



GLOBAL EDITION
April 2021
Number 104



Gulf of Suez
SS Turkia

South Australia
Edithburgh

Contributors' Picks
**My Favorite
UW Photo
Technique**

WWII Wreck
UJ-2208

Wrecks
**Lake
Ladoga**

UW Photo
Prep for Print

FRENCH POLYNESIA

Fakarava

COVER PHOTO BY LUREN FERRETTI

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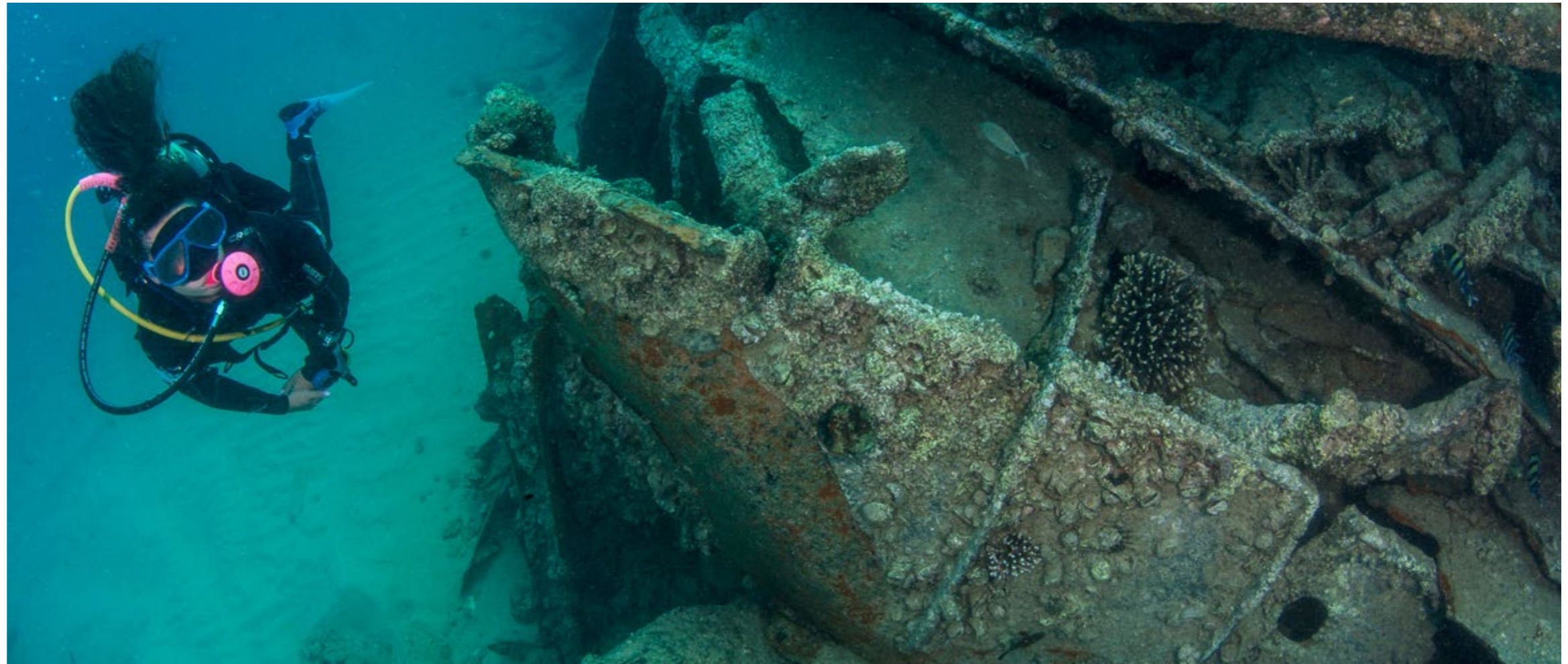
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COVER PHOTO: *Giant clam shot through a reflective cylinder, Yap, Micronesia*, by Lureen Ferretti (DeepWaterPics.com)

Diver on the wreck of the *Scalaria*, Gulf of Suez, Northern Red Sea. Photo by Rudolf Gonda



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**DIVE
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MOSCOW**

EUF Lavanchy Award is presented to X-Ray Mag's founder. Read the story on page 6.



Thank you!



editorial

Thank you, EUF.

Thank you, our team.

Thank you, colleagues, collaborators, associates and contributors.

Thank you, long time readers, sponsors and supporters.

While it is explicitly stated that the annual EUF Jack Lavanchy Award is a recognition that is generally given to a single person, our magazine has only become successful and recognised thanks to the stellar team of colleagues, collaborators and contributors—many of which have been with the magazine for quite some years. They are the true and unsung heroes. I wish to make that clear for the record. That is how I see it and feel, anyway.

I cannot and will not deny that I have had, over time, an instrumental role to play. Getting it off the ground and building it into an international and award-winning brand was not for the faint of heart, and standing firm and fighting to see one's vision eventually come to fruition meant many sacrifices.

But over time, my role as publisher and editor-in-chief has

transformed and expanded to include managing and coordinating and sometimes even coaching, whose job and perhaps main qualification has been the penchant for spotting, cultivating and optimising talent in other people. Thus, a team was created—and in the process also some long-lasting friendships all over the globe, which has been an invaluable gift.

To our friends and colleagues, I therefore have this to say: This is also your award. You all have a stake in it. We built this magazine and brand together, as a team.

Therefore, I thank you all for believing in this vision and for sticking with it for so long. Individuals may be transformative figures, inventors and visionaries, but all great achievements are done by groups, by teams and by pulling together in the same direction.

Our journey doesn't stop here. Together, we can go on creating more, building great things, and I surely intend to.

It is not only great fun being creative and developing new outlets and ways of connecting and bonding with our audience. There is also a serious underside and responsibility to it: Being communicators, we are also teachers, not just entertainers.

In this context, it is therefore both our role and responsibility to educate our audience about the aquatic realm and environment and raise awareness by furthering an appreciation and understanding of the nature that surrounds us and upon which we depend.

Come join us on that ongoing mission.

— Peter Symes,
Publisher and Editor-in-Chief



Edited by
Catherine GS Lim

from the deep
NEWS

Fiji's coral reefs recover

The swift recovery of Fiji's coral reefs four years after a powerful cyclone hit shows that they had been well managed by the local communities.

On 20 February 2016, tropical cyclone Winston struck Fiji. It was described as the most destructive cyclone ever to strike in the Pacific. With winds of up to 280km/h, the coral reefs in the Namena Marine Reserve and Vatu-i-Ra Conservation Park off Fiji were completely destroyed.

To understand how cyclones affect coral reefs and how fast the reefs recover, the team at Wildlife Conservation Society (WCS) Fiji conducted three surveys at different times—one month after, six months after and in December 2020 (more than four years after the cyclone).

They discovered that after just four years, the scenes of devastation had been transformed into those of hope and promise—in the form of fish swimming amongst vibrant and healthy coral reefs. Fish could even be found in parts of the reef where corals had not yet been replenished.

“The fast recovery likely reflects these reefs have good natural recruitment and they are well managed. Coral reefs that were healthier [before a destructive event like a cyclone] are

expected to recover a lot faster,” said Sangeeta Mangubhai, director of WCS Fiji, in an article in *The Guardian*.

Collectively covering nearly 200 sq km, the Namena Marine Reserve and Vatu-i-Ra Conservation Park comprise different marine ecosystems, including shallow reefs, deep water passages and small islands.

Because the local iTaukei communities hold customary fishing rights over Vatu-i-Ra and Namena, WCS Fiji had been working with them to establish reef management measures such as large no-take areas within the reefs.

Slow recovery elsewhere

Despite the swift recovery of Fiji's reefs, not all reefs affected by cyclones would recover as fast. In many other parts of the world, coral reefs are in decline.

The world is experiencing a climatic



VLAD KARPINSKY / FLICKR / CC BY-NC-ND 2.0

File photo: Reef scene in Fiji

crisis, which is expected to lead to more severe tropical cyclones and warmer, more acidic oceans, and this

will subsequently worsen conditions for coral reefs. ■
SOURCES: THE GUARDIAN, WCS



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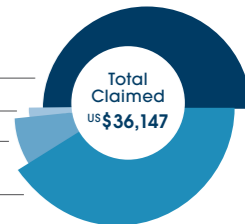


DCS in Maldives

A couple injured in Maldives relied on DAN's Guardian Plan to cover 100% of their claim. See the full story at DAN.org/Claim-Stories.

Medical Center & Hyperbaric Chamber (Husband)	US\$ 18,475
Extra Meal Cost (Both)	US\$ 687
Extra Hotel Stay (Both)	US\$ 1,763
Medical Center & Hyperbaric Chamber (Wife)	US\$ 15,222

Total Expenses Covered by DAN Guardian Plan US\$ 36,147



The scenario summarized above is offered only as an example. Coverage depends on the facts of each case and the terms, conditions and exclusions of the policy. Coverage may not be available in all states or outside of the U.S. Visit DAN.org for complete details.

Edited by
Peter Symes &
Catherine GS Lim



Sipadan Island, Sabah, Malaysia

PETER SYMES

Conservation in times of Covid

The impacts of Covid-19 have been felt in protected and conserved areas (PCAs) all round the world. Although each terrestrial and marine region has had a distinctive experience, and the news is not universally bad, there are common themes: sudden and massive reductions in visitor numbers (except near cities); associated losses of income for PCAs and for the economies linked to them, as income from tourism collapsed and government support was cut; reports of more incursions and illegal extraction of natural resources; the diversion of protected areas managers from their usual duties; and destabilising relationships between PCAs and indigenous and local communities.

Many PCAs have delivered innovative ways of engaging

visitors, opening up to new audiences and putting safety measures in place. Some governments and agencies have tapped into or created new sources of funding. Some tourist operators have been able to develop new products, even when numbers of visitors crashed. Some local communities have found new sources of work or income. While much of this is of a stop-gap nature designed to keep operations going through the crisis, many lessons have been learnt, which can be applied when the pandemic recedes.

Before the SARS-CoV-2 epidemic burst onto the scene, 2020 was planned to be a "Super Year for Nature," in which major new international targets to combat climate change and biodiversity decline would be set. That work has been delayed to

2021. This creates a unique opportunity to address all these pandemics with new resolve and commitment: a "Year of Green Recovery." ■

SOURCE: EXCERPT FROM FOREWORD OF "DEVELOPING CAPACITY FOR A PROTECTED PLANET," PARKS, THE INTERNATIONAL JOURNAL OF PROTECTED AREAS AND CONSERVATION

IUCN, the International Union for Conservation of Nature, defines a protected area as:

A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

Why marine creatures swim in circles

Animals might swim in circles to collect navigational information. Movement patterns may represent an intuitive connection to Earth's geomagnetic field.

Thanks to advancements in tracking technologies, scientists have discovered an intriguing behavioural trait amongst some marine species: They sometimes swim in circles.

When studying the navigational abilities of sea turtles, Tomoko Narazaki, a marine researcher at the University of Tokyo, observed that the turtles in her study would swim in circles so constantly "just like a machine."

She shared her observations with her colleagues, who disclosed that the animal species which they were studying (like sharks, whales, seals and penguins) also demonstrated somewhat similar circular movements.

For marine animals in the wild, the act of swimming in circles would waste precious energy reserves, as opposed to swimming in a straight line from Point A to Point B (which was more efficient). So, why were they doing it?

The scientists set out to find out, and recently published a paper in the *iScience* journal on their findings.

Courtship, foraging or navigation

It was found that there

were several situations in which marine animals exhibit circling behaviour. For instance, they may circle one another during courtship and social interactions, or when foraging for food as they surround the prey animal.

However, there were many other occasions when circling behaviour could not be explained, like when they did so outside of their feeding grounds or during times when they were not hunting. On such occasions, the researchers suggested that they swam in circles to collect navigational information and speculated that such movements may signify an intuitive connection to the planet's geomagnetic field.

Similar to how submarines circle during geomagnetic observation to cancel out "noise" (say, caused

by hull magnetisation) to obtain an accurate measurement, the marine animals might do so to gather directional and positional cues from the geomagnetic field, particularly in navigationally challenging situations.

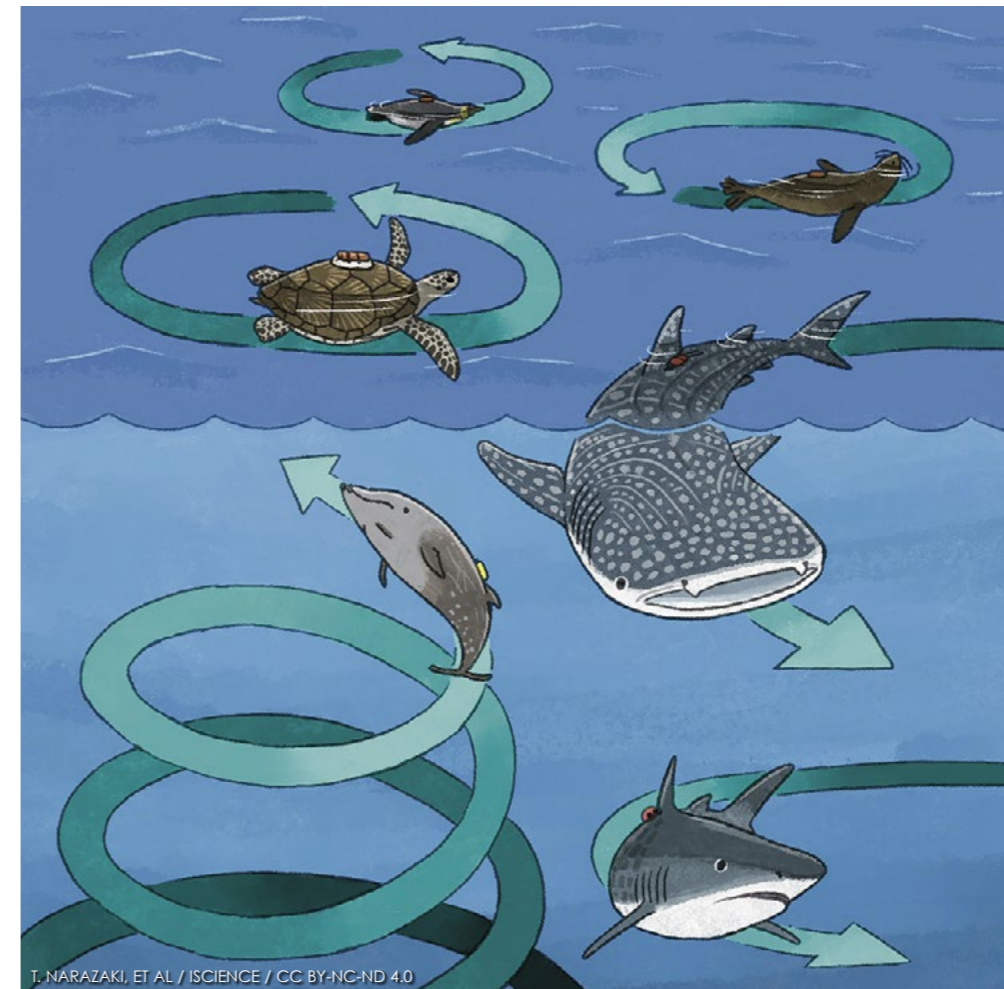
"Homing turtles did the turning behaviour at seemingly navigationally important points," said Narazaki, in a *New Scientist* article.

Advances in tagging

Incidentally, the discovery was made possible due to recent advances in tagging and 3D-biologging technologies. Now, scientists can record detailed geographic and behavioural data that can be used to hone in on the precise features of animal movements like pitch, heading, and small changes in depth.

To further understand the behaviour, the scientists hope to integrate the short-term data from tags with long-term satellite tracking, and to work with more species. They also hope to use video cameras and sensors during their observations to provide environmental context.

"We would like to examine animal movements in relation to animals' internal state and environmental conditions to examine why they circle," said Narazaki. ■
SOURCES: ISCIENCE



T. NARAZAKI, ET AL. / ISCIENCE / CC BY-NC-ND 4.0

Similar circling movements were observed across marine megafauna.

Edited by
G Symes

EUF Lavanchy Award is presented to *X-Ray Mag's* founder

The European Underwater Federation's Lavanchy Award was presented on 25 March 2021 to Peter Symes, the founder and editor-in-chief of *X-Ray Mag*, by the organization's president, Steffen Scholz. Also in attendance at the ceremony, which was held virtually due to Covid-19 restrictions, was Mark Caney, Deric Ellerby and Jesper Risløv.

Nowadays, digital publications are common, but back in 2003, when Peter Symes had the vision to establish and produce *X-Ray Mag*—the first digital dive publication—this was not the case. “Peter has created a publication that the whole world reads, because it covers the many aspects of our sport in depth: destinations, science, media, safety, research, equipment, people, places, etc,” stated the EUF in a press release.

With a background in science, Symes is a trained researcher, which has been invaluable to *X-Ray Mag*, giving the pub-

lication credibility in the scientific community. The EUF stated, “It has meant that the staff writers have been able to establish strong relationships with this community, and been trusted to write and publish cutting edge research in a format that will be read and shared by the advanced and technical diving community.”

In his gracious acceptance speech, Symes emphasized how it is very much a team effort to create each issue of the magazine. In addition



Peter Symes receives EUF Lavanchy Award.

to thanking the EUF for the great honor of the award, Symes thanks the publication's staff and contributors as well as *X-Ray Mag's* partners, sponsors and loyal readers.

About the award

The Lavanchy award is presented annually by the EUF, whose member organizations represent over three million divers, 60,000 dive instructors, 5,000 dive clubs and 2,500 dive schools. The award is presented in honour of the vision of dive pioneer and former Life Honorary Vice President of the EUF, Jack Lavanchy, “who was personally instrumental in the initial development and growth of European recreational diving,” writes the EUF, adding that over the course of his life, “Jack strived tirelessly to persuade the members of the diving community to work together for the good of the sport and the benefit of divers everywhere.”

The Lavanchy Award is presented each year to a person “who has made a significant and sustained contribution towards the responsible development of the European diving community.” ■

For more information, please visit: euf.eu.

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Diveheart partners with Tourism Malaysia for Moscow Dive Show 2021

Diveheart, in conjunction with Tourism Malaysia, will be presenting at the Moscow Dive Show 2021, 8 – 11 April 2021. The Moscow Dive Show, which is the largest exhibition of equipment, training and tourism for scuba diving and other water sports in Russia and Eastern Europe, will be held at the Gostiny Dvor Exhibition Center.

The exhibition is an excellent opportunity to connect with divers in Russia and Eastern Europe and widen the adaptive diving community, according to Jim Elliott, founder of Diveheart.

"We believe that everyone should have the opportunity to experience the life-changing power of scuba diving. There really are no boundaries to what we can achieve, and we have seen time and time again how educational scuba therapy has built confidence and transformed the lives of people with disabilities all over the world," said Elliott.

Elliott said he appreciated Tourism Malaysia's initiative in reaching out to Diveheart. "This collaboration demonstrates Malaysia's commitment to opening the doors to every diver, regardless of their abilities, to explore new dive destinations, build international friendships and gain new experiences at the same time."

Diveheart Ambassador

At the Moscow Dive Show, Diveheart will be represented by its Malaysian Ambassador Syed Abdul Rahman,

who is based in Kuala Lumpur, Malaysia, and is the founder and director of Kids Scuba Malaysia. In Malaysia, Syed has led Diveheart and adaptive diving programs for nearly a decade, training more than a hundred local adaptive divers and volunteers.

"I am pleased that more and more dive destinations in Malaysia are becoming more disability-friendly in terms of the facilities that they offer and willingness to accept adaptive divers," said Syed. In order to foster more accessibility for people with disabilities in the dive industry, Syed has personally conducted stakeholder engagements with government officials and agents of private tourism.

Syed will also be promoting Malaysia's world-class dive destinations at the Moscow Dive

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Diveheart Malaysia Ambassador Syed Abdul Rahman (third from the right) flashes the "OK" signal with participants in a Diveheart and adaptive diving program he conducted on Mabul Island, Malaysia.

Show. "Malaysia is truly blessed with so many beautiful dive destinations including Tioman Island, Perhentian Islands, Tenggol Island and of course, Sipadan Island," said Syed, adding that the waters around Malaysia are known for their beautiful coral reefs, rich underwater biodiversity, and a range of diving for all levels of divers.

About Diveheart

As a nonprofit tax-exempt 501(c)(3) organization, Diveheart's goal is to provide and support educational scuba diving programs for any child, adult or veteran with a disability, in the hopes of offering both physical and psychological

therapeutic value to that individual. "We have discovered the forgiving, weightless wonder of the water column provides the perfect gravity-free environment for those who might otherwise struggle on land," stated Diveheart in a press release. "Underwater, we're all equal." The organization works with people with a variety of disabilities, including physical and developmental disabilities, vision and hearing impairments, amputations, traumatic brain injuries, Post Traumatic Stress Disorder and more. Diveheart strives to help its participants to "Imagine the Possibilities" in their lives. ■

For information, visit: diveheart.org

wreck rap



At 100m, Andrea "Murdock" Alpini and Fabrizio Pinna explore the port side of UJ-2208, located off the coast of Genoa in Italy.

Text by Andrea "Murdock" Alpini
Archive photo research by
Andrea "Murdock" Alpini
Underwater photos by Marco Mori

This is the incredible story of the French trawler that was turned into the German submarine fighter UJ-2208 during WWII and sunk by a British submarine off the coast of Genoa in 1944. Nowadays, the UJ-2208 lies on the seabed at a depth of 108m, covered in Mediterranean mud, fishing nets, shrimp and oysters. A must-see wreck in Italy, it encapsulates a piece of history and presents a stunning adventure to experience on a deep technical dive.

The submarine fighter UJ-2208 was originally built in 1926 at Saint-Malo in France by Ateliers & Chantiers De Bretagne at the request of French shipowner Eugène Lemoigne who launched it as FV *Alfred*, an offshore fishing trawler. The gross tonnage of the ship was 966 tons, with a length of 65m, a width of 9.8m and a draught of 3.9m. The propeller was powered by a triple expansion steam engine, which generated a speed of 10.5 knots. In 1933, the trawler was sold to brothers

Jean Baptiste and Victor Pleven. The new owners sailed their new boat until 1939. When WWII struck in France, the French Navy confiscated the ship and converted the *Alfred* into an armed cargo vessel, which was rebaptized as *Alfred P-129*.

The new warship sailed under this name until 1942, when the German Kriegsmarine (navy) converted this ship into its final form: the submarine fighter UJ-2208.

On 3 October, the British submarine HMS *Sickle* resurfaced from its depth at sea to

torpedo the German submarine fighter UJ-2208. The *Sickle* launched a torpedo, which missed its target, and then started to submerge again. Meanwhile, the navy gun operator on board UJ-2208 made a mistake in pinning the correct position of

the *Sickle*. The battleship made it to the end of its first day in battle.

The following day, the UJ-2208 was again under enemy fire. This time it was HMS *Usurper* (P56) that targeted the unlucky German warship. The *Usurper*



Exploring the Wreck of **UJ-2208** *the WWII Battleship at Genoa*

MARCO MORI





was active in the Gulf of Genoa. It had the notable dimensions of 58.22 x 4.88 x 4.42m and was equipped with four torpedo tubes in the bow section and a machine gun on the main deck. The submarine was built in 1941 by the Royal Navy at the Welsh shipyard of Vickers Shipbuilding & Engineering, Ltd.

The *Usurper* had left Algiers on 24 September 1943 with the directive to reach La Spezia (a Ligurian harbor and military base) to refuel. On 3 October, the commander of the British unit received the order to travel to the Gulf of Genoa for a mission. The second part of the directive was to go back to the

base in Algiers on 12 October. The *Usurper* would never return.

The dynamics of the clash was not entirely clear, but the UJ-2208 reported in its captain's log that on 4 October 1943, it clashed with an enemy submarine at the coordinates CJ 1345 (44°15'N, 09°06'E, approximately). Most likely, the submarine was the *Usurper*, but it is not certain. In fact, one source mentioned the British submarine was lost due to hitting a mine, while another source reported that it was sunk by UJ-2208, which released 69 depth charges from the stern side, between 9:56 and 11:55 am. The *Usurper*, captained by David Roger Oakeley,

sank into the dark blue waters of the Ligurian Sea with its crew of 35 young sailors. To this day, the *Usurper* has never been located on the seabed. The British Navy officially reported the sub: "Missing on October 1943."

On 20 February 1944 at 7:23 p.m., the UJ-2208, under the command of Oscar Schmidt, accidentally struck a mine, which was left by its own navy, the German Kriegsmarine. It was a real disaster; 61 of the crew lost their lives. The collision with the mine split the battleship into two. Today, the stern and bow lie more than 160m apart from each other, in the muddy seabed. The bow portion

of the wreck measures about 25m, and the stern is about 35m long, more or less. The central part of the ship exploded into a thousand fragments. During the explosion, one more ship was involved: the Italian SS *Nina*, which sank to a depth of 116m, and rests precariously balanced on a slope close to the edge of the abyss. At any rate, SS *Nina* is another dive story that deserves to be told.

Diving on the UJ-2208

The team with which I was diving was already waiting for me at the water's surface, holding their BOVs (bailout valves) between their teeth. I could see their red and green LED sensors flashing. They were just waiting for me to give the OK signal to descend, because I was the only one diving on open circuit, so I needed to breathe calmly and deeply before departing from the surface. I eyed each one of them, giving each the OK signal, and we started to descend along the 98m downline that connected us to the top of the wreck.

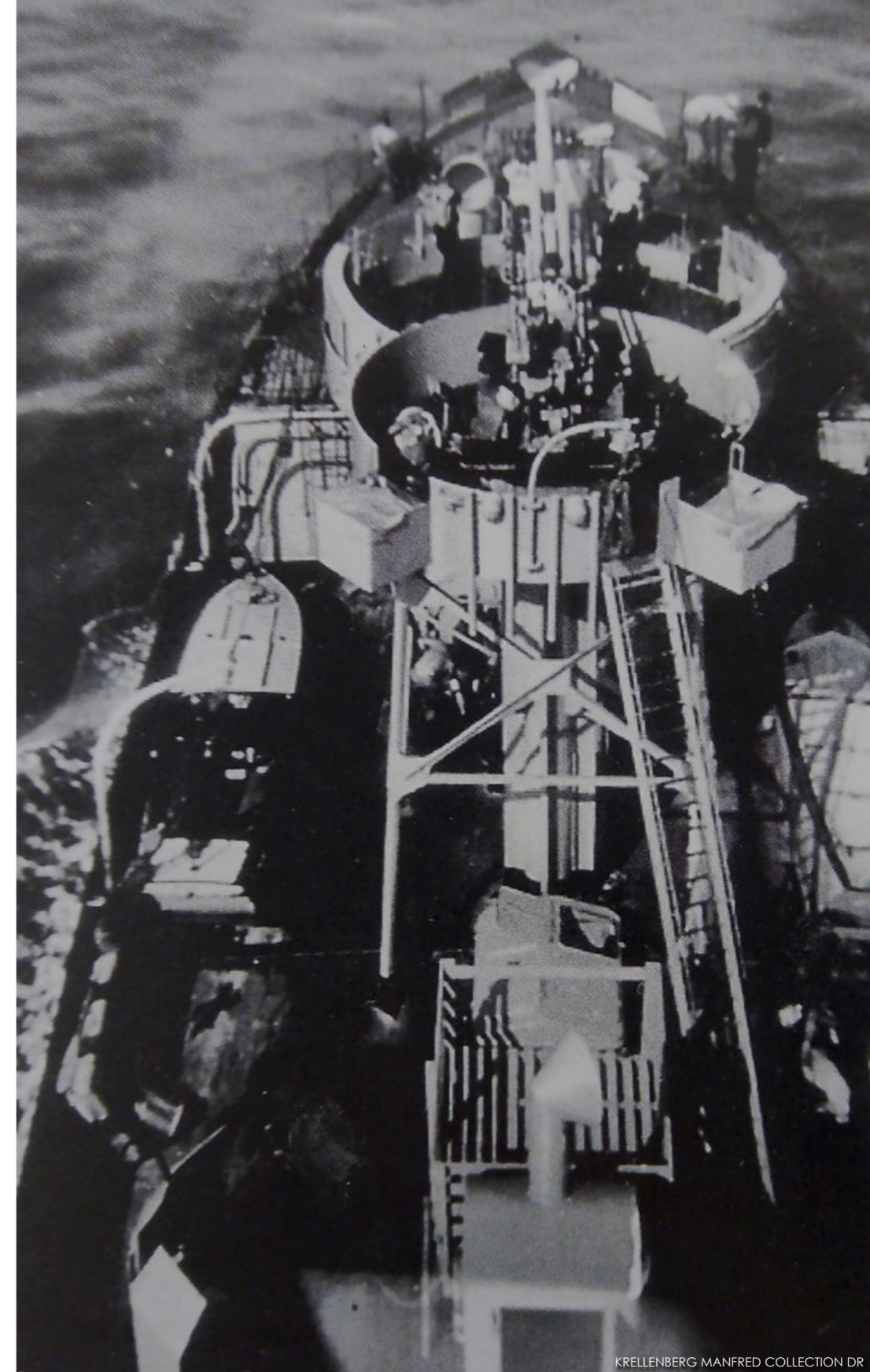
Step by step, I checked the gas switches while my thumb and forefinger slid down the white rope. When I reached the wreck, I fastened a strobe light above us to help us easily find our way back home. Today, the visibility was very poor; it varied from two to three meters maximum. A couple of minutes later, the team was ready to start the exploration of the wreck.

Orienting ourselves to the

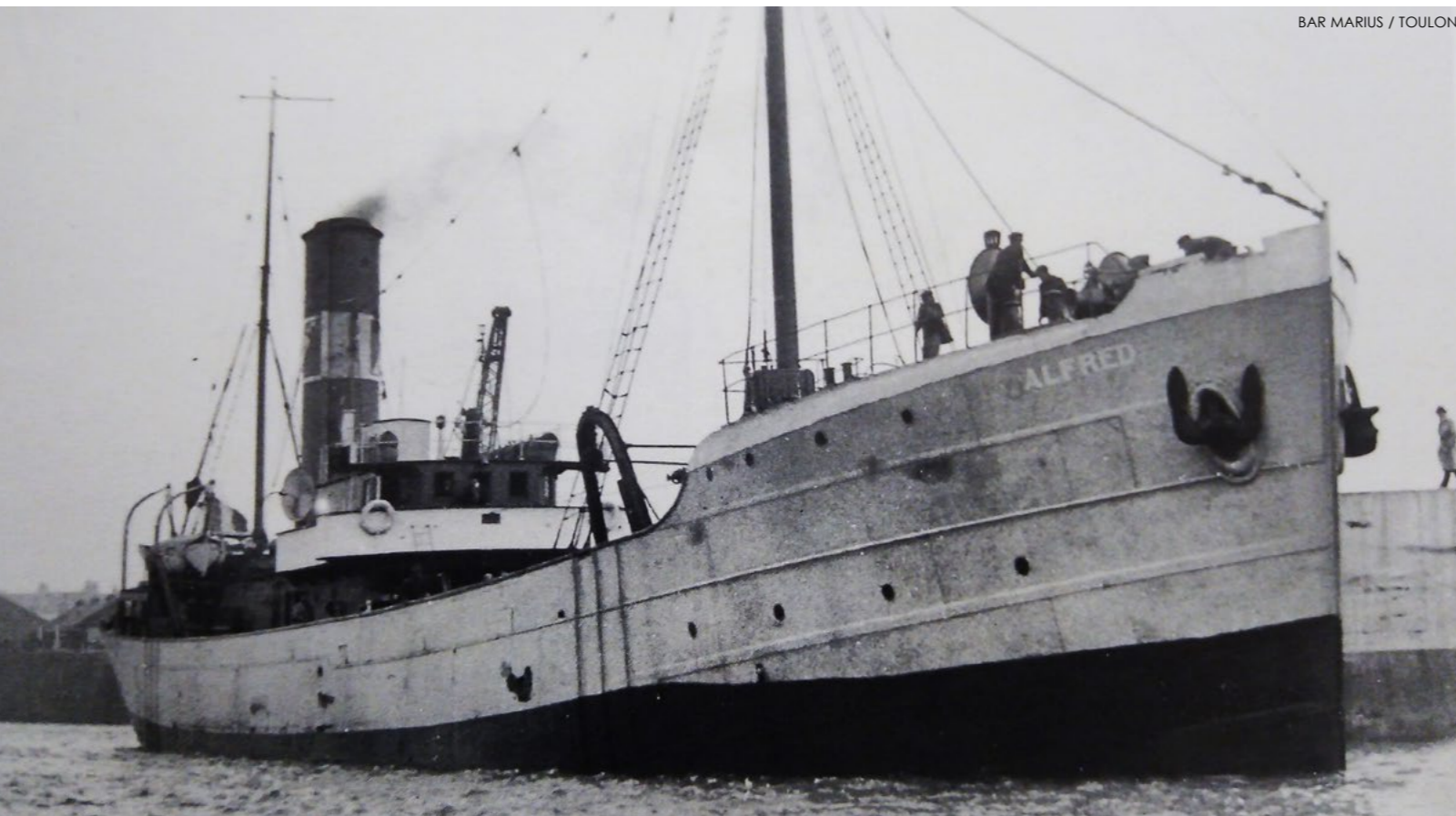
wreck was complicated; we had scant information upon which to plan the dive. We only knew that the bow leaned to the right with the keel pointing up to the sun. A quick glimpse at the wreck told me that this was not the case.

In fact, the hull was resting completely on its starboard side as if it was sleeping deeply. The main deck was perpendicular to the seabed—further complicating how to film the wreck and collect data.

Historical photo showing the bow of the submarine fighter UJ-2208, during a mission in WWII (right); Archival photo of the fishing trawler *Alfred* before it was converted into the submarine fighter UJ-2208 (below)



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I proceeded along at an average depth of 105m. I could see some cracks and holes in the ancient wooden main deck. The view I had of the wreck told me that it was very fragile and complex. Sometimes, discerning elements of the site was difficult, and I needed to get very close to the wreck. At this stage, I preferred to focus on only a few

elements and the overall shape of the wreck itself.

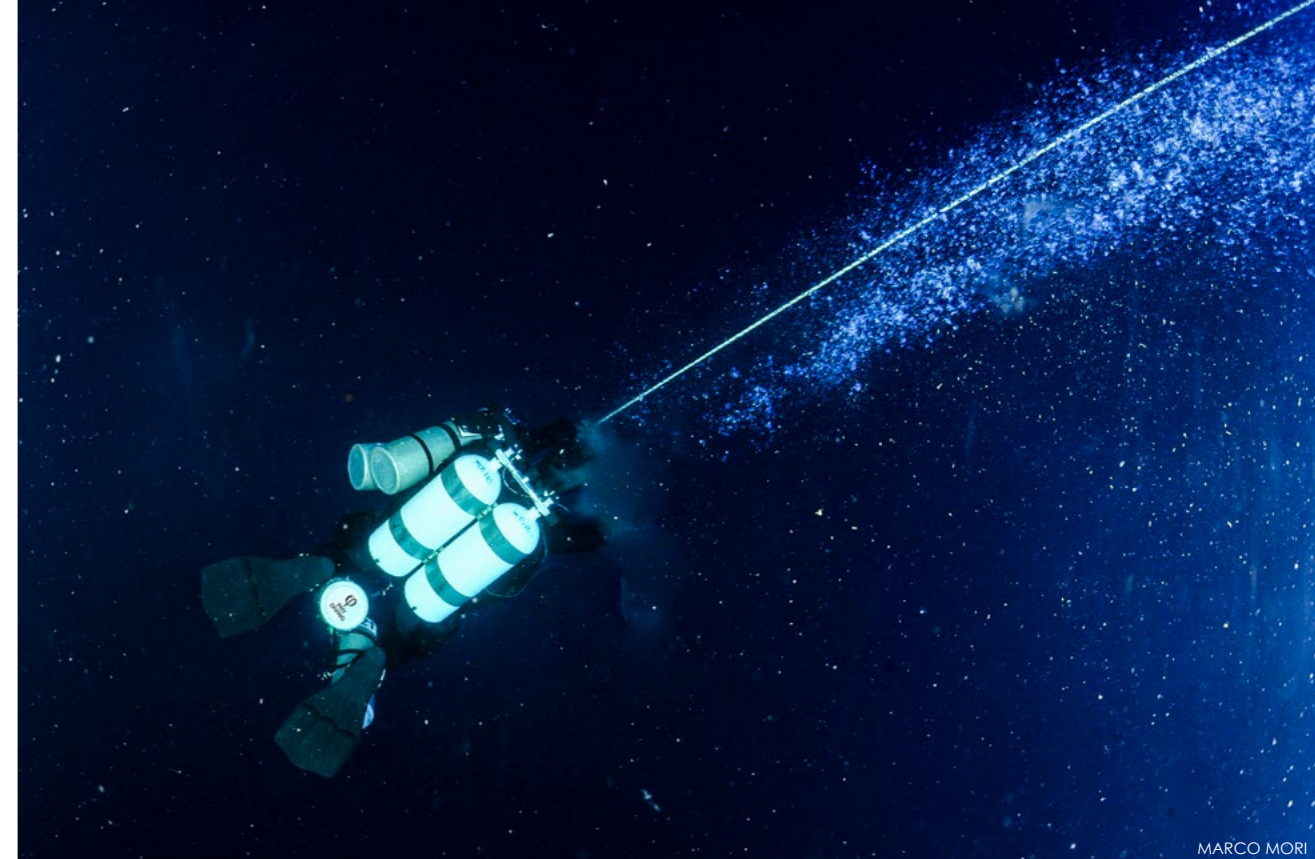
I descended a few meters lower. Now I was at 108m, the bottom. I inspected the steel beams covered in silt, then I turned back, retracing my steps, to again approach the extreme shape of the bow. There appeared a razor line that ran straight into the darkness of the sea.

I swam four meters along the draught of the ship's hull. Big shadows and zero visibility made it seem like this short swim was eternal.

Mine explosion damage

Moving up the hull to the top, I passed under our strobe light, which flashed proudly in the dark. Below this point, the

Alpini descending on the downline to the wreck of the UJ-2208 at 108m (right); Alpini looking inside the bow deck of the UJ-2208 at 106m (below)



MARCO MORI



MARCO MORI

wreck was open like a can of tuna. The mine blast had created a chasm in the ship. Looking at it, one could recognize each section of the ship. You could see, layer by layer, all the architecture and engineering of UJ-2208.

The mighty beams were curled like a brushstroke. The heat of the explosion must have deformed the ship into a new and irregular shape. I spent some time evaluating its condition. I was at a depth of 99m when I decided to go inside the wreck. I moved forward slowly. A few minutes later, I reached the bow. I could see the ribs of what was once the fishing trawler *Alfred*—it was amazing. After a while, I looked out through a crack and saw the shining lights of my diving buddies. Against the light, the skeleton of UJ-2208 appeared before me. Unfortunately, I could not fully savor the atmosphere to the end of the wreck because there was a constant silty fog that never lifted.

Details of the wreck

I exited the wreck at a depth of 106m and turned around to admire it from another point of view. Following the median line of the main deck, I noticed a hollow circular section that arose about 1.5m from the deck. I could not

identify its function; I could only hypothesize that it might have served as a point of communication between crew members above and below deck. A short distance away, I saw two cargo winches.

Then, I poked my head and my dive lamp through a rectangular hole in the hull, and a new scene appeared before my eyes. Inside, visibility was clear and a new world of small stuff and details now filled my view. "This part of the wreck looks more like a fishing ship than a battleship," I thought to myself as I continued my exploration.

We had five minutes left to spend on the wreck, so I decided to move toward an element that had piqued my curiosity. After a quick look, I recognized a circular structure that was one meter high—a kind of parapet or bulkhead. Inspecting it further, I found other structures merged with it. The framework was about six meters high; it seemed to be an armed turret or lookout tower.

My depth gauge signaled that my bottom time was over and I had to ascend. I still had time to recover my strobe light before calculating decompression tables: 28 minutes at an average depth of 105m. A carpet of red shrimp covered the downline's surroundings. This was the last glimpse of the wreck's bow section I had.



At 99m, a tiny door entrance on the main deck's starboard side at UJ-2208's stern (left); At 98m, on the wreck's stern, a Flak 38 anti-aircraft gun is hidden by fishing nets (bottom right).

UJ-2208

of the winter sea over decades, the wreck had collapsed in on itself. The main door through which one could get under the bridge was very narrow. It was necessary to remove our decompression cylinders or bailout to get inside this unexplored area. The central part of the ship was cut in two by the mine explosion. We were on the opposite facade from our last dive on the bow.

Challenging navigation

Our daily target was to reach the end of the main deck. I wanted to see what remained after the 1944 explosion. The mine had struck very hard. What we saw were just ruins—metal

sheets bent out of shape. Getting lost in this rubble was easy. My buddy and I had begun each exploration at the same metal sheets on our left when our navigation suddenly brought us to the right. Memorizing elements on the wreck was very difficult; the path to the end of the wreck was twisted and curved. The sensation of disorientation continued to grow until my dive buddy finally asked me: "Where is the stern?"

We had entered a void, traversing a land inhabited by huge metal sheets and beams. With my right hand held firmly out in front of me, I put my video light down, checked the compass, and took the correct direction towards the bow. We had been at a depth of 99m for quite a long time. The wreck appeared very fragmented and unrecognizable, like teeth of steel rising from the seabed.

Later, it would be only water and a long decompression time. After a while, the battleship UJ-2208 disappeared into a wild and stormy cloud of muddy current.

Revisiting the wreck

A few weeks later, I was diving again on the wreck of UJ-2208. This time, I decided to focus only on the stern section of the German battleship. We were more than 160m away from the point we had dived the last time. Approaching the wreck was

really fascinating. The first glimpse we got was of the old anti-aircraft Flak 38, with its guns pointing upwards, in search of daylight. The top of the gun was at a depth of 90m. Unfortunately, a lost fishing net partially covered the machine gun. It looked like a bride at the altar waiting to be revealed.

The atmosphere around the wreck was satisfying. Once the strobe light and a couple of decompression cylinders had been secured to the downline,

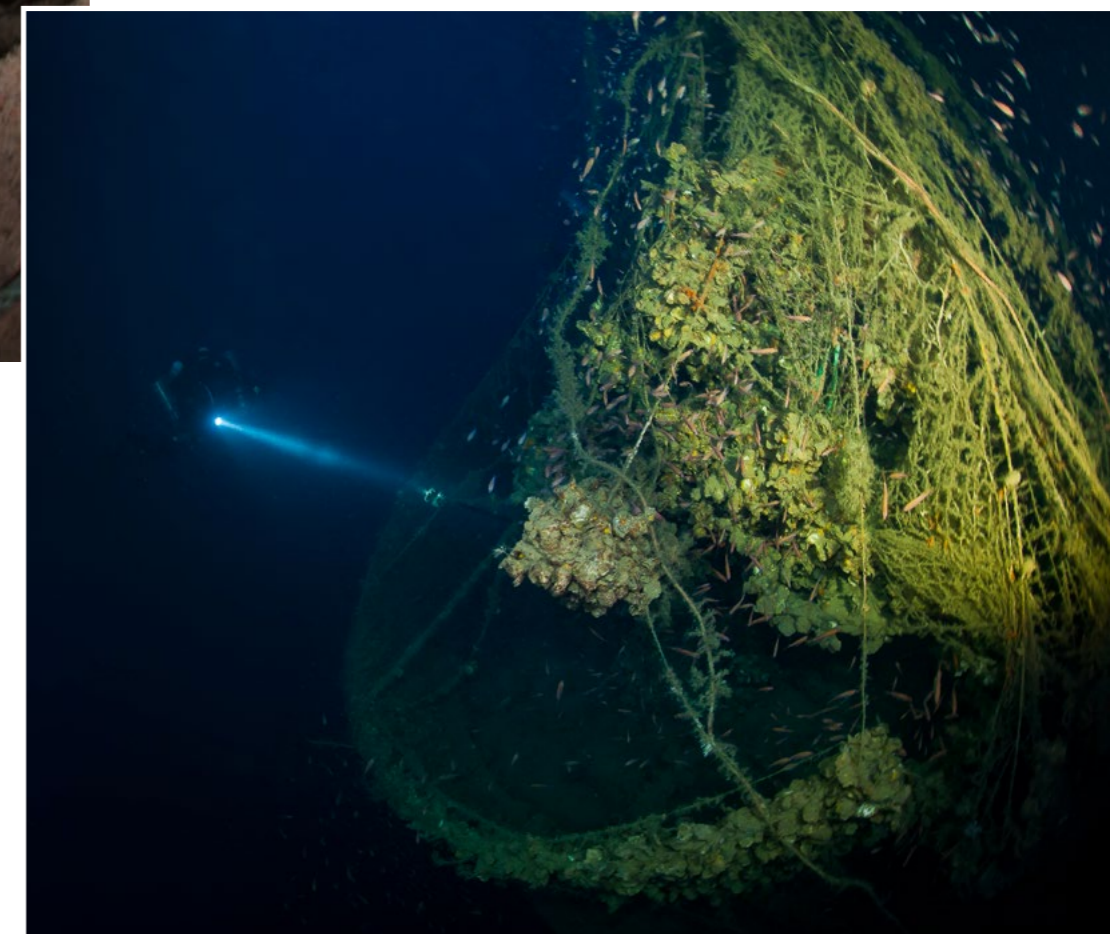
we began our exploration.

Crossing the stern from left to right, I rounded the circular shape of the structure that held the Flak 38. The steel structure had partially collapsed under its own weight and now lay flat on the transom. Looking through the tiny cracks of the wreck, one could catch glimpses of dancing crabs glued to the old ship's steel structure. Descending a few more meters, I followed the profile of the rudder until I reached the bulb of the left propeller.

Above my head, a labyrinth of fishing ropes and nets made the site look like a tropical forest of leaves, branches and vines.

Surprisingly, the visibility on the bottom was great. The ship's funnel lay on its side next to the port side of the ship at a depth of 102m. A few fin kicks later, I reached the left edge of UJ-2208, which was wide and grand, and completely covered by oysters.

I turned back again to the main deck. Subjected to the force





MARCO MORI

Alpini and Pinna switch gases during a decompression stop on the downline to UJ-2208.

While we swam back to the main deck of the wreck, I found a very interesting place where it was possible to get inside. Unfortunately, it was too far away from our downline and too late in our dive to investigate.

We moved forward quickly. Below me, I saw the destruction caused by the mine. A few fin kicks ahead, the handle of a machine gun appeared. Its position coincided with the archival photos I had studied during dive planning over recent weeks.

We were almost at the stern. Some meters ahead, I could clearly see our strobe light flashing. I now felt like I was home again. ■

The team's sponsors include PHY Diving Equipment, Scubatec,

Tecnodive Booster, Big Blue Lights and TEMC Gas Analyzers.

Based in Italy, author Andrea "Murdock" Alpini is a technical diving instructor for TDI, CMAS and ADIP. 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, SUB Underwater Magazine, ScubaZone, Ocean4Future, In Depth 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 specializes 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 first book, *Deep Blue*, about scuba diving exploration (in Italian) was released in January 2020 (see amazon.it). For more information on courses, expeditions and dived wrecks, please visit: wreckdiving.it.



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Historical photo of the USS Johnston off Seattle, Washington, USA, taken on 27 October 1943

USS Johnston, world's deepest known wreck, positively identified

An expedition has successfully relocated, surveyed and filmed the USS Johnston, a WWII US Navy Fletcher-class destroyer that sank in battle on 25 October 1944. Lying at a depth of 21,180ft (6,456m), it is the world's deepest known shipwreck.

The 115m-long US Navy destroyer is widely known for her bold action in the Battle off Samar in the Philippines. The actions of the relatively lightly armed Johnston—sunk after a fierce battle with a large fleet of Japanese warships—helped stop the Japanese Admiral Kurita's Center Force from

attacking vulnerable US landing forces, and inflicted greater losses to the Japanese attackers than they suffered.

Initial discovery

On 30 October 2019, it was announced that the research vessel *Petrel* of Vulcan Inc. discovered what was believed to be the deepest shipwreck ever, located at 20,406ft (6,220m) deep in the Philippine Trench; the wreck was in pieces with no significant hull sections located.

The wreckage pieces found consisted of two destroyed 5-inch (127mm) turrets, a propeller shaft and propeller, two funnels, a mast, a barrette, and unidentified piles of twisted hull, interior, or machinery debris.

On that expedition, film recordings of

pieces of the vessel were taken by a remotely operated vehicle (ROV), but the majority of the wreck, including its upright, intact, forward two-thirds—the bow, bridge and midsection—lay deeper than the ROV's rated depth limit of approximately 20,000ft (6,000m).

Confirmation

On 31 March 2021, it was announced that the research vessel DSV *Limiting Factor* of Caladan Oceanic had surveyed and photographed the deeper main wreck. The hull number, 557, was clearly visible on both sides of its bow, confirming the wreck as *Johnston*. She sat upright and was astonishingly well-preserved at a depth of 21,180ft (6,460m), making this vessel the deepest



Photographs of the wreckage leave no doubt that it is the wreck of the USS Johnston.

shipwreck ever recorded.

Two full 5in gun turrets, twin torpedo racks, and multiple gun mounts were still in place and visible on the superstructure. No human remains or articles of clothing were seen at any point during the dives and nothing was taken from the wreck. ■

SOURCE: CALADAN OCEANIC



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Edited by
Scott Bennett

Airlines start dropping pandemic-specific rules

Airlines in the United States report a sharp increase in bookings as vaccine distribution has increased and airlines are slowly starting to go back to pre-pandemic rules.

As more people get their first shots of the Covid-19 vaccine, some airline industry traditions are coming back. Airlines are slowly returning to their old boarding policies, while quietly re-adding change fees to certain tickets.

According to *Travel Weekly*, the majority of major airlines will go back to assessing fees for Basic Economy fares by 1 April 2021.

IATA endorses antigen Covid-19 tests

As part of the path to reopening international travel, Covid-19 testing will inevitably be part of the future. The International Air Transport Association (IATA) is suggesting governments adopt the rapid antigen test over PCR tests as the universal standard after a research study suggests they could be more accurate, conve-

nient and cost-effective.

From its data, the IATA noted that PCR tests come not only with a significant time cost for travelers but may also be limited in certain parts of the world.

"When international travel reopens, testing is likely to remain part of the strategy for controlling Covid. The type of testing regime chosen will make the difference in how quickly the travel industry recovers. The choice of a rapid test would be a real boost to the global travel and international business community, and our research shows it can be as effective as other testing regimes and as effective as a ten-day quarantine," said Michele Granatstein, a partner at Oxera and head of its Aviation Practice.

■ SOURCE: IATA

Vaccination becoming a condition to travel

The CEO of Qatar Airways, Akbar Al Baker, has said the requirement for Covid-19 vaccinations will likely be a trend in air travel, as the industry attempts to rebound from the coronavirus pandemic. Echoing these sentiments, the CEO of Australian airline Qantas, Alan Joyce, stated that "governments are going to insist" on vaccines for international travelers.

Cruise operator Norwegian Cruise Line has stated it would require mandatory Covid-19 vaccinations for all guests and crew when it restarts trips from US ports in July. The company's announcement follows the US Centers for Disease Control and Prevention's (CDC) latest guidance last week to the cruise ship industry, including the need for Covid-19 vaccinations.

The CDC announced on 2 April that fully vaccinated people can travel at low risk to themselves. For international travel, the US government does not require those leaving to be tested before the trip, but travelers do need to produce a negative test to enter the country and take another test three to five days after arrival. They do not need to self-quarantine post-travel.

All travelers are still required to wear face masks, maintain social distance and avoid crowds.

Advice about traveling abroad, including the latest information on coronavirus, safety and security, entry requirements and travel warnings can be a maze to navigate through, but updated and official travel information can often be found on foreign ministry or state department websites. ■

SOURCE: CDC

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Photo: Matthew Smith



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Edithburgh Jetty

South Australia's

Text and photos by Don Silcock





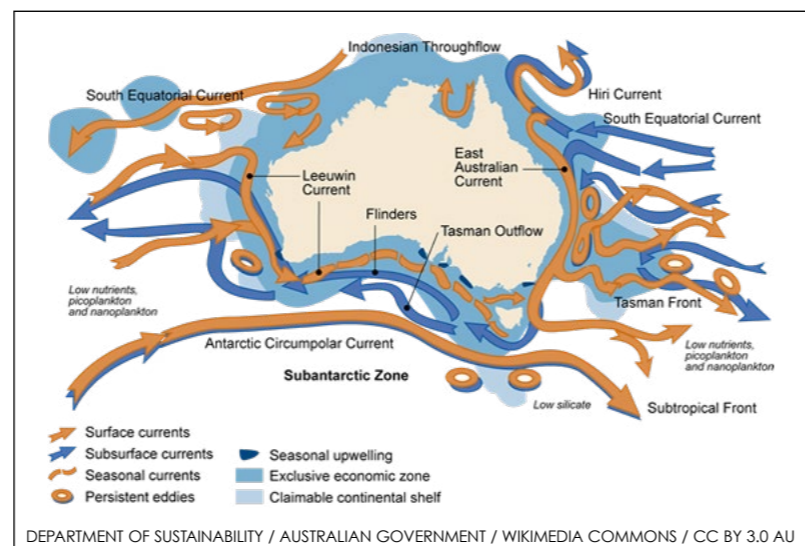
Located on the southeastern tip of the Yorke Peninsula, the small town of Edithburgh is home to what is possibly the absolute best of all the many wonderful jetties of South Australia.

Dived on a good day with optimal conditions, “Edith,” as it is known locally in the SA dive community, is a stellar dive that ranks highly among the must-do dives in Australia. Plus, if you can get there for a few days during the week, there is a good chance you will have the place (well, underwater, that is) to yourself!

Built in 1983, primarily to facilitate the export of locally produced salt around Australia and over to New Zealand, the jetty allowed Edithburgh

to become, at one point, the third busiest port in South Australia. The specific location was chosen for its sheltered location and proximity, across the Gulf of St Vincent, to the state capital Adelaide. But, unbeknownst to the people who planned the jetty, was the Great Southern Reef and the rich seasonal upwellings created by the Leeuwin and Flinders Currents that feed and nourish its superb biodiversity.

For those currents, the structure, shape and location of Edithburgh Jetty have provided an almost perfect



science-project-like petri dish to demonstrate to the world what they can do—and the results are truly stunning!

First impressions

Yes, I know—first impressions are not always correct, but they do matter



Sponges, tunicates and invertebrates cover the pylons (above, top left and previous page) of Edithburgh Jetty (in aerial view top right); Map showing Australia's ocean currents, gyres and eddies (left)



Brilliantly coloured invertebrates cover pylon at Edithburgh Jetty (above); Horned blenny (top right)

and definitely create that initial impression. With Edithburgh, your first impressions will have been formed by the three-hour-or-so drive out of Adelaide, which in my case has always been vaguely vanilla-like, at best, followed by a sharp left turn and the journey down the Yorke Peninsula, with its amazingly large and flat expanses of fertile wheat fields—that is, until you realise just how much natural vegetation and animal habitat must have been cleared to facilitate it all. That said, those local farmers work very hard doing what they do—and the world loves our clean and green produce, so let's take that particular discussion off-line.

and my thoughts are always that it may not be the end of the world, but I should be able to see it from here. It is neat, tidy and safe—but if you need to eat after 8:00 at night, bring your own food.

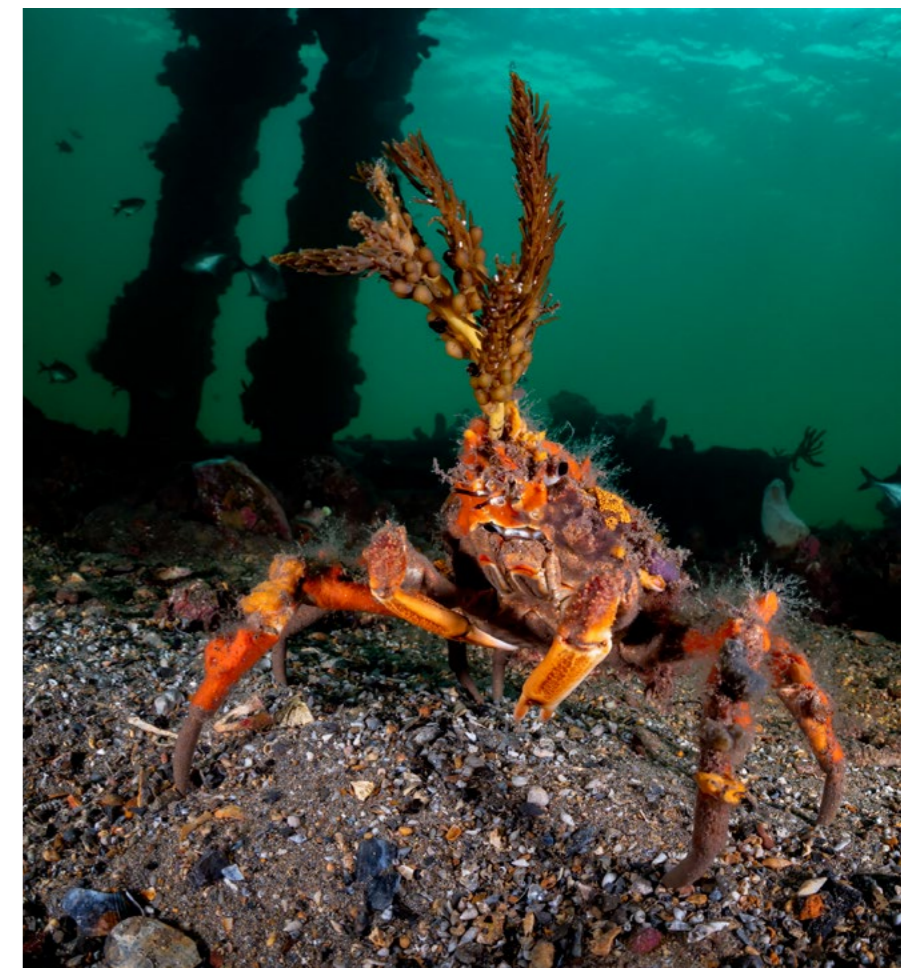
The jetty pylons

Life was hard and tough for the original settlers of Edithburgh and probably even harder for the “blow-ins” who came here to find work. If those hardwood pylons that underpin the jetty could talk, they would tell many an interesting



story about what they have seen.

They can't, of course, but what they can do is stand as silent witnesses to the fecundity of those Great Southern Reef currents and the rich upwellings they create. For the wide and low structure of the jetty has created an incred-



Decorator crab (above); Map of the region with location of Edithburgh and Adelaide (left)

Sponge crab at Edithburgh Jetty



Edithburgh

Mating pair of pajama squid (above); Leafy seadragon under the jetty at Edithburgh (left); Black angler frogfish (bottom left); Map sketched by the author, showing where critters like frogfish and seahorses were found around Edithburgh Jetty (right)



ible infrastructure for the temperate water corals, sponges and ascidians to thrive on an almost biblical scale—yes, it's that good!

When diving Edithburgh Jetty, the pylon growth seems rather sparse initially. Then, from about one-third down the 170m length of the jetty, it seems to double and then triple in density, as those nutrient-rich currents make their impact felt.

Studies of the pylons have identified some 30 sponge species, ten types of bryozoan aquatic invertebrates, 20 species of colonial ascidian filter feeders, nine solitary sea squirt species, nine tube-building polychaete bristle worms and four species of barnacles.

Iconic species

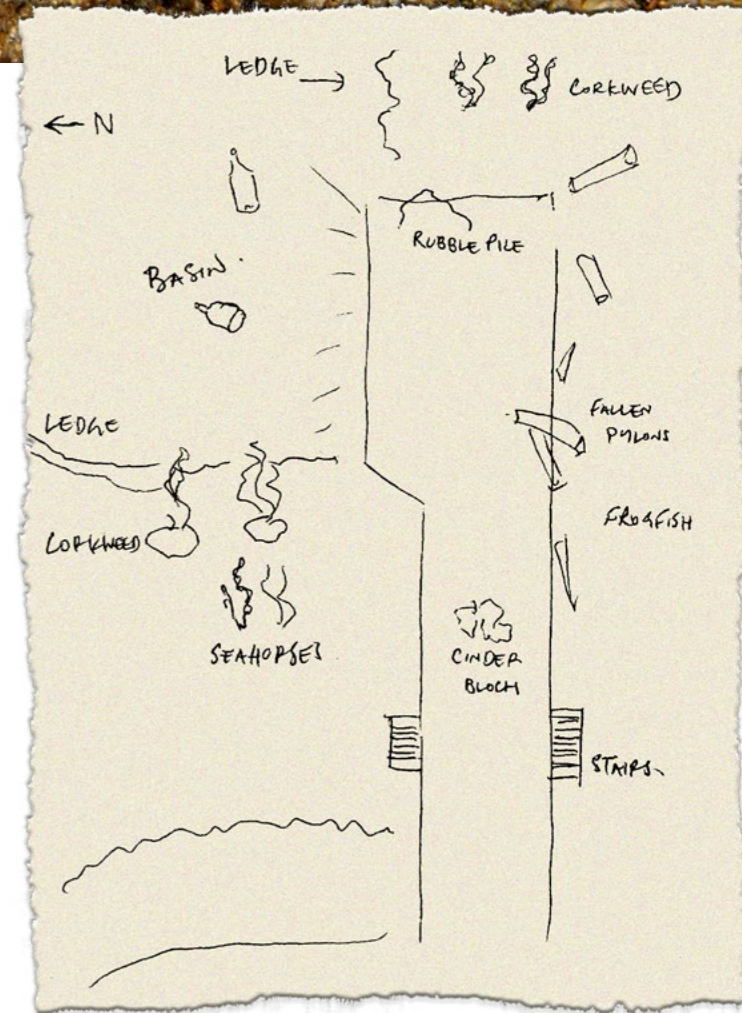
While the pylons are indeed spectacular, Edithburgh is also well known as a great place to see some of South Australia's iconic species—particularly the wonderfully serene and incredibly photogenic leafy seadragon (*Phycodurus eques*) and the equally photogenic striped pyjama squid (*Sepioloidea lineolata*).

The leafy seadragons are typically found most often during the day in the large patch of corkweed to the north of the jetty but can also be encountered at the very end of the jetty. While the pyjama squid are usually buried in the sand under the jetty during the day, they emerge at night to feed and, if you are lucky, to mate!

Edithburgh is also a great place to see and photograph decorator crabs (*Majoidea*) as they are common under the jetty and make great subjects, with their incredible stuck-on appendages. Plus, they will often remain motionless when approached, convinced they are invisible in their special camouflage. Among the fallen pylons and other debris under the jetty is also where you will find many southern blue-ringed octopuses (*Hapalochlaena maculosa*) at night, as they emerge to feed.

Diving the jetty

In a nutshell: quite straightforward. There are excellent stairs on both the northern and south-





Blue swimmer crab (above); Leafy seadragon under the jetty (top right); Highly venomous blue-ringed octopus (left)

ern sides of the jetty near the parking area. So, once you are geared up, it is a short walk and an easy entrance. Getting out again is the reverse and also straightforward, unless the wind changed while you were underwater.

Edithburgh is best dived when the wind is from the west or southwest, as the jetty's location means that it is nicely sheltered by the bottom of the Yorke Peninsula, and you will have excellent conditions. Conversely, when the wind is from the east or southeast, don't bother, as it blows in across the Gulf of St Vincent right onto the jetty. So, entry

and exit on the stairs will be challenging at best, dangerous at worst, and underwater visibility will be greatly reduced as the bottom is stirred up.

Once in the water, it is time to explore, and because of its 170m length and 11m width on the main section, there is a large area to do that. Depth under the jetty varies from two metres at the stairs to about ten metres, depending on the tides, so you can easily spend a couple of hours underwater.

Night dives

During the day, the jetty changes subtly as the sun waxes and wanes, creating

mood shifts as its rays penetrate under the jetty. Midmorning, together with late afternoon, are my personal favourite times to be in the water. But, if you like critters and observing their behaviours, then after dark is when Edithburgh Jetty really turns it on.

Those pyjama squid and blue-ringed octopuses that were buried in the sand during the day are out and highly active at night, as are a tremendous variety of other creatures. That said, be prepared for what could be a late night, as there is so much to see, and the shallow depth will probably mean a couple of hours underwater taking it all in.



Edithburgh Jetty



Diver under the jetty (above); Pylon covered with invertebrates (right)



Fisho's, or "people who like to fish," at the jetty

Logistics

The nearest dive shop is in Adelaide, a couple of hours away, so you need to arrive in Edithburgh with everything you need. The local BP service station has a compressor, and you can get tanks refilled. There was a lot of online gossip circulating about the quality of the air, but I spent a week diving the jetty in February and had no problems at all.

Weekends and public holidays mean lots of local divers from Adelaide, so there can be queues to get refills, and it also means that accommodation can get booked out. There is a good caravan park in Edithburgh with permanent cabins, but they are also popular with the "fisho's" (Australian for "people who like to fish"), who are a permanent feature of the jetty. Personally, I used AirBnB and have had good accommodation every time.

In the centre of town, there are two pubs that serve food—one at

the Edithburgh Hotel and the other at Troubridge Hotel—but last orders are around 7:45 p.m. There is also a deli in town which serves snacks and has a reasonable number of groceries, but the nearest supermarket is 16km away in Yorketown.

Final words

South Australia has, in my opinion, some of the best diving in Australia, and Edithburgh Jetty would have to be in the top five dives in the state. Those rich upwellings created by the powerful Leeuwin and Flinders Currents have produced an incredible area of temperate water biodiversity, concentrated into a relatively small area, which can be easily explored.

Getting to know it all over a series of dives is what I really enjoyed about diving Edithburgh. It is such an easy but great dive, where you can spend hours



Downtown Edithburgh during rush hour

underwater each time you get in. So, you can really get to know the place and understand where everything is. On a busy weekend, with lots of divers in the water and fisho's casting their lines, it is still good, but dive it for a few days during the week, and it is a completely different and very satisfying experience. ■

In more normal times, Don Silcock is based in Bali, Indonesia, but is currently hunkered down in Sydney, Australia. His website has extensive location guides, articles and images on some of the best diving locations in the Indo-Pacific region and "big animal" experiences globally. Go to: indopacificimages.com.

SS Turkia

— & Other Gulf of Suez Wrecks

Text and photos by Rudolf Gonda





Fusilier, damselfish and angelfish with a tire on the wreck of the *Turkia* (above). PREVIOUS PAGE: Sweepers swim past a car inside the *Turkia*

Everybody knows the legendary wrecks of the Egyptian Red Sea from the *Thistlegorm* to the *Salem Express*. But there are stories of rarely dived remains of ships that rest in the shallow waters up north in the Gulf of Suez.

When my fellow divers and I woke up, our dive boat was moored. The sea was calm, so we were able to see the silhouette of a huge wreck just below us. We clearly saw the cargo holds of the SS *Turkia*, so we did not waste our time. After a short briefing, we jumped into the water.

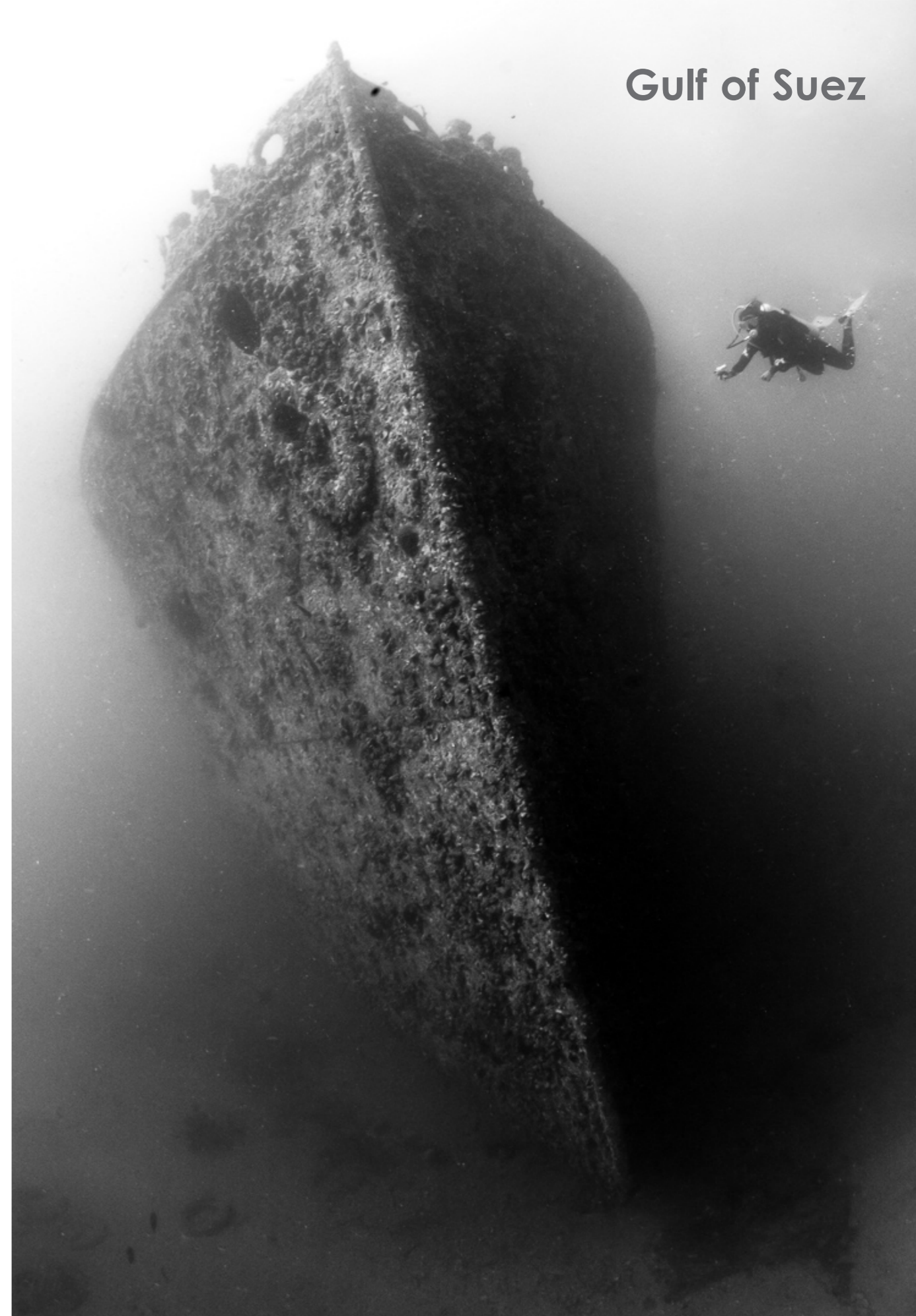
When one has been on all the typical liveaboard routes in the Egyptian Red Sea and seen the nicest reefs or the most famous wrecks, one starts looking for new spots. Although we love the *Thistlegorm*, sometimes it is crowded with divers and really disappointing to see how many of the artifacts have been stolen; there are no wheels on the cars, for example.

A few years ago, I read an article about the Gulf of Suez in which some wreck spots were mentioned. The SS *Turkia* seemed especially exciting. It is often compared to the *Thistlegorm*. The 90m-long steam cargo ship was sunk during WWII, and it carried war materials too. The maximum depth is only 24m, which means it is accessible to

any diver.

When I asked friends—who had many, many Red Sea dives under their belts—I found out none of them had visited the *Turkia*. They shared only rumors, and some of them said it was a bad idea to go to the Gulf of Suez because there is too much boat traffic, the visibility is poor, and the water is much colder. I have to tell you, I usually trust those who have first-hand experiences, so I contacted some local boat operators who would take divers to the *Turkia*.

Luckily, I found one, who told me about the challenges as well. When there is a strong wind from the north, it is not possible to reach the *Turkia* from Hurghada. So, one must choose the dates of one's trip carefully. My fellow



Diver dwarfed by the majestic scale of the *Turkia*





Diver explores compartments and cargo holds of the *Turkia* (above and right)

divers and I decided to go in July when there were less windy days.

It is useful if the skipper has some idea about the exact spots to dive, as there are no buoys or markers, and you will not find any other dive boats in the area. After months of planning, we arrived at the harbor, embarked on the boat, and started our adventurous dive trip in the Northern Red Sea. On the very first day, our skipper said we would have nice weather, so we could sail to the *Turkia*!

Diving the *Turkia*

Now, you can imagine our excitement when we first saw the huge wreck after the night-long journey. As we descended, we realized the stories about the bad visibility and the cold water were

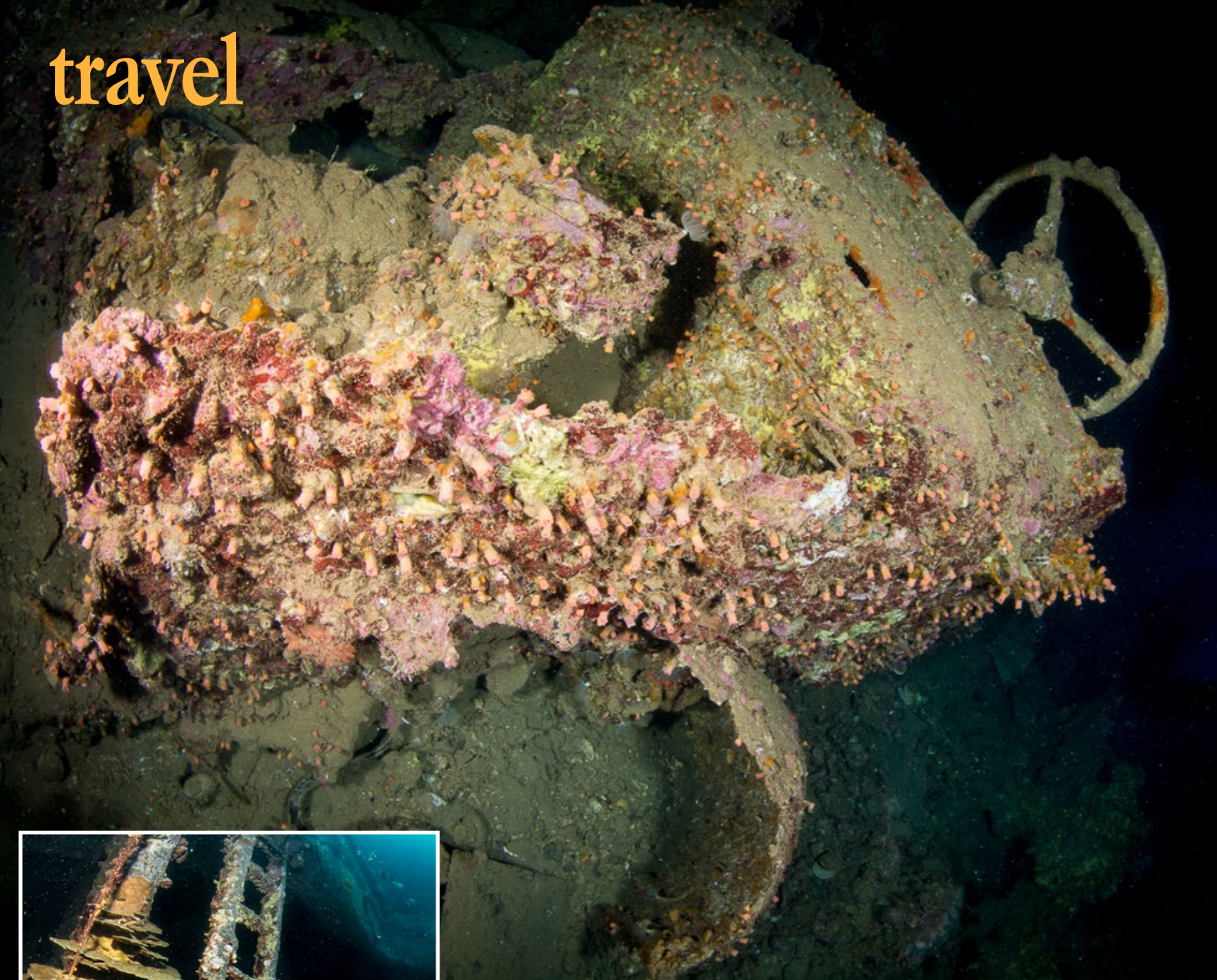
not true. We had fairly typical Red Sea conditions, so it was easy to swim around the hull of the *Turkia*. We saw the propeller and took some photos of the bow. After that, we started exploring the cargo holds. The entrance was huge, and there were more decks, but it was easy to navigate inside the wreck.

After the first dive, we shared what we had seen: Where we saw the car or the bathtub, who swam into the room in the stern, and was it possible to descend to the steam engines? Everything was new and exciting. When we prepared for the second and third dives, my buddy and I discussed what we had seen already and where we should go next.

I have to tell you, the *Turkia* is not the *Thistlegorm*. The latter has dozens



Diver by a ladder connecting the decks inside the *Turkia*



Car (above) and tires and coils by a ladder (left) in a cargo hold of the *Turkia*

of motorcycles, cars and engines that are far more spectacular than the tires and coils inside the *Turkia*. Although we found cars in the *Turkia* too, one cannot expect the same dives. On the other hand, there were many rooms and easy-to-penetrate halls in the *Turkia*, which meant we enjoyed all four dives there.

Every time we dive a new wreck, we learn about its story and think about the sailors who lived and worked on it. When you swim into a room where you find the bed frames or a bathroom, you realize that it

once was a proud ship, with men aboard, which sailed the seas in peace and war until its final voyage to the Gulf of Suez.

Maybe you cannot compare this wreck to the *Thistlegorm*, but there is still much more to see here than in the typical Red Sea wrecks. Not only is the *Turkia* itself worth the visit, but the marine life is worth seeing too. There were a lot of smaller and bigger species of fish, hunting trevallies and soft corals. We also found nudibranchs, crabs and shrimps during night dives. Sometimes, schools

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THIS PAGE: Scenes from the wreck of the SS *Scalaria*, a 125m-long oil tanker that sank in the Ras Gharib area in 1942

Ras Gharib

After a day of great diving, we sailed a bit south to find some smaller wrecks in the Ras Gharib area. When we woke up the next morning, we moored near one. No one knew which wreck it was. But it was not our first dive spot. We continued to look for other wrecks in the area.

Scalaria. At last, we found another one. When we descended, we realized it was the SS *Scalaria*—a 125m-long oil tanker that sank in October 1942.

Nowadays, the scattered hull does not look very spectacular. We found the stern without the propeller and the bow was quite intact too. One could see the huge boilers of the steam engine. There were some other parts of the wreck visible, but basically, one could not really visualize how the ship used to look like. It was an easy, shallow dive, but since it lay close to the shore, the visibility was not so good.



of thousands of small fish would cover parts of the ship! Inside the wreck, the engine room, the bow and the cars are favorite subjects for photographers, but I was sure after a few more dives that I would find other points of interest.

And the best thing was that it was highly unlikely we would meet any

other dive groups here. No one is there to interrupt you when you try to take a good shot of the cargo or while you explore the rooms. We even found the wheel of a car too! We left it there and I hope nobody will steal it from the *Turkia* as a souvenir.



THIS PAGE: Scenes from the wreck of the *Aboudy* in the Ras Gharib area. School of sweepers and damselfish shelter in the shadow of the remains of the *Aboudy's* hull (top left)



Aboudy. Our next dive was at the *Aboudy*, which was considered the best wreck of the area. Sadly, we found a salvaging platform there, and divers had already taken the majority of the wreck out of the water. The *Aboudy* had carried aluminum and medicines, but now, one can only find small bottles where the boat lies.

Finally, we found the wreck itself. To be honest, there was only a small fraction of the hull to see. When we swam into one of

the rooms, my buddy signaled to me because she saw something strange; it was the light of the underwater cutter. There were still some shoals of fish and an electric ray to see, but they will soon disappear when their home, the remains of the wreck, perishes.

We saw the remains of the bow only, and I think in a few weeks, the *Aboudy* will completely disappear. Maybe we were the very last recreational divers to dive the site. It was a really disappointing experience. Although dive tourism is not that popular yet in this part of the Red Sea, I am sure those who come here will miss the *Aboudy*.





Bakr. Afterwards, we went back to the first wreck of the day. We did not have any idea about the ship's identity until we found its name in the stern: *Bakr*. This Soviet-built survey vessel was 49m long and was sunk by Israeli fighters in 1973. Now, it lies in fairly shallow water, but at least it is intact. We tried to swim inside, but there were tight places with sharp metal pieces, so one had to be careful, especially when there was a swell. The depth of the deck is less than five meters, so we felt the moving waves there.

It was good for a fun easy dive, and I confess it was a special experience when we looked for clues about what kind of ship it was. It was easy when we found the name, but I am sure in the future, many more wrecks will be found in the Northern Red Sea and the identification will not be that easy. All of the wrecks we dived were discovered a few years ago, so they were only new to us, but since none of us had dived them before, we felt like wreck explorers. Where in the world can you find a popular and affordable dive destination

THIS PAGE: Scenes from the wreck of the *Bakr*, whose name was discovered on the stern; School of sweepers inside the *Bakr* (top left)



where you have the chance to dive on wrecks that none of your friends have ever seen?

Thistlegorm

Our next dive spot was the mighty *Thistlegorm*, so it was easy to make it a fine conclusion to our trip. We swam into the cargo holds, took the typical photos of the motorbikes and trucks, and had an awesome time there. There were not too many divers, and we were lucky with the

weather. The dives on the *Thistlegorm* were as good as ever. Certainly, we compared it to our experiences diving the wrecks in the Northern Red Sea, and I can tell you, we all felt it was a good decision to choose the challenging route.

Afterthoughts

The wrecks of the Gulf of Suez are definitely worth a visit, especially the *SS Turkia*. This ship, by itself, easily justifies the long boat ride. The smaller wrecks

are good for a stop on the way back to the south. If you cannot go to the north because of strong winds, you still have plenty of wreck sites to choose from; the *Thistlegorm*, the *Rosalie Möller*, the *Ulysses*, the *Dunraven*, the *Giannis D*, or the *Carnatic* are all good choices for a dive. Or you can visit some of these wrecks after spending the first few days of your trip in the north, like we did.

The Egyptian Red Sea is still one of the best destinations for wreck fanat-

ics. Because there are other wrecks to discover in the area, I am sure we will plan another trip to the Gulf of Suez to dive them all. Maybe, in the near future, it will become the new hot spot of Red Sea diving. ■

Travel journalist and blogger Rudolf Gonda is an avid diver and underwater photographer based in Budapest, Hungary. For more information, please visit: [instagram.com/el.che.74](https://www.instagram.com/el.che.74)

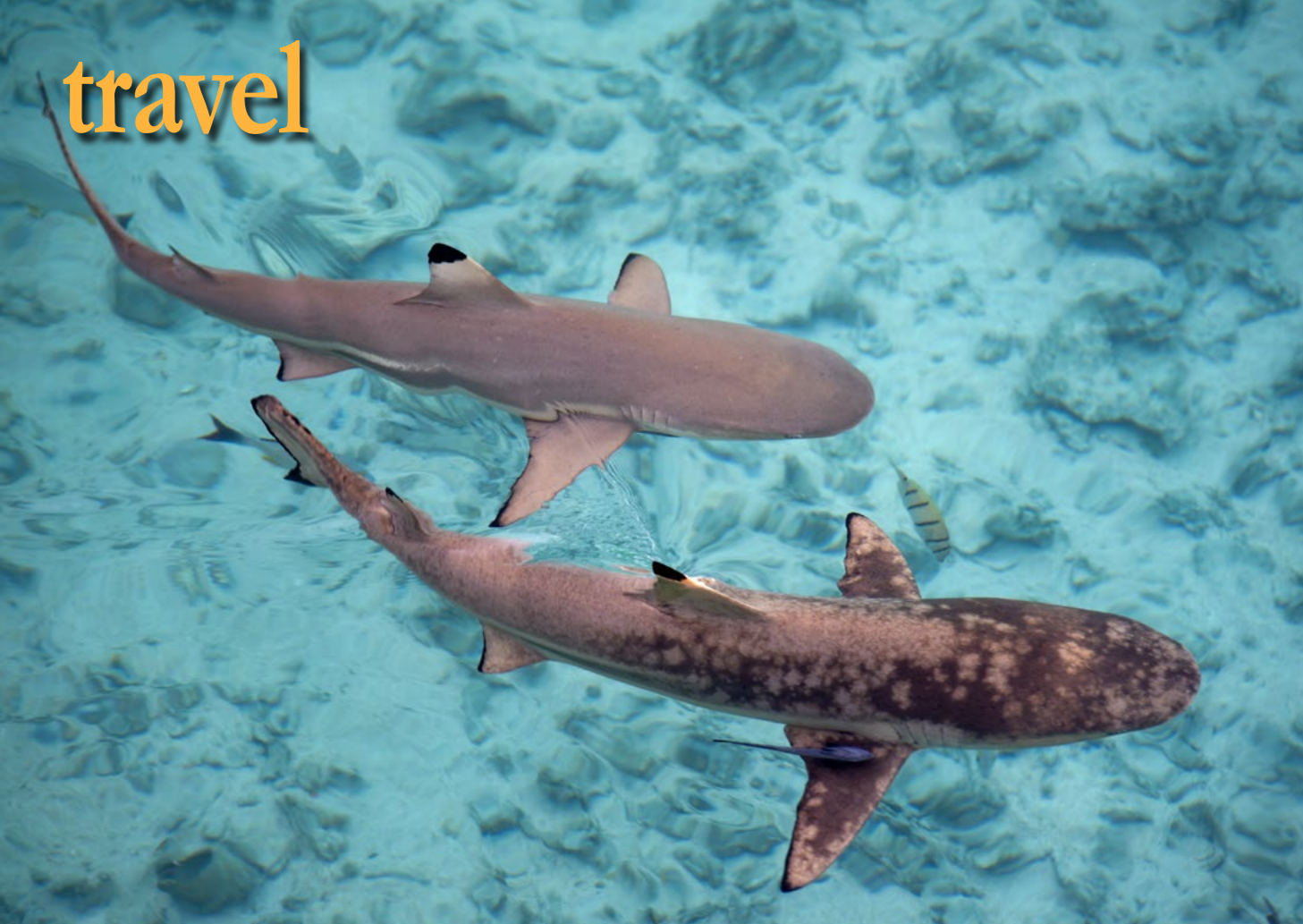
The dive safari to the deep north Red Sea wrecks was taken on the *Liberty* liveaboard (above); Hawksbill sea turtle (center right); Diver explores the remains of the wreck of the *Bakr* (top right and top left)

Fakarava

— *Diving in the Tuamotu Islands of French Polynesia*

Text and photos by Pierre Constant





The *motu*, or islet, Sables Roses at midday, named for its pink sandy beaches (above and previous page)



Divers in the "Red Boat" near the beach at Ngaruae (above); Blacktip reef sharks in shallow waters (top left)

Fakarava is an atoll in the Tuamotu Archipelago located about 440km northeast of Tahiti in French Polynesia. Pierre Constant takes us on a journey to the pristine lagoons of Tuamotu and describes what awaits adventurous divers in its underwater realm.

The wooden dive boat was at anchor in the Koh Prins Islands, south of Koh Rong. Turquoise blue was the lagoon at midday, an idyllic image of paradise. All of a sudden, someone shouted: "Whale shark!" The next minute, Sebastien jumped overboard with mask, fins and snorkel, chasing the poor creature with his GoPro action camera. It was his first whale

shark, ever. Amused, I watched from the upper deck, with a smile on my face, as other people were already in tow. There was no need to join the frantic club.

This occurred once upon a time in Cambodia, back in 2012. Sebastien and Sophyline were a French-Cambodian couple I knew at the time. By a trick of fate, I met them again seven years later on Fakarava Island, in the Tuamotu Islands of French Polynesia. Water has passed under the bridge since the last time I had seen them. Their story was that of an unexpected dream come true—a drastic change of life.

Sebastien had first worked as a *maître d'hôtel* (butler) for nine years in restaurants and luxury hotels of the French Riviera. Changing jobs later on to work in computers as a programmer and analyst, he was employed by BNP Paribas Bank and

became a project manager. His path crossed that of Sophyline in 2009, who also worked for the same bank in marketing and communications. They got married. In 2014, they moved to Switzerland to work for the same bank. On the side, they both became divemasters and PADI Instructors, teaching in dive clubs after hours.

Further on, they led various missions for the civic and social organisation company *Plongeurs du Monde* (Divers of the World) to train young people to become divers in Sri Lanka. Sophyline became the head of the dive division of BNP Paribas for the following five years, responsible for communications, organisation of trips and budget management. Sophyline's 40th birthday was the occasion for a trip to French Polynesia. The idea of a change of life emerged. Why not work as divemasters?





Aerial view of Rotoava, Fakarava (left); View of Fakarava Island from the top of the lighthouse (below)

Fakarava



They got in touch with Dive Spirit Fakarava during a transition period in 2018. Owned by a Spanish-French couple, the dive centre had been sold to new owners based in Moorea. Fortunate to meet the new and old owners, as well as the managers, Sebastien and Sophyline submitted their resumes just in case anything turned up. That caught the attention of the new owners, who realised the potential of the couple's professional skills. A few months later, as the managers resigned, Sebastien and Sophyline were offered the positions to run and manage Dive Spirit Fakarava. They moved to the Tuamotu in June 2019 to start a new life.

History and geology

Although Ferdinand de Magellan was the first European to sail by the Tuamotu Islands in 1521, it was the Russian navigator Fabian Gottlieb von Bellingshausen who was credited with the official discovery of

the archipelago in 1820. Frenchman Jules Dumont d'Urville visited the islands with his ship in 1838.

Fakarava is an atoll of the Tuamotu Archipelago, located 16°18' S and 145°36' W. It lies about 440km to the northeast of Tahiti. Fakarava seamount—an ancient volcanic island, now submerged, rising 1,170m from the seafloor—is crowned by a barrier reef in a rectangular shape, oriented northwest to southeast. One of the 76 atolls of Tuamotu, Fakarava's lagoon—which is 60km long by 21km wide—has a surface area of 1,121 sq km and two passes: Ngaruae to the northwest and Tumakohua to the southeast.

Rotoava, the main village has a population of about 850. Shaped like a boomerang, the island's only road stretches 20km to the southeast and 11km to the northwest, passing by the airport. To reach Tetamanu village at the South Pass, one has to catch a boat for a one-

hour ride, depending on surface conditions.

Fakarava's old name is *Havaiki-te-araro* (the fabled original homeland of the Polynesians). The atoll was declared a UNESCO Biosphere Reserve in 1977, to collaborate with the indigenous population in preserving the environment, alongside economic and social development (environment.fr).

Getting there

Air Tahiti's one-hour flight from Papeete to Rangiroa was followed by a 40-minute flight to Fakarava, where I landed mid-afternoon. Sophyline and Sebastien greeted me upon arrival. It was an 8km drive to Dive Spirit, which was conveniently located right on the lagoon. Two restaurants, locally known as "snacks,"



could be found nearby.

Still affected by a 12-hour jetlag from France, I waited a day before I went out diving. It gave me time to leisurely prepare equipment and my underwater camera, and to enjoy a bicycle ride around the village. Covered by vegetation, *Casuarina* trees and coconut trees, the island's ribbon-like land mass was barely 200m wide, from outer reef ocean-side to lagoon-side. The scent of frangipani and tiaré flowers permeated the air exquisitely.

Early in the morning, the lagoon lay



Sign for nearby "Snack Elda" restaurant (above); The ATR72 plane of Air Tahiti in Fakarava (center)



Manta ray (above) and round head parrotfish (right) at Ngaruae



in mist and it rained slightly. "It's nothing!" joked Carlos, one of the sturdily built Polynesian boat captains. Indeed, it stopped before 7:00 a.m. Dive Spirit had two hard-hull inflatable boats powered by twin 150hp outboards. The "Red Boat" was 8m long with capacity for eight divers, and the "Grey Boat" was 6m long with capacity for five divers.

Ngaruae
We departed at 8:00 a.m. for Ngaruae—the *Passe Nord* in French or northern channel—20 minutes away. With a width of 1.6km, it was by far the largest in Polynesia.

"There is incoming tide," explained the dive guide during his briefing. Nevertheless, the current can be erratic, with countercurrent and transversal water movements as well. The French rules are very strict when it comes to diving; Sebastien made sure that everyone understood the dive plan clearly, especially at the safety stop, before surfacing all together. "I want you to make a chain behind me, holding each other's tanks," he said, "as the captain will zoom in on me, holding the safety sausage well in evidence." In the channel, the tidal bore or *mascaret* in French—when

the wind hits the current—can be quite strong and the surface waves can be wild. With the water being 27°C, I dived without a wetsuit, although it felt slightly cool but bearable. There were plenty of small grey reef sharks, around one metre long, cruising by, as well as a school of barracudas in the blue. But the highlight for me was a group of three African pompanos (*Alectis ciliaris*), which were silver and had a diamond shape, with threadlike extensions in the dorsal



Tiaré flower, symbol of Polynesia

Manta ray cruising at 30m (above), grey reef shark with barred unicorns (top left) and African pompano (center) at Ngaruae



At Ngaruae: divers with school of barracuda (above), schooling yellow-mask surgeonfish (top right), school of paddletail snappers with yellowband surgeonfish (far right), Napoleon wrasse with bluefin jack (right) and diver at coral bommie (left)



and ventral fins.

Feeling a bit cold at the end of the dive, I donned a 5mm shorty to be comfortable and kept it on until the end of my stay! Fifteen-litre steel tanks were used daily. On the next dive, I noticed the common schools of fish on top of the reef; Paddletail snappers (*Lutjanus gibbus*) were very tame, unlike those in most of Southeast Asia, and could be approached for wide-angle shots. Long-nosed emperors, parrotfish, red snappers, Napoleon wrasse, unicornfish and pyramid butterflyfish were regular sightings. Massive in size, the coral reef was monotonous in colour, greyish white overall, with numerous

dark green to black sponges. Gorgonians, soft corals and sea fans were conspicuously absent. Hard corals included *Acropora*, *Montipora*, *Porites*, *Pocillopora* and *Millepora* species as well as the solitary *Fungia* coral.

On subsequent dives at Ngaruae, a couple of mantas appeared at a depth of 40m. One was dorsally black and white, which was the female, and the other one was dorsally black with white underparts, which was a



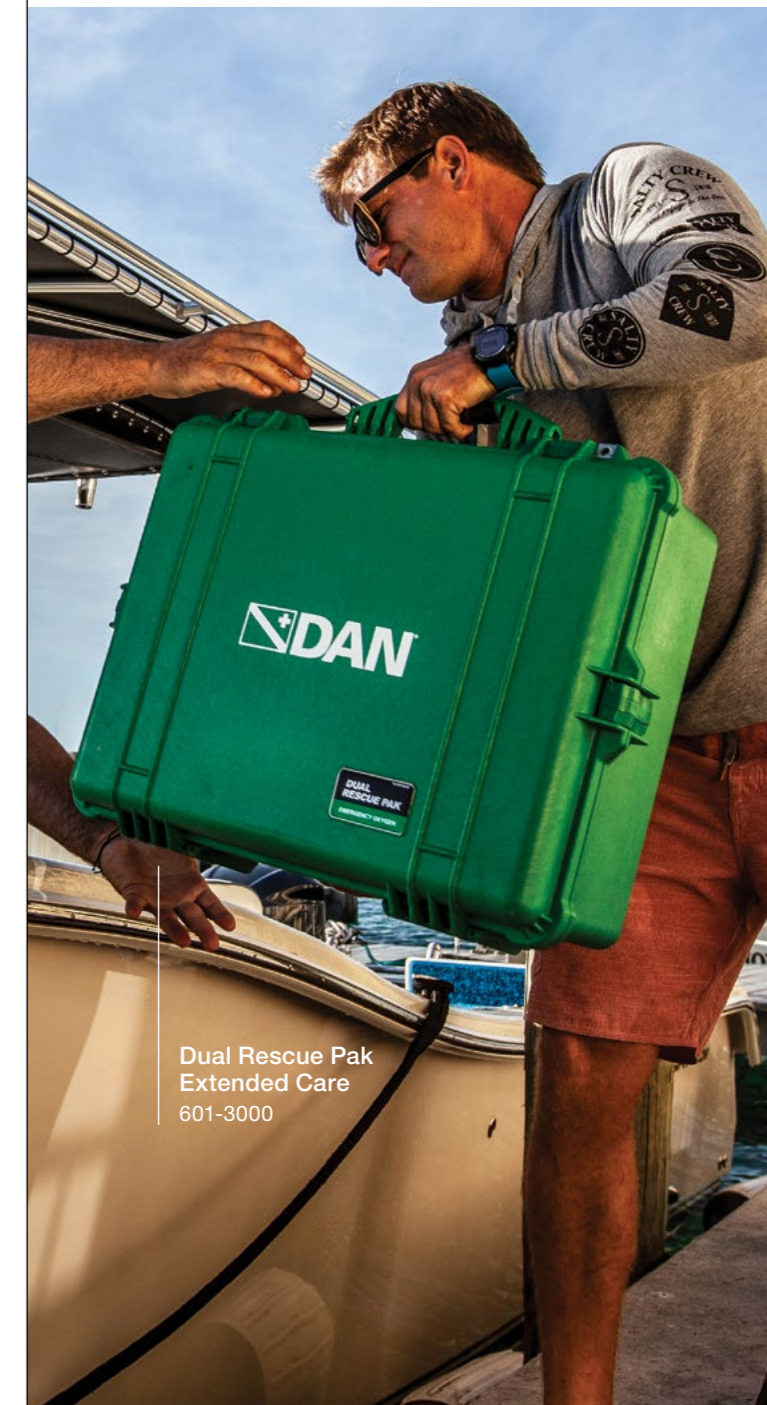
male in hot pursuit of the female. Large dogtooth tunas cruised by in a hurry, and lone great barracudas foraged on top of the reef.



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Gray reef sharks over the reef with one-spot snappers and soldierfish (above); School of spinner dolphins (right); Greater crested tern (top right); One-spot snappers (left); Black noddi (bottom left)



Ali Baba. One morning, we dived the site of Ali Baba, which was located well into the channel. It was a drift dive, in which one follows a canyon, with pockets of calm waters. There were impressive streams of yellowmask surgeonfish (*Acanthurus mata*) as well as large schools of one-spot snappers, (*Lutjanus monostigma*) and tight groups of bigeyes (*Priacanthus hamrur*), crimson red in colour. Schools of barred unicornfish (*Naso thynnoides*) could be seen at times. With clear visibility, cobalt blue waters and the sun on the surface, it was a photographer's delight!

Day Three

The sky was really dark when I strolled down the wooden jetty at 5:30 a.m. The Red Boat was the only touch of colour against the dark turquoise blue

of the lagoon. One hour later, it poured down heavily. "It should rain all day long," lamented Sebastien, "probably most of the week, according to the weather forecast." Eventually, diving was cancelled. Security and safety first, is Dive Spirit's motto.

A walk along the ocean side gave me a chance to see the bird life of the atoll. Seabirds spotted included the greater crested tern (*Thalasseus bergii*), with a yellow bill and black cap; the white tern (*Gygis alba*); the black noddy tern (*Anous minutus*); and the grey-backed tern (*Sterna lunata*). A brown booby (*Sula leucogaster*) flew by occasionally. Greyish blue reef herons and common egrets added to the picture.

"la Orana!" greeted Captain François of the Red Boat, looking very much like a pirate with his goat-like beard. "Today, Maï tai!" (All is well) he beamed, referring to the good weather. Our luck manifested itself in the presence of a school of spinner dolphins (*Stenella longirostris*) soon after we entered the water. It was a chance to get a couple of shots of them, albeit not too close. Exhilarating!

At one point in the dive, a lone manta came face-to-face with a group of divers hanging onto a coral slope. Indecisive about flying above the intimidating curtain of bubbles rising from the divers, it turned around with a Zen-like attitude. Adding to the excitement, during our surface interval,





At Tumakohua: gray reef sharks in the southern channel (above and top left), school of blue jacks (right) and school of blue and yellow bluestripe snappers (left)



an inquisitive humpback whale came breaching between the boats. With a final loud grunting noise, it displayed its flukes, upon diving into the deep.

Passé Sud

With the arrival of the weekend,

the conditions turned good, even perfect for the *Passé Sud*, or southern channel. It took one hour to reach the village of Tetamanu, at the southern channel of Tumakohua, where a dive centre and a few bungalows could be found. The site was very

steady stream of grey reef sharks swimming upcurrent in a leisurely manner. Divers were expected to cling to the coral reef at a depth of 20m, stay put and watch the performance, so that everybody could see the sharks. The maximum depth of the channel was 31m, but

exotic, postcard ideal, with a chain of *motus* (islets), and white sandy beaches crested with coconut trees.

The channel itself was not really wide, and we waited for the incoming current to dive at the entrance of it, on the ocean side. The show here was a so-called “wall of sharks,” which in fact was not a compact wall, as one would think, but rather a

we started at 13m, and gradually drifted downstream.

Blacktip and whitetip reef sharks passed by together. I came across a small school of blue trevally (*Carangoides ferdau*), with bars across their sides, over the white sand—aka the “Ski Slope”—and a rather shy scrawled filefish, which was pale green with blue dots and streaks. A school of blue and gold bluestripe snappers (*Lutjanus kasmira*) was an unexpected surprise against the reef slope. Towards the end of the dive, we drifted under the pontoon of the village, a refuge for a massive group of one-spot snappers, paddletail snappers and

the odd Napoleon wrasse. It was great for wide-angle shots, with the pier pilings and the sun rays in the background.

Our lunch break took place on a tiny paradisiacal *motu* named Sables Roses for its pink sands. Polynesian raw fish in coconut milk, fish fritters and rice made up the meal—just perfect! The lagoon environment was enchanting, and

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School of bigeyes at Tumakohua (above); The beach at Sables Roses (top right); Whale shark chased by a pack of gray reef sharks, Tumakohua (right); Indigenous flamboyant flower, 'Kofai', in Tetamanu (far right); Yellow trumpetfish at Tetamanu pontoon (bottom right)

the light breeze in the coconut fronds was most welcome.

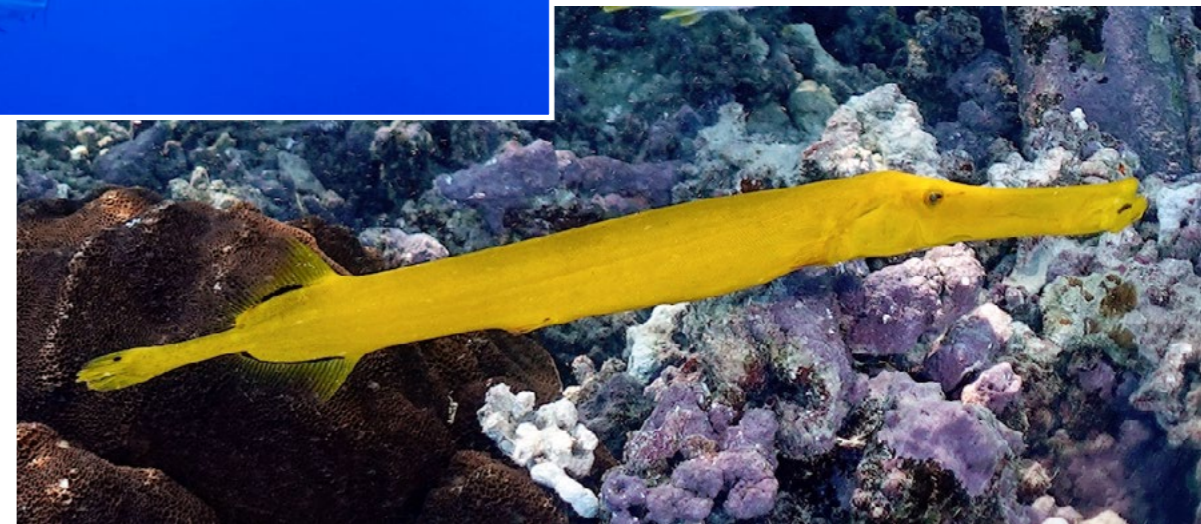
On the second day of diving at *Passe Sud*, Sophyline accompanied me as a personal guide. It was slack tide. We waited for a while at a depth of 30m to gaze at the virtual screen of sharks, more numerous than ever. I caught a glimpse of four passing silvertip sharks (*Carcharhinus albimarginatus*), or *tapete* in Polynesian, on which all the fins were white-tipped. Sadly, they were just too shy for me to take a close shot.

We left our observational balcony to avoid decompression time and entered the shallows of the channel, with the reef slope on our right. "Well, there is nothing else to see," I thought to myself. Then

Sophyline caught my attention, frantically pointing to something big behind me. Pivoting 180 degrees, I stared bewildered at a juvenile whale shark, with literally a swarm of grey reef sharks in tow, like a bride's veil, following the giant. I managed a furtive shot before it vanished lethargically into the blue. "The sharks are just waiting for it to get sick or tired; then they will hunt and go in for the kill, like a pack of wolves," confirmed Teddy, our other dive guide, who proudly displayed an octopus tattoo on his right arm. It was a breathtaking image to remember.

Traditions

I wondered about the conspicuous absence of sea turtles (*tifai* in Polynesian). When I asked Captain François about it, he confessed: "Now that they are protected by law, there is a lot of poaching... In the past, the elders used to collect and rescue baby turtles out of their nests; on hatching day, they brought them to enclosures. Then, they distributed them to villagers, who



School of one-spot snappers under the pontoon at Tetamanu (left); The coral on the lagoon side (below)



The beach and reef on the ocean side (above); A grey nurse shark near the jetty (left)



I ate dinner almost daily, also explained that Polynesians ate the raw meat of blacktip sharks. "It has long been a tradition at weddings."

Afterthoughts

Fakarava, with its clear blue waters, is one of the 76 atolls of the Tuamotu, where anything can happen at any time. The name "Tuamotu" comes from the Polynesian word *tua*, which means "maritime space," and *motu*, which means "a speck of detached land" or "islet." In such a vast expanse of water, such as the Pacific, be prepared for the unexpected. You might fall under its spell. ■

With a background in biology and geology, French author, cave diver, naturalist guide and tour operator Pierre Constant is a widely published photojournalist and underwater photographer. For more information, please visit: calaolifestyle.com.

would breed the hatchlings for a few months in their homes," to then be released in open water. This was their way of managing resources for the future. "You see, eating turtles is a part of our customs, especially on festive occasions." Elda, the owner of the "snack" of the same name, where



Wrecks of Russia's

Lake Ladoga

Text by Sergey Kulikov
Photos by Stanislav Trofimov



The Monastery of Valaam Island attracts tourists from all over the world (top row). This place is the pearl of the Russian North; Scenic view of Ladoga from bell tower of monastery (above). PREVIOUS PAGE: The islands of the archipelago are like a beautiful necklace of nature.



Ladoga is a magical lake—a location and natural monument that fascinates many tourists. In Europe, it is the second largest lake after the Caspian Sea. Sergey Kulikov takes us on a journey to this body of fresh water, located in north-eastern Russia, just outside of Saint Petersburg, and reports on an expedition to some of the wrecks that can be found here.

There are many attractive places in the waters and on the shores of Lake Ladoga. These include national parks, Orthodox shrines and other numerous historical monuments.

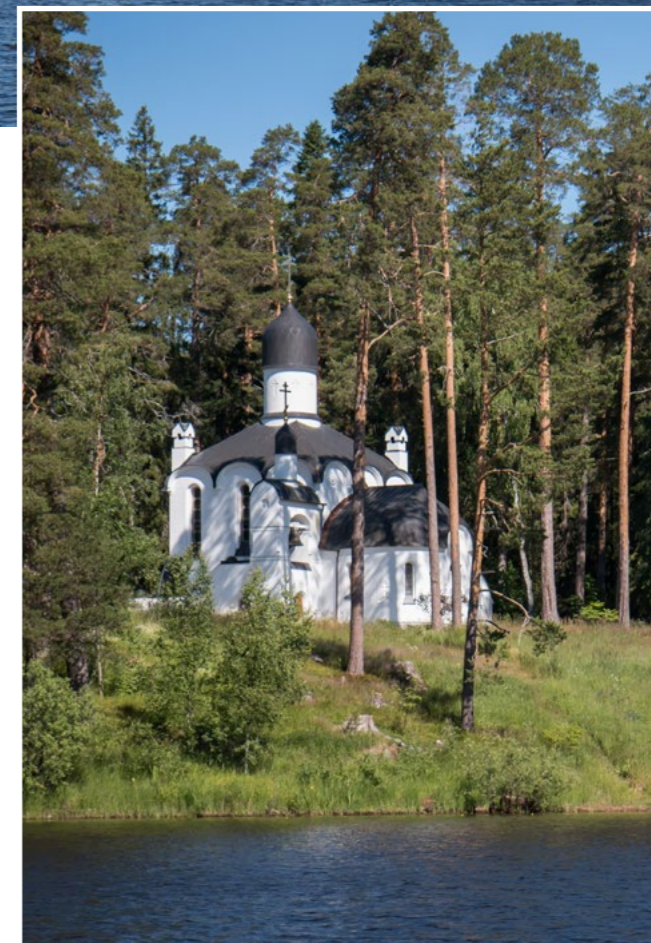
The lake is also rich with islands. Most of them are situated in the north. Like a beautiful necklace of nature, the

famous Ladoga skerries are separated by a whimsical labyrinth of straits. An integral part of these skerries is the famous Valaam Archipelago, where the ancient monastery, also called Valaam, is located. It can rightfully be regarded as the spiritual heart of the Russian nation. Historians believe that the first settlers appeared on the lake immediately after the Baptism of Rus.

Over time, the community has grown, and monasteries and temples were built. Nowadays, the islands attract not only pilgrims but also tourists who wish to see the monuments of Russian architecture surrounded by the pristine nature of Ladoga.

One of the unique inhabitants of the lake is the Ladoga seal. This is the only species of marine mammals that has adapted to life in fresh water. The seals' rookeries are under special protection on the islands of Valaam.

The amazing city of Sortavala is located on the northern coast of Lake



Valaam Island has a large number of large and small churches.



Divers of the Oryol dive club "Divo" on the dive boat Odyssey-2 captained by Mikhail Chupin

Ladoga. It owes its peculiar historical and cultural features to three countries—Finland, Sweden and Russia—to which it was attached at different times. This is where one finds Karelia, a most beautiful city, which surprises visitors with its unusual architecture.

Challenging conditions

The depth of Lake Ladoga can reach 300m in certain places. But what matters most about the lake is its character, not its scale. Often, in calm sunny weather, squalls of wind and strong storms with six-meter waves might abruptly appear.

The captain of the Odyssey-2 dive boat, Mikhail Chupin, who is a seasoned seaman, said, "The biggest wave I got into there was

during a five-meter storm." He continued, while puffing on his pipe, "It happened in 1993... Due to inexperience, I got into trouble. From Valaam, we went to the Svir River and on to Onega in Petrozavodsk. And suddenly a storm began, with waves of five meters. Because this was a freshwater lake, the storm accelerated instantly.

"The waves here are not the same as they are in a sea with high salinity, where the wavelength is about 120 to 140m, with a wave height of, I suppose, three meters. On Ladoga, the wavelength is just 20m. In the Gulf of Finland, which is fed by fresh water, there are also very dangerous waves. A wave of five meters on Ladoga is like a five-meter fence, which you have

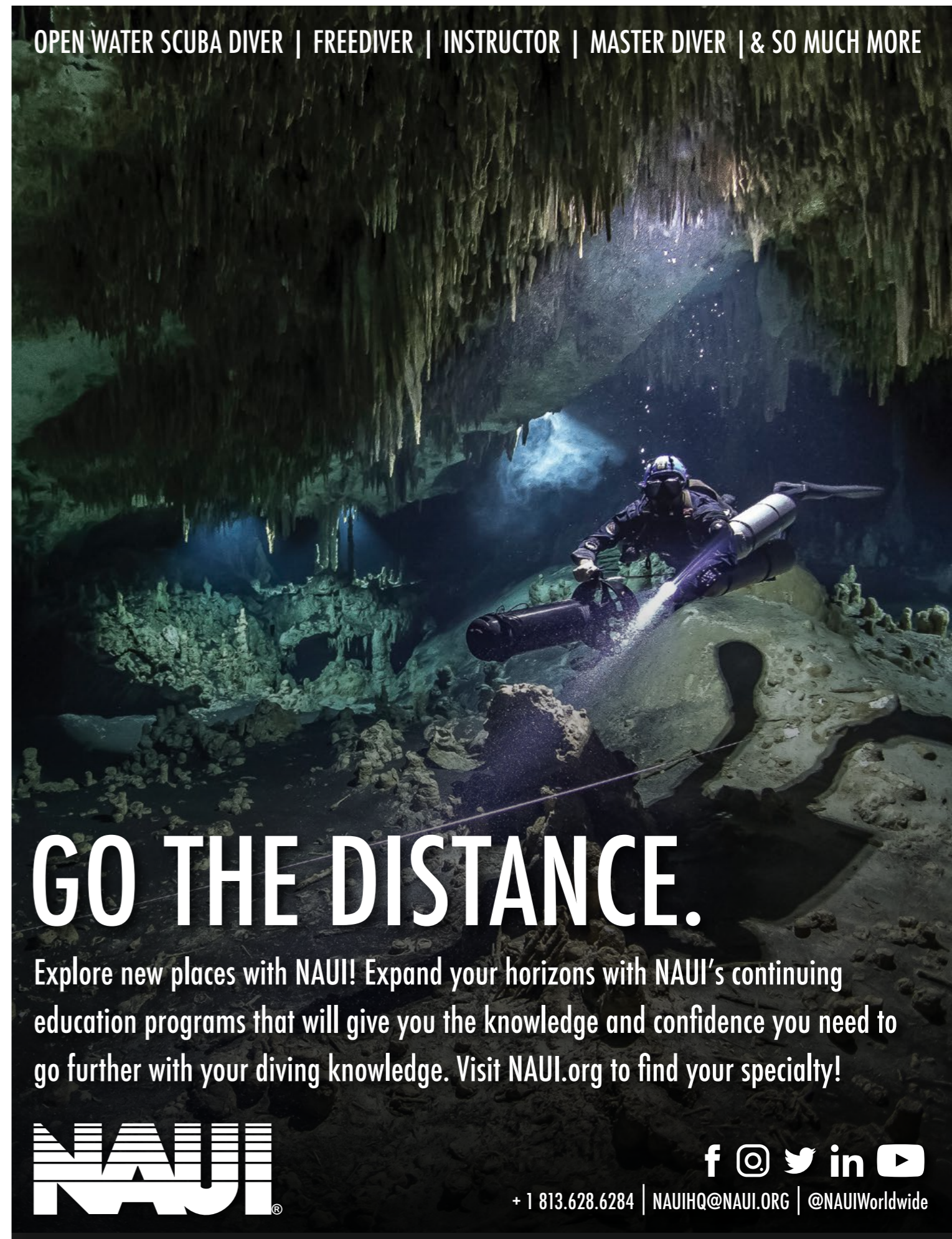
to somehow either pierce, or jump over; and if you keep jumping over this fence for an hour, or two, or three... it gets you very tired.

"It is impossible to describe how it was... I can only say that on the tenth anniversary of this event, those who were on board then on this diving boat came together specially to celebrate this occasion. It is important to mention that these guys, who had traveled the whole world and seen a lot, had never experienced anything like this in their lives... You just have to treat Ladoga with respect and understand where you are, and then everything will be fine."

Inspiration

Indeed, Captain Chupin is a leg-

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Historical photo of the steamer *Valamon Luostari* (above); Pre-dive briefing: Divers study map, historical documents and photos with views of the wreck of the *Valamon Luostari* (top and bottom left)

Finding a wreck

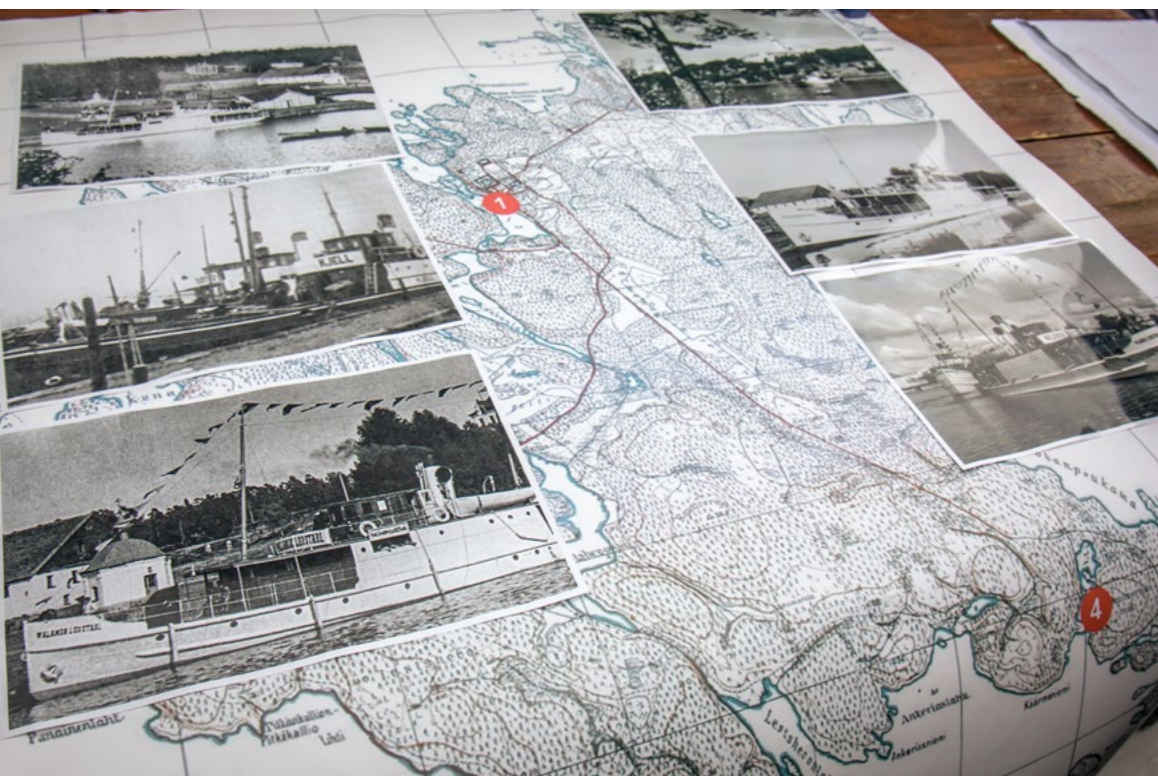
On one of our trips to Ladoga, our team decided to stock up on food on the island of Valaam. Three divers—Nikolay Logvinov, Eduard Chinyonov and Vitaly Dyumin—and a ship mechanic Sergei Loginov with his faithful companion, a dachshund, got into the zodiac. The group went to the nearest hardware store on the pier. Only there could one buy the famous smoked trout, which is raised and cooked according to a special recipe by the monks of the Valaam Monastery.

"We had already returned to the ship," remembered Logvinov, "in the Big Nikon Bay of the Valaam Archipelago. Once again, we decided to work with a side-scan sonar. We turned it on and saw the outline of an object on the device. It was Loginov, the mechanic and mate of the *Odyssey-2*, who was the first to see the steamer and said: 'Guys! This is something clearly man-made and it does not exist on any navigation chart.' We froze with delight. Had we found it? But what exactly?"

What we had managed to find

was the ship *Valamon Luostari*, which sank during the Winter War between the USSR and Finland in 1939 to 1940. This was the only combat loss for both sides during this period. It was well preserved and very promising in terms of a more detailed examination. At sea, it simply would have decomposed into atoms or turned into a beautiful reef.

Captain Chupin said: "The water is cold here; the visibility is not very good. As for living creatures—there are perhaps less than



endary man, an excellent storyteller and a lover of mysterious stories. It was in fact his tales about the sunken ships of Ladoga that inspired us divers from the Oryol dive club, "Divo," to spend our weekend here, on Ladoga.

In the last few years, there have been problems with traveling abroad, due to the exchange rate. At first, we were discouraged, but not for long. Peeking at a map of the immense country of Russia, we realized that our native land was full of places that were suitable for diving, such as the Barents Sea, Lake Baikal and Lake Ladoga. And we never regretted it. Nowhere is there more beauty than here. The white nights on Ladoga are definitely worth experiencing! On our first days here, we ran around like children—the islands, the beauty, the captain's stories—everything was so interesting.



Smoked trout prepared using Valaam Monastery monks' recipe



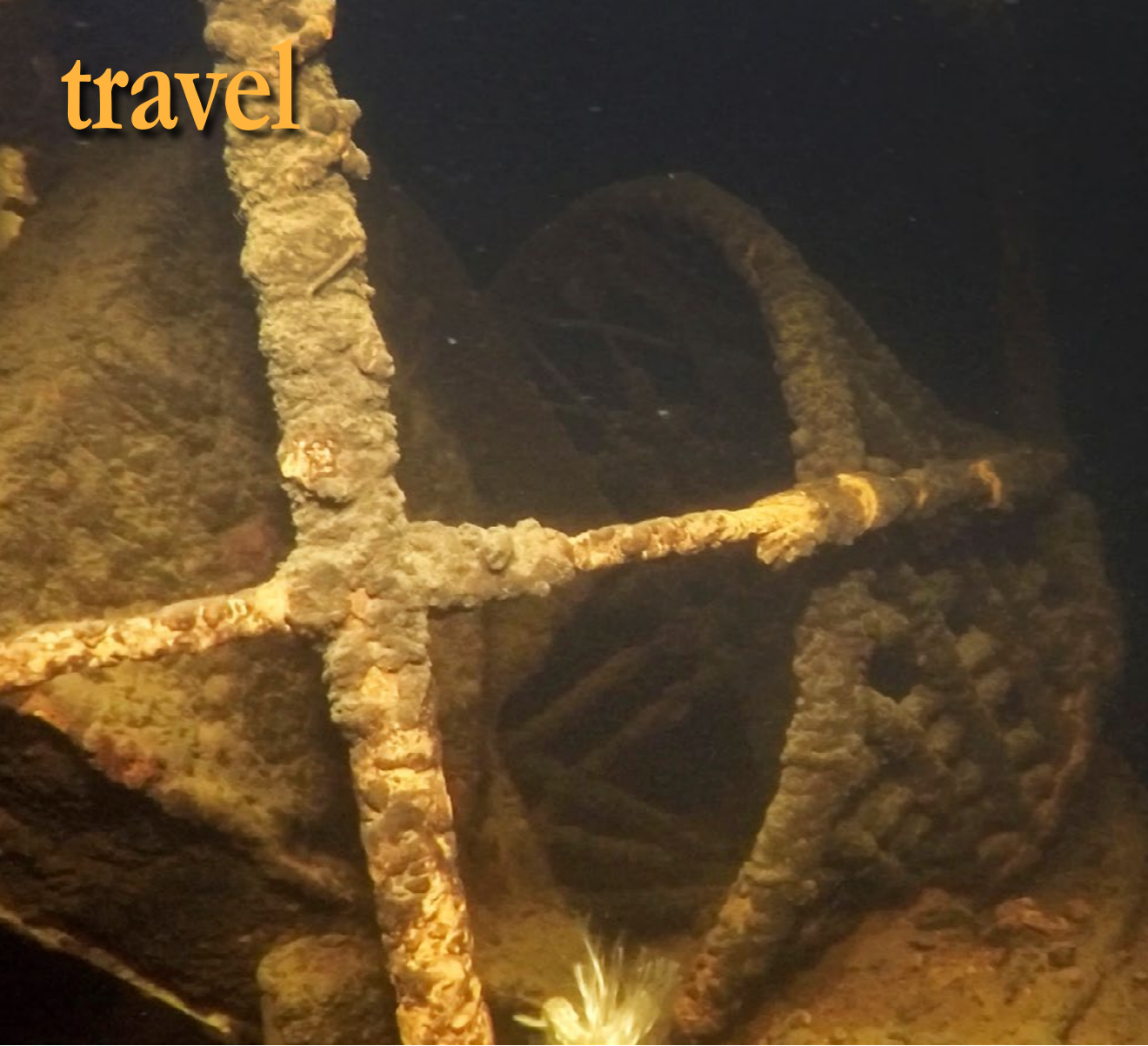
Dives return with artifacts from the *Valamon Luostari* such as a navigation light (left), gauge (above), porcelain cup (right) and teapot (far right); Mooring bitts on the sunken steamer *Valamon Luostari* were covered with silt (top right).

what is found on the moon! But there are also advantages—the preservation of everything that sank or drowned... it is like a museum. The water temperature at the dive points does not exceed 5 to 9°C."

I said: "Each diver dreams of finding a sunken ship. It's an indescribable feeling, an inner delight, which not everyone gets to experience. Thank goodness that there is such an opportunity to touch history!" Experienced divers say that it is a great success to be able to salvage from the lake bottom of Ladoga some

beautiful tableware, or simple luck to salvage a dive torch or a weight belt. During this expedition, tableware fragments from the galley, a gimbal joint (presumably from a gyrocompass), and two navigation lights were found. One of them had a nameplate on it with a mark and an indication of the manufacturer. But the main objective was a complete

inspection of the steamer. Often, the discoveries made by research expeditions, which are funded by state budgets and extrabudgetary funds, are less significant than the discoveries made by wreck enthusiasts—fanatics of their own adventures. Moreover, the equipment, preparation and organization of expeditions by



enthusiasts are a burden on the budgets of their families. But it is often the most passionate people who find the most fascinating things. First of all, a key to the success of any expedition is its people—like-minded folks who effectively complement each other and clearly distribute responsibilities.

A flock of cheerful, good-natured tourists often traveled with these divers, supporting them in their search, empathizing with them, organizing leisure activities, picking mushrooms and maintaining a friendly atmosphere. And, of course, they supplied the Coke with the freshly caught fish. In a word, those Russians whose vacations were canceled this year in the Maldives and the Canaries due to the pandemic, did not regret it for a second.

Revisiting the wreck

After some time had passed, our team

once again visited the previously found steamer *Valamon Luostari*. It had now become a tourist attraction, where divers dived the wreck regularly. Much had changed on it; the muddy sediments in the holds had been washed out by hydro-ejector. One of the anchors of the steamer, which was lying on the ground, had been salvaged and handed over to the Valaam Monastery.

We dived the site with bated breath. What if we managed to find something? A lot had changed on the ship during the year. Some of the elements that were there before were already missing. A colleague Stanislav Trofimov echoed my thoughts: "Of course, it's great that other divers get to see and dive the wreck, but I would like people to treat such objects with more consideration. Because the way it is now, you can take everything away as souvenirs."

Villeroy & Boch manufacturer's mark found on remains of a toilet on the *Valamon Luostari* wreck (above); Objects have remained underwater on the *Valamon Luostari* steamer for more than 80 years (top left); Beautiful brass elements found on the *Valamon Luostari* wreck (top right); Bottle of what turned out to be milk found on the *Valamon Luostari* wreck (right)

However, this day brought us not only disappointment, but also joy. The water in Lake Ladoga was dark, the bottom was muddy, but what good luck we had!

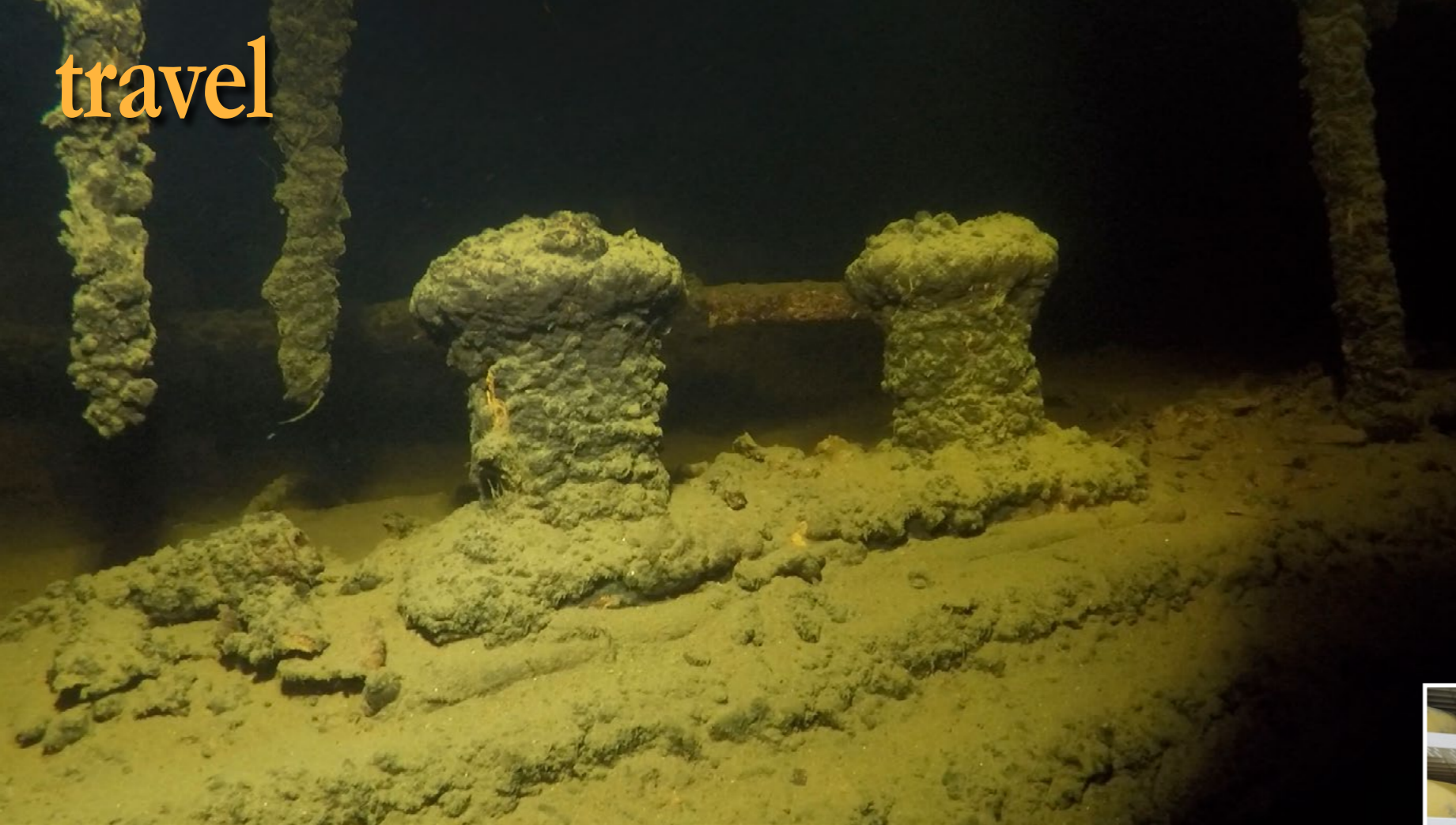
"The visibility is bad, like everything is in a fog," lamented fellow diver Alexander Arkhipov. "I got into one of the holds and found some bottles on the silted floor.

I have only two hands, so of course, I grabbed these two bottles."

It turned out that we also could not resist seizing something from the sunken steamer, although it was not acceptable to do so. But the find was worth it!

There is a lot of information in regard to the fact that bottles with alcohol

have been found on sunken ships, but on this steamer, we divers found bottles of milk. For 80 years, they had lain in the holds of the *Valamon Luostari*. The bottles were about 300 grams, tightly sealed with wooden corks. Inside was a white liquid, like milk. Presumably, it was a dairy product from the local monastery's



Milk bottles were returned to the Valaam Monastery (above); Milk bottles found in the Nikonovskaya Bay (top right); Details from Valamon Luostari wreck (left three images)

farm. Nobody tried the 80-year-old milk, though. The steamer belonged to the Valaam Monastery once, so we decided to return its contents to their owners.

Geological & historical insights
Our dive team was invited to a meeting

with the pilgrims of the Valaam Monastery. The tour guide of the pilgrimage service, Yana Gaidukova, spoke about the history of the Valaam Archipelago, about how these islands appeared: "When magma began to rise, it saturated the earth's crust and pushed it up. This process is called intrusion, and if the magma rose to the top,

it would become a volcano. But it never came to the surface of the earth's crust. Beautiful stones then appeared, which we call gabbro diabase, and the Valaam Archipelago is composed of them." The Valaam Archipelago occupies an area of 36 sq km, with around 50 islands. There are also so-called gull islands on Ladoga. They usually do not have a name, but the gulls love them and raise

their chicks here. The largest islands of the Valaam Archipelago include the island of Valaam, which is 28 sq km long, and the island of Skitsky. Monastic prayer has long been practiced on these islands. Gaidukova said: "It is thought that the Saints Sergius and Herman became the founders of the Valaam Monastery, and the monks, as the legend says,

Vladimir skete also houses a museum and ancient artifacts of Valaam Island.





The picturesque skerries of Lake Ladoga are a hallmark of the Russian North.



Statue of Saint Andrew the Apostle

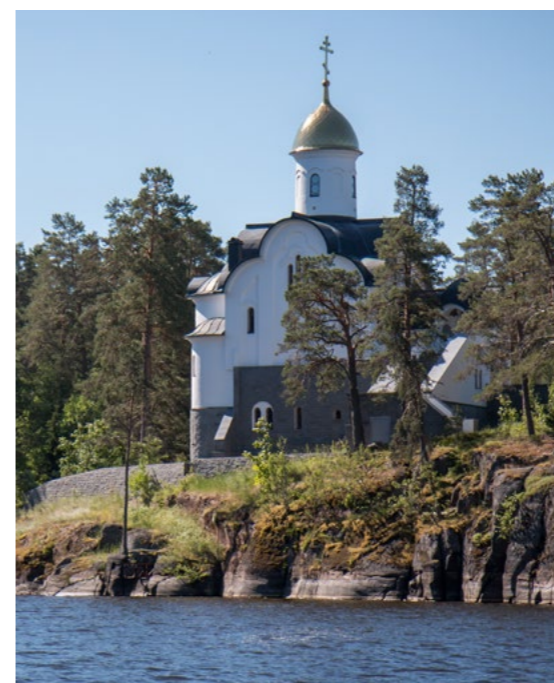
came from the Eastern countries, i.e., they were probably Greek missionaries. It is possible that Christianity appeared on Valaam even before the Baptism of Rus. Through the labors and prayers of the Saints Sergius and Herman—wonder workers of Valaam—the beginnings of the Valaam Monastery was laid.

And here is a stunning fact: The brethren had never taken up arms in the entire thousand-year history of the Valaam Monastery. They literally followed the oath of Lord: “Thou shalt not kill.” And when they learned about the invasion by the Swedes, they fled from the island, saving the relics of Saints Sergius and Herman, or hid in the woods, or accepted a martyr’s death. The land upon which we now stood was a land watered with the blood of Christian martyrs.

The holy righteous Saint John of Kronstadt wrote that on Valaam, on

every stone, one can serve the liturgy. Through the prayers of the Valaam martyrs, as well as the prayers of other Valaam saints, the Valaam Monastery had been revived again and again, despite often being subjected to devastation, destruction and desecration. And now, the Valaam Monastery is one of the most beautiful monasteries in Russia, one of the most populated monasteries, and let’s hope that this will continue, he wrote.

After the presentation, we sang songs, drank delicious Ladoga tea, warmed ourselves near the fire and watched the sunset. “Honestly, I have never seen such beautiful sunsets anywhere else. Wherever I have been, the best country for experiencing and watching sunsets has got to be Russia!” the youngest member of the expedition Vladimir Stroyev hurried to tell us, with delight in his eyes. This was the moment when we divers dis-



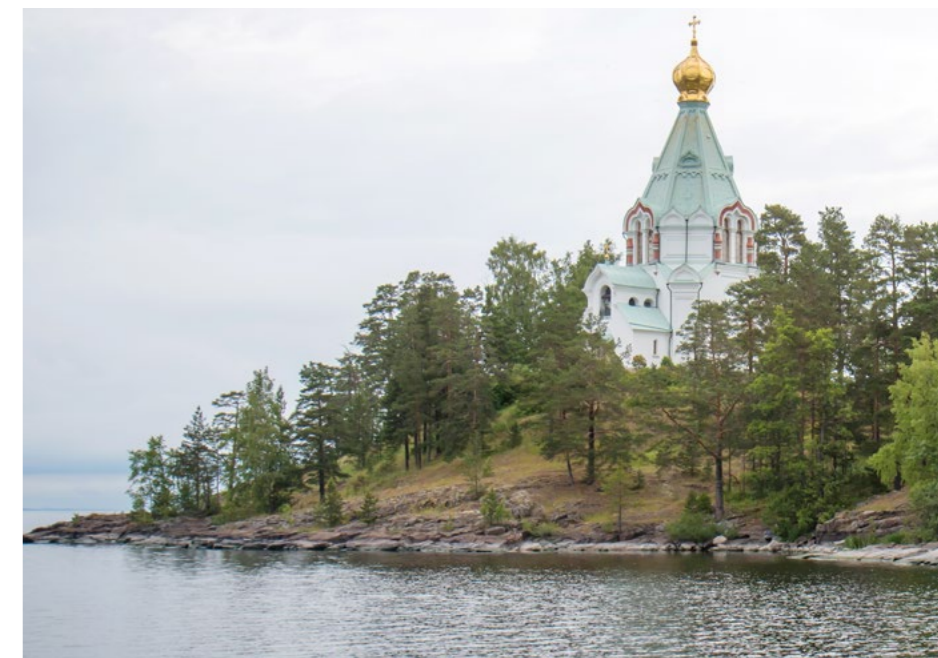
covered “... we don’t really need the Turkish coast and we don’t really need Africa.” In fact, all we need to do is to travel more often in our own country.

In parting, a so-called Scandinavian candle was “hoisted.” A one-and-a-half-meter log was installed vertically, cuts had been made in it from above, and the upper part of the log was set on fire. It burned for a long time, and it could be seen from afar. In fact, the Karelians used such candles as mini lighthouses, which burned and burned, clearly.

Kilpola

One day, we sailed to the island of

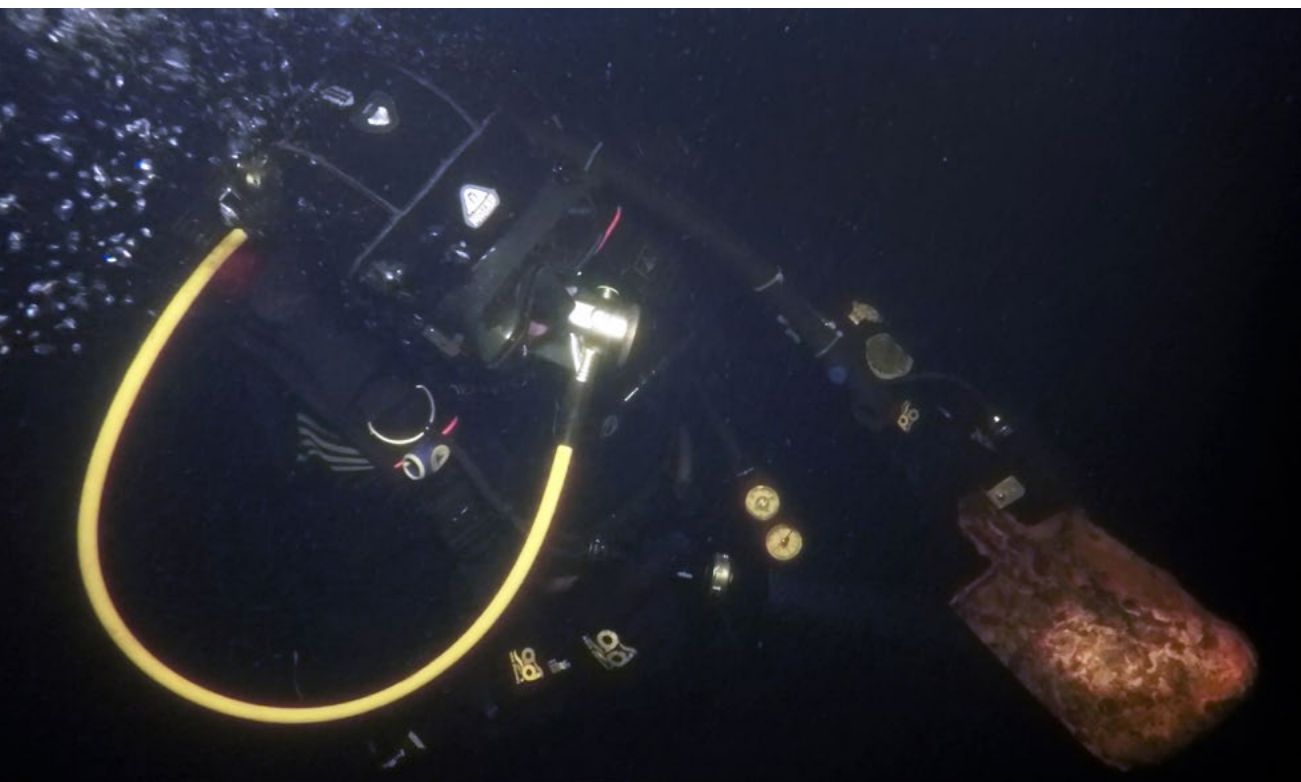
Ladoga



View of Nikolsky skete greets all visitors to Valaam Island (above); Artifacts (center, right column) found on the Valaam Luostari wreck were transferred to the Vladimir skete of Valaam Island (top right). Bell of the Valaam Monastery (top center)



Ladoga



Sonar scanner picks up shape of a barge (above); Diver with ammunition found on the barge (left); Beautiful sunset over Lake Ladoga (top left); Dive boat moors at a site where one can see the shape of the floating laboratory PS-1 Sevastopol just under the surface (top right); A 37mm automatic 70K anti-aircraft artillery system was found off Heinäsenmaa (right).

Kilpola—the western end of the Ladoga skerries. With the help of side-scan sonar, we examined the bottom of Severnaya Bay, where, according to our information, a barge could be located, which had been sunk during the Winter War (Soviet-Finnish war). But, unfortunately, it was never found. Moreover, as a rule, the cold and clear water of the lake this

summer turned out to be muddy, with visibility of no more than half a meter. But the members of our expedition were not going to give up.

We decided to explore a barge discovered back in the '90s of the last century. It lies not far from the coast. Apparently, it sank as a result of the explosion of another barge, which was

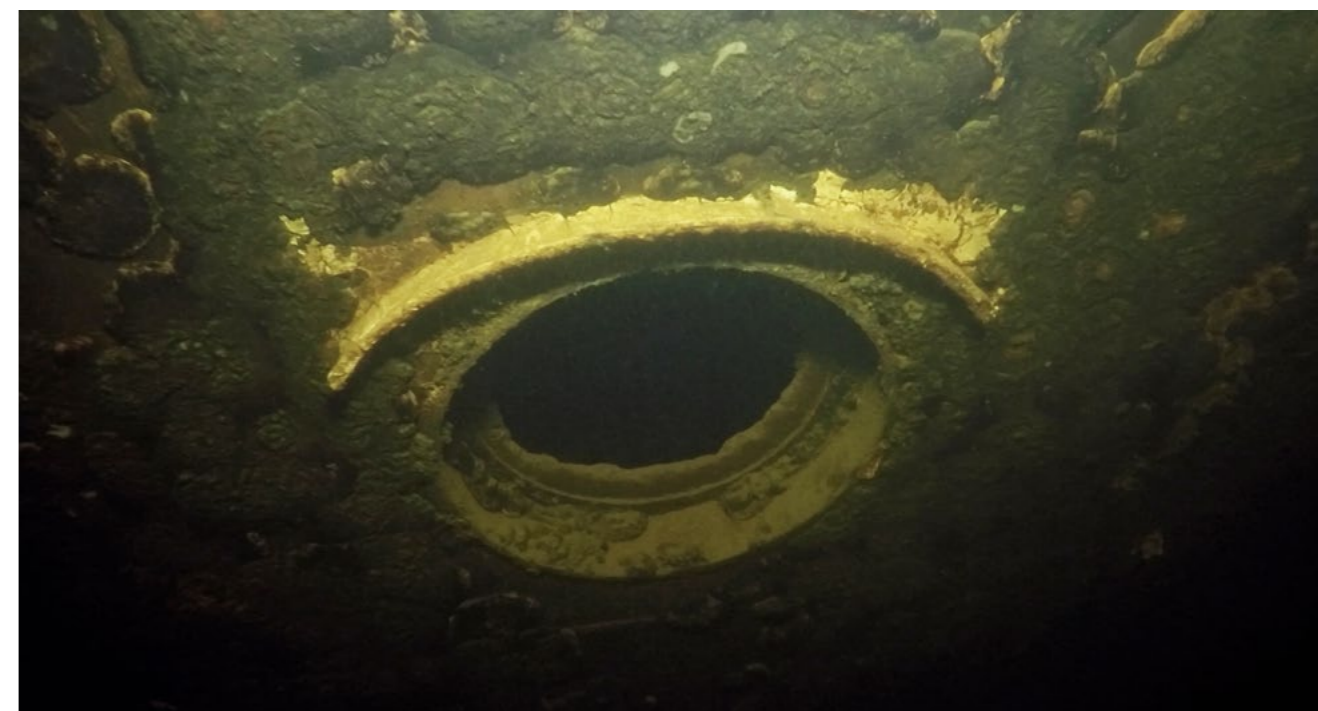
located nearby, loaded with ammunition. The area at the bottom adjacent to the detonation site is still replete with explosive artifacts. "At the anchorage near the island of Kilpola in August 1941, three Soviet divisions tried to evacuate through Ladoga under fire from the Finnish artillery. Divers found material traces of this event. Shells, car-

tridges and the barge itself, on which the evacuation was carried out, were found," said Vladimir Stroyev, a member of the expedition.

Although the first dives did not bring sensational discoveries, everything that was found excited us and gave one

food for thought: "One can only imagine what kind of battles were going on here," said fellow expedition member Oleg Shabunya. "The bottom is just littered with shells, cartridges, boxes... It is very impressive."





Wooden remains of a barge found in Death Bay off Kilpola Island (top left and left); Details of the floating laboratory PS-1 Sevastopol (above, top right and right)

Heinäsenmaa

Then we went to Heinäsenmaa—"hay land"—a group of small islands in Lake Ladoga, part of the Western Archipelago. On these islands during the Second World War, there was a defensive line, and then a secret research base. In the waters of the Heinäsenmaa islands, divers found a supposedly ship-based cannon. "During the diving survey, it was

found that it was a Soviet 70K anti-aircraft gun (sea version of 61K anti-aircraft guns)," said Shabunya.

On these islands during the war (1941–1944), an advance party of the Ladoga Finnish military flotilla was based. Puffing on his pipe, slowly, with a delay, savouring every word, Captain Chupin said: "There were six torpedo boats that Mussolini had sent. They did not par-

ticipate in hostilities, but they took part in the famous landing on Sukho Island. The Finns provided the base, and the Germans brought in Siebel-class landing barges. From here, they left 10, and from Otsanlahti, nowadays Vladimirskaia Bay, there were eight.

"The first were to capture the island of Sukho, and the second were to land at Kobona and, thus, block the Road of Life, leaving besieged Leningrad to die. This was the most successful counter-control

of our Ladoga military flotilla.

"The Nazis managed to land on Sukho. There were 300 of them against 50 of our guys. But the island was not given away! Our aviation sank their gunboats, and the Nazis retreated. Of the 18 fascist "Siebel," 12 were sunk. It's great to remember. We

have much to be proud of!"

And here is another story that the captain remembered on these islands. In 1946, a captured German destroyer was brought here. Experiments were carried out on it to protect forces against radioactivity, and a so-called "dirty bomb"



Details of the floating laboratory PS-1 Sevastopol (left column); Seagull chicks curiously watching divers (center inset)

Brilliant sunset over Lake Ladoga (above); Visitors can enjoy the diverse birdlife found on the islands of the Valaam Archipelago.

any furniture. The local population of the nearest territories, for example from Priozersk, did not believe in radioactivity, so they took this furniture home. Many people died..."

PS-1 Sevastopol

One of the interesting sunken objects visited by Oryol divers was the experimental ship PS-1 Sevastopol, which sank off a skerry near the village of Lakhdenpokhya. The ship rests almost on its keel. The depth at the bottom is eight meters and the deck is near the surface. Despite many attempts by researchers to learn more about the wreck, the history of this ship remains a mystery. It is known, however, that the ship undertook studies of new samples of underwater marine weapons.

On the deck of the wreck, one

can see an aircraft engine with a propeller made of narrow blades, measuring two meters across, which was used to pump air inside the ship. One can also see electric winches, a diesel engine, and details of the vessel's superstructure. Special training is required for those wishing to go inside the ship, so trying to penetrate the wreck without special training is not advised.

Afterthoughts

Nature is smarter than us. She heals herself. The main thing is not to interfere with it and not to bring it to the point of no return. The members of the expedition and tourists from the Odyssey-2 ship believed the captain, went to the islands and picked mushrooms. It must be said that the mushrooms were delicious there,

mostly ceps. In the galley, the cook fried them with potatoes. Home-cooked meals are always tastier.

The stormy waves of Lake Ladoga, which looks like the sea in windy weather, has incredible sunsets and sunrises, sheer cliffs on the skerries and sand dunes on the eastern beaches. All this will forever remain in the hearts of everyone who has seen these magnificent landscapes at least once in his or her life. It is worth coming here, because the harsh Ladoga is not only living history, but also one of the most beautiful places in Russia. ■

The wreck expedition team leader was Sergey Kulikov, who is head of the Oryol diving club "Divo" in Russia. Email: ssm.72@mail.ru or go to: dive-orel.ru





Text and photos by Larry Cohen, Brent Durand, Lureen Ferretti, Frankie Grant, Jennifer Idol, Kate Jonker, Matthew Meier, Brandi Mueller, Don Silcock, Olga Torrey and Martin Voeller

We asked our contributors what their favorite underwater photography technique was and they sent us images and insights into a range of intriguing techniques from close-up wide-angle to use of reflective cylinders and Snell's window to circular fisheye and snoots to using sunballs and sunrays for backlighting as well as how to create black backgrounds. *X-Ray Mag* contributors share their favorite techniques and details on how to use them to achieve compelling images.

My Favorite

UW Photo Technique

Contributors' Picks from Around the World



Yellow speckled klipfish portrait. Exposure: ISO 320, f/18, 1/250s. Gear: Canon EOS 7D Mark II camera, Canon 100mm macro lens, Sea&Sea MDX housing, Inon Z240 strobe with Iardino's Snooty, OrcaTorch D900V for spotting light

Snooting

Text and photos by Kate Jonker

When I first started making photos underwater, I was drawn to the minimalistic, colour-popping black background macro images I saw on social media. I soon learnt that this technique was known as "snooting," where only the subject is lit by a very narrow beam of light, leaving the rest of its surroundings completely black. This is achieved by narrowing the beam of your strobe—either by DIY means or by purchasing a specially made snoot.

The DIY method can involve attaching an item such as a short length of old wetsuit, PVC piping or even an old CV boot to the front of your strobe. The possibilities are endless and all one needs to remember is the smaller the diameter of the hole, the narrower the beam of light.

There are numerous snoots available on the market today that you simply

attach to the front of your strobe. Some are simple and just narrow the beam of light, some channel the light down a narrow tube of fibre optics, and others use optical lenses to concentrate the beam down a tube without losing quality of light.

An important thing to consider when purchasing or making your own snoot is that you need to know where it is pointing. The best way to do this is by having the focus light of your strobe light up exactly where your snoot is going to light, and most commercially bought snoots provide for this.

I attach my snooted strobe to the left handle of my housing using a medium and a short strobe arm. This gives me enough length to move the snoot into the position I want it to be. Before taking a photo of my subject, I move my snoot until it is centred in front of my port, pointing downwards approximately the same distance from the front of my port



Orange-eyed nudibranch. Exposure: ISO 160, f/18, 1/250s. Gear: Canon EOS 7D Mark II camera, Canon 60mm macro lens, Sea&Sea MDX housing, Inon Z240 strobe with Iardino's Snooty, OrcaTorch D900V for spotting light

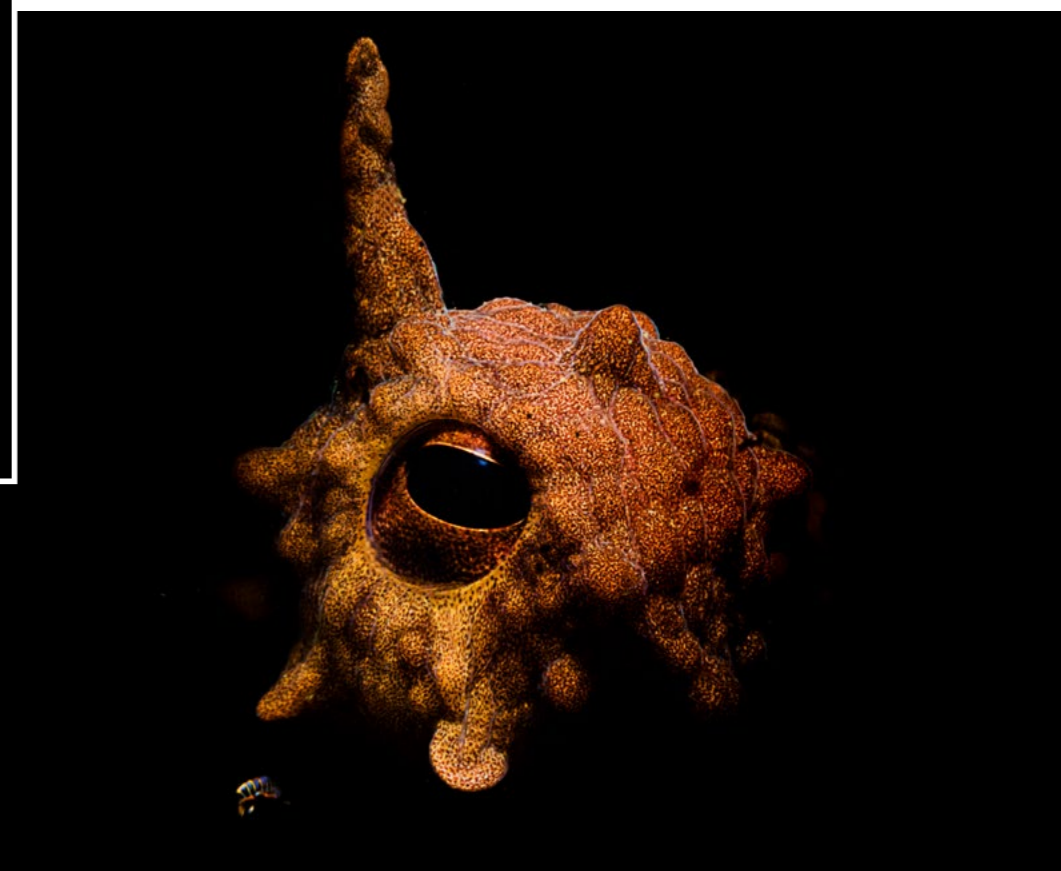
that I expect my subject to be. I find a stone similar in size to my intended subject. Looking through my viewfinder, I move my strobe with my left hand, until the focus light falls exactly on my stone. I tighten my strobe arms, and using back button focus, make sure that my subject is still in focus and lit correctly. I then go and shoot my intended subject.

Snooting can be challenging, and it does take a lot of getting used to—but the end results are worth the effort! Visit: katejonker.com



Blue and yellow gas-flame nudibranch. Exposure: ISO 160, f/18, 1/250s. Gear: Canon EOS 7D Mark II camera, Canon 60mm macro lens, Sea&Sea MDX housing, Inon Z240 strobe with Iardino's Snooty, OrcaTorch D900V for spotting light

PREVIOUS PAGE:
Anemone. Exposure: ISO 100, f/18, 1/160s. Gear: Sony A6400 camera, Zeiss Touit 50mm f/2.8 macro lens, Fantasea housing, Inon Z240 strobe with Iardino's Snooty, OrcaTorch D900V for spotting light



Octopus eye. Exposure: ISO 320, f/20, 1/200s. Gear: Canon EOS 7D Mark II camera, Canon 60mm macro lens, Sea&Sea MDX housing, Inon Z240 strobe with Iardino's Snooty, OrcaTorch D900V for spotting light





Snell's Window

Text and photos by Larry Cohen

As much as I enjoy creating photographs in deep water, there are some advantages to staying shallow. When one produces images close to the surface, there is plenty of ambient light. One may also make use of reflections and Snell's window, a phenomenon by which an underwater viewer sees everything above the surface through a cone of light. This phenomenon is caused by the refraction of light entering the water.¹

Including Snell's window in a photo is one of my favorite underwater photography techniques. It is essential to shoot upwards and

experiment with the angle until you can see the surface through the water. You need to make sure your shutter speed and aperture are correct to capture the above-water portion of the photo and balance the underwater part of the image with your strobe power.

I was able to create compelling images at Dutch Springs near the pump house. Photographing my dive buddy Olga Torrey in her dive gear, I captured the blue-sky clouds and trees. Taking a photo of Olga swimming on the platform, I used the smokestacks, which stem from the time when this was a working quarry, in the image. On a brisk fall day, I used the smokestacks as a background when photographing leaves floating on the surface from underneath. Visit: liquidimagesuw.com

Olga Torrey on pump house at Dutch Springs (top left). Exposure: ISO 200, f/8, 1/180s. Gear: Olympus E-620 camera, Olympus 7-14mm lens at 7mm, Olympus housing, dual Sea&Sea strobes

Fall leaves at Dutch Springs, PA, USA (above). Exposure: ISO 400, f/11, 1/250s. Olympus OM-D E-M1 Mark II camera, Olympus 9-18mm lens at 9mm, Aquatica housing, dual Sea&Sea strobes

Olga Torrey swimming at Dutch Springs (left). Exposure: ISO 200, f/5.6, 1/180s. Gear: Olympus E-620 camera, Olympus 7-14mm lens at 7mm, Olympus housing, dual Sea&Sea strobes



Technique

Diver with anemone, starfish and sea urchins on reef, Mendocino County, California, USA (left). Canon 5D Mk IV camera, 16-35mm f/4L lens.

Starfish in sea cave, Mendocino County, California (top left). Canon 5D Mk IV camera, 16-35mm f/4L lens.

Sea urchins on reef, Mendocino County, California (below). Canon 5D Mk IV camera, 16-35mm f/4L lens.

Jellyfish, Sonoma County, California (bottom left). Canon 5D Mk IV camera, 16-35mm f/4L lens.



Close-Focus Wide-Angle

Text and photos by Brent Durand

Conditions are highly variable here in northern California. Macro photography is always a safe bet when setting up the camera; however, I try to shoot wide-angle as often as possible.

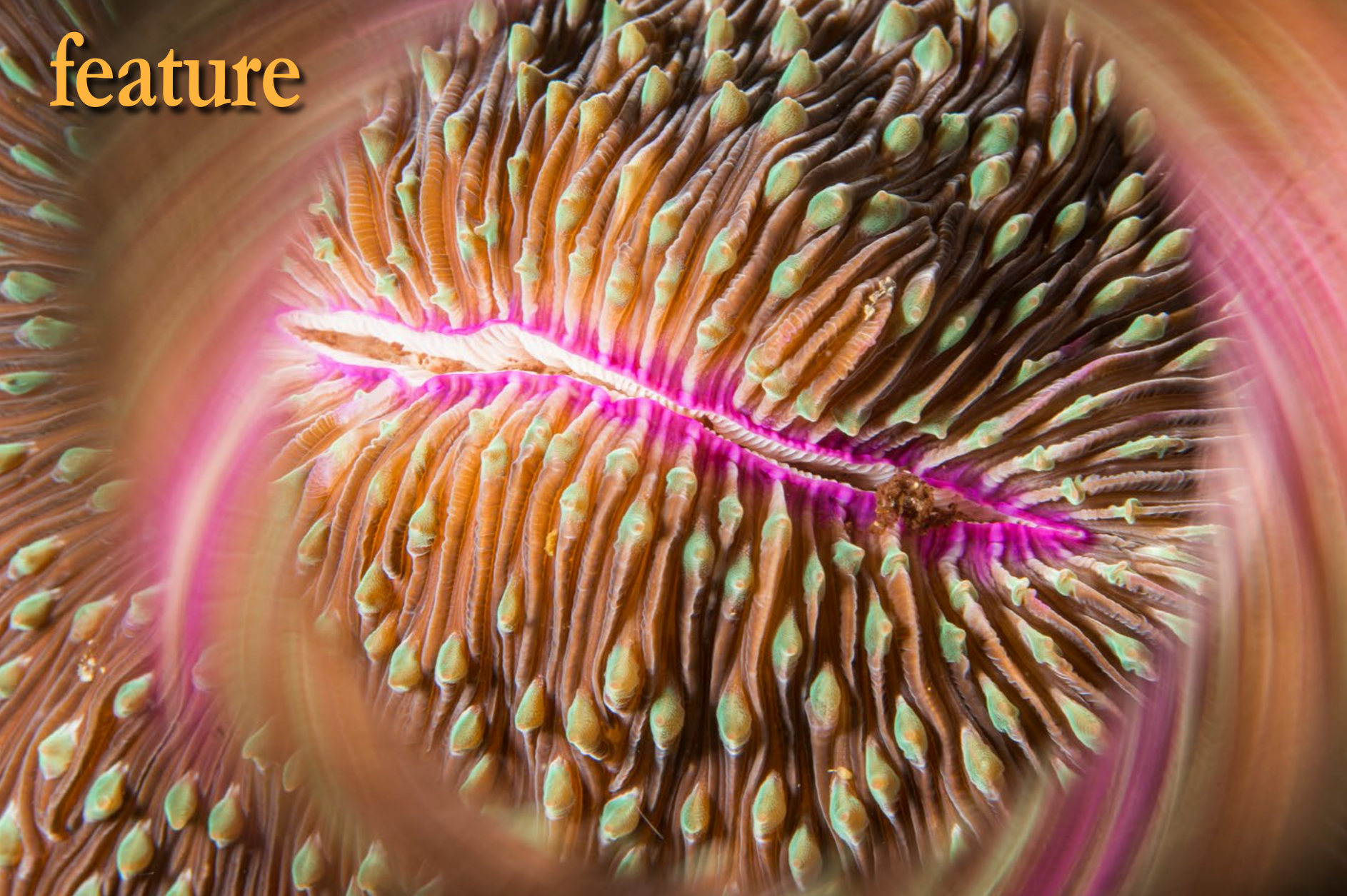
The close-focus wide-angle (CFWA) technique combined with my Canon 16-35mm f/4L rectilinear wide-angle lens allows me to create images in conditions ranging from exceptional to just 1.5m (4ft) of visibility. CFWA is a versatile technique that emphasizes the subject in the

composition regardless of the environment around it.

This technique does provide challenges, however. The subject must be the size of your hand or larger, the subject must be located on an area of the reef suitable to compose a nice image, lighting is tricky with the subject so close to a large dome port, and wave surge can make precise composition physically demanding.

Close-focus wide-angle can be used to create bold, impactful images, and I find myself using the technique in every dive image portfolio. Please visit: tutorials.brentdurand.com





Mushroom coral, Puerto Galera, Philippines (above). Exposure: ISO 100, f/14, 1/250s; Anemonefish, Puerto Galera, Philippines (below). Exposure: ISO 125, f/20, 1/160s; Gear: Canon 70D camera, Canon 60mm macro lens, Nauticam housing and a reflective cylinder, dual Inon 330 strobes.

Reflective Cylinder

Text and photos by Lureen Ferretti

From ordinary to extraordinary—the simplest method I was introduced to is shooting through a reflective cylinder. I find clownfish in anemones irresistible and cannot resist photographing them, resulting in hundreds of similar photos. I add pizzazz by shooting through a reflective cylinder. It creates a natural frame with the colors within the image and really makes your subject pop.

Does your prized subject hang out in places with hideous backgrounds or foregrounds? Another perfect use for the shiny tube—you can easily eliminate

those distractions. Some corals and clams have brilliant colors and textures; shooting them through the reflective cylinder can transform bland images into interesting artwork.

You can purchase a cylinder at your local hardware store. To use, simply hold it in front of your dome port while taking a photo. Be careful not to touch your dome port with it. I have had the best success using it with a 60mm macro lens. You can change the size and angle of the color swirl by moving the cylinder closer or

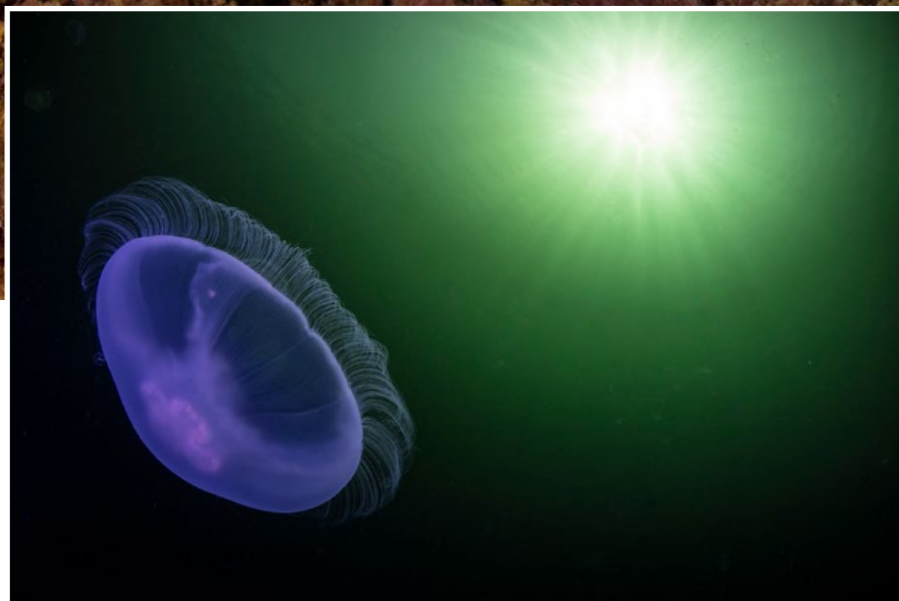


farther away from the dome port and changing the angle until you find the perfect effect! Visit: DeepWaterPics.com



Orange cup coral, Puerto Galera, Philippines. Exposure: ISO 100, f/14, 1/250s





Sunbursts

Text and photos by Frankie Grant

While sunburst photography can be challenging, the results of much practice and patience in this discipline can yield unique and powerful images with very dynamic light. Remember to use high apertures and shutter speed, along with one or two strobes to light the area facing away from the sun. The sun acts as a backlight on your subject. Get creative! Visit: frankiegrant.com

Moon jellyfish, Inside Passage, Santa Anna Inlet, Alaska, USA (above). Exposure: ISO 400, 10mm, f/11, 1/250s; Green sea turtle, Marine Room, Southern California, USA (top). Exposure: ISO 400, 10mm, f/18, 1/250s. Gear used for all photos: Canon EOS 7D Mark II camera, Tokina 10-17mm fisheye lens, Sea&Sea housing, dual YS-D2 strobes

Green sea turtle, Marine Room, Southern California, USA. Exposure: ISO 640, 10mm, f/18, 1/250s

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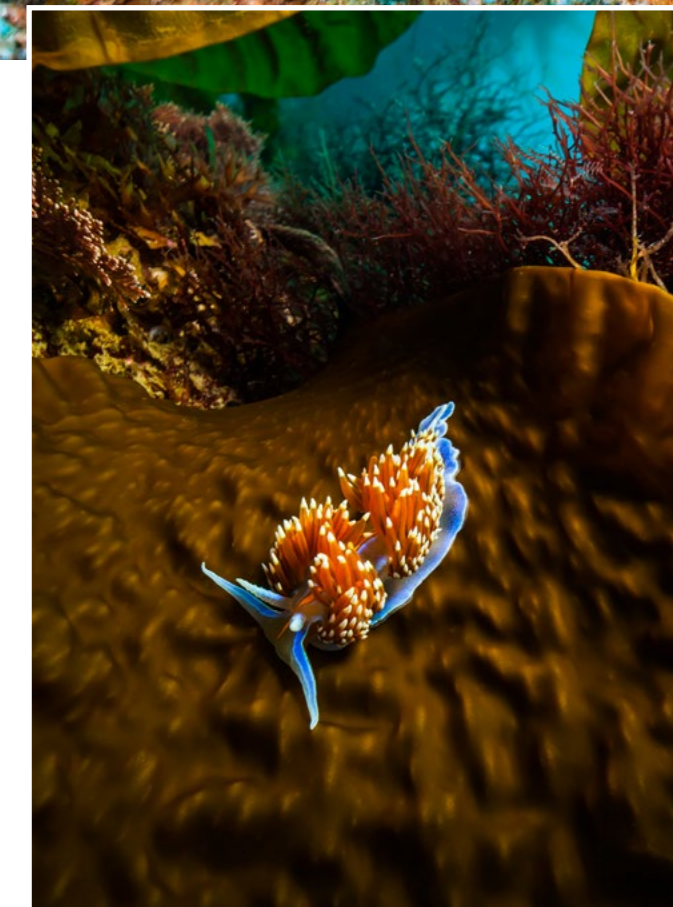
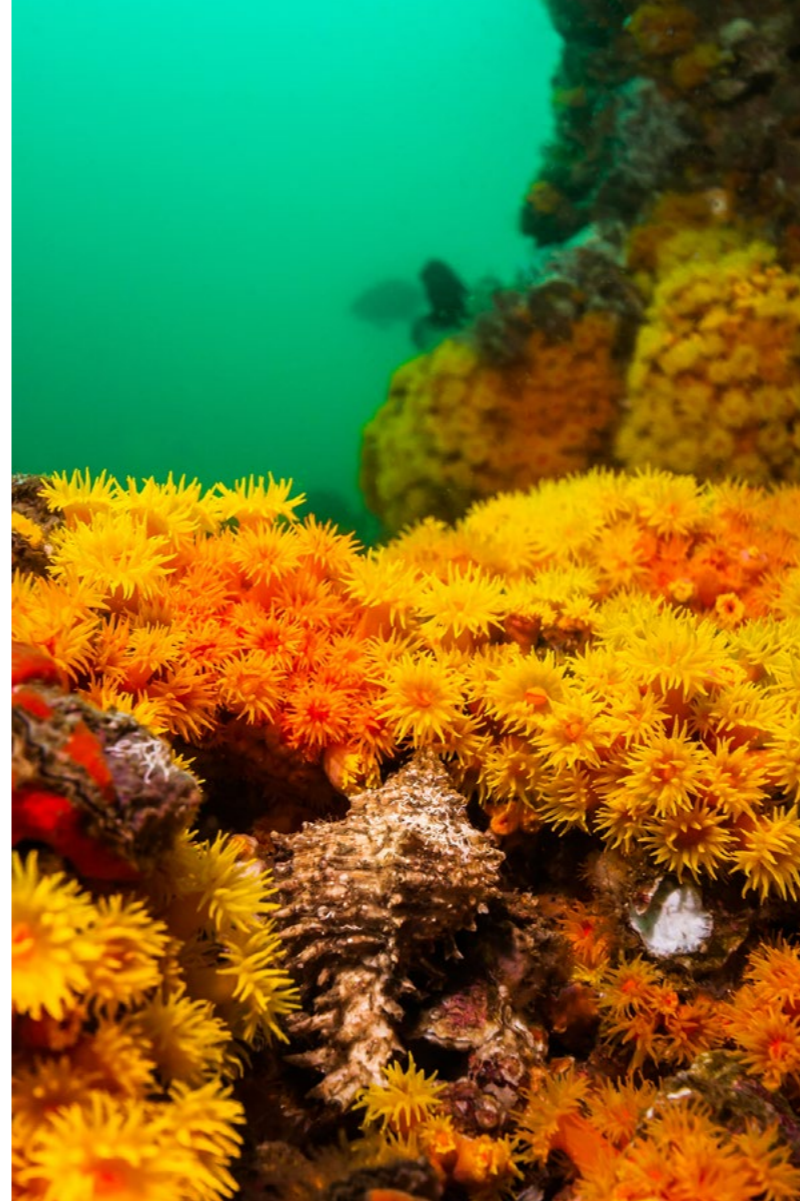
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Kelp rockfish in California, USA (above), appear surly when seen up close. Exposure: ISO 400, 24mm, f/4.5, 1/60s. Gear: Nikon D90 camera, Nikkor 10-24mm lens, Nauticam housing; Photographing *Tubastrea* or sun coral (right) with this method brings the viewer into the colony of corals rather than across the structure of the oil rig on which they are found. Exposure: ISO 800, 24mm, f/5.6, 1/40s. Gear: Nikon D90 camera, Nikkor 10-24mm lens, Nauticam housing



Usually a macro subject, this wide-angle photo shows the context in which this opalescent nudibranch lives. Exposure: ISO 400, 10mm, f/13, 1/80s. Gear: Nikon D90 camera, Nikkor 10-24mm lens, Nauticam housing

Close-Focus Wide-Angle

Text and photos by Jennifer Idol

Perhaps it is my nearsightedness, but I love to get wildly close to a subject with my wide-angle lens. It features subjects in intimate and unusual ways, especially for unique subjects. I think of wide-angle close-up photography as the macro world for wide-angle, looking at a potentially small subject in context with its environment.

This type of photography generally refers to shooting within two feet of a subject, which also makes focusing a potential challenge. Although I prefer creating these photos with my 14-

24mm wide-angle lens so I can take advantage of some of the distortion from shooting near a subject, any wide-angle lens can work.

As I look through the lens when shooting a subject in this way, I enjoy the detail in my scene. Although the landscape may appear large, the area I am shooting in is almost as small as when I shoot macro. This creates cropped moments that highlight the subject.

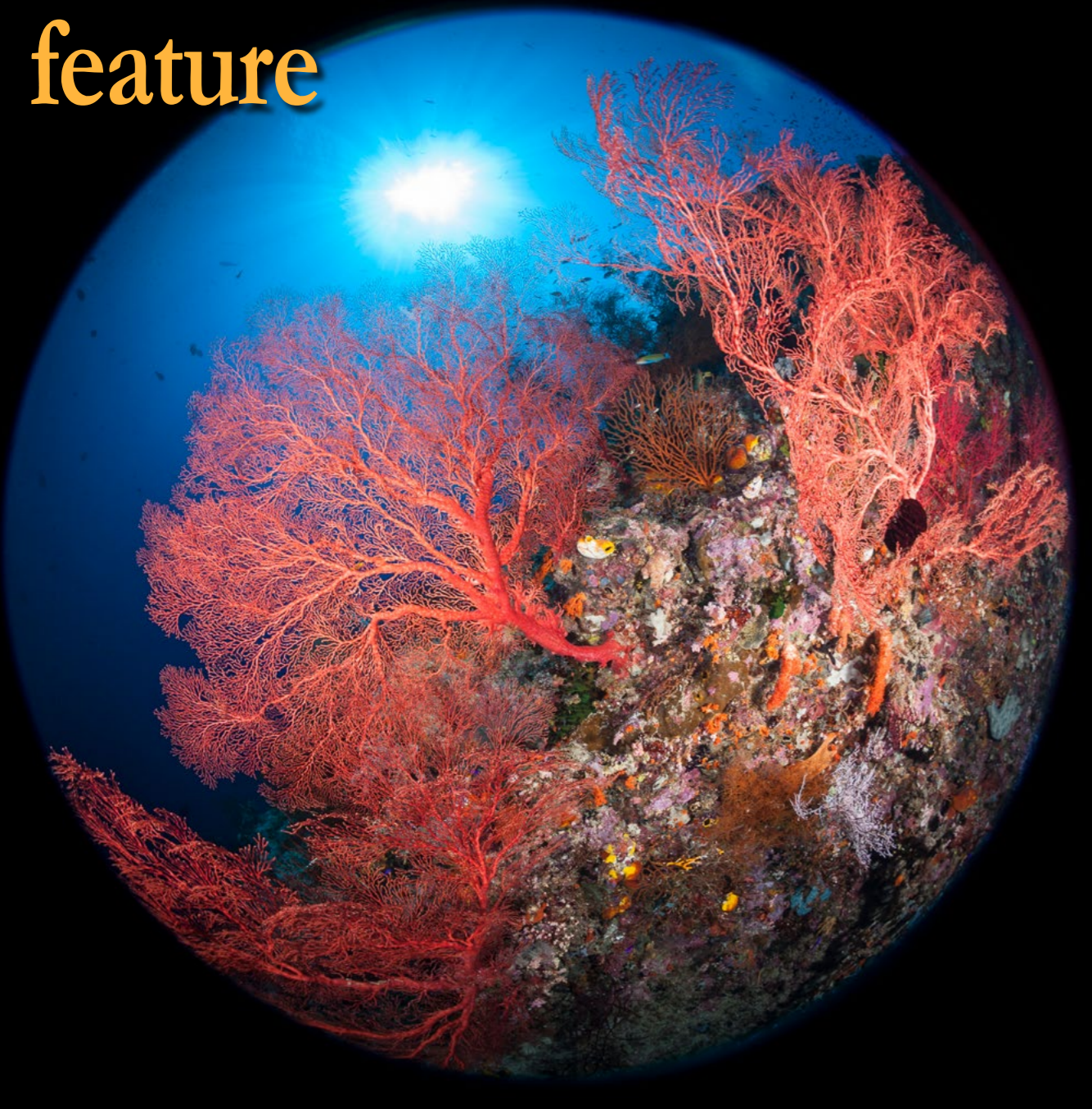
Most of my wide-angle photos are created using this style, though they may appear otherwise. I also take care not to disturb wildlife, and I approach slowly or let them approach me to get the shot. Visit: uwDesigner.com



Sometimes, corals like these in Raja Ampat, Indonesia (above), appear like lovely underwater foliage, though they are animals. Exposure: ISO 500, 14mm, f/22, 1/125s. Gear: Nikon D5 camera, Nikkor 14-24mm lens, Nauticam housing

This hooded nudibranch in Alaska, USA (left), swims just beneath the waterline. Exposure: ISO 800, 32mm, f/11, 1/250s. Gear: Nikon D5 camera, Nikkor 16-35mm lens, Nauticam housing





Circular Fisheye Lens

Text and photos by Matthew Meier

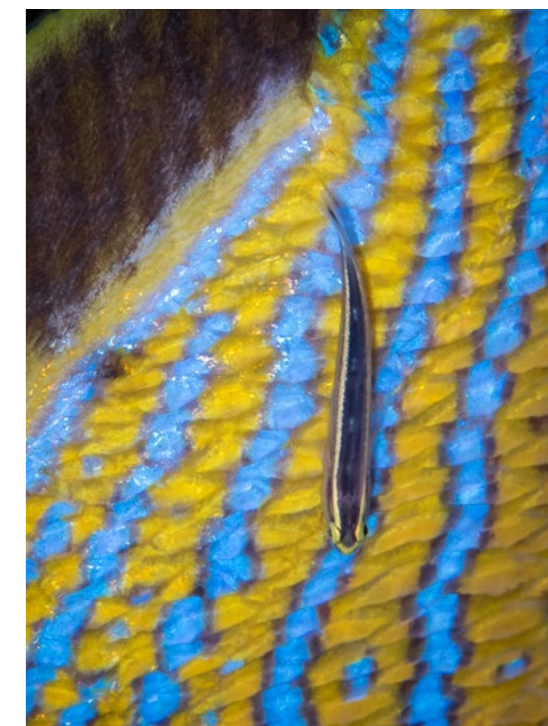
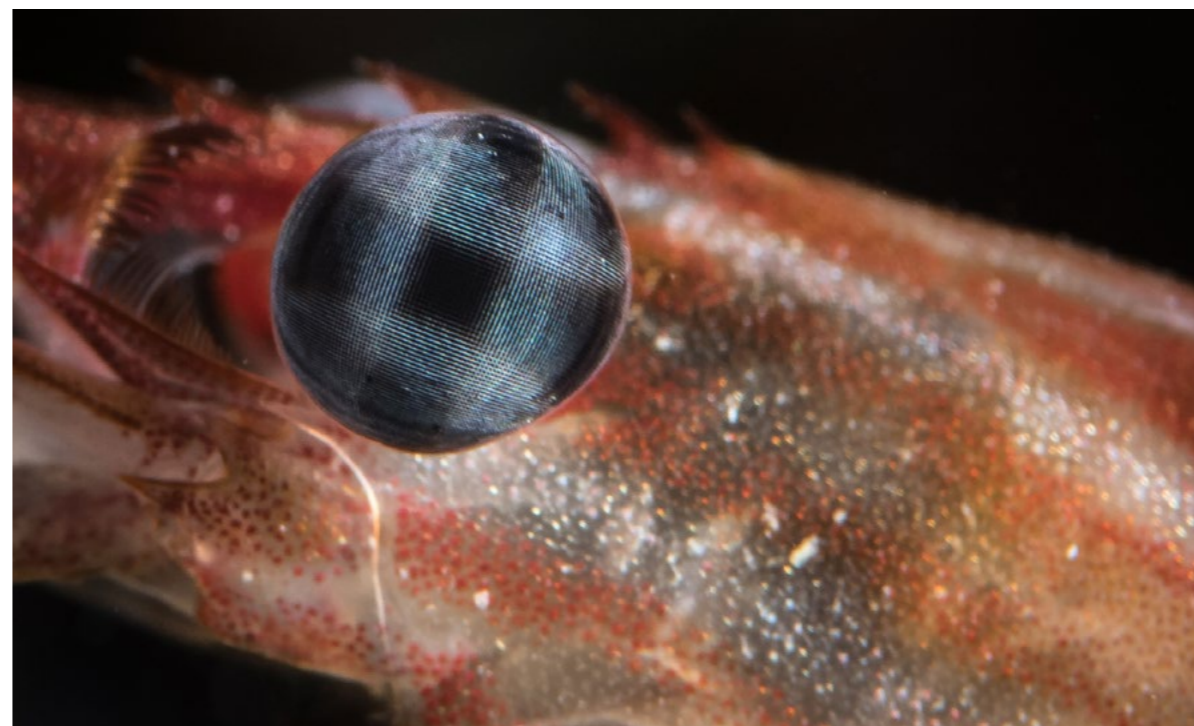
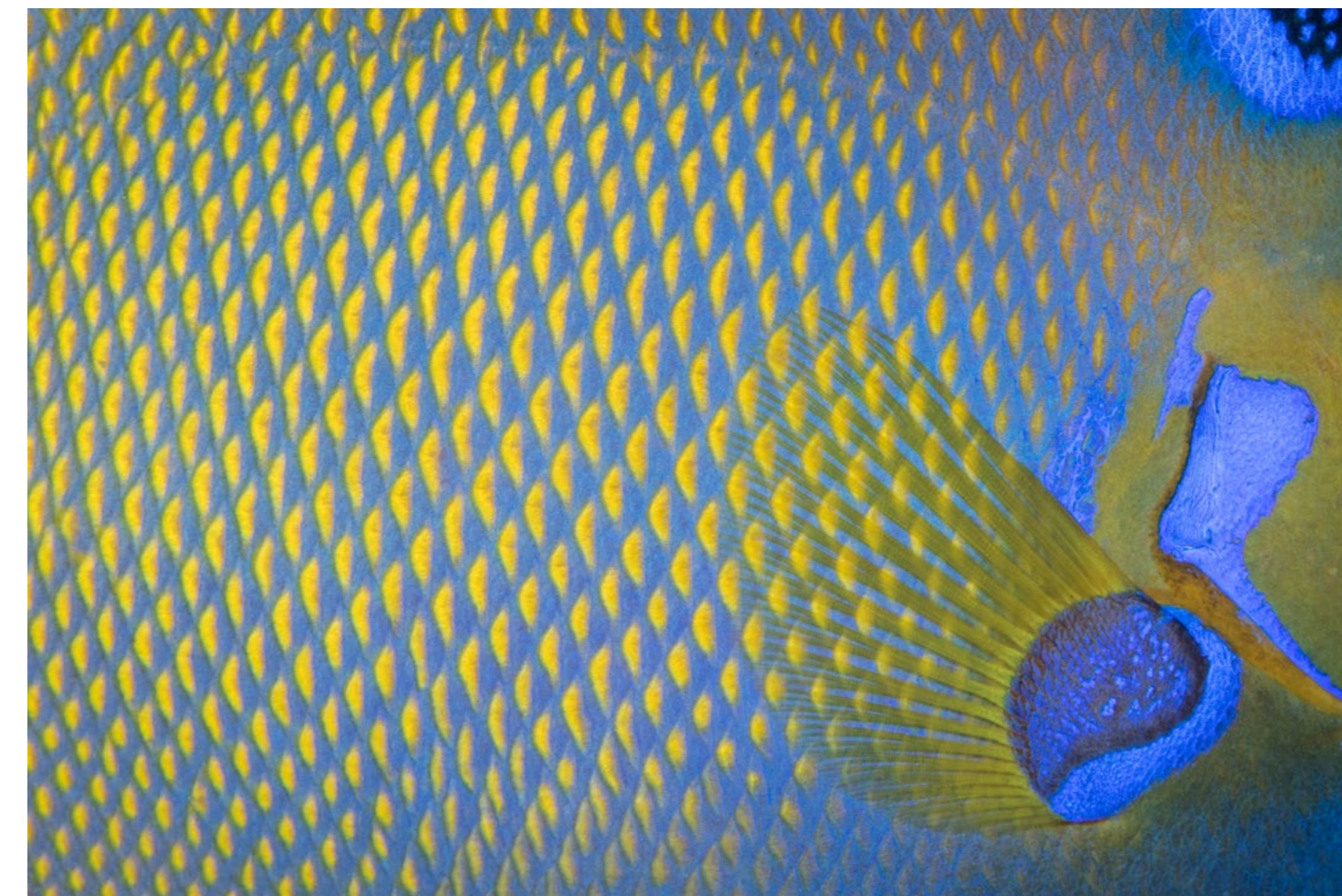
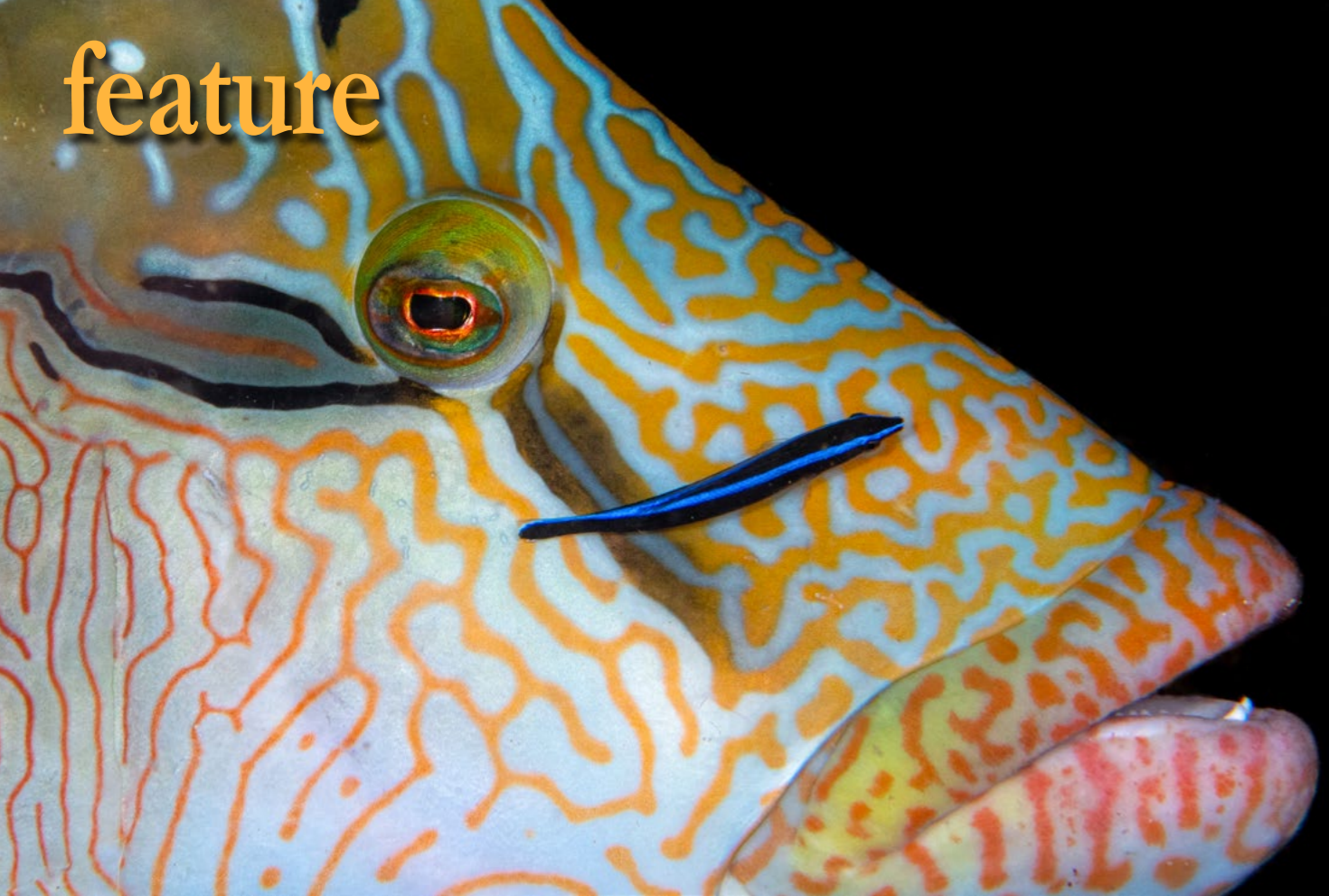
Shooting with a circular fisheye lens is similar to the close-focus wide-angle technique, except that you need to get even closer to your subject to fill the frame. Typical working distance is less than 1.5ft (0.5m) and requires impeccable buoyancy control so as not to damage delicate corals, sea fans, marine life or the dome port.

This specialty lens has a 360-degree field of view, which means that the dome shade must be removed, and as such, anything in front of the dome port will be in the photo, including your stray fin or a free-floating

octopus hose. Powerful strobes with a wide beam angle and diffusers are best to illuminate such a wide area and create a balanced exposure. The strobes should be positioned in line with the housing handles, behind the dome port, at 10 and 2 o'clock or 9 and 3 o'clock, facing forward or slightly outwards and close enough together to light directly in front of the dome.

Choosing the appropriate subject matter is key to a successful composition when using this lens. Larger objects help fill the frame, and a sunball overhead can enhance the negative space. I also really enjoy the unique perspective created when using this lens on land. Visit: MatthewMeierPhoto.com

Gear for all underwater images: Nikon D810 camera, Sigma 8mm circular fisheye lens, Subal housing, two Sea&Sea YS-250 strobes. CLOCKWISE FROM TOP LEFT: Sea fans and sunball, Misool, Raja Ampat, Indonesia. Exposure: ISO 200, f/8, 1/250s; Hawksbill sea turtle and sponge, Misool, Raja Ampat, Indonesia. Exposure: ISO 200, f/8, 1/250s; Plate corals and chromis fish, Misool, Raja Ampat, Indonesia. Exposure: ISO 200, f/8, 1/160s; Hand feeding a tiger shark, Tiger Beach, Bahamas. Exposure: ISO 200, f/8, 1/100s; Sea fan and sunball, Russell Islands, Solomon Islands. Exposure: ISO 400, f/6.3, 1/125s



Abstract Macro

Text and photos by Brandi Mueller

One of my favorite underwater photo techniques is what I like to call "Abstract Macro." I like to get super close to fish or coral, or whatever I can find, and take close-up shots of only small parts of the subjects' bodies.

Marine life has incredible colors, patterns and textures, which I think often go underappreciated as we

swim by. Taking an image of a whole fish might not show the unique colors and detail of the fish's scales or the dots around the eyes or the delicate lines of the fins. Even the actual eyes of ocean creatures fascinate me as some, like shrimp, have compound eyes in which you can see the individual cones or iridescent lines.

I tend to default to taking abstract macro shots when I cannot find much else to photograph. If I am ever underwater and find myself thinking, "I have nothing to shoot," I try to remember to get super close and photograph the amazing intricacies of the underwater world. Visit: brandiunderwater.com

CLOCKWISE FROM TOP LEFT: Napoleon wrasse. Exposure: ISO 250, f/16, 1/200s; Parrotfish. Exposure: ISO 200, f/11, 1/200s; Lionfish. Exposure: ISO 200, f/18, 1/250s; Bluestripe snapper. Exposure: ISO 320, f/11, 1/200s; Shrimp eye. Exposure: ISO 200, f/18, 1/200s; Queen angelfish. Exposure: ISO 320, f/9, 1/125s

Gear used for all images: Nikon D850 camera, 105mm lens, Ikelite housing, dual Ikelite DS161 strobes





Wide-Angle Macro

Text and photos by Don Silcock

“What is your favorite underwater photo technique?” An interesting question, and after 11 months of enforced hunkering down in Sydney, I have a completely different answer now, as opposed to more normal times!

Pre-pandemic, my response would have been “wide-angle close focus,” as I simply love the whole feel of such images, as they seem to place you right in the middle of the beautiful locations you can photograph with that technique. But, you

need beautiful locations and good visibility to deploy that technique effectively—and, as interesting as it is, local diving here in Sydney is rather lacking in the visibility stakes.

So, I have concentrated on developing my skills around the very viable alternative of “wide-angle macro”—a technique long popular with land photographers and popularized underwater by Alex Mustard over 10 years ago.

The thing with macro underwater photography is that it is incredibly popular and really quite difficult to get different images. What I really like about wide-angle macro are

the diverse and almost unique perspective it enables.

Equipment-wise, you will need a close-focusing wide-angle lens—in the Nikon world, that would be either the 10.5mm fisheye lens or the Nikon 8-15mm lens, or one could go with the Tokina 10-17mm fisheye zoom lens—plus you will need a teleconverter such as the Kenko 1.4, a small dome such as the Zen 100mm, the necessary EXR sensors and small strobes such as the Inon S2000. Then, you need to hone your stalking skills and get shooting! Visit: indopacificimages.com.



Gear used for all images: Nikon 500 camera, 15mm Sigma lens, 1.4TC, Nauticam housing, dual Inon S2000 strobes. Scorpionfish (top left). Exposure: ISO 500, f/8, 1/40s; Australian eastern frogfish (top right). Exposure: ISO 500, f/10, 1/100s; Nudibranch (above). Exposure: ISO 500, f/9, 1/40s

Seahorse. Exposure: ISO 400, f/9, 1/60s





All images were taken with an Olympus OM-D E-M5 camera. A Panasonic 8mm fish-eye lens for Olympus and a Lumix G Vario 7-14mm lens were used. For lighting, dual Sea&Sea strobes were used.

Diver at Taco PC in Cenote el Eden, Ponderosa, Mexico (left); Diver Gregory Borodiansky under the platform at Dutch Springs (right); Hawksbill sea turtle, Papua New Guinea (below); Liveaboard *Febrina*, Papua New Guinea (bottom left)



Sunrays and Sunbursts

Text and photos by Olga Torrey

When I create photographs underwater, I enjoy using light as a compositional element in the image. By using sunrays and sunburst, I attempt to create dramatic images that are pleasing to the viewer's eye.

When I visited Cenote el Eden, also known as Ponderosa, in Mexico, I brought my camera to show the unique beauty of this dive site. I found my first experience taking photographs in a cenote a little bit intimidating. I planned to use the sun's rays as the main element in my images. I used a Panasonic Lumix G Vario 7-14mm lens and set the camera to a slow shutter speed of 1/40th of a second. I needed to set the aperture to f/6.3 and the ISO to 1250 to capture the light streaming into the cavern. I used dual Sea&Sea



YS-D1 strobes on low power to fill in the shadows, light the diver and bring out the beautiful limestone's colors.

Another location, Dutch Springs in Pennsylvania, USA, is a 50-acre lake, which I use as an underwater studio. The lake is spring-fed from an underground

aquifer, which filters through limestone. The lake offers an ample variety of submerged attractions to practice photography. On a sunny day, I will work close to the surface to capture the sunbeams to enhance the subject. In this image, I used one of the training platforms to filter the light and a diver under the platform as a human element. To light details on the diver, I used dual Sea&Sea strobes. To get a forced perspective, I used the Panasonic fisheye 8mm lens. I set my camera's shutter speed to 1/250s, stopped down to f/7.1, and set the ISO at 250.

I have also been to Papua New Guinea, which is an underwater para-

dise for divers and photographers. On one of my dives there, I noticed a hawksbill sea turtle swimming towards me. It was a sunny day, and I waited for the opportunity to take the photo of the turtle with a sunburst. When that moment arrived, I took the shot. I filled the frame by getting very close to the turtle with my Panasonic fisheye 8mm lens. I set the shutter speed to 1/200th of a second and closed the aperture to f/16 in order to capture the detail in the background. I set the ISO to 250.

The image of the liveaboard *Febrina* in Kimberly Bay was taken with the idea of showing the sunburst rays coming through the ladder while divers stopped for their safety stop. I positioned myself under the boat to prevent the sun from overexposing the sunburst. I set the shutter to 1/250th, stopped down to f/16, and set the ISO at 250. I used the Panasonic fisheye 8mm lens. Visit: fitimage.nyc





Technique

Hana-otome nudibranch, or ornate *Dermatobranchus*, Izu, Japan (left). Exposure: ISO 280, f/6.7, 1/250s. Gear: Nikon D4S camera, Subal ND4 housing, two Inon Z-240 strobes

Face of a giant frogfish, Chiba, Japan (below). Exposure: ISO 280, f/22, 1/250s. Gear: Nikon D4S camera, Nikkor 105mm lens, Subal ND4 housing, Inon Z-240 strobe

Portrait of Asian sheepshead wrasse, Chiba, Japan (left). Exposure: ISO 560, f/13, 1/250s. Gear: Nikon D5 camera, Nikkor 16-35mm lens at 27mm, Subal ND5 housing with Zen DP-230 port, two Seacam Seaflash 150 strobes; Great hammerhead shark portrait, Bimini, Bahamas (below). Exposure: ISO 100, f/19, 1/250s. Gear: Nikon D300 camera, Nikkor 10.5mm lens, Zillion housing, two Inon Z-240 strobes

Black Background

Text and photos by Martin Voeller

I would say there is a handful of favorite shooting techniques for me, but one of my favorite underwater techniques is creating a black background (even during mid-day), as it often gives a strong contrast from the subject and pops the subject out, potentially giving a “wow” effect for the viewer. And there are several ways to achieve this effect, which includes positioning your strobes in a certain way, but my recommendation in achieving black backgrounds is by directing your strobes forward to directly light the subject and controlling the background via your shutter speed and aperture. This applies to both macro as well as wide-angle.

Before making adjustments to your camera settings, you must first ensure that there is no object directly behind your subject; else, this method will not

work, as the forward-directed strobes will end up lighting the object as well. In other words, there needs to be an open water column behind the subject.

Once this environment is achieved, it is time to dial in your camera settings. First, when photographing underwater with strobes, shutter speed itself does not affect the brightness of the lit subject—it only controls the color of the background. Therefore, make the shutter speed as fast as possible: 1/250th of a second in most cases.

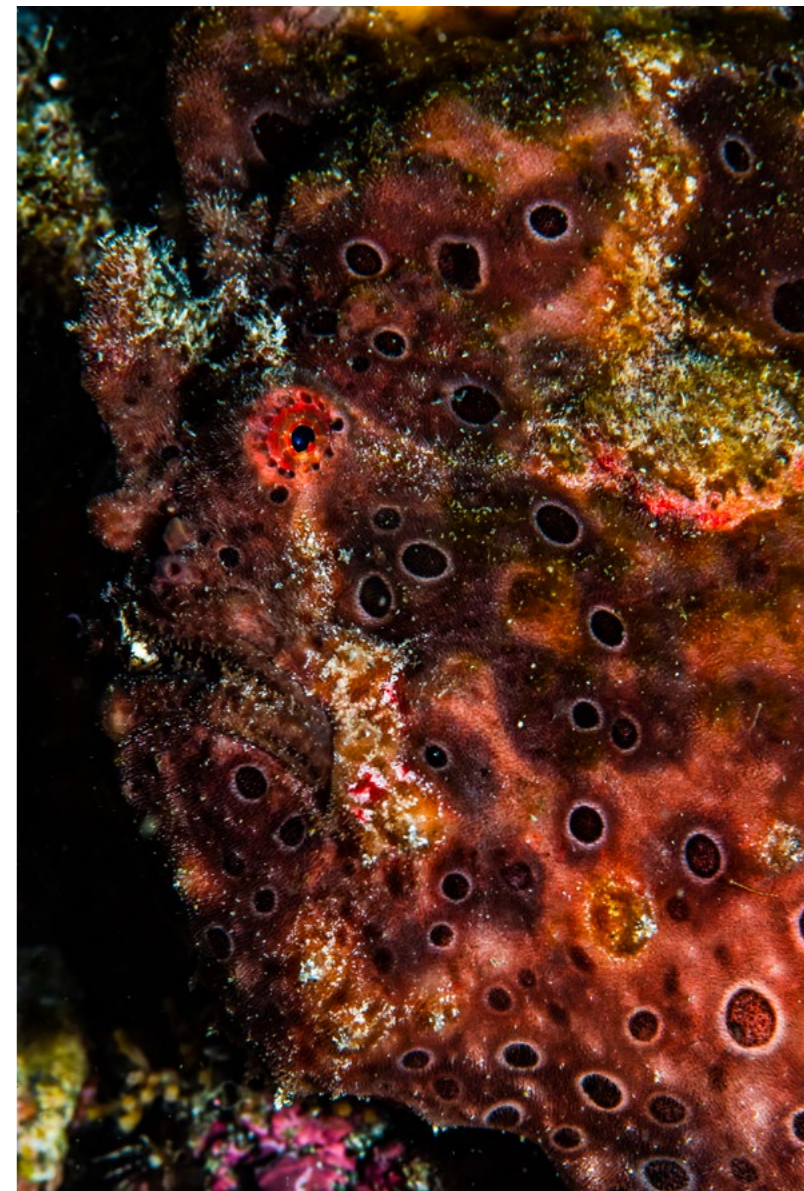
Next, as you want to cut out any further ambient light, you should minimize the aperture as small as you can. However, as you stop down your aperture, you will need to increase the strobe power, possibly towards full power, to ensure your subject is well lit (but this will not affect the background, as that is controlled by your shutter speed).

One last word of advice: Backscatter



is the bane of black background photography. It will become more evident against a black color, so you

must direct your strobes a bit outward to minimize or avoid this phenomenon. Visit: poseidonphotos.com





Interview with **Bruce Partridge** — Founder of Shearwater Research

Text edited by Peter Symes
Photos courtesy of Bruce Partridge
and Shearwater Research

Bruce Partridge is the founder of Shearwater Research, which makes high-quality dive computers, trimix computers and electronic control systems for rebreathers, with simple and intuitive user interfaces and a reputation for being reliable, user-friendly and easy to read underwater. In an interview with X-Ray Mag, we learn from Partridge how it all came about, what drives and inspires him, and his unique perspectives and insights on innovation and the dive industry.

X-RAY MAG: How did you get into diving?

BP: I had a computer consulting firm and at one point. I was also teaching sailing in my spare time on Saturdays. And one day, I mentioned to one of the other

sailing instructors that I was going to the Caribbean to hang out on a sailboat, and he said, "Okay, where are you going diving?" And I said, "I'm not diving, I don't know how to dive."

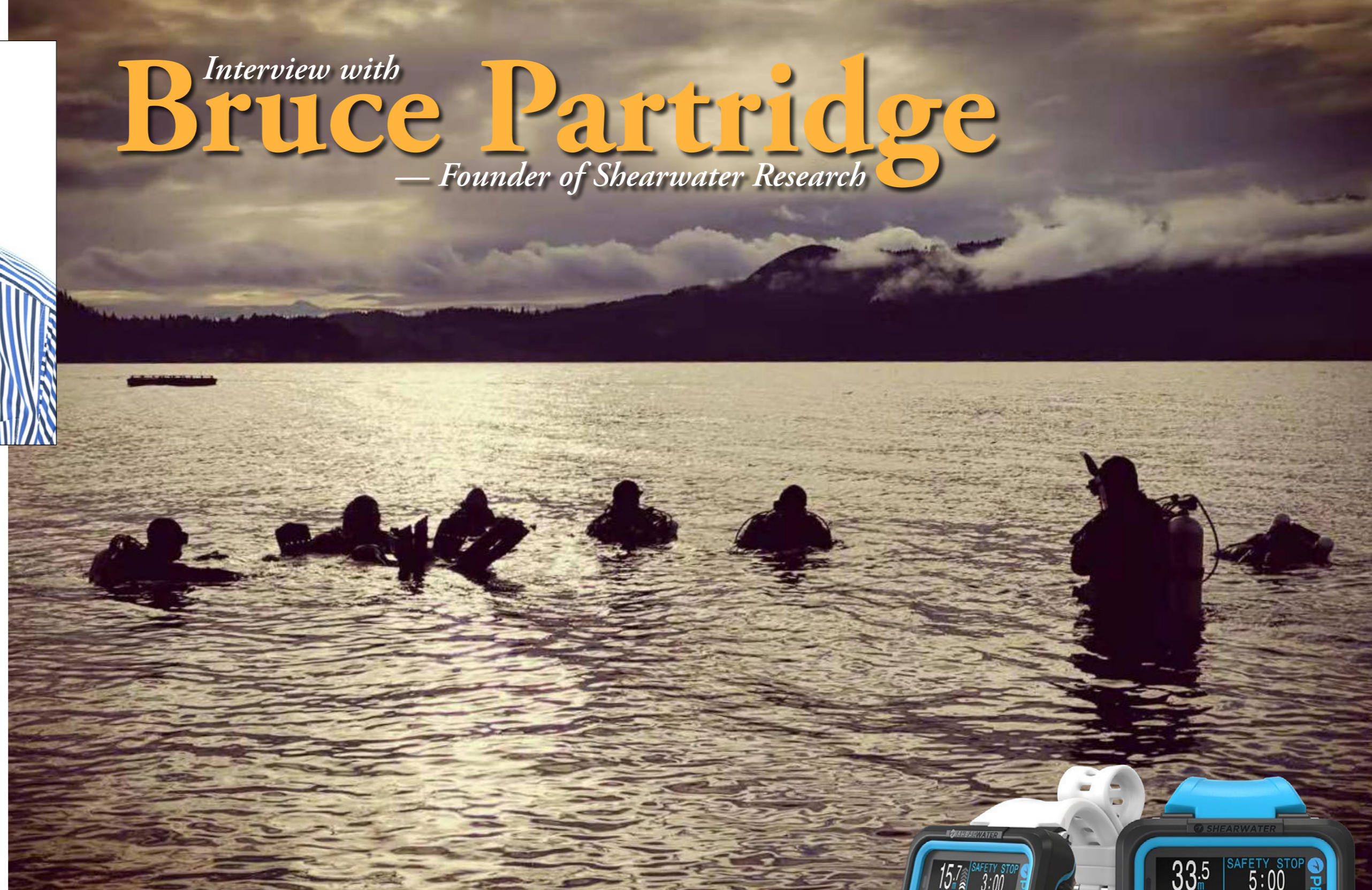
But he seemed to know what he was talking about, so I got certified at the local store before I left. When we got the sailboat there, we rented diving gear,

and we went diving.

We were on Stafia [St. Eustatius], and on one of our dives, we went down and sat on the bottom. There were a lot of turtles, and one of them swam right over to me and was just a foot from the front of my face. It wasn't the slightest bit concerned about me and looked at me very carefully. It was just such an amazing moment

for me. That was really the experience that changed everything and made me think, "Oh, I want to keep doing this."

Later on, I met up with diving instructors in Vancouver. Of course, they encouraged you to



Shearwater's Peregrine dive computer

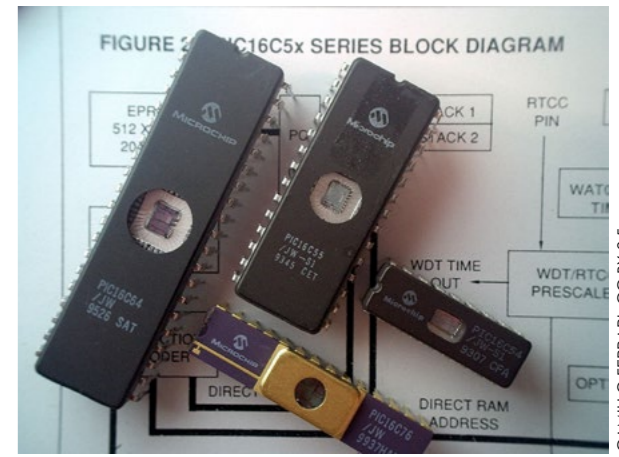




Bruce Partridge and his wife Lynn kitted up for a dive (left); The couple diving off Vancouver Island in British Columbia, Canada (below)

Bruce Partridge

The PIClist had thousands of people on it and many whose hobby it was to help others. You would send a question out, and somebody would send back a three-page answer with links to references and explanations on a really simple level. You could ask questions like what is an op amp? How do you connect it?



Various older (EPROM) PIC microcontrollers. File photo from Wikimedia Commons

or something like that. My first three sales went to Saudi Arabia, California and the UK. That was sort of how scattered it was. So, we started off being international from day one. There was never any question about it being a Vancouver business.

Analogue sensor

Anyway, so that's what got started. It turned out to be not a very good computer. I was using an analogue depth sensor, which would need to be recalibrated once a year. And there's just no practical way to have people shipping computers back from all over the world every year to have them calibrated.

So, I bought those three back, and I said, "Guys, give me a year, and I'll have something else." This led to the second version, which was much more professionally done and used a digital depth sensor.

I wrote all the software, the firmware, for the product. That little part was a

one-man show, and when I got to be pretty happy with it, I contracted an electrical engineer to do a board layout for me. I did all my own circuits too. I wasn't the hardware guy, but I learned how to use op amps [ed. operational amplifiers], how to use memory chips, how to mount a microprocessor and how to put power to it—and that sort of thing. I figured all that stuff out.

PIClist

A lot of what I got came from something called the PIClist [ed. the PIClist is a collection of people interested in the Microchip PIC and other similar processors who have joined the PIClist]. PIC is an entry-level, controller-type computer and a very simple device. You might put one of these in a lamp, telephone or flashlight, but they're not meant to be sophisticated, run word-processing or anything like that; they're quite simple processors.

continue to take classes so you could give them more money. I just kept taking classes. I was retired at the time, after having sold a consulting company, so I did have the time to do it.

I ended up diving more, taking more courses, and eventually also technical diving courses. Back then, it was pretty much on rebreathers that really weren't rebreathers. The military could use them, but it wasn't a recreational thing. But I kept on taking courses.

Meeting my wife

Next, I was going out on a live-aboard in the Vancouver area in cold water and drysuits. On one day, this lovely woman stepped onboard with her low-pressure 85 twins on her back. That was Lynn, and we did not hit it off well. At the time—you know, I'm not going to go into any details—she wasn't instantly attracted to me, and when I found out that her boyfriend climbed on afterwards, I was sort of less interested as well.

But as time went on, we dived together; we would see each other on dive boats, and she was a technical diver as well. Then at some point, years later, she had broken up with her boyfriend and we met at a dive show and decided to go out on a date—and the rest is history.

We ended up getting married and living together. At that time, I was still retired, but the money was running low. I didn't have enough to stay retired for the rest of my life, so I had to do something.

Unhappy with existing devices

I don't want to offend anyone, but I was quite unhappy with what was available on the market. Having been in the computer business my whole life, I had spent a lot of time thinking about user interfaces and intelligent interactions between devices and people. So, I thought that what was on the market was quite lame and had very odd interfaces. The

one computer I was thinking about had symbols for what you wanted to do and, in theory, that's a good idea. But I don't know how you make the mental leap associating a picture of a wrench with changing gases. I can do better than this, I thought. So, I decided to make my first computer.

I was diving rebreathers, so my first computer had to work with rebreathers. Because my contact with the industry was through the Rebreather List and Rebreather World, which was the big forum back at that time, we were part of a very international community, with like seven rebreather divers in each country,

“Oh, I want to keep doing this.”



profile

Why do you use it? Should it be bi-directional or uni-directional, etc? Using that information, I built a breadboard, and this is only the digital side. One of the take-aways of all this is that we would probably not have existed if it were not for the internet.

I didn't know anything about how to do the analogue side, so when I was ready to do the board, I called up one of the engineers on the PICList. We had a meeting at a restaurant, and he said he'd be happy to do it.

I brought mine in and he refrained from laughing. It was all these wires going from one pin to another on a breadboard. It was quite a mess. We talked about it, how bad it was, later. But it worked. So, he did the board layout for me, had it sent out to a board manufacturer and got it back. He was a consultant back then, but that guy still works for me.

I now had my circuit board. Next, I needed a case. At that time, KISS was in Vancouver, and they had their handsets, boxes and containers made by a machine shop in town. They were happy to make cases for our first computer—the GF, which was a monochrome computer but fully trimix-capable—and we made that [model] for a while.



Shearwater's NERD remote display



Shearwater's Perdix dive computer

The next one was the Pursuit, which was quite a clean-up [on the previous model]. It still had a monochrome display, but instead of just being a block, the case actually had some shape to it and looked a little bit better. It was also quite a bit smaller, because a lot of effort went into miniaturizing after the GF, which was a bit of a brick.

At that point, it was starting to become a business. So, we rented a bit of space in an office building and hired one full-time guy. I also had a part-time accountant. For many years, we had a list of every one of our customers and the serial number of their units, because

we were still selling only direct.

Because of this whole enabling of the internet, I was sitting in an office in Vancouver, and I was communicating with people all over the world through the Rebreather List and Rebreather World. There were a lot of esoteric and interesting people on the Rebreather List. Fascinating stuff, but all that is all gone now, I think.

It eventually became too much for me to do the sales, be on the phone, do the shipping all around, and build

Shearwater's Teric dive watches



all the computers—or assemble them [rather], because a board house would build a circuit board and the machine shop would build the case.

I went to a contract manufacturer, so I could just send them the parts. Then they would make five or ten of these things and pick them up.

Then I would bring them back to my office, package them in a UPS bag, and the courier would come to the office and pick them up. That was the company, which was basically me, full time, and a couple of part-time to full-time employees.

Growth

Lynn and I then decided to share a bigger office, and at that point, I hired a

full-time engineer. This was also when we first built the Windows interface so that you could update firmware from a Windows program.

We kept growing, so we decided to move to an industrial building. Then we took over the bay next door and doubled our space again and continued on. But still, we only had probably less than 10 employees at that point. We then

One of take-aways of all this is that we would probably not have existed if it were not for the internet.

hired Tyler, an engineer, and he was so good. He really upped the game for our company, and now our products were much more professional and sophisticated. We continued to just grow, and the products got more sophisticated and more interesting.

X-RAY MAG: Prior to all of this, did you know anything about running businesses? Or did you just learn on the fly? And did you have any bumps along the way, in that learning curve, that you can reflect upon in hindsight?

BP: I was pretty much already in business. I took a year of commerce and did my first year [at college], where I specialized in computing science. I did really well, and in the end, I was making so much money, there's no way I could go back to school. I then went to a consulting company, which was doing timesharing, and they had about 70 customers around the city.

Access to mini-computer

I worked there for several years, and of course, learned a lot. It had a radio school, and a mini-computer. It was fascinating in the sense that I had access to



Shearwater's Peregrine dive computer

the computers that you would just never get nowadays. As a junior programmer, I could walk into the computer room, turn things on, unplug things and plug things in. No programmer would get that kind of access nowadays. But I was in there and I learned a lot.

I then ended up getting into Gandalf data communications. That company's long gone, but it was a rock star back in the day, making communication systems for companies. I was the branch manager. When it started, it was just me, so I was the branch. But I ended up with bigger industrial clients and schools. That was sort of my beginning in business.

X-RAY MAG: Maybe I can try to turn the question a little bit on its head. Because I think there



Shearwater's Petrel 2 dive computer

profile

Lynn and Bruce Partridge and staff chat with visitors in their booth at TekDiveUSA 2018.

are many companies, in particular start-ups, where the founder is the innovator, the visionary, who in many cases, has little or no prior knowledge about being a managing director. Do you have a piece of advice for upcoming start-ups in the diving industry? How do you manage growth and make that transition, or combine being an inventor, or visionary, and a managing director?

BP: Well, I'm sorry, I can't be very helpful. I was born to a father who worked for a multinational company where he was a national manager. So, I have had business-level conversations my whole life. It was what we talked about in the house. But that's just one side of it.

The other side of it is—and this is key to our success—if you don't know what you're doing, hire somebody or rent somebody who does. And that has been our policy from the beginning. We



didn't try to do stuff that we didn't know how to do. If I don't know how to do something properly—if, say, it is board layouts—I can hire an engineer and get somebody who does know how to do it. We [followed that strategy] to the extent that we now have a completely professional management team. I don't have to do anything anymore. This company is completely self-sufficient [in regard to its] management. It's taken a few years

This is key to our success—if you don't know what you're doing, hire somebody or rent somebody who does.



Employees at Shearwater Research often go out diving together, testing Shearwater's products.

to get there [though].

But yes, I had a lot of exposure to business, and I got good advice, which helped me get going.

X-RAY MAG: *Is that also why you hired a CEO? Was it a matter of finding better competence in that area, or did you want to enjoy a little bit more free time?*

BP: It's actually both. That said, I was pretty good at being a manager. A lot of being a manager is just being a good person, listening to your employees and treating them with respect. Management comes fairly easily if you just start with these kinds of principles.

But yes, absolutely, the reason we hired a CEO was because I had outreached my ability to run this company. Up to a certain point, when you can talk to everybody and you can get

pulled in a room and just have a conversation, that's one thing. But when we got to [the point where we had] people working in different cities and chains of command in engineering, sales and production, that was way beyond my skill set.

At first, I brought in managers below me, again, for engineering, choosing engineering and sales [personnel], and Lynn was the sales manager. Then I got to a point where even that was getting too sophisticated, so I hired a guy who was used to running a multinational [company], and he is still our CEO.

At some point, the company did outgrow me. Could I have learned how to do it? Maybe. Did I want to? No.

X-RAY MAG: *Where does your inspiration come from? Do you have any role models? How do ideas come to you for new products or functions? You mentioned in the beginning that you questioned why somebody would use a wrench as an icon for a function on a computer and that this spurred you to create your first computer. So, are your ideas a reaction or response to something you don't feel is working well. Or do you have sort of*

"eureka" moment or vision where an idea comes to you? Is innovation an incremental and evolutionary process or does it spring from moments of inspiration?

BP: I think it is a mix. If you look back at our product history, starting with the GF [model]—this brick with a monochrome screen that weighed about six pounds—and on to where we are now, it is clearly a stepwise refinement, which really took off when I had professional engineers working for me. And that goes back to one of my principles about reaching out and hiring that next guy you need—maybe before you can quite afford him—to take you to the next level. In that manner, we have always tried to stay ahead. But, yeah, it's very definitely a stepwise refinement.

But another really important factor is that we're all diving these things, including the engineers. So, it's not like they're in some closed office, not having anything to do with diving. Everybody who comes to Shearwater gets a free dive certification. We rent equipment for them, and we pay for their courses. A huge proportion—even of our people in



Bruce Partridge (center, holding trident) with team of employees at Shearwater Research



Bruce Partridge with wife Lynn and Shearwater staff at the OZTek show in Australia (left), and giving a presentation at TEK DiveUSA (far left) and the Rebreather Meeting on Ponza Island in Italy (right)



BP: Yeah, that's an interesting question—And kind of hard to answer. In terms of our products, of dive computers, we're pretty much technology-driven. It is the same, whether you're looking at a computer

production and in accounting—they all learn to dive.

X-RAY MAG: You mentioned hiring the right people, finding the right people and having a good rapport with your associate collaborators or employees. How big of a role does the team and the team dynamics play in innovation?

BP: I think it plays a huge amount. We have a great company; everybody says that. If you go into our company, and you walk down the halls, people are laughing, and they're having fun, and they're friends. They socialize together sometimes; we have regular events.

There's no concept of the new hire production manager not being able to go and talk to a manager whenever he feels like it. We just try to be a really strong team. One of our four prime thoughts that keeps the company going is you have to treat everyone with respect. If you don't treat people with respect, you can't work for us. So, there's absolutely no problem with peo-

ple's production, or people going to talk to anybody or any of the managers in the company.

The other side of it is treating customers with respect. And it's surprising how much spirit you can get when people feel good about doing their jobs—that they're making people happy, that you get customers emailing you back and saying, "Wow, thanks. Nobody's ever done that for us before." And it really builds the spirit of the company.

X-RAY MAG: So, you teach newcomers that they are valuable from the get-go, and they shouldn't be afraid of speaking up, even against people who have seniority?

BP: Yep, exactly.

X-RAY MAG: Is that an active step that you take? Do you explain to them or teach them company culture? Or is it just implied by the way you converse on the job and arrange your workflows?

BP: It's somewhat organic, because we started off thinking [this way] but didn't formalize it until we moved to our third [and] last building, at which point, we were probably only 20 or 30 employees. I was getting beyond my skills in manufacturing, so I brought in a general manager who was very, very good at manufacturing and did wonders for organizing production. She also wanted to codify things and made us think about our values, and the need for putting them into words. You know, it can't be just ad hoc, what our values are. She was the one who coached us into getting our values, and what we believe, written down. We put them up on the wall in all the common areas and live by them.

Treating people with respect means that managers have to be aware of how people are reacting to their behaviour. And when we say treat everyone with respect, that includes customers. So, even if somebody's being a little bit difficult, we try really hard to treat them with respect.

X-RAY MAG: Where do you see the current frontier in the development of dive computers today? And where do you believe it will be in 5-10 years? What do you think will become possible? And in which areas do you think the next developments will take place? Or what do you think needs to be invented next?

keyboard or a screen or, for that matter, even a light on our furnace, we move with technology.

Key technologies

The two key technologies in regard to any handheld device, whether you're talking about a telephone or a dive computer, are displays and batteries. And the driver of development in these two areas is the phone business. As these technologies continue to improve, they drive a lot of the things that we can do.

In the early days, there weren't any good end-user displays. So, we were almost always stuck with industrial displays such as displays of CNC milling machines, because that's just all there was. There wasn't much of a concept of handheld displays until phones took off more. My first mobile phone weighed about 30 pounds and had a handle on it. You lifted the receiver off the battery, which was the size of a Kleenex box. So, in the beginning, we used industrial technology,



Bruce Partridge with wife Lynn and staff at a dive show

PEEK SYMES



and machine-tool type stuff was driving the processors and displays. Now, it is the phone business that's driving the processors that go into so many types of devices, and every year, microprocessors get more powerful and use less power.

X-RAY MAG: Dive computers are essentially just calculators that simulate gas loading in tissues. Do you think that we will, someday in the foreseeable and not-very-distant future, get technology that will directly measure gas loading in our tissues, say, through the skin, through some advanced technology that could be built into a future dive computer, or some other dive instrument?

BP: Not in the sense of decompression, I don't. The problem is [that] by the time you detect anything in decompression, a bubble in the blood, you're already too far—you're already caught by it, right? Although there may be some bubbling that happens to be safe bubbling—and I think there will be, as there is always a little bit of bubbling going on—I'm not aware of anything, even in the future, that will change that.

I wouldn't be one bit surprised if 10 years from now, open circuit is very unusual and entry-level rebreathers the norm.

The thing that I believe will change is other body sensing. In the space program, there has been interesting work going on for decades. They're monitoring people in the space program in many ways; they can tell when [the astronauts are] asleep, when they're awake, what their heart rate is—all that sort of stuff. And I think as time goes by, we'll see more of that with dive computers. Or perhaps not dive computers as such, as it might be something more akin to what is on rebreathers.

On that note, I wouldn't be one bit surprised if 10 years from now, open circuit is very unusual and entry-level rebreathers has become the norm. There are just so many advantages to them. I'm a big believer in recreational rebreathers, even though our company does not have any particular footprint in this field.

When I first started to dive, I wasn't particularly fit, and I was diving with a wetsuit and lots of weight in cold water. I would get 15 minutes off the tank. That was discouraging, and I'm not sure why I kept at it. I was around 40, and seeing how an 18-year-old could just pick it up in a snap, have a low breathing rate, and be able to last half an hour longer than me, was quite discouraging.

Now, when I look at it, and you ask how we can continue to grow the dive industry, I think of semi-closed rebreathers.

Closed circuit is too complicated. It is too easy to kill yourself with it, frankly. My vision is a semi-closed rebreather that is much more

forgiving in terms of making sure you have a gas that is breathable. Only, now you have a scenario where that new diver can last as long as he wants.

So, you're on your open water class. And yes, you have to deal with this big drysuit and the weight and have to climb in and out of the boat. And you know, by the time I get into the water, I'm already panting. But it doesn't matter, because you're not going to run out of air, right? And we're going to do a 40-minute dive, and everybody's going to do a 40-minute dive, and everybody's going to be able to do a 40-minute dive. I personally think that's the future.

X-RAY MAG: You're very particular about quietly supporting dive research. Where does this philanthropic ethos come from? What research have you supported? And how do you pick whom to support?

BP: We got into research by attending meetings. The first we attended was a meeting of the Undersea and Hyperbaric Medical Society (UHMS) in the [United States]. Dr Simon Mitchell was there talking about deep stops, and we thought since we're making dive computers, we should attend. There we were, among some 80 to 100 attendees, all medical professionals in the field of hyperbaric medicine, except for us and a representative from a manufacturer in Europe.

Lack of consensus
We were floored by the lack of consensus. I guess one of the surprising things was that even

My vision is a semi-closed rebreather that is much more forgiving in terms of making sure you have a gas that is breathable.

amongst the medical community, there's a lot of differing ideas. So, after Simon did his presentation, there were 20 people in line to ask questions and people calling in from the audience. It was very dynamic and and fascinating; we learned so much. So, we thought, "Oh, okay, this is kind of interesting." And as computer manufacturers, we have a duty to stay on top of where hyperbaric medicine is, and that got us started with it.

Then we started moving into other undersea medicine groups and got very involved. We just got into the science of it. Obviously, a lot of these folks are avid divers as well, so we have sort of become part of the diving science community too. What keeps us interested is that we're listening and talking to people on a regular basis, multiple times a year, who are presenting interesting, often conflicting ideas, on the whole idea of how decompression works, whether micro bubbles matter and all that sort of stuff.

One of the big things for us is watching the lack of agreement and the arguments on either side. That was how we

really got into the science side of it and continue to participate.

Until recently, we went to two or three of these events a year. At the meeting in South Africa in which all the hyperbaric medicine organizations of the world participated, it was fascinating to listen to all the different opinions and different positions and bring this information back with us.

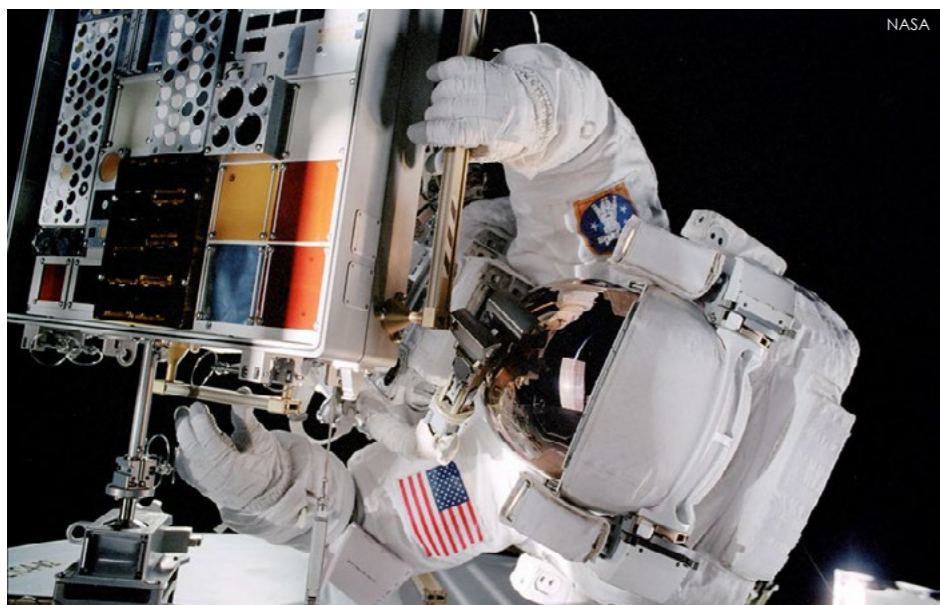
If there's anything that we think we're maybe not doing exactly the right [way] on our dive computer, we'll come back and say, "Okay, you know, the consensus is that this is really not the best way to do things."

X-RAY MAG: Why the bird names? Is it because you are a Partridge?

BP: Yes. Shearwaters are our pursuit predators, and the bird, and I dive. We continued to name all of our products after a bird—preferably, a species that has some relationship to diving.

X-RAY MAG: What did it mean for you to win the EuroTek award?

BP: It was great. It was also stressful to go



Astronauts have all kinds of physiological parameters monitored.



"We got into research by attending meetings." Presentation during Rebreather Forum 3 in Orlando, Florida, in 2012

PETER SYMES





The great shearwater (*Ardenna gravis*)

up on the stage and be expected to say something when you are not used to public speaking. But obviously, it's a great validation that we're on the right path. And it's wonderful to hear that other people think we're doing a good job and think we're contributing to the community.

X-RAY MAG: *What do you personally get out of your dives?*

BP: I do enjoy the life I encounter. I've done some wreck diving too, but at this point, I'm much more interested in life. I like looking at fish, particularly the sharks, and having seals playing hide-and-seek and intentionally interacting.

Dive community

The other aspect is that I love the community. There are so many interesting people on dive boats. The confluence of diving, diving science, animals and people is what makes the most fun come out of it. It's created a whole community

aesthetics of your computers? Is that left to designers?

BP: We have been lucky enough to have some really strong people, many of which have been with us for many years. Our engineering manager drives the design, and he is also so much better at it than I am, and he will show us stuff. We also have mechanical engineers who make physical presentations of the new products. My involvement in design is now restricted to product development meetings where the team will present a product and what they want to do with it. Usually, I love it, and sometimes, I also wonder why I didn't think of the good idea myself.

But there are times—because I still know the diving business better than many of the engineers—when I'll say I don't think that'll fly, or I think that feature is dangerous, and for these reasons, I don't think we can put it in. But mostly, it's just driven by the engineering department.

for us, and much of our travel and our recreation revolves around the people we dive with. It is an international camaraderie. You go to the dive shows around the world, meeting people, and all of a sudden, you have friends in Denmark, Canada, the US and in Australia. It is fascinating.

X-RAY MAG: *How do you come up with the design and*

X-RAY MAG: I can't help making a connection between this and what you mentioned in the beginning, about the wrench being a not-so-obvious symbol for something. Is usability or design aesthetics also part of your company values or profile?

BP: Absolutely, although it is not in our actual written values, and the ease of use of our products is also hugely important. The meetings where we have the most discussions, and where we really work on getting things right, is about the user interface, where we debate how various kinds of divers will react to some feature and how it would work for a guy that dives a rebreather and so on. That's a huge part of the way we do things.

What also plays a big part is the fact that almost everyone in the engineering team is a diver. They may come back after a dive and say, "Well, that's stupid—that doesn't work. You know, I had to push the button three times, and then remember whether it was one or two. We can't do that. It has to be simpler." That is really where the designs are driven from, primarily from the engineering team, who are all divers.

X-RAY MAG: *What software do you use? Is it of some models that you have developed yourself? How do you verify and validate your decompression model? Is it according to any kind of empirical data? Or do you use a standard theoretical model in your computers?*

BP: Honestly, I don't know. I am several levels away from that nowadays.

I don't know if you are aware, [but] we were very involved in the International System Safety Society. I have an award here on my wall [from them that says]:

"International System Safety Society, Scientific Research, Research and Development Award 2013, presented

to Shearwater Research, in recognition of outstanding development of system safety engineering methods."

We take it seriously. It is not about what we feel like doing, but about what science says and what engineering says. What are the best practices in a nuclear reactor or a car, for example?

Let fails be obvious

That's always been one of our priorities. I am really confident that we build safe systems, which fail in obvious ways if they fail, or don't fail. We tried really hard not to make systems that fail in subtle ways. If they fail, let it be obvious. And we do get some flack over this. Not a lot, but once in a while, people will ask about why we won't do some feature. Sometimes, we will respond that it is because it's just too prone to allowing somebody to do it wrong, and the consequences could be quite serious.

It does not happen a lot, but I can think of a couple of times when we got a request for a feature, and we looked at it and analyzed it. We use formal safety system analysis and there have been

Bruce Partridge

instances when you think, "Geez, if he then pushes this button wrong, he's going to die." So, we don't want to go there.

It is typically not about whether a diver is going to die but about being way off in regard to decompression and that sort of thing. So, sometimes the way you switch gases, and so on, could be made more streamlined, but we want to make really sure that the people understand what they're doing and that they're doing the right thing.

X-RAY MAG: *Any concluding comments?*

BP: I take a lot of pride in the fact that the company runs on its own now; it doesn't need me. You know, I don't go to the office anymore. I get emails from time to time, and I get invited to meetings from time [to time], particularly for doing a new product or something, and [how it] will sell. I just take a lot of pride in the fact that I've created a self-sustaining, self-sufficient, proud, happy company.

And that is quite an achievement and an accomplishment most people will never make. ■



IAN WHITE

This bird has the typically "shearing" flight, dipping from side to side on stiff wings with few wingbeats, the wingtips almost touching the water.



POINT & CLICK
ON BOLD LINKS



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Edited by
Rosemary E. Lunn
& Peter Symes

Equipment



Cold-water reg

There are times we yearn to explore the likes of the cold, crystal depths of Silfra, Iceland. This naturally means we have to dive certain equipment, such as a cold-water regulator. Cressi's second stage Compact Pro regulator body has recently been revamped, and it is now made using a thermo-conductive technopolymer. In plain English, this quite clever plastic helps combat cold-water problems such as regulator free-flows. The resulting DIN / Yoke (2 HP, 4 LP ports) reg set weighs in at 800g (28oz), without hoses. According to Cressi, the MC9-SC Compact Pro regulator gives a crisp, light breathe. **Cressi.com**

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Rebreather gag strap

In May 2012, Rebreather Forum 3 delegates supported the suggestion that the use of a mouth-piece retaining strap (MRPS), or gag strap, deserved further research. AP Diving has evolved its current mouth-piece retaining strap so that the lip guard is now moulded with the mouthpiece. This ensures security—it will not come apart, there are no dirt traps, and it is easier to clean. The one-piece lip guard provides an effective seal when diving in cold water, and allows divers to relax their jaws. **APDiving.com**

APDiving.com



Tech Tool Bag

No matter how well you look after your gear, you will invariably need to tweak or replace something in the field. Dive Rite has developed a Tech Tool Bag for just such an occasion. It should hold all the essentials you might need. The 1,000 denier compact Cordura roll has 11 stretchy pockets, and a separate zipped compartment for smaller items. Once you have slid your screwdriver, pliers, spanner, cable ties, Allen keys, etc, into the pockets, simply fold down the protective full-length flap and roll up the bag. The Dive Rite Tech Tool Bag is secured by a webbing strap and a plastic buckle—a neat solution, which weighs just 155g (5.6oz) when empty. **Diverite.com**



Roller bag

Apeks' latest offering is the spacious 90L Roller Bag (think 90 litres of volume, around 3ft³). This 500D PVC tarpaulin shell bag weighs in at 4.2kg (~9lb), and benefits from three inner mesh zip pockets—think small item storage—and heavy-duty roller wheels. There are various grab handles, and the telescopic handle can be zipped away when not in use. Entry is gained via a large zip flap, which can be additionally secured with two exterior compression straps. **Apeks.com**



Citizen Aqualand

To celebrate the iconic Aqualand series of dive watches, Citizen presents the Promaster Aqualand Chrono 200M Dive special edition set, of which just 1,000 are being made. The timepiece features an aluminium one-way rotating bezel in blue two-tone with sapphire crystal. It comes in a collector's box, which includes the Lifeline JAWZ titanium rescue tool, designed for both underwater and surface emergencies. **Citizenwatch.com**

Citizenwatch.com

Waterproof W7

The W7 is manufactured with the highest grade materials and technologies available in an effort to maximise durability, a four-way stretch and a comfortable fit. The suit comes with two anchor straps with anti-slip for your computer and a tough Duratex seat for abrasion protection. There are anti-slip surfaces over the shoulders and waist, as well as two streamlined, easy-to-use, flexible pockets with enough space to hold a spare mask, SMB with spool, decompression tables and so on. All zippers come equipped with zipper pullers to ease opening and closing with or without gloves. Tired of the neck or back chill when jumping into the water? As an option, you can get a detachable neck seal that eliminates the water flow—a very welcome feature when you dive without a hood! **Waterproof.eu**



Waterproof.eu



Text by Simon Pridmore
Photos by Andrey Bizyukin

In part one of this series, which appeared in issue #103, I suggested a few commandments to consider in order to ensure, as far as possible, that your technical dives are safe and successful. These were: First commandment: Prepare paperwork; Second commandment: Nominate a supervisor; Third commandment: Deploy safety divers. In this sequel, I deliver a few more tablets of stone.

**Fourth commandment:
Use an ascent platform and
a decompression station**

Every dive plan should include a fixed ascent route—whether this is a shot line, an anchor line or a reef wall. An ascent using individual DSMBs (delayed surface marker buoys), or even just one DSMB deployed by a nominated team member, should never be the primary ascent plan. That should always just be an emergency measure, used in the event that



Ten Commandments *for Technical Diving Ops – Part II*

the designated ascent route cannot be followed for some reason.

A drifting DSMB ascent can make life hard for the surface supervisor and safety divers. Especially in areas with high current flow, it is almost impossible for the ascending divers to stay together and they can end up scattered all over the ocean.

Ideally, an ascent plan includes both a fixed ascent route AND a decompression station deployed close by.

A typical decompression station looks like a multilayered trapeze suspended from large buoys on the surface, with weighted hang bars at shallow decompression stop depths connected by fixed

lengths of line.

At the beginning of the dive, divers descend along the shot line. While they are at depth, safety divers set up the decompression station and connect it to the shot line with a traverse line. When the divers ascend, they do their relatively short deeper decompression stops next to the

shot line, then cross to the decompression station for their longer stops. If there is a current running, once all the divers have arrived, the safety divers can detach the station from the shot line and allow it to drift free. The current carries the station along with the dive team aboard—with the safety divers hovering nearby in





attendance and the dive boat following.

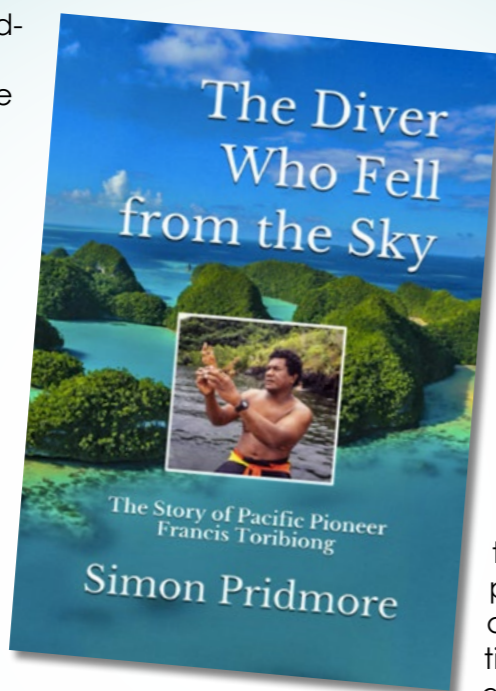
A decompression station also provides a place to stage emergency equipment and spare decompression gas and, best of all, it keeps the whole dive team together.

Fifth commandment: Use helium and plenty of it

Deep dives go better with helium. Air is dense, so at depth it is difficult to breathe efficiently, and this can easily lead to carbon dioxide (CO₂) build-up and hypercapnia. Air is also narcotic at

A New Book from Simon Pridmore

When his country needed him most, Palauan Francis Toribiong came along and helped the Pacific island nation find its place in the world and become an independent, forward-looking 20th century state. And he achieved this, improbably, via the sport of scuba diving. This is the inspiring tale of an absolutely unique life, written by Simon Pridmore and illustrated with images of the beautiful islands of Palau, above and below the water.



him this title, people were speaking both literally and figuratively.

Toribiong was so completely different from all of his contemporaries in terms of his demeanor, his ambitions and his vision, that it was as if he had come from outer space. Palau had never seen anybody quite like him and there was no historical precedent for what he did. He had no operations manual to consult and no examples to follow. He wrote his own life.

Toribiong was born poor, had no academic leanings and no talent for diplomacy. Yet he was driven to succeed by a combination of duty, faith, a deep-seated determination to do the right thing and an absolute refusal ever to compromise his values. And, as well as all that, he was Palau's first ever parachutist—known by islanders as “the Palauan who fell from the sky.” In giving

Toribiong was the first Palauan ever to seek and seize the international narrative. No Palauan, in any context or field, had previously thought to go out into the world and say: “This is Palau—what we have is wonderful. Come and see!” This is his astonishing story.

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depth and, below 60m (200ft), the oxygen content of air is high enough for it to become toxic and place a diver at risk of a convulsion. To make matters worse, CO₂ build-up increases the likelihood of an oxygen toxicity convulsion.

The advantages of using air as the bottom gas for a deep dive are that it is available everywhere, it is easier and quicker to fill your cylinders with it, and it does not cost much. Especially if you are diving on open-circuit, using air rather than helium-based mixtures makes your diving a lot cheaper. Wherever you dive, helium is expensive.

However, the advantages of using helium outweigh the disadvantages enormously. Helium has been by far the most significant factor in making deep diving safer in the technical diving era. It is very light, non-toxic and only minimally narcotic. By including it in your breathing

mixture to make trimix (helium, oxygen and nitrogen) or heliox (helium and oxygen), you considerably reduce the risks posed by narcosis, gas density and oxygen toxicity.

If you cannot afford to run a dive as safely as possible, using the optimum gas for each stage of the process, either change the plan or do not do the dive at all. Be aware that switching to air at highly narcotic depths can incapacitate any diver. Never use air as a travel gas. Stay on a helium-based mix until you get to a depth where you can safely switch to nitrox.

Sixth commandment: Do not take passengers

On any technical dive operation, there should be nobody in the dive team who is not fully trained to the level of the dive. It is always better to dive as a team, but

if any member of that team is not capable of making the dive alone, AND able to go to the assistance of another team member in difficulty, then they should not be in the water. The strength of a dive team derives from it consisting only of independent, self-reliant divers functioning together.

Seventh commandment: Adopt a cave-diving mindset

Every diver on a technical dive must think like a cave diver. On a deep dive, you may be able to see the sun as you are on the way up, but you are often two or three hours of decompression away from feeling the sun directly on your skin. Once you have a decompression burden, you are in a “virtual” overhead environment. From a survival point of view, you might as well be in the darkness of a flooded cave, with solid rock above your head





opinion



and far away from the nearest exit. Among other things, thinking like a cave diver involves:

- Knowing and not exceeding your limitations
- Maintaining heightened levels of self-discipline and team discipline
- Remaining alert for events or situations that may increase the risk of the dive
- Being ready to abort the dive when any member of the team perceives a threat to the successful completion of the dive.

Eighth commandment: Never drop your guard

Never relax until you and your team are safely back on the boat or beach. Even if you think you have covered every eventuality, followed all the commandments and have all your pro-

cedures in place, this does not mean you can then take it easy at any point of the dive.

Anticipate that something unforeseen may happen and be ready to think on your feet. I have twice ascended from technical dives to find both the boat and the decompression station gone. Another time, I came up to find that the boat was still there, but all the safety divers were gone. And, on many occasions, dives that began in blue skies and flat, calm waters have ended three hours later in raging seas and driving rain.

Never make the mistake of seeing the primary goal of any dive as reaching a target depth, finding the end of a cave, or being the first person to lay eyes on a deep shipwreck.

The primary goal of EVERY dive is to return safe and well to the boat you

jumped off or the beach you walked out from. That's it.

Only when you have accomplished that, can you relax, drop your guard and celebrate your achievement.

Ninth commandment: Dive as a team

When they first start technical diver training, students find confined water stress-testing drills impossible to manage, until they figure out that they have to deal with them as a team if they are going to confound the instructor's best efforts to make them panic. Then the drills become quite straightforward.

This is a deliberate ploy, of course. By the end of the training, the students should be operating as a team independent of the instructor, whose role changes through the course from leader to observer. In technical diving,

the team is always stronger than the sum of its parts. The team's strength derives from its combined force, skills and gas supply.

Tenth commandment: Keep up to date

Generally speaking, the way we currently run and decompress from technical scuba dives works pretty well. But human knowledge of decompression science is still incomplete and imperfect. If you define perfection as diving protocols that are 100 percent safe, there is still much room for improvement.

The final commandment therefore is: Stay current. Stay informed and connected with the community, read the research papers that appear from time to time, attend technical diving conferences, monitor what others are doing and make sure your procedures still match the current science. If there seems to be debate and confusion, steer a conservative middle course until a scientific consensus is reached.

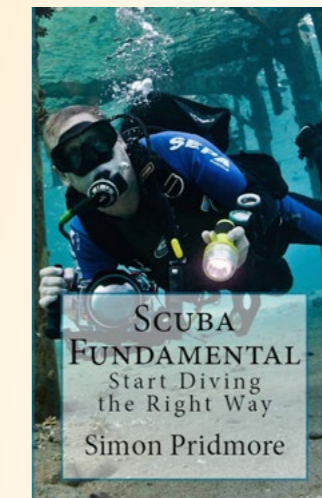
Finally, beware of outliers and prophets of a new way—especially if they are selling something. ■

Go to part one of this article in issue #103 here >>>

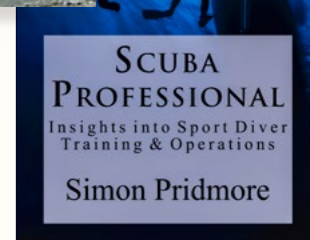
Simon Pridmore is the author of the international bestsellers *Scuba Confidential: An Insider's Guide to Becoming a Better Diver*, *Scuba Professional: Insights into Sport Diver Training & Operations* and *Scuba Fundamental: Start Diving the Right Way*. He is also the co-author of the *Diving & Snorkeling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

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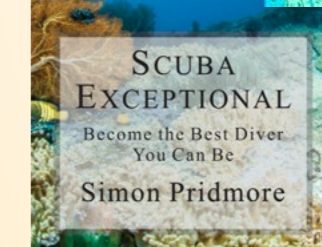
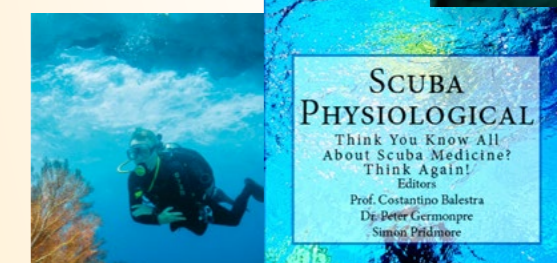
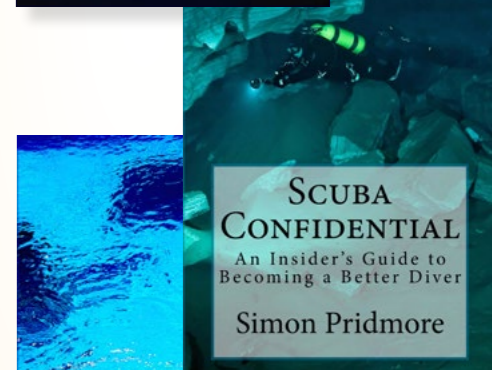
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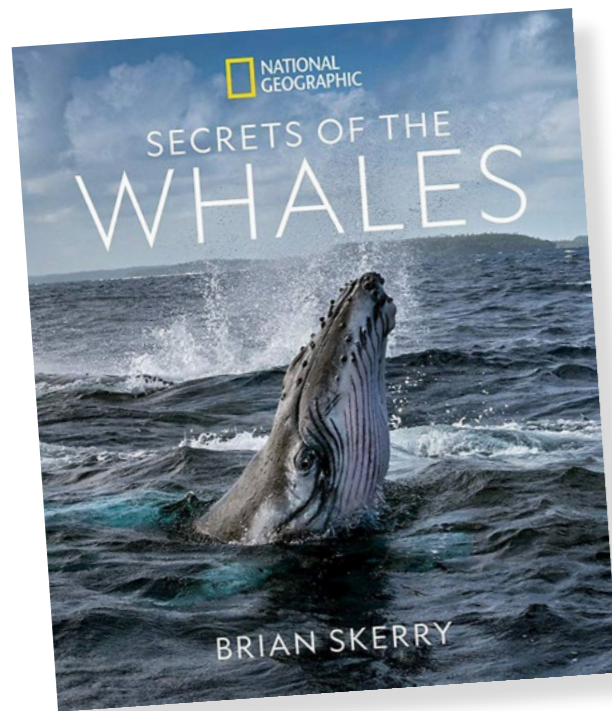


Learn more! Visit the author's website at:

SimonPridmore.com



Edited by Catherine GS Lim



Whales

Secrets of the Whales, by Brian Skerry

This book takes the reader into the lives of the world's largest mammals. It tells of how whales learn and adapt to opportunities,

from their specialised feeding strategies to parenting techniques. It also presents evidence of the deeper, cultural elements of whale identity, from their unique dialects and matrilineal societies to organised social customs like singing contests. Additionally, the book also demonstrates how whales can teach us about ourselves and our planet.

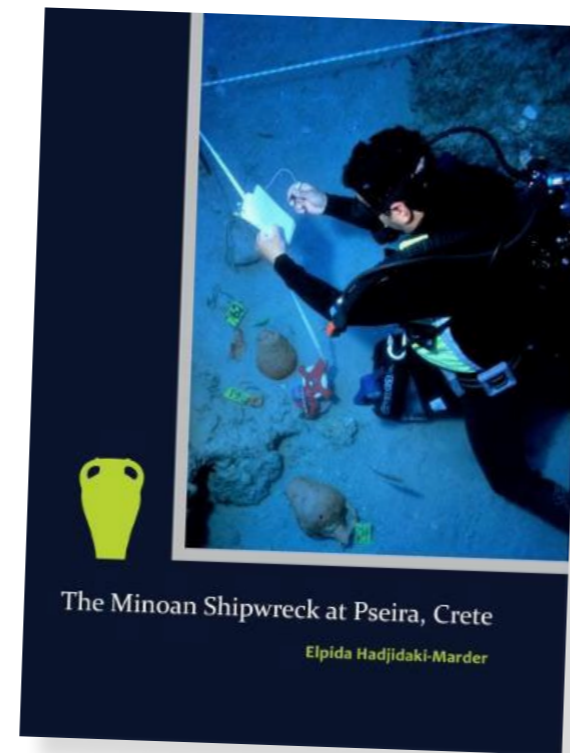
Publisher: National Geographic
Date: 6 April 2021
Hardcover: 192 pages
ISBN-10: 1426221878
ISBN-13: 978-1426221873

Deep Sea

The Brilliant Abyss: True Tales of Exploring the Deep Sea, Discovering Hidden Life and Selling the Seabed, by Helen Scales

This book explores our evolving relationship with the deep sea: how we imagine, explore and exploit it. Throughout this chronological journey—which covers the past, present and future—the tension between deep-sea explorers who seek knowledge and those who seek profit constitutes a recurring theme. It concludes by looking at humanity's advancing impact on the deep (including mining and pollution), and what we can do about it.

Publisher: Bloomsbury Sigma
Date: 18 March 2021
Hardcover: 352 pages
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ISBN-13: 978-1472966865

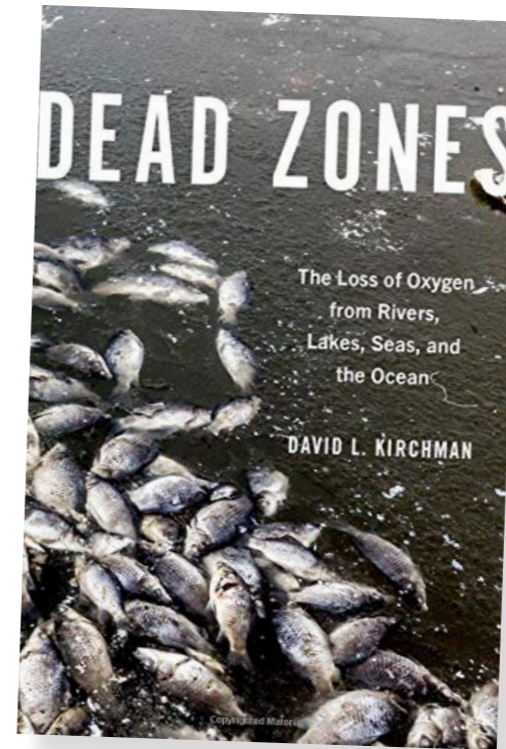


Underwater Archaeology

The Minoan Shipwreck at Pseira, Crete, by Elpida Hadjidaki-Marder, PhD

Between 2004 and 2009, a Minoan ship that sank near Pseira, Crete was excavated. The recovered artifacts included 46 amphorae, 41 spouted jugs and 11 hole-mouthed jars, and is the largest known corpus of complete and almost complete clay vessels from a single Middle Minoan IIB deposit in several categories. This book describes the activity of each season, alongside extensive discussion of the pottery, a petrographic analysis and catalogues of weights and stone tools; in essence, it tells the vessel's story and gives an insight into a seafaring society.

Publisher: INSTAP Academic Press
Date: 30 April 2021
Hardcover: 150 pages
ISBN-10: 1931534292
ISBN-13: 978-1931534291



Oxygen Loss

Dead Zones: The Loss of Oxygen from Rivers, Lakes, Seas, and the Ocean, by David L. Kirchman

Dead zones are uninhabitable oxygen-poor zones within our waters. This book explains the impact of dead zones (which have increased worldwide due to human activity) and relates the history of oxygen loss in water. The relationship between the agricultural industry and algal blooms is also covered. In addition, the author outlines what the dead zones mean for humanity, and presents ways we can reduce their deadly impact on human and aquatic life.

Publisher: OUP USA
Date: 8 April 2021
Hardcover: 224 pages
ISBN-10: 0197520375
ISBN-13: 978-0197520376

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marine mammals

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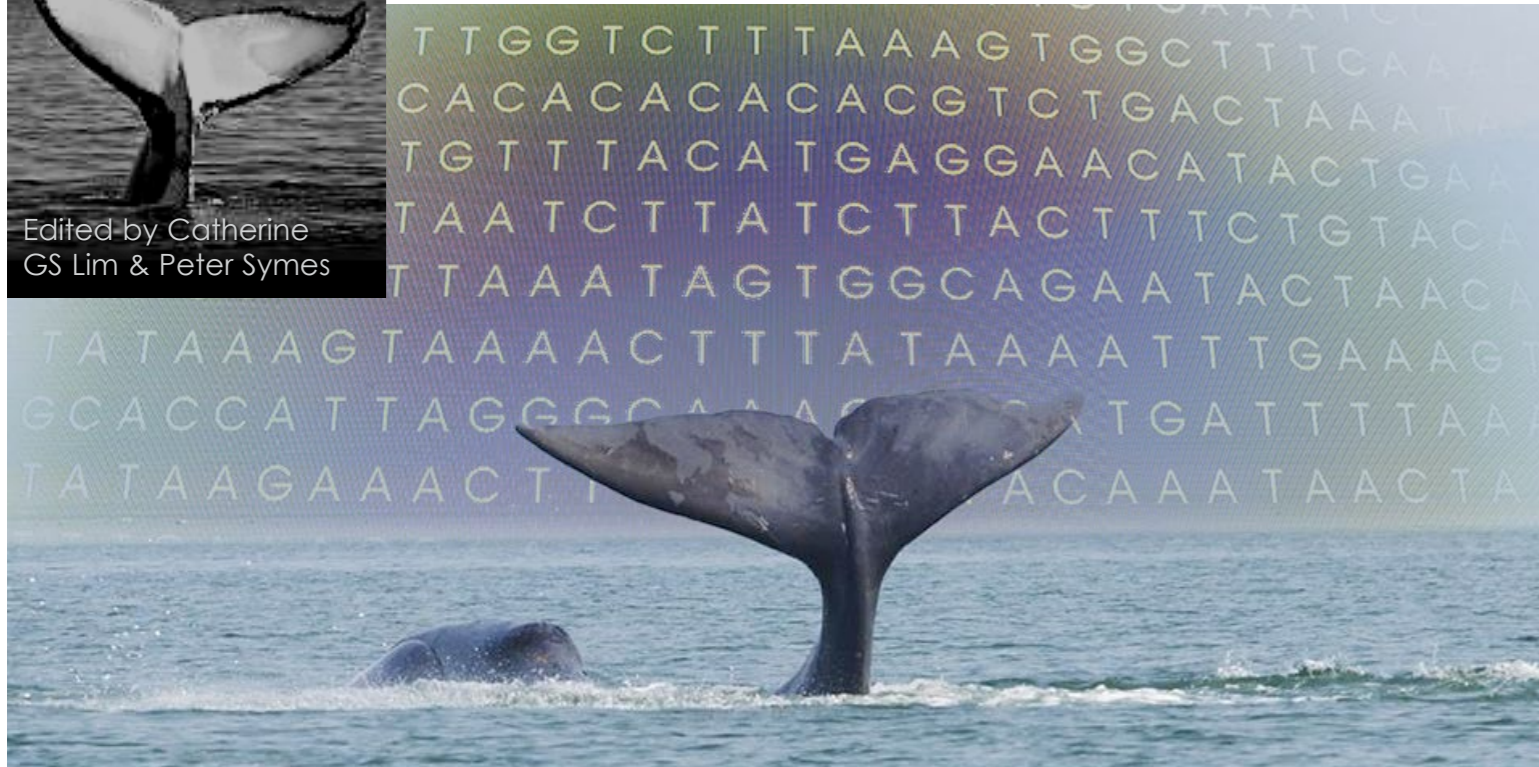


PHOTO-ILLUSTRATION COMPILED WITH PUBLIC DOMAIN IMAGES FROM PIXABAY

Why whales don't appear to get cancer

Cetaceans are the longest-living species of mammals and the largest in the history of the planet. They have developed mechanisms against diseases such as cancer, although the underlying molecular bases of these remain unknown.

Cetaceans were not limited by gravity in the buoyant marine environment and evolved multiple giant forms, exemplified today by the largest animal that has ever lived: the blue whale (*Balaenoptera musculus*).

There are trade-offs, however, associated with large body size, including a higher lifetime risk of cancer due to a greater number of somatic cell divisions over time. The largest whales can have ~1,000 times more cells than a human, with long lifespans, leaving them theoretically susceptible to cancer.

However, large-bodied and long-lived animals do not suffer

higher risks of cancer mortality than humans—an observation known as **Peto's Paradox**.

Gene repair

Comparative genomic results suggest that the evolution of cetacean gigantism was accompanied by strong selection on pathways that are directly linked to cancer.

A team of researchers led by Marc Tollis of the Biodesign Institute at Arizona State University in the US constructed—for the first time—the complete genome of a humpback whale, and then compared it to existing genomes for ten other species.

The results confirmed earlier research that found that gigantism is linked to the duplication of many genes that are associated with cell function, DNA repair and ageing.

Bowhead whales (*Balaena mysticetus*), for instance, have been estimated to live for at least 200 years, and their genome shows positive selection for genes that are important components of the DNA repair pathway. The species also has duplications in other genes that influence gene repair and cellular growth. ■ SOURCES: PROCEEDINGS OF THE ROYAL SOCIETY B, MOLECULAR BIOLOGY AND EVOLUTION

SARS-CoV-2 in wastewater may pose risks to marine mammals

Researchers from the Dalhousie University in Canada published a study in the journal *Science of the Total Environment* that found human wastewater to be a potential mode of coronavirus transmission to animals.

If left untreated, wastewater contaminated with SARS-CoV-2 could leave a devastating impact on already declining marine populations. The researchers suggested wastewater carrying SARS-CoV-2 could infect 15 mammal species and put them at high risk for extinction. ■

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Bottlenose dolphin (*Tursiops aduncus*)

Are dolphins self-medicating?

In the Northern Red Sea bottlenose dolphins have been observed rubbing themselves against gorgonian corals. Video recordings obtained while scuba diving showed dolphins approaching gorgonians and then rubbing their body into

them while rolling on their sides, backs and bellies.

Several hypotheses have been put forward concerning the functional role of this behaviour. These include hygiene (e.g. ectoparasite removal), sensual pleasure, play and socializing activity. As

gorgonians possess antibacterial and antifungal properties, it has also been hypothesised that this behaviour represents prophylactic or even therapeutic self-medication.

Getting high?

Footage from a BBC documentary series, *Spy in the Pod*, has also revealed what appears to be dolphins getting high off of pufferfish.

Most pufferfish contain a neurotoxin that makes them foul-tasting and potentially deadly to other fish. The toxin is deadly to humans, but dolphins seem to be able to handle the pufferfish very gently and delicately, like they were almost milking them, to not upset the fish too much or kill it. They nudge the fish with their snouts, and as the toxin is released into the water, they seem to lapse into a trance-like state. Zoologist and series producer Rob Pilley said that it was the first time dolphins had been filmed behaving this way. ■ SOURCE: UNIVERSITY OF ZÜRICH



Giant marbled eel

Text by Ila France Porcher

I first discovered freshwater eels in an estuary pool by the sea in Tahiti. There were usually about eight of the thick-bodied creatures, each over two metres long with triangular fins at their gills and vertically flattened tails. They would emerge from the shadows to swim languidly into the sunlight, undulating against the boulders, and turning on their backs to wriggle against the stones, as if this pool, these rocks and this morning's rising sun were all that they needed to be happy. But the ones I found on the mountainside were smaller, and very secretive.

For a while, I kept an observation site high on the shoulder of a mountain on Tahiti's sister island, as part of my studies of the local birds. I was trying to learn about the species of seabirds that

nested there, which were, at the time, unknown.

That wet season brought record rainfall. One night, a metre of rain fell, and it ran down the side of the mountain and through

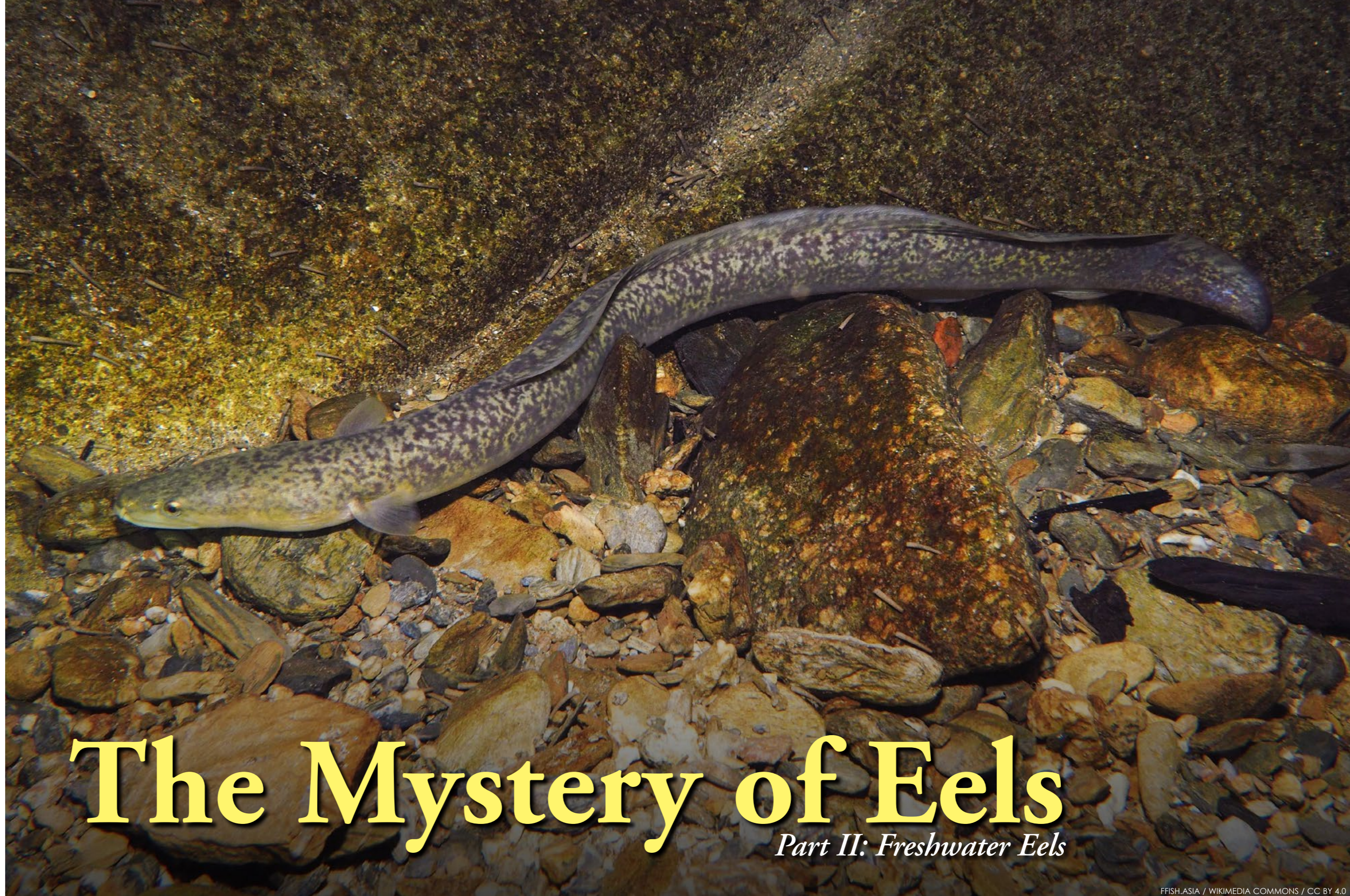
my shelter. An eel slithered out from beneath the floor, saw me and retreated back out of sight. But soon it reappeared and glided to the nearby stream, but instead of swimming away, it

dove straight down into the earth. Later, another eel came wending its way over the flowing forest floor, and it, too, disappeared underground.

There was a place where water

poured out to make a fountain in the air. Here, there were channels cut beneath the trees by water—a world invisible, of passages known only to eels.

Encounters with an eel
In the tropical heat and high humidity, it was a great pleasure to be able to sink, at times, into the cool waters of one of the pools. At dusk, an eel appeared



The Mystery of Eels

Part II: Freshwater Eels

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ILA FRANCE PORCHER

A long-finned Polynesian eel, the one that would look out at me as I bathed in the deep pool

in the pool, and I began to see him lying on the bottom late in the day or early in the morning. But by the time I could return with my camera, he would always be gone. He would hide at the sound of my footsteps even when I was quite far away. So, I began sneaking around in an effort to take his picture, and often crept down to the pool to see what he was doing. Once, he was lying immobile on his back on the surface and I went to get my camera, but by the time I returned, only his nose and eyes were visible in the darkness of a hole between two of the great stones.

Later, he seemed to be hunting for insects. I delicately picked a leaf from

the surface to clear the view for a photograph, and like lightning, he struck my hand.

One afternoon, I threw him a grain of corn, and he responded by lifting his nostrils above the surface, presumably looking for the source of the alien item. He was not stupid!

As time passed, he became used to me, stopped fleeing at the sound of my footsteps, and no longer hid when my camera flashed into his pool. He came out into the open earlier, and stayed later, so that I was able to watch him in the daylight. He was well camouflaged lying there. Animals did not notice him when they approached to drink, but he

was quite aware of them, through the slightest vibration at the water's edge.

Another pool, another eel

Because of the eel, I looked upstream for another pool to bathe in and found one so deep that I could sit in it up to my chin. How beautiful it was to recline in those silken waters, looking up through the endless patterns of tropical foliage to the sky, in a supernatural silence ruffled only at times by the sound of the wind. There was even a flat rock to lay my head upon for comfort. Dreamy as I felt in that luxurious pool, a long time passed before I saw the enormous eel that inhabited it. He habitually looked

out of his hole beside the rock upon which I rested my head, but I did not mind—it was such a pleasure lying there, dreaming, close beside the mysterious eel in my bath.

One night, it rained heavily and in the morning the stream was a churning dark river. One very large eel made his way upstream like a big snake and at nearly every pool, an eel showed a few coils at the surface, slicked with silvery water, as it shimmied away.

Sometimes, I crept along the big stones above the stream as darkness fell. There was an eel in nearly every pool, secretively gazing out. Some were tiny, sliding slowly from one stone to another,

all but invisible. Others were very large. Some were on the move, and only a series of serpentine coils appeared with a few gleams and the softest splash. The eels came out at night, and like sharks, were bolder then.

But the largest one was the eel in my bathing pool, and at night he emerged from his hole. Once, while I manoeuvred for a photograph, he extended his length across the pool to the boulder where I stood, rested his head, and gazed up at me.

Eels hunting and feeding

One evening, I sat meditating above the eel's pool as night fell. It was too





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An eel (bottom left corner of image above) approaches unsuspecting junglefowl chicks getting a drink at a stream; Several eels fight over the caught chick (right and top right).

dark to write, and I had gone out to sit with the birds as they gathered to fly into the trees. A group of juvenile junglefowl chattered and preened nearby and moved to the stream to drink. I was taking the occasional photograph, but in the darkness, could not, myself, see the eel sliding towards them, yet it is visible in one of my photographs (above).

The glistening blackness of the water suddenly moved, and the birds exploded away from a splash. The eel had caught the black chick. I leapt down, lifted the creature from the water, and found myself in battle with a powerful and very slippery animal, as muscular as a snake. It dropped the bird, which began flying across the surface to the shore. I reached out for it, but with unexpected power and speed, the eel unerringly clamped its mouth shut on the bird's throat, wrenched itself from my grasp, and slithered back into the pool. I could not get the bird back. It was being violently shaken in



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water that was instantaneously opaque. The eel blasted back into its hole, the image of haste as it tried to angle its prize through the small opening, apparently aware that I could interfere with it again. Finally, it succeeded in forcing the bird through, and into its subterranean passage. But it left its tail carelessly draped upon the rocks outside for some time.

Soon, strange sounds began to emerge from underground, rather like the sounds a toilet plunger makes and variations thereon. The eel was churning around. From the little I could see of it, it had multiplied—three eels were thrashing together, turning over and over. A tiny eel came out and slid into the pool, then another.

As night came, there were eels everywhere, apparently having scented the feast through their maze of underground passages. All were trying to tear off a bite by clamping onto the bird and spinning. Mercifully, darkness soon obscured my view of the multiple serpentine writhings, but the sound of them continued deep into the night.



Freshwater Eels

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Giant marbled eel (above) and Polynesian long-finned eel (right)

Three species

There are three species of freshwater eels in French Polynesia. The large estuary eel is the giant marbled eel (*Anguilla marmorata*) which inhabits the larger rivers below the waterfalls.

The mountain eel is the Polynesian long-finned eel (*Anguilla megastoma*). It is slender and serpentine, and inhabits the narrow and elusive waterways higher up.

The third species is the Pacific short-finned eel (*Anguilla obscura*). It is uniformly dark in colour with a white ventral surface and tends to inhabit more stagnant regions upon the coastal plain and the pools of streams deep in the valleys. It distinguishes itself from the other two, it is said, by eating insects and molluscs instead of shrimp and fish. However, I found them all to be more opportunistic than that, and to eat whatever they could grab.

Life cycle

The life cycle of eels is one of the most remarkable things in the biosphere. They hatch in special places in the ocean and drift with the currents, nibbling on plankton and other



ILA FRANCE PORCHER

microscopic bits and pieces. When tiny, they are transparent and are called glass eels. They become elvers as they grow older. After a long migration, they arrive at the rivers and streams from which their parents originated, and by then, they are large and strong enough to swim upriver until they find a suitable place to pursue their lives.

The eels of Polynesia live only in the fresh waters of a few Pacific Islands and the place where they mate and

spawn is not known for sure but is thought to be to the east of Tahiti, or between Samoa and Fiji.

Australian freshwater eels live in mountain streams as high as 1,200m in elevation and travel from all across the eastern coast of Australia to mass spawning events near New Caledonia. The offspring spend about two years growing before returning, as elvers, to the river where their parents lived. On the full moon of March, they leave the sea and swim hundreds of kilometres

upriver, breaching obstacles (including waterfalls and cliffs) to reach their destination, where they live for many years before migrating back to the place where they hatched, to breed.

The freshwater eels of both North America and Europe spawn in the Sargasso Sea and travel with the Gulf Stream to their respective continents. All over the world, local eels have their own migration routes, many of which are yet to be discovered.

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Giant marbled eel peeking out of its den (above), on the sandy bottom (right), and entangled in underwater vines and roots (left)

The giant marbled eel

While exploring the rivers, I met several giant marbled eels. One small one would zigzag forth from a pile of rocks some distance away to confront me each time I passed. He set himself

down in front of me and gazed. Then, he would raise his lip, as if snarling.

On one of my approaches to the river, there was a spectacular water lily in a little backwater, and each time I passed it, I stopped to admire it. It was

just as dramatic beneath the surface. One day when I went underwater there, beneath those shading leaves, a huge eel was entangled.

I raised and snapped the camera instantaneously, and at the same moment, he exploded into action and raised a screen of mud. His bulging eye looked about as astounded as I was. I always looked for the water lily eel when I passed through that pool, and found him in a variety of places, even hanging in the greenery.

But I was never able to learn more about the behaviour of these strange fish. Even the ones who encountered me many times did not interact at all. They only came forward and made eye contact. Likely, they were ready to defend themselves in case I should attack. Sadly, these mysterious animals have been fished unmercifully until they have disappeared completely from large regions of the world.

Go to part one in **issue #103 here >>>**

Ethologist Ila France Porcher, author of The Shark Sessions and The True Nature of Sharks, conducted a seven-year study of a four-species reef shark community in Tahiti and has studied sharks in Florida with shark-encounter pioneer Jim Abernethy. Her observations, which are the first of their kind, have yielded valuable details about sharks' reproductive cycles, social biology, population structure, daily behaviour patterns, roaming tendencies and cognitive abilities. Please visit: ilafranceporcher.wixsite.com/author.

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SMITHSONIAN'S NATIONAL ZOO

Newly hatched common cuttlefish

Cuttlefish are smart enough to wait for a better reward

Cuttlefish pass the marshmallow test with flying colours.

Using a modified version of the Stanford marshmallow test, researchers at the Marine Biological Laboratory (University of Chicago) discovered that cuttlefish had the ability to delay gratification for a better reward—and those that were able to do it for a longer duration possessed better cognitive learning abilities.

The findings, which demonstrated the link between self-control and intelligence, was published recently in the *Proceedings of the Royal Society B* journal.

According to lead author Alexandra Schnell of University of Cambridge, United Kingdom, “We used an adapted version of the Stanford marshmal-

low test, where children were given a choice of taking an immediate reward [one marshmallow] or waiting to earn a delayed but better reward [two marshmallows].” Incidentally, king prawn and grass shrimp were used in place of marshmallows in this adapted version.

“Cuttlefish in the present study were all able to wait for the better reward and tolerated delays for up to 50–130 seconds, which is comparable to what we see in large-brained vertebrates such as chimpanzees, crows and parrots,” said Schnell.

Measure of intelligence

In addition, the cuttlefish were also tested on their learning ability, which is a measure of intelligence. It was found that those that possessed better cogni-

The **Stanford marshmallow experiment** was a study on delayed gratification in 1972 led by psychologist Walter Mischel, a professor at Stanford University.

In this study, a child was offered a choice between one small but immediate reward, or two small rewards if they waited for a period of time. During this time, the researcher left the room for about 15 minutes and then returned.

The reward was either a marshmallow or pretzel stick, depending on the child's preference.

In follow-up studies, the researchers found that children who were able to wait longer for the preferred rewards tended to have better life outcomes, as measured by SAT scores, educational attainment, body mass index (BMI), and other life measures.

— Wikipedia

tive learning abilities were better able to resist temptation longer during the modified marshmallow test.

The scientists have not figured out why the cuttlefish have evolved this ability, suggesting that it may have been due to its need to hide from potential predators.

“Cuttlefish spend most of their time camouflaging, sitting and waiting, punctuated by brief periods of foraging,” said Schnell. “They break camouflage when they forage, so they are exposed to every predator in the ocean that wants to eat them. We speculate that delayed gratification may have evolved as a by-product of this, so the cuttlefish can optimise foraging by waiting to choose better quality food.” ■

SOURCE: PROCEEDINGS OF ROYAL SOCIETY B



Do octopuses dream?

Shifts in colour, behaviour and movement are evidence of a sleep cycle—with the octopus switching between active and quiet sleep just as humans switch between deep sleep and REM sleep—suggesting that octopuses may experience something akin to a dream.

Scientists used to think that only mammals and birds experienced different sleep states. More recent research, however, has revealed cuttlefish—another cephalopod and relative of the octopus—show non-REM and REM-like sleep.

A new study has found that the octopus also has “quiet” and “active sleep.” States differ on arousal thresholds, skin colour and texture, and eye and mantle movement. Octopuses usually change their skin colour for camouflage or for communication but during sleep, environmental factors no longer trigger these patterns.

Do they really sleep?

Octopuses have a very different brain

structure to humans, so how can we know that they dream, or even sleep?

Electrophysiological recordings in mammals show distinct spectral profiles that comprise two major alternating sleep states, one quiet and another active. Much less is known about neurobiological rhythms in invertebrates because electrophysiological recordings remain very challenging in these animals. Despite these limitations, the study of invertebrate sleep has advanced using behavioural criteria originally developed to investigate mammalian sleep.

Among cephalopods, the common octopus's (*Octopus vulgaris*) sleep state meets all the criteria that defines sleep.

“It is not possible to affirm that octopuses dream because they cannot tell us that, but our results suggest that during ‘active sleep,’ the octopus experiences a state analogous to REM sleep, which is the state during which humans dream the most,” wrote the study authors Sidarta Ribeiro and Sylvia Medeiros in an email to CNN. ■ SOURCE: ISCIENCE (CELL)



South African cave diver Karen van den Oever sets new women's deep cave diving record

The record dive, which reached a depth of 236m in the notorious Bushmansgat Cave, took place on 26 March and lasted seven hours and 18 minutes.

Boesmangsat, also known in English as "Bushman's Hole," is a deep submerged freshwater sinkhole in the Northern Cape province of South Africa—and the third-deepest freshwater cave in the world.

In 1994, while helping a team prepare for a dive, Deon Dreyer died on ascent at a depth of 50m. Dreyer's body remained in the cave until being discovered ten years later at a depth of 270m by renowned cave diver David Shaw. On 8 January 2005, David Shaw died while attempting to recover Dreyer's body. On 12 January 2005, Dreyer and Shaw's bodies were ultimately recovered near the surface, while part of the staff was recovering part of the technical equipment. ■



Retaining straps become a mandatory design requirement for rebreathers sold in Europe

When compared to open-circuit scuba, the probability of exposure to an inappropriate breathing gas is increased when using rebreathers, which can lead to loss of consciousness with little or no warning.

Frequently referred to as the rebreather "3H hazards," inappropriate breathing gas scenarios most frequently associated with rebreather use are: (1) hypoxia, resulting from respiring a hypoxic gas; (2) hypercapnia, resulting from increased levels of inspired carbon dioxide (CO₂), or hypoventilation; and (3) hyperoxia, resulting from respiring an hyperoxic gas.

One means of protecting the airway following loss of consciousness underwater is the use of a full-face mask. However, such masks are complex and expensive; therefore, they have not been widely adopted by the sport diving community.

In recognition of the possibility of encountering inappropriate breathing gas and the associated potential for loss of consciousness underwater, when a full-face mask (FFM) is not used, the mouthpiece retaining strap (MRS) combined with related training has been employed by militaries worldwide for over half a century. In its simplest form, the MRS is an elasticated adjustable strap secured to the breathing loop/mouthpiece. To optimise its effectiveness, the MRS is worn over the crown of the head and adjusted to positively hold the mouthpiece in position without causing undue discomfort.

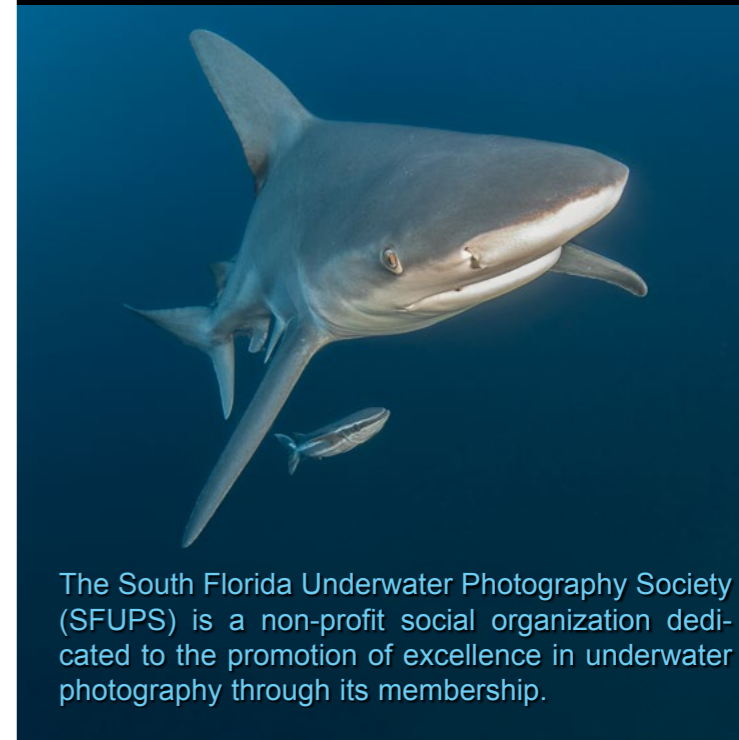
When worn correctly, evidence indicates an appropriately designed MRS can prevent the rebreather mouthpiece from being dropped. This will significantly increase the probability of preserving the airway, potentially preventing or limiting wa-

ter aspiration, breathing loop flood, loss of buoyancy and the likelihood of drowning.

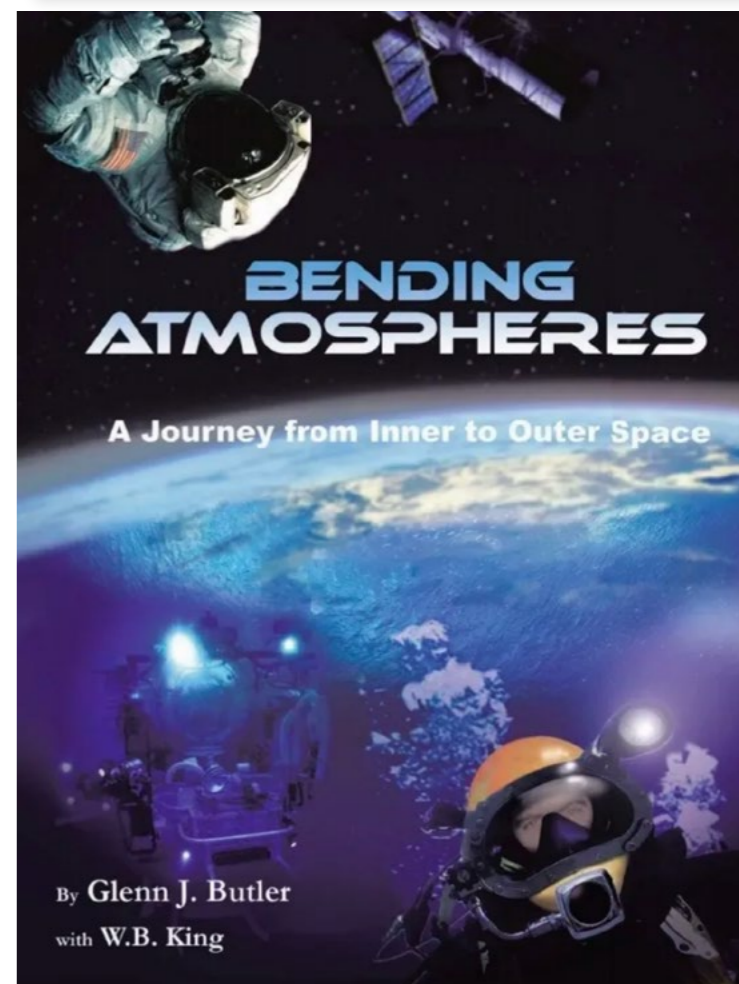
Using a retaining strap increases the probability of surviving loss of consciousness underwater when using a rebreather. The British rebreather manufacturer AP Diving has evolved their current mouthpiece retaining strap (shown) so that the lip guard is now moulded with the mouthpiece.

Following correct installation, an MRS should be positioned and adjusted so the strap is worn over the back of the head such that when in a relaxed state, the mouthpiece is held comfortably in position.

When diving with a hood, to avoid mask strap and MRS conflict, one method is to wear the diving mask strap under the hood and the MRS on top of the hood.



The South Florida Underwater Photography Society (SFUPS) is a non-profit social organization dedicated to the promotion of excellence in underwater photography through its membership.



Required component
Because of these potentially life-preserving functions, an MRS is a mandatory design requirement for all rebreathers sold within the European Union and United Kingdom. European rebreather standard EN14143:2013 specifies a design requirement for a facepiece (mouthpiece assembly), which shall minimise the ingress of water during normal use and in the event of a diver falling unconscious or having a convulsion. It shall be adjustable or self-adjusting and shall hold the mouthpiece firmly and comfortably in position. ■

SOURCES: REBREATHING TRAINING COUNCIL (RTC), PAUL HAYNES, DIVING AND HYPERBARIC MEDICINE



photo & video

Simulation: For large prints, the increased viewing distance plays an important role when it comes to DPI resolution and thus maximum possible print size. The larger the print, the less DPI is necessary. All large prints will still look awesome when printed at 150 DPI, and they will still look great at 125 DPI or even 100 DPI. Printing at 100 DPI would make it possible to turn your native (as captured) 70 x 50cm (around 24 MP) image into a 210 x 150cm huge wall art print, and it will still look good when viewed at a distance of about 4.5m (around 15ft).

Text and photos by Rico Besserdich

The final stage of creating an image is printing it. Despite the fact that we are living in an increasingly screen-oriented world, a printed image still proves the old saying, “If it’s not printed, it does not exist.” This is 100 percent right. As a matter of fact, only a good print can reveal the full magic and spirit of your image. This is what you, and your images, deserve, and this is what we are going to discuss now.

Regardless of whether a photograph is destined for your own wall in your living room, a gallery, or to be sold to a client, to prepare an underwater image in a way that results in a deeply satisfying print



Prepping for Print

— *in Postproduction of Underwater Images*

requires a different mindset and workflow. This tutorial is meant to guide and help you. Furthermore, it will deal with some fancy but very wrong myths regarding

proper printing, which often occupy the minds of many photographers.

Before rushing to the nearest photo lab, let's first have a look at a basic list of

factors that will need our consideration:

- I. The source material (your image)
- II. Where to print it (photo lab, home

- printer, offset printing)
- III. What to print it on (photo paper, canvas, aluminium, acrylic, etc.)
- IV. The size (dimensions) of the print





I. Your image

Your starting point should be to have a final processed (edited) image in its native dimensions (as shot, or as cropped to your taste), in Adobe RGB 1998 colour space, and in high resolution, which is 300 DPI in today's standards. Ideally, you have saved (or exported) it as an 8-bit TIFF.

Hint: Always create a copy of your original image file when preparing it for print. A print-optimised or edited image might not serve well for an online magazine or social media; and vice versa, it is the same story—a screen-optimised image will not serve well for print. It is always a good idea to have the original file saved somewhere, and then create and edit a copy of it, depending on the specific task.

Now comes the moment of truth. You did calibrate your monitor before editing your image, right? If not, now is the very last chance to do so. There is no point in spending hours and hours processing your photos for print if you have not calibrated your monitor.

What is monitor calibration for?

Logically, you want to be able to match your monitor display with that of your print as closely as possible. To do that, it would be wise to calibrate your monitor. A calibration adjusts the balance of colour and contrasts displayed on your monitor so that it more accurately reflects how your images look (in realistic colours) and how your print will look.

To perform a calibration, you need two things: a spectrometer and calibration software. A spectrometer is a piece of hardware that detects the balance of colours and contrasts on your monitor

and allows the calibration software to make adjustments in order to display colours more accurately. The result will be a colour profile that will be loaded automatically to your graphic card whenever you start your computer. (This applies to standard monitors only. A high-end monitor has an in-built calibration device and will store the calibration results by itself).

About monitors

Please bear in mind that almost all monitors (standalone or built-in ones, such as laptop screens) come with factory settings that actually display everything "better than in life." Strong contrasts, popping colours—everything looks just great. However, by trusting an uncalibrated monitor's colour display and then attempting to print one's image can quickly result in disappointment, as the print will not look like your edited image on your uncalibrated monitor. Even slightly better monitors (such as my own Samsung SyncMaster) promise amazing things such as "50,000:1 Dynamic Contrast" and "16.7 million colours," etc. And what does it all mean for prints? Nothing. Be smart and calibrate your monitor. But beware of the following commonly held myths.

Myth 1: "A perfectly calibrated monitor will show me exactly how my image will look when printed."

Unless you have a print-dedicated monitor (and we are talking about monitors in a price range of US\$5,000–12,000), you can only hope to get "as close as you can," even with a calibrated monitor. This means, thanks to your calibration, that the reds in your image will not look

purple or orange in print, and the black and white points will be set correctly. Therefore, calibrating your monitor is important, but when it comes to print, we need to think a bit further.

Why is this so?

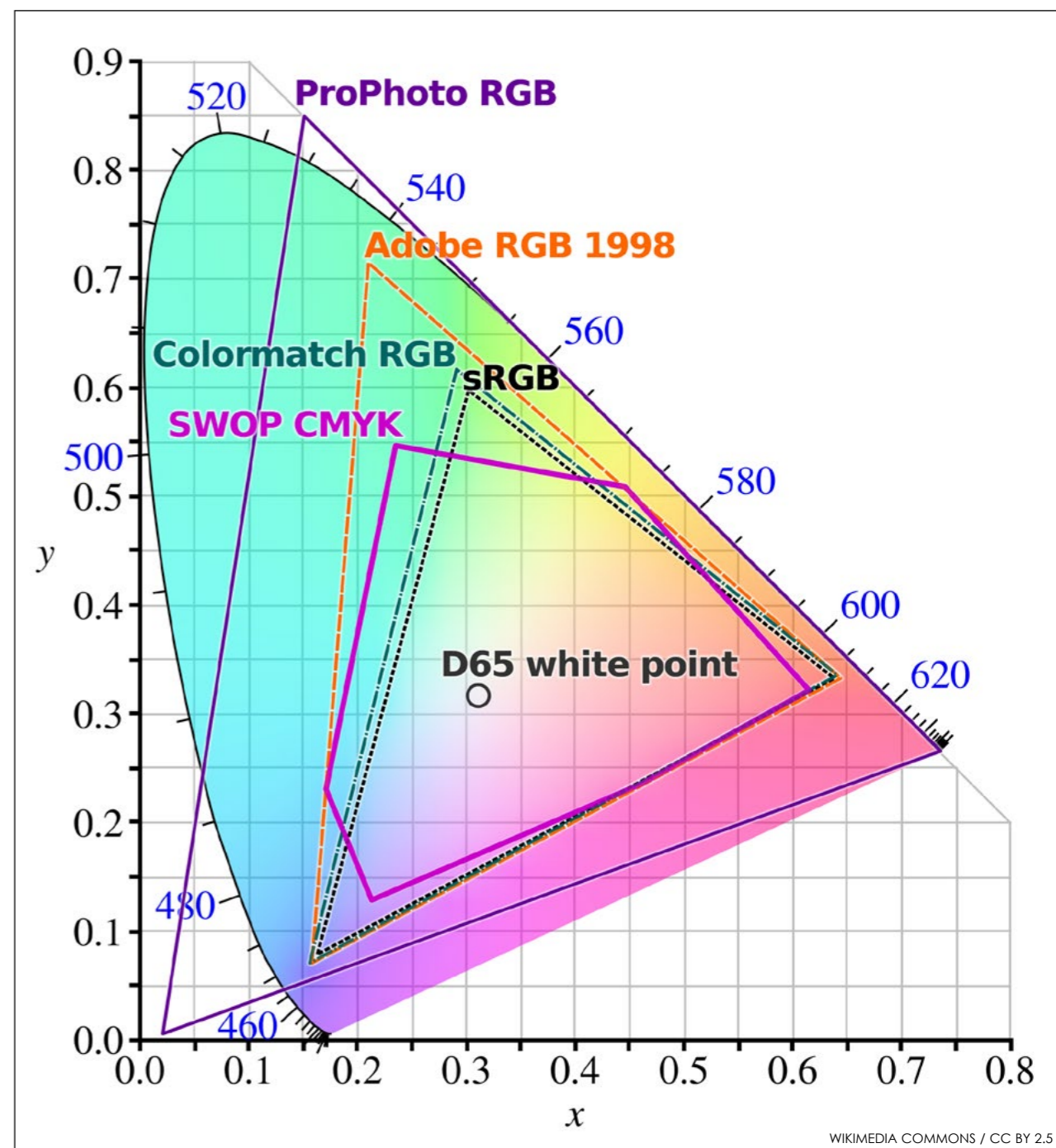
First of all, monitors (and the images displayed on them) are back-lit, but prints are front-lit. This feature effects the brightness of your printed image dramatically, because almost all monitors are simply set far too bright, thus resulting in a print that is a bit too dark.

Tip: Professional printing technicians always recommend raising the brightness of the image you want to print by 10 to 20 percent. However, make sure you do not get burnt out whites when doing so. Whenever you feel unsure, just refer to the histogram. Monitors may display whatever they want, but the histogram always shows the "truth."

Secondly, except for some really expensive ones, all monitors—regardless of whether they promise "16.7 million colours" or whatever—operate in the so-called "Standard Red, Green, Blue" (sRGB) colour range. By the way, this matches the mighty promises of my monitor (and probably yours, too) of 256 values of red, 256 of blue and 256 of green, or $256 \times 256 \times 256 = 16,777,216$. Voila! We all snorkel in the tiny colour range of sRGB.

Professional print labs, however, can print colours far beyond this number. In essence, sRGB was invented to be a sort of standard (i.e., everything looks the same everywhere). It works fine for computer screens (including display of websites, social media, etc.), but print is different. Well, at least, good prints are.

Comparison of some RGB and CMYK chromaticity gamuts. It is clear to see that CMYK has a very limited colour range, compared to the others.



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Then (and we are still talking about how your image looks on your monitor and how it looks when printed), we also need to think about different types of monitors.

Types of monitors

A regular monitor (and 99 percent of you will have a regular monitor) operates in the sRGB colour space and (working together with your computer's graphic card) 8-bit colour depth. An 8-bit monitor is okay, but it cannot show you subtle details in shadows, highlights and gradations of colour. A DDC (display data channel) monitor can show colours up to 14 bits (which means more

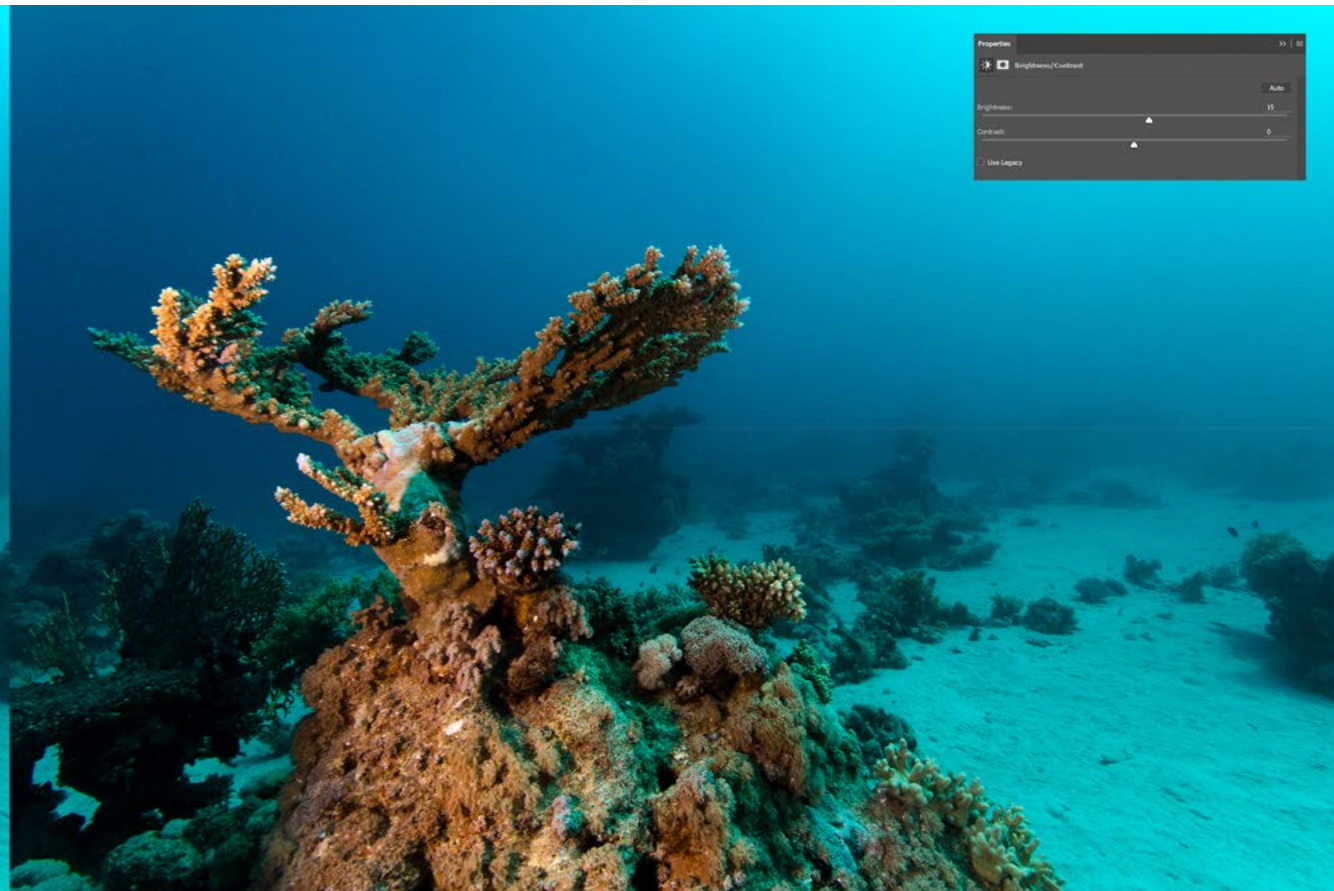
details). Such a monitor will show 98 to 108 percent of Adobe RGB 1998 colour space (which is pretty awesome). However, buying a DDC monitor will be tough on your piggy bank. Yet, it is, of course, cheaper than booking a trip to the Sardine Run.

Conclusion: Even a calibrated monitor can only display something "near to it" (the actual print colour) when it comes to prepping images for print. If you want to be 100 percent sure, you will need to request a hard proof from your printer or photo lab. Please keep on reading.



photo & video

Whilst the left version of this image looks just great on a backlit monitor, it will appear a bit too dark in a print, which is essentially front-lit. Therefore, increasing the brightness by +15 (right image) helps in matching the print with the image on the monitor.



Myth 2: “16-bit is best!”

Some image-editing software will allow you to save TIFF files in 16-bit, for example. Lured by the sirens to sail towards the 16-bit rock (metaphorically-speaking), we may think “the bigger the better!” However, just like the song of the sirens in Greek mythology, the 16-bit song does not make any sense, at least not when it comes to print.

Why is this so?

First of all, we just learnt that even the best monitors can display only 14-bit. This means that our display devices cannot display what is in an image.

The bit range has an effect on the dynamic range of any image, theoretically. So, if you are saving an image as a 16-bit TIFF, the only thing you would do is create a huge file, without any benefits—in print or elsewhere. On a personal note, think about your carbon footprint: Transferring data through the internet requires energy. Creating energy harms our planet. Please help save our planet by reducing the file sizes of your data. Please check out the Green Web Foundation if you want to learn more. Go to: thegreenwebfoundation.org

Secondly, even if you send a 16-bit TIFF image to a photo lab for printing, the processing software of that lab (and by the way, many labs do not know this) will

automatically reduce your mighty 16-bit image file into a standard 8-bit image file. Therefore, saving your image for print as an 8-bit TIFF file will be the right thing to do.

Myth 3: “Use ProPhoto RGB, and you will be just fine.”

Well, keep on dreaming. ProPhoto RGB is a standard specifically available to users of Adobe Lightroom, but it is offered by some other image-editing programmes as well. This colour profile promises to store more colours and colour information in your (final edited) image than the classic “Adobe RGB 1998” does. This, so far, is true. However, 99.9 percent of all photo labs simply cannot process (and print) images with the ProPhoto RGB colour range—at least not with the colours that ProPhoto RGB promises. When working in Adobe Lightroom, it might be good to work on 16-bit files in the ProPhoto colour space, just to bring out very subtle details of your image during postproduction. Of course, ProPhoto RGB exists for several reasons, however, printing is not exactly one of those reasons.

II. Where to print it

If you want to print your image on your own home printer, that is okay—please go ahead. However, you should at least buy yourself some proper photo paper, as images printed on standard A4 paper will simply look terrible.

Most photographers, when they get to the point where they want their images printed in a really nice way, will end up at a photo lab.

In printing, the universal rule, “you get what you pay for,” applies. So, if you are tempted by an online printing service that offers you a 60 x 40cm print for as little as US\$2.99, you certainly will get what you paid for—which means, not much. When you are thinking about printing your images, think about how much money and time you spent on photo equipment, trips to special locations, and all that stuff. Now, when it finally comes down to it, the final step—the printing of your images—well, this is the wrong time to be stingy.

Considering that you may not have a high-end photo printer, or even a plotter, at home, you most likely will submit your images to a photo lab. They print photos every day, so they should know best

how to do it, right? At any rate, it is just so easy to upload a file, pay with your credit card, and wait for the postman to ring twice.

Of course, everything depends on your personal preferences. If you are happy with your printed image, then you are happy—and there is nothing more to discuss.

However, low-cost print labs are usually happy with you just submitting an sRGB image, since their printing machines cannot produce anything better anyway. If you submit an RGB image, they will convert it into sRGB. However, if a lab requests your image to be submitted in sRGB colour mode, you better do the conversion yourself. Keep control of everything.

Many people will not even see the difference, but you certainly will. There is nothing wrong with sRGB colour space. It is just that if you worked so hard to get the perfect shot, you certainly do not want to see any details missing in the final print.

As I said in the beginning, the print is the very final stage of your image creation, which means it is no time to skimp and pay peanuts, no time for compromises. What is the point in investing US\$15,000 or more

on fine camera equipment, and perhaps another US\$5,000 on a trip to somewhere nice, and then have your image printed at the lowest possible quality?

Side note: Many online photo printing services do not even have their own printing labs. They might look very “professional,” offering you “awesome” deals and promising you the Holy Land of image printing, but in the end, they are just resellers of big labs. This means that your submitted image might be automatically altered (there is no human to blame behind this—everything is done via scripts and algorithms), forwarded to the photo lab for printing, and then posted to you.

I have heard of cases in which photographers did not even recognise their very own images after the final prints were delivered to their homes. Yes, it was that bad. So, when submitting images to a printing lab, make sure they print it themselves. Serious labs always clearly state where your images will be printed. Any third parties or resellers could be a very difficult bunch to deal with, in case you are unhappy with your





print and want it redone (or you want your money back).

A professional photo lab will usually ask you to submit your image to print as an 8-bit TIFF in Adobe RGB 1998 colour mode. If your image is of proper quality (in terms of printing, this means nicely exposed, properly edited, and of sufficient resolution), the photo lab will take it from there, meaning they will take care of anything else that should be done to print your image in the best quality possible. This might be not very cheap, but it is worth every cent.

Myth 4: "I must always convert my images to CMYK."

It is, of course, true that most professional printers work and print in CMYK colour mode. CMYK refers to the primary colours: Cyan, Magenta, Yellow and Key (i.e., Black). These are the inks used on the press in "4-colour process printing," also known as "four-colour printing."

That said, your RGB image (as captured by your camera and processed in your computer) should be converted to CMYK. But how can you be sure the colours (after the conversion) are correct or will display as intended in the print if your (even calibrated) monitor can only display sRGB colour mode? The simple answer: You can't.

You can only simulate it (by converting the colour profile in your image-editing software) and

get a rough clue about how your image may perhaps look in a CMYK print. You can even go one step farther by assigning specific ICC printer profiles to your image (again, in your editing software). But still, your monitor is based on sRGB colour mode, thus it is not able to display how the printed image will finally look—at least, not if you print something better than sRGB.

As I said before, we are talking about serious, professional printers. So, to shed some light on the "CMYK Myth," let's quote Mr Xander Fischer, a printing technician at Print Lab Chicago—a high-end print lab for fine art prints. In short, these guys have made printing their life. Xander says, "Please, please, please do not send us CMYK images!"

The thing (behind that) is, we simply cannot do what they can do. Proper colour conversions (such as from RGB to CMYK) are not something to be done with just a mouse-click in Photoshop or elsewhere. A successful conversion depends on many more factors, such as the image itself, the material it will be printed on, and the capability of the printing machine.

That said, leave the colour conversion to the print lab. They have print-dedicated monitors that can simulate up to 99 percent how the image will look in print, they know how the colours will look on the paper (or other material) you order, and they know how to squeeze out even the finest colour details. They can do things we

To determine and change the DPI resolution of your image in Photoshop, just go to Image > Image Size and change the resolution according to your planned print. It is recommended by professional print labs to have the "Resample" option switched off when changing image resolution for print.

cannot do with our computers and monitors (even if they are good ones).

Any photo lab that forces you to deliver CMYK converted images is simply too lazy to do a proper printing job. This applies mostly to many of the online photo labs, because their entire printing process—from you submitting the image and ordering a print, to them doing that print and delivering it to you—is entirely automated. There is absolutely no one that personally takes a look at your image, perhaps performing slight adjustments to make your print look the way it deserves to look. As I said before: You get what you pay for. Go cheap, and your print will look cheap.

Conclusion: Choose a proper printing lab. Pay them their proper fee and see your image printed in a quality that not even you could believe existed. Don't make yourself crazy with RGB-CMYK colour conversions.

Myth 5: "I am good because I did a soft proof."

Soft proofing is the ability to view a simulation (on your computer monitor) of how your image will look when it is printed. Soft proofing, despite professional image-editing programmes such as Photoshop or Lightroom offering



it, still remains a simulation, which often lacks any reflection of reality. As a matter of fact, soft proofing only works on a monitor that you can calibrate 100 percent (like a DDC monitor). In all other cases (which means, all other monitors), soft proofing is pretty much pointless.

If you are picky and want to be sure, you have no other choice but to request (and perhaps pay extra for) a hard proof from your photo lab of choice. A hard proof is a digital printing sample for checking the colour quality of printing files before commencing the final print run. In simple words, a hard proof is a printed piece of paper that will show you how the colours and contrasts will look in the final print.

When a single large format

poster print is the goal, the hard proof might only show a fraction of it. Yet, all colours will be exactly as it will be in the final print. A hard proof is something physical (printed on paper), which you will have to examine in person, and perhaps require specific changes in terms of colour and contrast range. This might cost more money (every time a printer prints something, it costs money), but this is how the pros do it.

III. The material to print on

The material you finally want to use, to bring your printed image to life, pretty much affects the expression of your image. As a general rule: Each print medium has its own perceived brightness and ambient reflectivity. Therefore, it makes a serious difference whether you

print on paper or, let's say, aluminium or canvas. Aluminium prints and lumachrome acrylic prints have high ambient reflectivity and perceived brightness, therefore they require very little, if any, brightness adjustment. Traditional inkjet prints and canvas require a lot more brightness adjustments if you want the printed images to look the same as they look on your computer monitor.

Myth 6: "For a proper printing result, I must always oversharpen my images in postproduction."

It is true that, when printing on paper (any type of paper), images might lose a tiny bit of



photo & video

Converting an RGB image to a CMYK image by using a standard monitor (which only recognizes sRGB) often results in confusion and even disappointment, as any standard monitor cannot display the final CMYK result correctly, thus leaving you uncertain of how your print will look—especially when it comes to blue colour tones! Therefore, leave the correct colour conversion to the print lab. A print lab that insists on receiving CMYK images (for a large print) from you, is a print lab you better avoid. If you do not have any other choice, (in Photoshop) go to Edit > Convert to Profile and pick the CMYK colour space in the “Destination Space” field. Usually, US Web Coated CMYK serves as a widely accepted standard.



ADOBE RGB 1998



CMYK

sharpness due to the printing process on that paper. Therefore, it is said that you should add a bit of extra sharpness to your images, in order to compensate for this effect.

However, even if this applies to pretty cheap types of paper, it does not apply to all types of paper, nor to other materials such as aluminium or acrylic. In fact, an oversharpened image looks terrible when printed on aluminium. Of course, your image should be sharp and in focus anyway. If it is not, even the best print lab cannot improve it. What the human eye perceives as being sharp is, actually, more a matter of contrasts. A photo with proper contrasts will be perceived as sharp, meaning that what is more important than sharpening in post-production is to take care of a proper contrast range.

However, if you plan to print on paper, and if you really want to be on the “safe side,” you might want to consider adding +5 to a maximum of +10 percent in sharpness when editing your images for print. No more! When doing so, please make sure you only sharpen areas (of your images) that need to be sharpened. There is no need to sharpen areas of blue water!

IV. The size of your print

Myth 7: “It must always be 300 DPI, no matter what!”

Needing 300 DPI for whatever size you are printing is a myth. In essence, 300 DPI is a general standard—a common denominator, just like sRGB. A resolution of 300 DPI only makes sense when publishing images in print magazines, catalogues, brochures or books.

The key is the viewing distance. A magazine or book is usually viewed at a distance of 40 to 50cm. Such close viewing distances indeed require a higher resolution, a resolution that guarantees “photo realism,” meaning, all details in the image are exactly as captured by the camera.

However, to print an image on a full A4 (21 x 29.7cm) page (like in a magazine or book) in 300 DPI “photo realistic” quality, an image resolution of 2480 x 3508 pixels is required. This would be equal to an 8.7 MP (megapixel) image. If you deliver an 18, 24 or even 50 MP image, it will not make any difference. However, for a nice big print to be hung on a wall, we theoretically might need a bit more.

So, let’s imagine you have a 24 MP camera. This resolution would allow for a high-

quality print (300 DPI, photo-realistic) of 76.2 x 50.8cm (30 x 20 inches). That is already a nice print size, but what would it mean if your camera produced image files, not at 24 MP, but only at 12 MP? Would you be limited to just a 15 x 10in print (38.1 x 25.4cm, half the size of the 24 MP version) because your camera lacks resolution, thus finally forcing you to raid your piggy bank and go for a “better” camera?

The answer is no.

As a simple matter of fact, large format prints are actually never printed at 300 DPI. Most print labs these days can produce beautiful images at 150 DPI, or sometimes even lower. There is no noticeable difference between 150 and 300 DPI for most images. The larger you print your image, the larger the viewing distance will be. The average person cannot detect any difference between 150 and 300 DPI, at a normal viewing distance. Period.

What this means for you is that instead of upsizing your image in Photoshop (which is not recommended anyway since artificial upscaling of images results in blurriness and pixelation) you can change its size by just altering the DPI amount.

Changing the DPI value of a 24 MP image from 300 to 150 DPI will result in doubling the size of printable image dimensions. This means that instead of a 30 x 20in (76.2 x 50.8cm) print, you could print a 60 x 40in (152.4 x 101.6cm) print. That’s a seriously big print!

You could even go as low as 125 DPI, which would allow a print of 178 x 118cm—a big print, and yet it would look beautiful, because absolutely no one (except you, perhaps) will ever look at such a large print from a 40cm distance.

Here, a simple general rule might be of use: The diagonal of your printed image, multiplied by two, will give you an idea of what the normal viewing distance should be.

The diagonal of 178 x 118cm is 213.56cm. To figure this out, either have fun with fancy math formulas such as $d = \sqrt{l^2 + w^2}$ or be smart and just use one of those many online calculators on the internet as I just did. Then, to calculate the viewing distance, do the following:

$$213.56 \text{ (diagonal)} \times 2 = 427.12\text{cm. Or, in easier terms: } 4.27\text{m or } 14\text{ft (rounded).}$$

This is the viewing distance required to perceive the entire print nicely as one,

and yes, it would look perfectly fine in just 125 DPI resolution. That is good news, because to print an image of that size in 300 DPI, you would need to find a camera with a native resolution of 210 MP (megapixels).

A large number of megapixels (delivered by your camera) only makes sense if you plan to print big—and I mean really big, like 200 x 150cm or more. Please note that the number of megapixels is not a real factor of image quality. Just remember, even the top models of Canon and Nikon cameras have, for many years, just provided a 16 MP resolution. Yet their ability for dynamic range and colour rendition allows large format prints, such as for fashion and beauty advertisements. Just go to your nearest shopping mall and check out those huge poster prints of fashion models featuring dresses, make-up or whatever. Some of these prints are 500 x 200cm or larger. They look perfect when viewed from the “ideal” viewing distance. Yet, they all were printed at 150, 125, and sometimes just 72 DPI.

Again, it is all about the viewing distance. This means that even if your camera “only” produces images with a 10 MP resolution, you still can create



photo & video

awesome prints in a nice and presentable size.

Image ratio

A final thing to consider is the image ratio of your print. When using a full-frame camera, or an APS-C sensor (cropped sensor), you will have an aspect ratio of 3:2. This is a perfect ratio for a 4 x 6in or 8 x 12in print, but the aspect ratio changes when printing in other standard sizes, such as

5 x 7in (7:5) or 8 x 10in (5:4).

Keep in mind when you are cropping images for print that you may lose some of the image composition due to the aspect ratio changing. You should always crop the image to the correct aspect ratio, or intended print dimensions, before sending it to the printer.

Many print labs will automatically crop your image without taking composition into consider-

ation. After which, the result might not be as you intended. It is better to exactly crop and prepare your image for the image ratio and size desired.

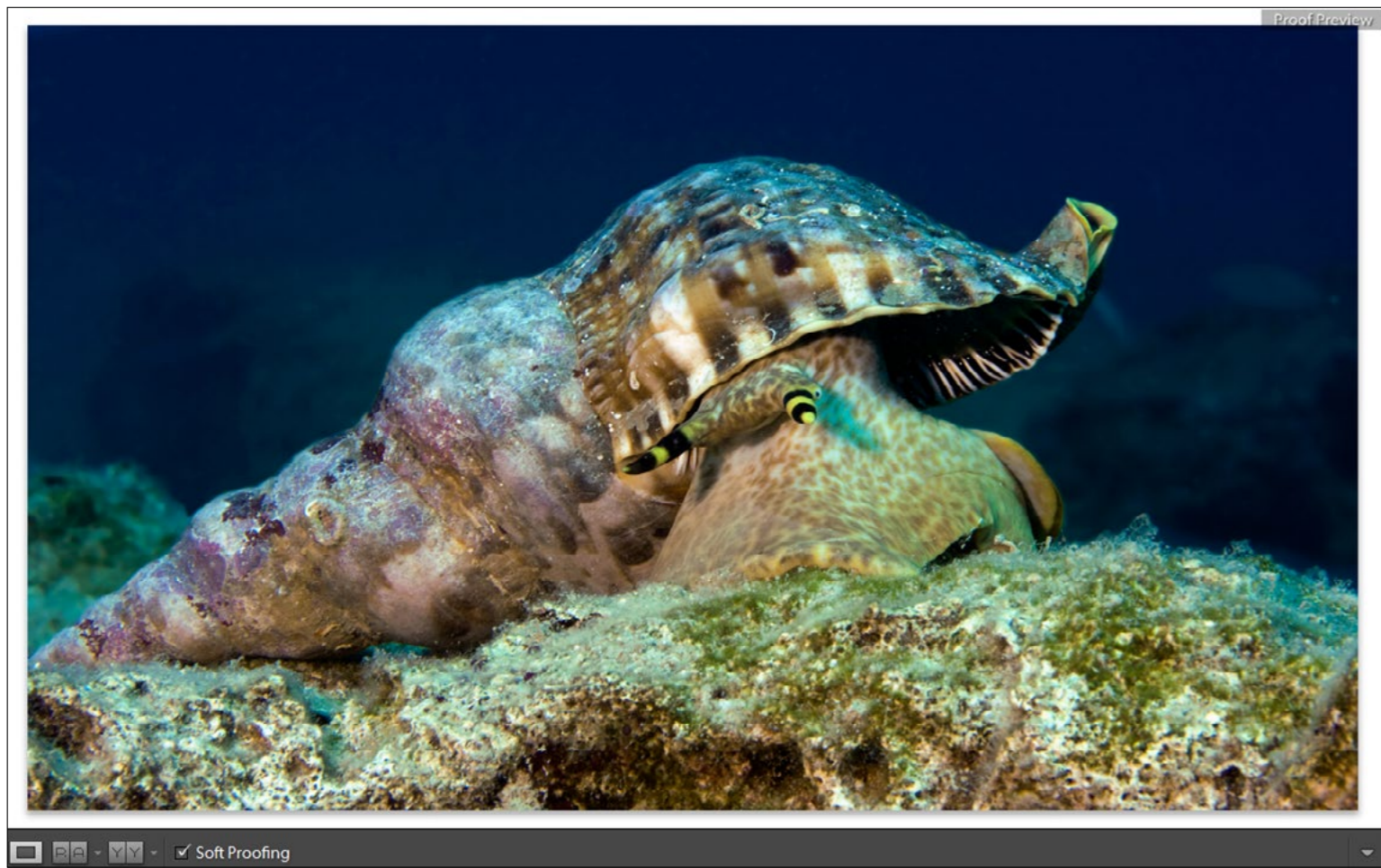
This means that if you plan to have your image printed at, for example, 60 x 40cm (a 3:2 aspect ratio), you must send a 60 x 40cm image to the print lab—no exceptions. The same, of course, applies to different print sizes and aspect ratios. Ideally, you should first look

up which sizes your print lab of choice has to offer (76.2 x 50.8cm prints are not available, but 70 x 50cm or 75 x 50cm prints often are), choose your format, and prepare your image to print accordingly.

In summary

- Calibrate your monitor.
- Work with a copy of your image file (never touch or alter the original) when prepping it for print.
- Add a bit more brightness (keeping the back-lit / front-lit principle in mind).
- Don't use ProPhoto RGB, unless your print lab clearly states that it can print the colours of such a profile (only a handful can).
- Don't put your whole trust in your monitor (even if calibrated); trust the print lab.
- "You get what you pay for." If you want a really good print, do not go cheap. A good print costs money; good print labs are worth every cent.
- Don't make yourself crazy with colour conversions, such as RGB to CMYK. A good print lab can do that conversion far better than you ever could. Deliver your images in Adobe RGB 1998 and the lab of your trust will do the rest.
- Don't trust soft proofing, unless you have a DDC (14-bit) or

Simulated image of prints: The true beauty and spirit of a photograph reveals itself when it is printed. "If it is not printed, it does not exist."



Soft proofing (here, a screenshot from a soft proof in Adobe Lightroom) lets you temporarily simulate how an image will appear on another device, such as a printer. However, soft proofing only works accurately when using DDC (14-bit) monitors that can be fully calibrated to printing and industry standards. Soft proofing on standard monitors does not help much as the display of the "soft proof" cannot be 100 percent trusted. Standard monitors can give you only a rough value of how your image may look when printed.

print-dedicated monitor. If you do not trust your print lab that much, require a hard proof and check it with your own eyes.

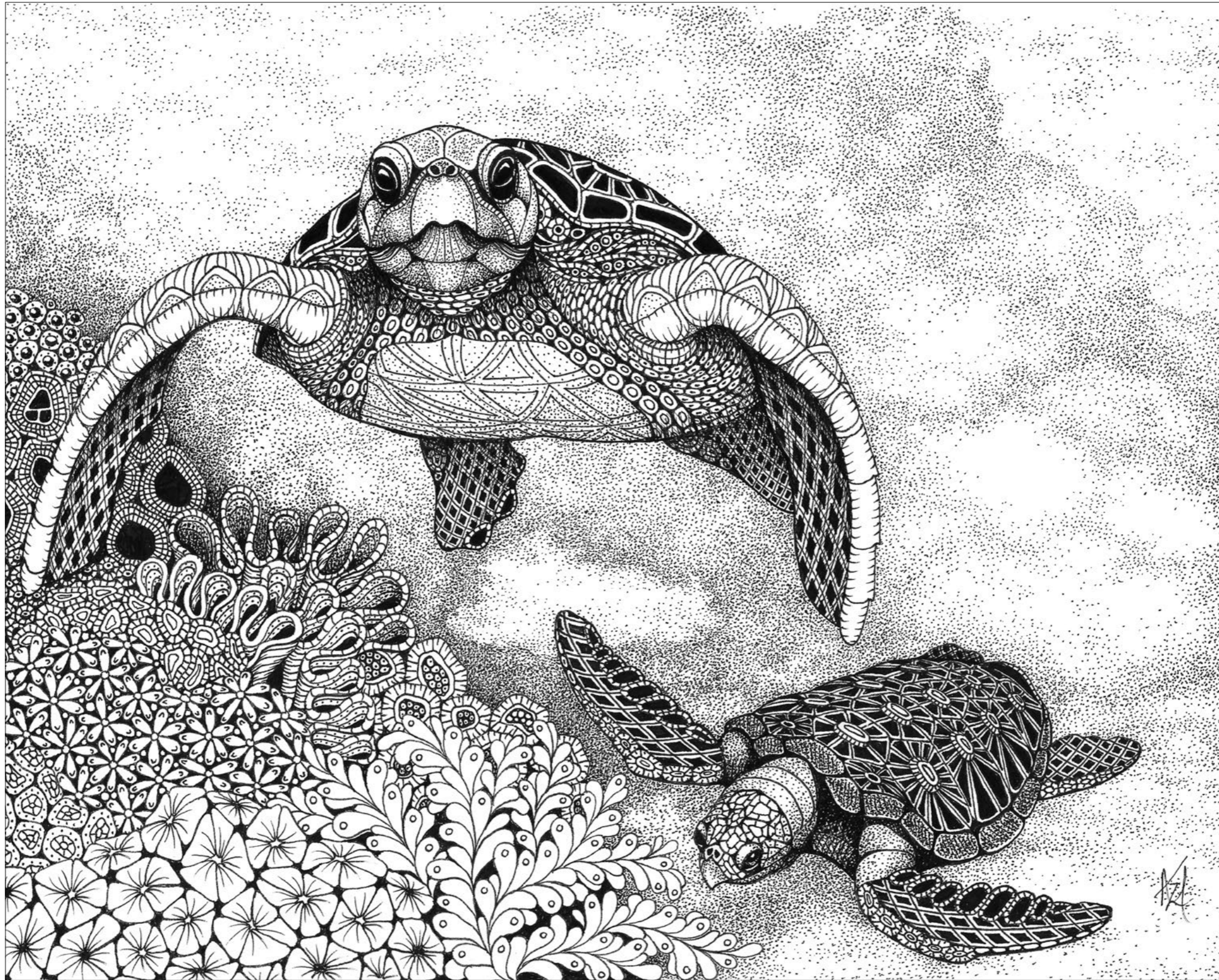
- Take the material you plan to print on into consideration.
- Be careful with oversharpener your images. A +10% amount of sharpening might be okay for paper and canvas prints; however, prints on aluminium or acrylic usually do not need any extra sharpening.
- Your ideal image file to submit should be an 8-bit TIFF in Adobe RGB 1998 colour space. If the photo lab insists on JPGs, create a JPG with minimum

reduction (set it to maximum, or 100%, when saving), again in Adobe RGB 1998 colour space, unless the lab requires something different.

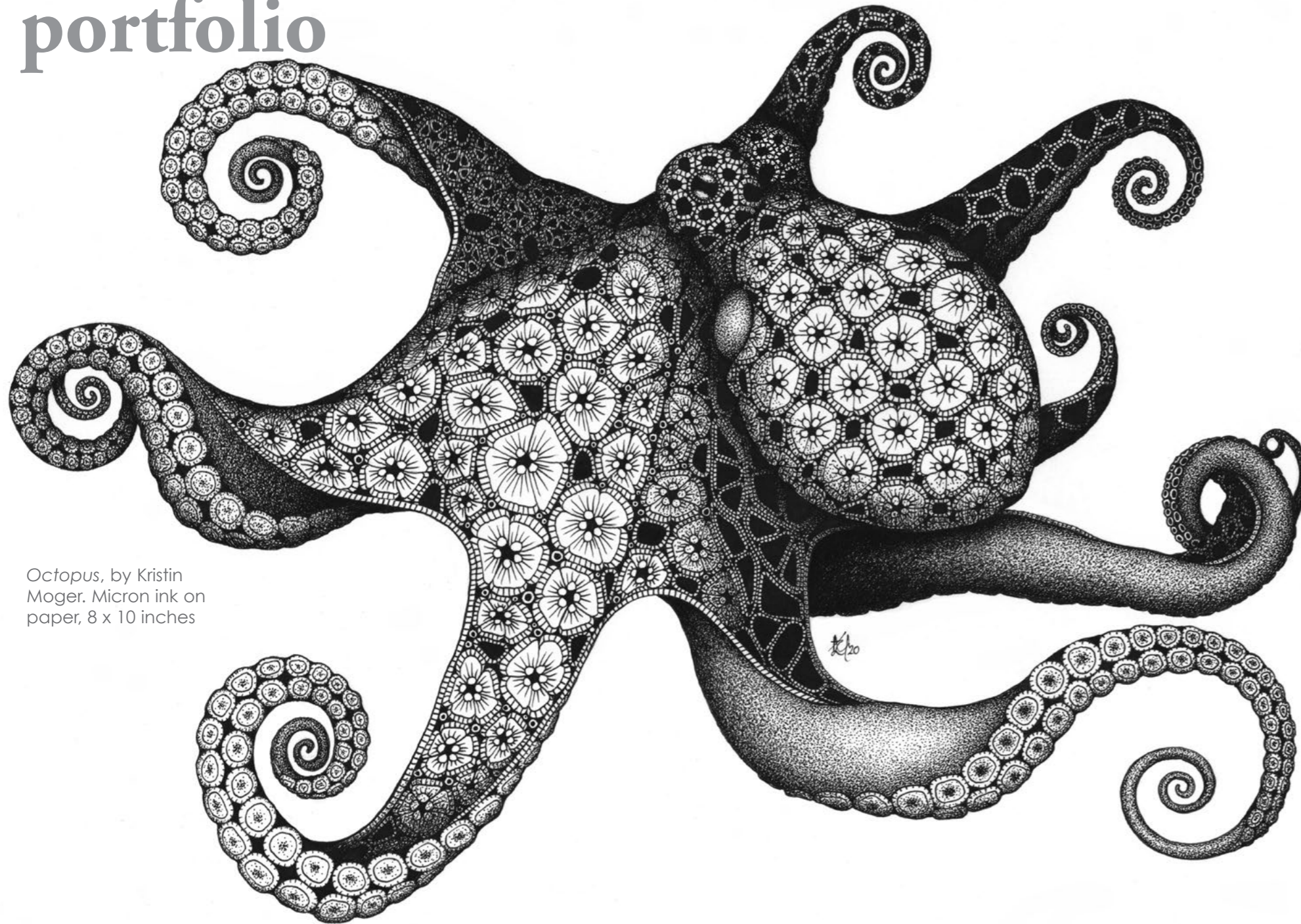
- Remember, you do not need 300 DPI resolution if you go for a large print. Instead of upscaling your image to match the print size intended, it is better to lower the DPI value. However, many good print labs can do that job automatically for you. ■

Rico Besserlich is a widely published German photographer, journalist and artist based in Turkey. Visit: Maviphoto.com. See his latest book at: Songofsilence.com.

Kristin Moger



P O R T F O L I O



Octopus, by Kristin Moger. Micron ink on paper, 8 x 10 inches

American artist Kristin Moger, who is based in Pennsylvania, creates beautiful, precise and intricately patterned black-and-white drawings of marine life, bringing to life the animals' dynamic and sublime personalities on paper. *X-Ray Mag* interviewed the artist to learn more about her creative process and perspectives on art, nature and conservation.

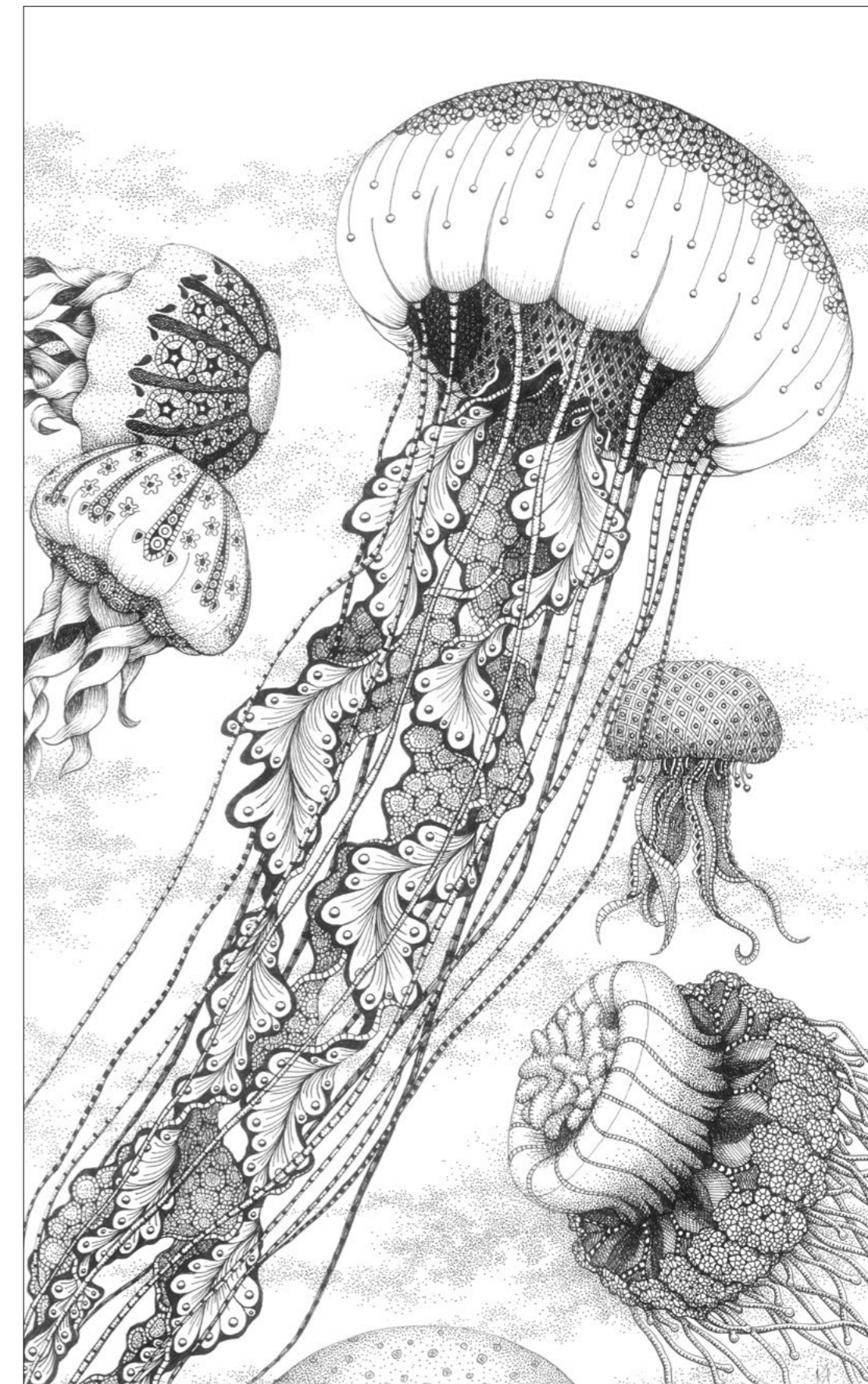
Text edited by G. Symes
All artwork and photos by Kristin Moger

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

KM: I have always loved art and creating with my hands. I was hand-sewing at age two (yup, my mom kept the little cloth turtle I created) and I drew during free time at school. My parents fostered this with art supplies, encouragement and cultural experiences.

In middle school, I overheard my art teacher tell another student (who was quite

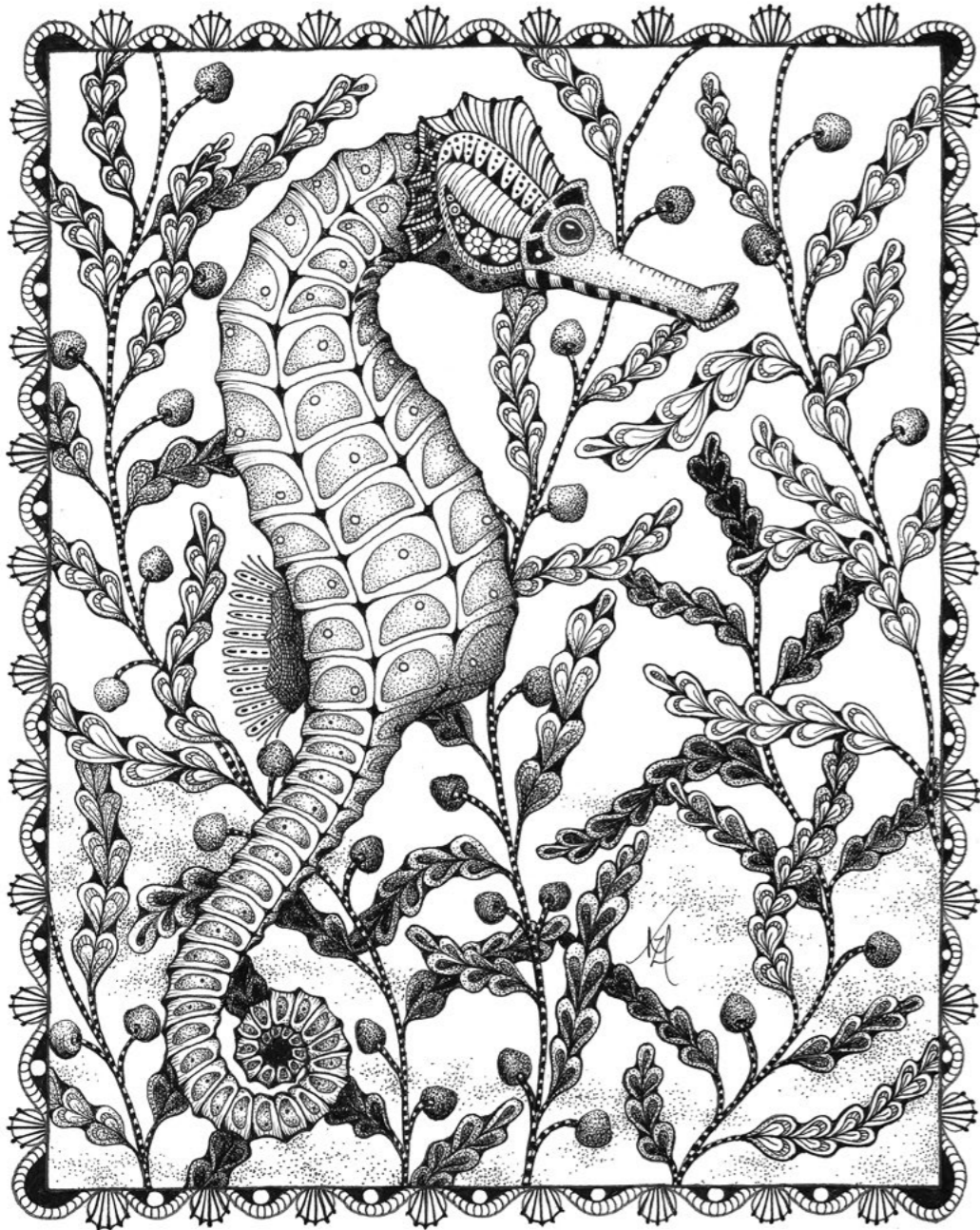
talented, but comparing her work to mine, feeling inadequate) that I would never amount to anything (in my art). Devastated, I cried passionately when I got home. My father kindly told me that I could believe this teacher and stop doing what I loved, or use the comment to fuel my desire to grow and learn. At age 13, I dug deeper and decided to pursue my passion and grow in my knowledge and skills. I chose to pursue a degree in fine arts (painting) and art education to foster both my own artist's heart as well as encourage children to explore their creative sides.



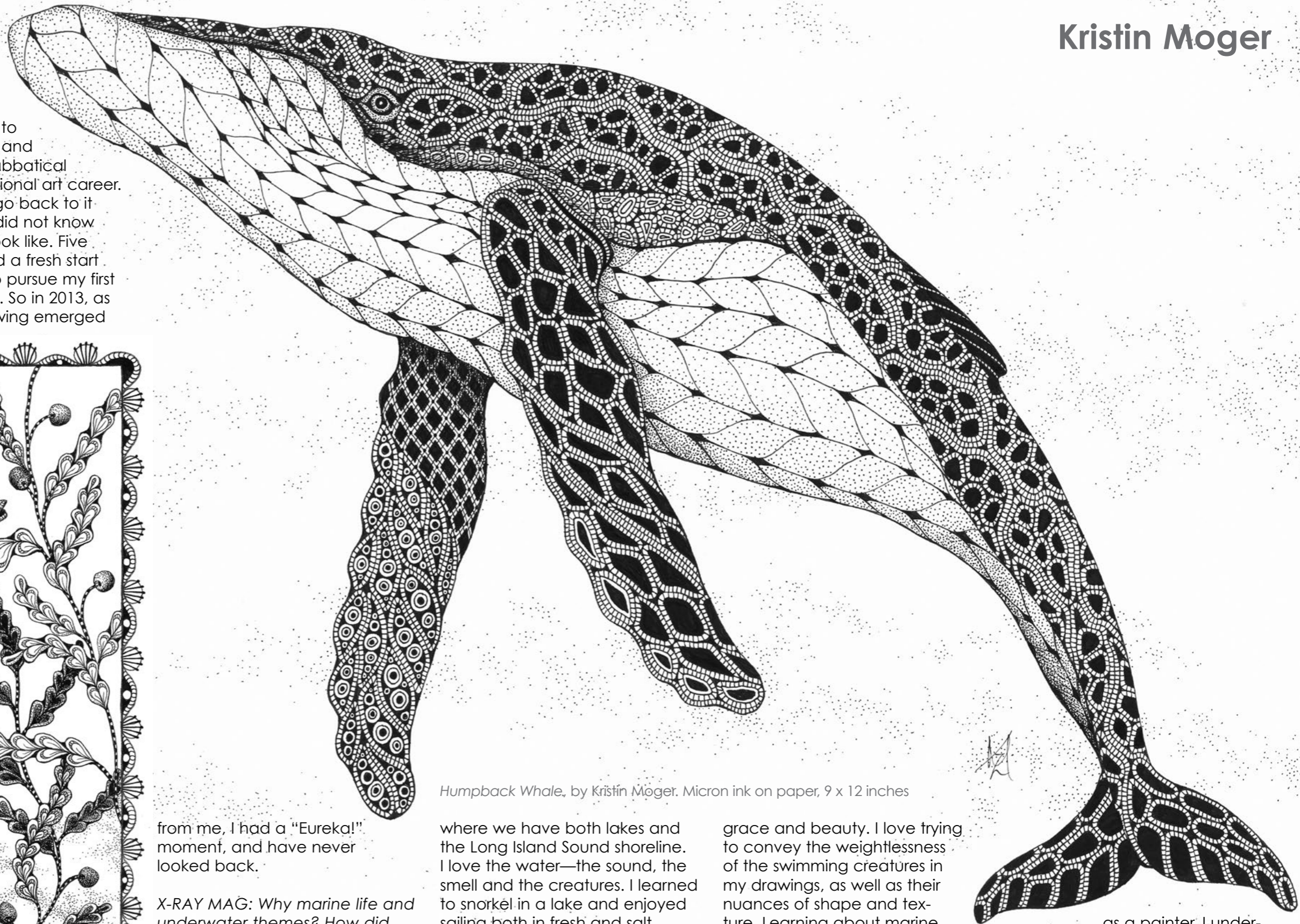
Jellyfish Dance, by Kristin Moger. Micron ink on paper, 17 x 11 inches

I taught art at both public and private schools as well as dabbled in my own creative expression for the next 20 years. I explored so many different media in those days—paint, clay, print-making, jewelry, clothing, knitting, drawing and mixed media—but never really landed for more than a few years on any one of them.

In 2008, I had to take a medical and life-changing sabbatical from my professional art career. I knew I would go back to it sometime, but did not know what it would look like. Five years later, I had a fresh start and decided to pursue my first love of drawing. So in 2013, as this style of drawing emerged



Sea Horse, by Kristin Moger. Micron ink on paper, 10 x 8 inches



Humpback Whale, by Kristin Moger. Micron ink on paper, 9 x 12 inches

from me, I had a "Eureka!" moment, and have never looked back.

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

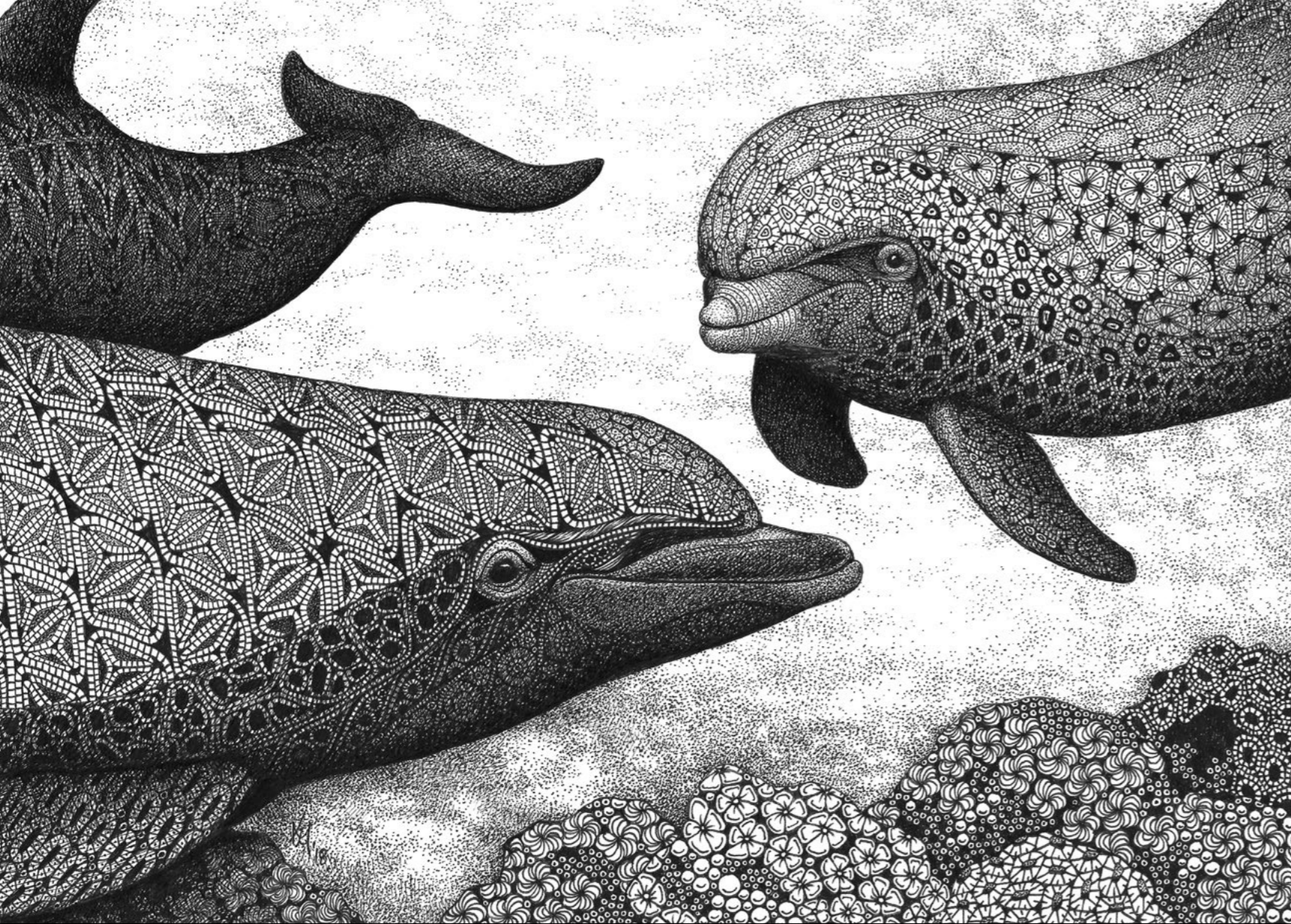
KM: I grew up in Connecticut,

where we have both lakes and the Long Island Sound shoreline. I love the water—the sound, the smell and the creatures. I learned to snorkel in a lake and enjoyed sailing both in fresh and salt water. I went to Mystic Aquarium (in Connecticut) and was mesmerized by the marine life. Even today, I can quietly watch sea life and lose track of time in its

grace and beauty. I love trying to convey the weightlessness of the swimming creatures in my drawings, as well as their nuances of shape and texture. Learning about marine life is important and enjoyable to me as I attempt to bring them to life in my drawings.

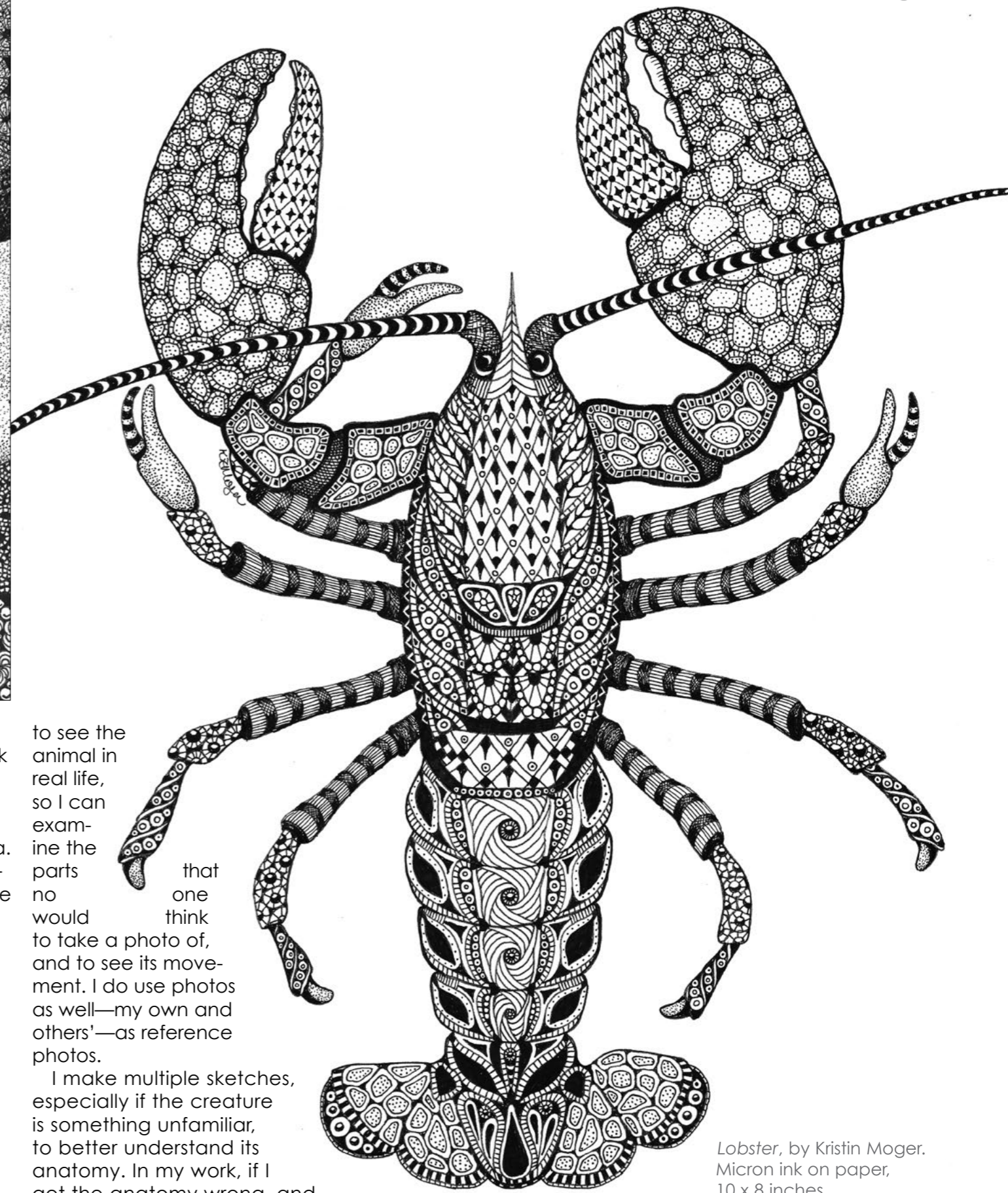
The colors of marine life can be astoundingly beautiful. Trained

as a painter, I understand how color works in art, and I love color. But as an artist, it is a creative challenge to me to create something astoundingly beautiful and compelling just



Dolphins, by Kristin Moger.
Micron ink on paper,
8 x 10 inches

Kristin Moger



Lobster, by Kristin Moger.
Micron ink on paper,
10 x 8 inches

from black and white patterns, and limiting myself to ink on paper. I want the work to have depth that keeps the attention of the viewer over and over again, as well as evoke emotion and sympathy for the creature.

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

KM: It is hard to say what, in a lifetime of education and experiences, influences my current work. But, as I reflect back to my early years, I loved and studied architecture, biology, textiles, calligraphy, illuminated manuscripts, old etchings and lithography, and the Renaissance masters' painting and drawing. I have also loved learning about indigenous peoples around the globe and how

they express themselves through art. So many groups of people use pattern and designs to decorate common objects in their lives, and I have undoubtedly been influenced by that in my own work. None of this is purposeful, but we all acquire visual information over our lives, translate it, and it emerges as part of us, not always knowing exactly from where it came.

In 2013, at the end of my health sabbatical, I decided to take a free workshop on "tangling" at a local library, just for fun. I always loved to doodle (my schoolbooks were covered with it), so I thought it would be a way to start some joyful playing again after a long stretch of hard life. As I started the simple task of drawing repetitive shapes, my mind

became a whirl with images and possibilities. The work harkened back to all of the things I loved about art from the beginning, and related (in my mind) to the most recent work I had been doing in 3-D mixed media. The artistic problem was the same—to create a dynamic cohesive whole from unlike parts using pattern and design. But it was so much more than what I had been doing previously. It did not have the limitations of resources and space, and it utilized my gift and love of drawing!

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

KM: Each drawing starts with research—the anatomy, habitat and behavior of the animal. I prefer

to see the animal in real life, so I can examine the parts no one would think to take a photo of, and to see its movement. I do use photos as well—my own and others'—as reference photos.

I make multiple sketches, especially if the creature is something unfamiliar, to better understand its anatomy. In my work, if I get the anatomy wrong, and

that
one
would
think



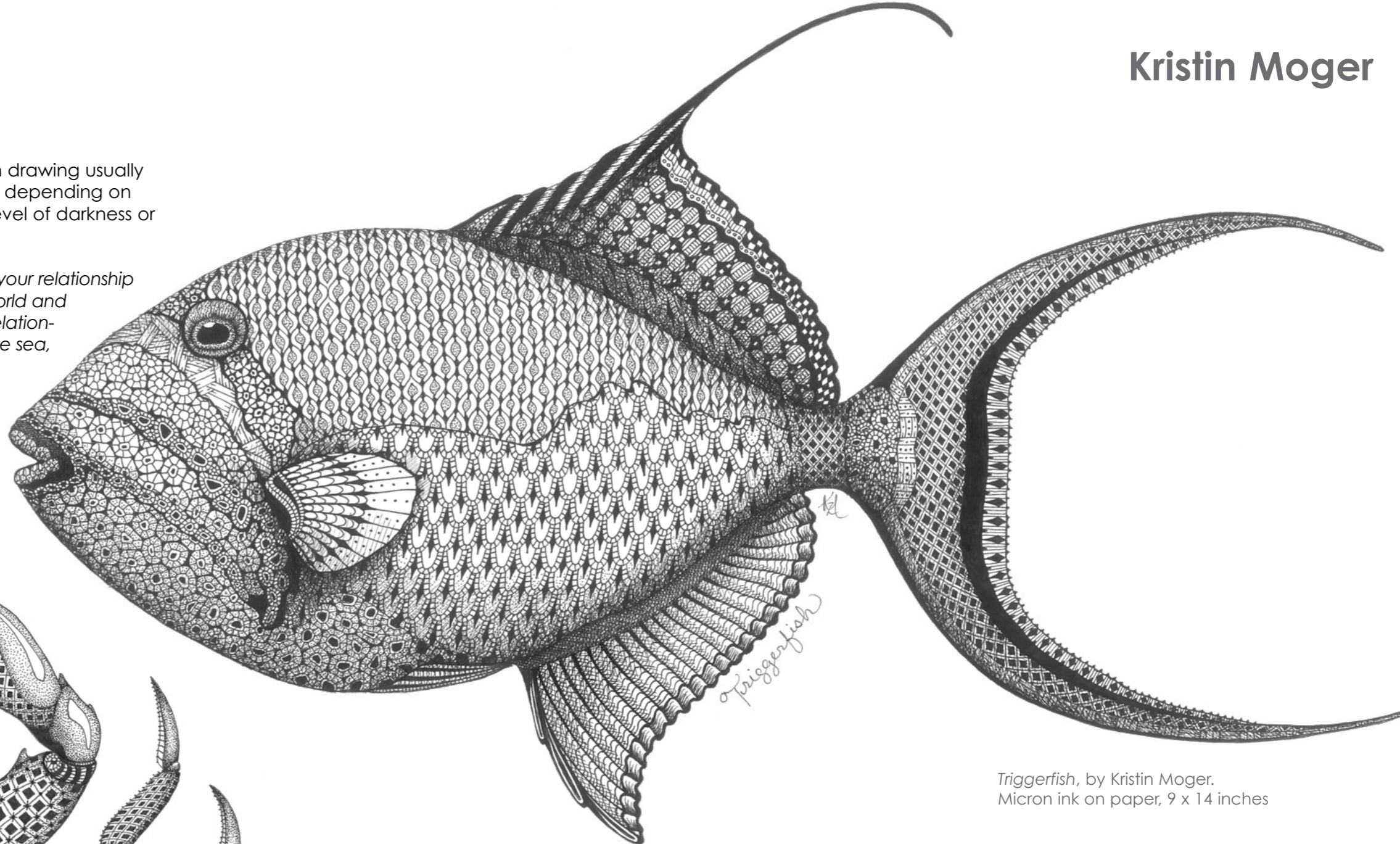
then put all these crazy patterns on it, the drawing will not be cohesive and pleasing. That is a whole other artistic style!

After I decide on and sketch the main composition, I outline the main lines in ink. Then the fun starts! I usually have one pattern in mind for a specific area and lay that in. Then I slowly and meticulously fill in areas with various patterns to create the form, texture, depth and mood of the drawing. I think strategically about the patterns I choose—the direction and shapes matter. I always have to guard against going too dark too fast—there is no erasing in this medium! I frequently use stippling (tiny pin-point dots) to create underwater effects. This is very labor-intensive

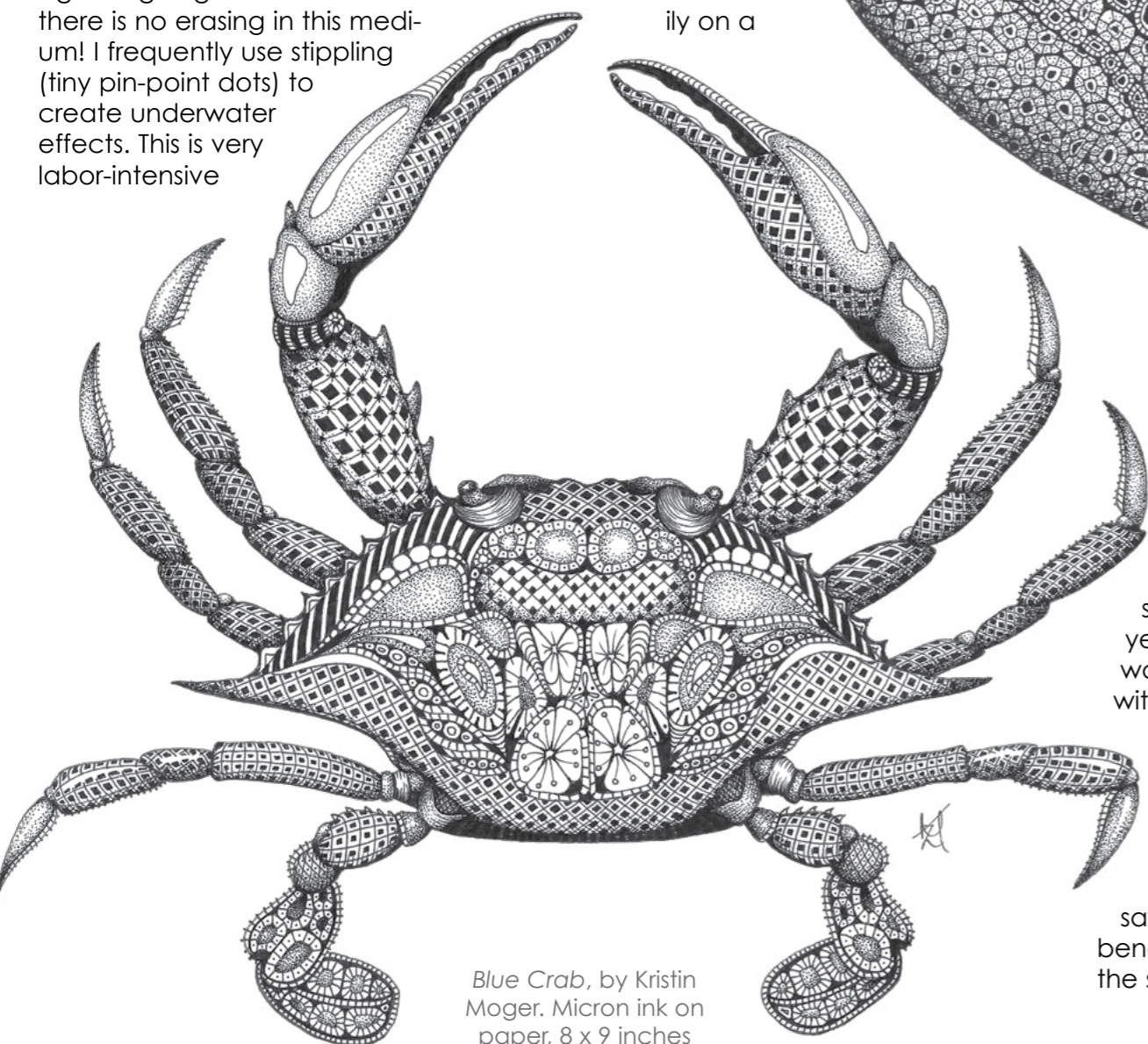
work—an 8 x 10 inch drawing usually takes 30 to 50 hours, depending on the detail and the level of darkness or stippling it has.

X-RAY MAG: What is your relationship to the underwater world and coral reefs? In your relationship with reefs and the sea, where have you had your favorite experiences?

KM: I think I was 10 when my parents took the family on a



Triggerfish, by Kristin Moger. Micron ink on paper, 9 x 14 inches



Blue Crab, by Kristin Moger. Micron ink on paper, 8 x 9 inches

three-week sailing trip around the Virgin Islands. They were very skilled sailors and had sailed these areas for years. We snorkeled about every day. I was able to get up close and personal with gorgeous reef fish, coral, anemone, sea urchins (ouch!), and a very nosy barracuda that needed to investigate my mask. I remember holding my breath and gently backing away from that four-foot torpedo with teeth. Later that evening, we saw a number of barracuda tussling beneath our grill as it dripped juice into the sea. It reminded me of the wildness of

the ocean and that I was just a visitor. The beauty of the reefs that we got to explore have stuck with me through my life.

X-RAY MAG: What are your thoughts on ocean conservation and coral reef management and how does your artwork relate to these issues?

KM: I love the ocean and recognize that it really is a resource that we need to guard and protect. Over the last 20 years, I have been learning more about conservation and what I can do now to cut down on waste and pollution. My husband and

I have converted to solar power in our home, with the help of government incentives. I experience the waste that washes up on the shore every day as I walk the Connecticut shore in the summer (with a bag to collect trash as well as one to collect rocks and shells). I continue to seek out applicable education in areas of abuse and protection of our oceans and vulnerable reefs and seek to collaborate with rescue and conservation organizations.

The materials that I use to create my art are minimal, and I repurpose, reuse and recycle as much as possible in order to cut waste. Who does not love a fabulous

Manatee, by Kristin Moger.
Micron ink on paper,
8 x 10 inches

Kristin Moger

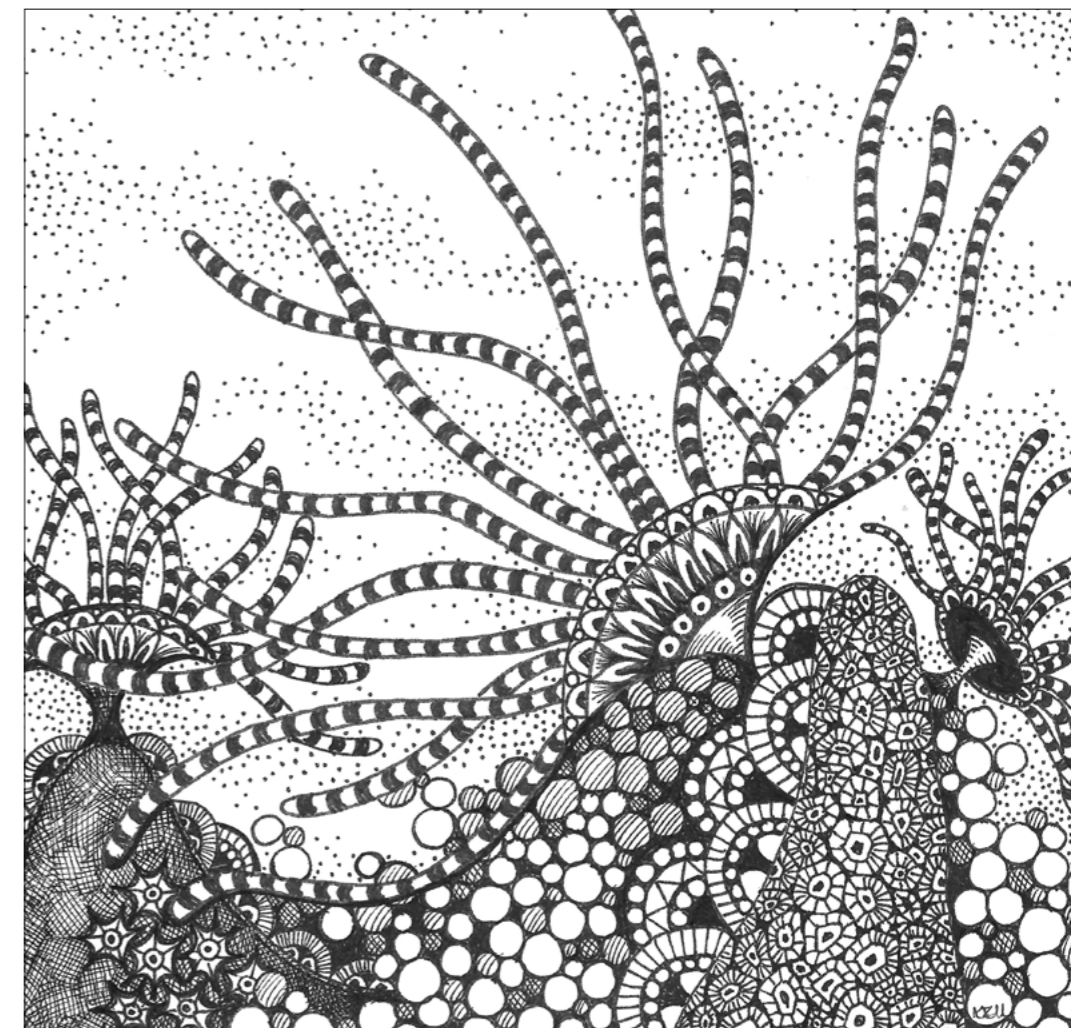
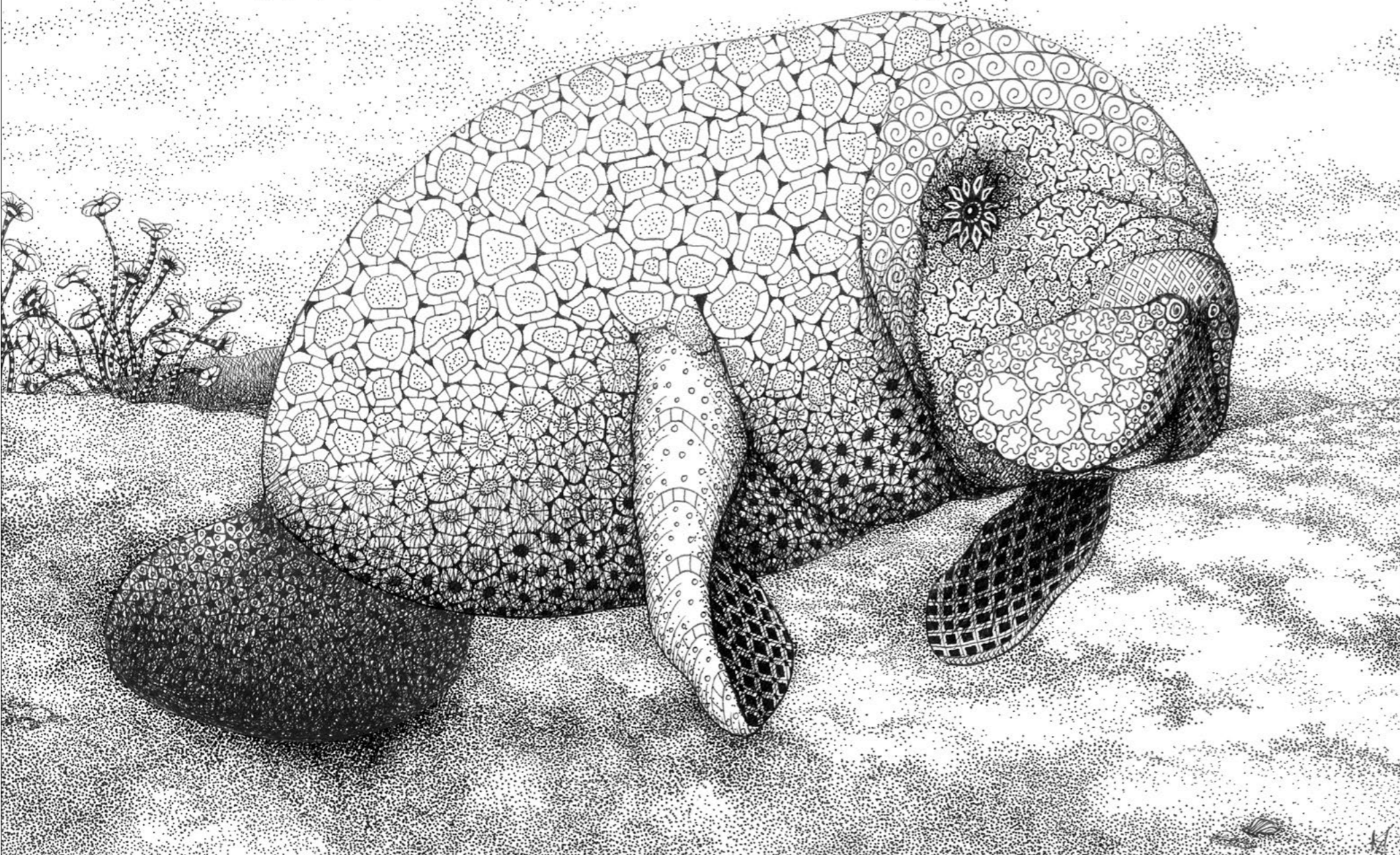
to change their interests and style over time, and you want the freedom to do that and the tools to do it. Then follow your passion, work hard and be a person of integrity. It will show in your art, and your collectors will want to connect with you and share your artwork with others.

X-RAY MAG: How do people—adults and children—respond to your works?

KM: A jeweler friend of mine observed, after watching me sell my work at a fine art show, that my clientele was “all over the map.” It’s true. My work appeals to a wide array of peo-

ple. Science- and math-minded people love the patterning and visual references to cell structures and other microscopic images. Biologists have appreciated the accuracy of my anatomy. Artists are amazed by the detail and precision of my work, which comes very naturally to me. Viewers enjoy the surprise of seeing a recognizable animal that they love, then realizing that it is composed of patterns. They are drawn closer to the image as they see more and more detail.

Parents frequently ask children to find certain animals in my display, or what animals they see. It amazes me that even the wee ones (who I can barely under-



Anemone, by Kristin Moger. Micron ink on paper, 5 x 5 inches

vintage frame and pre-used shipping materials?

X-RAY MAG: What is the message or experience you want viewers of your artwork to have or understand?

KM: I create my artwork from a place of joy, peace and a great

appreciation for all living things. I want my art to connect with people on a heart level, evoking appreciation, joy and compassion so that they will be inspired to protect what they love.

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?

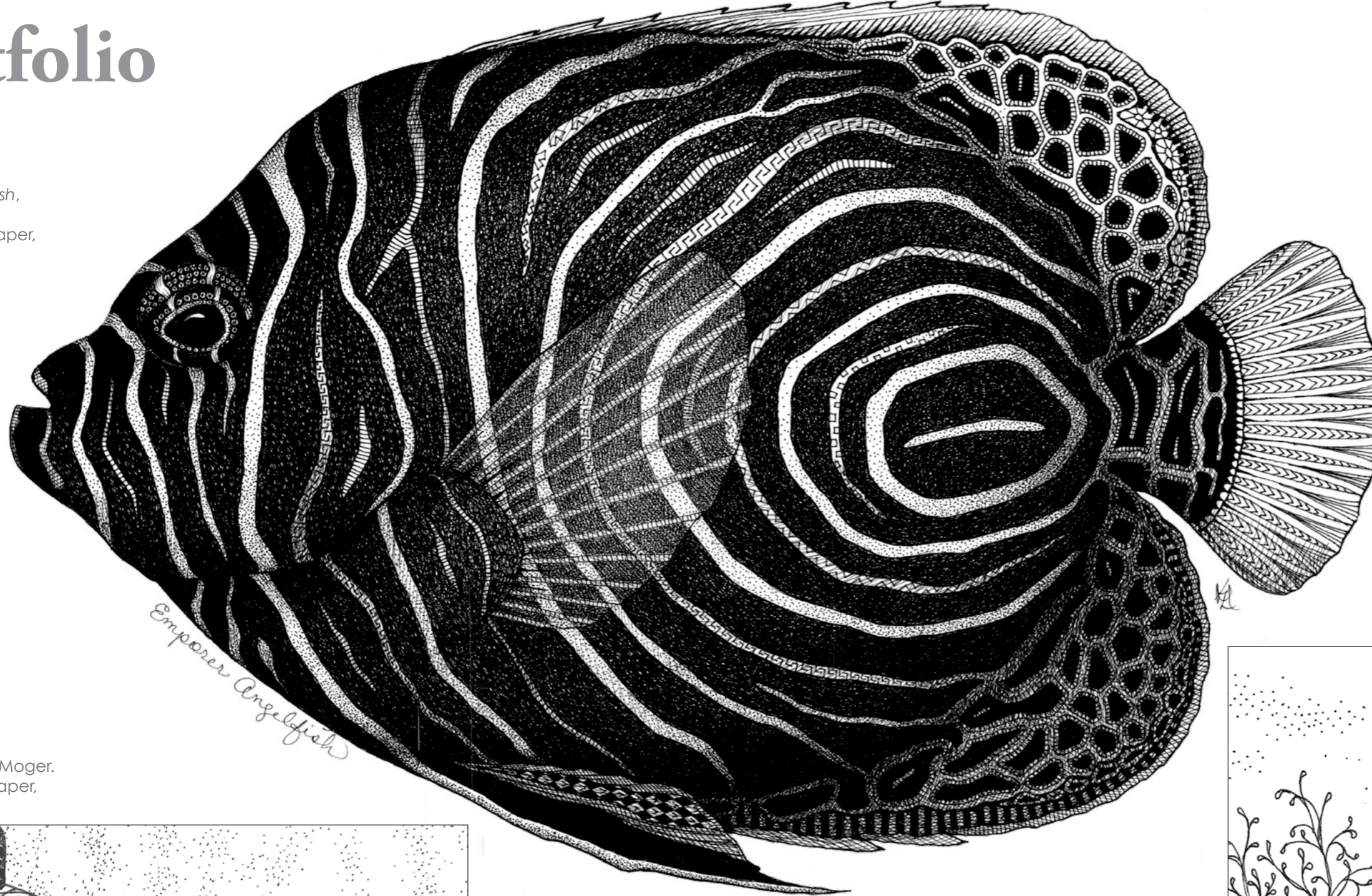
KM: It is hard to be a full-time artist. It takes discipline, courage and vision that the the artist alone is responsible to foster. Gratefully—because of technology—tools, training, connections and support are more available than ever.

Young artists will find it easier to access those resources than those of us who began working as artists before the Internet era. But if you love the ocean and its treasures—learn everything you can. I tell students to stuff their toolboxes with knowledge and skills, even if it does not precisely fit what you think you want to do. Artists tend

portfolio

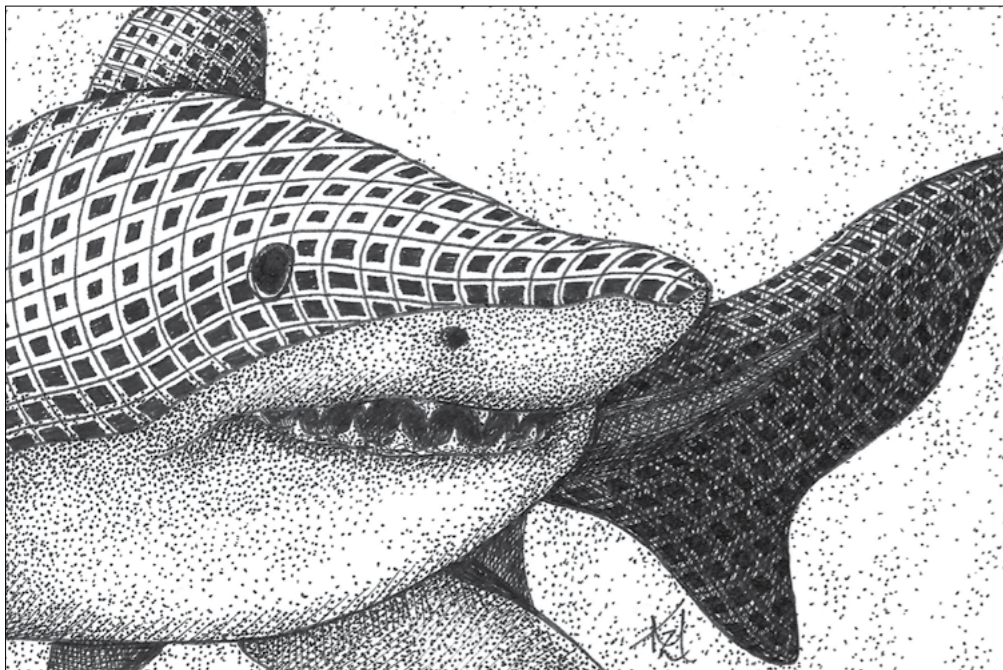
Kristin Moger

Emperor Angelfish,
by Kristin Moger.
Micron ink on paper,
11 x 14 inches



Emperor Angelfish

Shark, by Kristin Moger.
Micron ink on paper,
3 x 5 inches



stand) still recognize the animals, despite there being no color and are composed of crazy patterns.

One of my biggest delights is when a child spends a long time looking at my work, goes away to see other people's fabulous artwork at the show, and then comes back announcing that they have chosen to get their "very first real art piece" from me. The sparkle in their eyes and the delight on their face makes my day.

X-RAY MAG: What are your upcoming projects, art courses or events?

KM: I am hoping to be able to show my work again this year at large art festivals. It invigorates me to interact with people as they encounter my work, reminds me of the purpose of my art, and connects me to other humans as they share their stories with me.

I have identified some conservation and rescue organizations that I hope to partner with on projects and outreach events this year. Making connections between these organizations and artists for mutual benefit is something I believe in.

I also plan to create more cre-

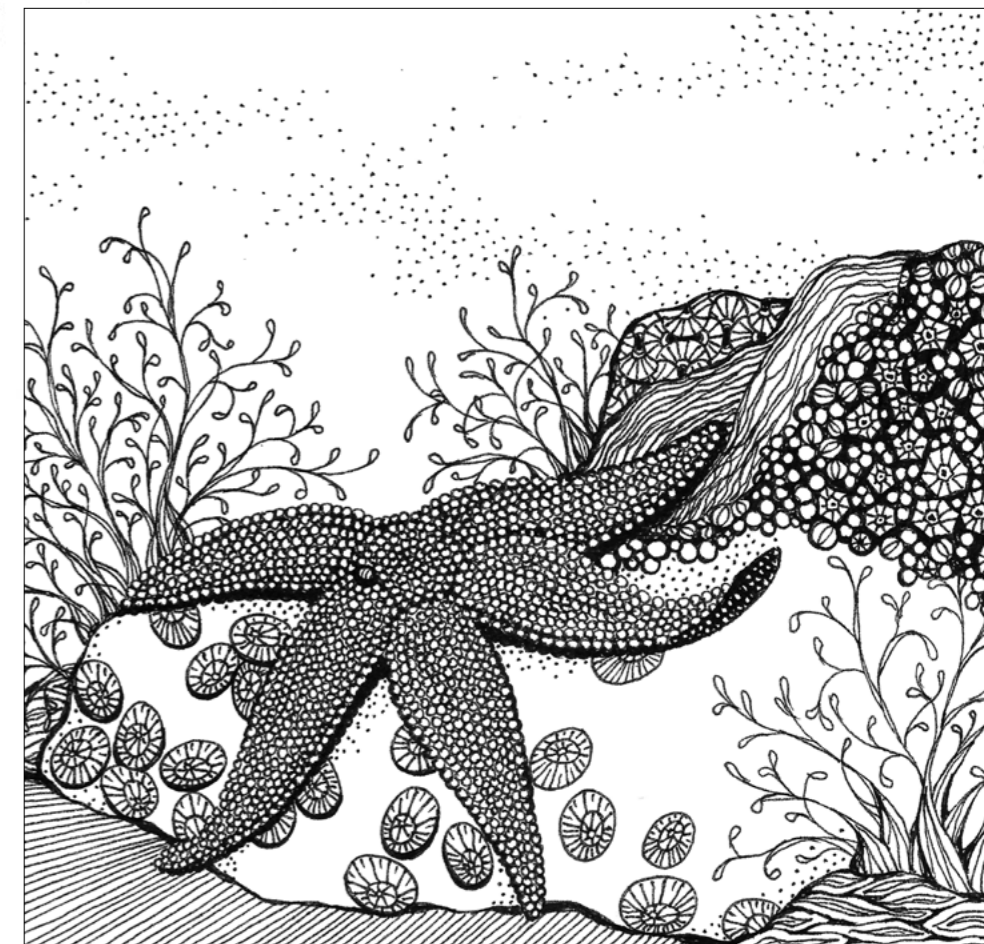
ative process videos this year to share on Instagram and YouTube so that people can see "the method behind the madness."

X-RAY MAG: Lastly, is there anything else you would like to tell our readers about yourself and your artwork?

KM: I love doing commissioned work. It gives me an opportunity to learn new things and hear people's stories. People matter to me, and their stories matter. I am always honored when people choose to share something of their lives with me and am equally honored when they desire to know me too.

You can get details about custom commission work on my website at: kristinmogerart.com/custom-commissions. ■

For more information or to purchase prints, please visit the artist's website at: kristinmogerart.com.



Star Fish, by Kristin Moger. Micron ink on paper, 5 x 5 inches

