he and his company got around to producing rebreathers to sell to the public towards the end of the 1990s, it was too late. By then, other firms had developed models targeted specifically at sport divers and were well ahead in terms of marketing



OLGA TORREY

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Rebreathers

Halcyon rebreather, OZTeK, 2000

Taiwan, Scuba Physiological: Think You Know All About Scuba Medicine? Think Again! and the Dining with Divers series of cookbooks. New in 2023 is the book, Technically Speaking: Talks on Technical Diving Volume 1: Genesis and Exodus. For more information, please see his website at: SimonPridmore.com.

and production. They were also selling machines that cost much less to buy than the Cis-Lunar.

Clough built a whole series of rebreathers in the 1980s and 1990s, both on his own and together with other companies—one of which was Oceanic, a major mainstream US dive equipment manufacturing company led by Bob Hollis—but he and his various partners never succeeded in coming up with a viable production unit.

Although none achieved commercial success with their inventions, this small band of deep cave pioneers succeeded in firing imaginations nevertheless, igniting dreams and keeping rebreathers in the spotlight—as far as technical divers were concerned

anyway. The mainstream diving world remained oblivious. During much of this period, it was still trying to decide whether open-circuit single-cylinder nitrox diving was a good thing or not.

Nothing did more to generate excitement about the enormous potential of rebreathers than a report that came over the wire from Mexico in early May 1994. The US caving world had just lost its patron saint, Sheck Exley, and was sorely in need of some positive news. In a last gasp “Hail Mary” move right at the tail end of a project that had begun with massive sponsorship and a raft of publicity, but had almost ended in tragedy and total failure, Bill Stone and Barbara am Ende pushed Huautla, the deepest

cave in the Americas, beyond all expectations.

After ten years of research and a development budget of over US\$100,000, the Cis-Lunar rebreather (in its fourth manifestation) did what it had been designed to do. It took the two divers beyond the San Agustín sump that had held Stone and others up on previous explorations. Stone and am Ende’s final excursion—the culmination of 44 days underground—required a complex traverse of three kilometres of air-filled cave and 655m of flooded tunnel and extended human exploration of the Huautla cave system to over 56km and a depth of 1,475m.

Coming so soon after Exley’s death had placed an exclamation mark on the limitations

of open-circuit scuba; this was a closed-circuit line marker that pointed the way forward. Now, it was up to some new personalities to enter the field and bring rebreather diving to the wider sport diving community...

(The story continues in Chapter 10, “Closing the Loop,” in *Technically Speaking—Talks on Technical Diving, Volume 1: Genesis and Exodus*.) ■

Simon Pridmore is the author of the international bestsellers Scuba Fundamental: Start Diving the Right Way, Scuba Confidential: An Insider’s Guide to Becoming a Better Diver, Scuba Exceptional: Become the Best Diver You Can Be, and Scuba Professional: Insights into Sport Diver Training & Operations, which are now available in a compendium. He is also the co-author of the Diving & Snorkeling Guide to Bali and the Diving & Snorkeling Guide to Raja Ampat & Northeast Indonesia. His recent books include The Diver Who Fell From The Sky, Dive into



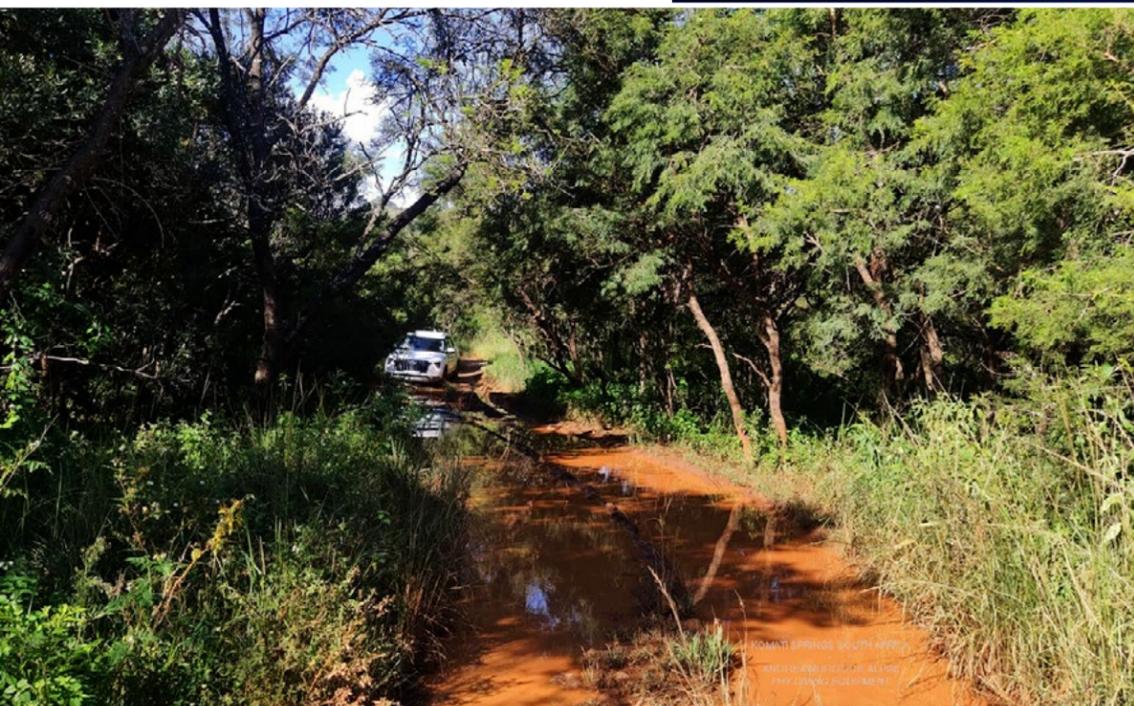
LARRY COHEN



Descending
in the "Shaft"
in Komati
Springs mine

Text and images by
Andrea Murdock Alpini

If you have ever wondered how dark the earth was before humans discovered fire, then spend some time in the forest. The night arrives shortly after 6 p.m. and the sun rises around 5 a.m. In this period of time, you may feel enveloped by the darkness in this part of South Africa. Andrea Murdock Alpini shares his adventure diving the Komati Springs.



Driving through the forest to reach the flooded mine



Wild Dives at Komati Springs *in South Africa*

There was not even a star in the heavens tonight. The vault of the sky was obscured by clouds that, pushed by the northern winds, reached this flap of South Africa on the border with Swaziland.

Nature here was wild. Metre after metre, civilisation marked by the surrounding villages seemed to slowly disap-

pear, swallowed by the primordial forest. It was a green wave merging everything together and defining the landscape as an infinite expanse of trees from which primeval peaks emerged.

I was standing on a plateau at an altitude of 900m, where rocky outcroppings appeared low and desolate. They dot-

ted the thick bush here and there. The highest mountain reached up to 1,400m, but it was not the altitude that characterised it, but rather its age.

I was told that the peak was 4.5 billion years old. "The Americans have the Grand Canyon, but it is nothing compared to our Old Mountain," say



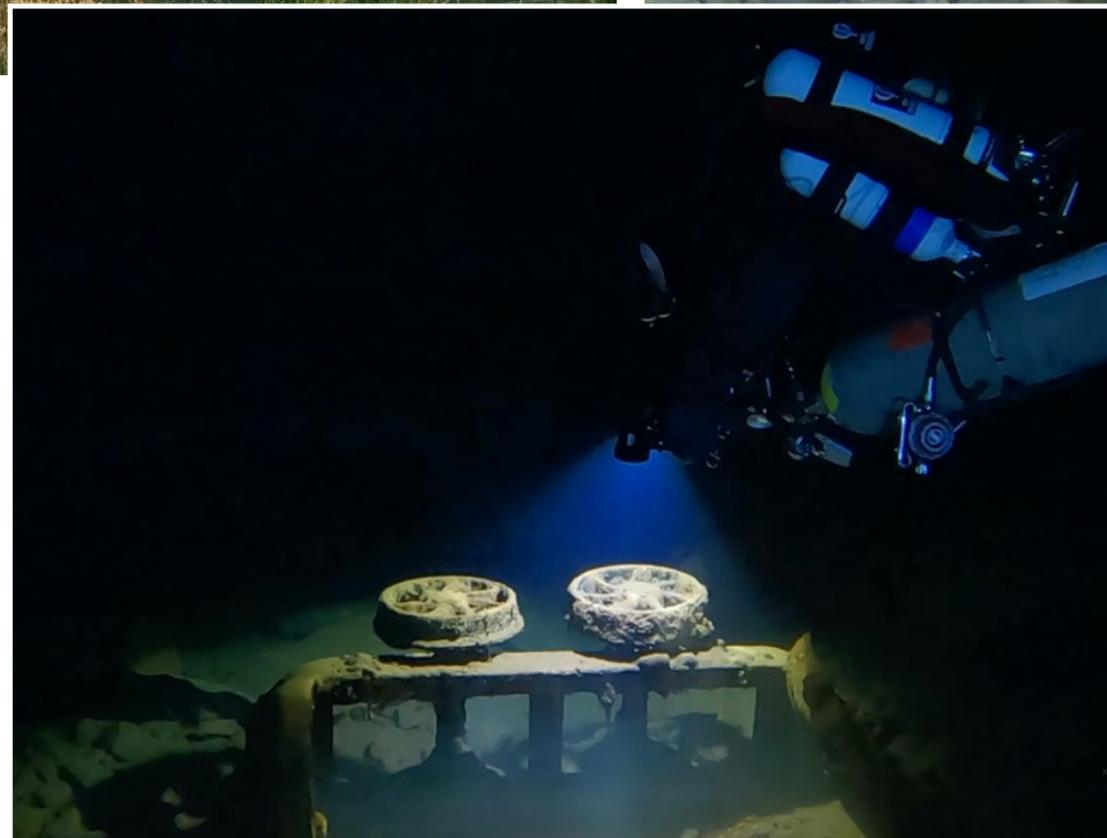
The lake in which the mine is located

the locals. In fact, any epoch compared to this primordial rock feels like yesterday.

Getting there

Getting to the mine required patience and determination and also a bit of luck. Thankfully, everything went the right way. My dive partner and I prepared the equipment, and then we got on the trail, heading towards a stretch that sloped and descended. It was time to carry out an inspection, both along the path that led to the mine and to the body of water that led to the entrance of the cave.

We found a flooded basin dominated by beautiful vertical rocks. All around us was the jungle, which had taken back the space that humans had tried to claim from it in the past. The lake was 54 metres deep, while the entrance to the flooded mine was about 18 metres. The cave that led into the mountain was enchanting.

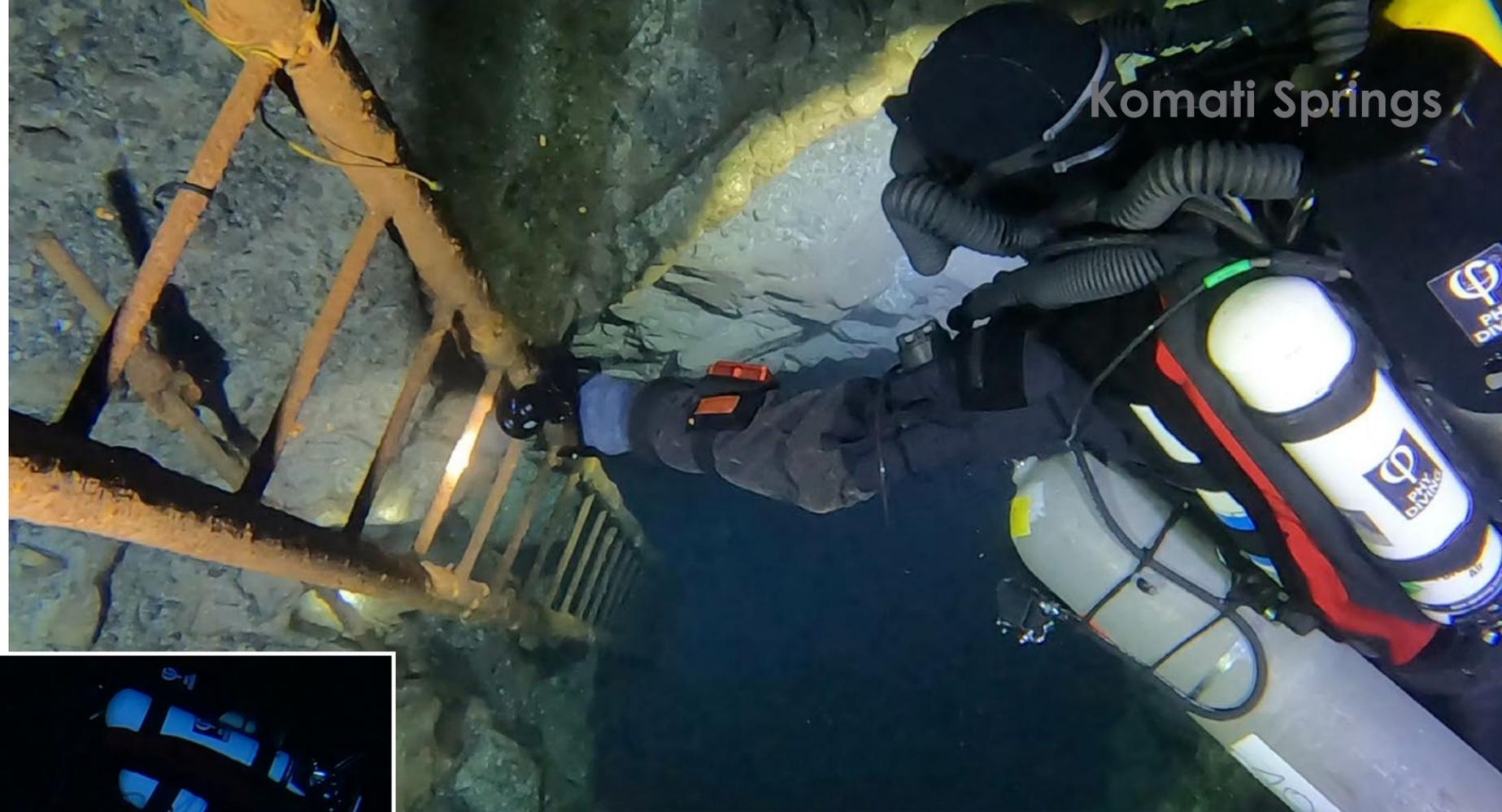


Diving

From the shape of the rock, you immediately understood that this place had charm. It had character. Many images struck me underwater—abandoned machinery, rails, fire doors—in the end, it was nature

that made the greatest impression upon me.

On entering the mine, everything was pitch black. Reality, as we knew it, disappeared. With the lack of light... nothing had shape or colour. Everything vanished; it was up



Komati Springs

Descending to the level in the mine at -48m (above); An abandoned mine trolley on the third level of the mine (left)

to an individual to decide where to put light to this world of darkness and make it more inviting.

The first tunnel was about 110m long and led to the vertical distribution well, which was called the "Shaft." But before you got there, you had to go through a small, narrow fire door. The door opened to the right. The structure was made of iron, while all around us, a wall of cement bricks closed in the space and separated the two environments.

Beyond the wall were wooden structures and iron staircases, with roped pathways that descended vertically towards the last transverse tunnel of the mine, at 110 metres. Lighting up this well gave us a dimensional sense of the place.



A wildebeest skull found in the forest area



The author, Andrea Murdock Alpini, in pre-dive mode at Komati Springs mine (above); Exploring a side tunnel on the third level of the mine (right); Setting up the equipment at the base camp cotage (left)

were compared to the Mountain and how fragile you were here, in this environment, which, to be made hospitable, needed light.

Light was the only element that made the mine appear anthropic. Structures left by humans were not enough. This place was really more like a large and complex cave than an old mine, where fireproof fibre was obtained from the excavated rock. The mine was decommissioned in the 1970s. Since then, the only people who had set foot inside it were speleodivers.

We found significantly sized logs, which lay flat atop one another, before and after the second fire door. Here, in the area before the entrance of the second level, the space was slightly wider than on the upper level,



but once you entered, the spatial pressure of the tunnel changed.

The tunnel was excavated to human size, about 2m high and 1.5m wide. The vaulted ceiling collected the discharged bubbles of us divers, thus creating a strange optical effect, which made it seem as if there was a mirror above our heads.

As I proceeded, I checked the rigs I had assembled yesterday. I made sure that everything was in place and that the line was well stretched at every point. At 38m, the tunnel had even better visibility, with more transparent water quality than the upper level. In a few areas, there was denser visibility. But for the most part, only the range of one's headlights limited the visibility of the area.

Artefacts and features

Several artefacts were found abandoned: a huge spool that carried tons of steel cable, tubes for ventilation, and some tools used by miners. In a small den on the left were several abandoned beams accompanied by a lot of iron netting (mesh). Some cable was still wrapped around its wooden spool; another cable was folded in upon itself, left as the last minors had used it.

The colour of the rock at this level was very different from the previous one. The walls were cerulean, speckled with grey, blue and black. It even seemed to be brighter here. What the mind does not do just to tame an inhospitable place... The bottom, and the objects found there, were covered with heavy sediment.

Sometimes, the movement of the water was enough to move the sediment and cause zero visibility. Other times, it was our fault; with just a kick out of place for a moment, images were quickly ruined.

The fire door here was much farther ahead than on the previous levels. It was much smaller than the others, too. Behind it, the space suddenly became small and narrow. A sort of corridor then opened onto a great chamber, which had four large pillars.

Our plan was to continue on the left side and search for the staircase that led to the 48m point of the fourth level. This was in fact the only blind level that exchanged with the level below 70m, but not with the "Shaft."

Introspection

Looking into the abyss, you saw yourself. You understood how small you



Sunset in the stunning landscape of the wild South Africa surroundings at Komati Springs (above); The author and his dive buddy, Marco Setti, at the end of a week of explorations at Komati Springs (left)

the innate aim of every person who descends or dives underground. Being here in this supernatural light was an ecstasy of the senses. I stopped and enjoyed the scenery. ■

Based in Italy, author Andrea Murdock Alpini is a technical diving instructor for TDI, CMAS and PSAI. Diving since 1997, he is a professional diver focused on advanced trimix deep diving, log dives with open circuit, decompression studies, and research on wrecks, mines and caves. Diving uncommon spots and arranging dive expeditions, he shoots footage of wrecks and writes presentations for conferences and articles for dive publications and websites such as ScubaPortal, Relitti in Liguria, Nautica Report, ScubaZone, Ocean4Future, InDepth and X-Ray Mag. He is also a member of the Historical Diving

Society Italy (HDSI), and holds a master's degree in architecture and an MBA in economics of arts. He is the founder of PHY Diving Equipment (phidiving.com), which specialises in undergarments for diving, as well as drysuits, hoods and tools for cave and wreck diving. Among other wrecks, he has dived the Scapa Flow wrecks heritage, Malin Head's wrecks and the HMHS Britannic (-118m), Fw58C (-110m), SS Nina (-115m), Motonave Viminale (-108m), SS Marsala (-105m), UJ-2208 (-108m) and the submarine U-455 (-119m)—always on an open circuit system. His books (in Italian) about scuba diving exploration, **Deep Blue**, released in 2020, and **Immersioni Selvagge**, released in 2022, are available at Amazon.it and Magenes.it. For more information on courses, expeditions and dived wrecks, please visit: wreckdiving.it.



Return

Turning back, at the end of the dive, we were now accustomed to the absence of light; we felt part of that environment until a greenish light appeared, of a unique intensity. It was emerald in colour. This brilliant colour resulted from the combination of light filtering through the water and aquatic plants dyeing the lake green, the same hue as the thorny acacias that surrounded it.

Getting back to the light is

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Photo 1. Soft
Coral Tree,
by Anita
George-Ares

Text and photos by
Anita George-Ares, PhD,
and John A. Ares

Have you ever noticed how an underwater sea anemone or coral form might resemble a flower or plant found on land? Photographers Anita George-Ares and John A. Ares take a colorful dive into the realm of botanical comparisons, with side-by-side shots of flora and fauna above and below the waves.



Botanical Comparisons *in Underwater Images*



Photo 2. Orchids, by Anita George-Ares

Diving and photography are our passions. The New York Botanical Garden (NYBG) in New York City is a great place for photography. On previous NYBG visits, some plants reminded us of sea life. Many comparisons of marine and terrestrial "gardens" can be made. Soft corals resemble flowering plants or trees. Urchins resemble cactus. Just let your imagination run wild! All the plant images in this article were

photographed at NYBG. The underwater images of marine fauna were taken in Indonesia, the Maldives, the Philippines and the Red Sea.

We visit NYBG at various times of the year but especially during its annual orchid show. Each year, different varieties of orchids are arranged according to a featured artist's interpretation. Both orchids and soft corals are noted for their beautiful forms and colors.

Comparison: Clusters

— Soft Coral Tree and Orchids

The images of the soft coral tree (Photo 1) and orchids (Photo 2) share several elements of composition. Both images depict numerous individuals. The soft coral polyps form small clusters while the orchids form larger clusters. Bold coloration in two tones dominates the images. The orchids are pink and magenta while the soft coral



Photo 6. (right) *Xenia Soft Corals* and Photo 5. (bottom right) *Maui Wormwood*, by Anita George-Ares

is pink and white. The soft coral and the orchids display branching forms in a horizontal orientation.

Comparison: In the Field — *Anita and Orchids* and *Anita and Soft Corals*

The image of Anita photographing orchids (Photo 3) is compared to the image of her swimming by magenta and pink soft corals off Ras Mohammed in the Red Sea (Photo 4). The orchids and the soft corals both form a wall of bright colors.

Comparison: Muted & Feathery — *Maui Wormwood* and *Xenia Soft Corals*

Maui wormwood in Photo 5 is a rare Hawaiian plant species that only



grows in the wild at the top of the Haleakala volcano. Fortunately, the attractive plant is grown at the NYBG and in nurseries. In Photo 6, the *Xenia* soft corals form a dense garden of

different species. Both images feature a composition of muted coloration and feathery projections. The luxuriant, silvery-green plants fill the frame, as do the luxuriant soft corals.



Photo 4. (above left) *Anita and Soft Corals*, by John A. Ares; Photo 3. (above right) *Anita and Orchids*, by John A. Ares

Photo 9. (right) A Lotus Flower Pod and Photo 10. (far right) A Corallimorph, by Anita George-Ares

Comparison: Plates — Elephant Ear Anemones and Giant Lily Pads

Circular patterns are common in nature. Many examples are found among the corallimorpharians, or corallimorphs. Corallimorphs are closely related to hard corals but resemble sea anemones.

Elephant ear anemones (Photo 7) are the largest among the cor-

allimorph species. The world's largest water lily species is the Queen Victoria's water lily in Photo 8. Both the lily pads and the corallimorphs form groups of yellowish-green, circular plates with raised edges. The lily pads float on the water surface, while the corallimorphs appear to "float" over the bottom.

Comparison: Circular



Photo 7. Elephant Ear Anemones, by Anita George-Ares



Photo 8. (above right) Giant Lilly Pads, by Anita George-Ares

— A Corallimorph and A Lotus Flower Pod

A lotus flower pod (Photo 9) contains hundreds of seeds. As the seed pod develops, its shape and color changes. Photo 10 shows a species of corallimorph. Both images have similar compositions where the lotus pod and the corallimorph are circular and fill the frames. The radial symmetry of the corallimorph's short yellow tentacles resembles the radial symmetry of the yellow and pink seeds in the pod. Conspicuous borders are shared by both the corallimorph and the lotus pod.

Photo 11. (right) Willow Catkins and Photo 12. *Hearth Heart Urchin*, by Anita George-Ares

Comparison: Fuzzy — *Hearth Heart Urchin* and *Willow Catkins*

Willow catkins (Photo 11) are flower clusters that appear in the spring before the willow tree produces leaves. *Hearth heart urchins* (Photo 12) live in burrows and crawl on the bottom in search of food. The fuzzy catkins resemble the fuzzy urchin. Both the catkins and urchin share muted coloration. With the exception of a few long spines, most of the urchin spines are of uniform length. The spikes of the catkins are also of uniform length.

Comparison: Spiny — *Globe Urchin* and *Cacti*

The NYBG has a desert section that displays cacti and succulents of various species and morphology. Some cacti with their shapes and spines resemble sea urchins. Both the urchin (Photo 13) and the cacti (Photo 14) have similar shapes. Each “globe” has radiating lines bearing golden spines against a uniform color background. The radiating lines connect to central points on top of the urchin and cacti.

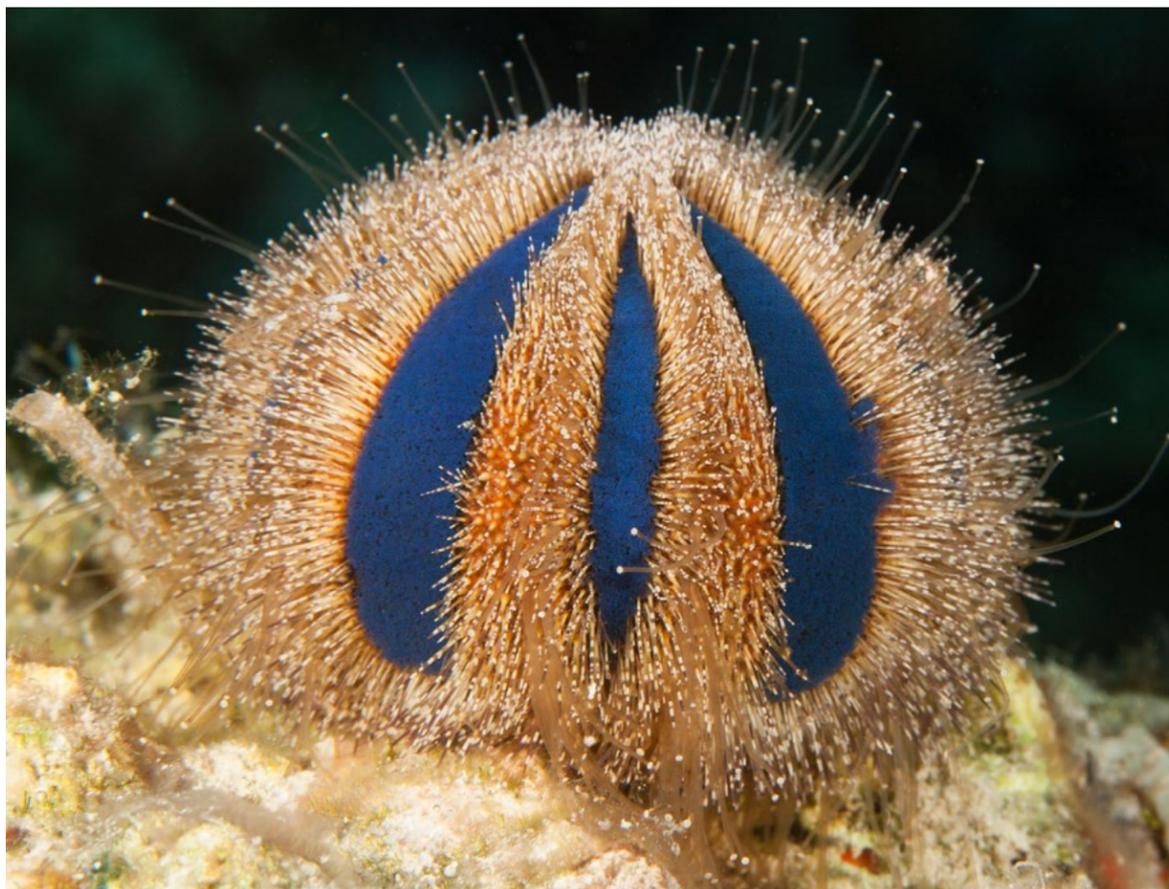


Photo 13. *Globe Urchin*, by Anita George-Ares

Photo 14. *Cacti*, by John A. Ares

Photo 15. *Coleus Plant*, by Anita George-Ares



Comparison: Bright Colors — Coleus Plant and Crown-of-Thorns Sea Star

Coleus plants (Photo 15) are featured at NYBG and come in many varieties. Their attractive foliage makes *Coleus* a favorite ornamental plant. Like the *Coleus*, a crown-of-thorns sea star (Photo 16) varies in color. Bright colors in nature are sometimes a warn-

ing of toxicity. The spines of crown-of-thorns sea stars contain a toxin that is released in puncture wounds resulting from contact. The leaves of the *Coleus* plants are mildly toxic to humans and may cause a rash upon contact. Both the sea star and *Coleus* have radial symmetry and bold, two-color patterns.



Photo 16. *Crown-of-Thorns Sea Star*, by John A. Ares

Developing an eye for photography

As photographers, we always look for interesting subjects to shoot, both on land and underwater. One does not necessarily have to shoot the obvious. We keep our eyes open for the not-so-obvious subject matter such as subtle shapes and forms, different angles and compelling compositions. John and pioneering underwater photographer Ernie Brooks once got into a discussion about black-and-white underwater photography at the Beneath the Sea Exposition in New Jersey. Ernie emphasized “shoot for form,” a lesson that we have taken to heart.

Photographic creativity is influenced by how one sees.

A critical asset in enhancing one's ability to see is one's passion for being outdoors and observing nature. We are often intrigued and inspired by the similarities we find in the shapes and forms of flora and fauna in the botanical and underwater realms.

If one is passionate about experiencing nature, whether topside or underwater, then it is likely that one will look more closely and recognize patterns of form and color. If you share the joy of observing nature, then you already have what you need to start your own photographic journey of discovery. Who knows what you will find... The discoveries are endless! We encourage you to take the challenge: Go

out and look at the world—and notice the diversity and similarities of shapes and forms in nature. ■

Contributors Anita George-Ares and John A. Ares are regular presenters at the Beneath the Sea expo. Anita is a member of the Women Diver's Hall of Fame. To view more images, please visit [facebook.com/profile.php?id=100016947967639](https://www.facebook.com/profile.php?id=100016947967639) and JohnAres.com.

REFERENCE:

BARNBAUM, B. (2017). THE ART OF PHOTOGRAPHY, A PERSONAL APPROACH TO ARTISTIC EXPRESSION. ROCKYNOOK INC. 393 PP. A USEFUL REFERENCE, PARTICULARLY THE CHAPTERS ON COMPOSITION, VISUALIZATION AND LIGHT.

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Lens Beyond Ocean International Photo Competition 2023

Lens Beyond Ocean (LBO), the annual international underwater photography competition that is now in its twelfth year, is accepting entries until 10 May 2023.

Launched in 2011, the LBO competition has drawn over 1,000 accomplished underwater photographers from around the world, and grows bigger every year. It has also attracted sponsors offering high-quality prizes.

Prizes

Participants have a chance to win prizes valued over US\$10,000, including spectacular dive holidays in Asia, as well as gear and equipment, dive courses and more.

New developments

Each year, something new is added to the competition to motivate and encourage more underwater photographers and videographers to take part, and go out and capture images of the wonderful nature and marine life found under the waves. With the culminating photo exhibition, which is

open to the public, winning images by these artists have helped to increase awareness of the beautiful yet fragile underwater ecosystems of our oceans.

To recognise home-grown photographers exploring local waters, a new category was added last year, called "Best of Malaysia by Malaysians." There was an overwhelming response to this new category, which is expected to be even more popular this year.

Other categories of the competition include: Macro, Wide-Angle, Compact Camera, and 3-Minute Video.

Be a winner

Are you a diver who is passionate about sharing your underwater images and experiences? LBO offers a fabulous chance to show off your talent and creative eye.

Judges

Entries will be judged by a panel of experts, each widely published with their underwater photographs appearing in numerous publications and venues.

Showcase of winning entries On Wednesday, 18 May 2023, winners will be announced. Prizes will be presented to winners on Saturday at 10:00 a.m., on the main stage of the Malaysia International Dive Expo, which will take place 26-28 May 2023 in Kuala Lumpur. Winning images will also be displayed in an exhibit in the foyer, and winning videos will be showcased on the big screen on the main stage during the expo.

Submission deadline

The last date for submission is **10 May 2023**.

Prize Sponsors

Sponsors for the 2023 LBO prizes include Amun Ini Beach Resort and Spa, Atlantis Dive Resort and Liveaboard, Cocotinos Hotel and Resort, Red Divers Luma' Selakan, Salaya Beach House and Silver Reef Dive Resort. ■

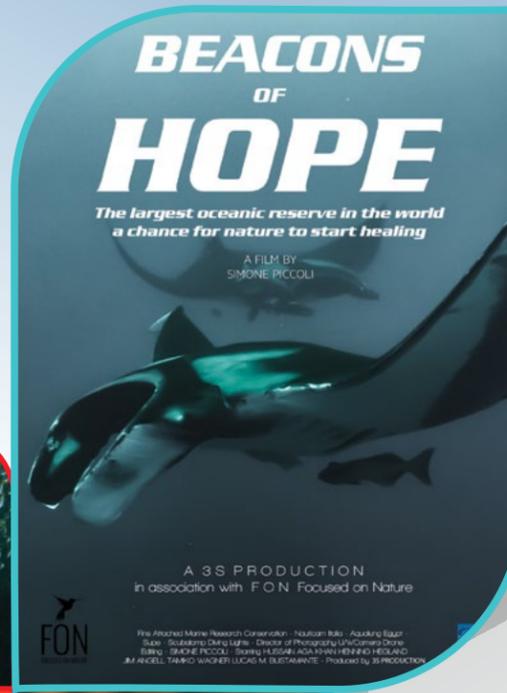
For more information about how to enter the competition, please visit: lensbeyondocean.com



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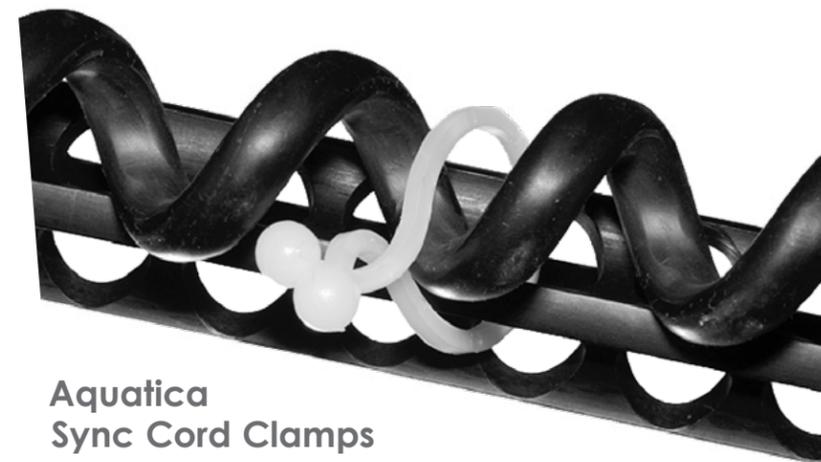
AOI LCD Magnifier for Olympus compact cameras

The LCD Magnifier UMG-01 from AOI cuts out annoying screen glare and allows you to get a sharp, magnified image from the LCD screen on Olympus TG-3, TG-4, TG-5 and TG-6 systems. The magnified screen makes shooting the Olympus TG-3, TG-4, TG-5 and TG-6 much easier, specifically in super macro. The loupe-style viewfinder with a magnification factor of 2.3x cuts out the glare that is often quite disturbing when shooting in water with lots of sunlight. The magnifier snaps directly and securely onto the back of the housing, replacing the existing screen hood. The focal length of the eyepiece can be adjusted to get it dialed in exactly to where your eyes focus best. Weight: 205g on land, 99g underwater. aoi-uw.com



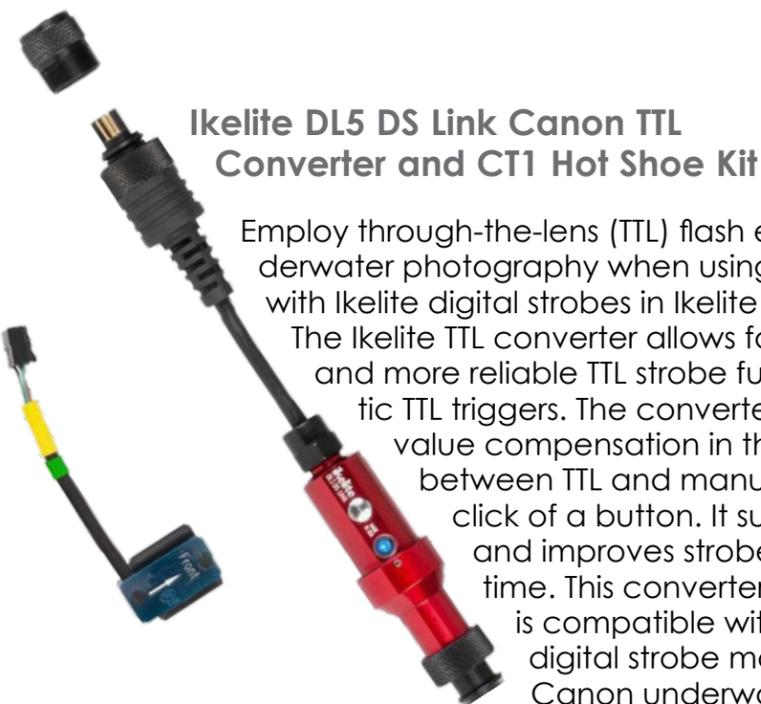
QYSEA FIFISH V6 Expert M100A Underwater AI ROV

The FIFISH V6 Expert M100A from QYSEA is an underwater drone with an AI vision lock that improves focus and image sharpness by keeping your subjects locked in at the centre of the frame. A professional-level underwater robot and multi-capable tool, the FIFISH V6 Expert can operate as both a video and still camera, down to 100m. Using the controller and companion iOS/Android FIFISH app (which is included), photographers can easily switch focus between subjects with a single touch, swipe or pinch, enabled by the vision lock, which also allows one to securely lock the ROV's position against underwater currents and other disturbances. The integrated camera (1/2.3" Sony CMOS) captures up to UHD 4K/30fps video and 12MP (DNG/RAW) photos in an ultra-wide 166° field of view. In addition, it records slow-motion video in 1080p HD at 120 fps or 720p HD at 240 fps. Vision enhancement algorithms assist to bring out the vibrancy of the underwater environment. Alongside the camera, the FIFISH has a pair of ultra-bright 6000-lumen LED lights that have a 120° beam angle. The underwater drone can operate for 1.5 hours underwater. Images/videos are stored on a 128GB microSD card. qysea.com



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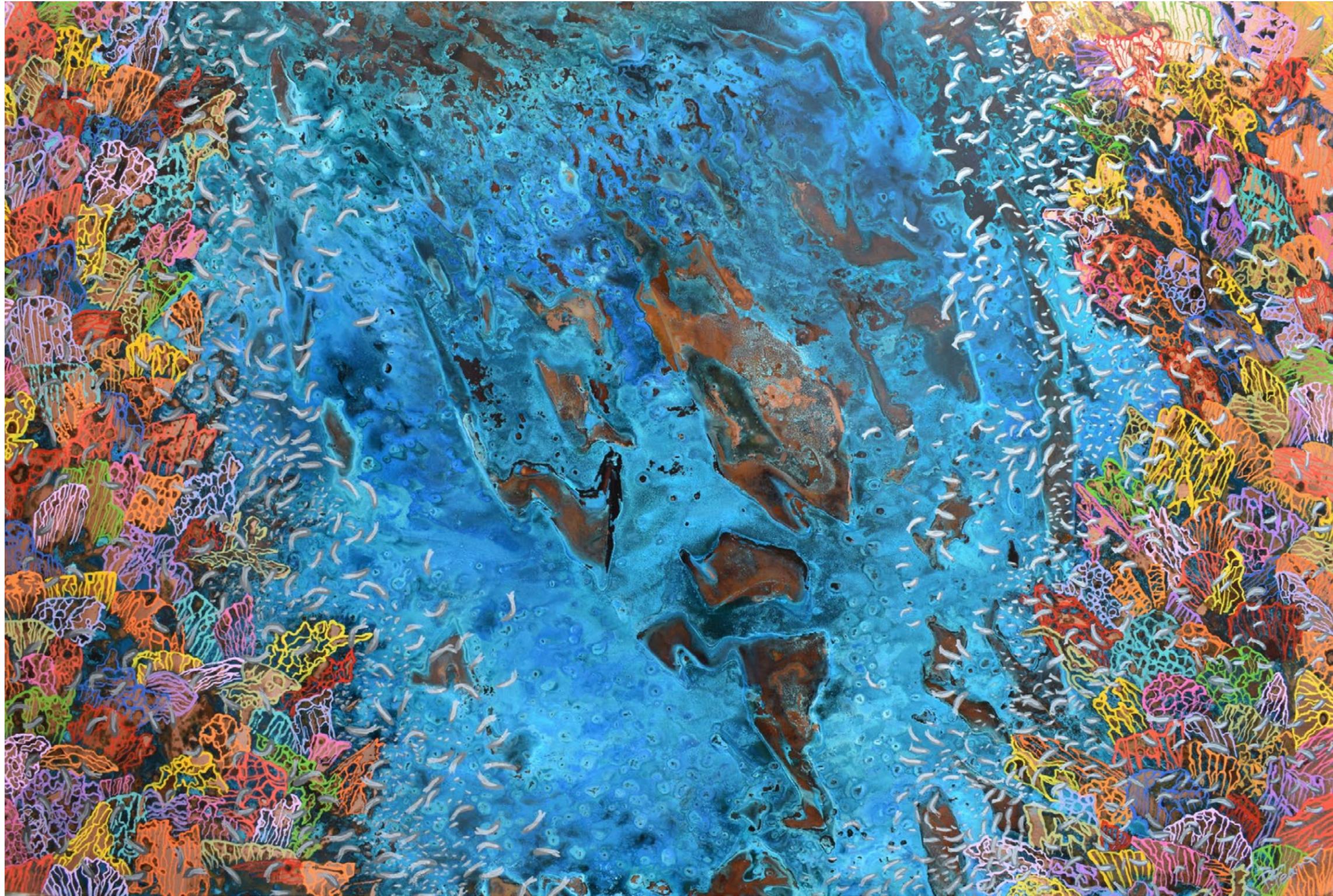


Nauticam Housing for Panasonic Lumix S5II and S5IIX

Since 24 March, Nauticam's NA-S5II housing for the new Panasonic Lumix S5II and S5IIX has been ready to order and ship. According to the manufacturer, the new housing provides "unfettered access" to all camera controls and functions, which enable a photographer to fully use the capabilities of the camera on dives. With durable construction and user-friendly features, the housing is "an ideal choice for underwater storytellers seeking a dependable and efficient underwater housing option," states Nauticam. nauticam.com



Paul Fearn



P O R T F O L I O

Interview by G. Symes
Images by Paul Fearn

British artist and avid diver Paul Fearn paints beautiful underwater scenes and marine life on copper metal plates, using unique patinas that evoke the ambiance and watery depths of the underwater realm. *X-Ray Mag* interviewed the artist, who is based in West Sussex, to learn more about his unique artistic process as well as his perspectives on diving and saving the fragile ecosystems of our oceans.

X-RAY MAG: Tell us about yourself, your background and how you became an artist.

PF: As a small child, a relatively difficult start to life ensured that I became somewhat introverted in my early life, so solo activities became favourites. Reading and drawing allowed me to pass hours in my own company, and when I was adopted into a wonderful family in a suburb of South London at the age of five, they encouraged me in these pursuits, buying me books and taking me on regular trips to the local library.

I devoured travel stories like they were chocolates—especially the *Adventure* series by Willard Price, which are now very outdated and deal with the sticky subject of collecting specimens for zoos. However, they did awaken two things in me, a love of wildlife and a passion for travel.

My family really got my travel bug going with two trips to Greece in my early teens, and from the age of 16,



I was travelling solo wherever I could get to and whenever I could afford it. Across Europe, I would spend days walking with my sketchbook getting purposefully lost. By now, my art was

coming on leaps and bounds, and whilst I had not yet found a style, I had the patience to really develop my technical drawing.

However, life has a habit of getting



in the way, and after spending four years studying languages at university, I ended up in a 12-year career working for the UK Civil Service. It was there that I met my wife who, already

an advanced PADI diver, introduced me to scuba diving.

Following austerity measures in 2008 onwards, the opportunity for voluntary redundancy arose and I grabbed it

portfolio

Octopus I, by Paul Fearn. Etched copper with patinas, 20 x 20cm (right)

Ghost Ship, by Paul Fearn. Copper sheet with patinas and acrylic, 100 x 100cm (far right)

Blue Dragon, by Paul Fearn. Etched copper with patinas, 27 x 27cm (below)



with both hands. That allowed me to pursue my career as an artist, and I spent a good couple of years figuring out what I wanted to do and how I would do it. I began entering major competitions and managed to reach the finals of the David Shepherd Wildlife Foundation's "Wildlife Artist of the Year" award four years in a row. I had also been reaching out to galleries, and shortly after, I landed my first contract with a gallery in the south of England.

X-RAY MAG: *Why fish and marine life? How did you come to these themes and how did you develop your style of painting?*

PF: My style and subject of artwork really developed hand-in-hand. I began experimenting with patinating sheet copper between 2012 and 2014. At first, I was still a generic wildlife artist, painting and drawing everything from pelicans to elephants. But the process of developing different patina finishes to the copper

really started leading me towards marine life, as many copper patinas tend to be shades of blues, greens, verdigris and aquamarines.

In 2007, my amazing wife had bought me a PADI open water course prior to my Egypt trip, and honestly, I did not get on well with it. A day of dive tables and acronyms confused me enough, but the second day of practical skills, with 20 divers and instructors crammed into the

deep end of a cloudy swimming pool, ensured that I thought, "This isn't for me." However, we arrived in Egypt a month later, and whilst my wife went out on the boat, I did a refresher course in the swimming pool with two very good instructors. The fact I could even see what was around me made an instant difference.

That afternoon, I was out on the boat myself for my first open water dive—a shallow reef





called Shaab Petra, not far from Hurghada. I jumped in, terrified that I would make some sort of mistake, run out of air, get claustrophobia, or worse. As I bobbed around on the surface with my instructor shouting encouragement, I gave the descend signal back to him, deflated my BCD and saw the water line rise above my mask.

I was feeling the panic start to rise as I slowly descended, and then, as if it knew, a little sergeant major damselfish came up to my mask and said hello. It just came up and had a look at me, and as I stared back at it, I realised all other emotions had disappeared; there was just this incredible curiosity about the little fella, and him towards me. I was captivated. It was

the same fish I had seen in a million aquariums but this one was in the wild, and I was in his territory. That one tiny fish dispelt all of my fears and changed my life.

So began the slow change from wildlife to marine artist. I found myself returning more and more to the underwater world as my theme, hungry for more and more encounters. Since then, my wife and I have dived hundreds of times across the northern hemisphere, and we have plenty more trips planned. And the more I have dived, the more my artistic style has naturally developed, to the point that I no longer think about the process but more about the subject, and the process just “happens.”

X-RAY MAG: Who or what has inspired you and your artwork and why?

PF: It is very hard to pick out artists or movements that have inspired me, as I tend to take a little of something from everyone and everything, but there are some standouts. In my early career, my technical ability leant heavily on the Dutch still-life painters, and images such as [the 16th-century German artist] Albrecht Dürer's *Rhinoceros*.

But as my style has progressed towards the patinated copper sheets, I have found myself drawn more towards the less figurative creative processes of Gerhard Richter, Jackson Pollock and Mark Rothko. But my biggest boost has probably come from a fantastic art-



Seahorse Couple I, by Paul Fearn. Etched copper with patinas, 20cm x 20cm (above)



The Midnight Sky, by Paul Fearn. Copper sheet with patinas, 60 x 60cm (left)

The Coral Sea II, by Paul Fearn. Copper sheet with patinas, 45 x 60cm (far left)

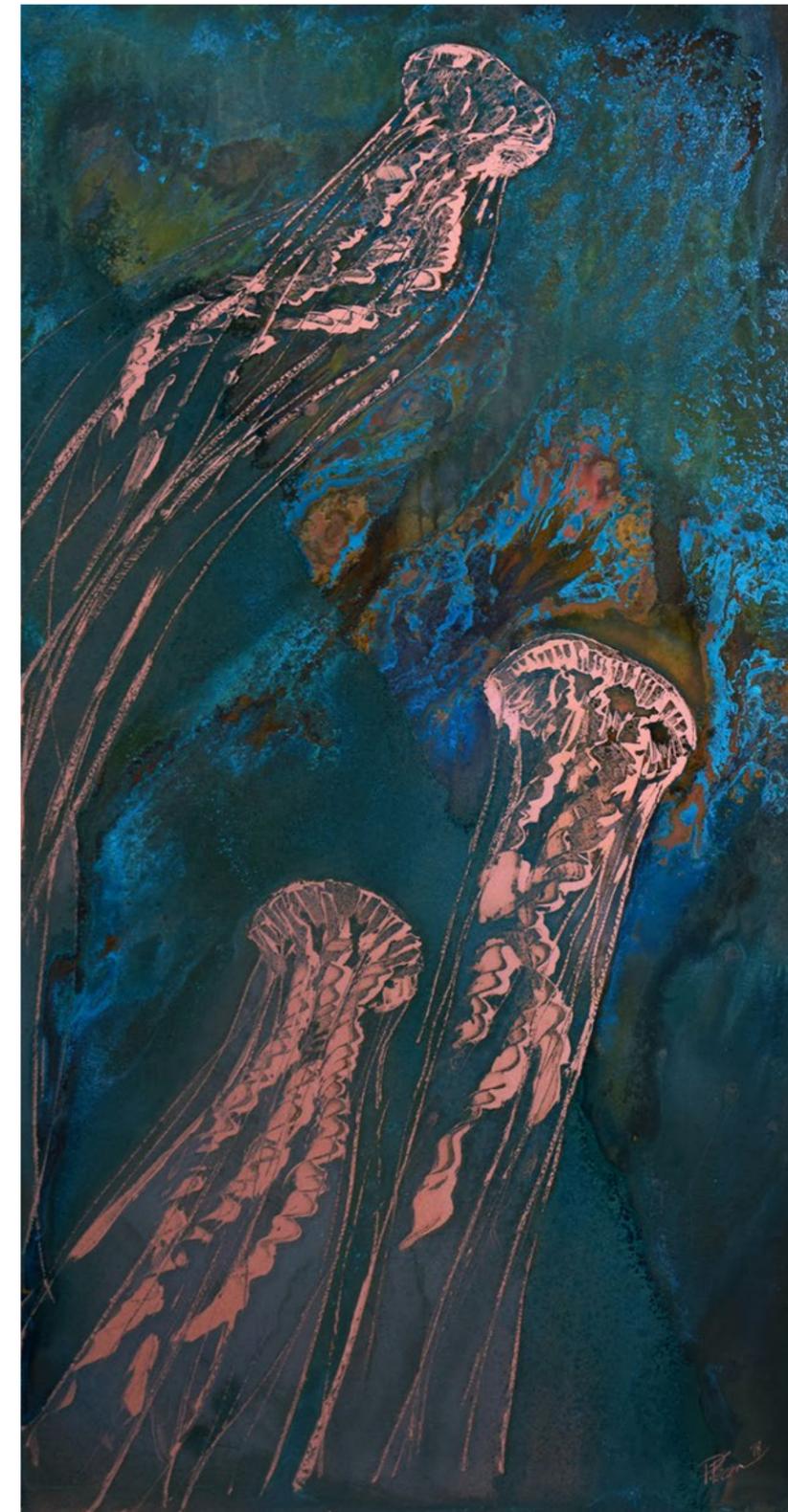


The Sting, by Paul Fearn. Copper sheet painting with patinas, 50 x 31 cm (left)



Seahorse Couple II, by Paul Fearn. Etched copper with patinas, 20 x 20cm (left)

Wave Riders, by Paul Fearn. Patinas on copper, 80 x 40cm (right)



Octopus II, by Paul Fearn. Etched copper with patinas, 20 x 20cm (right)



ist, Herman Lohe, who was, for a while, resident in a studio next door to mine in Kingston Upon Thames.

Herman and I used to chat for hours about art and the processes involved, and he certainly gave me a few pointers in the right direction. It was he who taught me, as an adult, that the paint-

ings I thought were finished were not necessarily so, and who reinstalled in me the patience in the process that I had had as a child.

X-RAY MAG: What is your artistic method or creative process?

PF: The process of creating my artworks differs from piece to piece, but most follow the same basic rules. First is the cleaning and de-greasing of the copper. Then, it is sanded down with increasingly fine sandpaper to give the patina a textured surface to "bite" onto. I then usually paint out the coral reefs, koi, or any

captions



The Reef II, by Paul Fearn. Copper sheet with patinas and acrylics, 40 x 30cm (below)



areas I want to remain “clean” with a resist [acidic solution].

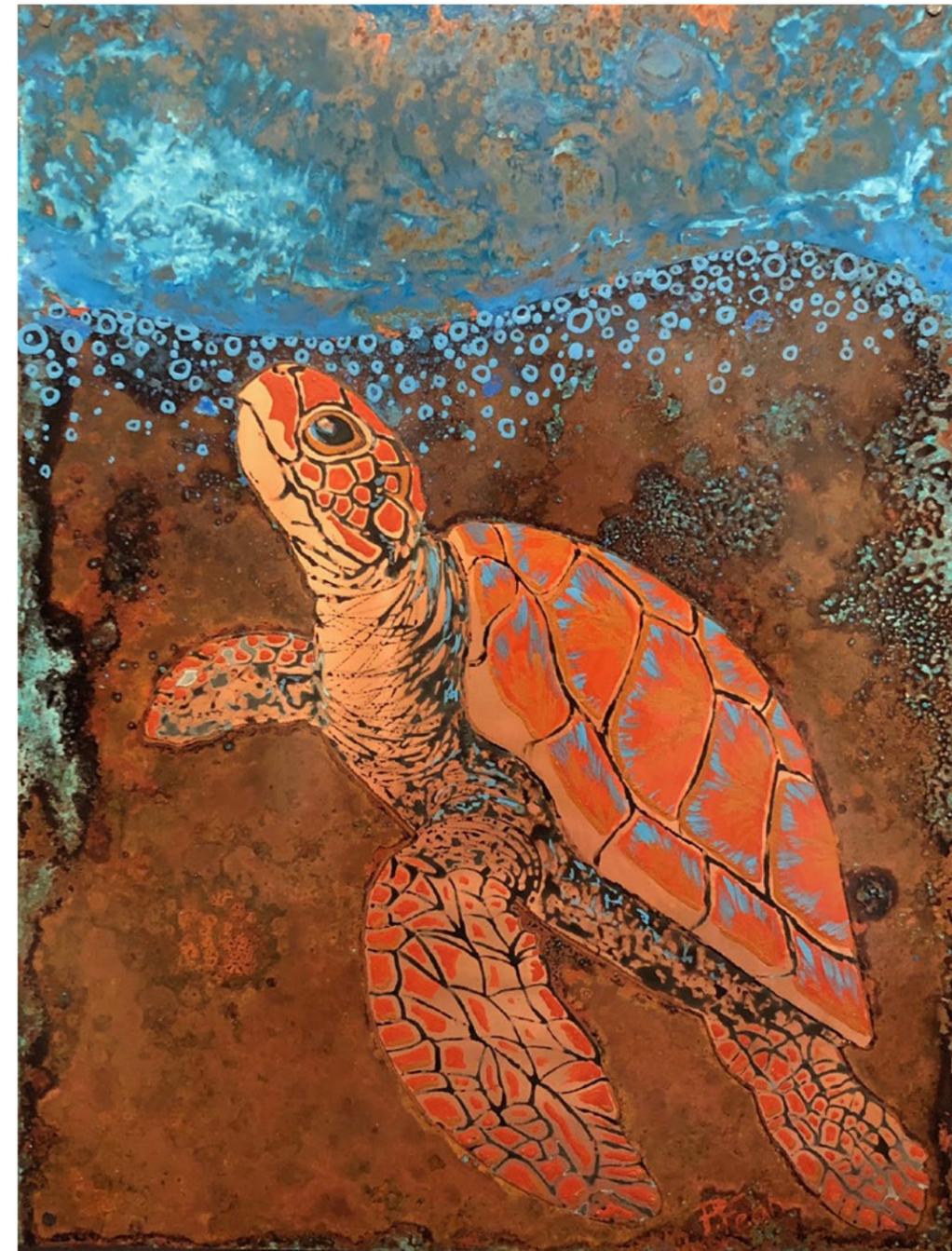
Once that is complete, I choose which chemicals and additives I need in order to achieve a specific colour and texture. I have many recipes that I keep fairly secret, but the one I started with (and the most widely used) is the ver-

digris patina, which is made from a simple 50 percent fine salt and 50 percent malt vinegar recipe. The solution is then either poured or sprayed onto the copper sheet, which is put into a fume chamber to “cook.” This gives it a similar finish to the Statue of Liberty [in New York City], I just speed up



Predator, by Paul Fearn. Copper sheet with patinas, 80 x 80cm (left)

The Air That I Breathe, by Paul Fearn. Copper sheet painting with patinas, 40 x 30cm (below)



the process, which would naturally take years, to a few hours or days.

Different chemicals give different colours and finishes; for example, sprinkling sea salt on top of a patina solution can result in a much more textured finish. I personally like that, as it starts to mimic the different visibility conditions in the ocean.

There has been a lot of experimentation over the past ten years with different solutions. Some acids have eaten the copper away completely and some have sat in a fume chamber for days without making a mark on the surface of the copper. In addition, many patinas, which I thought were winners, simply washed away during the next part of the process where I have to spray the patina with water to stop the

reaction from continuing.

My years of experimentation have left me with a raft of solutions and cooking times that I can use to achieve a myriad of results. I think, looking back on this process, I took to the patination element well as historically I have not liked painting “backgrounds.” In this way, I can use a natural process to convey a natural substance like sea water.

Once the patinated copper has been washed, dried and lacquered, the next part of the process can begin. This is where the actual paints come out.

I use acrylic paints for the colours that I cannot achieve naturally, and they also help to “pop” out from the background. First, the corals are painted in a pseudo-realistic manner, with squiggly lines

making up underwater city structures. And then, the fish. Neon-coloured fish in front of multi-coloured corals surrounded by a blue salty sea? Yes, please!

And this is where patience again kicks in, as some of my larger pieces can contain thousands of fish. Just as if one were painting a flock of birds, not all of the fish are painted

Paul Fearn

portfolio

The Cave, by Paul Fearn.
Copper sheet with patinas
and acrylic, 66 x 100cm

in high detail, but enough have to be, in order to backfill the empty water with faraway anthias that can be represented with a deft flick of paint. I am attempting to represent the vast shoals here that are often seen hovering above the corals.

X-RAY MAG: *What is your relationship to the underwater world and coral reefs? How have your experiences underwater influenced your art? In your relationship with reefs and the sea, where have you had your favourite experiences?*

PF: My wife and I each have hundreds of dives to our names—we do not know how many, as we stopped keeping log books years ago. But we are very definitely what I would term “lazy divers.” We have certainly been on drift dives with ridiculously strong currents, we have explored the cenotes in Mexico, kitted up at the roadside and clambered over rocks in Malta to get to the sea, and also run out of air underwater, but our perfect dives have been less than 20m deep, where we are relatively near to the surface. The colours there are more pristine, there are more anthias and shoals, and we can spend a longer time underwater—which is especially good for filming, as I only take a GoPro



with me to capture footage. It is this “close-to-surface” world that I really want to portray in my art, as I want to give the viewer an idea of what it is like to be underwater. If you

are trying to tempt somebody to become a diver, chances are you will more likely achieve that by taking them to a place that looks like an aquarium than a place with sharks and

deep-sea critters. Don't get me wrong, I love sharks and diving with them, but I am aware that this is not what your average human wants to think about when they go snorkelling.

Of all our diving adventures together, I would pick out two dives as favourites. The first was a whale shark encounter in the Maldives, which was simply stunning—enough said.

The second was at Eagle Point, Bagalangit, in the Philippines. The Mabini headland juts out from the mainland, and Marikaban Island, just opposite, creates a highway for pelagic



Three Colours Blue VII, by Paul Fearn. Copper sheet with patinas and acrylics, 40 x 30cm (below)



species. On the one dive, we saw ocean-going tuna and pygmy seahorses. It was also on that dive that I unknowingly stopped at a very busy cleaning station.

When my wife looked around for me, she said she saw a human-shaped ball of

fish. She finned back to join me, and the two of us were enveloped in a neon shoal tickling away at any bare skin they could find (quite a lot, as we were wearing shorties). Every time we giggled and released bubbles, they would all move away, then instantly



The Wall II, by Paul Fearn. Patinas and enamel on copper sheet. 50 x 50cm (left)

Crimson Peak, by Paul Fearn. Copper sheet with patinas and acrylic, 38.5cm x 28.5cm (below)



come back to carry on cleaning. It was honestly a magical experience, and we both felt that we had been “accepted” as water-dwelling creatures.

X-RAY MAG: What are your thoughts on ocean conservation and coral reef management and how does your artwork relate to these issues?

PF: It is insanely easy to ignore the underwater world when you do not live in it. Even for us divers who regularly go six months between dives (or years when Covid-19 struck), the importance of actively helping oceanic life to thrive can be lessened by events in our daily lives above water. That is why it is vitally important to do what we can, when we can.

The small and obvious ways

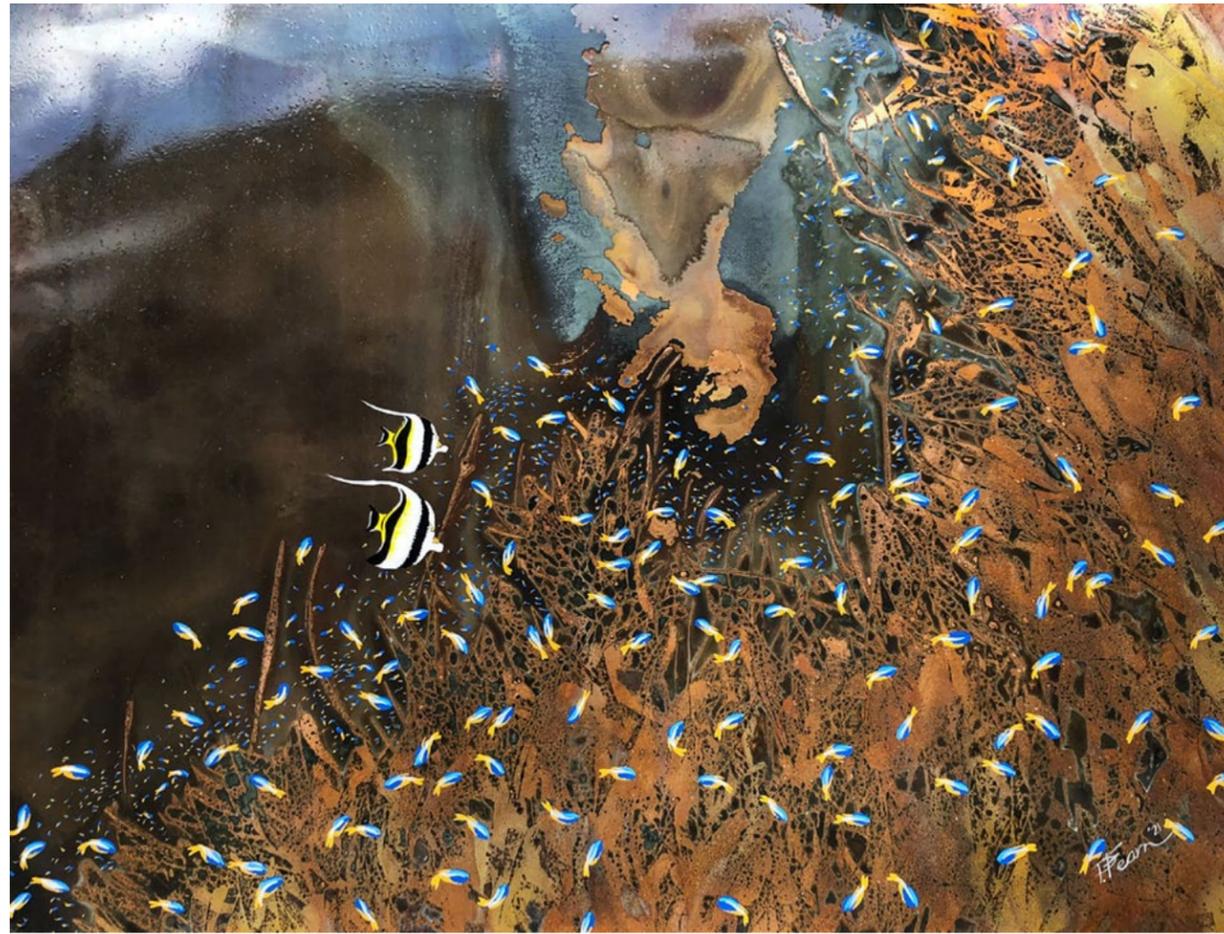
of helping are numerous. For example, during our dives, we always carry a bag to collect any litter we find in the sea, and a flat-tipped knife to free anything caught. To date, I have not had to free anything from fishing lines or plastic, but it is better to have it and not need it than the other way around.

Many of the ways to help save the ocean lead to things we should be doing in our daily lives anyway—e.g., using less water and saving energy where possible. I have in the past year been taking cold showers (with a blast of hot water at the end); it cuts down on the time I spend in the shower and heating the water. It is also part of a larger plan to get used to cold-water immersion, so that I can dive more sites closer to home in the

United Kingdom, cutting down on air travel and making the trips more affordable.

With my artwork, I want to give people another insight into these underwater worlds, so that even non-divers may

start to care about those environments. The more intriguing I can make the artwork, the more people can be converted to become part of the worldwide army of humans trying to make a difference.



Somewhere Over The Rainbow, by Paul Fearn. Copper sheet with patinas and acrylic, 60 x 45cm (left); *Coral Sea I*, by Paul Fearn. Copper sheet with patinas, 45 x 60cm (above); *Butterfly*, by Paul Fearn. Copper sheet with patinas and acrylic, 38.5 x 28.5cm (right)

X-RAY MAG: How do you choose species to paint? Do you work from specimens or take underwater photographs of these species, and if so, what camera gear do you use?

PF: As previously mentioned, the only thing I take with me on my dives is a GoPro, which I turn on to film as soon as anything interesting happens underwater. I find it helps me to use video, which I can freeze-frame later, as generally, I point the GoPro in whichever direction I am looking, so I get a much more natural view, which more often than not, includes the surrounding coralscape. This helps me plan out my entire artwork, rather than painstakingly setting up a per-

fect photo of an individual creature. I have seen many a photographer miss a passing shark, turtle or eagle ray whilst taking five minutes to photograph another shrimp.

In general, the singular specimens do not form the subject of my art, rather it is the environment and the feeling of being immersed in it that I am trying to capture. It is only at the very end that I will think, ok, I need more anthias here or a Napoleon wrasse there; I think I have some footage of one somewhere... It is the environment that is the star and not the one fish.

X-RAY MAG: What is the message or experience you want viewers of your artwork to have or understand?

PF: The biggest message that I would hope to get across is that diving opens up another part of our world that, whilst needing to be respected at all times, can be welcoming and transformative. If I can get landlubbers to jump into the sea on their first dive due to discussing the ocean world with me, then I am just as happy as when achieving a sale.

X-RAY MAG: What are the challenges or benefits of being an artist in the world today? Any thoughts or advice for aspiring artists in ocean arts?

PF: The art world, just like everything else, has suffered in the last couple of years due to the cost of living,

and the Covid-19 pandemic, in particular. As an artist, you have to be ready for these times, so my strongest advice would be to have a backup plan, a part-time job or a continuation of your previous job, to keep the bills paid. Then, and this is the bad news, you will have to try to fit in a full week of art into the evenings and weekends.

Having a full portfolio and an online presence is vital if you are approaching galleries, but also try entering competitions first to make sure your art is well-received and/or sellable. You ideally want to have 10 to 20 fully finished pieces ready for any gallery you approach.

Lastly, if you are painting the underwater world, you really have to know it. It will show, if you don't. Nobody can get away with using online imagery that is not theirs. Online reference is fine for working out the anatomy of different species, for example, but you have to know which fish sits next to which. You would not paint a seahorse next to an orca, for example; it just would not feel right, even to non-divers. Know how species interact with each other, such as anthias and lionfish (run away!) or cleaner wrasse and giant moray eels (time for your dentist appointment, sir!).

portfolio

Fantasy Island, by Paul Fearn. Copper sheet with patinas and acrylic, 80 x 100cm (right)

X-RAY MAG: How do people—adults and children—respond to your works?

PF: In most of my larger pieces, I tend to hide a Nemo-looking clownfish amongst the hundreds or thousands of others, which keeps the children entertained for at least a few minutes. But the main responses to my art are either a fascination over the

process, or twenty questions about diving: “Is the underwater world really that beautiful?”, “Where have you dived?”, “Where would you recommend for a first-time diver?”, etc.

I, like nearly all other divers, love talking about diving, so it often happens that a sale comes about naturally through the conversations I love having anyway. And if no sale occurs, well, I would have still generated an interest in diving in somebody new.

X-RAY MAG: What are your upcoming projects, art courses or events?

PF: All artists need to develop their work over time—no matter how far along on their artistic journey they are. I am now looking at using engraving more as a finishing layer to my pieces, emphasising the swirls, eddies, currents and thermoclines we encounter under the sea. I also want to explore using some more realistic painting techniques to complement the somewhat abstract and

chaotic nature of my patinated backgrounds. But more than anything, I have a desire to keep exploring the world's oceans and to venture farther into the southern seas, experiencing more environments that I can portray in my future pieces.

X-RAY MAG: Is there anything else you would like to tell our readers about yourself and your artwork?

PF: Lastly, I would just like to say a big thank you to everyone who has stopped to look at, talk about or pur-

chase my artwork, whether they have spoken to me in person or looked at my art online, at an exhibition or in a magazine. I never realised when I began my diving journey just how welcoming, fun and friendly the dive community was. It is so easy to get talking to people, whether you are part of a couple or single, and we have made more friends over the past 16 years than we can count. ■

For more information or to purchase artworks, please visit the following links to galleries in the United Kingdom:

No Naked Walls, Bramley, Surrey (nonakedwalls.co.uk/artists/paul-fearn-metal-sheet-wildlife-paintings)

Mayne Gallery, Kingsbridge, Devon (maynegallery.co.uk/artists/paul-fearn/4670/gallery)

Bradford Gallery, Bradford on Avon, Wiltshire (bradfordgallery.co.uk/artists/111/Paul_Fearn)

Or visit [instagram.com/paulmfearn](https://www.instagram.com/paulmfearn) and paulfearnwildlifeartist.com



Coralito I, by Paul Fearn. Copper sheet with patinas and acrylic, 40cm x 30cm

