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Number 93



Seychelles Islands
Alphonse Atoll

Red Sea
Sudan Safari

Bosnia
**Clearing
Mines**

Wrecks
Scapa Flow

Whales
**Humpback
Migration**

UW Photo
White Balance

INDONESIA

Lembeh & Bangka

COVER PHOTO BY KATE JONKER

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Photo by Kate Jonker (katejonker.com)

Lobster under a ledge, Alphonse Atoll, Seychelles Islands. Photo by Brandi Mueller.



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Time for prudent choices

Earth and its biosphere can be viewed as one huge machine, which turns solar energy, elements and chemical compounds into all the resources we need to exist: oxygen to breathe; plants to harvest; fish in the oceans; animals to provide meat, milk and do work; forests to provide wood and so on.

So, it has always baffled me, even as a young schoolboy, that there have been so many conflicts—sometimes violent confrontations—between environmentalists and corporate interests. Did people not see that our entire economy and welfare rested on the resources that nature provided for us?

Soon enough, I came to realise that where such conflicts arose, it was mostly because of some limited and short-sighted interest of a select minority over that of the common good, often driven by greed and disregard for the long-term protection of valuable and essential natural resources.

Nature is exploitable, and that is a wonderful gift, but only within certain sustainable limits. If we harvest less than these limits, the crops and forests will regrow, fish stocks will replenish themselves and so on. The dynamics are

really not that complicated, just basic math—and I am not stating anything novel here.

But as fisheries in particular have learned the hard way, overfishing leads to collapse of entire fish stocks, taking the economy with it. As a result, everyone loses—both environmentalists and corporate interests.

Ancient cultures were often very savvy in finding ways, or engineering solutions, to make nature work for them. For instance, the Chinese placed chicken coops across fishponds. Unused fodder and faeces went into the pond. But instead of turning the pond into a cesspool, the waste fertilised both algae and water weeds. These, in turn, were grazed upon by a mix of silver carp and grass carp. Silver carp are filter-feeders, which feed on algae and phytoplankton. Grass carp are herbivores, which graze on water weeds. By carefully balancing the ratio of chickens, silver carp and grass carp, a high sustainable yield of both fish and fowl was produced while taking care of the waste. That is smart thinking.

What is not smart thinking is the extensive burning of the rainforests (in the Amazon primarily, but

also in Southeast Asia). We, who follow the news, are all witnesses to this devastation. And with climate change, we are also witness to the collapse of the Great Barrier Reef, which started forming 25 million years ago.

On the other hand, in a very short time span, the use of single-use plastics has become socially unacceptable. Individuals, households and businesses have taken measures to change their habits, procedures and purchases in order to prevent plastics from ending up in nature. I believe these actions are happening because it is something we all can and want to do.

Protecting the rainforests and the reefs does, however, require intervention on a higher level. I call upon all responsible politicians to step up to the plate and set short-sighted and petty differences aside in a concerted effort to save our beautiful blue planet for both ourselves and the next generations.

Please make sure they do.

— Peter Symes
 Publisher & Editor-in-Chief



News edited
by Catherine GS Lim

NEWS

from the deep

Corals seek cooler pastures in subtropical waters

Coral reefs have been seeking new pastures, as rising temperatures heat up their natural habitats.

Over the last four decades, coral reefs have been progressively shifting their homes from equatorial waters to more temperate regions.

The reason? Climate change.

"Climate change seems to be redistributing coral reefs, the same way it is shifting many other marine species," said Nichole Price, a senior research scientist at Bigelow Laboratory for Ocean Sciences and lead author of the paper on the topic.

Based on the study, which was published in the *Marine Ecology Progress Series* journal, the number of young corals on tropical reefs has declined by 85 percent, and doubled on subtropical reefs in the last four decades.

"The clarity in this trend is stunning, but we don't yet know whether the new reefs can support the incredible diversity of tropical systems," said Price.

Drifting coral larvae

As the ocean temperatures rise, the equatorial waters become too warm

for corals, prompting drifting coral larvae to seek more comfortable environments—in this case, the subtropical regions—to settle down in.

However, this option is not available to all coral species, as this is based on how far the

coral larvae can travel before they exhaust their fat stores. This scenario is being played out on both the north and south of the Equator and is perfectly mirrored on either side.

"We are seeing ecosystems transition to new blends of species that have never

coexisted, and it's not yet clear how long it takes for these systems to reach equilibrium," said Satoshi Mitarai, an associate professor at Okinawa Institute of Science and Technology Graduate University and an author of the study. "The lines are really starting to blur about what a native species is, and when ecosystems are functioning or falling apart."

At present, researchers do not know which other species like coralline algae are also expanding into new territories, and if they are not, how well the young corals can survive without them.

Diversity on new reefs

Price hopes to investigate the relationships and diversity of species in the new reefs, so as to understand the dynamics of the new ecosystems.

"So many questions remain about which species are and are not making it to these new locations, and we don't yet know the fate of these young corals over longer time frames," Price said.

"The changes we are seeing in coral reef ecosystems are mind-boggling, and we need to work hard to document how these systems work and learn what we can do to save them before it's too late." ■ SOURCE: BIGELOW LABORATORY FOR OCEAN SCIENCES



NICHOLE PRICE (BIGELOW LABORATORY FOR OCEAN SCIENCES)

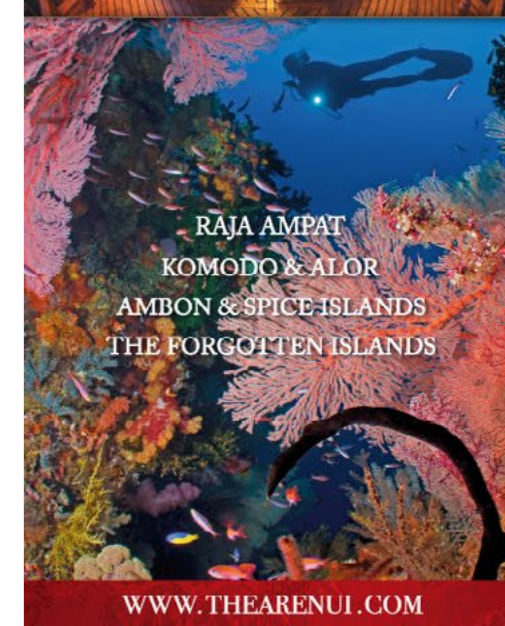
Coral larvae being collected at Palmyra Atoll National Wildlife Refuge. This allows researchers to enumerate the number of baby corals settling on a reef.



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Kelp forests provide food and shelter for many marine species. Sea urchins are able to break up this tough giant algae, leaving nutritious waste behind, which benefits bottom-dwelling critters, thus contributing to a healthy food chain.

Study reveals sea urchin's important role in kelp forest ecosystem

Mention “sea urchin” and the image that materialises in your mind is essentially a ball of spikes. Have you wondered about this animal's role in the ecosystem?

As divers, we stay out of the sea urchin's path to avoid a nasty sting. In the media, reports abound of sea urchins stripping

away swaths of kelp forest, leaving behind a barren landscape.

Before we dismiss the sea urchin's role as merely pests in the underwater realm, consider a new study in the *Proceedings of the Royal Society B* journal that beings to light their role in the kelp forest ecosystem.

Breaking up tough kelp

Researchers have discovered that sea urchins play the essential role of breaking up the tough kelp

into a more manageable form that can be eaten by detritivores, scavengers that live on the kelp forest floor.

Giant kelp is hard to digest, and is unpalatable compared to single-celled phytoplankton. Enter the sea urchin. They “process” the kelp in two ways. First, as these messy eaters consume the kelp, bits and pieces of kelp are scattered on the sea floor.

Nutrient-rich waste

Secondly, they digest very little of what they consume. In their guts is a rich assortment of microbes, some of which pull nitrogen from the seawater, enriching their urchin's waste. In fact, some studies have indicated that their feces may be more nutritious than fresh algae.

In this way, they help to retain the food within the kelp forest ecosystem. As Christie Yorke, a postdoctoral scholar at UC Santa Barbara's Marine Science Institute,



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states, “without the urchins there, it's possible that this kelp would just get washed out of the kelp forest by the current and be unavailable altogether.”

Indeed, kelp that is washed out of the kelp forest may wash up on beaches, get swept out to the open ocean or drift into the deep sea.

Kelp litter benefits bottom dwellers

In their study, the researchers set up some tanks with kelp and detritivores of different species. Half of the tanks had purple sea urchins (*Strongylocentrotus purpuratus*) and the other tanks did not. To find out the extent the “residents” consumed the kelp, they spiked the kelp with rare forms of carbon and nitrogen by letting it to photosynthesise in seawater enriched with these isotopes for three days. After 28 days, they compared the specimens' isotope measurements to baselines established

beforehand.

“We found that a whole host of detritivores can take advantage of kelp as long as urchins are there to process it for them, whereas otherwise they can't,” said co-author Bob Miller, a research biologist at the Marine Science Institute. It was discovered that only one species, a type of brittle star, ate a significant amount of kelp in the absence of sea urchins. Nonetheless, the brittle stars used much more kelp when the urchins were present, added Yorke.

The team also took into account 11 years of historical data collected by the Santa Barbara Coastal Long Term Ecological Research project (SBC LTER), which included the amount of kelp litter over time and sea urchin abundance and biomass. They then concluded that the amount of kelp that urchins shred and process could comprise a significant portion of the resources avail-

able to the creatures that live on the seafloor.

Unsung heroes

“Urchins are generally cast as the villain in the kelp forest,” said Miller, “but this study shows that they can play an important role as an intermediary in the food web.”

“We should not go around and vilify or smash sea urchins before we understand their role in the ecosystem better,” he added. “They're not necessarily always the bad guy they're made out to be.”

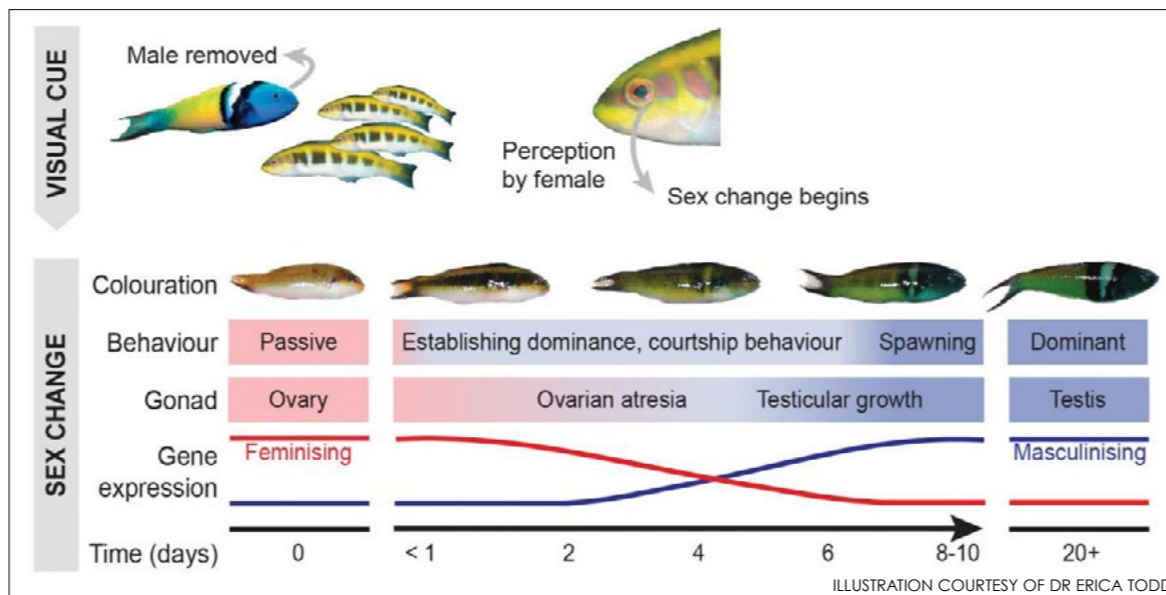
■ SOURCE: MARINE SCIENCE INSTITUTE OF THE UNIVERSITY OF CALIFORNIA, SANTA BARBARA



Purple sea urchins, *Strongylocentrotus purpuratus*, (above and right inset)

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Sex change in the bluehead wrasse: Loss of a dominant male signals sex change in a female. The dramatic changes in coloration, behaviour and gonadal anatomy are orchestrated by changes in gene expression.



How some female fish turn into males

A new study unlocks the secrets of sex change in fish.

In about 500 fish species, a natural but mind-blowing process takes place when the dominant male dies or is taken from the group—the largest female in the group takes his place. Literally. That is, “she” turns into a “he”.

Dr Erica Todd, of the Department of Anatomy at the University of Otago in New Zealand and co-lead author of a new study, elaborates: “When a dominant male [bluehead wrasse] is lost from a social group, the largest female transforms into a fertile male in 10 days flat. Females begin this transformation within minutes, first changing colour

and displaying male-like behaviours. Her ovaries then start to regress and fully functional testes grow in their place.”

Genes turning on and off

But how does this complete sex reversal come about? The study, led by the University, appears to have unlocked some clues about the process at the genetic level. Its findings were recently published in the *Sciences Advances* journal.

The researchers discovered how and when specific genes were turned on and off in the brain and gonad to enable the sex change to take place.

“Our study reveals that sex change involves a complete genetic rewiring of the gonad. We find that genes needed to maintain the ovary are first turned off, and then a new genetic pathway is steadily turned on to promote testis formation.”

All this starts when a gene called aromatase, which is responsible for making the female hormone estrogen, is turned off. Currently, researchers do not know what triggers the gene to turn off, but the stress

of social change caused by the loss of the dominant male may be an important signal.

Cellular memory

Co-lead author PhD candidate Oscar Ortega-Recalde, also from the Department of Anatomy, said that the transformation appeared possible through changes in cellular “memory”.

He explained, “In fish and other vertebrates, including humans, cells use chemical markers on DNA that control gene expression and remember their specific function in the body. Our study is important because it shows that sex change involves profound changes in these chemical marks, for example at the aromatase gene, thus reprogramming cell memory in the gonad towards a male fate.”

“Understanding how fish can change sex may tell us more about how complex networks of genes interact to determine and maintain sex, not only in fish but in vertebrate animals generally,” said Todd.

Potential benefits

The team’s discovery holds the potential of future applications in tissue and organ engineering, with potential benefits to medical science. In addition, the aquaculture industries may also benefit, as some fish species with commercial value are amongst those species that can change sex. ■

SOURCE: UNIVERSITY OF OTAGO

Fish populations altered due to coral bleaching

Researchers at Lancaster University have discovered that bleached coral reefs experience lasting change to their fish communities.

Specifically, there would be less large predator fish (like snappers and groupers) and very small fish (like damselfish and butterflyfish). In their place would be more seaweed-loving fish (like rabbitfish and parrotfish) and invertebrate-feeding fish (like emperors and wrasses).

This was because the bleaching had caused the collapse of the fish’s habitat structure and this allowed seaweed to take over the space. Thus, the number and composition of fish was substantially changed.

Writing on their findings in the *Global Change Biology* journal, the researchers related their study on the coral reefs in the Seychelles. There, they tracked reef recovery (after a bleaching event in 1998) before another major bleaching event struck the reefs in 2016.

It was found that despite the recovery period between the two coral bleaching events, the original fish populations did not recover to pre-bleaching numbers.

Lead author Dr James Robinson, of Lancaster University, said, “Although the 18-year period between major mass bleaching events allowed corals to recover on some reefs, we found evidence that fish populations were not able to return to their pre-bleaching levels, and they were substantially altered on the reefs that become dominated by seaweeds.”

According to other studies, the time period between bleaching events is now reducing, and it is typically less than 10 years.

Given that the respite between the two bleaching events in the University of Lancaster’s study was 18 years and that was still insufficient for fish populations to fully recover, the researchers anticipate that other reefs will experience similar shifts, with bleaching events becoming a more frequent occurrence. ■

SOURCE: LANCASTER UNIVERSITY



A male bluehead wrasse (top left) defends a group of females (yellow).



Coral reef affected by a bleaching event, Grand Anse Praslin, Seychelles Islands

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wreck rap



Historical photo showing the upperworks of the German battle-cruiser SMS *Hindenburg* jutting out of the water at Scapa Flow

Text by Lawson Wood

Separated from the northern coast of mainland Scotland by only the six-mile-wide channel of the Pentland Firth, Orkney has some 90 islands, only 18 of which are inhabited. In the southern region of the archipelago is the large area of sheltered water known as Scapa Flow. Scapa Flow was the base chosen by the British Admiralty as the home of the Grand Naval Fleet. This deep, formidable, cold, natural harbour has served the warring nations' fleets since the time of the Vikings, the Knights of St. John, the Spanish Armada and the American War of Independence. Scapa Bay was also the rendezvous point for merchant ships en route to the Baltic Sea during the Napoleonic Wars from 1789 to 1815.

Graeme Spence, maritime surveyor to the Admiralty, said in 1812: "... the art of Man, aided by all the Dykes, Sea Walls or Break-Waters that could possibly be built could not have contained a better Roadstead than the peculiar situation and extent of the South Isles of Orkney have made Scapa Flow . . . from

whatever point the Wind blows a Vessel in Scapa Flow may make a fair wind of it out to free sea . . . a property which no other Roadstead I know of possesses, and without waiting for Tide on which

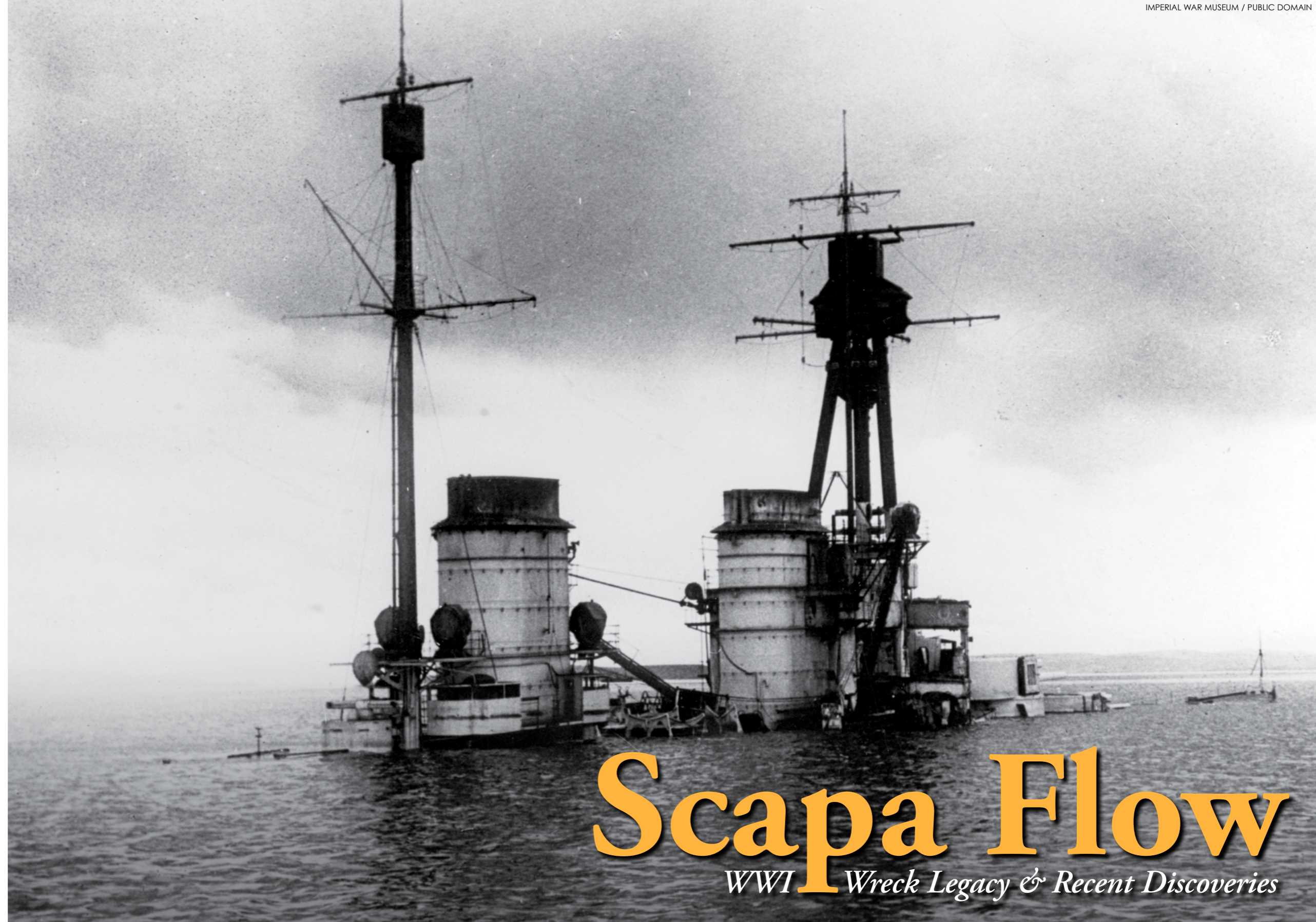
account it may be called the Key to both Oceans."

History

After a rather confusing end to the Battle

of Jutland on 31 May 1916, when 25 ships were lost from both sides and with both navies claiming a moral victory, the German fleet returned to her home bases at Kiel & Wilhelmshaven and

languished under extreme duress until the end of WWI. As part of the terms of the surrender, it was agreed that the entire German High Seas Battle Fleet (except the submarines, which went to Harwich)



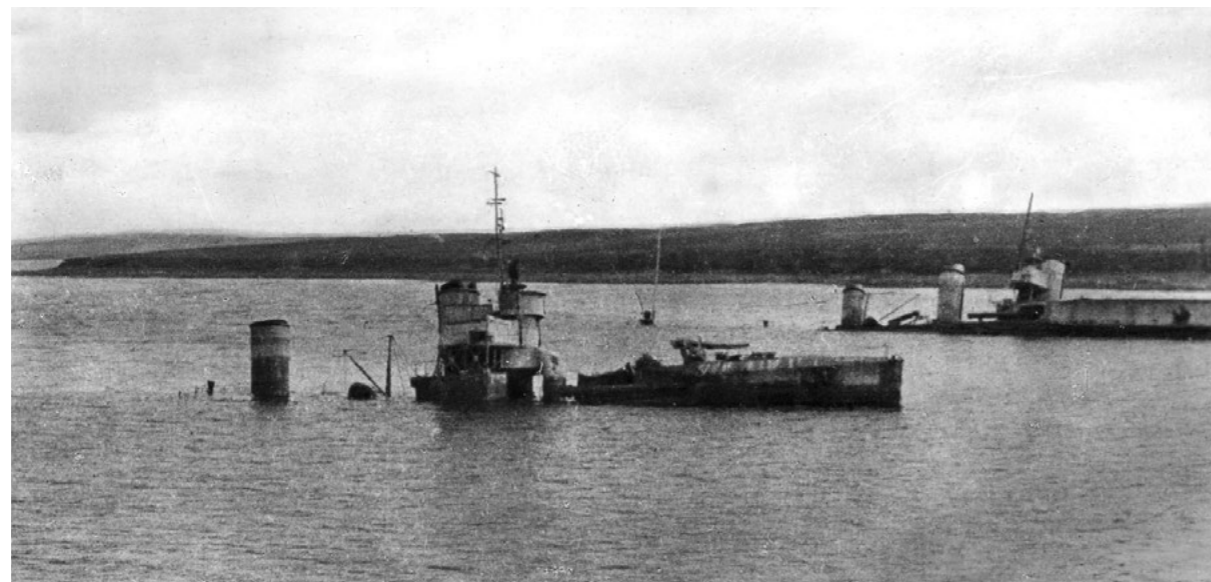
Scapa Flow

WWI *Wreck Legacy & Recent Discoveries*





Historical photo showing destroyers of the German High Seas Fleet sinking in Scapa Flow



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would be interned at Scapa Flow until the Allies could make a decision as to their fate.

The Orcadians were no strangers to large numbers of ships on their doorstep, but on 23 November 1918, they woke up to witness the greatest naval spectacle ever seen on the planet. Almost the entire naval fleets of both Germany and the United Kingdom were at anchor in Scapa Flow. When you consider that the population of the islands numbered around 20,000 at the time, this huge combined fleet manned by over

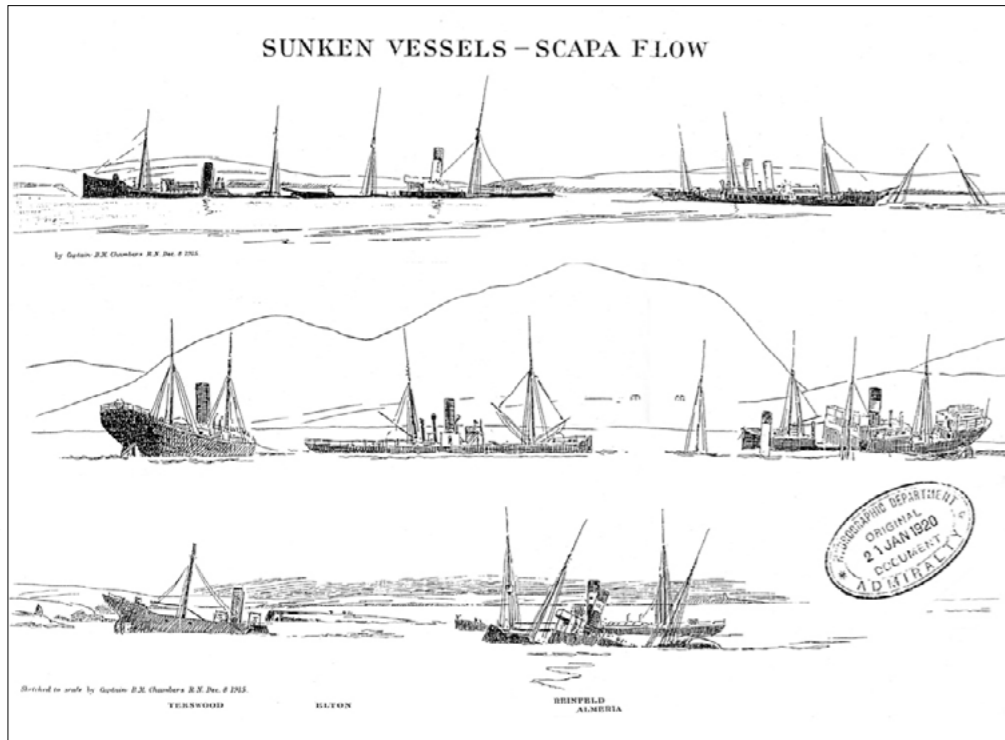
70,000 naval personnel and 74 German ships, which included its 11 best battleships and all six of its battlecruisers.

Time dragged on and many of the disgruntled German Navy's crew were moved to detention camps before being repatriated. Taking advantage of the internment to save the Imperial Fleet from further disgrace and not having been informed properly over the reasons for the Armistice being surrendered on 21 June 1919, Admiral Ludwig von Reuter was convinced that war conditions were to be reinstated

and that his fleet was to be used by their enemies against their homeland. The German Commander thought that the Treaty of Versailles would leave them with little choice but to scuttle their own fleet, lest the Allies get their hands on an entire navy.

Whilst (coincidentally) virtually the entire British Navy left Scapa Flow on exercise on Midsummer's Day in June 1919, Admiral Reuter sent out a coded message to his entire fleet (this coded message was actually delivered by a British dispatch tender!). This message instructed each ship to open their seacocks, break all valves and scuttle the entire fleet.

Much to the astonishment of a party of Orcadian schoolchildren who were on a field trip that day, they watched the German crews whooping and shouting for joy as they made off in small boats from the sinking fleet. This culminated in the largest intentional sinking in worldwide naval history, where over 400,000 tons of modern shipping was lost that day. The British Navy were immediately alerted, returned as fast as possible and even managed to beach a few of the smaller ships; however, the fleet arrived too late for most of the sinking.



Historical illustration showing the sunken vessels in Scapa Flow



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Historical photos of salvage work at Scapa Flow (right), two German motor torpedo ships, or destroyers, aground at Scapa Flow (lower right), and the scuttled SMS *Derfflinger* (far right)



Salvage

It did not take long for the locals to start that “diving lark.” Seeing the potential for some easy scrap metal, the first salvage company started three years later by the Stromness Salvage Company, which raised the Light Cruiser *G-89* off the Isle of Cava. They eventually sold this to Cox & Danks.

But before Frank Cox and his team moved in, the Scapa Flow Salvage and Shipbreaking Company opened for business in 1923 and initially bought four destroyers. They hoped to raise these ships by running hawsers under the hull, so that when the rise and fall of the tide raised them up sufficiently to get them off the seabed, the salvagers could pull them into shallow water. They would repeat the process until the ship was above the surface at low tide, where the water in the hull would then be pumped out and the vessel could float off easily on the next high tide.

However, before they could start this enterprise, Cox moved in with all of the equipment and personnel required to raise a fleet of sunken ships. Cox had earned his fortune and reputation in the

scrapping of railway engines and quickly recognised the potential on offer in Scapa.

The greatest marine salvage operation ever undertaken on the planet was set to begin with quite exemplary and innovative techniques. This basically consisted of building huge towers, which were attached to the hulls of the upturned ships. The water in these tubes was then pumped out, and a hole was cut into the hull to allow the hard hat divers access into the wreck’s interior, where they proceeded in blocking off all the holes in the rest of the ships. Compressed air was then pumped into the hulls, filling the ships with pressurised air and simply floating them off the bottom. Employing this method, Cox & Danks raised the heaviest ships from the deepest water—and just about everything else in between!

Using equipment gained from Germany as part of the reparations for their “illegal” actions of sinking their fleet, Cox



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raised 32 ships in the next eight years. He then sold out to the Alloa Shipbreaking Company, which changed its name to Metal Industries and continued the salvage works from 1934 until 1947. Using the same techniques as Cox & Danks, Metal Industries even managed to raise the intact *Derfflinger* at 28,000 tons, which was the largest ship ever raised from the deepest water at 45m (150ft).

Arthur Nundy then took up the challenge in 1956 and systematically blew the guts out of most of the remaining ships to get at the valuable scrap inside. Unfortunately, he was the person

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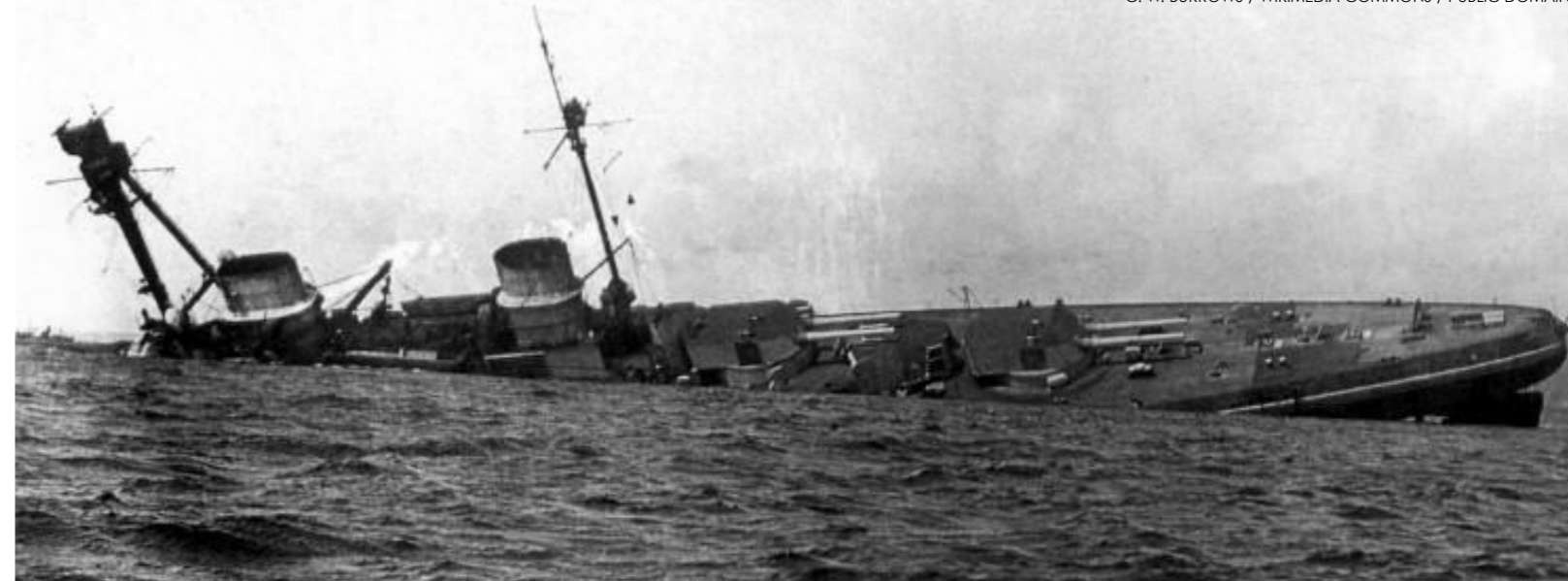
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responsible for the sad fate of the remaining deep battleships, which now have horrendous cavities in their hulls, resulting in the hastening of the deterioration of this once grand fleet. He finally sold out to Scapa Flow Salvage in 1972, which worked on the remains of the sunken fleet until the removal of the scrap became no longer viable.

Wreck legacy

Virtually all of the German High Seas Battle Fleet were subsequently raised and scrapped. But by the time the value of scrap metal had dropped, the state of the remains

left behind were not worth further effort. Those that were left are what we all dive on now. This comprises the following:

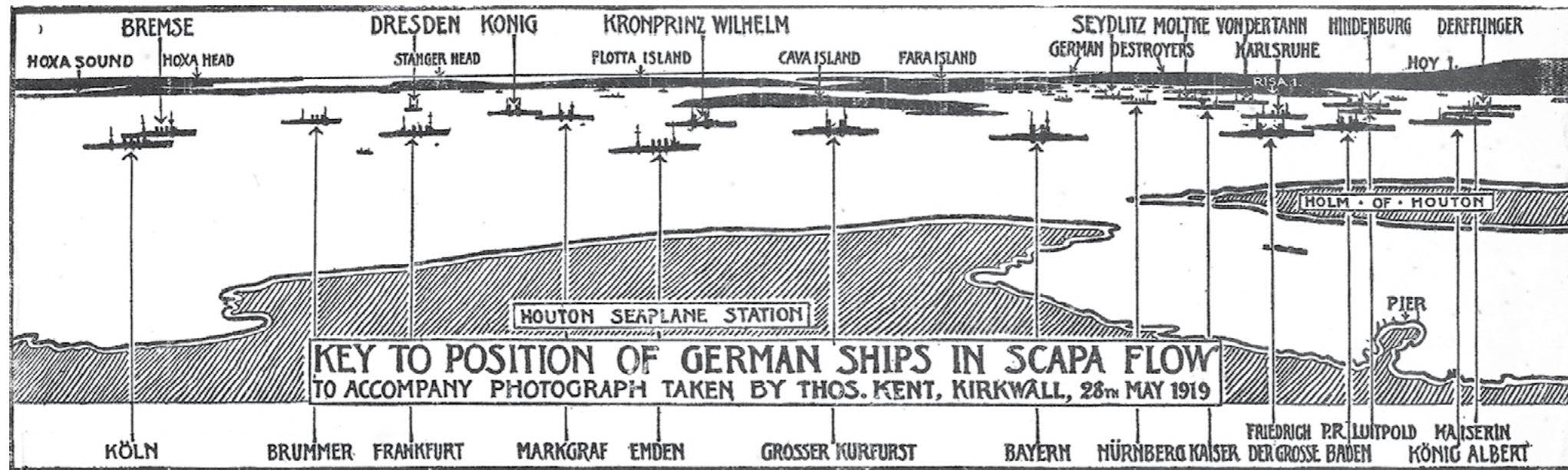
- 3 German battleships: *König*, *Markgraf* and *Kronprinz Wilhelm*
- 4 battleship debris sites: *Bayern*, *Seydlitz*, *Kaiser* and *von der Tann*
- 4 light cruisers: *Brummer*, *Karlsruhe II*, *Dresden II* and *Cöln II*
- 1 light cruiser debris site: *Bremse*
- 5 torpedo boats (small destroyers): *B109*, *S36*, *S54*, *V78* and *V83*
- 1 WWII destroyer: *F2*
- 1 German submarine: *UB 116*
- 17 large diveable blockships (out of 43 sunk): *Tabarka*, *Dyle*,

- Gobernador Boreis*, *Inverlane*, *Aorangi*, *Numidian*, *Thames*, *Minieh*, *Rosewood*, *Almeria*, *AC6 Barge*, *Emerald Wings*, *Ilsestein*, *Martis*, *Empire Seamen*, *Reginald* and *Juniata*
- 47 large sections of remains and salvor’s equipment
- Many other bits of unidentified wreckage and numerous small ships, supply barges and aircraft

What these erstwhile salvors left behind are now classified as national monuments and protected under the Protected Wrecks Act of 1973 and Ancient Monuments and Archaeological Areas Act of 1979. The two War



Historical illustration with map of the German ships scuttled in Scapa Flow



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Graves of HMS *Vanguard* and HMS *Royal Oak* are also protected under the Military Remains Act of 1986, and diving on these ships is prohibited.

Geography & wreck locations

Considered by many to be impregnable to attack, the bay of Scapa Flow covers some 311 sq km (120 sq mi) and is now almost totally landlocked with Mainland to the north; the islands of Hoy and Flotta to the southwest; and to the southeast, the Churchill Barriers link the islands of Lamb Holm, Glimps Holm, Burray and South Ronaldsay. This results in some relatively calm waters for most of the year.

The Churchill Barriers were built by around 1,400 Italian prisoners of war as a direct result of the attack and sinking of HMS *Royal Oak* in October 1939. They not only left behind a lasting legacy, which links all the southeastern islands, they also left behind their "Italian Chapel," located on Lamb's Holm, which is a must-see on everyone's pilgrimage to Orkney.

The blockships sunk previously in the main passages into the Flow were designed to stop enemy ships' movements, but they soon deteriorated under the constant battering of the fierce currents and tides into Scapa. The Churchill Barriers, of course, removed the need for many of the hulks. Subsequently, many of the ships had to be removed to make passage safer, undeniably making

scuba diving in this area that much richer and more interesting.

The wrecks are actually dotted all over Scapa Flow, with blockships found in the extreme eastern and western areas of the Flow. The German light cruisers and battleships are found roughly in the centre of Scapa Flow, arranged in a horseshoe shape near the island of Cava and a rocky pinnacle called the Barrel of Butter. However, because the tidal streams which used to pass through the sound have been altered due to the construction of the barriers, Scapa Flow just is not as clear as one would like it to be, as the particulates in the water tend to stay in suspension for quite long periods, particularly after the algae blooms in the spring and autumn.

The natural harbour of Scapa Flow in the Orkney Islands has the largest concentration of shipwrecks in Europe. I am reliably informed that there was more scrap metal here in this confined space than in any other place on the planet.

Diving

For the most part, all of the diving is in open water, involving jumping off the side of a dive boat and swimming down a shot line, generally in water with poor visibility. However, there are a few locations in very shallow water where visitors can either scuba dive or snorkel on the remains of some amazing shipwrecks. For those who are

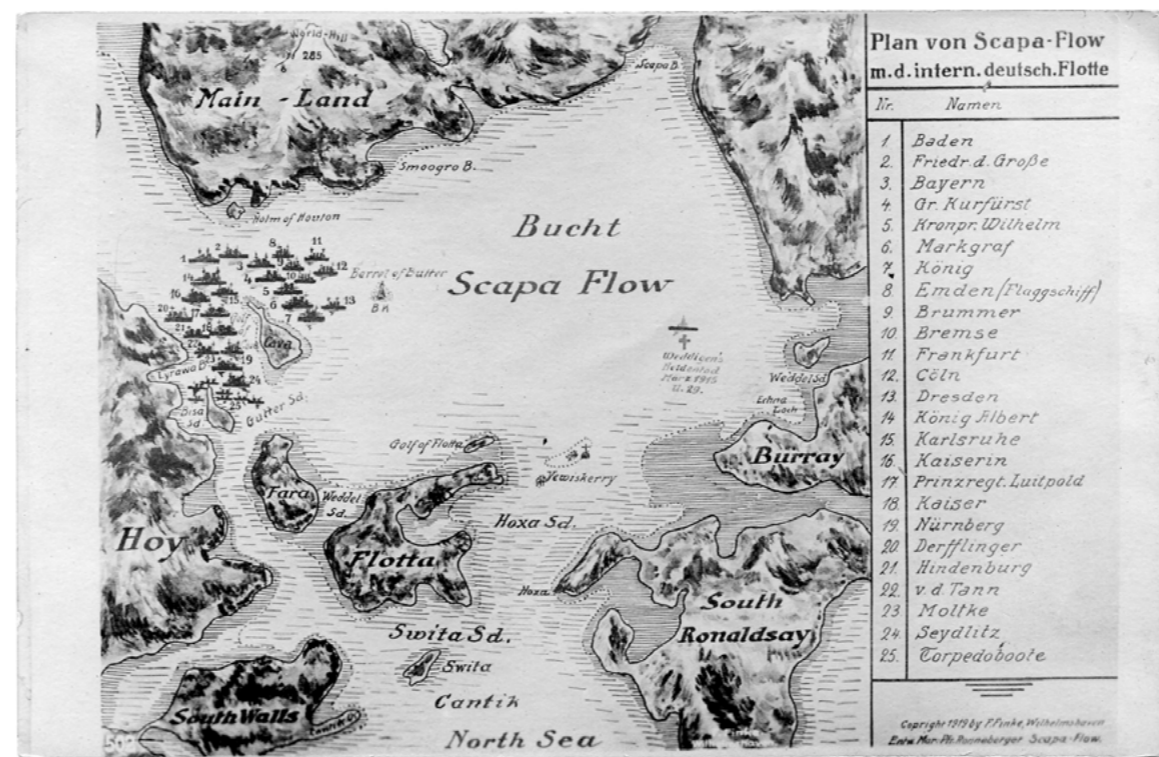
unqualified, there are a couple of dive schools on the island. For many people, it is the shipwrecks of Scapa Flow that are part of their first diving experience.

Many divers still assume that one can only explore the German Fleet wrecks using nitrox, trimix or rebreathers, and that all of the wrecks should be treated as decompression dives, only to be dived by super-qualified "technical" divers. However, diving in Scapa Flow can be as simple or as complicated as you want to make it.

Novice divers can have a great diving holiday in Scapa Flow, and indeed, many visitors gain their first

diving qualification through the excellent dive schools on the island. The shallowest part of the *Karlsruhe* is in only 15m (50ft), and the seabed is less than 30m (100ft) deep. All of the motor torpedo boats and blockships are in less than 18m (60ft). The blockships at Barrier II are at depths under 6m (20ft) and are quite possibly some of the best shallow shipwrecks in Europe. Therefore, all the blockships and German light cruisers are achievable for novice divers (under supervision).

A diving holiday in Scapa Flow is realistic for novice divers, as the diving on offer goes beyond mere



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Historical illustration with map of the islands surrounding the bay of Scapa Flow



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Historical photos of salvage work on a scuttled German WWI battleship (right) and the guns of a sunken German battleship jutting out of the water (far right) in Scapa Flow



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opinion and expectation. Novice divers are able to dive alongside those super-qualified, mixed-gas divers on over 70 percent of the same shipwrecks.

Whatever your preferences are in diving standards, qualifications or preferred air mix, there is no denying the mystery, mystique and historical importance of the German High Seas Battle Fleet as well as the remains of the blockships. Thankfully, all of the ships are now protected and are regarded as national treasures for everyone to enjoy. While Scapa Flow is there to be enjoyed by everyone, please dive responsibly and please recognise that all of the shipwrecks have protected status under the Protection of Wrecks Act of 1974 and are scheduled under the Ancient Monuments and Archaeological Areas Act of 1979.

Recent discoveries

As the author of the *Scapa Flow Dive Guide* by Aquapress, the work never actually stops after the book has been published as there are always new and exciting discoveries to be made. Now, the 100th Anniversary edition includes new and important information, which has come to light through the additional extensive research of Kevin Heath and both of us painstakingly going through all of the archival photographs during WWI and WWII War Department records.

Heath in particular discovered in one instance, it would appear that back in 1914 when the Admiralty was sinking some of the first blockships in Burra Sound, they made a dreadful spelling error! This is not the first time that such mistakes have happened, as I found out doing my research on the book *Shipwrecks of The Cayman Islands*.

Back to Scapa Flow, and trawling through the National Archives in Kew and the Maritime Museum in Greenwich. We have discovered that there was no such ship as the *Doyle*. It is sometimes confused with the *Moyle*, which was a 1,761-ton, steel, 79.3m (260ft) long, single-screw coastal steamer built in Troon, Ayrshire, registered in Belfast. She was used as a blockship, but not in Scapa Flow. She was sunk in the approaches to Dunkirk on 4 June 1940. Ian Whittaker, who compiled the excellent wreck resource book *Off Scotland*, confirmed these details for me. That spelling error has contributed to the wrong name being used from the date of her supposed sinking in 1915. The ship that was actually sunk in Scapa

Flow on 7 October 1914 is now to be known as the *Dyle*.

Dyle. Built in Newcastle by A. Leslie & Co. Engineers in 1879 for W. Johnson in yard No.209, she was sold to Turner Brightman & Co in 1886 and finally became the *Dyle* when she was subsequently sold to De Clerck & Van Helmerlyk in 1902 and registered in Antwerp, Belgium. She was eventually sold to British shipbreakers in 1914, who resold her to the Admiralty for use as a blockship. Of iron construction with five bulkheads and a 177NHP two-cylinder engine and one propeller, she weighed 954 tons and was 260ft (79.25m) long.

Many regard the *Dyle* as being the best of the diveable blockships in Burra Sound. As the smallest of the three most intact blockships (the *Gobernador Boreis* and the *Tabarka* being the other two), the *Dyle* is completely open in aspect. Lying on her port side and fairly well embedded in the gravel seabed, her propeller is very distinctive, covered in miniature plumose anemones. Her wooden decks are long gone, creating



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easily managed swim-throughs between the supporting iron ribs. Both the bow and stern are relatively intact and topped with kelp, making for some excellent photographic opportunities.

at 2,733 tonnes, 70m (230ft) long, built in Hartlepool in 1889, but sunk ten months apart.

The records should now show the following:

Clio (I) and Clio (II). Other discrepancies have also occurred in the descriptions of the *Clio (I)* and the *Clio (II)* over at the opposite side of Scapa Flow at the Churchill Barriers. Both ships were thought to be steamers, identical in size

Clio (I): 2,733-ton steamer, 90m (300ft) long, built in West Hartlepool in 1889 and sunk in Water Sound on 29 April 1914. (She was scrapped prior to the construction of Barrier IV. She is confused with the identically named



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Historical photo of salvage crew working on the scuttled German High Seas Fleet in Scapa Flow



Historical photo of capsized German WWI battleship in Scapa Flow (right) and salvage work on the German battleship *Baden* (far right)



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SS *Clio* that was sunk ten months later at Barrier III on 27 February 1915).

SS *Clio (II)*: 793-ton steamer 70.1m (230ft) long, built in Kinghorn in 1873 and sunk in Weddell Sound on 27 February 1915. (The firing circuit failed, and the *Clio* was swept out to sea. A wreck out to the east of Glimps Holm may be this ship. She is confused with the identically named *Clio* that was sunk ten months earlier at Barrier IV on 29 April 1914).

Cape Ortegat. Further research by Heath has now confirmed and cleared up some confusion over the blockships in Skerry Sound to the east of Churchill Barrier II. The wreck we assumed was the *Cape Ortegat* should now be recognised as the *Almeria*, as the remains on the seabed only show two boilers. The *Cape Ortegat* had three boilers. As the area where she was sunk was in the deepest part of the Skerry Sound channel, it looks entirely possible that the ship sank into the deepest part of the channel, similar to the fate of the *Minieh* to the west of Barrier I.

Through studying naval photographs and documents,

Ordnance Survey and other aerial resources, the archives in the Orkney Library and newspapers, as well as all records held in the National Archives, we have discovered no evidence or records of the *Cape Ortegat* being scrapped for salvage, so we can only assume that she now lies directly underneath Churchill Barrier II, as no other evidence has been found—yet. A full survey of the substrata of the barrier is yet to be undertaken to confirm this, but the evidence at this stage is compelling for the findings.

Naja. In addition, over on the Churchill Barriers, we now have positive confirmation of the *Naja*! I had this blockship on Barrier IV that crossed Water Sound, identified as the *Maja*. Again, a spelling blunder led us all along the wrong path, and I have seen the same ship identified as the *Nadja*, *Maja*, *Nada* and the *Madga* in various books and periodicals. We can now confirm that this ship is the *Naja*.

We have her original bill of sale, how much she was then resold to the Admiralty for, how much Metal Industries charged the Admiralty for her sinking, her position and even a contemporary line drawing

of the vessel in her eventual position. She was never salvaged and still lies beneath the ever-encroaching sands of Water Sound.

In the last few years, virtually all obvious signs of these once great blockships are now gone. The shoreline is now over 130m (400ft) farther out to sea, and sand dunes have covered virtually all of the ships, excepting for the bridge of the *Collingdoc* and a small part of the steel mast of the *Carron*.

Warwick aircraft. The Warwick aircraft, which ditched after engine trouble on 10 June 1944, was always a mystery. We searched for her relentlessly over several seasons near Lyness, on the Isle of Hoy, where she was finally found—or what was left of her remains. She actually ended up on the shore, and parts of her bomb bay are still underwater, but what was left on the shoreline was all salvaged.

TS37. Finally, a more contemporary shipwreck is located near Houton, to the northwest of Scapa Flow. A small fibreglass cabin cruiser with the registration numbers *TS37* sank apparently in 1995; however,

the photograph that we have managed to get from the Orkney Image Library was taken in December 1995. She once belonged to the late Kenny Bain and was driven ashore in bad weather. Subsequently towed off from the shore by a local pilot boat, she was so badly damaged that she sank on her way back to Scapa Pier. She is now lying on the bottom of the Flow, just off Greenigoe, in 29m (97ft) of water, relatively intact and upright on the seabed.

Undeniably, all of the ancient High Seas Battle Fleet are seriously deteriorating, but with due care and caution, there is no reason why we cannot continue to enjoy these superb shipwrecks in an area which can be dived all year round and suitable for all levels of divers. The shipwrecks of Scapa Flow are some of the most important historical shipwrecks accessible to divers in the whole of northern Europe, and the fact that we are still discovering information on their history is

fascinating enough to make you want to go back and dive them all again. ■

Lawson Wood is from Eyemouth in the southeast of Scotland and has been scuba diving since 1965. With over 15,000 dives logged in all of the world's oceans, he is the author and co-author of over 50 dive books.

He made photographic history by becoming a Fellow of the Royal Photographic Society and the British Institute of Professional Photographers solely for underwater photography. He is a Fellow of the Royal Geographical Society, a co-founder of the first marine reserve in Scotland and a co-founder of the Marine Conservation Society.



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Historical photo of salvage work being done on the German cruiser *Bremse*



The Reflection at Sea ceremony on NLV *Pharos* took place around the site of SMS *Dresden II*, commemorating the centenary anniversary of the scuttling of the WWI German High Seas Fleet in Scapa Flow, Scotland, in 1919.

Text by Rosemary E Lunn
Photos by Niki Wilson, Able Seaman on the NLV *Pharos*

Friday, 21 June 2019. Dawn broke on the longest day of the year in the Orkney Islands of Scotland. In reality, at this latitude, the summer evenings are almost endless as nights do not exactly get as black as pitch this time of the year. As the islands and inhabitants slept, the charcoal smudge of dusk had gradually darkened during the wee small hours. Twilight broke early, with first light at 2:32 a.m. As the heavens brightened, a faint molten golden ribbon began to grow, glimmer and glow in the sky, eventually illuminating the mountains surrounding Scapa Flow. Today was an important day. It would be the final act that would close the marking of one hundred years since the Great War.

I grabbed my travel mug of tea and headed out the door as the 7:00 a.m. *BBC Breakfast* headlines announced that ceremonies were going to take place later today to remember the 15 German sailors who died as a result of the internment and subsequent scuttling of the German High Seas Fleet a century ago today.



NIKI WILSON

“The loss of one life, irrespective of the side they are from, is always a tragedy. If the Great War is remembered for anything, then it is for the unprecedented scale of that loss of young lives . . . The loss of each one of these young men here in Orkney, far from their homes and their families, is something that we still feel a great sadness for, even a hundred years later. Here today within an atmosphere of peace and a spirit of reconciliation, we commemorate their lives and mourn their loss.”

— Harvey Johnston, Convenor, Orkney Islands Council.

#Scapa100

Centenary Anniversary Event
of the Scuttling of the WWI
German High Seas Fleet

My commute across the verdant green, rolling Orcadian landscape to Kirkwall and then onwards to Stromness was hardly an ordeal. The drive along the swooping empty roads was a pleasure, and landmarks and local life were now more familiar to me, including the Churchill Barriers and the rusting blockships, the meadow where the orange-red-stocked oystercatchers (complete with matching-coloured beaks) strutted

and snacked, the magnificent anchor by the side of the road at St Mary's, and the field of hairy pigs. The 30-minute journey was peaceful and gave me time to reflect as I revelled in the wild, splendid beauty of these islands.

Today was the culmination of a lot of work done by several key people. On the civilian diving front, the skipper of MV *Huskyan* and Explorer Club Fellow Emily Turton was the driving force



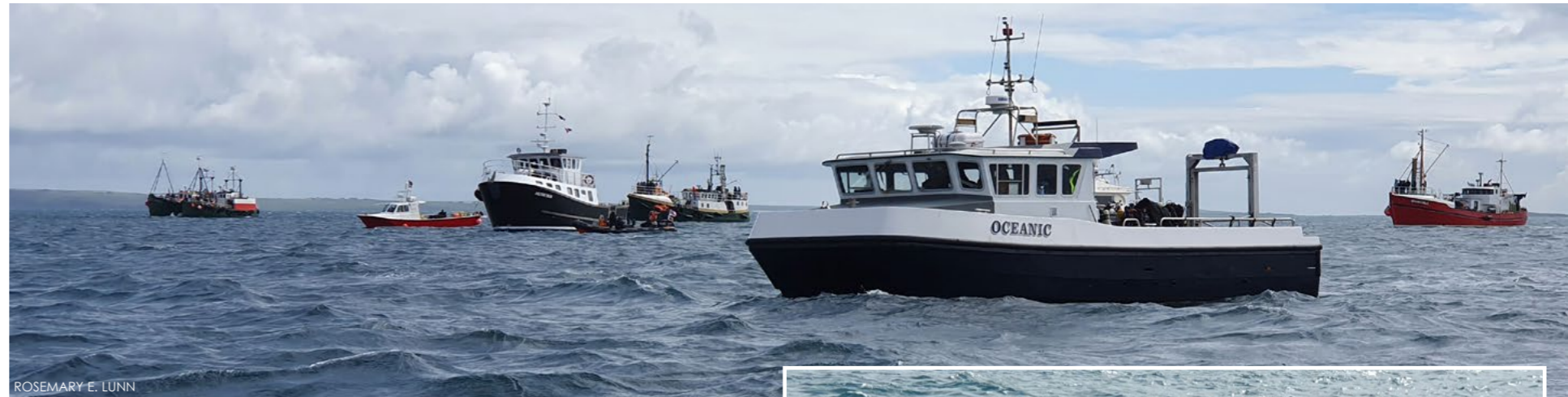
NIKI WILSON



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#Scapa100

Reflection at Sea ceremony around the site of SMS *Dresden II* (far left); NLV *Pharos* and *Polestar* (left) were joined by 19 craft for the ceremony, including dive charter boats, ferries and lifeboats (below); Militärdekan Christoph Sommer led the service on NLV *Pharos* (lower right)



ROSEMARY E. LUNN

The salvaged *Von der Tann* bell (right) was rung seven times by Yorck-Ludwig von Reuter (the grandson of Rear Admiral Ludwig von Reuter).

Sommer, Chaplain of the Fleet of the German Navy, from *Corinthians*, before the Last Post was played. As the notes died away, Bosswain Dave Steedman got ready to lower *Pharos'* ensign.

Reuter (the grandson of the Rear Admiral Ludwig von Reuter who ordered the scuttling of the German High Seas Fleet interned in Scapa Flow 1919). One, two, three... I counted the strikes—seven in total, to mark the number of the High Seas ships. It was a big bell, but the sound did not resonate as brightly and as strongly as I expected it to.

The unique sound of the *Von der Tann* bell had not been heard on Scapa Flow for 100 years. Last time, it signalled the destruction of the German High Seas Fleet. Today, the tolling of the bell marked the start of a minute's silence. We stood quietly, hove to. Water slapped against



NIKI WILSON

"It is a great honour to perform this duty, and an emotional moment for myself and my three sons, Alexander, Dominic and Emanuel. It is important to commemorate these wartime events so that they can be remembered by future generations."

— Yorck-Ludwig von Reuter

Tolling of the bell

Across the water from the back deck of *Pharos*, almost 100 years to the hour, came the sound of the salvaged *Von der Tann* bell, rung by Yorck-Ludwig von

the side of the boat, and I thought about the 5,000 Germans on their rusting floating prisons. Reveille was sounded and the ensigns were raised before Rear Admiral Stephan Haisch from the German Navy and Captain Chris Smith, Royal Navy Regional Commander for Scotland and Northern Ireland, "lay commemorative wreaths." In reality, they threw the two

Emily Turton (left) spearheaded the event, collaborating with the Orkney Islands Council, Stromness Museum, Newcastle University, University of Dundee, Deerness Distillery, the Royal Navy and the Deutsche Maritime Forces.

behind the #Scapa100 event commemorating the centenary anniversary of the scuttling

A gathering of the fleet

At 11:00 a.m. today, a Reflection at Sea ceremony would be conducted around the site of SMS *Dresden II*. Dive charter boats, along with ancillary craft, including the Orkney Ferries vessel *Thorsvoe* and the Longhope Lifeboat, came together in a crude circle of 19 craft with the two much larger ships from the Northern Lighthouse Board, *Pharos* and *Polestar*.

From a radio on one of the dive boats, which I was aboard, I could catch snatches of the service being conducted on the back deck of the *Pharos*. "Strive for full restoration, encourage one another, be of one mind, live in peace. And the God of love and peace will be with you," read Militärdekan Christoph



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of the WWI German High Seas Fleet in Scapa Flow. She had collaborated with the Orkney Islands Council, Stromness Museum, Newcastle University, University of Dundee, Deerness Distillery, the Royal Navy and the German Navy. As a result, an imaginative programme had been created to commemorate the impact and the lasting legacy that the scuttling of the squadron has had on the islands.



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As part of the #Scapa100 event, MV *Huskyan* (above) took divers from the Royal Navy Northern Diving Group (left) and the Deutsche Marine Seebataillon Minentaucherkompanie for a commemorative dive on the *Dresden* wreck in Scapa Flow; Historical photo of the SMS *Dresden* (right); Orkney scenic view (top right)

Orkney Islands Council to commemorate the German sailors who lost their lives in Scapa Flow 100 years ago.

"I am deeply touched by the heartfelt commemoration service that was organised by the people of Orkney. Commemorating what happened here 100 years ago also brings to mind how far we have come since those dark days. How from enemies we, the United Kingdom and Germany, have become true friends. Today, our nations stand side by side on the world stage, upholding the joint values we believe in."

Captain Smith said: "The Royal Navy has a long history with Orkney and Scapa Flow, and has supported many of the First World War commemorations of the past four years. It is quite fitting that we are completing that series of events here in Orkney, recognising the importance of the scuttling of the High Seas Fleet and just as significantly paying our respects to the memory of the 15 German sailors

who lost their lives.

"I am honoured to stand alongside Rear Admiral Haisch in friendship on this day, looking back to a time when our countries were not as close as we have since become—and to represent the Royal Navy as we complete the task of commemorating the sacrifice made by so many during the course of what we now call the First World War.

"We have carried out that task, and that period in our history is now far better understood and more widely known as a result, and those who gave their lives have indeed been remembered, which is the duty we have and will continue to perform.

"Today has seen sailors of both the Royal Navy and the German Navy jointly recognised as a part of our collective history and doing so as allies, demonstrating that out of the adversity which once divided us, we have forged a lasting friendship, which I think is the best tribute

we can pay to those whose memory we honour on this day."

Commemorative dive on Dresden

Over on the adjacent MV *Huskyan*, two teams of divers from their respective navies—the Royal Navy Northern Diving Group (NDG) and the Deutsche Marine Seebataillon Minentaucherkompanie (the German Navy's Sea Battalion Mine Diver Company)—were preparing to dive the *Dresden*. It was a rare shared act of commemoration by both nations. There had been a temporary diving embargo in place on this wreck in preparation for this morning's ceremony. I later caught up with Turton to find out why this particular wreck had been chosen.

"The Navy divers have to dive within



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certain parameters, and they can dive for 28 minutes on this wreck," said Turton. "Secondly, Orkney Islands Council owns this wreck. Therefore, getting permission to attach two wreaths, and fasten and fly the German ensign from her was straightforward. And the *Dresden* does have a very pretty bow."

The Navies were joined by a civilian support dive team—Marjo Tynkkyn (photographer), Kari Hyttinen (videographer), Caroline Appleyard (underwater artist), Chris Rowland (underwater lighting),



Rev. David Dawson (right) welcomed everyone to the Lyness Royal Naval Cemetery for the land ceremony commemorating the 100-year anniversary of the scuttling of the WWI German High Seas Fleet at Scapa Flow; Four men carried the German flag, the British naval flag, and the Kirkwall and Stromness British Legion flags (bottom right); Divers of the Royal Navy Northern Diving Group and the Deutsche Marine Seebataillon Minentaucherkompanie stand at attention in salute during the ceremony (bottom left)

Emily Turton (underwater lighting), Clare Fitzsimmons (underwater lighting) and Nick Butcher (ensign wrangler)—to help capture the event underwater.

I then asked Turton what it was like to watch the German and Royal Navy divers shake hands after unfurling the ensign. She said it was a moment to remember. "It is always a pleasure to dive with NDG, but on this occasion I feel both honoured and humbled to have witnessed a powerful symbol of reconciliation as the two divers shook hands in front of the ensign."

On the military front, closed-circuit rebreather (CCR) diver Lieutenant Jennifer Smith, Deputy Naval Liaison Officer for Scotland and Northern Ireland, also played a key role in the #Scapa100 event. She joined the civilian support dive team to illuminate the ensign underwater and coordinate the Reflection at Sea service, as she was responsible for the diving element of the ceremony. Smith said that it had taken months of meticulous planning. "It

was an absolute privilege to be involved and a humbling experience to be able to bring all the elements together in the way that we did. To see 19 boats together for the commemoration was really striking, as they numbered a quarter of the 72 ships that went down on 21 June 1919."

With the Reflection at Sea service finished, there was another ceremony on the island of Hoy that I had dearly wanted to attend. In the afternoon, a land ceremony would be held at Lyness in the Royal Naval Cemetery by the Commonwealth War Graves.

Land ceremony

It was obvious that a lot of work had gone into the afternoon ceremony. It was a well-structured, thoughtful, inclusive service with lots of small touches by both the British and German representatives.

The two dive teams had rapidly changed out of their diving kit, donned their uniforms and were now standing in two lines on the shorn lawn as Rev. David



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Dawson RNR, Chaplain to the Sea Cadet Corps of the Royal British Legion Kirkwall Branch and the Royal Naval Association Orkney Branch, welcomed everyone to the Lyness Royal Naval Cemetery. A few steps away, four men carried the German flag, the British naval flag, and the Kirkwall and Stromness British Legion flags.

The ceremony took about an hour and included the very relevant hymn for so many of us: "For those in peril on the sea." German and Royal Navy representatives gave readings, and the three clergy (Rev. Dawson, Militärdekan Sommer and the Venerable Martyn Gough) led the prayers. I found it particularly moving that Matthias Schmidt, Captain of the German Navy and Naval Attaché of the Embassy of the Federal Republic of Germany, read The Exhortation, an excerpt from a poem by Laurence Binyon:

"They shall grow not old, as we that are left grow old;
Age shall not weary them, nor the years condemn.

At the going down of the sun and in the morning
We will remember them."

Remembrance

Over the years, I have discussed the act of remembrance with quite a few Germans, most of whom have been divers. In the United Kingdom, we have Remembrance Sunday (the closest Sunday to 11 November), and we stop for a two-minute silence on Armistice Day at the 11th hour, on the 11th day, of the 11th month, to remember our War Dead from all campaigns. The Germans have *Volkstrauertag* ("people's day of mourning"), commemorating those who died in armed conflicts, including members of the armed forces of all nations and civilians.¹

I am not going to get into semantics of war here, but I believe that remembering a previous generation's service to their country does not glorify war. It reminds us that we have to find peaceful solutions where and when we can. I personally struggle with the fact that thousands of men died on both sides, and not all of them are remembered on an annual basis

¹ <https://en.wikipedia.org/wiki/Volkstrauertag>



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At the end of the land ceremony, wreaths were laid on the graves of Germans who lost their lives during the internment and scuttling a century ago (left); Militärdekan Sommer and Rev. Dawson read out each name and their rank in German and English, respectively (right)



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in both countries. Each of these men was someone—a son, a husband, a brother, an uncle, a friend, a colleague or a best mate. For this reason, having a German officer read the Exhortation on the centenary of the scuttling made it even more special for me.

We stood in silence in brilliant sunshine, buffeted by the wind. If I shut my eyes, I would not know I was surrounded by 200 other souls. There was not a sound to be heard from the Naval Divers, the Royal Marines Band, the local schoolchildren, the official representatives, a rabble of divers and the general public.

It was time to remember the 15 Germans who lost their lives during the internment and as a result of the scuttling. A hushed cemetery listened as Militärdekan Sommer read out each name and their rank in German, before Rev. Dawson repeated the same in English:

- Marine Engineer Max Aumüller, 29 November 1918
- Leading Stoker Jabusch, 6 December 1918
- Stoker Johannes Thill, 7 December 1918
- Telegraphist Friedrich Bonneder,

- 4 January 1919
Stoker Albert Haushälter,
- 11 March 1919
Petty Officer Otto Hinte, 7 April 1919
Lieutenant-Commander Walther Schumann, 21 June 1919
Warrant Engineer Wilhelm Markgraf, 21 June 1919
Chief Engine-Room Artificer Gustav Pankrath, 21 June 1919
Chief Engine-Room Artificer Friedrich Beicke, 21 June 1919
Chief Petty Officer Hermann Dittmann, 21 June 1919
Yeoman of Signals Hans Hesse, 21 June 1919
Stoker Karl Bauer, 21 June 1919
Stoker Karl Funk, 22 June 1919
Engineer Apprentice Kuno Eversberg, 29 June 1919

Kuno Eversberg was the last person in the armed forces to die at the very end of World War I.

Schoolchildren then and now
On the morning of the scuttling of the German High Seas Fleet in 1919, a party of schoolchildren from Orkney were taken out on The Flying Kestrel to take a closer look at the interned squadron as a special treat. It meant

that they were able to experience this extraordinary historical moment. Some children were terrified, others thought that the ships were being sunk especially for them. What it is to have the active imagination of a child!



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A final salute to the fallen, accompanied by the Royal Marines Band



The Lockheed L-1011 TriStar entered commercial operations in April 1972. As only the third wide-body airliner, it had a seating capacity of up to 400 passengers. Its tri-jet configuration has three engines with one engine under each wing, along with a third engine center-mounted with an S-duct air inlet embedded in the tail and the upper fuselage.

The sinking took about 90 minutes, as onlookers lined the shore.



Aqaba sinks Lockheed TriStar

Text and photos by Peter Symes

On Monday, 26 August 2019, the former airliner slipped slowly below the surface, just south of Aqaba's main port, to become the latest addition to the already substantial number of artificial reefs along Jordan's stretch of Red Sea coastline.

The TriStar plane is a commercial airliner that has been out of service and parked at King Hussein International Airport for several years. The Aqaba Special Economic Zone Authority (ASEZA) recently purchased the plane with the intention of sinking it, and it was transferred to the main port to

prepare it for its final role. The TriStar is the second aircraft to become an artificial reef off Jordan's coastline. In November 2017, a Hercules C130 was scuttled a bit farther down the coast.

The sinking

Many of the assembled members of the dive press were more than just a tad sleep-deprived, following a very late arrival into Aqaba the preceding night, but also upbeat and sat on port authority's comfortable vessel, observing the scuttling process as close as was safety permitted.

First the supports under each wing, which looked like miniature barges stacked with tires, were pulled away. For quite a long while thereafter, very little appeared to be happening.

The plane was not sitting any deeper in the water. A couple of divers, or snorkellers, swam around the hull and were doing... something. I could not quite make out what they were fidgeting with. I suppose they were tending to lines and deflating flotation devices.

Then the jet started to lean onto its left wing, which floated for a while. At this point, we have probably been watching for three quarters of an hour already, but nobody was impatient, and there were plenty of cool drinks inside the air-conditioned lounge. Most of us with cameras wanted the best possible shot, so we climbed onto the flat roof of the vessel. It was a hot day—a very hot day—and the wind coming down from the desert

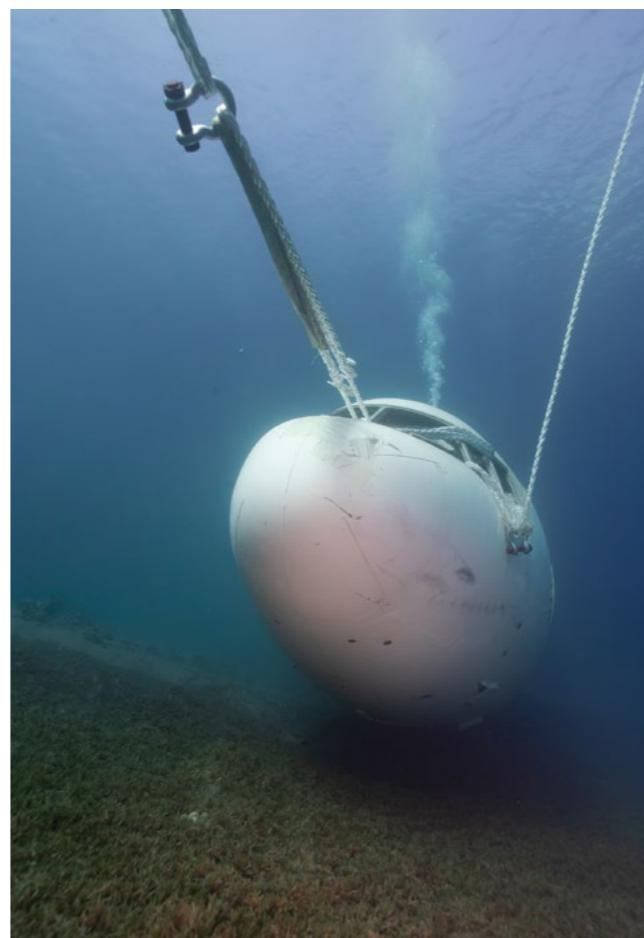
was as hot as the air from a giant hair dryer, almost burning the skin. I was definitely happy that I brought my hat.

After another quarter of an hour, the exhaust of the jet engine under the tail starting going under, and it started to lean back. But still it did not go fast. I anticipated that the process would accelerate, as it did the last time I witnessed the sinking of an artificial reef, but this one sank quite slowly, even to the end. Very controlled.

After perhaps 90 minutes, the plane slipped completely under the surface and presumably settled gently on the bottom in the intended position.



Dive media colleagues stewed in the blistering heat to get the best possible view of the sinking plane.



Have a seat! Some of the interior has been left in place for a nice change (above); The TriStar as seen from just under the boat (right)

First ones to dive the plane

The notion that we were the very first to dive the new wreck was not lost on any of us in attendance. When do you ever get to be the very first to check out a freshly sunken artificial reef?

The plane—or perhaps just all the particles stirred up—had been allowed to settle for two days after the scuttling before we were allowed to dive on it. Painted bright white, it was

easy to spot, as the dive boat moved into location and parked right above the tail fin. We were told planned depth at the front of the plane should be at 10-12m, and the tail at 25-30m. That was precisely where we found it. The tip of the tail stood up to about 12m. Hovering over the hull and wings that were still draped in some of the lanyards used for the sinking, the massive proportions of

the aircraft became apparent. The engine intake at the tail was like a huge gaping mouth, ready to suck you in and swallow you whole. I did not venture inside, as I found myself uncomfortably underweighted—only later did I realise that the salt content at the top end of the Gulf of Aqaba is somewhat higher. I needed a whopping

13kg of lead, wearing a 5mm wetsuit, to be comfortable.

As the images show, we stayed on location all day so we could try diving the plane at night. Underwater, the white hull gave the plane a ghostly but

quite photogenic appearance.

During our brief stay in Aqaba, we also got to dive some of the other artificial reefs and locations, which we will cover in more detail in a later issue. ■





EYOS EXPEDITIONS

Strong ocean currents, salt corrosion and metal-eating bacteria are attacking the ship. In 2012, the wreck became protected by UNESCO.

Titanic is now rapidly decaying

Lying almost 4,000m down in bitterly cold -1°C water, the wreck has become vulnerable to sweeping eddies and subjected to ever-changing sea currents. The wreck is being slowly consumed by the strong, deep currents that flow through the Atlantic here, along with natural salt corrosion and metal-eating bacteria.

No one has seen the *Titanic* in nearly 15 years. The *Titanic* was last dived and physically seen by a human in 2005 during an expedition led by Rob McCallum, founder of Eynos Expeditions.

A new expedition, also led by Eynos, was based aboard DSSV *Pressure Drop*, which is equipped with the world's only unlimited depth (11,000m) submersible, *Limiting Factor*. The sub was deployed to conduct several

dives on the wreck over a 10-day period.

The dive sequence began on 29 July 2019 when DSSV *Pressure Drop* arrived above the site of the wreck. Before the sub was launched, the crew held a memorial service on deck and laid a wreath over the side in honour of the over 1,500 people who died on the ship in 1912. Over the next week on site, five dives were made to the wreck to extensively

The RMS *Titanic* has been underwater for more than 100 years, lying about 600km (370 miles) off the coast of Newfoundland, Canada.

document its current condition and appearance.

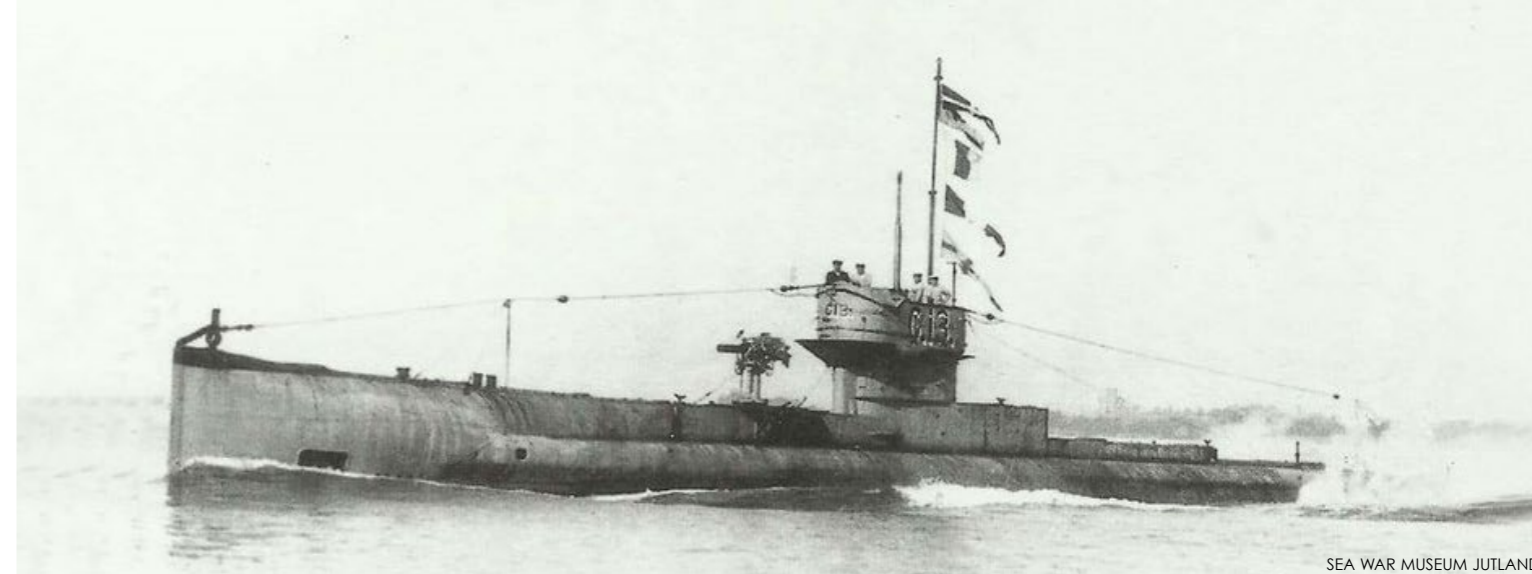
The eerie images and video footage captured show the crumbling wreck is being rapidly devoured by underwater bacteria. While parts of the wreck were in surprisingly good condition, other features had been lost to the sea. The worst decay was seen on the starboard side of the officers' quarters.

Captain's bathtub gone

Titanic historian Parks Stephenson stated to *BBC News* some of what he saw during the dive was "shocking." "The captain's bathtub is a favourite image among *Titanic* enthusiasts—and that's now gone," he said.

Scientists are studying how different types of metal erode in the deep Atlantic waters, to assess how much longer the *Titanic* has left.

In 2010, the *Titanic* was scanned with high-resolution sonar using a remotely operated vehicle. In addition to assessing her condition, researchers were able to place scientific experiments near the wreck and to conduct scientific research. Many of the experiments centred around metallurgical samples, which are sacrificial pieces of metal that researchers use to track the breakdown of metal at these depths. The information is useful in predicting how shipwrecks break down over time. In addition, scientists monitored the biology around the wreck which serves as a large artificial reef. ■
SOURCES: EYOS EXPEDITIONS, BBC NEWS



SEA WAR MUSEUM JUTLAND

The long lost British WWI submarine HMS *G8* has been found off the coast of Denmark.

British WWI submarine found in the North Sea

A wreck off the northern coast of Denmark has been identified as the British submarine HMS *G8*, which went missing in 1918.

Using a 3D multi-beam scanner, researchers from the Sea War Museum Jutland have discovered a century-old British submarine, which sank off the northern coast of Denmark in 1918. The wreck was covered with trawling nets, making identification difficult. An underwater submarine armed with a camera was subsequently dispatched to photograph it, thus confirming its identity as HMS *G8*.

100m

The wreck lies at a depth of about 100m, north of Hirtshals, in the Skagerrak Sea. "The hull is very rusty and there are several corrosion holes in the outer hull and pressure hull. There doesn't seem to be any damage from mines or other explosives," said Gert Normann Andersen, the head of Sea War Museum Jutland, in a *CPH Post Online* article.

When it was found, its depth rudders were pointed towards the surface, which suggested that the submarine was attempting to ascend to the surface. This enforces the theory that the submarine could have perished due to an accident or technical problems.

Did not return as expected HMS *G8* was attached to the 10th flotilla during the First World War, assigned to search for German submarines in the North Sea.

On 27 December 1917, it left on a mission with the submarine HMS *G12* and the destroyer HMS *Medea* to patrol Kattegat. On board was a crew of 28 sailors. Halfway through, she was ordered to return.

However, HMS *G8* did not return as expected on 6 January 1918, and was officially declared missing on the 14th. ■
SOURCE: SEA WAR MUSEUM JUTLAND

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Alphonse Atoll

Text and photos
by Brandi Mueller

— *Pristine Diving in the Seychelles' Outer Islands*



Grouper, lionfish and anthias on coral reef

life painting showed the shallow depths of the lagoons lightening to turquoise and surrounded by white sand and green palm trees. I could not help but think, "Our planet is so gorgeous."

Arrival

I was still smiling like a kid on Christmas when our plane landed on the island, which was just 1.8km long by 1.4km wide (1.12mi by 0.87mi), and out the window was a line of resort staff waving to us. We disembarked and were greeted with



Alphonse Atoll had an incredible number of sea turtles on all the dives.

There is just something that always feels right about getting on a small airplane for the final leg of travel to begin a dive trip. In my mind, it almost guarantees the destination is somewhere amazing—a place that is so special that the large jets used in mass transit cannot even get to it. I departed the island of Mahé, the largest and most-populated island in the Seychelles, for the tiny island of Alphonse, with that giddy, childlike feeling in which I could not stop grinning. I looked around at my fellow passengers also destined for Alphonse, and I could see them smiling too.

As we flew away from Mahé, a beautiful granitic island in its own right, it took about an hour to fly 400km (250 miles) southwest over blue seas before we began to descend on a small coral atoll, just a speck of palm trees and sand that steadily got larger as we approached. I watched out the open cockpit windows as the pilots took us straight in, onto a clear-cut runway in the center of the island. My spontaneous grinning continued.

Below was a small section of the Seychelles' outer islands, the Alphonse group. It consisted of Alphonse and St. François atolls. The deep water surrounding the atolls was a shadowy, dark navy, but the green and ivory specks of the islands were encircled by what I would like to call Seychelles' blue—an abstract watercolor painting of every shade of blue imaginable, from the lightest pale blue to sapphire and indigo, with brush strokes of jade and light brown. The real-



Divers on a wall with sea fans (above), with a school of snapper (top left), and with a blue-fin trevally over sea fans (previous page)



The resort's pool (above) and bar area (left), which was a meeting place to discuss diving and fishing tales before dinner each night



My charming bungalow home for the week (top); The bungalow's airy interior (middle) and cozy deck (bottom), overlooking palm trees and the sea just beyond



is known to have some of the best fly-fishing flats on earth. Obsessive fishermen (whom I found to be comparable to obsessive

introductions and smiles (big smiles, but probably not as big as mine.) I was about to spend a week on an isolated island in the middle of the Indian Ocean visited by only a small number of people each year. And honestly, most visitors come to fish, not dive. (Crazy, I know!)

The Alphonse group of islands

divers) travel halfway around the world to throw a fly at tarpon, bonefish, milkfish and giant trevally, among others (it's catch-and-release only here). The Alphonse Resort was initially just a fishing lodge, but now has a full range of activities, including diving, snorkeling, kayaking, stand-up paddle boarding, nature walks

and bike tours, a lovely spa, and plenty of other activities to keep anyone busy.

Getting around

Taken in a golf cart to my luxury bungalow with beachfront access, I learned that this was one of the fastest modes of transportation on the island. Sitting in front of my adorable A-frame bungalow was my personal transportation for the week—a beach cruiser bike with a basket (in lime green) with my name on it. I do not know if it was possible for my smile to get any bigger, but it did. I loved this place already.

Biking over to the restaurant and main bar area (also oceanfront), I joined the rest of the guests who had arrived for a fresh

coconut and some information about the island. Other guests included a lovely family with two small girls from Botswana and a South African fishing TV show crew. (Well, I guess the fishing really is *that* good.)

I ventured over to the activity and dive center where my gear had already been delivered and made plans for the next day. I would be diving, of course... and the only one. (Seriously? I thought, who goes to pristine islands in the middle of the Indian Ocean and does not dive?!?! Answer: fishermen). I would find myself revisiting this question in my mind throughout the week, only to discover it was exactly what the fishermen (and fishermen) were saying about me.



Trevally swim over sea fans (far left); Endemic Seychelles anemonefish (top center); Bumphead parrotfish at Car Wash (above); Cleaner wrasse give a fish a cleaning (right); The resort's dive boat (left)



a golf cart to pick up my (large) camera while I was at breakfast (it was too big to manage on my bike), and it also magically appeared on the boat waiting for me. Once I was ready, the boat headed out to a site called Car Wash. The fishermen had all left much earlier and the boat ride felt like we were heading out on an adventure into the unknown, with no other boats or people around.

It was not unknown to the crew though, who gave an impressively accurate dive briefing of the site, even down to where we would see schools of certain fish.

Once underwater, it felt just as adventurous—there would be no hordes of other divers here, and no risk of another boat dropping a dozen tourists on top of us. It was just me and my guide, Rose, for hundreds of miles. How incredibly cool was that? And—the diving was excel-

lent. As briefed, groups of bluefin trevally swam past us. As we passed a school of bluestripe snapper, Rose pointed out endemic Seychelles anemonefish, and there were massive pink gorgonian sea fans everywhere. The big surprise (not in the briefing) was a group of about eight massive bumphead parrotfish. Not bad

Morning bliss

After waking up naturally by the golden light of dawn streaming through my curtains, I made a cup of coffee in my room and strolled out to the beach in front of my bungalow. While the other bungalows were not too far away, the gardening and landscaping made it feel as if I was the only person on a private island. Looking out at the water, I saw several turtles pop their heads above the surface for a breath and then disappear back underwater, but I could still make out their silhouettes in the clear, shallow water in front of me.

I leisurely made my way to breakfast,

having ridden my bike only a few minutes before arriving, and enjoyed more coffee, along with yogurt with fresh fruit and a croissant and muffin. More hardy options were available as well, such as eggs made to order and other hot items.

Diving

Over at the dive center, my gear was already on the boat and my wetsuit folded and waiting for me. They had also sent



Endemic Seychelles anemonefish

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for the check-out dive.

Currents and visibility are influenced by the tides, so to get the best conditions, the dive team suggested we dive once in the morning, take a long break, and then two dives later in the day. I was traveling alone, and somewhere along the line prior to arriving, I had mentioned it would be great to have a dive model. Just to start to describe how accommodating the staff was, they provided me with a dive model. On my next two dives, I had a dive guide and a dive model (and a quite good model at that).

We visited the dive sites known as Abyss and Arcade, and my model posed with more schools of bluestripe snapper and yellowspot emperors. We swam over an old anchor that probably belonged to a ship that long ago hit the reef. A large school of barracuda passed by and friendly batfish followed us around like curious puppies, particularly on our safety stops where they seemed to hover right along with us until we returned to the surface.

After diving and a warm shower (in my

Divers swim through a school of yellowspot emperors; Batfish (top center); School of bluestripe snapper (top right)





Hammock on the beach (above); One of the baby tortoises (right) born on the island and raised in tortoise pens. When they grow bigger and their shells harden, they are released and can roam free.



Aldabra giant tortoise (above); Sunrise at Alphonse (top left); Pesto pasta for lunch—many of the ingredients were grown on the island—and an ice cream sundae for dessert (top center)

lovely outdoor shower), I headed to the communal meeting point (the oceanfront bar) where the fishermen were telling tales of their bonefish and giant trevally catches. Soon after, I enjoyed a fantastic dinner under the stars before heading to sleep, with the sound of waves playing a natural soundtrack off in the distance.

Island life

I very quickly fell into a rhythm of waking up, making coffee to be sipped on the beach or on my patio, slowly making my way to breakfast and then riding my bike to the dive center. I was riding along, feeling ever so relaxed, when I rode past a

rock and I did a double take. Backpedaling on the brakes of my cruiser bike, I stopped, slowly backed up, and to my right, was a giant Aldabra tortoise—on the side of the bike path!

Thinking nothing of the tourist gaping at it, the tortoise continued to munch on grass. The Aldabra giant tortoise (*Aldabrachelys gigantea*) is one of only two giant tortoise species left in existence, the other being the Galapagos giant tortoise. While these two species are the last giant tortoise species on earth, they are not directly related. The Galapagos are most closely related to a tortoise species hailing from South America. The

Aldabra are related to a species from Madagascar. Giant tortoises can live longer than 150 years, with some in captivity confirmed to be living over 200. Over 152,000 tortoises are thought to live in the Aldabra Atoll, which is a protected World Heritage Site.

While other islands' tortoise populations were decimated long ago by sailors who brought them on ships to be kept for food and by habitat loss and destruction, some Aldabra tortoises survived on Aldabra Atoll. Today, they

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A nalolo blenny smiles out from its tiny hole (left); Anthias pile into a hole with a moray eel (far left); Moray eel being cleaned by a cleaner shrimp (right)



Porcelain crab in an anemone (left); Yaeyama blenny (above left); Bluestriped fangblenny (above right)

are being reintroduced to several outer islands, including Alphonse, which now has around 60 tortoises roaming the island.

Also on the island was a "tortoise pen," in which little baby tortoises of different sizes were kept. I passed the pen daily on my way to the dive center. Adorable toy-sized giant tortoises could be seen chomping on leaves and slowly wan-

dering about their enclosure. I learned later that all the babies in the pen were born on Alphonse and were usually found by the gardeners around the island. Keeping them in the pen offered protection because their shells are quite soft when they are very small, making them easy prey for birds, which are returning to the island, as well as invasive rats and cats, which island staff are actively trying to eradicate. Once the tortoises get larger

and their shells harden, they are set free to roam the island.

Still in awe of my first giant-tortoise sighting, I excitedly told my story to the dive team who clearly were used to such tales, and one even replied that there was a tortoise that liked to live near her house on the island and was usually sitting right where she liked to park her bike. (Can I make a hashtag—*#AlphonseIslandProblems?*)

Back on the dive boat

After all my excitement, we were soon back on the boat (with my camera mysteriously picked up from my patio once again and appearing on the boat when I got there). The staff had suggested visibility might be a little low due to the tide, so I had my macro lens on my camera, ready to capture some of the small stuff around Alphonse. Needless to say, I was not disappointed. Hardly moving at all underwater, I saw eels being

cleaned, porcelain crabs in anemones along with the endemic Seychelles anemonefish, and blennies, blennies and more blennies.

I also tried to get a few shots of a behavior I had noticed the day before. Swarms of anthias buzzed around the reefs, and as I got close, they would (as usual) hide in the crevasses of the reef... but I noticed they were going into holes occupied by moray eels. I had never before seen this symbiotic rela-



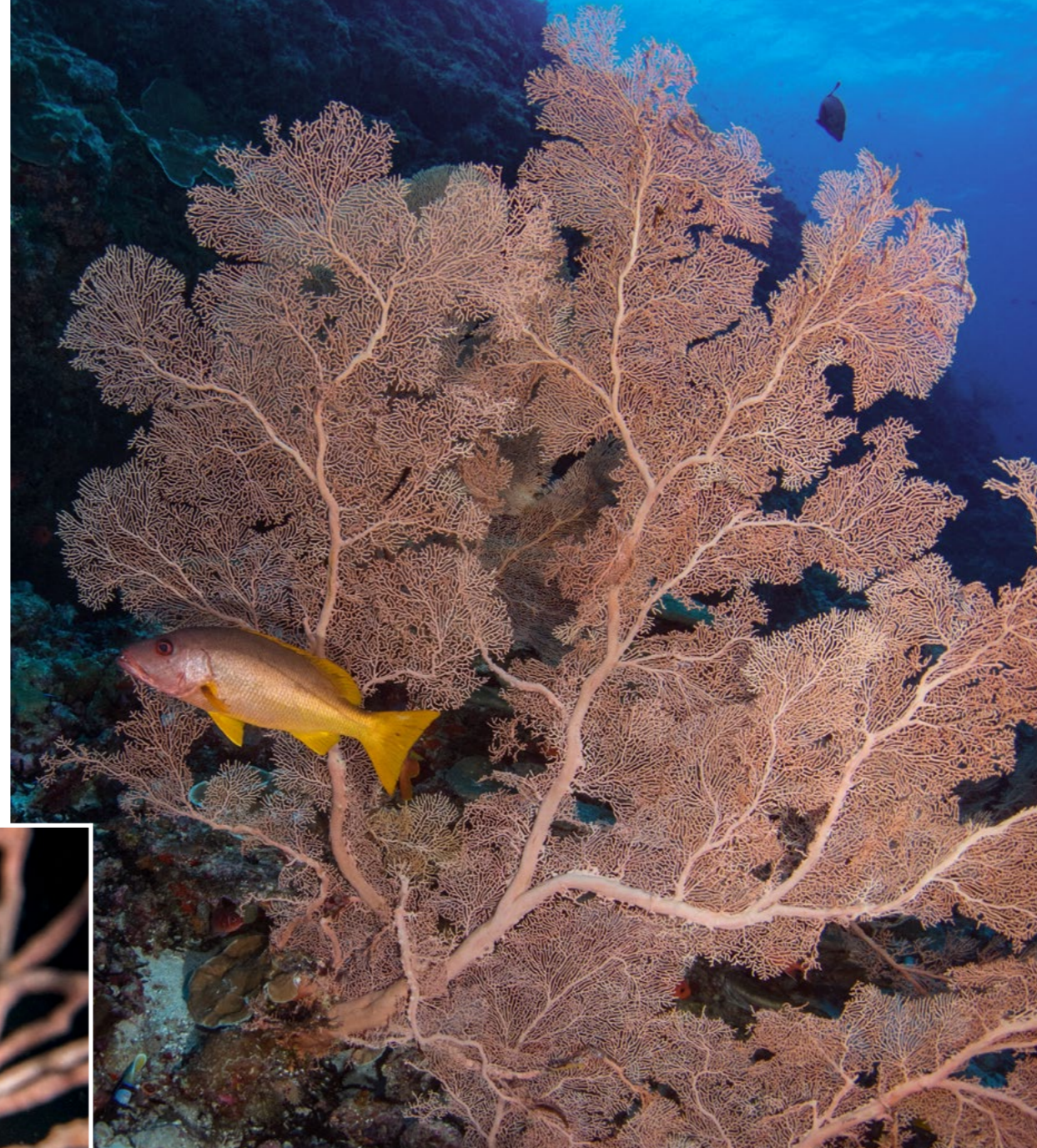
tionship in which dozens of pink, purple and orange anthias would crowd into a hole, sometimes even touching an eel which seemed to stand guard. The eels seemed to get upset with me and would quickly charge out and back into the hole when I came too close while taking a photo, as if they were protecting their anthias.

In the afternoon, we dived Boiler and Eagle Nest, and I had not one, but two amazing dive models: Chris, who worked at the activities and dive center, and his partner, Jenn, the absolutely phenomenal pastry chef on island (for real, I am still daydreaming about her beetroot panna cotta). Boiler was a forest of giant sea fans. They grew so tightly packed together that their shapes were altered by the other sea fans growing into them. Schools of fusiliers would whirl by, and on close inspection, the sea fans had long-nose hawkfish and gobies living within.

In the evening, there was a presentation given by the resident staff of the Island Conservation Society (ICS), a Seychelles non-governmental organization. Several staff members live on the island year-round and conduct research



on and around the island. They monitor the island's seabird populations, and green and hawksbill turtle nesting; they also conduct coral reef surveys and have many other projects. It was amazing to hear about their conservation projects on Alphonse and several other outer islands. The Seychelles has over 50 percent of its land under nature conservation, and this



is one of the groups helping to protect and restore the natural environments and advise on new projects taking place on the outer islands.

The perfect day

As the sun set on my third day at Alphonse, I sipped a perfect gin and tonic while watching the sky turn pink and reflected on what makes diving "good" at a certain location. There are some places and specific times where we go to see a certain animal or behavior: sharks, manta rays or coral spawning,



Goby on a gorgonian sea fan (above); Snapper with gorgeous sea fans on a wall (top right); Longnose hawkfish (left); Unlikely roommates: anthias and eels (top left)

OUTER ISLANDS CONSERVATION

When Alphonse Island was still a plantation, in an effort to improve the working conditions and overall state of the outer islands, the Islands Development Company (IDC) took charge of Alphonse and most of the outer islands in the early 1980s. They worked to improve conditions and production, and began to build hotels and resorts for tourism on the outer islands.

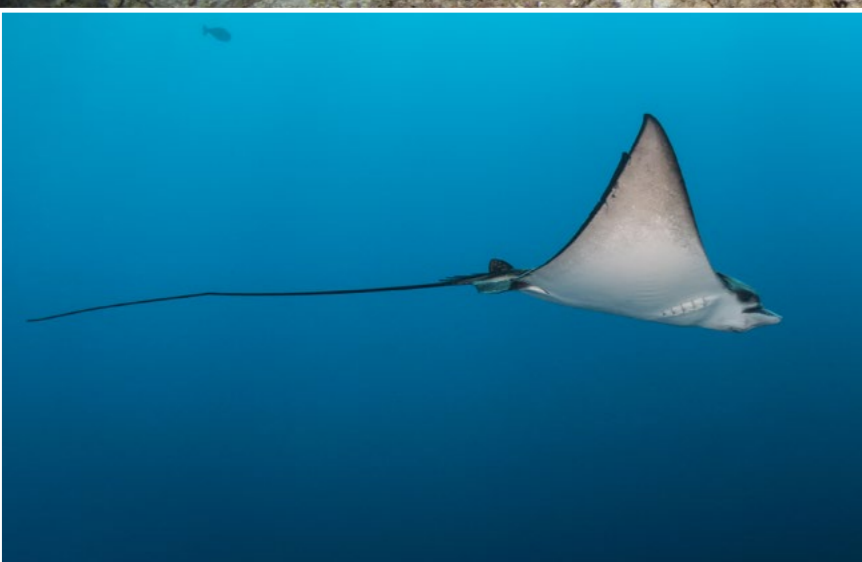
Currently, the IDC aims to make the outer islands profitable in an environmentally-sustainable manner. They own and operate planes to provide charters to the outer islands and manage electricity, water treatment facilities and infrastructure. They also provide many jobs for the people of the Seychelles and beyond.

The IDC recognized early on that the outer islands and their natural environments were special and should have an economic value, such as ecotourism. The IDC has an agreement to be advised by the Island Conservation Society (ICS) in the best ways to protect the environments of the outer islands. The ICS has conservation centers on Alphonse and several other islands, and they monitor the rest of the IDC islands.

The amount of conservation projects in which the ICS participates is really incredible. I heard stories about baited remote underwater cameras monitoring shark and ray presence and movement. They have a doctoral student from the University of Massachusetts studying giant trevallies and helping to implement catch-and-release fishing practices that cause the least amount of harm to the fish. They monitor the corals and sea turtles, tortoises, birds and so much more. They also advise on future changes to the island, including how to add buildings with the least impact. ■



Lucy poses with a trevally (above); Nurse sharks sleep under a ledge with blackbar soldierfish (left); Eagle ray in the blue (lower left)



Pinnacles, which several staff had mentioned as their favorite.

Pinnacles

The boat dropped us off at the edge of the island where the current was flowing directly towards land and wrapping around it in both directions. As we descended into clear water, the amount

of marine life below was stunning. A huge school of chubs lingered just below the surface, and closer to the sandy bottom were massive schools of bluestripe snappers and yellowspot emperors, filling the gaps between several rock pinnacles.

As we got closer to the coral-covered pinnacles, a few sea turtles swam from their sitting positions on the coral up to the sur-

face, passing right by us. As one returned from taking a breath of air, it swam back down, passing right between Lucy and me. Under rock overhangs, there were numerous tawny nurse sharks.

It was nonstop action, with a turtle here and a shark there. Lucy had lined up behind a school of blackbar soldierfish for a photo when right behind her emerged an eagle ray. At another point in the dive, she swam through a space between two pinnacles and several bluefin trevallies swam right in

etc. But there are so many places we visit just because the diving is "good," having pretty reefs, lots of fish, maybe a turtle or an eagle ray sighting. I thought back on dive trips that were "good" in which I only saw maybe a turtle or two, or one ray, and a few sharks.

This day felt like it was all of the "good" diving most people experience in a lifetime—but jam-packed into one day. I took another sip and tried to remember what we had all seen. I was, for the third day in a row, the only diver. My guide was Lucy, one of the dive center's managers, and she also agreed to be my model for the day. Our first dive was at a site called



Lucy takes a look at a sleeping nurse shark (above); Curious hawksbill sea turtle (left)

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to snap photos, I started to wonder how many photos of giant pink sea fans was too many.

Lunch was a bit different on this day; all of the resort guests met on an area of shallow sandflats at low tide for a BBQ-style lunch. Chairs and umbrellas for shade were set out as we ate together

on this remote, isolated island, upon which so few people ever step foot, devouring BBQ chicken pitas and some of the best brownies I have ever tasted.

Soon, we were back on the boat, about to dive a site called Hacksaw. Lucy back rolled into the water first, and she came back up and yelled "Silvertip!" I looked at our boat captain and wondered if that was a "get-in-the-water-right-now" sort of silvertip call or a "stay-on-the-boat,

front of her. A sweetlips, posing perfectly for the camera, seemed to get closer and closer, and we even had a giant trevally swim very close at the end of the dive.

Back on the boat, we motored over to the next dive site, but did not get far before we were surrounded by spinner dolphins. I asked if I could jump in and moments later, I was encircled by dolphins only for a moment before they swam off. Back on the boat, we started moving again and they were back. Once again I jumped in, only to see them for a few seconds before they took off again.

Napoleon and Hacksaw

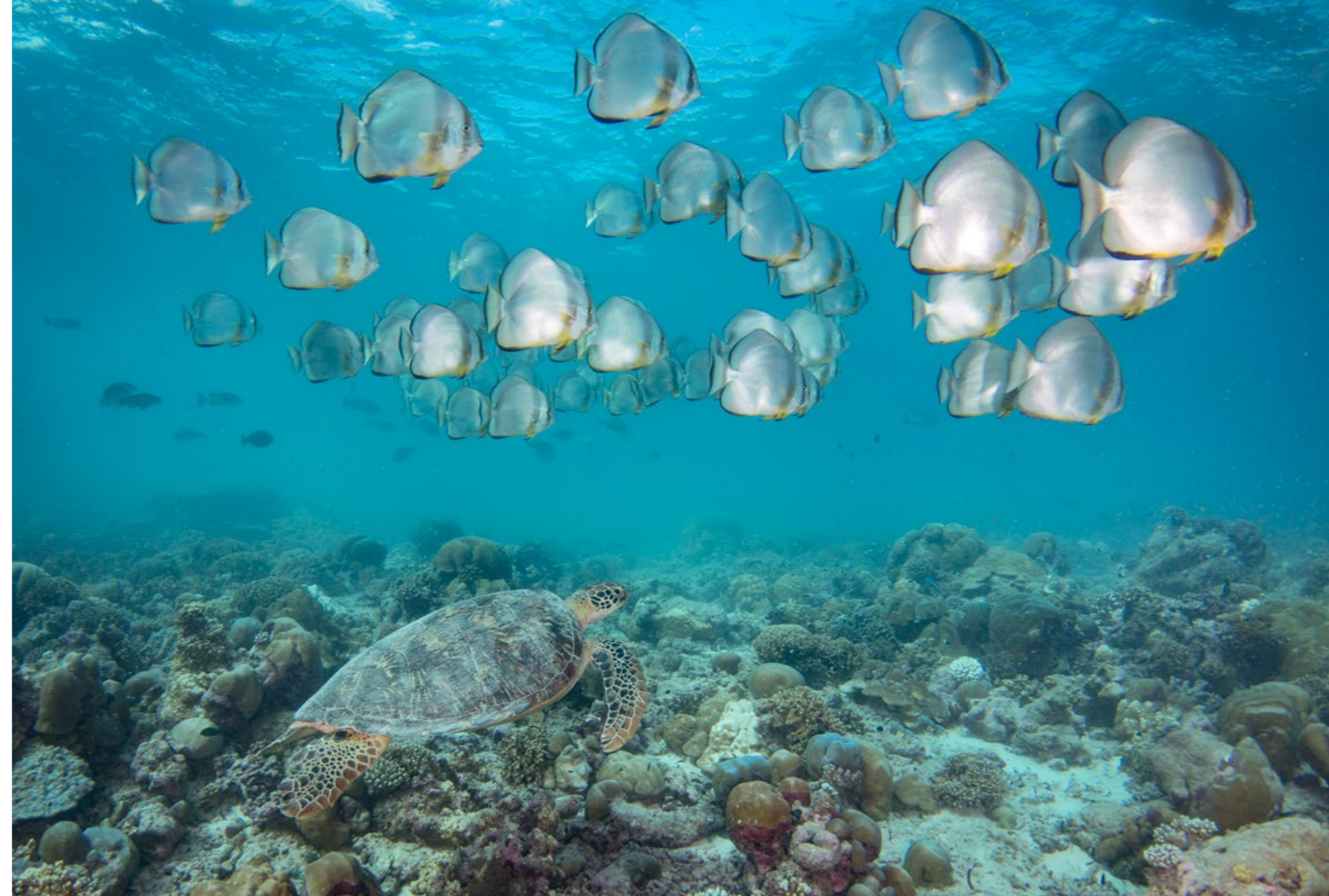
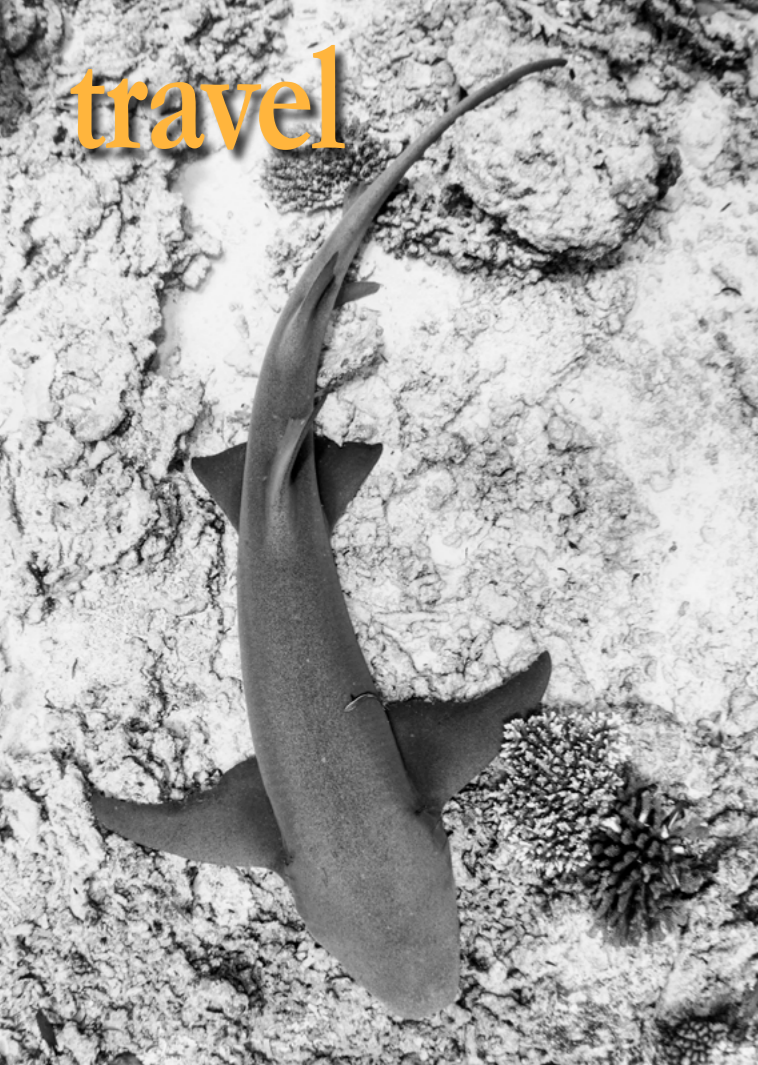
Our next dive site, Napoleon, was a swirl of sea fans and fish, and as I continued

discussing the diving (and the fishing). One boat of guests had gone snorkeling, including the two youngest guests, Megan and Taylor. They told me about the dolphins they saw on the way (I had seen them too), the turtles they swam with, and how they spent the morning collecting trash on the beach for an art project. I was very excited to see this art project when it was finished.

It was pretty fantastic to be on an exposed bit of sand, which is usually covered with water, and having lunch. Once again, I was surrounded by that jaw-dropping "Seychelles' blue," with the water changing shades of blue from dark to light, concluding its spectrum with the white sand. It reminded me that we were



All the guests at Alphonse met on a sand flat at low tide and had a fantastic BBQ lunch as the tide started to rise (above); Spinner dolphins encountered while snorkeling (top left); Silvertip shark (top right); Lucy with sweetlips (center) and giant sea fan (bottom right)



there-is-a-silvertip-shark-charging-me" sort of call. But I did not ask or wait for more explanation, I back rolled into the water and headed straight down—there was a silvertip to photograph!

I did not expect the shark to stick around, but it did, for about five minutes, and was joined by two others. Continuing the dive, we headed into another patch of sea fans, and the silvertip sharks seemed to follow us for a bit. I thought maybe I would get the perfect shot of a silvertip shark with pink sea fans behind, but they did not cooperate and soon left us. During the dive, we spotted an octopus, a peacock mantis shrimp and many schools of fish.

At the end of the day, we had seen two species of sea turtles, three species of shark, eagle rays, dolphins, giant trevally, huge schools of snapper, octopus, mantis shrimp, sweetlips and batfish, and enjoyed a lunch on an isolated sandflat in the middle of the Indian Ocean. Not a bad day... not a bad day at all.

Spoiled

It was around this point that I started to get spoiled. Underwater, I had passed up photos of turtles, batfish and nurse sharks just because I already had so many. Our first dive at a site called Arcade was indeed a turtle city. Every few feet, there was another green or hawksbill turtle—some under ledges scratching their shells, some at cleaning stations getting a bath, others in the water column going up for air, others coming back down, and one even seemed to slowly lead me to a school of batfish, so it could have its photo taken with them.

My guide, Rose, had the cutest batfish follow her the whole dive, which made me smile; it just stayed a few feet behind her, continuously looking like it was about

to nip at her fins. I pointed it out to her, and she gave a heart hand signal underwater. As our dive ended, we ascended to our safety stop, and her batfish buddy seemed to have called all its friends. We had maybe two dozen circling us.

Pinnacles was so good the day before that we went back, and it did not disappoint. Once again there were plenty



CLOCKWISE FROM TOP LEFT: A nurse shark lying on the sand is cleaned by wrasse; Following a sea turtle, it took me to a school of batfish; Octopus hiding in reef; Dive guide Rose surrounded by batfish; Hawkfish





of nurse sharks, schools of snapper, several Napoleon wrasse, which would not get close enough for a good photo, and at the end of the dive, a fever of marbled stingrays. Just another day of diving around Alphonse Atoll...

Change of scene

A few other divers joined the boat doing an advanced open water

class, and we dived Arina, a site in the lagoon of St. François Atoll. There were schools of humpback snapper, two eagle rays, which snuck up behind me, a school of bigeye trevally and lots of fish.

Our second dive was back at East Side Wall. This time, I used my wide-angle lens. A cold thermocline crept in early in the dive and would not go away. I found myself shivering and was just about to call off the dive around 40 minutes in, when a school of bumphead parrotfish came straight for us. I took one shot and they turned around to swim away, but one turned back around towards me. It found a piece of coral to bite, and while it was eating, it let me get quite close. When it was finished, it looked right at me, and then, swam away. We also had a glimpse of a lemon shark.

Our day finished with sunset drinks at the beach bar, a short bike ride

through the jungle, ending near the western corner of the island. Mingling with other guests, we sipped drinks and nibbled on fresh fish tacos and dried plantains, discussing our daily adventures and how beautiful and unique this place was. After the sun set, we rode our bikes back for dinner, and I found myself on my beach looking up at a million stars before calling it a night.

Macro life

On my last day of diving, I decided to shoot macro because the weather looked dark and stormy. At a site called Theater, I found a large pufferfish, with bite marks on its face, being cleaned by several wrasse. The cleaner wrasse moved around the red, exposed, fleshy areas near the eye and mouth of the fish. I also found several longnose hawkfish in



the sea fans. An octopus came out to inspect us, and at the very end, of course, a manta swam overhead (these things always happen when shooting macro).

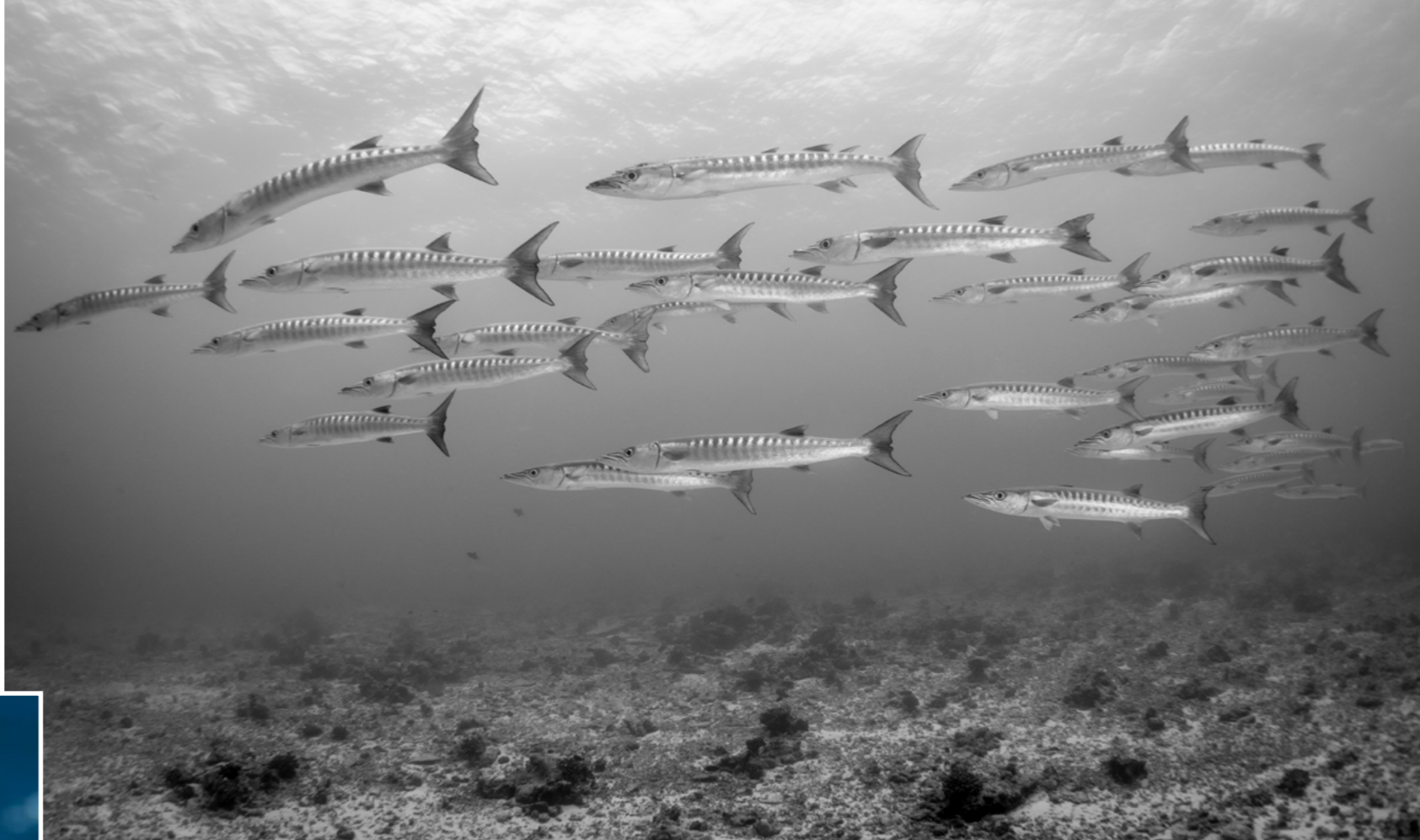
FADs

The last dive was a special dive. The students were doing a Dive Against Debris, and the plan was to try and remove a FAD (fishing aggregation device). Large commercial fishing boats in the Indian Ocean are known to send out these floating platforms with lines or nets hanging from them to

Bumphead parrotfish (left); A fever of rays on the reef (above); A pufferfish's wounds are cleaned by a wrasse (lower left)



Scorpionfish (above); Healthy reefs with diverse marine life can be found at Alphonse (top right); Fire dartfish (center inset)



Giant barracuda (above); Blacktip grouper (top left); Life under a FAD (left)—barnacles were growing on the lines and there were dozens of golden trevallies; Wall art made by guests after beach clean-ups included this palm tree by Alphonse's youngest guests Megan and Taylor (right)

attract fish. Many are equipped with satellite GPS systems and fish finders to signal to the larger boats when large schools of fish are below.

Unfortunately, a lot get "lost" and drift up on the reefs and beaches of Alphonse (and other islands). They can entangle sharks, rays, turtles and fish, and can be left as piles of rubbish on beaches or shallow reefs. Lucy had told me about the FAD problem, and when she said we were going to go and try to remove

Alphonse that we saw three within a few hundred feet of each other. We managed to remove two in just under an hour, with a group of about eight people. I was shocked at how severe the FAD problem was here, yet it seemed unknown to the rest of the world.

Turning beach debris into art

Back at the dive center, the amazing staff cleaned my gear and hung it to dry (and my camera disappeared and reap-

one, I also thought that involved looking for one, as in, we know they are out there, maybe we will come across one and be able to remove it.

I was wrong. This was not a "maybe-we-will-find-one" mission, the FADs were apparently so numerous around

peared at my bungalow). I also noticed a new piece of artwork on the walls. Made from plastic and garbage found on the beach. Megan and Taylor, the youngest guests of Alphonse, had turned discarded flip-flops, bottle caps, a yoga mat, cigarette lighters and toothbrushes into a palm tree collage. Their artwork was hung with a humpback whale, a turtle, and other designs made by other guests—such a cool project, and their palm tree turned out so well!

Everyone met at the oceanfront bar for drinks and storytelling from the final fishing day. I found myself again contemplating how remote we were, the amazing service of the resort, and the variety of things you can do on the island. Over 100 staff reside on the island, and the resort can house around 70 guests—although often, it is much less. The staff paid attention to so many little details, such as the lights at night on the bungalows



and around the island. They were green and red, so that newly hatched turtles would not get confused and crawl inland towards white lights instead of out to sea.

WHO YOU DIVE WITH

As I continue to travel for diving the same realization keeps occurring to me: as consumers, we need to make educated decisions as to what companies we patronize.

- Choose to dive only with operations that care about the state of the ocean. Those that do all they can to minimize their impact by making efforts to better the waters they dive such as beach clean-ups or teach educational programs and policies that help divers to be environmentally-friendly.
- Choose to stay at resorts and hotels that make efforts to conserve water and energy (such as rainwater catchment and solar power).
- Find out what happens to the waste. Does sewage get dumped on the very reefs you will dive the next day or is it treated?
- Are the restaurants importing foreign foods with a huge carbon footprint and at the expense of the environment when they could be using local produce?

If we only patronize eco-friendly businesses, it will force the rest to convert to more sustainable practices. We have the power to change dive travel for the better. We also need to realize that being environmentally-friendly will likely cost business owners more. We need to be willing to absorb that cost during our stay, not opting to use the cheapest option just to save a few bucks. For example, it costs nothing to dump sewage directly into the ocean, but having waste water treatment plants costs money, we need to be willing to absorb the costs of our dive vacations not doing harm the very environment we desired to see. So maybe the Alphonse model is an answer. We sacrifice part of an island to tourism, but in the most environmentally-sustainable way possible, and support the rest of the island in its return to a healthy ecosystem. Visitors get to stay on a pristine island and dive untouched, unspoiled reefs. ■



African pygmy angelfish (above); An octopus with two-tone chromis and sea fan (left)

It seemed like the staff anticipated what I needed (sometimes even before I realized I needed it) and nothing was too much to ask.

The resort also offered fishing and diving trips to other outer islands, including Astove, Cosmoledo and Poivre Atolls. The same thought kept crossing my mind, "What an amazing place." Also, "How do I get back here again? How can I get to the other outer islands? I wonder if they need a dishwasher?"

**The last day:
Island exploration**

On the previous night at dinner, Sam and Lucy had suggested a guided island bike tour—something most guests did the first few days they were on island, but my diving sched-

ule did not allow time for it. I eagerly said yes, but woke up to stormy skies, and I wondered if anyone would want to ride around in the rain with me.

After breakfast, I headed to the dive center in a light drizzle, passing three tortoises munching on grass in the rain. I gave them each a wave and a silent goodbye. I figured that if my tour was cancelled, I would say goodbye to the dive team as well, but Sam was there and ready to show me the island, so off we went.

Before my trip, I had read up on some of the history of the island, and Sam reiterated that it was originally a coconut plantation, with only a few people living on the island. They had cut down most of the natural vegetation to make way for coco-



Red-spotted coral crab on hard coral



Grouper and anthias on healthy reef (left) and palm trees on beach (above) at Alphonse Island; A green sea turtle scratches its shell under a coral head (right)



nut palms, and they had mined the island for guano, which was used to fertilize the palms, to the detriment of the topsoil. As a result, many birds stopped breeding on the island because the vegetation in which they nested was gone. In addition, turtle eggs (and bird eggs) were harvested, causing a decrease in populations.

Sam also showed me the gardens where much of the food consumed on the island was grown. Several gardeners worked full time to grow fruits and vegetables. He also took me to the island's solar plant where almost all of the power needed to operate the island was harvested from the sun.

Alphonse Resort really seemed to be the epitome of ecotourism. It felt like the resort had done it right and this would be an excellent model for other companies in the tourism industry to follow. Admittedly, it is not a budget destination, but one is paying for an island that is being rehabilitated. While visitors get luxury and adventure in a pristine environment, the island is being cared for and given a chance to return to its natural

state, as evidenced by the return of the birds and turtles.

The isolation of the outer islands of Seychelles makes them easy places for illegal fishing and poaching. One way to deter turtle and seabird egg poachers is to have people on the island year-round (like tourists). Of course, this may mean that the poachers just go to another island, but at least some islands will be safe havens for the birds and turtles.

And on Alphonse, it is apparent that this approach is working, as I have never seen so many turtles. In the mornings, when I walked out to the beach, at any given moment, two or three sea turtle heads would be peeking out of the water to grab a breath of air. The dark shadows of sea turtles diving and gliding past the shoreline were everywhere. Birds were constantly seen circling the island and also nesting.

As the days passed, full of activities, but still at the relaxing pace of the island, one could almost feel the collective sadness among the guests as we realized we would soon have to leave this wonder-

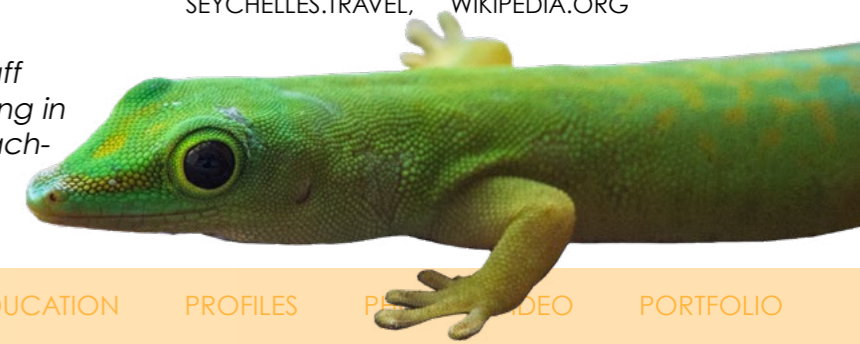
ful island. We were gathered up on Saturday afternoon, leaving our bikes behind and returning to the runway in golf carts. I suppose my bike soon had another name on it and someone else was riding it in paradise. The IDC plane came, and we hugged the staff on our way out (in my head, I was already plotting how and when I could return to visit Alphonse and the other outer islands). I got on the plane, craned my neck to see out the window and watched the island disappear into the blue. Still smiling, I thought, "What an amazing place." ■

Special thanks go to Alphonse Island Resort (alphonse-island.com).

Brandi Mueller is a PADI IDC Staff Instructor and boat captain living in Micronesia. When she's not teaching scuba or driving boats, she's most happy traveling

and being underwater with a camera. For more information, please visit: Brandiunderwater.com.

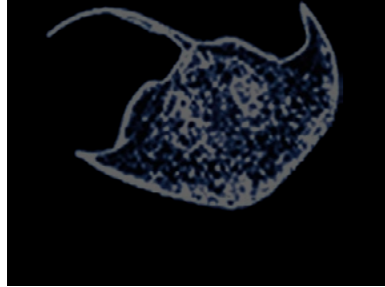
SOURCES: ALPHONSE-ISLAND.COM, BLUESAFARI.COM, IDCSEYCHELLES.COM, ISLANDCONSERVATIONSEYCHELLES.COM, SEYCHELLES.TRAVEL, WIKIPEDIA.ORG



Bicycling along the scenic paths of Alphonse (above); Seychelles day gecko (right)

fact file

Seychelles Islands



SOURCES: ALPHONSE-ISLAND.COM, US CDC, BLUESAFARI.COM, IDCSEYCHELLES.COM, ISLANDCONSERVATIONSEYCHELLES.COM, SEYCHELLES.TRAVEL, STATE.TRAVEL.US, US CIA WORLD FACTBOOK, WIKIPEDIA.ORG, XE.COM

History The islands of the Seychelles were initially settled by the French in the late 1700s and then ceded to the British in 1814. Estates were established throughout the islands growing coconut, cotton, sugar cane, cinnamon and vanilla. The Seychelles gained independence in 1976.

The Alphonse group (Alphonse, St. François and Bijoutier) as well as many other outer islands were developed into coconut plantations by the late 1800s. On Alphonse and many other islands,

the native flora was destroyed to make way for coconut palms and the turtle nests ransacked for their eggs, meat and shells. The birds were either killed or they stopped returning because their habitats were lost. The island was mined for guano, further damaging the island, but helping to grow plenty of coconuts.

In 1977, the government took control of the outer islands with means to improve working conditions. In 1983, the Island Development Company (IDC) began managing the Alphonse group (and the outer islands). In 1999, the Alphonse Island Resort and the Island Conservation Society (ICS) has had a center on the island since 2007. Currently, the IDC, ICS, resort and fishing company work together to preserve Alphonse (and several other islands) and rehabilitate the islands as best as possible to restore them to their natural state. The partnership allows people to visit these unique islands. Government: presidential republic. Capital: Victoria

Geography The Seychelles is located in the Indian Ocean, just south of the Equator, east of Kenya and northeast of Madagascar. It includes 155 (plus seven reclaimed) islands, which are divided up into the inland islands and the outer islands. The inland islands contain 42 granitic and two coralline islands, which is where 98% of the population lives. The outer islands consist of the Amirantes group (29 coral islands), the Farquhar group (13 coral islands), and the Aldabra group (67 raised coral islands). Alphonse is part of the Amirantes group and is 400km (250 miles) from Mahé. Coastline: 491km.

Climate The Seychelles has an equatorial climate with high humidity and a temperature that changes little throughout the year. The northwest trade winds blow from October to March, bringing more precipitation and lower winds. The southeast trade winds blow from May to September, which tend to be higher winds with dry, cooler temperatures. Water temperatures are generally 26-27°C (78-82°F), although chillier thermoclines are

Location of Seychelles Islands on global map (right); Location of Alphonse Atoll on map of Seychelles Islands (below); Sergeant damselfish on reef (bottom left)



US CIA WORLD FACTBOOK / PUBLIC DOMAIN

common; these can be as cold as 18°C (66°F). Alphonse offers diving from November to May for the best water conditions.

Environment Many of the outer islands were used as plantations in the past, wiping out native vegetation and destroying seabird and turtle nesting areas. Major efforts are being made to attempt to restore many islands, and bird and turtle populations are returning. Extensive fishing, both legal and illegal, continue to decimate fish populations. Fishing trawlers deploy thousands of FADs (fishing aggregation devices) that float freely and often entangle marine mammals, turtles, sharks and rays. They also wash up on beaches, getting tangled up on coral reefs and become marine debris. Climate change and sea level rise are also problems as the outer islands are low-lying. The Seychelles is working

to solve environmental issues and embraces ecotourism as a means to both increase the economy and preserve the beautiful islands. There are many protected and managed conservation areas, working to restore previously damaged habitats to more natural states.

Economy In the past, major exports of the Seychelles came from plantations growing copra, cinnamon and vanilla. Farming and fishing continue today but at a much smaller scale, mostly for local use. Current exports include processed and frozen fish, copra, cinnamon and vanilla. Tourism is a large part of the economy.

Population 94,633 (July 2018 est). Ethnic groups: primarily creole (East African and Malagasy); plus French,

Indian, Chinese and Arab populations. Religions: Roman Catholic 76.2%, Protestant 10.5%, other Christian 2.4%, Hindu 2.4%, Muslim 1.6% (2010 est). Internet users: 52,664 (July 2016 est.)

Currency Seychellois rupee (SCR). US dollar, Euro and British Pounds are sometimes accepted in tourist areas. ATMs are common throughout Mahé, but there are none on Alphonse. Credit cards are commonly accepted, although sometimes with fees. Exchanges rates: 1USD=13.32SCR, 1EUR=15.03SCR, 1GBP=16.03SCR, 1AUD=9.03SCR, 1SGD=9.04SCR.

Language English, French and Seychellois Creole.

Phone/Internet Mahé has reliable cellphone networks with data plans available. Most hotels and some restaurants have Wi-Fi. On

Alphonse, there is no cell service. The resort provides free Wi-Fi in the reception and bar areas. It is possible to call out of Alphonse, but only by costly satellite service.

Voltage 220-240 volts AC 50 Hz; British standard square three-pin. Alphonse has multipin adapters in the rooms.

Travel/Visa The Seychelles is a visa-free country, but visitors must provide on arrival a departure ticket, confirmation of accommodation and proof of sufficient funds. Visitors can stay up to three months, with extensions up to 12 months. Proof of yellow fever vaccination may be required if coming from countries with yellow fever.

Transportation In Mahé, taxis are common, there are plenty of rental car agencies, and the island has an extensive public bus system.

Health & Security In Mahé, tap water meets WHO safe drinking standards. That being said, it is advisable to drink bottled water. Alphonse makes its own water, so it is safe to drink from taps. There is no malaria or yellow fever in the Seychelles, but outbreaks of mosquito-borne diseases such as dengue and Zika occur occasionally, so avoid mosquito bites. Routine vaccinations are suggested, including measles.

In Mahé, crime rates are low, but like anywhere, take sensible precautions. Secure valuables in safes, do not leave valuables in plain view inside cars or on beaches, and be aware of your surroundings. On Alphonse, there is little chance of issues.

Decompression Chambers Mahé Victoria Hospital in Victoria Silhouette Island (45-minute boat ride from Mahé). ■



A hawksbill sea turtle (right) is rescued from entanglement in a dFAD; Removal of dFAD off the reef in Alphonse Atoll (far right and bottom right); Chub shelter under dFAD, St François Atoll, Seychelles Islands (center inset)



dFADs threaten marine life in the Indian Ocean

Drifting fish aggregating devices (dFADs) are threatening the marine environment in the Indian Ocean. In 2015, marine conservationist Lucy Martin worked with the Island Conservation Society (ICS), a non-governmental organisation in the Seychelles, on a large survey to find out how big a problem dFADs actually were.

Text by Lucy Martin
Photos courtesy of Lucy Martin and ICS

A dFAD is a floating raft equipped with solar-powered batteries, a fish finder and a GPS system. They enable vessels to track the location and quantity of schooling tuna. Usage of this fishing practice has been accelerating since the 1990s, and nowadays, mass-produced dFADs follow the ocean currents, signalling the best fishing grounds. Made of scrap netting and long ropes, dFADs work by creating shade—the shelter of which attracts small fish in the vast open ocean. This, in turn, attracts larger fish. After a period of about five months, the volume of available food brings a tuna feeding frenzy. The industry then uses purse-seine nets that circle the shoal, close at the bottom and bring in the whole catch.

Discarded and drifting

In response to campaigning by turtle conservation groups, a change to dFAD design was encouraged in 2012 in order to avoid entanglement of these marine reptiles in the hanging nets. However, what my colleagues and I found in 2015 was that dFADs were being carelessly discarded at the fishing grounds and left to drift around the ocean until they hit shallow coastal waters, like that of the Outer Islands in the Seychelles where I live.

Many of these Outer Islands are atolls, and I found that the impacts of dFADs



entering this sensitive ecosystem were many. The seabed outside the atoll—with pristine coral reefs—would be the first to take a hit; the net and rope attached around coral heads and would anchor dFADs, then rip colonies off the seabed in strong currents, swell or wind. Once freed from the seabed, dFADs would move onto seagrass flats and uproot plants and marine organisms. Eventually, the train wreck of damage made it into the lagoon or onto the beach. All this while, marine life became ensnared and died. The synthetic materials used were persistent and therefore so was the threat.

Survey and removal

In the 2015 survey, ICS and I quantified the damage being done and started more intensive removal of dFADs. Since then, I have moved into ecotourism and run a PADI dive centre. Here, I organise



dFAD removals with guests and promote the Project AWARE Dive Against Debris Speciality in which I regularly remove dFADs with students.

Reductions and FAD Watch

Since the issue has been highlighted, reductions in dFAD quotas have been made, and the industry is looking into biodegradable dFADs. A collaboration with Spanish Tuna Purse Seiner Fishing

Representatives, named FAD Watch, has been initiated to attempt to intercept dFADs before they hit the reefs. All of the advancements are big improvements, but there is still a lot that needs to be done. ■

Watch this space to read Martin's first-hand accounts of dFAD removals, as well as the problems and conservation successes revolving around dFADs, in an upcoming issue.



A drifting fish aggregating device, or dFAD, which has gotten anchored to the reef, Alphonse Atoll, Seychelles Islands



Indonesia's
**Lembah &
Bangka**

— *Expect the Unexpected*

Text and photos by Kate Jonker



Dive boats ready for morning launches at our resort in Lembeh (above); Flamboyant cuttlefish at Sarena Besar (right)



Lembeh



Yellowtail clownfish at Sarena Besar (above); Tiger butterfly nudibranch, *Cyerce nigra*, at Muka Liggua, Bangka Island (previous page)

***Ting-ting-ting-ting-ting-ting-ting!* Someone, somewhere, had found something really exciting! One of the dive guides was tapping frantically on the side of his cylinder with his metal pointer. *Ting-ting-ting* replied my dive guide Opo, only to receive more frantic tapping in response. My pulse rate upped a few more levels in anticipation of yet another exciting find. Following Opo and the frantic tinging up the dark sand slope, we finally found its source—one of the other dive guides had found a beautiful flamboyant cuttlefish.**

As we watched, the cuttlefish disappeared under a discarded coconut shell and reappeared. Opo motioned to me that it was laying eggs. We watched in awe and fascination but eventually left the cuttlefish to its maternal duties in search of other exotic creatures.

This was just the second day of diving Lembeh Strait and I was already starting to realise that despite everything I had read, Lembeh was not at all what I had expected.

Getting there

Lembeh Strait, more commonly known as just “Lembeh”, is a narrow stretch of water between the eastern coast of the Indonesian province of North Sulawesi and Lembeh Island.

Getting to Lembeh is relatively easy and usually involves a flight into Sam Ratulangi International Airport in Manado from one of the central hubs such as Singapore,

Jakarta, Kuala Lumpur or Bali. Once in Manado, it is a 90-minute drive to Lembeh and most resorts arrange a transfer from the airport, taking the stress out of trying to use taxis and public transport.

We had done exactly that and as we exited the airport terminal, we were met by a beaming gentleman called Johannes who loaded our suitcases into his air-conditioned van and handed us very welcome ice-cold bottles of water for the trip. Before long, we were travelling down well-maintained roads and enjoying incredible views of lush green hills and towering volcanoes whilst Johannes dodged the swarms of motorcycles and cars that came at us from every angle.

We reached a tiny and very busy jetty in the port town of Bitung where our luggage was loaded onto a boat with incredible efficiency for a ten-minute ride across the Lembeh Strait to our resort.



Variable neon slug at Nudi Falls



Tiny yellow goby peeks out of a bottle at Tike 3 (top left); Spiny seahorse photographed with side lighting and shallow depth of field at Hair Ball (above center); Great Phyllodesmium nudibranch at Tike 3 dive site, photographed using a shallow depth of field (top right)



The resorts

There are many resorts in Lembeh, most with fantastic reviews on the Internet. This makes the decision of where to stay really difficult, especially as most resorts are similarly priced. As we had wanted to split our time between Lembeh and Bangka Island, we found it more convenient to choose a company that had resorts in both destinations.

The resorts are either situated on the mainland or on Lembeh Island, and most are located directly at the water's edge. It can be quite hot and humid at water level and we were very happy to discover that our rooms, the restaurant, bar and swimming pool were perched at the top of a headland that always seemed to be cooled by a gentle breeze. We did have to climb a fair number of steps after diving or working in the camera room, but this was a small price to pay for the lovely cool air and beautiful views we had from our rooms and the public areas.

The diving

The diving in Lembeh is done from purpose-built motorised wooden boats, which have two or more outboard motors on the back and are hand-steered by the captain who sits next to the motors.

The boats are large and spacious with a small open deck in the front of the boat, a covered area with cushioned benches and overhead stowage areas in the main section and a toilet at the back of the boat.

We had booked three dives a day and the usual routine was to leave the resort at 08:00 and do two dives in the morning with a surface interval between dives. We would then return to the resort for lunch at noon and go out again for a third dive at 2.30 p.m.

When we checked into the resort, we were allocated plastic crates with our names on for all our dive gear. From that moment on, the incredibly efficient and kind staff kitted up our gear for us,

ensured it was on the boat every morning and that there were extra cylinders, which they changed for us, ready for our second morning dives. We were offered tea, coffee, water, fresh fruit and cookies between dives and there were even beautifully scented towels with our names on for us to use whilst on the boat.

As this was the first time our little group had dived in Lembeh, there was great excitement as we climbed aboard for our first dives. There were six divers on the boat with three dive guides between us and whilst the crew was getting the boat ready to leave, we donned our wetsuits and booties. The boat left shore and we headed across Lembeh Strait to the mainland.

Police Pier. Within ten minutes, we were slowing down alongside a partly sunken wreck and a huge old steel barge. "Welcome to Police Pier," announced our dive guide Opo.

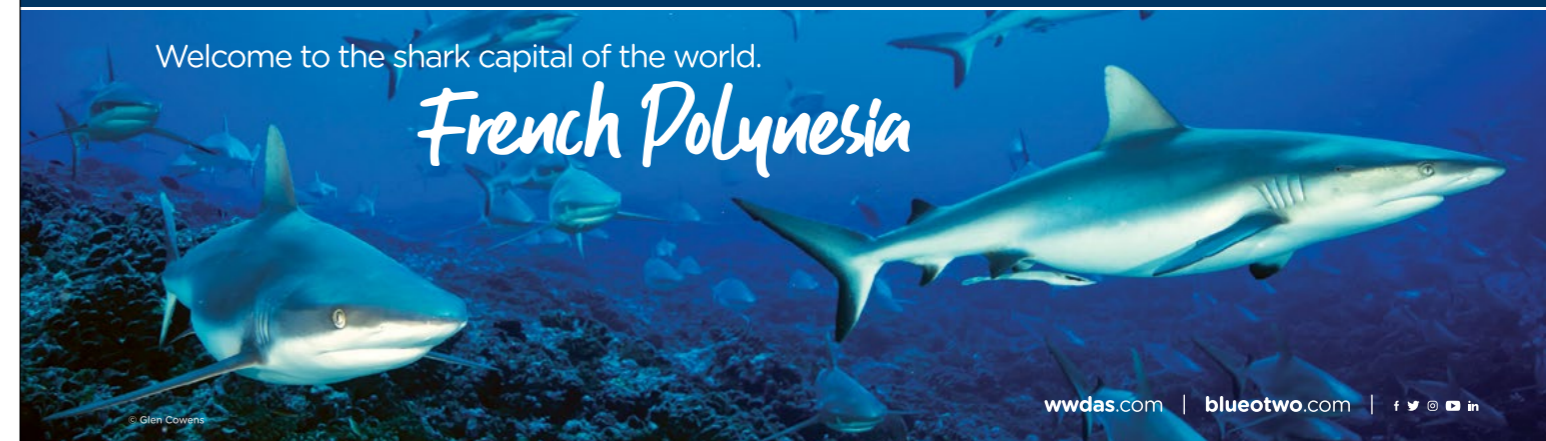
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Bigfin reef squid beneath boat, Sarena Besar





Zebra crab on its host fire urchin at Hair Ball dive site (left)



Warty frogfish at Police Pier

Opo gave us our pre-dive briefing and split us into three groups. We kitted up and waited for the go-ahead to back-roll into the water. As I looked down into the water, I was amazed. The water was clear and blue, and not the dirty, dingy green I had read about. I fell back into the water and looked down. Where was the trash I had heard so much about? As I descended to the seabed below, I felt as though I was dropping into someone's untidy backyard. Poles, planks and ropes littered the coarse, rubbly dark sand, but I saw none of the plastic rubbish I had expected.

Before I had the chance to turn on my camera and strobes, I saw a bright yellow creature staring up at me. It was a small frogfish hiding

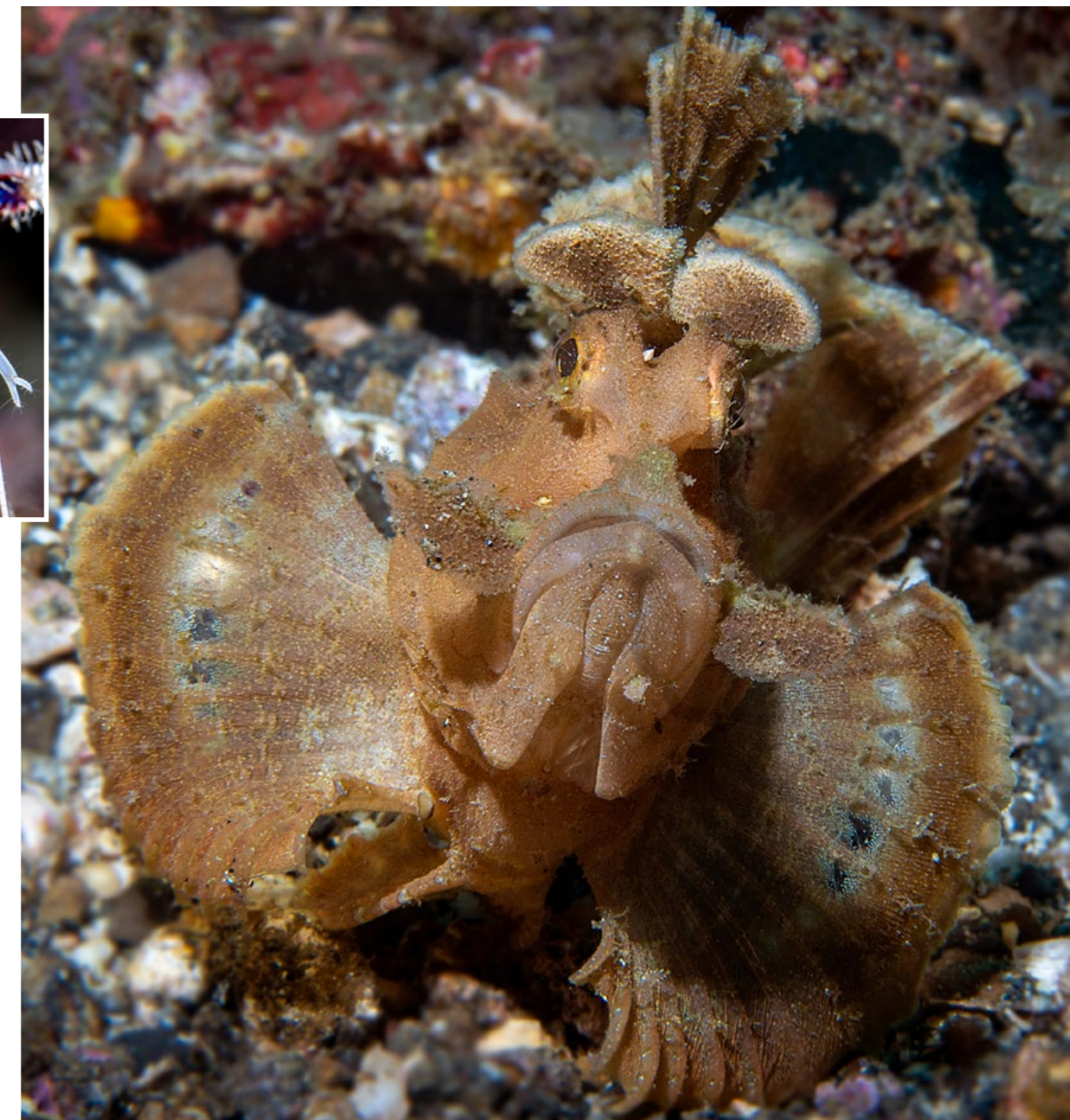
amongst the marine life and dark stone rubble. I took a few photos and left it to the rest of the photographers.

Two metres on, I found a black crocodilefish with blue eyes resting beneath a wooden beam. As I started taking its photo, one of the dive guides nudged my arm and pointed to what looked like an old rag swaying gently to and fro. Upon closer inspection, I realised I was looking at a paddle-flap scorpionfish—one of the creatures I had always wanted to see. As I was taking a few shots of it, I saw a googly-eyed peacock mantis shrimp watching with great interest. It amiably let me take its photo before turning around and scuttling away.

At this stage I was suffering

from severe sensory overload and took a moment to relax and take in my surroundings. I was amazed at the variety of colourful reef fish flitting around this untidy garden. Wrasse, anemonefish, juvenile batfish and fish I had never seen before were absolutely undisturbed by our bubbly intrusion. All too soon, I realised it was time to ascend. Just as I was about to start my safety stop, one of the dive guides came up to me and wrote "juvenile pinnate batfish" on his slate. When I gestured to him that my dive was over, he patted me on the head and swam off.

Getting back on board



Paddle-flap scorpionfish at Police Pier (above); Banded boxer shrimp at Makawidey dive site (center inset)



Indonesia Luxury Liveaboard: 6 Cabins - 18 Crews - Asian/Western/Vegan Cuisine - Massage - Eco Friendly



Juvenile pinnate batfish at Nudi Falls



after a dive was very easy and simply required removing one's fins and handing them to a crew member and climbing up a sturdy wooden ladder.

Sandy slopes and coral gardens

Critter Hunt. After an hour-long safety stop, we found ourselves descending

Yellow goby at Tike 3 (above); Ornate ghost pipefish at Trikora (right); Orangutan crab needing a haircut at Magic Rock (bottom right); Black-horn Thecacera nudibranch at Trikora (left)

yet again into beautiful blue water. This time, the dive was at a site called Critter Hunt, which was a steep slope of coarse light-coloured sand. We made our way down to about 19m and slowly followed the slope to a shallower depth. We did not need to hunt very hard as critter after critter popped out at us—from beautiful ornate ghost pipefish, tiny red hairy shrimp, a red scorpionfish that was no larger than my thumb, a huge yellow and green Tambja nudibranch and a minute orange *Thecacera pacifica* nudibranch known as "Pikachu." We finished our dive on a lovely coral reef before having to return to the boat. What an



incredibly beautiful dive!

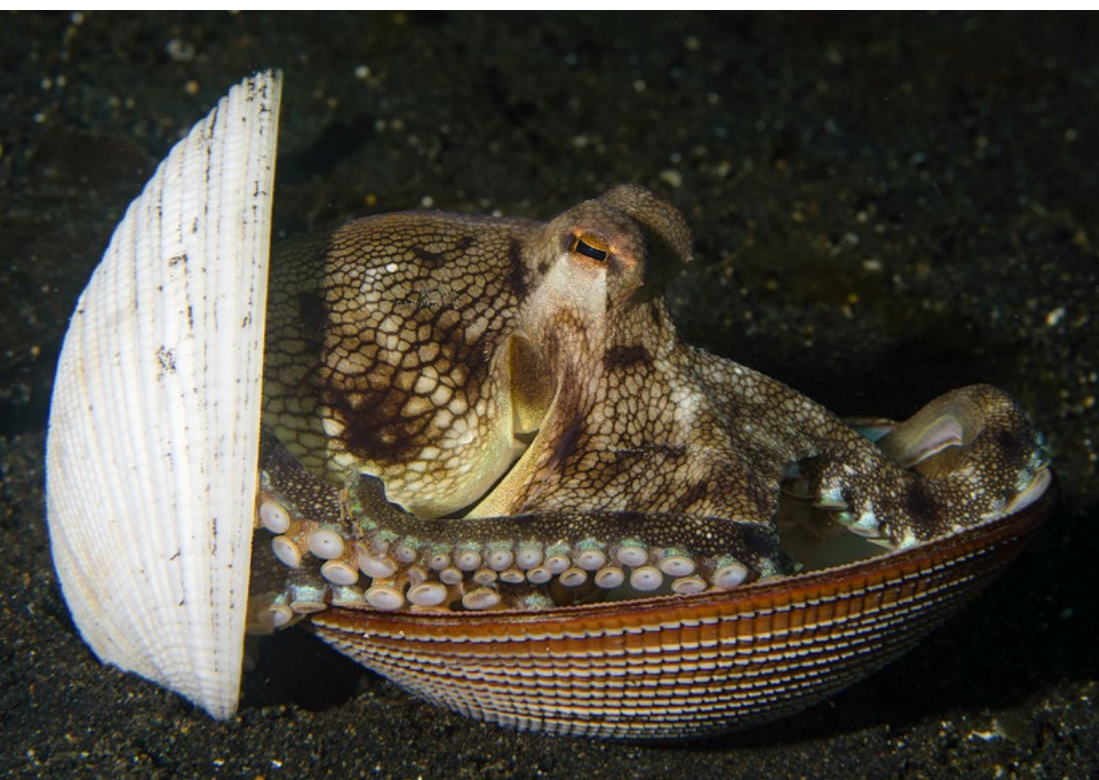
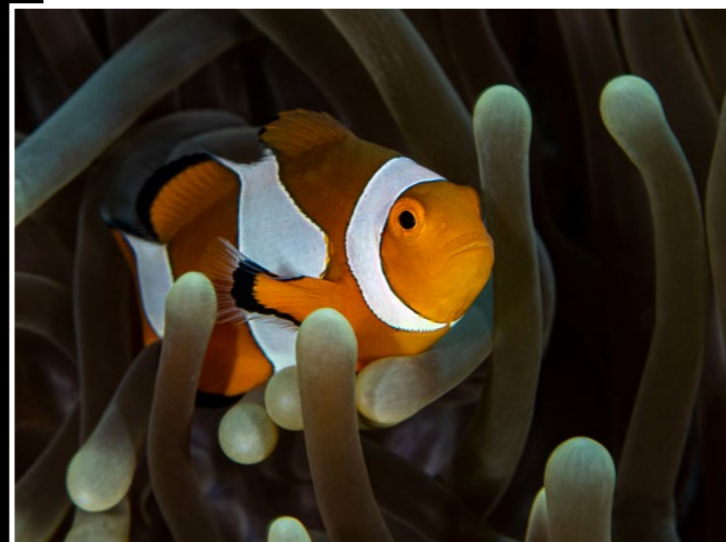
After our second dive, it was back to the resort for a delicious buffet lunch of very tasty Indonesian cuisine and a quick change over of camera batteries before climbing back onto the boat for our third dive of the day.

We were all very excited to hear that we were going to visit the famous dive site known as Hair Ball for our first real "muck dive" of the trip.





Snake eel photographed using a snoot at Hair Ball (above)



Muck diving

Hair Ball. As we descended into a moonscape of fine black sand, I was again taken aback by how little rubbish there was. I had really expected muck diving to be all about digging amongst plastic

bags, discarded babies' nappies, plastic bottles and other rubbish in search of critters. At Hair Ball, we did see the odd discarded shoe and a few empty tin cans and bottles, but not nearly the amount I had expected.

We followed our dive guides down to about 17m, stopping along the way to photograph a coconut octopus possessively guarding its shells and a small white frogfish perched on a white algae-covered sponge. I was incredibly excited to see a snake eel poking its head out of the sand and a crazy-looking Ambon scorpionfish with algae hanging from its appendages. A shy-looking porcupine pufferfish hid in a tin can, its eyes perfectly matching the eyes on the label on the side of the tin. A lone remora swam alongside us looking for an unsuspecting diver to latch on to and a beautiful spiny seahorse clung to an orange sponge. Soon after that, I spotted one of the hairy frogfish after which the dive site is named.

As we headed back up the slope to our boat, I stopped in amazement as I found myself looking at

a sargassum fish hiding amongst some seagrass. This was a creature I had always hoped to see! I was able to take a few photos of it as it rested in the sand before it suddenly launched itself at me and chased me down the slope. No matter which way I turned, this feisty little fish kept on chasing me.

Eventually, the sargassum fish came to rest on the sand once more. I had been so busy photographing it as I beat a hasty retreat down the slope that I had not noticed a diver with a very large video camera filming the entire episode. So, someone out there has very funny footage of a big photographer being chased by a tiny fish!

And so ended our first day in Lembeh.

As I reviewed my photos that night and thought back on the dives we had already done, I real-

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Sargassum fish that chased me down the slope at Hair Ball (above); Clownfish at Makawidey (top center); Long-spine porcupinefish (center) and coconut octopus (left) at Hair Ball



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Shoreline (above) and weird-looking spiny waspfish (right) at Tike 3; Very tiny, 3mm candy crab photographed with a +15 wet diopter and 90mm macro lens at Rodjos (bottom right); Huge painted frogfish at Bianca (left); Warty frogfish at Nudi Falls (bottom left)

ised how different Lembeh was to what I had expected. I was very keen to uncover more of the surprises Lembeh had in store for us!

Over the following five days, we explored 15 more dive sites, all of which were incredibly diverse, not only in topography and bottom composition, but in the marine life found at each site.

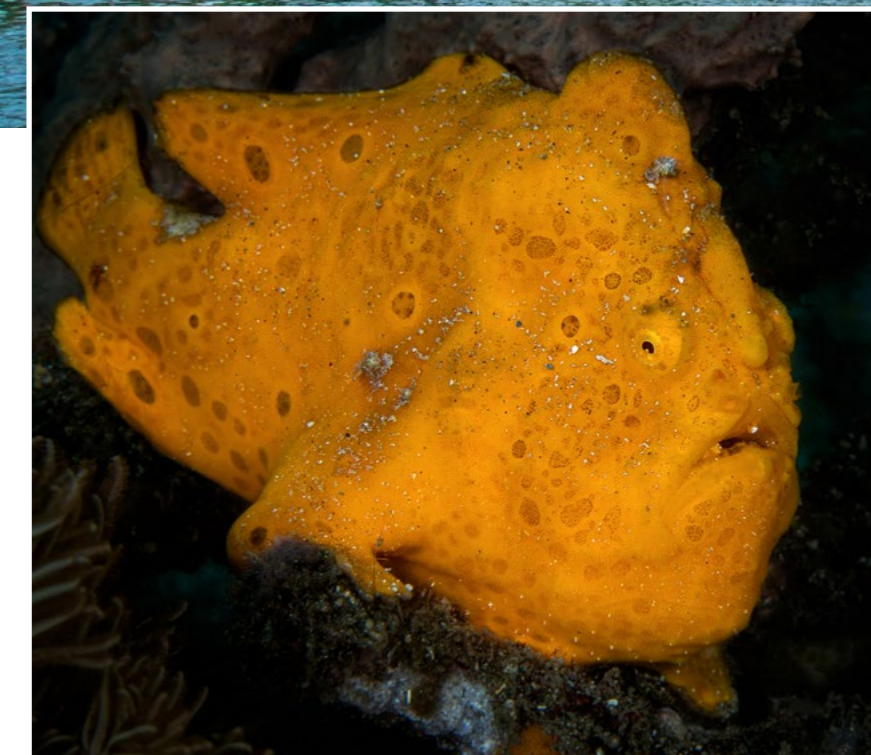
Sites included Arena Besar and Sarena Patah, with steep, sandy slopes and coral gardens in the shallows; Magic Rock and Makawidey, with colourful coral gardens; Trikora, Bianca and Police Pier, which were rubble dives with discarded pipes, poles, wood and rope; and Tike 3, Rodjos and Hair Ball, which were muck dives with dark, silty sand.

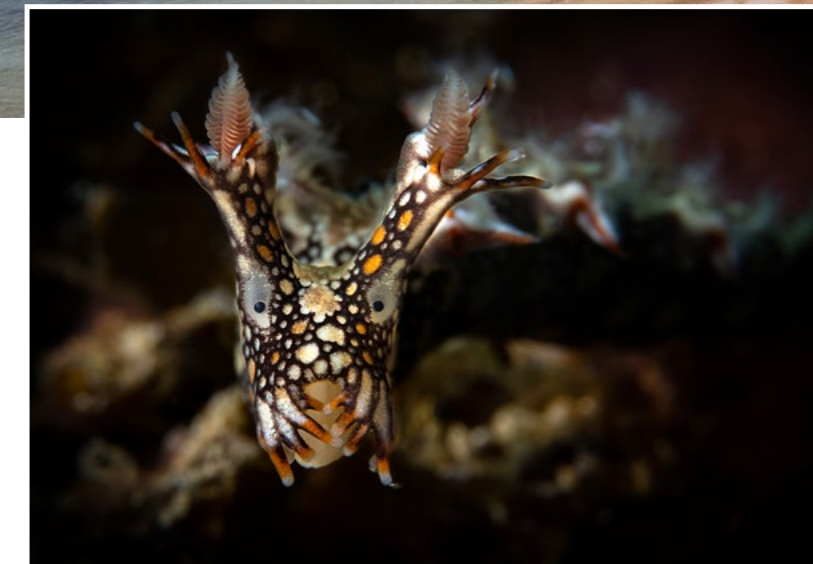
After six nights and 17 dives in Lembeh Strait, we waved goodbye to our Lembeh friends as the resort's speedboat whisked us across the Strait for the last time. Our luggage and dive gear were loaded into a van, and before long, we were driving through the bustling streets of Bitung, on our way to the northern coast of North Sulawesi where we would board another boat for Bangka Island.

We had been told that the trip would take us about an hour and a half, but with the



Anna's Chromodoris nudibranchs at Bianca





High tide and the boats are ready for the morning's dives at Bangka Island (above); The very tiny, 3mm-long, Pontoh's pygmy seahorse at Demak (top center) and a candy crab (top right) at Batu Pica, Bangka Island; The beautiful sunset that welcomed us as we arrived at our Bangka Island resort (right)

amount of traffic on the roads, the trip took us almost three hours. By the time we reached the beautiful island of Bangka, the sun was starting to set over the sea. It was absolutely picture perfect!

Bangka Island

We were greeted with warm welcomes and enjoyed refreshing drinks of coconut water straight out of young coconuts. As we completed the required waivers and documents, the manager Thomas told us about the resort, which had only opened the previous October. It was cleverly built around a central public area comprising a huge, open-air restaurant, bar and lounge area, camera room and sparkling rim-flow pool. No matter where you were in the small resort, whether on the deck of your lovely wooden chalet or in the pool, beautiful views

across the stretch of water between Bangka Island and the mainland greeted you.

The diving procedure was the same here as it was in Lembeh, with the same type of boats and the same excellent staff service. As there was a large and beautiful house reef right in front of the resort, a long cement jetty had been built, enabling us to board the boats out beyond the reef.

Tanjung Usi 1. Our first dive was at a dive site called Tanjung Usi 1. This time, there were seven guests and three dive guides. We had wanted to visit Bangka Island to dive the beautiful reefs we had heard about. As soon as I rolled back, I realised we had made the right decision. Below us sprawled a sloping coral reef covered in soft corals and cloaked in schools of beautiful reef fish and sprinkled with a

confetti of colourful nudibranchs. Tiny pygmy seahorses hung out on the sea fans and octopuses prowled the nooks and crannies in search of food.

Yellow Coco 1. For our second dive, we crossed to the mainland to do some muck diving at a site called Yellow Coco 1. One of the highlights of this dive site was a hot spring of fresh water that flowed from beneath the sand at about 20m. The seabed that surrounded it looked like a mini-oasis, with crinoids, sponges, soft corals, cuttlefish, nudibranchs and frogfish all making their homes here. It was fascinating to see how the fresh water shimmered as it flowed from the ground into the salt water and how the marine life seemed to thrive around this little warm spot.



Although the many colourful reefs with fantastic topography provided excellent wide-angle opportunities in Bangka, I decided to forgo the use of my fisheye lens and kept to my macro lens for the remainder of the trip instead. Our incredible dive guide, Yap,

continued to find the most amazing critters that we had not found in Lembeh—from boxer crabs, Pontoh's pygmy seahorses, the tiger butterfly nudibranch *Cyerce nigra*, to seamoths, weedy scorpionfish and even mandarinfish. We were really glad we had





A very small black dot nudibranch at Makawidey, Lembeh, photographed using a 90mm macro lens and +15 wet diopter (left); Coleman shrimp at Batu Pica, Bangka Island (right); Anemone shrimp at Trikora, Lembeh (lower left)

As I tend to feel the cold quite easily, I wore a 5mm full-length wetsuit and a hoodie. Some divers wore 3mm wetsuits but started feeling chilly towards the end of their dives. I would recommend a full-length wetsuit to protect yourself from stings. I also wore booties (with open-heel fins) to protect my feet from rock rubble and other sharp objects when wading out to the house reefs. Gloves are discouraged and not necessary.

Underwater photography

North Sulawesi offers incredible photo opportunities for underwater photographers at all levels of experience and camera types. The critters range in size from large (turtles and schools of fish), medium (giant frogfish) to tiny (super macro sized nudibranchs, shrimps, and Severn's and Pontoh's pygmy seahorses).

Compact camera users have the luxury of being able to add wet wide-angle lenses and magnifying diopters of varying strengths during dives, and owners of the Olympus TG cameras can use their fantastic microscope mode. I would definitely recommend adding one strobe to these systems in order to light up your subjects correctly. One strobe, positioned above your housing, will work wonders in lighting up critters very close to the port of your housing as well as lighting up larger marine life a little farther away, which your camera's flash cannot reach.

Lenses to use

I found a 60mm macro was great for fish portraits and larger subjects such as frogfish, octopuses,



larger seahorses, ghost pipefish, flamboyant cuttlefish and reef fish. Adding a magnifying wet diopter to a 60mm macro lens helps you to take pretty good shots of smaller seahorses, shrimps and nudibranchs. I often used a +12.5 diopter with my 60mm macro lens and found this really quite versatile.

Macro lenses of 100mm (Canon), 105 (Nikon) and 90mm (Sony mirrorless) are also fantastic for smaller subjects such as nudibranchs, small fish, shrimps and little crabs. They are also useful when photographing shy fish due to the longer working distance these lenses give you. Adding diopters to these macro lenses will

had expected to see was not there. I had heard the villagers had made huge efforts to clear away rubbish from the beaches and perhaps this was why. I had expected the water to be dark and dirty with very low visibility, but we had experienced clear, blue waters on almost every dive. I had not expected to see much coral or colourful reefs in Lembeh, but only a third of our dives had been on dark, silty muck. I had also expected to see lots of ugly, drab creatures and had been surprised to see beautiful nudibranchs and reef fish on every dive. My advice to anyone visiting this beautiful part of the world—expect the unexpected!

Tips

What to wear

We visited at the beginning of June and the water temperature ranged between 26°C and 28°C.



decided to explore this little gem of North Sulawesi!

All too soon, our holiday came to an end and we made one final trip across the ocean to mainland

North Sulawesi. The trip had been full of surprises and incredible experiences. Diving in Lembeh was not what I had expected. The trash, plastic and rubbish I



Lembeh

In Lembeh: Clownfish eggs, still quite undeveloped at Sarena Besar (above); Crested Nembrotha at Nudi Falls (left); Whipfan goby with parasite at Jahir (right)



The author's Canon EOS 7D Mark II simple macro setup

bring you much closer to your subjects and magnify them to super macro proportions. I used a +15 diopter with my 90mm macro lens and captured some incredible super macro images.

I had taken my Tokina 10-17mm fish-eye lens and mini-dome port along with me, but did not use them, despite my best intentions to get some close-focus wide-angle shots towards the end of the trip. There were still critters I wanted to find, and I was certain I would see them when I had the Tokina on. There is always next time...

Strobes

On most dives, I used two strobes and changed their positions according to the type of lighting I was after. This ranged from standard front lighting to side lighting to inward or back lighting. On some dives, I used one of the strobes for my snoot and the other for standard lighting by centring it above the top of my housing.

Muck diving with a camera

Not only was the black sand on muck dives fine and silty and easily kicked up, but if you put your hand down to steady yourself whilst taking photos, this stirred up the sand just as much. I found that using a frog-kick finning technique helped to prevent the sand from being kicked up and that a pointer was a great help. Word of warning, though—make sure you are not accidentally spearing any marine life before digging that pointer in!

As most of the creatures are literally on the sand, I found it virtually impossible to use my normal camera position of slightly below and tilting upwards, or holding my camera at eye level of my subjects. I have heard of divers digging their cameras into the sand to achieve the right angle, but I was not keen to disturb the seafloor or possibly scratch my port.

In order to stay camouflaged, most muck-dwelling critters (octopuses, hairy frogfish, cuttlefish, some nudibranchs,

scorpionfish and pipefish) tend to be very drab. Photographers might therefore find muck diving less colourful than what they are used to.

Handling of cameras

Many resorts have dedicated camera rooms for underwater photographers, usually with individual workspaces that have strip lights, shelves and power points. Most also have compressed air hoses to dry cameras with. The rooms are usually air-conditioned, helping to prevent moist air entering your housing and steaming up the inside of your port during a dive. I liked being able to set up my camera the night before, leaving it in the camera room overnight and just doing my final checks before loading it onto the boat the next morning.



The dive guides are usually very keen to carry your camera and put it on the boat for you. I found that our guides knew exactly how to handle cameras and I was always grateful for their assistance.

The dive resorts we stayed with had big plastic crates filled with fresh water on the boats and the guides liked to put the cameras straight into these



Volcanic scenery en route to Bangka Island (above); Donut nudibranch at Tiga Batu, Bangka Island (right); The monument overlooking Trikora, Lembeh (lower left); Clownfish at Sarena Patah, Lembeh (left). The tongue-eating louse inside its mouth is a parasite that enters via the gills, attaches to the tongue and severs the blood vessels, causing the tongue to atrophy and fall off. The parasite then continues in place of the fish's tongue.



onto yours, and chose to keep my camera with me on the boat instead.

When entering the water, underwater photographers do a backward roll and then have their cameras passed down to them by one of the crew members. Before I entered the water, I made sure my camera was close by and reminded the crew where my camera was and to pass it to me. This was done with great care and worked very well. Upon surfacing after a dive, I would just pass up my camera to a crew member who would

then put my camera into one of the rinse tanks. As they knew I was quite sensitive to this, they took great care to make sure there was no big camera next to mine.

Wish list

I think every diver has a wish list of critters they would like to see, and the dive guides love a challenge. I had done my research of what one could find in Lembeh and put together a wish list of what I would love to see for myself. For the first couple of days, I did not share this list with our guide and was soon able to tick off many of these creatures, but there were still a few I really wanted to see but had not. I shared my list of about 10 critters with our guide and told him I would love to see them but that he was under no pressure to find them as "this was the ocean and nothing is guaranteed." He looked at the list with interest and even added some of his own.

Over the next few days, our combined search formed a strong bond between us, and we had a lot of fun on our dives. I would highly recommend giving your guide such a list, emphasising that if he

finds them, that would be fantastic, but if not, no problem.

Bottom time and dive profiles

Depending on the resort, you might find that the dive guides allow you to dive for as long as your bottom time and air allows. In both Lembeh and Bangka, our dives averaged 60 to 80 minutes. Our dives were never cut short if other divers needed to surface, and a dive guide would stay with us until our dive was done. I am certain there would be limits on very shallow dives, as the boats do need to get back to the resort for lunch at noon.

Mandarinfish dives

One of the huge drawcards in Lembeh is the mandarinfish mating at sunset. Upon arrival, we discovered that each resort

was allocated a certain night to do the "mandarinfish dive," and we would not be there for our resort's allocated night. If you want to see the mating mandarinfish, remember to check on this with your resort before you make your booking! ■

Kate Jonker is an underwater photographer and writer based in South Africa. She teaches underwater photography, is a dive guide and dive boat skipper for Indigo Scuba in Gordon's Bay and leads dive trips across the globe. For more information, please visit: katejonker.com.

crates as soon as we boarded the boats in the morning. I have often heard that most leaks happen in the rinse tank, usually when someone drops their camera

fact file

Indonesia



SOURCES: CDC.GOV, STATE.TRAVEL.US, US CIA WORLD FACTBOOK, WIKIPEDIA.ORG, XE.COM

History In the 13th century, Muslim merchants from Persia came to Indonesia and established trade links to India and Persia. With trade, they brought Islam to the Indonesian people, especially in Java. The Portuguese came in 1511, seeking spices, after conquering the Islamic Empire of Malacca. The Spaniards followed, spreading Christianity, especially in the Moluccas, comprising Minahasa/North Sulawesi and Maluku. In the early 17th century, the Dutch came and made Christianity the predominant religion of North Sulawesi. During WWII from 1942 to 1945, Indonesia was occupied by Japan. Indonesia declared independence just before Japan's surrender. But it was not until 1949, following four years of sporadic

negotiations, brutal confrontations and UN mediation, that the Dutch finally agreed to transfer sovereignty. The ensuing unstable parliamentary democracy saw conflicts continue until martial law was declared by President Sukarno in 1957. A futile coup in 1965 by alleged Communist sympathisers removed Sukarno from power. From 1966 until 1988, Suharto was president of



RIGHT: Location of Lembeh Island on global map
BELOW: Location of Lembeh Island on map of Indonesia
BOTTOM LEFT: Bianca dive site in Lembeh Strait



Indonesia, but following some street riots, he was toppled in 1998. Free and fair legislative elections took place in 1999. Indonesia is the third largest democracy in the world. Government: Republic. Capital: Jakarta.

Geography Located in Southeast Asia, Indonesia is an archipelago situated between the Indian and Pacific Oceans. Coastline: 54,716km. Terrain consists primarily of coastal lowlands, with mountains on larger islands. Natural hazards include earthquakes, tsunamis, volcanoes, severe droughts, forest fires and occasional floods.

Climate Tropical, hot and humid, with more moderate climate in the highlands. The water temperature is usually 28-29°C (84-86°F) all year round, occasionally falling to 27°C (82°F) in some spots. Wetsuits of 1mm are most often used, but some prefer 3mm.

Environmental issues Challenges include heavy smog caused by wildfires associated with large-scale deforestation, which is often illegal; overfishing and exploitation of marine resources; and water pollution from industrial waste and sewage. Air pollution, traffic and management of garbage, water and waste water are challenges

in rapidly growing urban areas.

Economy

Indonesia is Southeast Asia's largest economy. It has experienced slowing growth since 2012, primarily due to a decrease in commodities exports. Indonesia did outperform its neighbours in the region during the global financial crisis, posting growth along with only two other G20 members—China and India. Its annual budget deficit is capped at 3% of GDP, and the country's government decreased its debt-to-GDP ratio from a high of 100% soon after the Asian financial crisis of 1999 to 34% currently. Standard & Poor's upgraded Indonesia's sovereign credit rating to investment grade in May 2017. Challenges the country continues to face include poverty and unemployment, an infrastructure that is inadequate, corruption, complicated regulations and unequal resource distribution amongst its regions.

Currency Indonesian Rupiah (IDR). Exchange rates: 1USD= 14.25IDR; 1EUR=16.01IDR; 1GBP=18.09IDR; 1AUD= 9.93IDR; 1SGD= 10.43IDR

Population 262,787,403 (July 2018 est.) Ethnic groups: Javanese 40.1%, Sundanese 15.5%, Malay 3.7%, Batak 3.6%, Madurese 3%, Betawi 2.9%, Minangkabau 2.7%, Buginese 2.7%, Bantenese 2%, Banjarese 1.7%, Balinese 1.7%, Acehnese 1.4%, Dayak 1.4%, Sasak 1.3%, Chinese 1.2% (2010

est). Religions: Muslim 87.2%, Protestant 7%, Roman Catholic 2.9%, Hindu 1.7% (2010 est). Note: Indonesia is the country with the largest population of Muslims in the world. Visitors are encouraged to respect local traditions and dress modestly. Internet users: 143 million or 53.7% (Dec. 2017)

Language Bahasa Indonesia is the official language. It is a modified form of Malay. English and Dutch are also spoken, as well as local dialects (of which Javanese is the most widely spoken).

Health There is a high degree of risk for food or waterborne diseases such as bacterial diarrhoea, hepatitis A and E, and typhoid fever, as well as vectorborne diseases such as chikungunya, dengue fever and malaria. Check with the WHO or your dive operator for prophylaxis recommendations and required vaccines. Bring insect repellents containing DEET. International Certificate of Vaccination required for Yellow Fever if arriving from an infected area within five days.

Hyperbaric chamber

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Travel/Visa/Security

Citizens of over 160 countries entering Indonesia via Jakarta, Ujung Pandang, Manado, Bali and certain other entry ports do not need to pay for a visa on arrival, as long as their visit does not exceed 30 days. The list of countries includes ASEAN nations, EU states, Australia, the USA, Canada and Japan.

Websites

Indonesia Travel
indonesia.travel/en



Sudan Safari

— *Shark Diving in the Red Sea*

Text by Carlos Martinez
Photos by David Fernandez, Rafa
Fernandez and Carlos Martinez



RAFA FERNANDEZ

Colorful healthy reefs (above). Grey reef sharks are present on almost every dive (previous page)

From all over the world, more and more divers are coming to the Red Sea to discover its underwater paradise. The vast majority choose the Egyptian Red Sea as their main destination because it offers a wide variety of dive sites, suitable for all levels of diving; it is where one can travel all year round at a great price. But there is another Red Sea, one that has been nearly kept in a time capsule, practically intact, unexplored and retaining a sense of adventure that the Egyptian Red Sea offered 30 years ago. We're talking about the Sudanese Red Sea—the wild Red Sea!

When travelling to a place full of history, who hasn't stopped to think about what it might have been like many years ago—trying to imagine each age, every change and interaction, and their effects on the present day? This is what I describe when someone asks me about Sudan.

Sudan was the largest country in Africa until 2011. After long years of conflict, it was divided into North Sudan and South Sudan. North Sudan, which is officially known as the Republic of Sudan, has 853km of coastline along the Red Sea. For the past 25 years, it has been immersed in internal struggles, civil rivalries and ethnic conflicts, which have completely impeded tourism and infrastructure development.

For many years, divers have wanted to dive in Sudan, but due to the lack of reliable operation of flights and boats there were drawbacks to planning a trip to the country. Since 2016, some



RAFA FERNANDEZ

Sudan



CARLOS MARTINEZ



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Small and big pelagics are everywhere



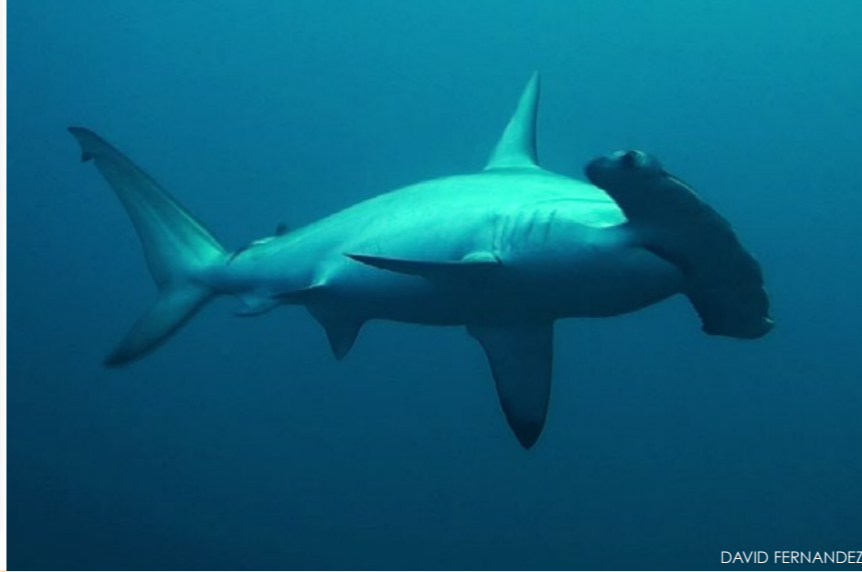


RAFA FERNANDEZ

The abundant soft corals of Sanganeb show how healthy the reef is (above); Hawksbill sea turtle (right); Hammerhead shark (below)



RAFA FERNANDEZ



DAVID FERNANDEZ

airlines have made it easier to fly to Port Sudan, where divers can embark on liveboards. Thanks to this, Blue Force Fleet—a company with more than 20 years of experience in dive

safaris on the Red Sea—has moved to the waters of the Sudanese Red Sea, with one of the most modern and well-appointed dive boats in the area, the new *Red Sea Blue Force 3*.

This liveboard provides divers with opportunities to dive the best and most remote reefs in Sudanese waters, with the guaranteed service of a reliable and experienced operator.

Shark diving expedition
Due to weather conditions, Sudan has a relatively short dive season. Temperatures during the summer are very high, both above and below the waves—often reaching 30°C underwater. The high temperatures prompt large pelagics such as sharks to range at deeper depths, out of reach of recreational divers. This is why the season with the best



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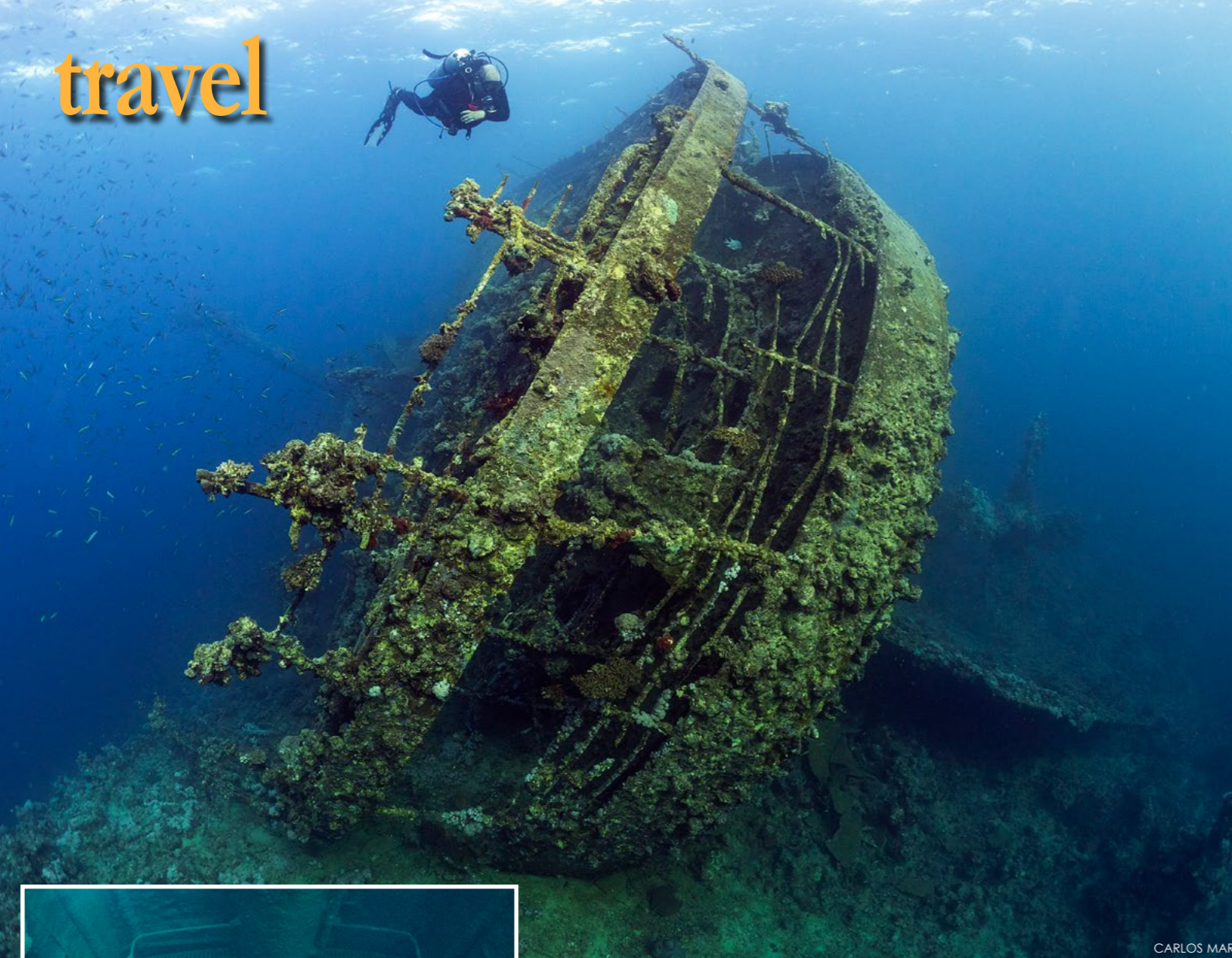
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The holds are a veritable military museum.

CARLOS MARTINEZ



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The sheer size of the *Umbria* wreck is realized as this diver is dwarfed by its propeller.

conditions for shark sightings is limited to the months with the lowest water temperatures—January to May—when the water reaches 24 to 26°C.

In addition to sharks, the other great dive attraction in the Sudanese Red Sea is its spectacular reefs, with extensive colonies of various corals, extending from the depths up to the surface. These reefs are found in the open sea, far from the coast, so they are ideal places for marine life to shelter from predators, which, in turn, go to these places in search of prey. It is a perfect formula: a scenario of trophic equilibrium, which guarantees encounters with large groups of fish of different species and their natural predators. Together with the nearly nonexistent commercial exploitation of these places, these reefs truly are an

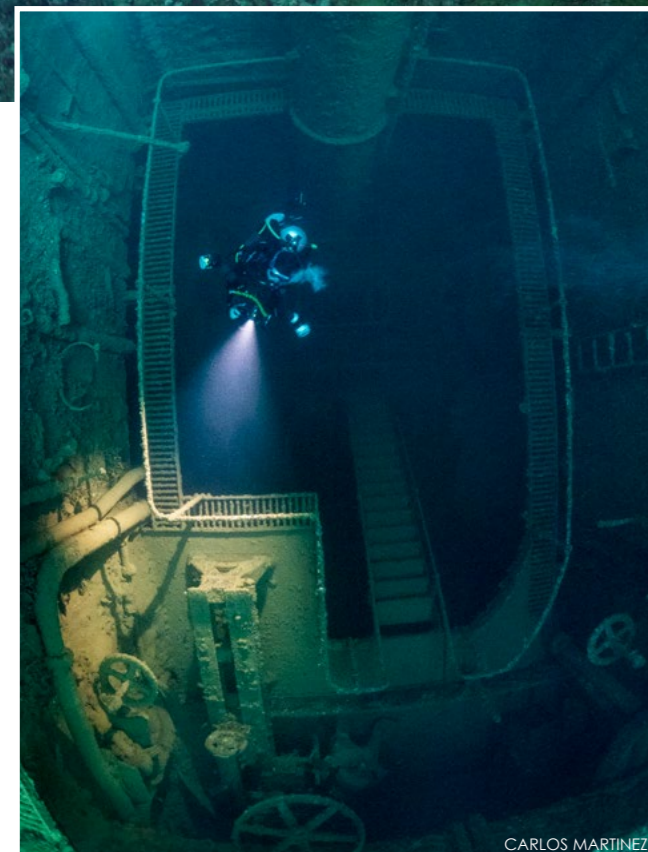
underwater paradise.

Two main areas have been defined by diving routes, designed by the Blue Force Fleet for its Sudan Shark Dive Expedition—the Sudan “Central and North” and the Sudan “Extreme South.”

Sudan Central and North

The Central and North route is the classic and best-known route. It includes the central reefs and the upper part of the southern Red Sea. Here, one can dive the impressive wreck of the Italian ship SS *Umbria*. It is one of the best WWII wrecks that can be visited even by snorkelers. Resting at a shallow depth, it is full of ammunition and war supplies.

In addition, divers get the opportunity to dive on the remains of the underwater laboratory *Precontinent II* in Shaab Rumi, which Jacques-Yves Cousteau built in



CARLOS MARTINEZ

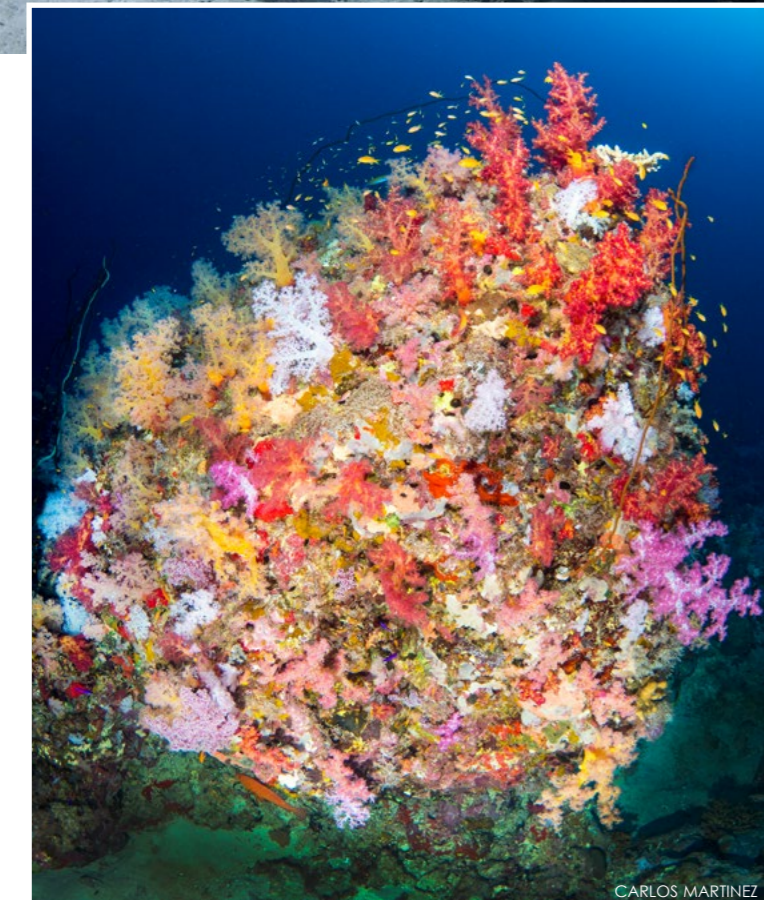
Diver in the engine room of the *Umbria*



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Precontinent II (above) at Shaab Rumi (right), the underwater lab that Jacques-Yves Cousteau built in 1963; Hawksbill turtle (right)

1963. It comprises a set of submerged structures in which eight people can live continuously for up to a month, at a depth of about 10m, in the attempt to prove the viability of human life under the sea.

The rest of the dives on the Central and North route are usually carried out on the northernmost reefs of the Shaab Rumi Reef. These dive sites are full of life, large shoals of fish, incredible hard and soft corals and, of course, the ubiquitous sharks. It is difficult to describe the amount of life one can see on these dives—you have to be here to understand it.

Another notable reef along the Central and North route includes the triangle of Shambaia, where the following dive sites stand out:

Angarosh. Translated from Arabic, *angarosh* means “mother of sharks.” At this site, the reef is visible at the surface with a beautiful island created by coral remains. Along its reef walls and plateaus, one can see grey reef sharks, hammerhead sharks and spectacular schools of jacks. It is one of the most exciting dives of the Central and North route.

Merlo. Diving on the pinnacle at this dive site always reminds me of the best *thilas*, or underwater islands, in the Maldives. The light, the amount of life, the colours and the



RAFA FERNANDEZ

shallowness of the main pinnacle makes it a compulsory dive.

Abington. This is another coral needle dive site, which blossoms from the abyss and fills the whole area with life. Its terraces and walls turn the reef into an ecosystem where one can see large tunas, schools of jacks and, of course, sharks.



RAFA FERNANDEZ

An untouched Red Sea exists and is waiting in Sudan.



CARLOS MARTINEZ

Interior of *Precontinent II*, which was built in 1963 as part of Jacques Costeau's dream of settling the sea (above); Diver with school of barracuda (top right)



RAFA FERNANDEZ



NASA

Location of Sudan on global map (above)



US CIA WORLD FACTBOOK / PUBLIC DOMAIN

Location of Port Sudan on map of Sudan

Sudan South and Extreme South

This route visits more wild and unexplored reefs, and also more remote sites, so it is usually done on longer trips. These reefs still retain large populations of different species of sharks.

In the southern reefs, the following dive sites stand out:

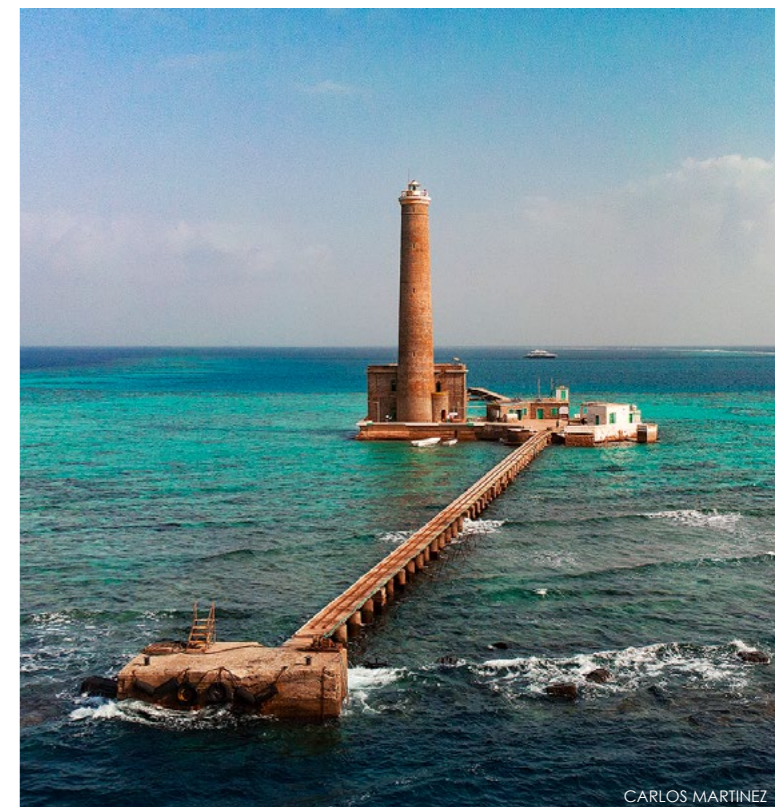
Sha'ab Jumna. This site is located on the northernmost reef of the Suakin. A towering coral island, marked with a small lighthouse, is one of the best dives in the area. Here, it is easy to spot hammerhead sharks, grey reef sharks, whitetip sharks and occasionally silvertip sharks.

Sha'ab Ambar. This is a huge reef, more than five miles long.

It offers an inner lagoon, which provides shelter for dive boats. In the southern part of the reef, there is a sandy plateau at 25m, which is ideal for encounters with hammerhead sharks, grey reef sharks and numerous jacks.

Pinnacle. This pinnacle-shaped reef ascends from the depths, offering a rich and varied concentration of reef fish in the areas most influenced by currents. There are frequent encounters with hammerhead, grey, silver, silky and even thresher sharks.

Protector. This is a two-mile-long reef, which surrounds a large lagoon. Its southern face offers coral-filled dives and abundant reef life. In the deep waters of



CARLOS MARTINEZ

Sanganeb's lighthouse is a must to visit during the trip.



DAVID FERNANDEZ

Big schools of hammerhead sharks (above) and grey reef sharks (right) can often be found in Sudan.



RAFA FERNANDEZ

The lagoon of Shaab Rumi has been home to big pods of dolphins.

Logan. The northern face of this dive site is the side that offers the greatest chance of encounters with hammerhead, silky, whitetip and grey reef sharks as well as large concentrations of humphead parrotfish. Occasionally, manta rays can also be found here. The eastern and western sides of the reef harbour a wide variety of corals and sea fans.

where one can observe pelagic species patrolling the waters. Here, it is easy to find groups of dolphins, schools of barracudas and hammerhead sharks.

Dahrat Qab. Located 14 miles south of Masamirit, this dive site has a diverse coral reef with a wide variety of soft corals and huge sea fans. The southern tip of the reef is the most interesting point, where one can see grey reef sharks, silvertip sharks, hammerhead sharks and occasionally even a tiger shark.

at its southern point. These areas allow one to observe large shoals of jackfish and barracudas passing through the area, as well as the hammerhead sharks that usually patrol the wall limits.

Dahrat Abid. This dive site is located at the southernmost islet of Sudanese waters. At the top of the reef are the remains of a wreck, and there is abundant life. The shallowest waters of the reef are covered in soft corals, and in deeper waters, various pelagics and sharks are the great attractions. ■

Masamirit Island. This site has a vertical wall on its eastern side and a plateau on its northern end at 25-30m, with several coral colonies

Qab Miyum. Located south of Masamirit, this site presents a staggered wall of coral plateaus at 6m, 25m and 45m

Blue Force Fleet, with more than 20 years of experience in the Red Sea, operates in Sudan with its new spectacular liveaboard boat, the Red Sea Blue Force 3, which was launched in November 2018. It offers 7-, 10- and 11-day cruises on all Sudanese routes

from February to May. For more information about the routes, schedules and the liveaboard boat, please go to: blueforcefleet.com.



CARLOS MARTINEZ

Bumphead parrotfish at Sanganeb

the outer wall of the southern tip, it is easy to find hammerhead sharks, silky sharks and sometimes oceanic manta rays.



ROB PERRYMAN

Manta rays at Manta Ridge in Raja Ampat, Indonesia, one of the most popular spots to dive and observe manta rays at cleaning stations

A new study has revealed that manta rays have social bonds and choose their friends. Researchers from the Marine Megafauna Foundation, Macquarie University and the University of Papua are the first to describe the social structure of manta rays in a study published in the journal *Behavioral Ecology and Sociobiology*.

In contrast to sharks and rays, reef manta rays move in groups at cleaning sites and feeding grounds in shallow waters. Over 500 of these groups were studied over five years in Raja Ampat Marine Park in Indonesia. At Raja Ampat, which is one of the most biodiverse marine habitats on the planet, two distinct but connected communities of manta rays were found living together. One group was primarily made up of mature females, while the other was a blend of males, females and juveniles.

"We still understand very little of how mantas live their lives, but we know they are socially interactive, and these interactions seem important to the structure of their populations. Understanding social relationships can help predict manta ray movements, mating patterns and responses to human impacts. That's essential for conservation and eco-



ROB PERRYMAN

tourism efforts," said Rob Perryman, the lead author of the paper who is a Ph.D. student at Macquarie University and a researcher for Marine Megafauna Foundation.

Social network analysis

Social network analysis was used by scientists to reveal the network of various type of relationships in manta ray communities, ranging from passing acquaintances to long-lasting friendships. Even though mantas do not live in close-knit groups, the researchers found that females tended to have long-term bonds with other females, while males tended not to connect with many others—a disparity which could be due to distribution or different aims in reproduction.

"Like dolphins, manta rays are intelligent and perform collective behaviors such as foraging and playing," said Perryman. "They

are curious, often approaching humans, and individuals appear to have different personalities. It turns out that reef manta rays actively choose to group with preferred social partners."

Balance

Finding the right balance when weighing protection and conservation of a species with ecotourism is important. "Knowing how mantas interact is important, particularly in areas where they are susceptible to increasing dive tourism," said Dr Andrea Marshall, principal scientist and co-founder of the Marine Megafauna Foundation. "The increasing number of boats and scuba divers around reef mantas in Raja Ampat, particularly at cleaning stations, could break apart their social structures and have impacts on their reproduction." ■

SOURCE: PHYS.ORG

Manta rays are social

Manta rays develop long-lasting relationships with other manta rays and move in established groups



shark tales



NUNA SÁ

Blue sharks, which are threatened by overfishing the world over, dive pockets of warm ocean currents to reach food in the ocean twilight zone, between 200 and 1000m below the water's surface, where they feast on small fish and squid.

Blue sharks ride the waves to get fed

Researchers from Woods Hole Oceanographic Institution (WHOI) and the Applied Physics Lab at the University of Washington (UW) have discovered that blue sharks use eddies, the ocean's large, swirling currents, to quickly get to the ocean twilight zone, which is located between 200 to 1000m below the ocean surface, where the largest fish biomass on Earth is found.

The scientists, whose findings were published in the journal *Proceedings of the National*

Academy of Sciences, monitored over a dozen blue sharks, which they tagged off the northeastern coast of the United States, for nine months. Data from the tags was relayed back to the scientists by satellite and showed that the sharks spent a large part of their days diving pockets of warmer currents to reach the twilight zone, where they would forage for an hour or more on small fish and squid, returning to the surface to warm up so they could dive again.

"Blue sharks can't regulate their body temperature internally to stay warmer than the ambient seawater like white sharks can," said Camrin Braun, an ocean ecologist at UW and lead author of the study. "We think this is why

they show a clear preference for the warm-water eddies—it removes a thermal constraint to deep diving."

The study helped to fill in knowledge gaps about blue sharks, which are threatened by over-fishing and industrial fishing bycatch across the globe, and underscored how important the ocean twilight zone is as a biomass resource. "The twilight zone is vulnerable to overfishing," said Simon Thorrold, a coauthor of the study and Braun's former advisor. "If we're harvesting low-value fish there at the expense of high-value fish like blue sharks and other pelagic predators, that's probably not a good tradeoff." ■

SOURCE: WOODS HOLE OCEANOGRAPHIC INSTITUTION

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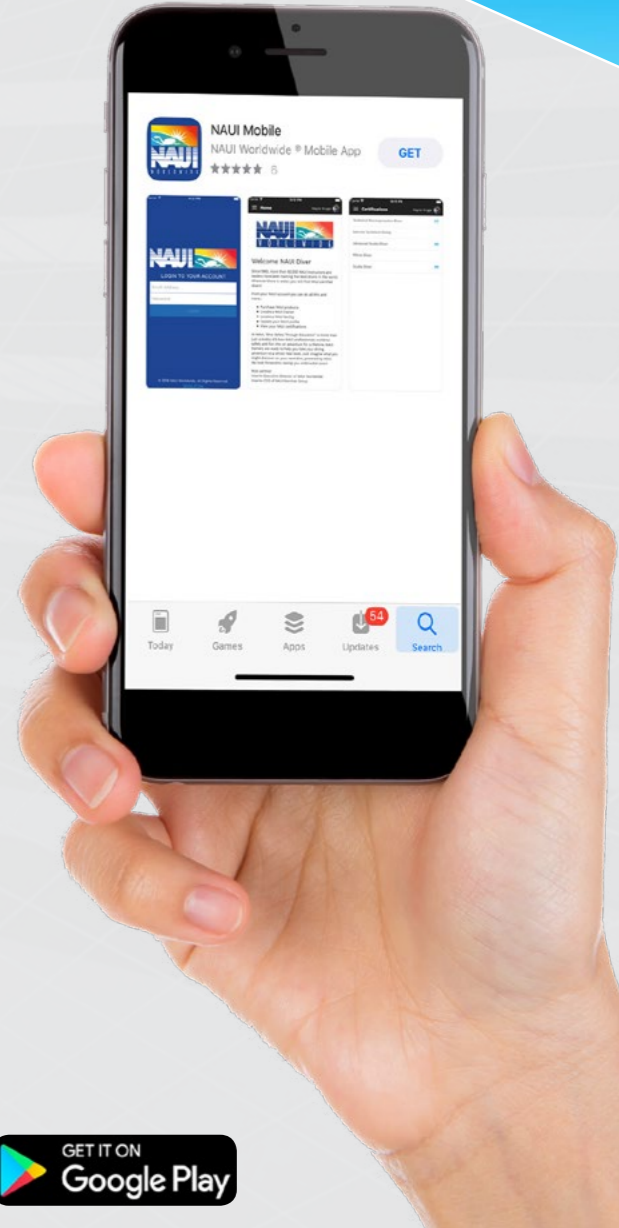
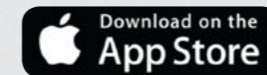
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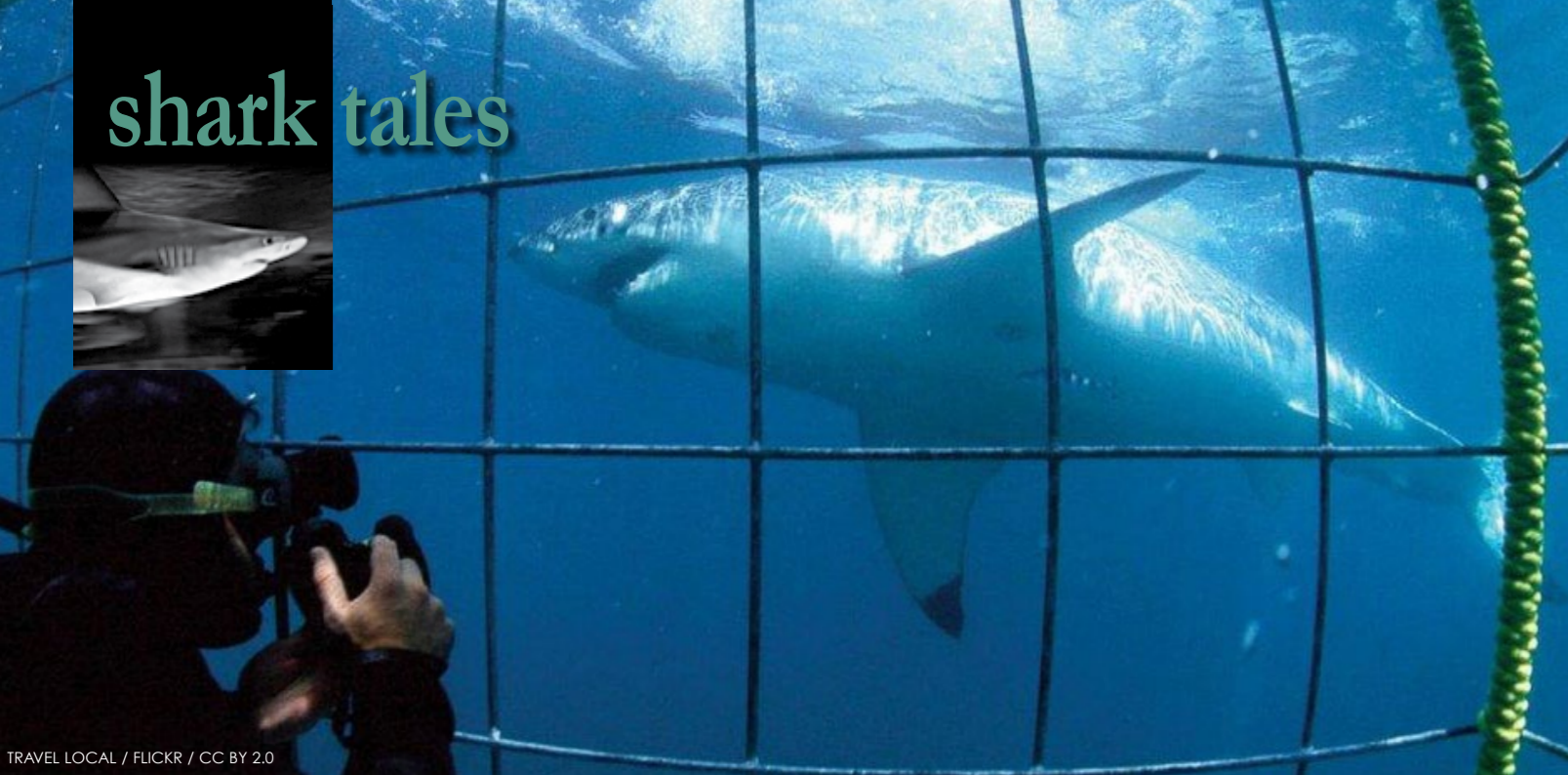


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shark tales



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Great white sharks (*Carcharodon carcharias*) display a variety of behaviors depending on their sex, size and maturity.

What do sharks make of divers in cages?

Cage diving has proven to be an important sustainable practice in ecotourism when it comes to great white sharks (*Carcharodon carcharias*). But not much is known about the sharks' behavior during this activity.

In a study, which monitored the surface behavior of white sharks during cage-diving activities around Guadalupe Island in Mexico, researchers observed a variety of behaviors as well as the role of an individual shark's length and maturity on whether or not it caught the bait offered during these encounters. The relative size of sharks also played an important part in social interactions between individuals, with smaller sharks giving way to larger ones, even if the smaller shark arrived first on the scene.

During a total of 87 days on-board six cage-diving boats in 2012-2014, the surface behavior of 106 white sharks were recorded. Most of the observed sharks were young (63%), with 37% considered mature. The majority of sharks were male (71%).

A range of behaviors

Researchers classified the sharks' interactions into 11 behaviors, including parading, close inspection, horizontal attack, vertical attack, bait catching, feeding, not feeding, buoy catching, encounter, escape, and staying. Mature males tended to do more parading, close inspections and horizontal attacks, while immature females tended to do more vertical attacks. But there was no difference in behavior between older and younger males.

Scientists found the sharks displayed a simple stimulus response

reflex, a pattern related to feeding, and warned that intentional feeding of individual sharks should be avoided to prevent white sharks from being conditioned to boats, possibly leading to negative impacts on ecotourism.

Standardized method

This study was the first ethological analysis of the behavior of white sharks in Guadalupe as they aggregated in open ocean. The study devised a standardized method for the study of white sharks in baiting situations, which could be applied to other locations.

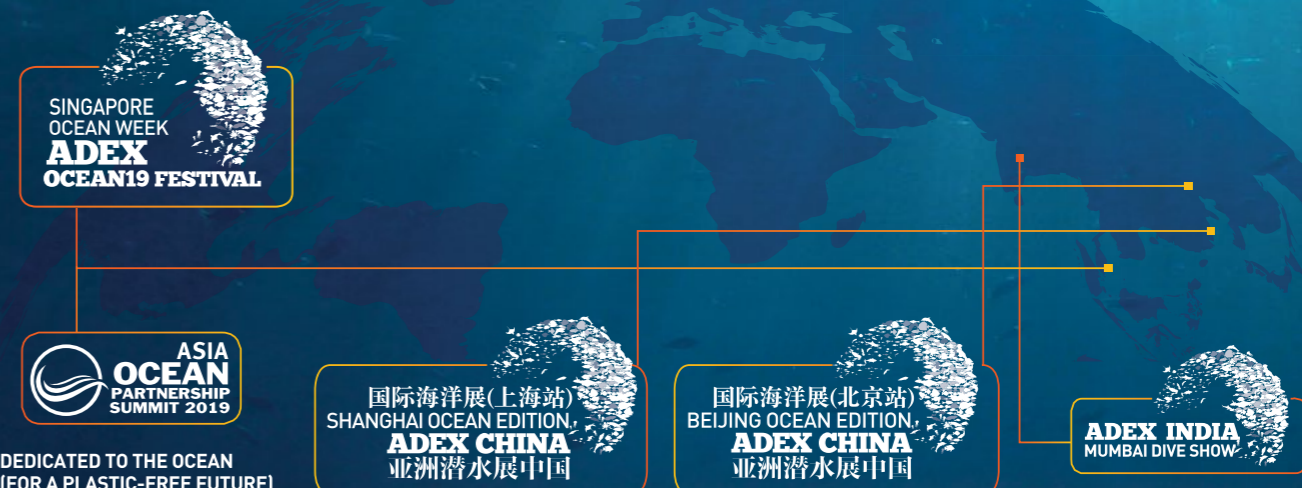
As white sharks are a vulnerable species, the researchers suggested that more studies of this kind could help improve monitoring, management and conservation of the sharks. ■

SOURCE: AQUATIC CONSERVATION

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Photo courtesy of Matthew Smith





Pod of reef manta rays. The largest population of manta rays is found in the Maldives in south Asia.



Ultrasound scanning of wild reef manta rays

A pregnant wild reef manta ray has been successfully scanned by researchers from Manta Trust and the University of Cambridge. By using the world's first contactless underwater ultrasound scanner, scientists were able to get clear ultrasounds images of the manta's fetus.

The team of researchers is studying reef manta rays in the Maldives in south Asia, where the largest populations are found. It is hoped that the research project will reveal what causes annual fluctuations in breeding and why mantas breed in some areas and not others.

Close relatives to sharks and rays, mantas can grow up to 7m in width and up to two tons in weight, but are gentle giants.

"Manta rays are one of the most beautiful and iconic creatures that swim in our oceans," said Dr Gareth Pearce of the Department of Veterinary Medicine at the University of Cambridge. "Unfortunately, like many animals, their future is threatened. They are increasingly fished, both deliberately and through bycatch and their populations are now at risk." Pearce added, "Using the scans, we're able to determine the stages of maturity and when animals are becoming reproductively active. We can observe the stages of pregnancy, the development of the fetus and importantly, whether an animal maintains that pregnancy and gives birth to a live animal." ■

To see a video of how the underwater scanning of mantas is done, go to: <https://bit.ly/2PIKiQG>

SOURCE: UNIVERSITY OF CAMBRIDGE

World's largest stingray travels far

Using images and videos submitted by divers for the first study of the world's largest stingray, the smalleye stingray (*Megatrygon microps*), which can grow up to 222cm in width, researchers found that the species travels hundreds of kilometers during migration along the coast of Africa.

One pregnant female was recorded to have traveled 200km from Tofo to Bazaruto Archipelago and back—a total round-trip of 400km.

Researchers from the Marine Megafauna Foundation, whose findings were published in the journal *PeerJ*, studied these elusive animals in southern Mozambique, which is one of the only places on earth where they can be regularly observed in the wild on inshore reefs. The scientists used photo identification for the first time to track the species' behaviors and movements.

"We reported the first sightings of smalleye stingray in 2004 and have since been racing against the clock to learn more about their ecology before it is too late," co-founder and principal scientist of the Marine Megafauna Foundation, Dr Andrea Marshall, said. According to the IUCN Red List of Threatened Species, 31 percent of the world's sharks and rays are threatened. Marshall said, "This species of ray is likely in trouble too, but we can't protect what we don't know much about. Our

study is an important first step in understanding more about the animal's ecology and behavior."

Divers contribute

Over 140 photographs of the stingrays, some dating as far back as 2003, were gathered from scuba divers who contributed images to the study. "Through local dive centers, we called on tourists to help us collect images of this solitary stingray. Fortunately for us, southern Mozambique and its rich marine life attract many passionate scuba divers, most of which own GoPros or other lightweight cameras and will happily make their images and footage available for research," said Atlantine Boggio-Pasqua, a volunteer with the Tofo-based foundation.

With these images, marine biologists found that they were able to use the white dorsal spots on smalleye stingrays to distinguish and track individuals over extended periods of time. Seventy different individuals were identified using the dorsal spot patterns, 15 of which had been seen in the study area several times.

As smalleye stingrays are likely threatened by fishing pressures, collecting more data about them will help scientists learn more about their habitat preferences, reproduction, growth, feeding and cleaning behavior, as well as assist researchers to formally assess the species' conservation status, providing important information for management practices. ■ SOURCE: EUREKALERT.ORG

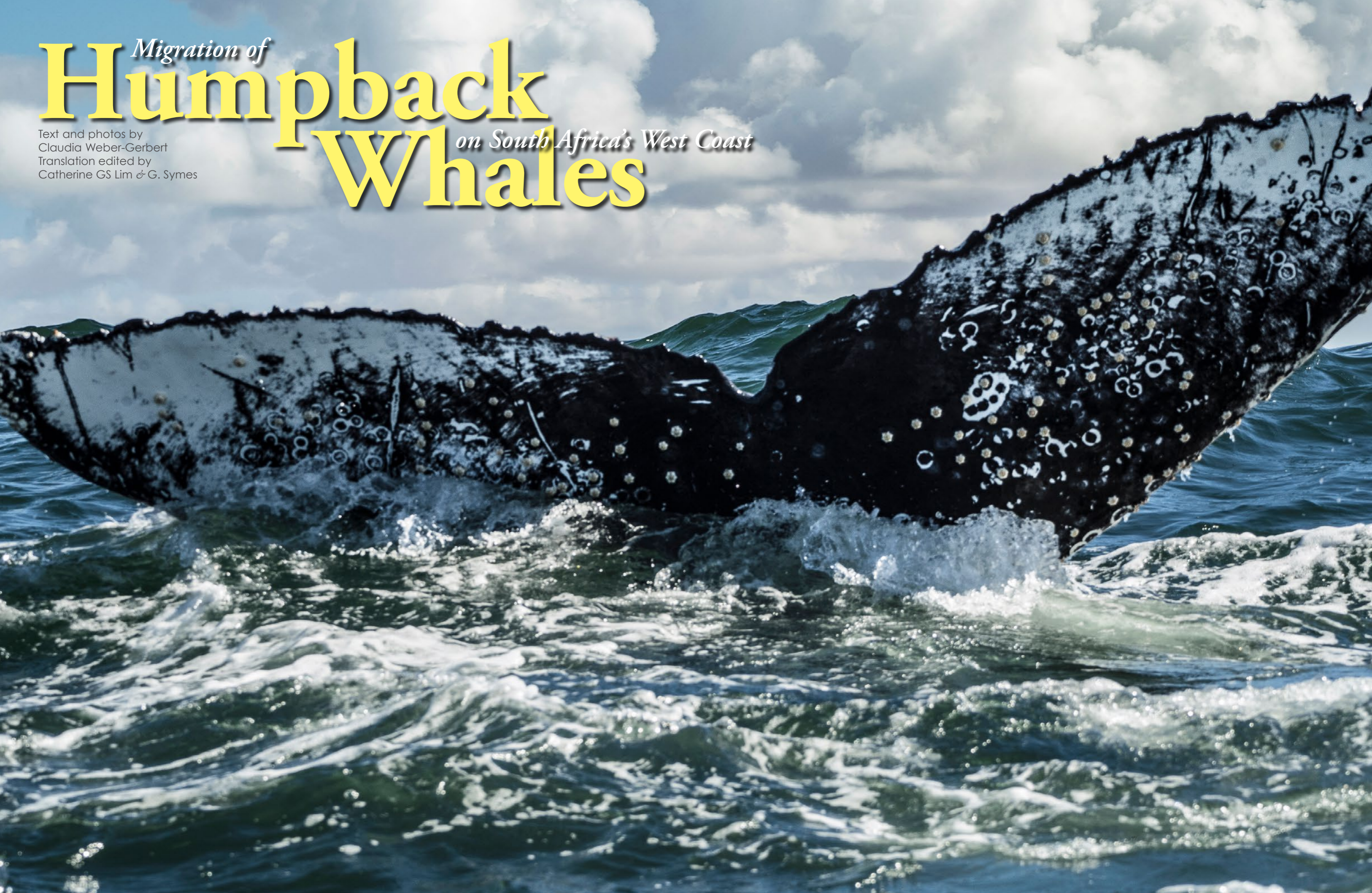


Diver with the world's largest stingray, the smalleye stingray (*Megatrygon microps*)

© ANDREA MARSHALL / MARINE MEGAFUNA FOUNDATION

Migration of **Humpback** *on South Africa's West Coast* **Whales**

Text and photos by
Claudia Weber-Gerbert
Translation edited by
Catherine GS Lim & G. Symes





Photographers on the expedition's dive boat photograph a super-group of humpback whales found off the western coast of South Africa (above); The tail fluke of a humpback breaks the water's surface as the whale makes a steep dive to deeper depths (previous page)

Since 2011, scientists in South Africa have observed an unusual event: large groups of humpback whales seen from mid-October to mid-December off the western coast of South Africa, between Cape Town and St. Helena Bay. During this time period, depending on weather and wind conditions, the Benguela Current brings krill, upon which the whales feed, northward from Antarctica.

Up until recently, permits to observe the humpback migration had not been provided by the researchers of the University of Cape Town. In early 2017, however, they were willing to give permits to a few filmmakers and photographers,

so that the humpback whale migration could be reported worldwide.

I was part of a group of seven photographers from Germany and Austria who were the first Europeans to ever witness this unique and astounding spectacle. Since hardly any pictures had been published of this migration, no one knew what to expect—or if we would even see the whales there. So began the adventure!

Special permits

As with all "special" permits coming from a government ministry, it is a game of chance and may take longer than one would expect. Rainer Schimpf of Expert Tours, who has lived in South Africa over the past 15 years or so, has experience obtaining permits for his other dive activities. So, he managed to get two licenses for his boat from the authorities in order to take six to seven photographers and filmmakers to see the humpback

whale migration. However, since the license was only valid for the boat, rather than assigned to a particular person, it meant he had to transport the boat over 850km from Port Elizabeth to Langebaan.

Humpback whale biology

Humpback whales (*Megaptera novaeangliae*) belong to the family of baleen whales. They filter small prey such as krill, sardines and anchovies from the water with baleen, a filtering system of keratin bristles on their upper jaws. Adult animals are about 15 to 18m long and can weigh up to 35 tons. During the summer months, the animals migrate to the Arctic and Antarctic waters, where they feed on krill and develop a thick layer of fat, or blubber. In the winter months, humpback whales are found in warmer waters near the Equator, where they have a mating season and the mothers give birth to their young. During this time, they eat very little and benefit

Humpbacks



Nose and mouth of a humpback whale consuming krill at the surface (above); Dorsal fin of a humpback whale breaking the water's surface (top right)



Large shoal of krill (above), which are the prey of humpback whales, mixed with chlorophyll-filled phytoplankton makes the water look like green pea soup. *Euphausia pacifica* krill (left inset)

MOIRA GALBRAITH / IOS/ NOAA/ PUBLIC DOMAIN

the coast of South Africa.

from their own blubber. In the Atlantic, there are the northern humpback whales, and the Southern Hemisphere is where the southern humpback whales live. These southern humpback whales are also found off the coast of South Africa.

The southern Benguela subsystem

The Benguela Current is one of the major currents that keeps our oceans moving. This current circulates in the Atlantic, in a counter-clockwise direction, almost circularly between Antarctica, South Africa, the equator and South America. When summer starts in the Antarctic, several krill species multiply in enormous numbers and are transported in high concentrations as plankton along the southern subsystem of the Benguela Current along

The zooplankton consists predominantly of the krill species *Euphausia pacifica* and *Euphausia lucens*, but also of brine shrimp, the crustacean species *Artemia nauplii*, and anchovy larvae *Engraulis capensis*, which, in turn, are regarded as prey of the *Euphausia* species. In the current, there is also phytoplankton, which are plant cells containing chlorophyll, so the water becomes a green soup.

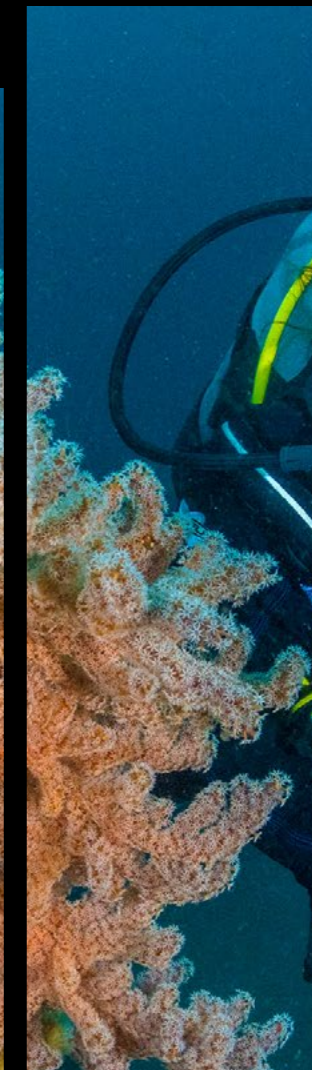
In this area off the coast of South Africa, an upward flow forms, pushing the krill up to a depth of 30m and even to the surface. It is known that *Euphausia lucens* krill are found below 70m during the day and only ascend to 30m at night. So, near the coast where water depths are shallower than 70m, the krill cannot submerge to a safer depth and therefore become easy prey for whales, dolphins, fish and birds.

Humpback migration

In this region, there are feeding grounds for the humpback whales and other baleen whales that gather here and benefit from the abundant food supply. Humpback whales from all over the southern Atlantic Ocean come to this area of the southern Benguela system, which stretches over 220 nautical miles.

It has been estimated that there are about 500 animals in an area of 2 sq km. The total area of this feeding ground is about 10 to 20 sq km. The scientists call these collections of humpback whales "super-groups" or "super pods." The mass feeding by the humpback whales starts in the coastal area of St. Helena Bay, and the whales eat their way south to Cape Town within four to six weeks, from mid-October to mid-December.

So, what we wanted to find off the coast of South Africa were these large collections of



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Not only do the large shoals of krill attract humpback whales, but also dolphins (right), Cape seals (below) and various sea birds; There's lots of action to observe, including the flukes of diving whales (left) and whales breaching ((lower left)

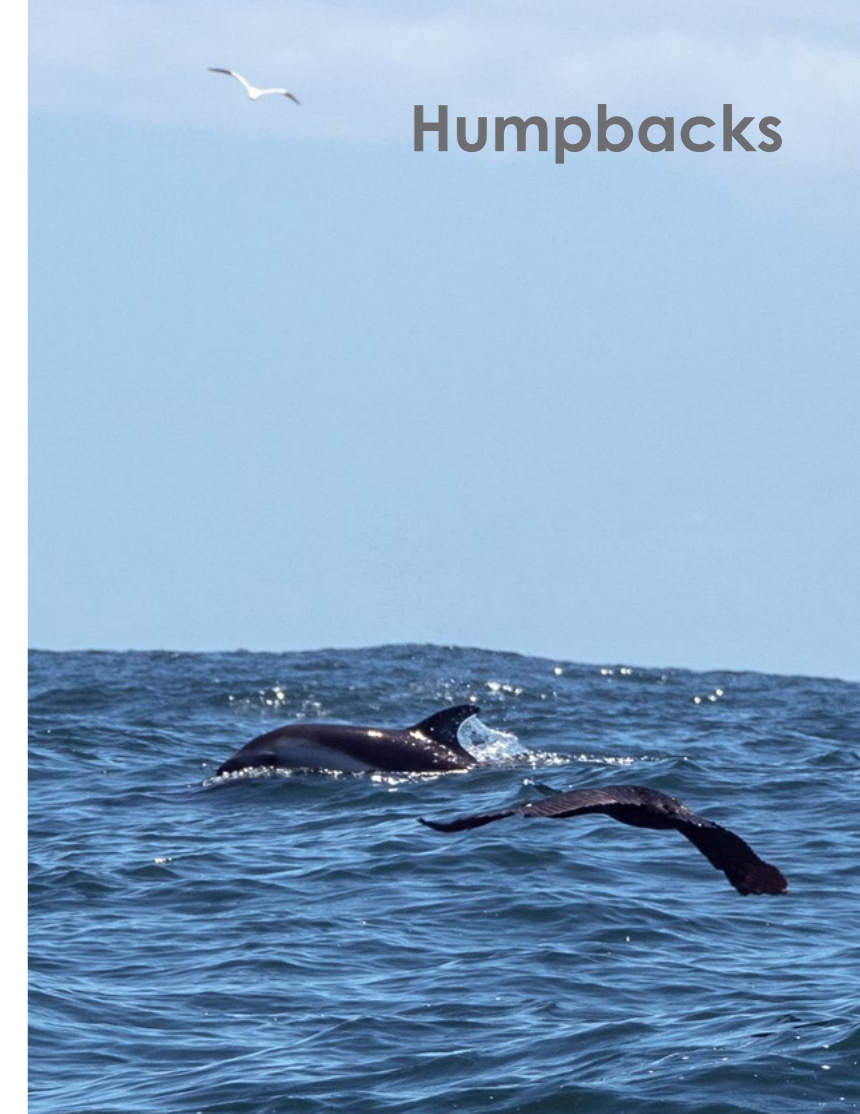
search of shoals of krill, while the really big super-groups were seen when the food supply was obviously very rich in a particular area.

What was overwhelming to observe was not only the sight of so many humpback whales in one place, but also the sheer size of these animals. It felt as if we were in a tiny car parked between a lot of big trucks. But it was also the unique sound of the whales blowing that was captivating—of several whales emerging out of the water at the same time to exhale! It was like the sound of air forced through a large pipe connected to the surface of the water.

All in all, it was an unforgettable, once-in-a-lifetime experience!

The big meal

Often, groups of five to ten humpback whales, sometimes even 20 animals, would dive very steeply at the same



super-group. There were humpback whales all around our boat as far as the eye could see. This super-group of hunting humpback whales was an overwhelming sight, the massive scope of which one could neither describe in words, nor capture properly in photographs or film. The definition of the "super-group" was far surpassed here, with many more animals gathered in one spot and placed much closer together than five body lengths.

As a photographer, I was

humpback whales. The term "super-group" was defined by the whale researchers as including 20 or more humpback whales, with an estimated distance of less than five body lengths to the nearest neighbour. "Super-groups" included loose collections of individual groups of up to 20 animals each, within sight of one another.

Our adventure

Fortunately, on the first day of our adventure, we came across such a

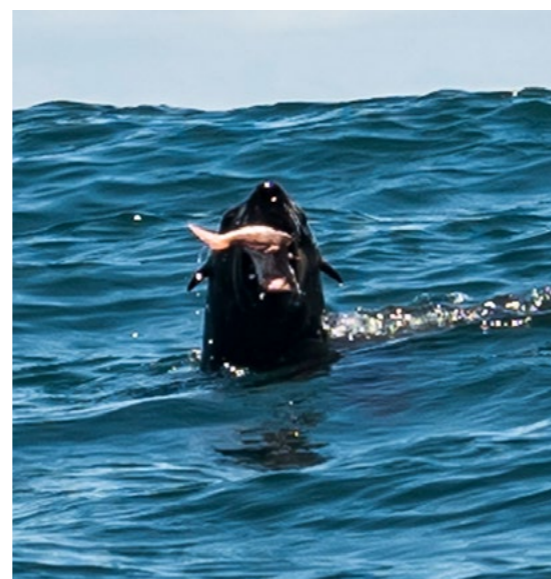
were able to observe and film the spectacle, with each day being different from the next, and different highlights occurring every day. While the really big dense super-groups were not always present, we could always find loose bands of five to ten, or ten to 20, humpback whales.

These groupings were certainly related to wind conditions. Strong southwest winds are the engine of the Benguela Current. Depending on the wind force, there would be more or less krill in the current. The large groups of up to 20 humpback whales descended often underwater in

overwhelmed, because I did not know where to shoot first. Everywhere around the boat, there was compelling action to shoot—of whales feeding, breaching, ascending and descending.

The whales were accompanied by dolphins, fish, Cape fur seals and various species of birds—all with the intention of finding enough food to eat. Even right whales and sometimes fin whales joined the groups.

Over the next seven days, we



Lucky seal catches a fish in its gaping jaws (left); A group of Cape seals on the hunt (above)





Snorkellers with a humpback whale spouting vapor, or whale-blow, and seawater as it takes a breath at the surface (left); The gaping mouth of a humpback whale shows the baleen, or keratin bristles, on its upper jaw that filter krill and other prey from the water (lower left)

water, and two-thirds are underwater. Applying this ratio to the whales, and assuming that the estimated number of humpback whales on the surface was 30 to 50, then the super-group amounted to 90 to 150 animals—all blowing and feeding around the boat. An overwhelming sight!

Primarily adult animals were encountered in these super pods. There were hardly any mothers with their young calves. Indeed, it would be far too dangerous for the calves to take part. In these crowded gatherings, the

mothers would lose sight of their calves. And there were also collisions between these enormous animals, which a small calf would not be able to survive. The few humpback whale mothers that were found did not mix with the super pods, but fed alone outside these dense groups of whales.

Photography

Just about everybody has seen the beautiful photographs and films taken of singing humpback whales in warm waters, where these colossal figures glide elegantly and weightlessly through the water, to suddenly catapult nearly completely out of the water as they breach. However, as the Benguela Current carries a lot of plankton with it, the water is anything but clear—it is rather like a green pea soup. This makes taking pictures underwater nearly impossible, even for experienced

that were ejected by the whales to drive the prey in a particular direction. The animals were in a veritable frenzy—the water seemed to seethe with activity.

It was therefore very difficult to estimate how many animals were actually


in these super pods. At the water's surface, 30 to 50 animals could be seen. But with the constant diving and emerging of individuals, one could not say how many whales were underwater, and thus, what the total number of whales in the super pod actually was.


Of dolphin pods, it is said that a third of the group is above

time, typically lifting their hind flukes out of the water, and coming back to the surface after two to three minutes, one after another, with their mouths open at the surface. This synchronous descent was particularly evident in subgroups of the super pods. On the radar on the boat, one could see huge shoals of krill on the seabed. The whales seemed to drive the krill upwards, where they only had to open their mouths wide to consume the krill. After two to three breaths, the whole sequence was repeated. Often, you could also clearly see rising bubbles




Visibility underwater was greatly affected by the thick clouds of of krill and phytoplankton, making it a real challenge for underwater photographers to capture clear images of the humpback whales.






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Pair of curious young humpback whales approach the dive boat (left); The blow of a humpback whale as it takes a breath at the surface, spraying photographers on the boat with saltwater and misting up camera lenses (lower left)

unpleasant—like fermented fish. With so many animals around the boat, it was a very penetrating smell. However, the smell was gladly endured as a small price to pay for seeing this overwhelming spectacle.

Another big challenge was trying to take photographs with a telephoto zoom lens on a rocking boat. With nearly 3m-high waves, it was no child's play to get a firm footing and maintain a steady hand. As the humpback whales came very close to the boat, it was even possible to take close-up shots. With the whales' fins and other body parts overgrown with barnacles, the visual aspects proved to be very interesting. But wide-angle lenses were also needed to photographically capture the numerous whales of the large groups passing right next to the boat.

The blows of the whales brought yet another challenge: Depending on the wind direction and proximity of the animals to the boat, not only were we photographers showered with exhaled water vapour, but it also completely fogged up our camera lenses, which were polluted with a mixture of whale blow and saltwater.

However, even the best photo or film technology is not able to give a real impression of what it is like to be in a small boat with a super pod—"live." It's unique!

Special encounters
It is a wonderful feeling when you can spend

your lunch break in the company of ten to 20 or even more humpback whales—a rare privilege, of which we were most aware. With the engine switched off, our lunch break on the Atlantic (cameras packed first, of course) was a break for the whole team. There was a unique soundscape all around us, with the snorting whales. Wonderful. And if you are then discovered to be an interesting object by two curious young humpback whales—it's even better!

These two youngsters separated from the larger band of whales and approached our boat. First, the two orbited our boat several times. But, in order to get a better view, they came



Spy-hopping young humpback photo-bombing my shot

underwater photographers.

That the water would not be very clear, we photographers on the boat were already aware. But the sheer extent to which the water was cloudy, nobody had expected. Even at a distance of only one meter, it was not possible to take really sharp photos or video. The whales appeared grey in our field of vision and focus on our cameras just did not work. Therefore, only a few underwater photos were taken. Unfortunately, nobody was able to predict this factor in advance.

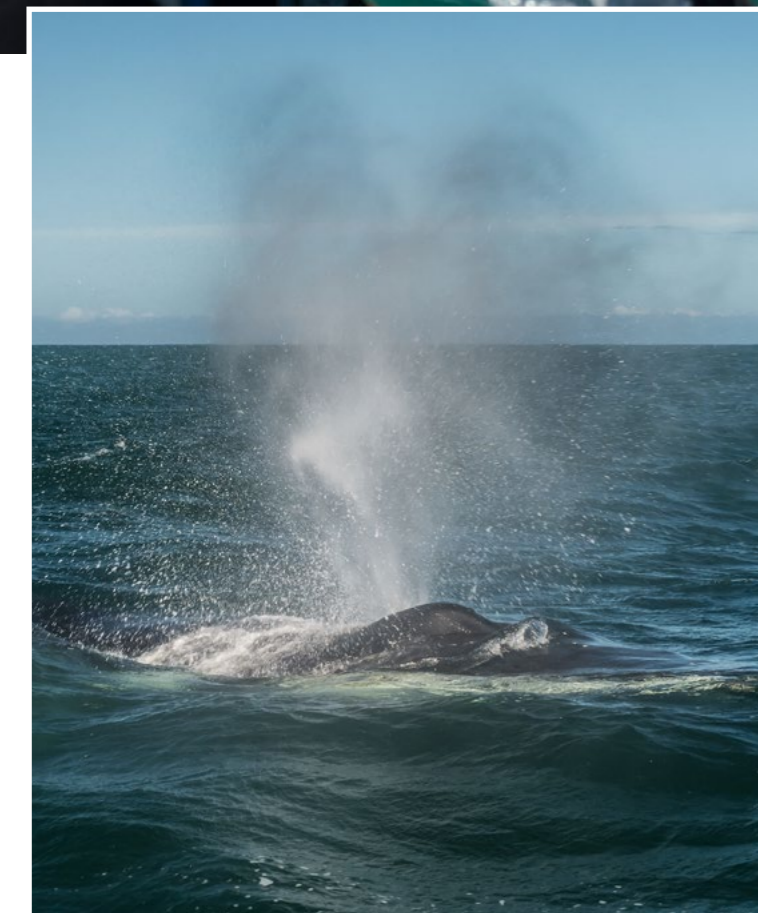
For the trip, it had been planned that we would dive when conditions were good. But this plan had to be abandoned, as it would have been far too dangerous.

So, we attempted to snorkel at least, freediving with the whales. Thus, we were able to capture some underwater film

footage. But unfortunately, we just could not see the whales underwater, even if they were only a metre away from us.

As for the whales themselves, this was probably not a problem. They knew exactly where the snorkellers were in the water, and cautiously moved around us accordingly. It is amazing how agile such a 15m whale can be when it tries not to touch the little human in the water. While no underwater photos could capture the scene, what remains with me is the special feeling I experienced when I was lifted by the wave produced by a humpback whale, just two metres away, diving and disappearing into the depths!

However, we were particularly rewarded with breathtaking shots taken above the water's surface. I say "breathtaking" also because the smell of the whales' blow was quite





A curious, young humpback whale checks out the boat and greets the divers

even closer to us, and the animals began what is known as “spy-hopping,” i.e. with the tip of their heads coming straight out of the water, their brought their eyes partly over the water’s surface, behind and beside our boat. It was a unique spectacle, seeing these smart and very curious animals spy-hop, which kept us in an excellent mood for over an hour.

Another highlight of the trip was when a whale calf photo-bombed my video, when I wanted to record an introduction for a later commentary. As already mentioned, mothers with calves were rarely found within the super-groups. But on the sidelines, the humpback whale mothers benefited from the high-energy food supply of the krill. In this case, a calf had moved away from its mother and was heading straight for the boat to take a closer look at this weird thing. Unfortunately, the mother did not quite

agree with this move, and so, the calf did not stay long.

A sight that makes every photographer’s heart beat faster is the “breaching” of the whales—when a whale makes a partial or even complete jump out of the water. It is so majestic to see 35 tons of weight catapult out of the water with apparent ease. Again, we were allowed to observe and marvel at this event every day. Both near the boat and also from a distance, the impact of the whales’ bodies on the water’s surface was clearly audible.

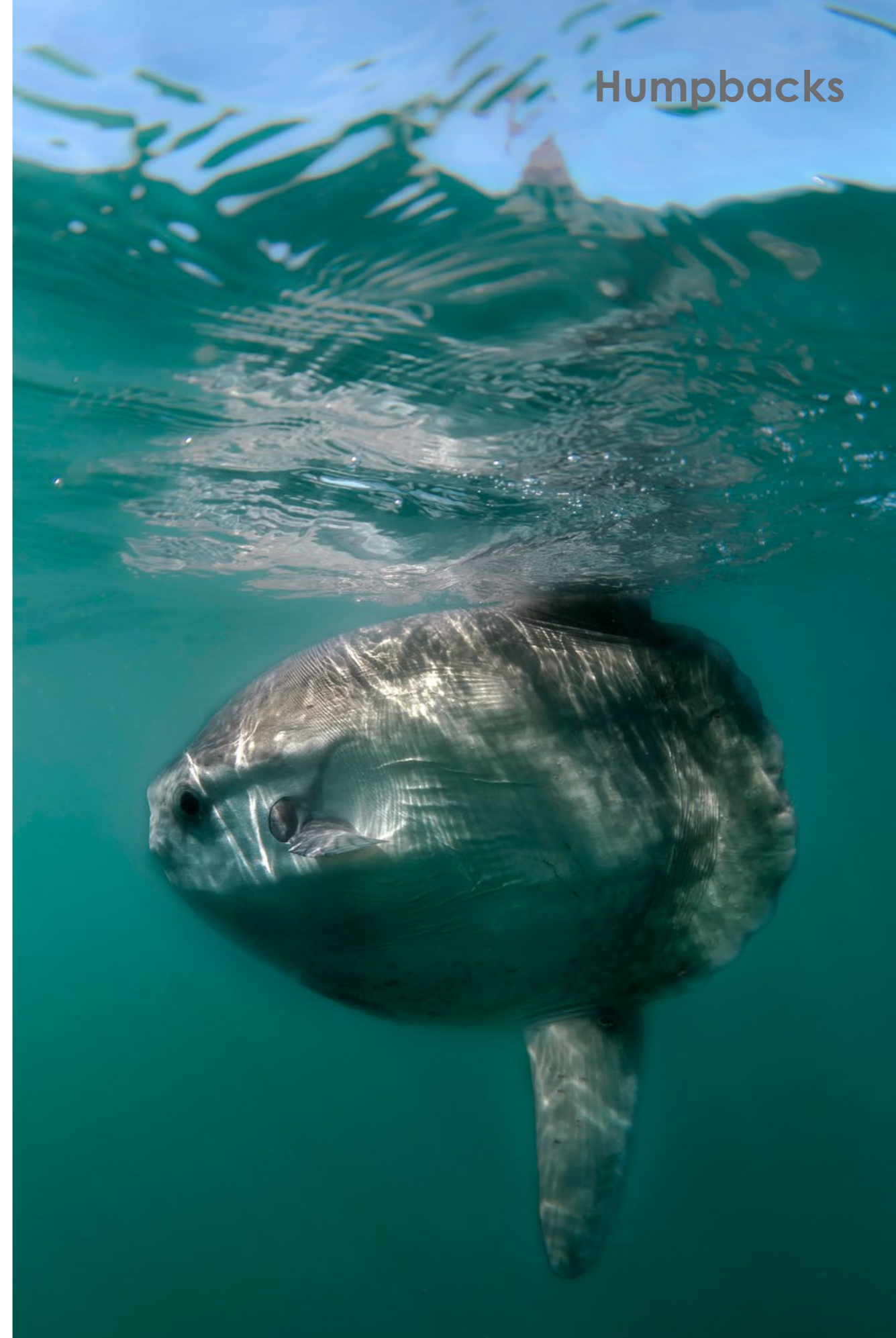
There was one additional high point. Apparently, the rich food source of the Benguela Current also attracts ocean sunfish, the *Mola mola*. They were observed here daily. Such a rare sight!

Migration theories

Scientists at the University of Cape Town

have been monitoring and researching the humpback whale migration in the years 2011, 2014, 2015 and 2017. A scientific paper on the subject has been published by Mduduzi Seakamela and Ken Findlay. It contains maps, tables, estimates and theories. The paper described what we saw for ourselves: super-groups of 50 to 200 humpback whales along the South African coast between St. Helena Bay and Dassen Island, and farther south to Cape Town. The scientists also found it difficult to estimate the number of animals due to the large number of individuals that were hidden under the water’s surface.

Overall, the scientists assumed that it was a “new” behaviour of the humpback whales to feed at low latitudes. Such behaviour in low latitudes and densities has not been spotted anywhere else on earth. So far, “big groups” have only



A rare sight observed daily on the humpback whale expedition: ocean sunfish, or *Mola mola*



The blow-holes of a pair of humpback whales passing very close to the dive boat (above); Spy-hopping was a common behavior of curious, young humpback whales, checking out the dive boat and its humans (left)



Fluke of a humpback whale diving

ever been defined as up to 20 animals. The term “super-group” has now been reintroduced for the event observed in South Africa.

So, it is possible that the humpback whales have re-discovered the abundant Benguela Current as a food source of energy-rich krill. Actually, it was assumed that the animals are much farther south towards Antarctica at this time of year, i.e. in the high latitudes. But the food supply is great and the distance to be covered by the whales is not that far. Or it could be that the Antarctic does not provide enough food for all the whales, and they are forced to seek out other sources to meet their needs.

On the other hand, until the 1960s, there were still whaling stations in Saldanha, the lagoon of Langebaan and near Cape Town. Large quantities of whales were killed here seasonally, and their meat and blubber processed. So, it could be quite conceivable that there had been a humpback migration

to the Benguela Current long ago, but their populations were so decimated by whaling that the migration was not visible in the form and massive numbers we only now can observe again today, since the population has recovered reasonably well. That would definitely be a positive development.

However, rising humpback whale populations, in turn, place even more pressure on the ocean ecosystem, as rising numbers have even higher food requirements. The overfishing of our oceans creates a vicious cycle in which the supply of food is becoming more and more scarce, not only for marine mammals but for humans too.

The humpback migration on the western coast of South Africa is not yet well-known, since researchers have only been working on it for a few years. However, it is certain that this stretch of coastline is becoming one of the most important seasonal feeding grounds for southern humpback whales in the

early summer months of the Southern Hemisphere. ■

Claudia Weber-Gebert had the opportunity to join the humpback whale expedition once again in December 2018—an overwhelming experience. If you would like to take part in a humpback whale expedition yourself or want further information, please contact the author. Go to: facebook.com/claudia.webergebert or linkedin.com/in/claudia-weber-gebert-79b8b516 To see video of the humpback migration, go to: youtube.com/watch?v=BciXn52V3UU&t=63s or youtube.com/watch?v=QTh34uCsrlU

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Edited by
Peter Symes

Equipment

Smooth ride

Nauti-Craft's ride control system is a novel concept to deliver improved safety and comfort while traversing rough seas, say, on the way to a dive site. A patented technology separates the vessel's hulls from the deck and superstructure via an interlinked hydraulic system to provide "passive reactive" pitch-and-roll control, smoothing out the waves in a similar manner in which a car's suspension absorbs bumps when going over pot-holes. **Nauti-craft.com**



Solo Analyzer

This compact gas analyzer from DiveSoft is a nifty little tool for measuring oxygen and helium concentrations in nitrox and trimix gas mixes. The analyzer is also capable of detecting the presence of some other gases, including argon, giving off a "Foul Air" warning. The unit can be both programmed and charged via an USB-C, which comes included. It takes less than four hours to charge fully.

Divesoft.cz



Series 189

The 189-series is being branded by Anchor Dive Lights as the all-in-one dive light for photographers and cave divers. Several new features include separate wide-warm (CRI 85) and wide-cool (CRI 75) functions, which will benefit underwater photographers. An increase in UV wavelength to 420nm ensures a more even illumination of hard and soft corals. An eight-degree spot beam will benefit cave divers, search-and-recovery personnel who can use it for signalling, and any diver looking under rocks or wrecks during the day. **Anchordivelights.com**



Ellipse

Fourth Element has worked with SI Tech to come up with a simple, reliable, ergonomic system, designed to provide an easy solution for dry gloves. The ergonomic elliptical shape offers a slimmer profile whilst still allowing a larger hand to pass through. Aligning the glove and suit rings is made easier by an intuitive key system: the gloves are attached by pressing the rings together. A robust nitrile O-ring provides a reliable seal for the gloves, which will stay secured throughout the dive.

Fourthelement.com



Drysuit in summer

Santi's Flex 80 is a lightweight and elastic undersuit, which has been designed for diving in warm waters, for summer, or as a complement to a thicker undersuit in transitional periods. The neckline has been finished with a stand-up collar, the sleeves are fitted with a cuff with an additional rubber band, which is also used in the wider version at the bottom of the legs, preventing them from being pulled up when the suit is donned. There are two cut pockets at the front and a built-in rubber band in the waist, which can be adjusted. The suit's double-sided zipper is mounted diagonally.

Santidiving.com



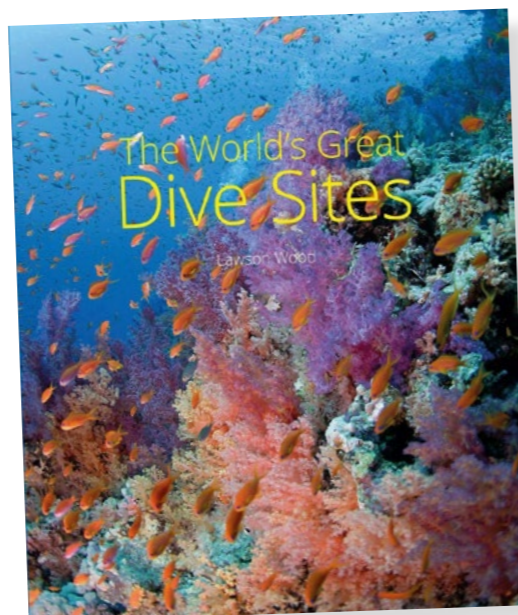
Dry at sea

Ursuit's Gemino Action is a two-piece drysuit intended not for diving but for a number of activities out at sea, such as fishing, paddling, sailing, or operating a dive vessel. The suit is manufactured from high-quality Gore-Tex and is completely wind and water tight, keeping you dry and high afloat if you happen to fall into the water. The neck seal and wrist seals are made of elastic neoprene, which makes the use more comfortable and is also warmer than latex, for example, in colder weather. The pockets on the jacket are big and have splash-proof zippers. The location of the pockets makes them easy to use even when wearing a life jacket.

Ursuit.com



Edited by
Catherine
GS Lim

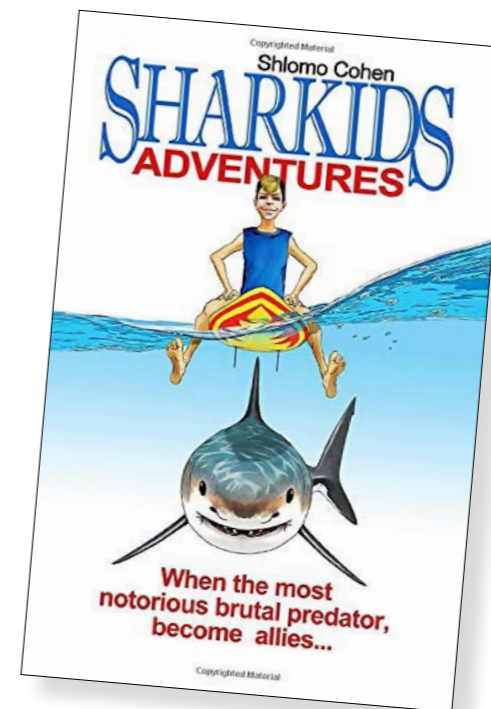


Dive Sites

The World's Great Dive Sites,
by Lawson Wood

With so many awesome dive sites around, how does one decide where to go? In this book, acclaimed underwater photographer Lawson Wood shortlists the world's best dive locations, including those in the Caribbean Sea, Bermuda, the Red Sea, Indian Ocean, Indo-Pacific and Pacific Ocean. Each dive site featured includes information like the type of dive to be experienced, what one can expect to see, travel advisory as well as quality photographs of wrecks, habitats and marine animals.

Hardcover: 208 pages
Publisher: John Beaufoy Publishing Ltd
Date: 28 September 2019
ISBN-10: 1912081083
ISBN-13: 978-1912081080

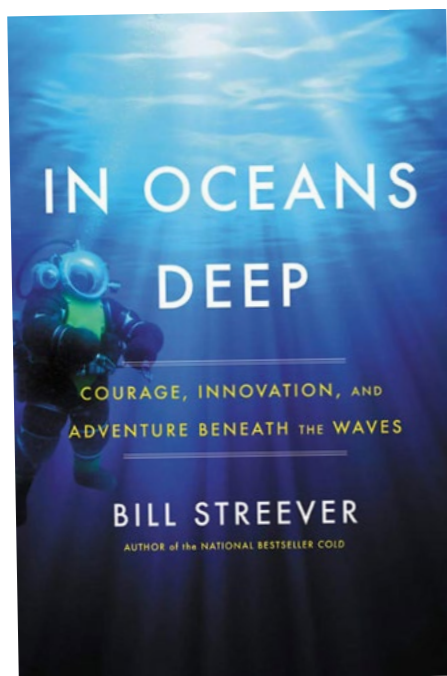


Sharks

Sharkids Adventures, by Mr Shlomo Cohen

Sharks worldwide are in grave peril and their continued existence is in doubt. Hence, it was decided that they share their biggest secret with the humans—a secret that has enabled them to survive for so long. Led by their leader—the last surviving Megalodon—they make contact with some special children, signalling the start of a wonderful yet dangerous adventure. This book is part of the Sharkids trilogy, and is suitable for both young readers and adults.

Paperback: 283 pages
Publisher: DP Publishing
Date: 22 June 2019
ISBN-10: 1075568331
ISBN-13: 978-1075568336



Deep Sea

In Oceans Deep: Courage, Innovation, and Adventure Beneath the Waves, by Bill Streever

Bring out the adventurer within you, with this book that takes you beneath the waves to explore our oceans, past and present. From the earliest submarine technologies and exploratory deep dives to the world of ocean-bound robots and oil rigs, from the deepest known point in the ocean (Challenger Deep) to sunken treasure ships and submarines, this book promises to be a fascinating voyage into the vast ocean depths and the boundless courage of the human spirit.

Hardcover: 320 pages
Publisher: Little, Brown US
Date: 15 August 2019
ISBN-10: 0316551317
ISBN-13: 978-0316551311



Dive Adventures

Wild Dives: A book filled with underwater adventures, by Nick Robertson-Brown and Caroline Robertson-Brown

Which scuba diver has not dreamt of an up-close-and-personal encounter with a large-than-life marine animal whose sole intention is to check you out and say hi (and not regard you as potential prey)? In this book, underwater photographers Nick and Caroline Robertson-Brown relate exciting, mind-blowing encounters with wild marine animals from around the world.

Hardcover: 240 pages
Publisher: New Holland Publishing
Date: 31 August 2019
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opinion

Text by Simon Pridmore

The following article is adapted from a chapter in Simon Pridmore's latest book, Scuba Exceptional: Become the Best Diver You Can Be.

It was day seven of the liveboard trip and the twentieth dive of Darren's holiday. He joined his team in the tender boat and they sped off to the dive site. He donned his gear and ran through his usual pre-dive checks, while the guide dropped in to do a current check. It was only when the countdown began for all the divers to roll into the water together that Darren reached for the mask hanging around his neck... and it was not there.

He raised a hand to stop the countdown and searched around to see if he might have inadvertently taken it off and put it down on the bench next to him, but he could not see it. He had left it back on the liveboard. When the countdown resumed, all his fellow divers

went in without him.

Darren was devastated, not only because he had missed a dive, but also because he thought that the incident made him look careless and he prided himself on being a capable diver. He

took some good-natured ribbing for a short time afterwards and then everyone else forgot about it. But Darren did not forget. The incident weighed on his mind for a long time.

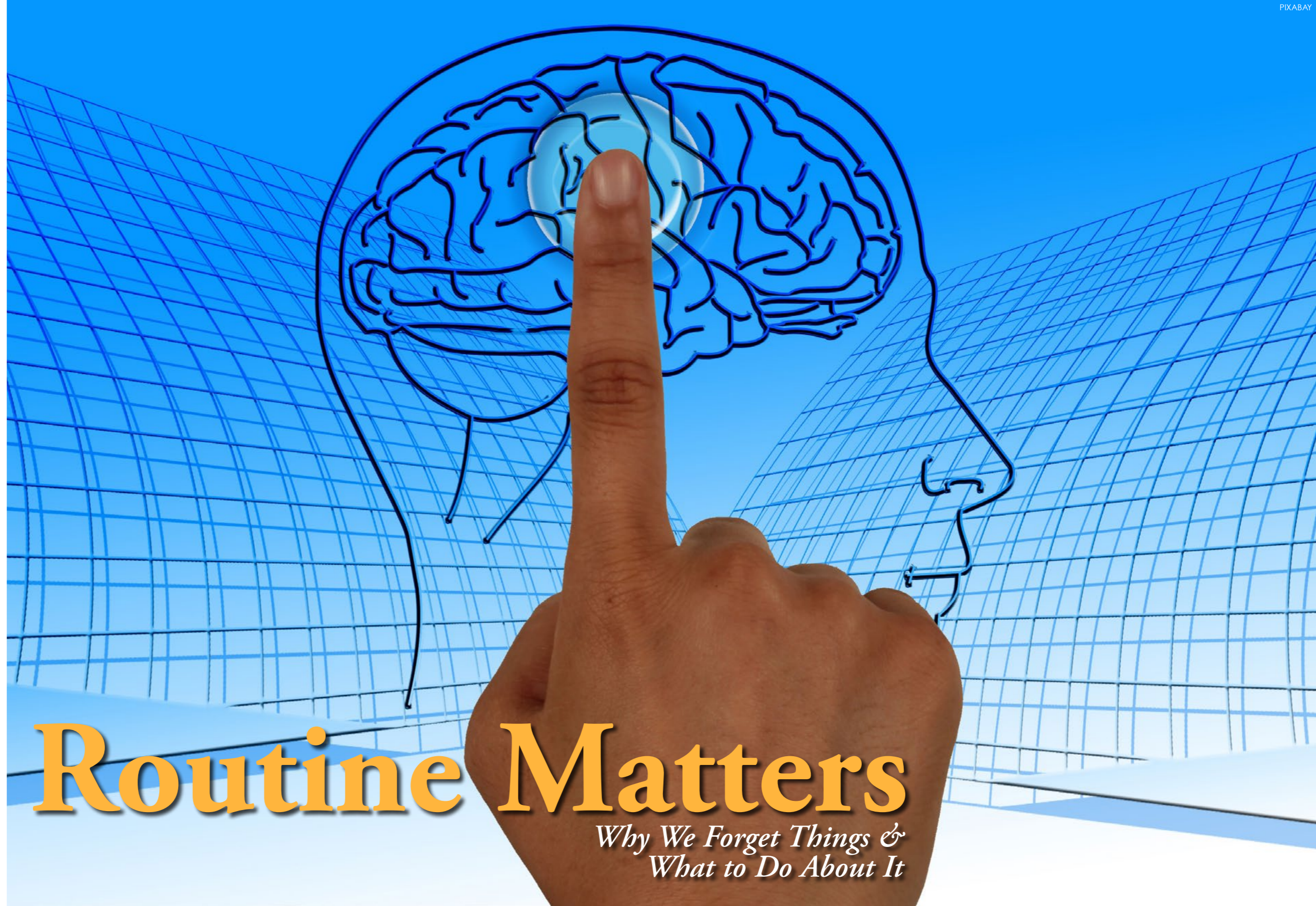
He knew how it had happened. After

the previous dive, there had been much excitement on the dive deck, with everyone chattering about what they had seen. Darren had taken his mask off and had absent-mindedly stowed it under the bench he had been sitting on. That

meant it had not been with the rest of his equipment when he came to prepare for the next dive. Impossible though it might seem, he had not noticed he did not have his mask with him until he tried to put it on his face.

Routine Matters

Why We Forget Things & What to Do About It





Forgot your mask, fins or dive computer? It usually happens when you least expect it, just when you are dive-fit, in the groove and able to trust your instincts —or so you believe.

A solution to the problem

He swore that such a thing would never happen again and decided that the solution was to become more methodical in his dive preparations. He needed a routine. So, he developed a process that

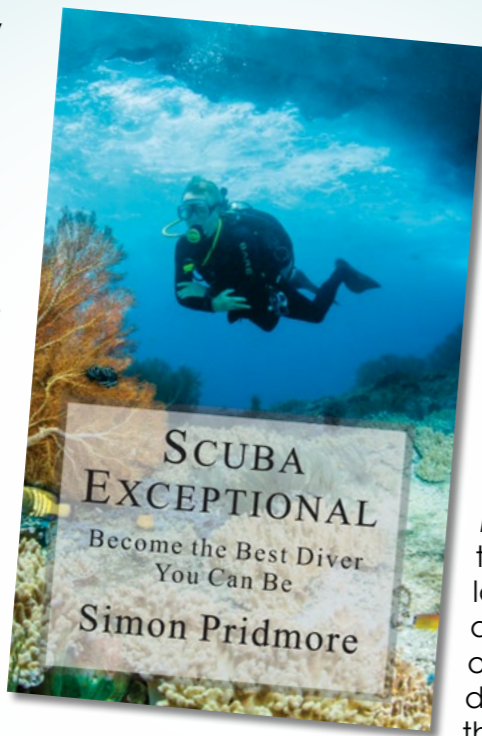
would make sure he always remembered everything he needed to do before and after a dive. First, he wrote all the steps down in order on a slate and then he made sure he followed the sequence assiduously, with the slate close at hand.

A New Book for Scuba Divers!

Scuba Exceptional may be the fifth in Simon Pridmore's *Scuba* series, but it is actually the true follow-up to his first book, the best-selling *Scuba Confidential*.

The philosophy of safer diving through the acquisition of knowledge and skills is the same, although this time the themes are different. As before, Pridmore provides us with a whole host of extremely useful advice and techniques, illustrated by real-life experiences and cautionary tales.

The focus this time, though, is more on issues that experienced divers face. There is more technical diving content, and Pridmore covers some relatively complex issues in his usual clear and easy-to-read style. In many cases, the issues that concern technical divers reflect those that affect scuba divers at every level. After all, as Pridmore writes, technical diving is on the same spectrum as conventional sport diving:



It is just a different frequency.

Scuba Exceptional also deals in more detail with the psychological approach to scuba diving, broaching familiar topics from new angles and borrowing techniques and procedures from other areas of human activity.

While most of *Scuba Exceptional* focuses on the diver, it also takes a look at the wider picture and highlights a number of areas where scuba diving professionals and the "industry" as a whole are letting divers down.

As always, Pridmore is realistic in his assessments. He may shine a little light on the dark side of the scuba diving world, but he does this in order to illuminate bad practices and encourage change, while offering solutions.

Scuba Exceptional: Become the Best Diver You Can Be by Simon Pridmore is available on: **Amazon.com**.

He tried to avoid distractions and would restart his routine from scratch if he was interrupted at any point in the process.

It worked—although it was a while before he was confident that his list covered all eventualities. He also had to adapt it a little from time to time, depending on which boat he was diving from and whether it was a day boat or a liveaboard. He also found he had to tweak his list a little for beach diving. But, he never missed anything again and he wished he had come up with the idea sooner.

Forgetfulness

Darren is not alone. Almost everyone who ever breathed air underwater has

experienced a similar moment. As in Darren's case, it usually happens when you least expect it, just when you are dive-fit, in the groove and able to trust your instincts—or so you believe.

I have seen people forget their computer, even their fins.

I even have a friend who prepared his underwater camera system for a dive, loaded it into the tender boat, dropped into the ocean and popped back up to take the camera from the tender crew, only to see a gaping hole where the lens dome should have been fitted, but was not. It was still lying on the workstation in the liveaboard's camera room. My shocked friend stopped the crewman, hopped back into the tender and asked the driver to take him back to the mother boat, where I was standing, wondering why he had aborted his

dive. As he approached, he held up the camera housing, showing me the vacant dome port. He saw me smile and then it dawned on him why I was smiling. "This story doesn't go in one of your magazine columns," he called out. "Of course not," I reassured him.

Sometimes divers do not notice the thing they have forgotten until they have already begun their dive. They notice their computer is missing when they first look to see how deep they are and find themselves staring uselessly at an empty wrist. Or three or four breaths into the dive, they try to take another breath and discover that they are sucking on an empty hose. They might have checked their gauge while they were gearing up and seen that it was full, but they forgot to test that the valve was actually open, either by trying the handle or taking a few test breaths.



ILLUSTRATION COMPILED WITH IMAGES FROM PIXABAY



opinion



PETER SYMES

Buddy check system

When you first learn to dive, you are given a routine to follow in the form of the buddy check system. It is usually presented as an acronym, which changes from training agency to training agency, designed to help you remember what to do to make sure

your buddy has made all the necessary preparations for the dive. At that point in your diving life, it seems inconceivable that anyone would ever go into the water without double-checking, even triple-checking, absolutely EVERYTHING!

However, in most cases, it is not long after your initial training that the buddy

checking stops. You never forget the acronym, but you quickly neglect the process that it was supposed to help you remember. You become comfortable with doing your own checks and you know that, as long as you concentrate, you are completely capable of preparing for your own dive without any help.

Then, after a while, you stop concentrating because you assume that you are now so experienced that you are infallible. Then you get distracted or experience a moment of inattention and that is when you forget something.

Establishing a mental checklist

If you are like Darren, you feel stupid and promise yourself that you will never do it again. Maybe, as he did, you decide to write down all your pre-dive and post-dive procedures on a slate or in your logbook and always keep it with you as a cheat-sheet. Or perhaps, instead, you work hard at developing an established sequence of actions that you keep in your head and practise time and time again until the process becomes completely unforgettable and instinctive.

I see veteran divers and professionals on dive boats all over the world who

have done this, whether consciously or subconsciously. If you ask them about their routine, some might claim they do not have one. But they do. Just watch them: It is almost spooky. They have a mental checklist and they follow it minutely, repeating exactly the same sequence of actions before and after every dive.

Adopt a routine—it matters! ■

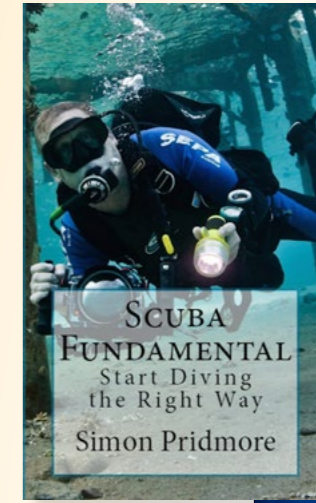
Simon Pridmore is the author of the international bestsellers Scuba Confidential: An Insider's Guide to Becoming a Better Diver, Scuba Professional: Insights into Sport Diver Training & Operations and Scuba Fundamental: Start Diving the Right Way. He is also the coauthor of Diving & Snorkeling Guide to Bali and Diving & Snorkeling Guide to Raja Ampat & Northeast Indonesia, and a new adventure travelogue called Under the Flight Path. His recently published books include Scuba Exceptional: Become the Best Diver You Can Be, Scuba Physiological: Think You Know All About Scuba Medicine? Think Again! and Dining with Divers: Tales from the Kitchen Table. For more information, see his website at: SimonPridmore.com.



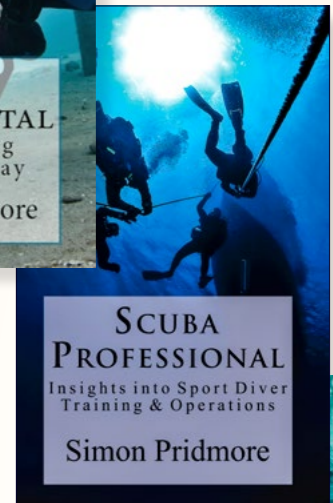
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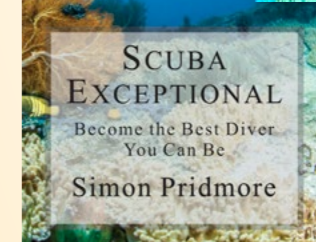
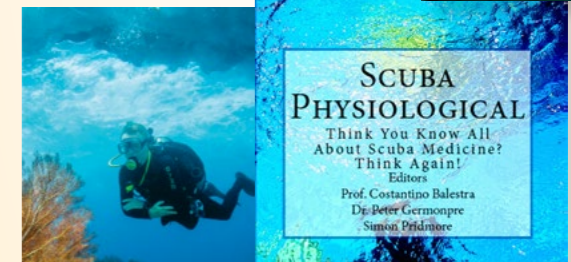
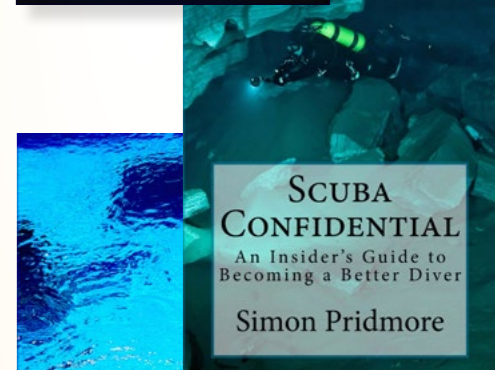
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Text by Jens O. Meissner
Photos by Andrey Bizyukin

How big is the technical diving market? What trends can we see? How many technical divers are out there? What are their typical careers? And what do we know about them and their purchasing behavior? Three studies in brief shed light on these questions.

Know your customer
Every instructor candidate has to run through a lecture about the business processes of a dive center. The lecture includes information and concepts about customer processes, i.e. how to win new customers, do cross selling and to retain and develop customers. From an academic point of view, this knowledge is very basic. However, it can be enough to guide instructors to behave effectively in terms of doing business. What textbooks never describe is the specific customer and his or her typical profile. This is especially true for technical divers. It is time to sketch a more detailed picture of this customer.

The following descriptions are based upon several smaller studies that have been conducted by myself or my students during the Business Administration Studies program at the Interdisciplinary Future Laboratory "CreaLab" at Lucerne University of Applied Science and Arts.

How Big is Tech Really?

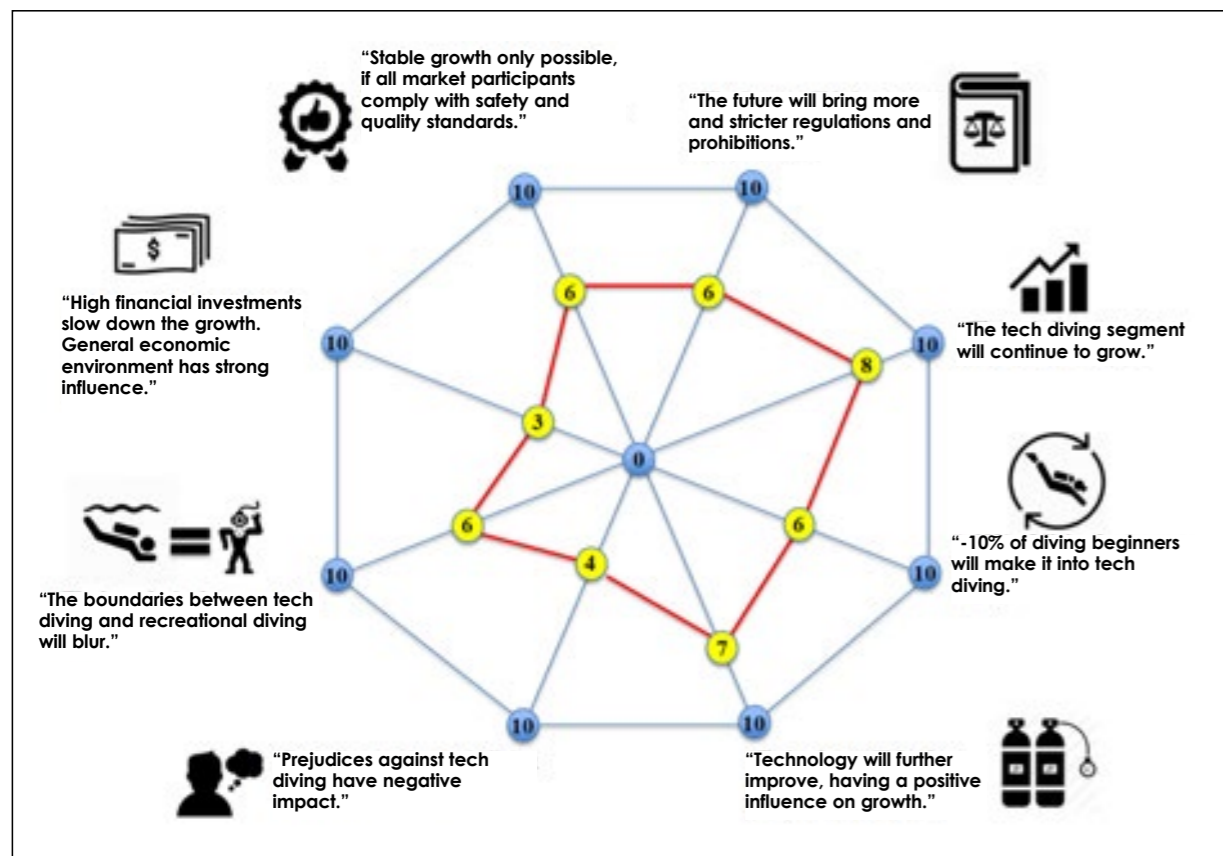


Figure 1: Trends in the technical diving market

Know your market: Which trends affect technical diving?

The first study focused on the question: How many tech divers are there globally? A group of students did research and conducted interviews with a dozen decision-makers within the international dive industry (Kaufmann, Koch, Lukacs, Suter, 2017). They started with the basic number of six million active divers worldwide provided by DEMA in 2015. Technical diving was defined with being minimally certified in "Advanced Nitrox." The transcription and analysis of the interviews followed the standards of qualitative social research. The group identified eight central topics that the decision-makers regularly discussed (see Figure 1).

When reviewing the statements, it seems to be obvious that the technical diving market segment will continue to grow. Technological progress has a major impact on this development, because it lowers its entrance barriers. The growing number of female technical divers

changes the demographics of the market and is an important growth potential. Ecological, economic and political

aspects only have a limited impact, since the market is a mere niche of the overall sports diving market.

How many technical divers are out there?

The share of technical divers among all recreational divers is estimated between 4-12%, depending on which dive association was asked. Larger institutions assumed lower numbers and vice versa. The true number should be in between, but closer to 4 than to 12%. An estimation around 6.0-7.0% seems to be realistic, and represents a part of 240,000-720,000, with a fair estimation around 400,000 divers (see Figure 2). Experts agreed that around 40% of technical divers sign up for further education and training programs. This results in a plausible estimation of around 160,000 active technical divers worldwide.

The study is an estimation, thus it is not representative, which is its key limitation. Also, it mainly focuses on the European and North American market, based on the experts selected. Developments in the rest of the world may be under-represented.

The typical technical diver's career A second study resulted by coincidence in September 2017. Well-known technical diver and photographer Becky Kagan-Schott launched a Facebook post in which she asked when people began recreational diving and then when with technical diving. The post developed dynamically, and I asked her for permission to use it for a detailed analysis. Two hundred and ninety-five people answered her question and 28% of the respondents were female.

On average, divers started their diving careers at 20.8 years of age (with peak values around 14, 18, and 29 years of age) and their technical diving careers at 30.2 years of age (with peaks at 21, 24, 30 and 33 years of age). The mean time until their entry into technical diving was 9.2 years, showing two distinct sub-groups with around five and 15 years: the "speedies" that worked through the initial recreational diving phase quickly, and the slower divers, that spent triple the amount of time to become technical divers. It is likely that every experienced instructor has distinct memories of both types of divers.

Again, most answers came from divers of the North America and Europe. The distribution of answers might look different in other parts of the world, but from my own personal impressions, these two market segments seem to fit.

Characteristics and purchasing behavior of technical divers

A third online study was completed in December 2018. This survey was more detailed and contained socio-demographic questions as well as items regarding experience and activity level, community behavior, different (self) management aspects and financing practices. The survey was carried out via the web tool Questback and was distributed within the community via several opinion leaders and dive associations.

All together, 900 interested persons opened the survey and 300 completed all questions. After quality control, 36 data sets were erased, so that the final data set contains 264 complete answers. In the subsequent step, the data was prepared for analysis (e.g. translation of

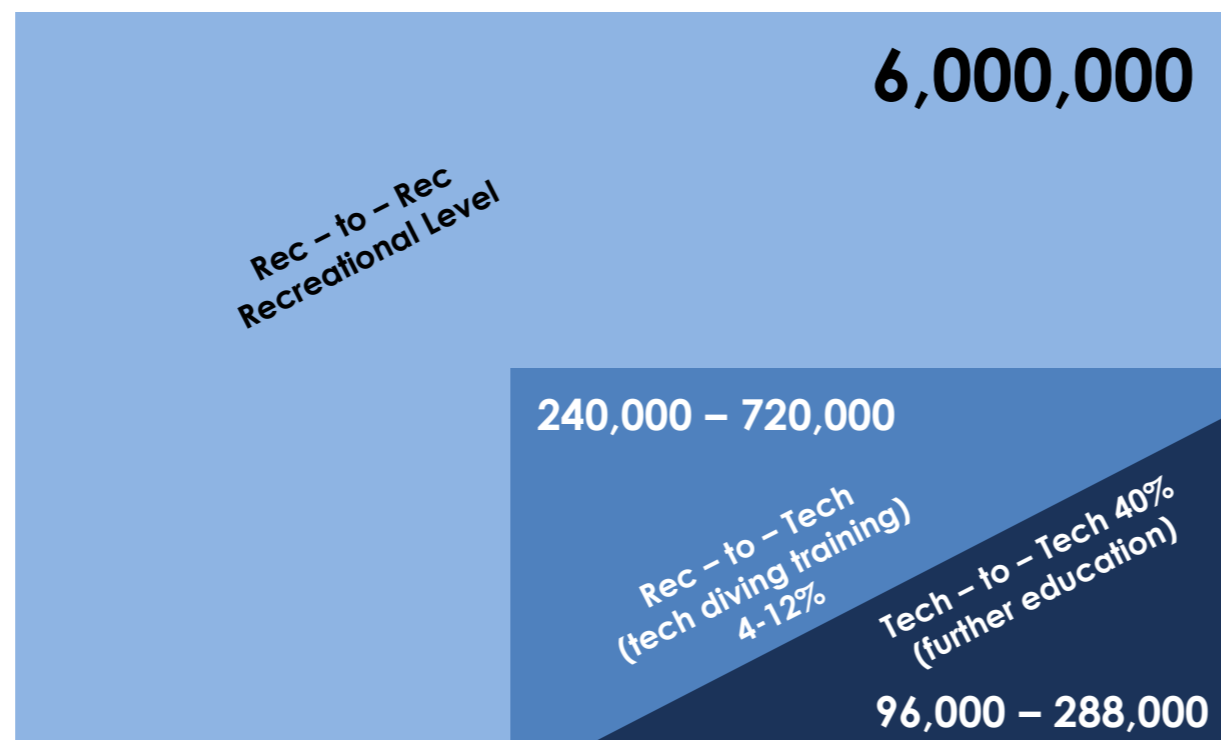
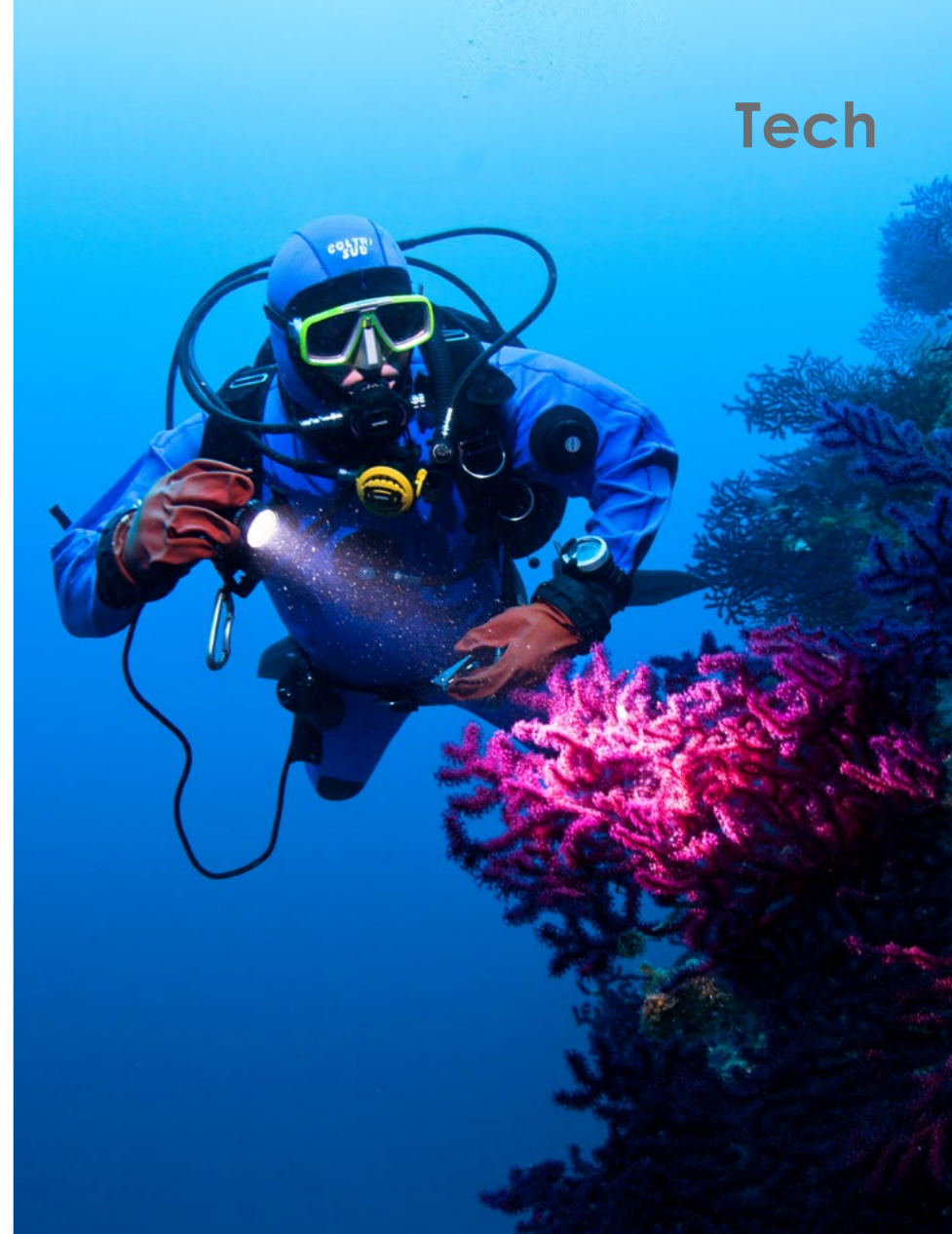


Figure 2: Technical divers worldwide



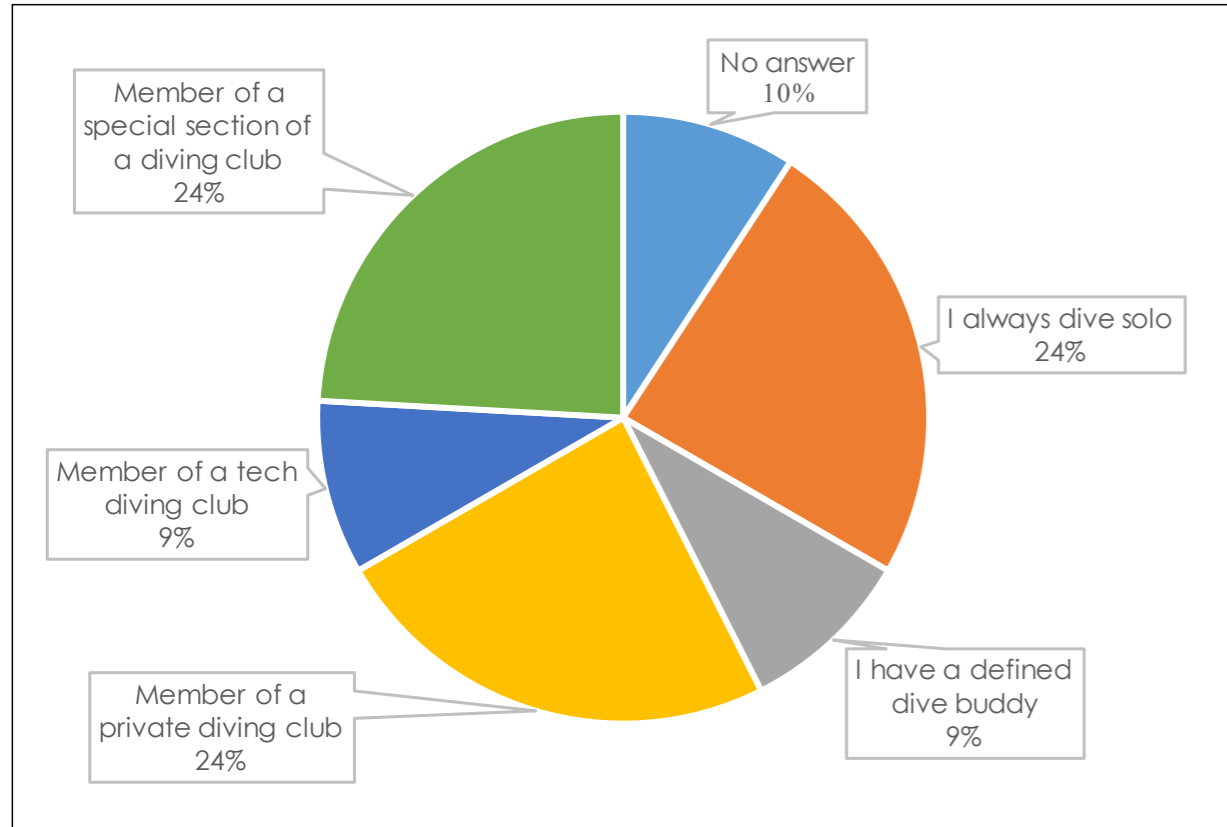


Figure 3: How technical divers manage their dive partnerships (n=264, single-choice answers)

currencies, unifying answer types, etc.). This data set is the first, high-qualitative and globally unique data set about technical diving! The study is representative with a confidence level of 90% and a standard error of 6.0%.

So, what were the most interesting facts about “tech divers” found through the study? In all, 226 men and 36 women completed the survey. We may assume that 16% represents the percentage of females in technical diving, which may be a little higher, since men are more active regarding online behavior. The average age was 44.2 years, and the average diving experience was 18.4 years in recreational diving and 8.7 years in technical diving.

Divers had logged 1,567.3 dives, with 99.2 dives per year and an estimated 133.6 hours of diving per year. That means, an average dive lasts 81 minutes. However, the percentage of dive professionals was around 55.3%, which means that many shorter training dives could have pushed

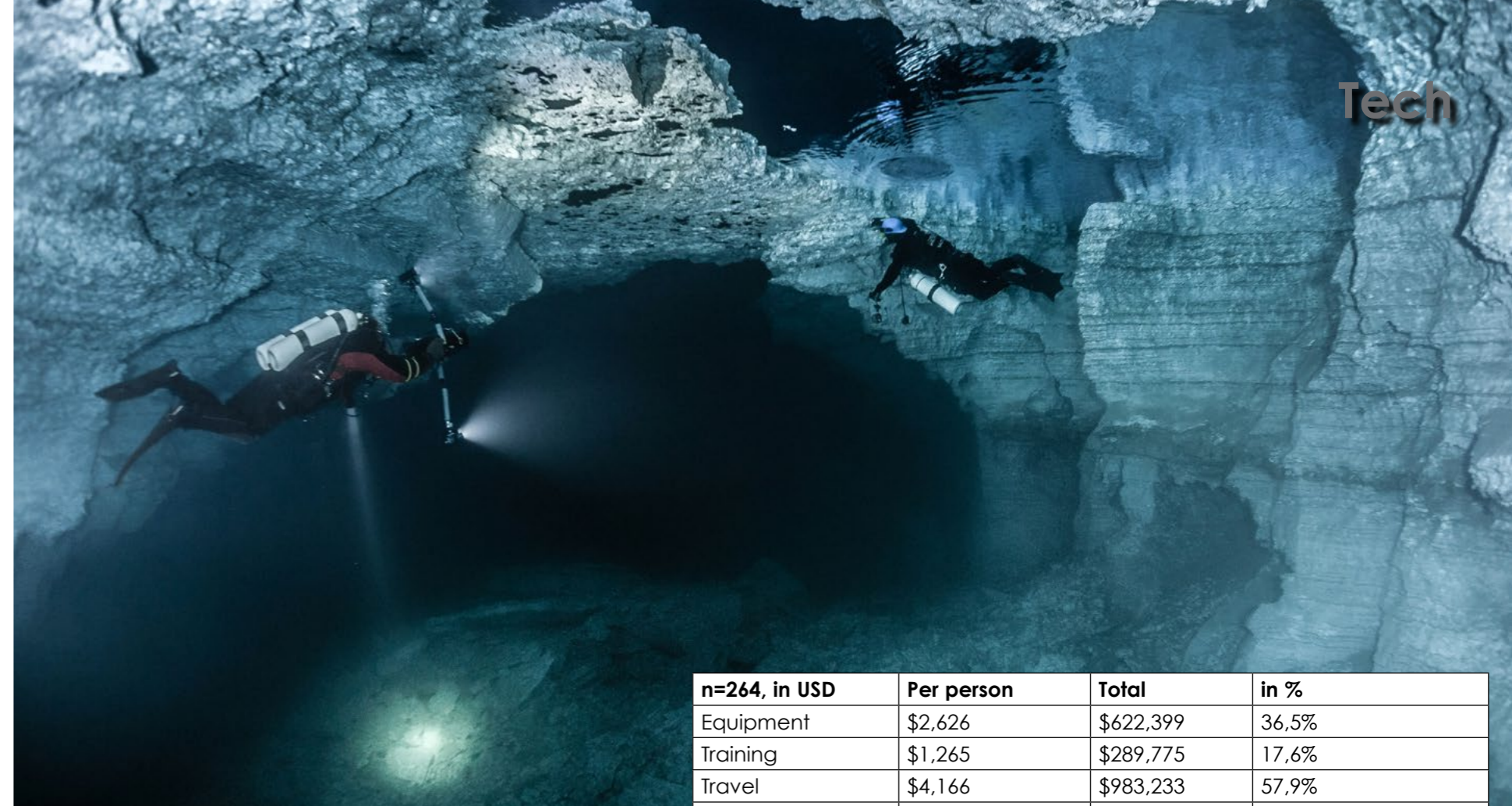
the dive duration downwards.

Those surveyed were members in 1.8 dive associations (varying from 1 to 7). The percent of divers who were members of SDI/TDI was 26.4%, IANTD 21.5%, PADI 13%, GUE 8% and CMAS 5%. Not surprisingly, GUE shows the highest number of solo memberships, because unlike most training agencies, it includes a membership organization.

Regarding the dive partner management, the answers show the following behavior (see Figure 3):

About a fourth either dive solo, are members of a private dive club or members of a special section of a diving club. Only 9% have a regular dive buddy. The relatively high percentage of solo divers shows that diving alone is a common practice. It is not known whether the divers really go diving alone or just see themselves as being self-reliant when diving in a team.

The consolidated answers regarding the purchasing behavior were also very inter-



n=264, in USD	Per person	Total	in %
Equipment	\$2,626	\$622,399	36,5%
Training	\$1,265	\$289,775	17,6%
Travel	\$4,166	\$983,233	57,9%
Total	\$8,058	\$1,895,407	

Table 1: Technical diving expenses for the sample (n=264)

esting (see Figure 4). Nearly half of the participants describe themselves as episodic buyers. Almost as many clearly set an emotional priority and prefer passion over money. However, only 16% are spontaneous, almost a third look for the best offers, while 11% are chasing the best bargain, nevertheless. Most shop owners will painfully remember encounters with customers that turn out to be penurious hagglers. Surprisingly, only 9.0% mention an annual budget, and 7.0%, a monthly budget.

Although multiple answers were possible, few respondents (6%) seem to buy gear at a fair or trade show. Only 1.0% of those surveyed always buy the newest gear regardless of cost. We may conclude here that most technical divers primarily want to identify the best product to solve their problems, and the price is of less relevance. A product may be expensive, but this does not seem to be

problematic if its function is well-proven. So, technical divers are commonly price-sensitive, but know that quality gear is valuable.

Finally, questions regarding the annual expenses (average) for equipment, training and travel were raised (see Table 1). Total spending for all respondents was US\$622,399 for equipment, US\$289,775

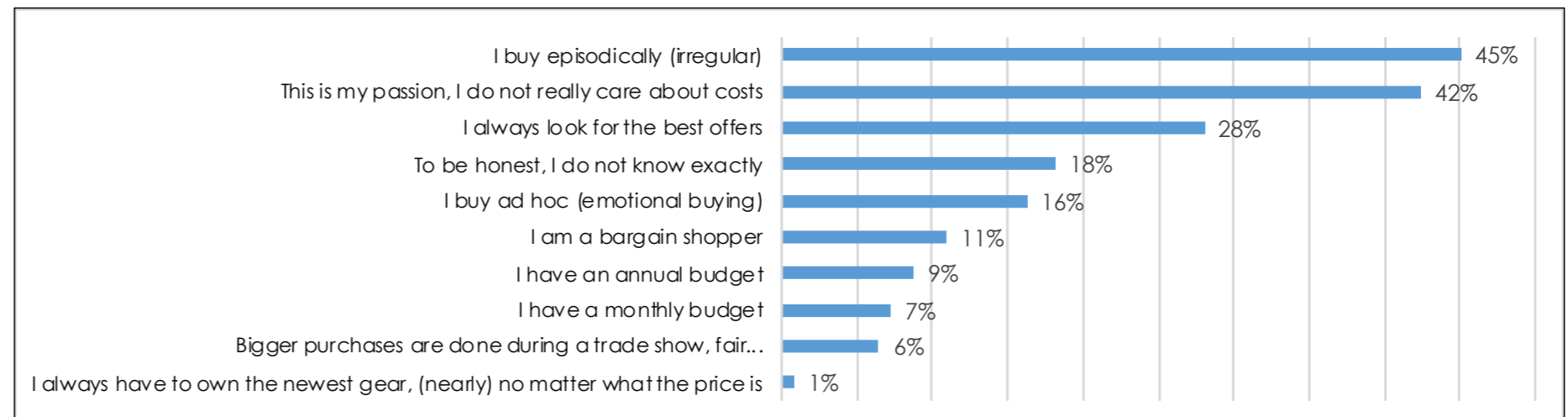


Figure 4: Purchasing behavior (n=264, multiple answers possible)



for training, and US\$983,233 for traveling. Thus, their total budget is about US\$1.9m for 264 respondents, or on a per-person basis: US\$2,626 for equipment (36.5%), US\$1,265 for training (17.6%), and US\$4,166 for travel (57.9%)—in total: US\$8,058.

This amount and its composition seem to be plausible, but a new diver could be turned away by this relatively high cost. However, this is only fair to avoid building wrong expectations. Technical diving is about life-support equipment and related techniques, and these are costly. End of story. It would be dangerous to save costs where training and life-support equipment are concerned.

So what?

Of course, all of the studies presented here are based upon assumptions, which are only representative for the technical diving community. Note that all of the respondents were people that a) can be reached via Facebook and Instagram, b) are active in North America or Europe, and c) were open to sharing their information. Nevertheless, we may summarize: If the technical diving market numbers 160,000 participants, then the total annual market volume would be \$1.3 billion. So big is tech diving! ■

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Divers Adrift

— *Surviving Being Lost at Sea*

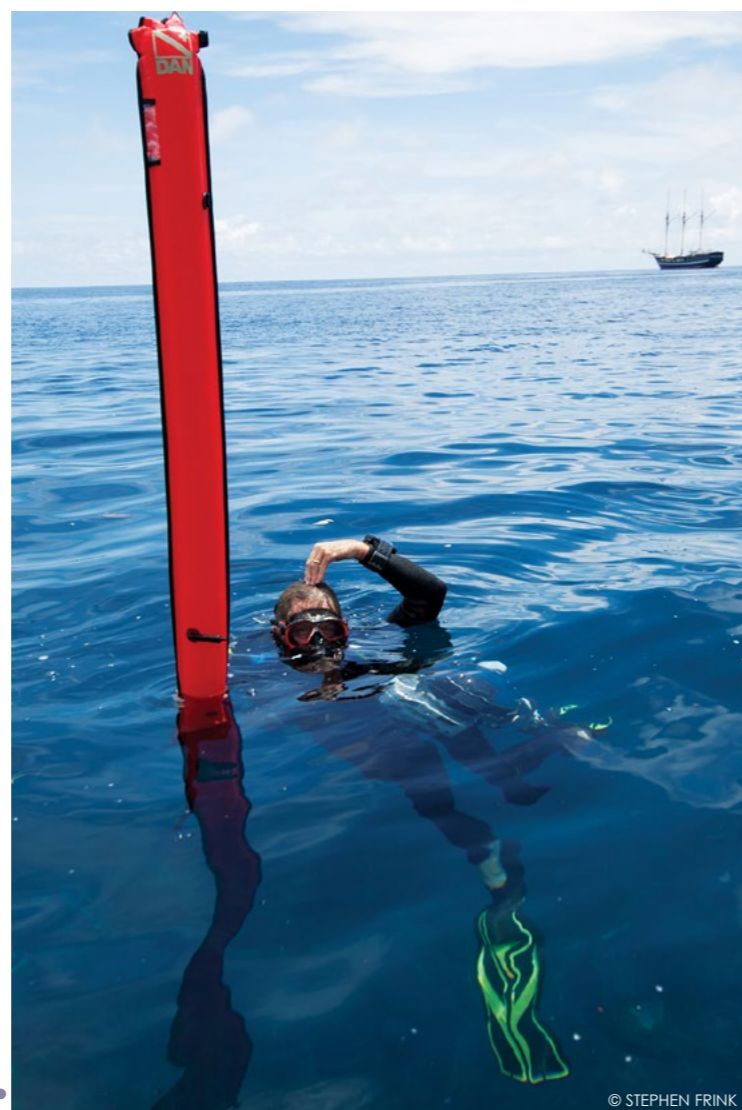
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Exploration is not easy—if it were, everyone would do it. The reality is that the next big shipwreck to be found may be hundreds of miles from the nearest coast, tucked into a remote cove hours from civilization or in an area with huge tidal currents. The more difficult a wreck is to get to, the more rewarding its discovery, but also the more likely it is that you will run into trouble during or after your dive. Challenges become hazards quickly, and many offshore adventures are rife with risk factors that make it more likely that you will surface from your dive without a boat in sight. Whether your charter sprung a leak and became a new dive site or drifted off in search of another diver here is what you need to know to survive.

Assess your situation

The first step in any survival situation is to take in all the information available to you. Were you live-boating and might a vessel be coming to pick you up, or did you drift away from an anchored vessel by accident? If you are lost without the knowledge that a vessel is actively looking for you, it may be wise to start thinking about nearby shore. With near-coast-

al charters in particular, land may be just a short swim away. Extended exposure to the elements means dehydration, loss of body heat, exposure to sun and lack of food and water. You will want to look at what you have for signaling devices and exposure protection first; your most important task is to signal a vessel, but you will need to avoid becoming too sunburned or cold in the process. Should your attempts to signal a passing ves-



sel fail, you will want to ensure you are as warm and uninjured as possible while you wait for a search party to locate you.

Keep calm and float on

Keeping a cool head may be the most important thing to do in any emergency situation. Once you have assessed your situation and discovered that you are

actually lost at sea, it is critical that you take a deep breath and force yourself to think as clearly and rationally as possible.

It is a common occurrence in some areas to be out of sight of a dive vessel at times, particularly in areas like Northern Ireland where diving in tall seas is common. It may be the case that the crew has a careful eye on you from a higher vantage point (the view from a tall wheelhouse is much better than that of a diver floating on the surface), or they may have gone after another lost diver but still know your location. At night, a vessel may run with minimal lights to preserve the crew's night vision, and you may have to look for red and green side markers to spot them.

In case you have been lost by your vessel, panic can quickly make your situation dangerous. Take a deep breath, locate and grab hold of your buddy, make yourself

positively buoyant and as comfortable as possible, and prepare for your next step.

Hope for the best and prepare for the worst

If it is apparent that help will not arrive very soon, it is time to begin planning for the worst-case scenario. Ditch your weights and extraneous gear (if you have not already), inflate your BCD and lie back on it to keep yourself out of the water as much as possible. Tie your BCD to your buddy's with a piece of line from a reel or a clip—positive outcomes in survival situations are more likely in groups. Stay close together for warmth and to help each other deal with any issues that arise. You will be able to survive for about three days without water and three weeks without food.

Depending on when and where you have been stranded, exposure protection will most likely be your first concern. Keep your exposure suit of choice on, minimize unnecessary movement, and pull your legs toward your torso and hug them to minimize heat loss. You can find some protection from the sun by holding up a fin, a piece of a wetsuit or some

other light piece of gear. It is unlikely that you will be able to source water or food while floating, so focus on staying warm and close to your buddy.

Make yourself visible

After you have prepared yourself to spend the night out, it is time to make yourself easy to find. Focus on low-energy signaling devices; you will want to save your strength as much as possible. Surface marker buoys, dye markers, strobes and flashlights are great. Any shiny object (even a mask or dive computer) can be used to reflect light at passing vessels, and a brightly colored fin waved in the air can get the attention of someone much more effectively than your hand.

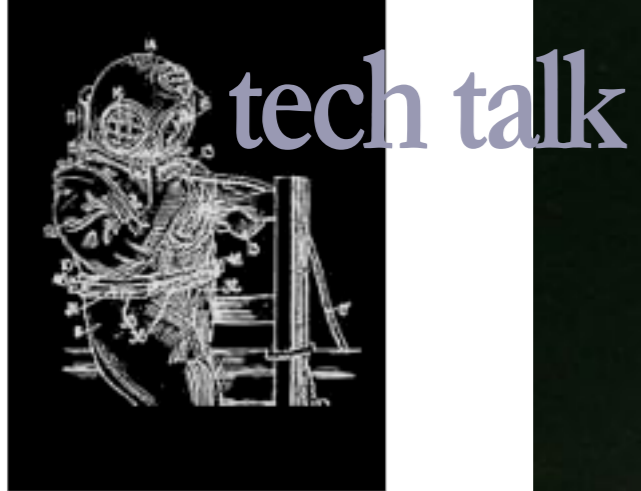
At night, a flashlight shined up into a tall surface marker will illuminate it and make for an excellent signaling device, and noise-makers such as whistles can attract the attention of rescuers amid the din of wind and surf. ■

For more information about survival at sea, visit: DAN.org.



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tech talk

Czech police divers and EOD personnel have been clearing the Bosnian rivers of ammunition from the war for seven years. They tracked down and destroyed about six tons of explosives.

Text by Ivana Faryová
and Pavel Švec
Edited by Michael Menduno
Photos by Radek Prygl

Landmines. They are some of the most insidious weapons mankind has ever created. Invisible, hard to destroy and waiting years for their opportunity to kill. Tens of millions are scattered around the world. In fact, Czech police divers and bomb disposal experts returned from another mission in Bosnia, where they were looking for war ammunition, especially landmines, in the rivers.

Mine-explosion victim statistics are appalling. According to last year's report by a coalition of organizations known as the International Campaign to Ban Landmines (ICBL), landmines have killed more

than 2,000 people in 2016 alone, injuring or crippling another 6.5 thousand. That is the highest number in the last 20 years.

For years, the Czech Republic has been one of the nations try-

ing to do something about it. Czech police divers and explosive ordnance disposal (EOD) personnel have been searching for and destroying unexploded mines and bombs in the waters of

the Sava, Una and Drina rivers in Bosnia-Herzegovina for the past seven years.

A four-member team of military EOD personnel has also been deployed to join a US Engineer

Battalion in Afghanistan. They are destroying improvised bait systems and ammunition around the base in Bagrám. However, the Czech demining teams are among the world's leaders.

Difficult moments underwater

Police specialists in Bosnia are well respected. Not only do they help locals live without fear of stepping on a mine or unexplod-



Clearing Mines

in the Sava River of Bosnia





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wreck
cave
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ed ammunition, they also give assurance that the world has not forgotten them.

"With our help, they don't feel like an abandoned country among the wealthy states around them," said police diver Martin Kučera who just returned from Bosnia. "In Bosnia, we've seen the citizens who fled the war return for weekend visits. They come in their Mercedes, enjoy parties with fireworks, and don't understand what happened here and what is happening now. Then they leave again. It's hard on the locals; their memories of war remain. The people who escaped are perhaps better off than those who stayed and defended their land."

Kučera and his colleagues have been in Bosnia since 2011, exploring the shores and bottoms of rivers in search of dangerous ammunition. The Czechs were



the only ones in the world to sign up for the underwater work, where the line between life and death is pretty thin. The work is unimaginable.

You can hardly see in the mud and you are constantly drawn by the current. The danger is hidden in the sediments—one careless move is all it takes. "When you



enter the water, you cannot get rid of the feeling that there are mines everywhere, which could blow up any second," said Kučera. "It is only when you get used to the area underwater and use your detector that you can

calm down and realize there is less danger, and you can kneel and have time to move in a certain direction," he added.

Over the past seven years, the Czechs have combed through every centimeter of hundreds of meters of river flows, neutralizing tons of mines, bombs and grenades. Nevertheless, misfortunes still occur in Bosnia. For example,

a recent mine explosion killed a large herd of sheep and injured the herdsmen.

Mines and ammunition were thrown into the rivers by fighters during the war. Some sank to the bottom with sunken ships, others drifted under bridges that were bombed, and some remaining munitions found their way to the riverbed through flooding.



Disposal by detonation of an unexploded hand grenade found in the Klokot creek near Bihač (above); Dangerous ammunition found at the bottom of a Bosnian river (left); Divers use buoys to mark the search sectors (top left); This is how dangerous places are marked in Bosnia (center inset)



tech talk

Working in rivers is made more complicated by bad visibility and current (right). The diver must determine exactly which ammunition he has found and whether it can be handled or will have to be detonated underwater. When he is unsure, he scans the finding with a camera, and the type of explosive is then examined by experts on a bigger screen (lower right).

Clearing Mines



An EOD team's nightmare

The worst situations from an EOD team's perspective are amateur grenades and mines, which were made by the fighters themselves, because no one knows exactly how they were assembled. The anti-personnel mines of Yugoslav origin are also a nightmare—the warring parties buried huge amounts of them in the Balkans.

One particular type of mine provokes terror: the Protupješačka Rasprskavajuća Odskočna Mina (or PROM). When stepped on, the mine is ejected above the terrain from its hiding place, before exploding and bursting with small metal balls. It is a death sentence for anything within 50 meters.

PROM still kills and maims people and animals in many countries, including

Angola, Chile, Croatia, Kosovo, Eritrea, Iraq and Namibia. And soldiers set such mines around Bosnian rivers.

"When the floods come, they are washed out of the banks. Some either spontaneously explode or they get into the river, and that's the trouble," Kučera cautioned.

There is not an estimate as to how much work remains for EOD experts in Bosnia. "The deployment of EOD personnel in Bosnia and Herzegovina is continuing. In addition, police divers have begun to train a demining unit of the Republic of Serbia," said police spokeswoman Eva Kropáčová, adding that sending Czech divers to Ukraine is currently being considered.

Since 2011, over 40 Czech experts



have helped remove mines in Bosnia. The mission has a budget of about CZK 1.5 million per year. It is funded by the Czech Treasury through the Ministry of the Interior.

Professionals are a must

It should be mentioned that police specialists in the former Yugoslavia have already followed up on the work of their colleagues in the army. Czech soldiers have recently helped to demine the territory of Bosnia-Herzegovina and Kosovo. In addition, they helped Jordan and parts of Afghanistan through the ISAF operation.

"Since August, a two-man EOD service team has been deployed in NATO's operations in Lithuania. The main task of the unit is training activities," said Magdalena Dvořáková, spokesperson of the General Staff.

Unfortunately, despite of all the efforts of deminers around the world, the deployment of mines in recent years has been increasing in places such as Syria, Iraq,

Czech police divers and pyrotechnics work mainly on the rivers Sava, Una and Drina (left). Priority is given to areas where people live.





Clearing Mines

THIS PAGE: Czech operation in Bosnia. On arrival, the team of EOD personnel and divers must first create a base for tents and equipment (above). However, the site must first be checked and possibly cleared of mines. The Sava River map (lower right) identifies hazardous, mined and safe places. Police diver Martin Kučera (right) has been to Bosnia to demine rivers for seven years.



Yemen, Afghanistan, Libya and Ukraine. In addition, mine areas that have been overrun with new handmade mines by Islamists are incomparably more laborious because they include a significantly larger amount of explosives.

For example, the new generation of landmines that the Islamic State militants have deployed around the Iraqi city of Fallujah some time ago contains up to 15kg of explosives. By comparison, traditional mines have only about 200 grams! So, while training the local population to help with the destruction of traditional mines had been sufficient, it is not enough for the mines of this strength. Professionals are needed to take care of them, which unfortunately comes with a large price tag.

"This kind of improvised explosive device requires a much more sophisticated level of knowledge—someone who has years of experience in

explosives disposal," Stan Brown of the US Mine Removal Office told *The Guardian* recently.

According to the ICBL, which was awarded the Nobel Peace Prize in 1997, the total cost of removing mines in 2016 alone was US\$560 million, or almost 13 billion Czech crowns.

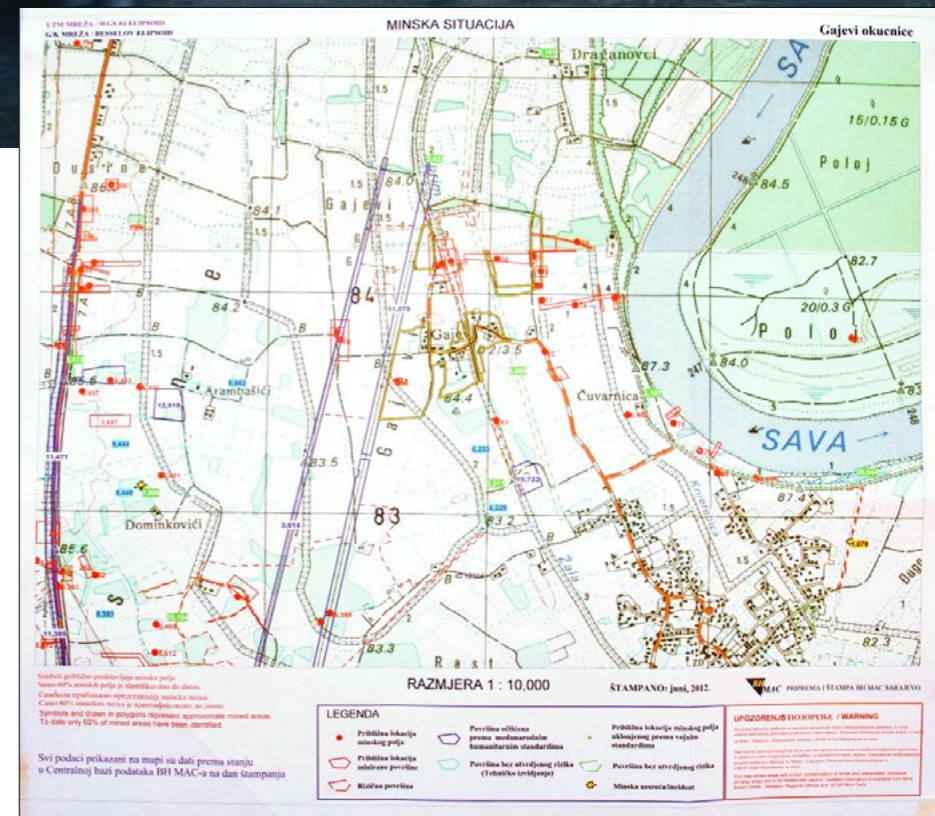
Two thousand minefields

Landmines started being used in large quantities during World War II and were used in a majority of later conflicts, including Angola, Cambodia, and, of course, in former Yugoslavia. Bosnia-Herzegovina is now one of the countries with the largest number of landmines in the world.

There are about 2,000 minefields in this Mediterranean state—which is roughly two-thirds the size of the Czech Republic. What is even worse is that many more minefields are not

documented or labelled. One mistake could mean the loss of life. Therefore, EOD personnel must always be on the alert. Anyone who ventures beyond the ominous "Beware of Mines" signs is at huge risk. Every year, many people in the country lose their lives or are injured.

"I believe that people in Bosnia need help. When you see their eyes light up when we are successful, when they invite you into their homes, when they come to you in the eve-



ning to thank you, and when you see how grateful they are, we realize the huge responsibility we carry," Kučera explained. ■ SOURCE: IDNES.CZ



Image 1:
Opening the
RAW image
file in Adobe
Photoshop

Text and photos
by Rico Besserdich

When it comes to final editing of your digital underwater images, the white balance should be the first step of your digital post-production workflow. Always.

What is white balance? Different light sources produce light with slightly different colour tints. Think about sunlight, your camera's strobe or underwater video lights, for example. By adjusting the white balance, we tell our cameras or imaging software which area of the photo is supposed to be white or neutral grey. This step of editing removes colour casts, and as a result, displays your image with natural colours.

What is important for underwater photography is that a successful adjustment of white

balance during post-production requires a sufficient amount of light (colour information) to be existing in the (original) image. This is especially important when

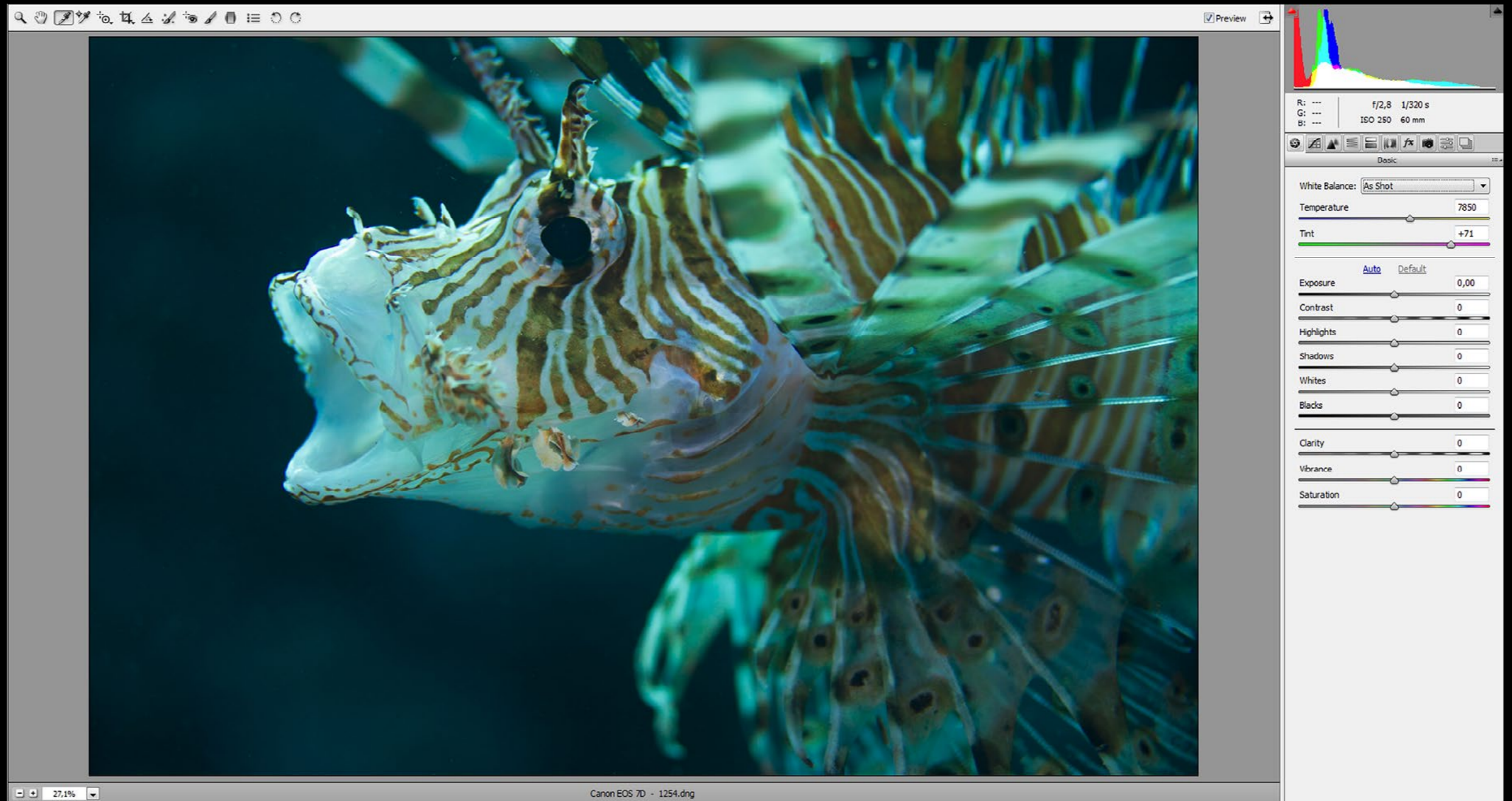
shooting in ambient light (using no strobes or any other light sources other than sunlight). As colours do fade away with the increasing depth of a photo dive,

one should better not expect to be able to restore colours of underwater images taken in deeper waters (10m and more) using sunlight as the only light

source.

When using underwater strobes, it is a different story. Underwater shots that are entirely lit by a strobe or flashgun (i.e.

most macro shots) often require only minimal white balance adjustments—sometimes, none at all. However, the moment two or more different light sources



Adjusting White Balance

in Post-Production of Underwater Images

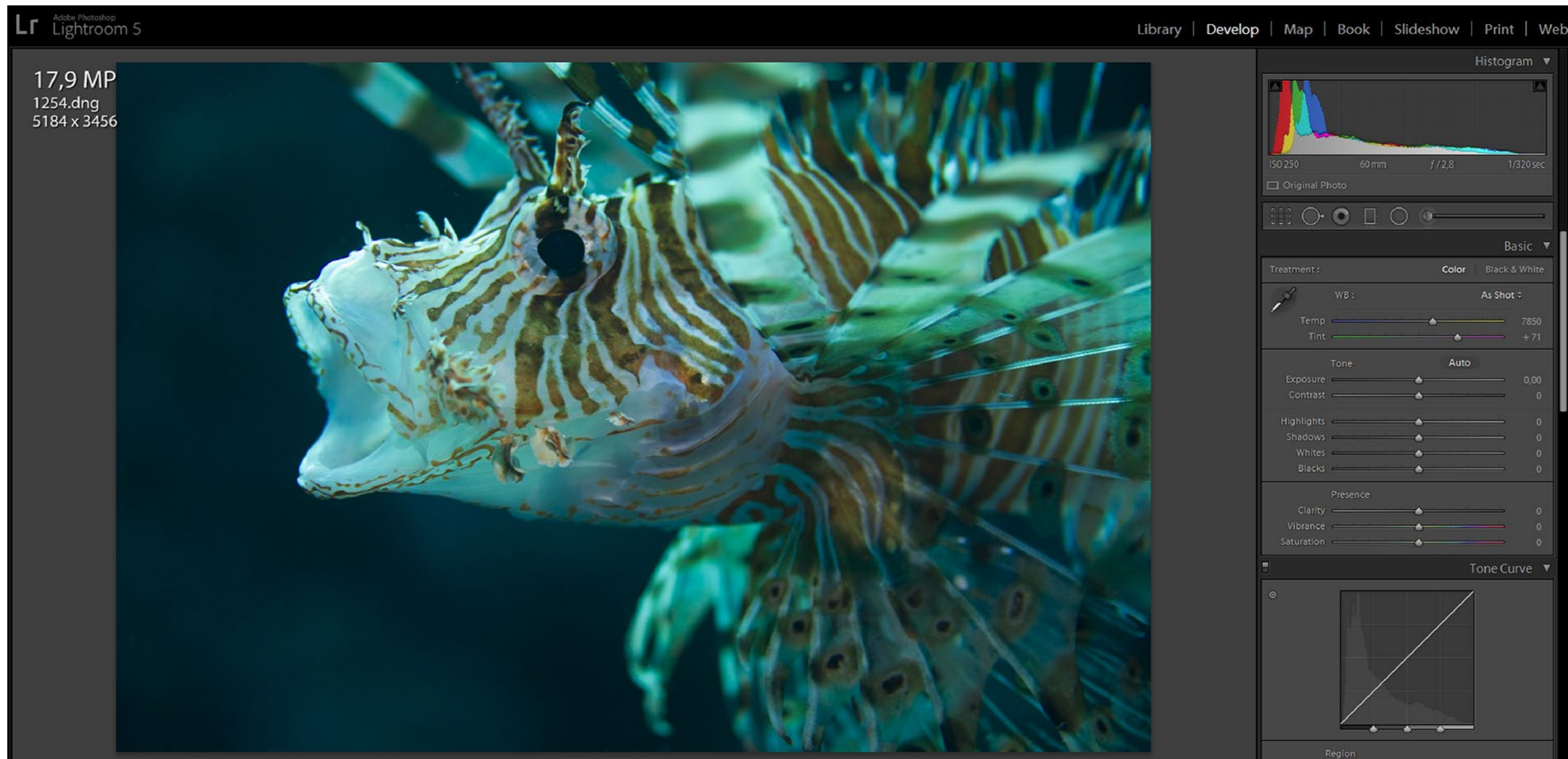


Image 2: Importing the image file into the Lightroom catalog

are present in one image is the moment a colour cast will show up. In underwater photography, we have to deal with a cyan colour cast most of the time. This can be fixed by adjusting the white balance during post-production.

What we need:

- Photographs in RAW or DNG format. Those are the only formats that give you the opportunity to adjust the white balance after you take the shot. If you shoot in JPG, you had better go for a manual white balance in your camera.
- A colour-calibrated computer screen. Proper monitor calibration will ensure that your colours and black levels are true, which is crucial for proper image editing and for later printing.
- An image editing software that is able to process RAW (or DNG) images. Adobe Photoshop or Lightroom are the classics here, but any RAW processor can do the job, even the (free) one on your camera's software CD-ROM.



This tutorial utilises Adobe Lightroom (LR) and Photoshop (PS). In terms of editing RAW images, Photoshop's ACR (Adobe Camera Raw) and Lightroom are based on the same software engine. The only difference is the user interface.

Note: It is not necessary to own the newest versions of PS and/or LR; older versions work fine, too.

Adjusting white balance
In this tutorial, we are using the example of an image of a yawning lionfish from the Ras Mohammed National Park, Red

Sea, Egypt. Depth: around 8m. Light source: one 2500-Lumen video light, plus some ambient light from the sun.

In Photoshop, open the RAW file in ACR by double-clicking in Adobe Bridge or by dragging and dropping your RAW file on the Photoshop icon. Photoshop starts and ACR pops up. (See Image 1 on the previous page)

In Lightroom, import the image into your Lightroom catalog by using the import option. (See Image 2)

Lots of fancy sliders here, but we only need the white balance section, found at the top-right corner of both programmes. (See Images 3 and 4)

In this example, the camera was set to "AWB" (automatic

white balance), and I think we can agree that something needs to be fixed here, as this image suffers a serious cyan colour cast. ACR and Lightroom offer a couple of white

balance presets (such as "auto," "daylight," "cloudy," etc.), but those rarely work well with underwater images. So, let's leave the image as it is: "as shot."

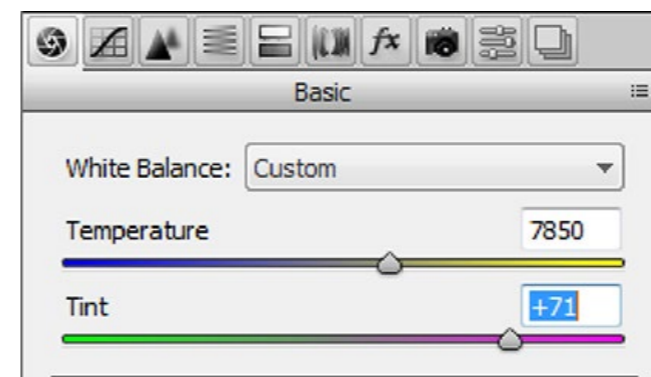


Image 3: White balance sliders in Photoshop

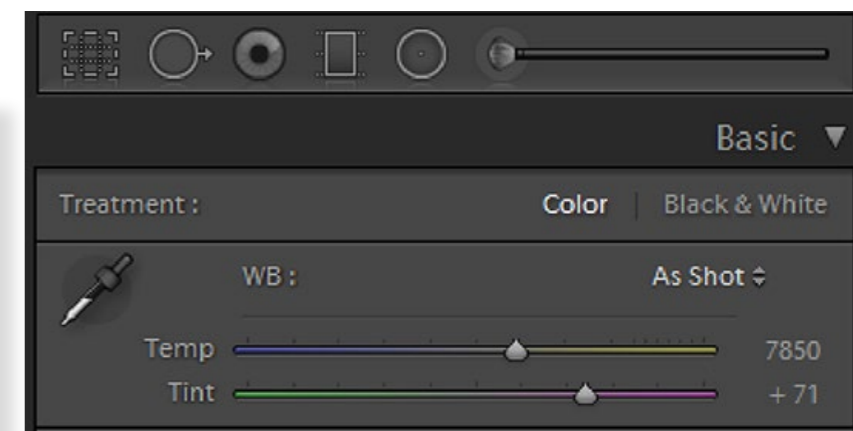


Image 4: White balance sliders in Lightroom



photo & video

Image 6: How the image looks after using the white balance colour picker. The cyan is gone but there is a bit too much magenta.

The tool offers us a colour picker, a slider for the temperature, and a slider for the tint. "Temperature" defines the colour temperature in Kelvin. This slider goes from blue (cold light) to yellow (very warm light). "Tint" defines the colour range between green and magenta. Slide the sliders and see what happens. No

worries, going back to "as shot" always brings you back to the original state of the image. What is important here is developing a sense for the colours by watching the change of the finest details very carefully.

And then there is the

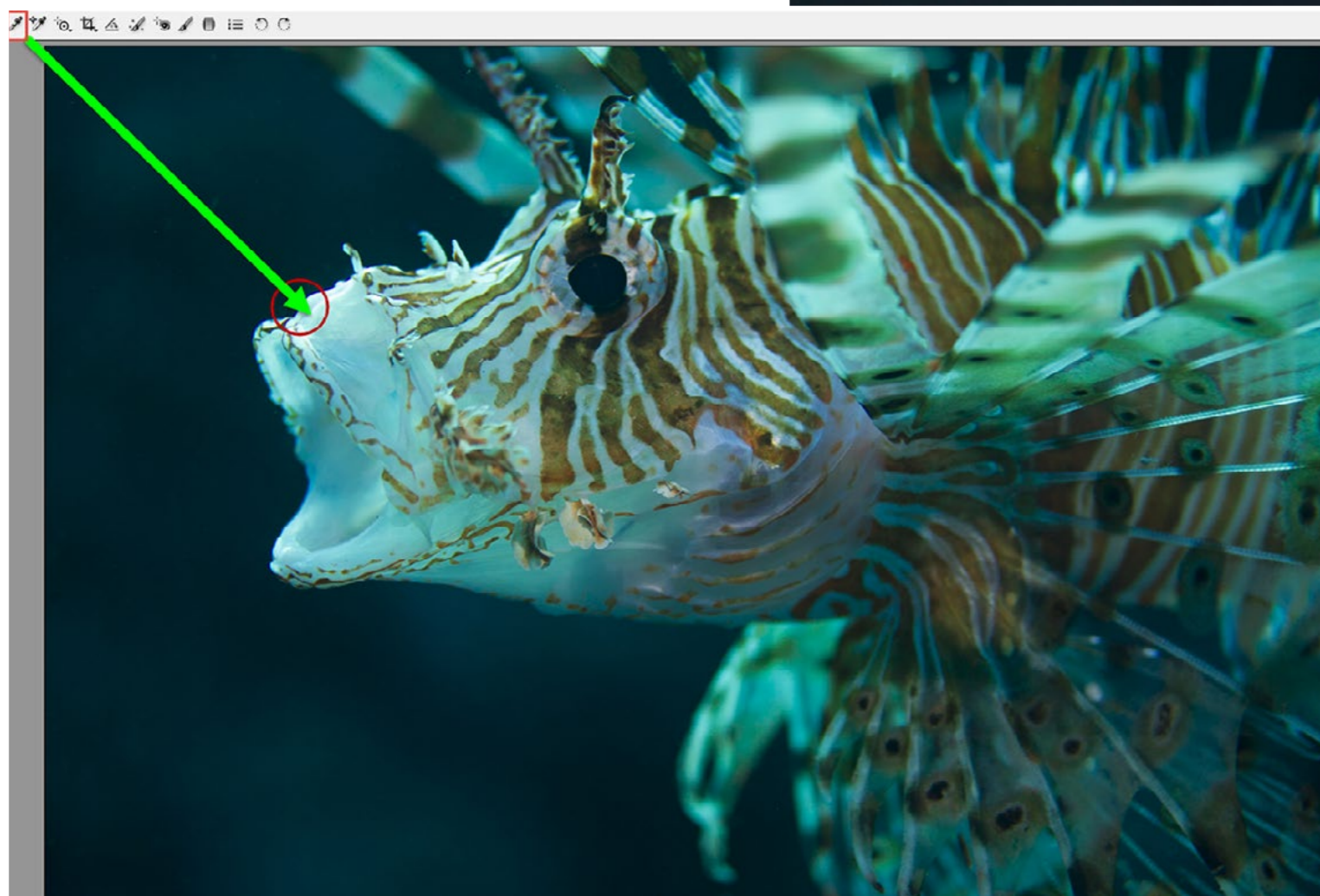
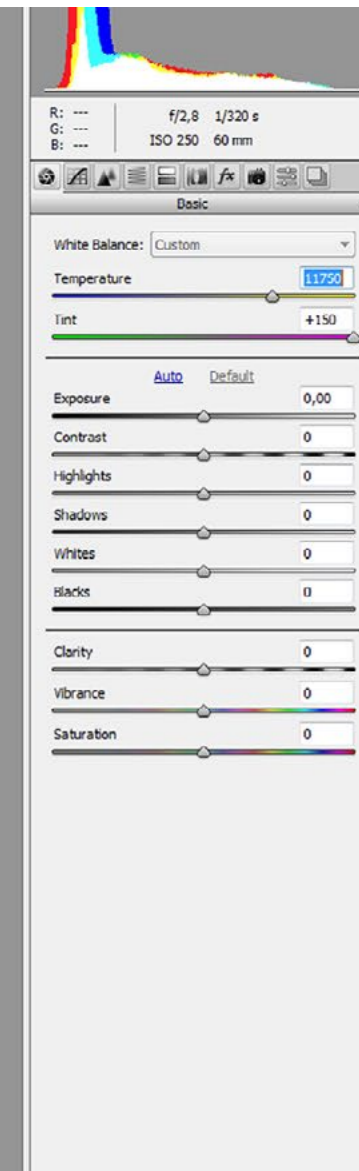


Image 5: The red circle indicates the area to do a colour pick, which should be white (or gray)

colour picker. Let's start with that one. Using the colour picker, you basically click on an area in your photo that is supposed to be white or grey. It comes in handy here to be able to remember what should be white (or grey) and what should not.

I recommend using the colour picker for a first "rough mix" and then doing the fine adjustments by using the temperature and tint sliders.

Getting back to our yawning lionfish—as I recall, the "lips" of that fish are supposed to

be (more or less) white. I use the colour picker and just click somewhere on the area of the fish's lips. (See Image 5)

The red circle indicates the area where to do a pick. In some cases, several attempts are needed to achieve a pleasing result. See Image 6 for how the picture looks after using the white balance colour picker.

The cyan colour cast is gone, and the colours (and thus the overall image) look better already. But looking carefully at the image, we notice that there is now a bit

too much magenta in it.

In this example, we just need to move back the tint slider a bit. Remember, this slider adjusts colours from green to magenta. After using the colour picker, the tint slider went to "+150"—obviously, too much magenta. Moving it back to around "+1242" fixes the problem here. Now, you can move the temperature slider a bit, making your image look warmer or colder. That is totally up to you and how you want your image to look like. I leave it here at the "picked" value of "11750."



"Before" shot—the original image before processing.

Image 7: "After" shot. This is how the image looks after the white balance correction in post-production is completed.

Now, the image looks like this. (See image 7)

Tip 1: When PS or LR displays extreme high "temperature" and "tint" values (temperature at or near 15,000; tint at or near 150) after applying the above-mentioned technique, this often indicates an insufficient amount of light and colour information in the original image file. Colour information that does not exist (in the original image) cannot be restored.

Tip 2: When placing the white balance picker tool on parts of your image, PS and LR always display the RGB values (right below the histogram) of that specific area. If the value shows "255, 255, 255," this means that a pure white already exists in the image and not much can be done regarding white balance. ■

Rico Besserdich is a widely published German photographer, journalist and artist based in Turkey. For more information, visit: [Maviphoto.com](https://www.maviphoto.com). See his latest book at: [Songofsilence.com](https://www.songofsilence.com).

Tip of the Day

by Peter Symes

Are your colours off?

There is a simple way to check whether your computer monitor reproduces the colours of photographed subjects with reasonable fidelity.



Calibration devices

Professionals and other serious users will know about colour profiling and calibrating all of their equipment, and using a colour-balanced workflow throughout, for consistent and accurate results. To ensure correct calibration of monitors and printers, calibration devices have to be used. Professional-grade monitor calibration devices, such as X-Rite i1 Display Pro, Datacolor Spyder or ColorMunki, will set the user back some \$/€ 200-300, with colour target charts included. And then a proper wide-gamut monitor should really be used, which may be an additional and more substantial investment. The casual shooter may not want to go down that road just yet.

There is an easier, and much cheaper, way of checking a computer monitor's fidelity and making some adjustments for a better match between rendition and the original subject.

Colour charts and underwater cards

The credit card colour chart shown is a ColorChecker rendition card seen on Amazon for about US\$/€ 20. There is a reason why these specific colour patches are used, but that will be a story for another time. Suffice it to say, this chart represents a standardised set of colours, and the card is a reference we can easily carry with us in the field, and even underwater if the card is plastic.

When shooting a series of images, start by taking some test shots in which the card is placed somewhere in the scene where it is clearly visible. Once back at your computer, you can then directly compare how the colours on the card in the images are rendered on your monitor to the colours on the physical card, which you can simply hold up beside the monitor.

Any discrepancies in colour reproduction and white balance will immediately stand out, enabling you to make some appropriate corrections in an image editor such as Photoshop.

Digital colour chart

Having said that, a good-quality, correctly calibrated screen is always the better option. To check how accurate your screen is, download a digital copy of this chart, <https://bit.ly/2U2HUPy>, which can then be compared to the physical card. ■



photo & video

Ball Mount for Shearwater Teric

With diving safety and comfort for underwater photographers in mind, Jon Anderson has designed a universal ball mount, which allows one to attach the popular Shearwater Teric dive computer to any underwater camera housing. The ball mount comes in a standard 1-inch size, and, while still attached, allows the dive computer to be charged using the Shearwater charging station. Using this ball mount makes all diving-related data visible right on top of the housing's viewfinder. When the dive computer's vibration alarm is activated, underwater photographers can "feel" the vibration notifications while still having their hands on the handles of the housing. jonandersonphoto.com



10BAR Adjustable Flip-Frame for Dive Masks

With age, it might become more difficult for one to read camera displays and other related display information while diving with an underwater photo or video system, especially when using cameras that do not have a built-in viewfinder that is adaptable for visual impairment. Spotting tiny critters might be an issue for aged eyes as well. Underwater housing manufacturer 10BAR has designed a flip-frame with corrective lenses (ranging from +/-3 to +/-5 in strength), which can be attached to most common diving masks. The flip-frame is made of anodised aluminium. In addition, it comes with two quarter-inch threads, which allow one to attach smaller accessories such as lights or action cams. 10bar.com

Easydive's Easybag Trolley

With the needs of underwater photographers who are frequent travelers in mind, Italian underwater photography gear manufacturer Easydive has designed a new, super-lightweight trolley. With a weight of only 2,000 grams, dimensions of 46 x 38 x 24cm, durable Cordura material, and adjustable compartments and safety straps, the Easybag Trolley allows one to safely and comfortably transport a camera housing, ports and other gear as carry-on luggage. For usage as a rucksack (shoulder straps are included), the trolley unit can be removed, which then reduces the weight by 800 grams. An extra pocket on the front of the trolley provides additional space for tablets, documents or smaller accessories such as cables, O-rings, batteries, etc. easydive.it



Fantasea NP-FW50 Battery Cradle A

For owners of Sony Alpha mirrorless cameras, Fantasea has designed a battery cradle that holds one additional Sony NP-FW50 battery (of the Sony Alpha and NEX series), doubling battery life, and thus avoiding the necessity of replacing camera batteries between dives. The cradle unit connects itself to the camera's micro-USB port and is stored together with the camera in the housing. The cradle is compatible with the Fantasea line of mirrorless camera housings but can be used with housings of other brands as well, as long as the housing provides enough space. In length, width and height, the cradle's dimensions are 55 x 37 x 25mm (2.16 x 1.46 x 0.98in). fantasea.com

Geneinno Titan

In case you like to sip your cocktails while shooting underwater images or videos, or if circumstances do not allow one a safe dive, an underwater drone might be a possible solution. The Titan underwater drone made by Geneinno is equipped with a 1/2.5-inch CMOS sensor to capture 8MP still photos and 4K video (with a fixed lens angle of 160°), and it can also stream a 1080p live view to the handheld controller. Two 1500-lumen lights help to bring light into the depths. Its 9000mAh, 10.8-volt battery delivers a runtime of four hours per charge. The Titan can operate at depths up to 150m (492ft). Its maximum controllable thrusters allow easy control of the drone. The Titan dimensions are 390 x 347 x 165mm and it weighs 4.4kg. The unit can be remote-controlled via cable (with 50m, 100m and 150m cables available as extra accessories). Visual control works via a special app (IOS and Android), which allows the operator to see what the drone sees, controlling it accordingly by using a tablet or smartphone as a device for visual reference. geneinno.com





photo & video

Photographing the Keystorm wreck in 1000 Islands, New York, USA

Text by Larry Cohen
Photos by Larry Cohen and Olga Torrey

With the abundance of choices available on the market today, choosing the right camera and underwater housing that fits your needs can be a daunting and bewildering task. Larry Cohen offers advice, insights and tips to help underwater photographers make the best selection.

The camera

Sensors. Before spending your hard-earned money on a camera for shooting underwater, you



Using strobes? Shoot in manual mode so you can use shutter speed to control background ambient light exposure.



Choosing a Camera & Underwater Housing

do need to look for certain features. The larger the camera sensor, the more information the sensor will hold. This translates to better shadow and highlight details

(dynamic range). Images will have less noise when shooting at high ISOs. Having a larger sensor is more important than the number of megapixels. This is why a

large interchangeable lens camera that is 24 megapixels will produce better image quality than a small point-and-shoot camera with 24 megapixels. These days,

there are a number of small point-and-shoot cameras with a built-in lens that have a large sensor; these cameras could be used effectively underwater.

Manual mode. Manual exposure control is another important feature. When shooting with strobes, it is best to shoot in manual mode, so you can use your shutter speed





photo & video



LARRY COHEN

to control the background ambient light exposure. The shutter speed will have very little effect on the strobe exposure. The strobe's power dial should be used to control the foreground exposure. Since the aperture will affect both the background

ambient light and the strobe exposure on the subject, this should not be changed as often.

RAW files & autofocus. Since most underwater images will need some post processing, it is important that your camera can capture RAW files. It is also important that the camera can autofocus in low light and can focus at a reasonably fast speed.

Compact. The more compact the camera, the smaller the housing. With airlines increasing luggage fees and reducing the weight of carry-on luggage, the smaller your gear, the easier it will be to travel with it.



LARRY COHEN

Back-up body. You should also buy a camera in a price range so you could afford two camera bodies. This way, you do not have to remove the camera from the housing for surface photography, and you have a back-up for shooting underwater.

Camera type. Digital Single Lens Reflex (DSLR) cameras have been the main tool for serious underwater photography, while point-and-shoot cameras have been used by the occasional shooter. These days, many small point-and-shoot cameras have the features listed above, but having a built-in lens has some limitations. Interchangeable lens mirrorless cameras have the small-size advantage while still having the above features and the flexibility of different lenses.

Housing availability. Another often overlooked feature is to ensure that there is a housing for your kind of diving available for your camera. Many people buy a camera and then try to get a housing. Housing manufacturers produce housings for a limited number of camera models. If you are a technical diver doing 100m dives and

Housing made with aluminum material (left); Photographing a sea lion in La Paz, Mexico (far left)

the only housing available is rated to 50m for your camera, you will not be able to shoot on your dives.

The housing

Material. The first thing to consider is the material the housing is made of. Aluminum and polycarbonate are

the two main materials. Aluminum housings are more robust and are usually rated deeper. Polycarbonate housings are less expensive and lighter.

Camera & Housing

Buoyancy. It is best to get a housing that is close to neutrally buoyant or slightly negative. You should always have the housing attached to your harness. This way, you can let go of the housing without losing it. A positively buoyant housing is very annoying. When you have it attached to your harness and you let go, the housing will float up and hit you in the face. If the tether breaks, your housing could float away.

The housing's buoyancy will vary depending on the attached port. Buoyancy can be easily adjusted. Housings that are negatively buoyant can be adjusted by adding floats,



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Photographer using a point-and-shoot camera in Bonaire



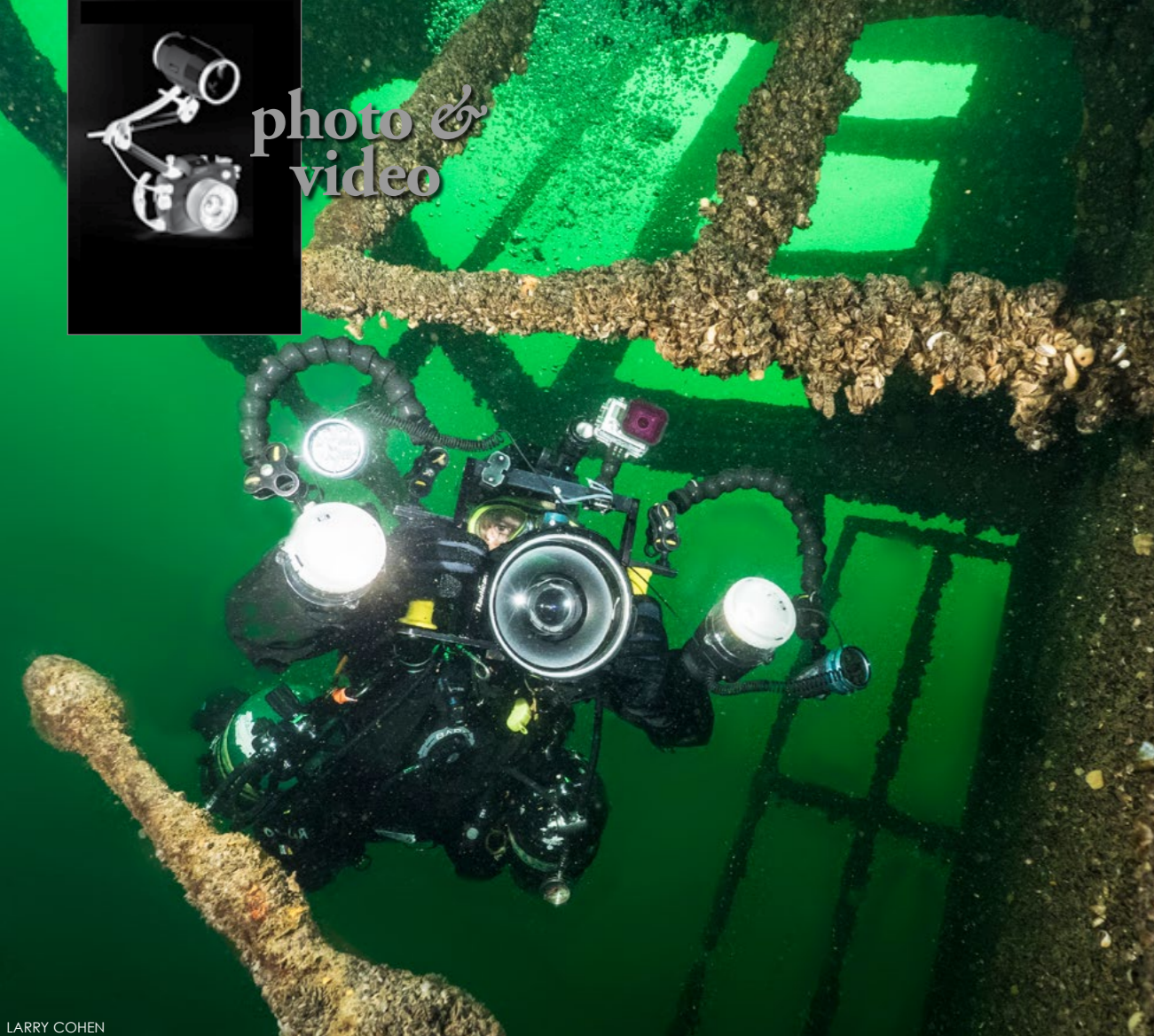
LARRY COHEN

Your camera should display aperture and shutter speed.





photo & video



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LARRY COHEN

shoot camera with a built-in lens in a housing, it is important that the housing's built-in lens port has filter threads. This way, you can add a wide-angle or macro conversion

lens to the front of your housing. These lenses can be added to the housing or removed underwater. A

wide-angle lens will allow you to get closer to your subject. This way, you have less water between the lens and the subject. This will increase image quality. All good point-and-shoot cameras have a macro mode. Using a macro conversion lens will give you more magnification with a larger subject-to-lens distance. This way, you do not scare shy marine life, and you have more room for your lights.

Photographing a whale shark in Malpelo Island, Colombia (above), and the *Keystorm* wreck in 1000 Islands, New York, USA (left)

and weight can be added to positively buoyant housings.

Lens ports. If you are putting an interchangeable lens camera in a housing, it is important that the lenses you want to use are on the manufacturer's lens port chart. The chart will let you know the correct port, extensions, zoom or focus rings that are needed for the lens. Manufacturers do not support all lenses but do support the most popular and practical lenses for shooting underwater. Nowadays, it is popular to use lenses from one camera brand on another camera brand by using an adapter. Remember that the lens with the same adapter has to be on the lens port chart.

If you are putting a point-and-

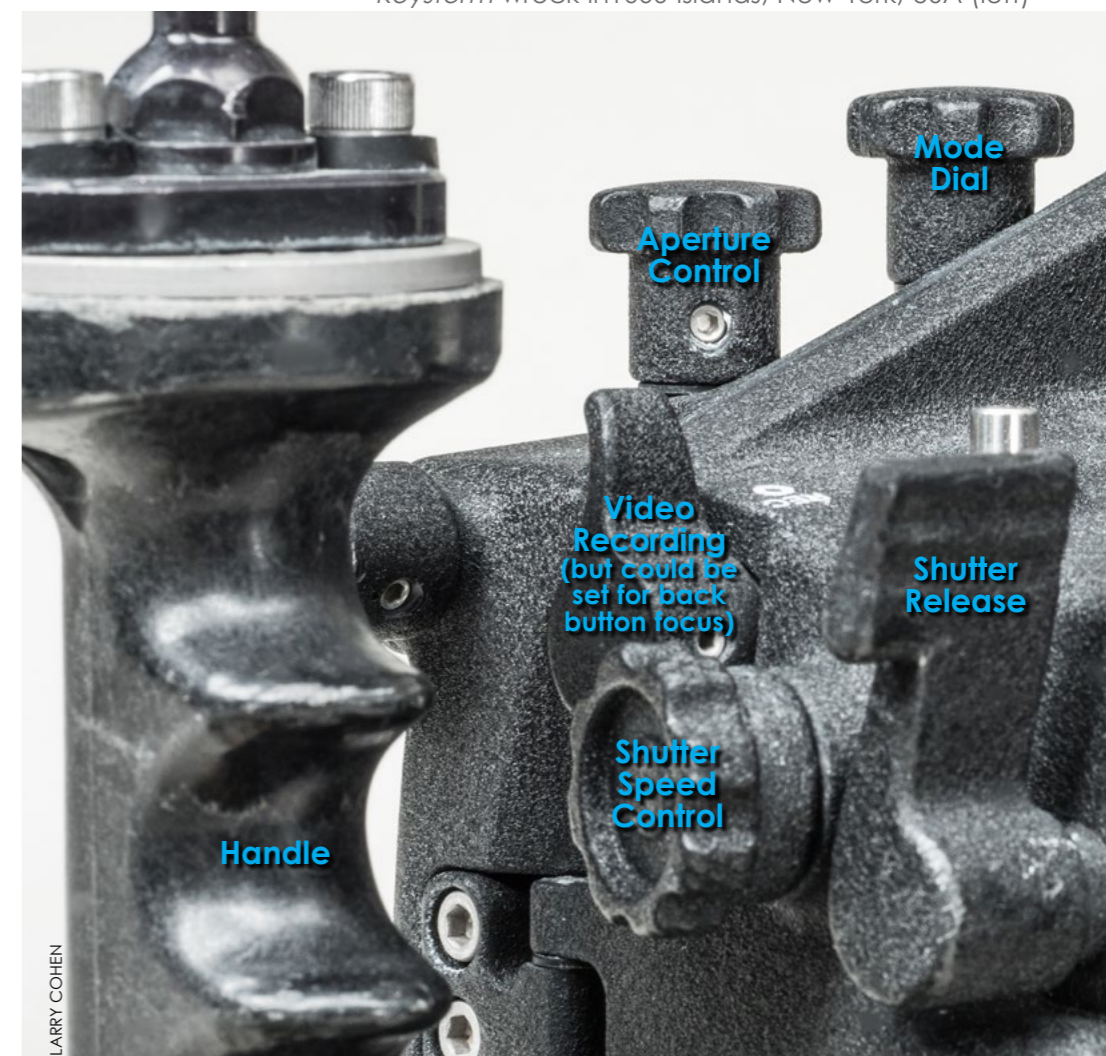


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A housing should allow access to all important camera controls.

Access to controls. The housing you choose should allow access to all important camera controls. At the very least, this includes the shutter release, menu, image playback, delete, flash on/off, ISO, white balance, exposure mode, exposure compensation, aperture and shutter control. Being able to set up the camera and housing for back-button focus is useful.

Where the controls are located on the housing is important. At times, this is dictated by where the controls are located on the camera. It is ideal to have two different dials to control the shutter speed and aperture. Since one tends to



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Better housings have separate controls for aperture and shutter speed, which can be accessed without removing your hand from the handle.

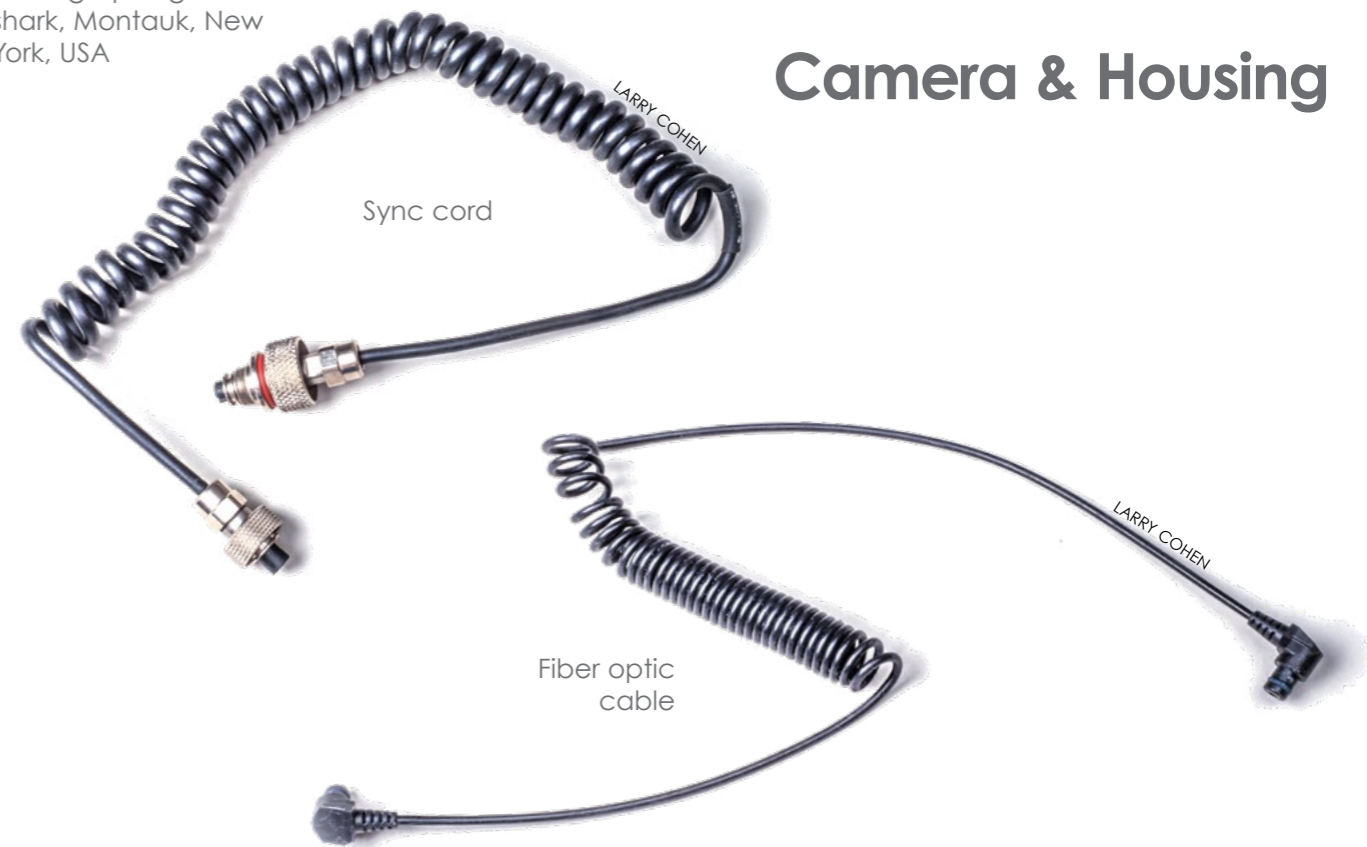




OLGA TORREY

Photographing a blue shark, Montauk, New York, USA

Camera & Housing



Sync cord

Fiber optic cable

change the shutter speed often, it is nice to be able to access that control and the shutter release without taking one's hand off the housing's handle.

Strobe connection. Another consideration is how external strobes sync to the camera. Some housings have a bulkhead for attaching a sync cord. This method has a hot shoe connec-

tion inside the housing and a water-proof bulkhead on the outside to plug in the sync cord. This method has many failure points. When the strobe does not fire, the problem could be the sync cord, hot shoe connection, bulkhead on the housing or the bulkhead on the strobe.

Other housings use fiber optic cables. These housings have two fiber optic cable ports in front of the camera's built-in flash. Fiber optic cables get plugged into these ports and into a port on the external strobe in front of a built-in slave trigger. When the camera's flash fires, the light travels up the

cable and fires the external strobe. This system is very secure. The problem is the camera's flash will deplete the camera's battery quickly, and you have to wait for the camera's flash to recycle. This is usually much slower than the external strobe. Another problem is many professional cameras do not have a built-in flash.

Many housing manufacturers include an LED trigger, so you can use fiber optic cables with cameras that do not have a built-in flash. LED triggers are sometimes offered as an optional accessory. These are usually for housings for cameras that have a flash, but the photographer wants to save camera battery power and needs faster recycle times. It is important that your external strobes have a built-in slave trigger sensitive enough to be fired with an LED trigger. Not all strobes will fire in this way and might require the image-maker to invest in new strobes. Some housing manufacturers offer both fiber optic ports and bulkheads. Others offer fiber optic ports and optional bulkheads.



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Fiber optic cables attached to a housing



OLGA TORREY

Diver with camera gear, shooting in San Diego, California, USA





photo & video



Vacuum valve on housing (above); Creating a vacuum to check for leaks (left)

Photographing a giant manta ray in Socorro Island, Mexico (right)

OLGA TORREY

Closing the housing should be easy and secure.



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The camera tray needs to hold the camera in place and be easy to lock.



LARRY COHEN

Camera & Housing

Mechanics. The mechanics of the housing is important. Closing the housing should be easy and secure. This is true about the port locking system. The camera tray is a small but important feature of any housing. The tray holds the camera in place and needs to be locked in position easily. This allows the housing's control to line up correctly with the controls on the camera.

Moisture alarm. Moisture alarms have been offered in housings for decades. They provide sound and visual alarms which tell you when there is water in the housing. The problem is that by the time you get the warning, it is too late. Vacuum seal systems are a relatively new feature on many housings. You create a vacuum

in the housing with a pump. The alarm goes off if that vacuum is broken. If air gets in the housing, so will water.

The best choice of housing will be different for every underwater photographer. Use the above features as a starting point to pick the perfect housing for your needs. ■

Larry Cohen and Olga Torrey are well-traveled and published underwater photographers based in New York City, USA. They offer underwater photography courses and presentations to dive shops, clubs and events. For more information, visit: liquidimagesuw.com and fitimage.nyc.

Vacuum/moisture alarm



OLGA TORREY

Mark Adlington



P O R T F O L I O

Arc of the Diver, oil on canvas, 92 x 92cm (right), and *Deep Blue*, oil on canvas, 76 x 76cm (previous page), by Mark Adlington

Circle of Life (left) watercolour on paper, 56 x 38cm, by Mark Adlington



Text edited by G. Symes
All artwork by and photos
courtesy of Mark Adlington

British artist, painter and sculptor Mark Adlington has travelled to the wild and remote corners of the world, studying and sketching wild animals in their natural habitats, and from these impressions, created large, vivid, spellbinding paintings and fluid drawings featuring the dynamic movement and magnificent presence of some of the earth's most threatened species. His underwater paintings feature polar bears, otters and seals. X-Ray Mag interviewed the artist to gain insight into his art and perspectives of these animals.

Seal Head Bear, mixed media on paper, 26 x 26cm, by Mark Adlington

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

MA: Like all small children, I loved to draw and paint. My mother was a portrait painter though, so unlike many kids, I was aware from an early age that adults too, could enjoy messing about with paint, and that probably encouraged me to continue and take it a little more seriously. On some level, I probably always

knew that I would become an artist. But at 13, I went to a very academic school, which regarded art as child's play. So, it was not until I had been through the whole process of university and a few years working for an auction house that I had the courage to go back to art school and start again!

X-RAY MAG: Why marine mammals? How did you come to these underwater themes in your art?



Moon Bears, oil on canvas, 91 x 91cm, by Mark Adlington

MA: I grew up on the edge of the Atlantic, just a few yards from the ocean in one of Ireland's most beautiful and remote bays. I was obsessed by nature and all wildlife from a very early age, but my first great animal love was seals. Our bay is rare in that it has the shelter and low tide haul-outs for harbour seals, but is close enough to the Atlantic proper to be frequented by the much larger grey seals as well. There is often a young grey seal resting on the rocks with its smaller cousins.

I have always understood why so many legends and myths (particularly in Celtic traditions) surround seals. There is something miraculous about the fact

that they seem so familiar to us, and yet can go between two worlds/elements—at home above and below the surface.

I used to spend hours swimming with them, or just sitting in a rowing boat, waiting to see where the next heads would pop up. Once safely in the water, they feel far more confident and seem as curious and fascinated by us as we are by them. I noticed the same phenomenon with the magnificent walrus in Svalbard when I was there—another wonderful animal that I would love to paint.

Along the shoreline, and even on the edge of our garden, there were otters. They were, and continue to be, more elusive, but have always held a very



Constellation, mixed media on paper, 42 x 30cm, by Mark Adlington

MA: One of the eccentricities of our family home was that it contained a number of Chinese paintings by very well-known Chinese artists of the 20th century. So for me, the idea of placing a drawing or painting of an animal on a blank page without landscape or background seemed completely normal—though I now realise this is a difficult concept for many, being so different from the European tradition.

So, in one sense, I have always, for purely painterly reasons, been attracted to water, ice and desert as landscapes, as they give me the whole animal, unencumbered by grasses, trees or foliage. For this reason, when I made my first show of studies of otters and seals, I made the somewhat unconventional decision not to paint the water itself, but to imply it within the figure of the weightless animal.

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

MA: Speed is an essential part of my creative process. I have always had a tendency to overwork, and like many artists, have great difficulty in knowing when to stop. W.C. Fields famously advised, "Never work with animals or children." But



special place in my heart.

Farther out to sea, we would often spot porpoises, dolphins and sometimes even basking sharks or whales.

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



Wave, oil on canvas, 50 x 100cm (above), and *Swimming Cub*, mixed media on paper, 31 x 31cm (upper right), by Mark Adlington

Mark Adlington



Under the Ice, oil on canvas, 100 x 70cm (left), and *Courtship*, watercolour on paper, 27 x 35cm (below), by Mark Adlington

Mark Adlington



in my case, drawing animals from life, which so often has to be done with great speed and simplicity, has given me an invaluable insight into mark-making and reaching for the essential essence of a subject.

I try to spend as much time as possible with my subjects, observing, waiting, watching and scribbling in sketchbooks. Then, in an ideal world, any work that is made in the studio will happen with energy and speed. Of course, the reality is that we do not live in an ideal world, and sometimes, I can get stuck on a painting for many weeks, losing the path completely

before (hopefully) wrestling it back to the original idea. For this reason, I have always enjoyed working on paper, where it is very quickly clear whether to tear it up and try again, or leave it well alone.

I am very random with both materials and technique, and enjoy adapting both to the subject matter. When painting the underwater polar bears for example, I used a bizarre combination of Moroccan pigments and household bleach to try and capture the surrounding air bubbles and displaced water around the arctic giants.

X-RAY MAG: *What is your relationship to the underwater world and coral reefs? Are you a scuba diver or a snorkeller, and how have your experiences underwater influenced your art? In your relationship with reefs and the sea, where have you had your favourite experiences?*

MA: Despite my early and ongoing relationship with the sea and the rich coastal life of the Irish Atlantic shore, I have never learned to scuba dive. I spent my whole childhood gazing into rock pools and trying to see the seals in the bay underwater, and have always loved



Ice is Life, mixed media on paper, 26 x 26cm, by Mark Adlington



portfolio

Grey Seal, watercolour on paper, 28 x 38cm (left), and *Velvet Tail*, watercolour on paper, 56 x 38cm (below), by Mark Adlington

Mark Adlington



snorkelling or floating above the bay in a little boat on a calm day, spotting fish, crab and lobster below.

However, when I was working with the desert fauna of the Arabian peninsula in Oman, I was offered (quite illegally, I am sure) the chance to make two 40-minute "trial dives" with a bare minimum of swimming pool training. It is an experience I will never forget. Becoming the man from Atlantis, and being able to follow the breathtaking fish and turtles of the Arabian Sea in their own element was one of the highlights of my life. I was like a puppy on acid, on a high that stayed with me for months. I swore that I would take the necessary exams, but somehow have failed to find the time. It will happen though, of that I am sure.

With the bigger marine mammals, especially the polar bear, while I was lucky enough to spend time in Svalbard with many wild bears and watch them swimming between ice floes and rocky islands, I realised that swimming underwater with one of the earth's largest carnivores was going to be beyond



me. very feelings (despite valued contributions and education) but they are, of course, hugely useful for wildlife artists. Being of partly Danish heritage, I was lucky enough to have family to stay with while studying the bears underwater

I have mixed about zoos their often under-valued contributions to conservation



Deep, oil on canvas, 92 x 122cm (above), and *Hunter*, watercolour on paper, 56 x 38cm (left), by Mark Adlington





Swim, oil on canvas,
163 x 92cm, by Mark
Adlington

Mark Adlington



Dive Study, mixed media on paper, 21 x 30cm, by Mark Adlington



Mother, conte and pastel on paper,
59 x 42cm, by Mark Adlington

at the Copenhagen Zoo, where there is the possibility to watch the polar bears diving and swimming below the surface from many interesting angles. This experience became an essential component of my book, *Painting the Ice Bear*. It would have been totally wrong to carry out a visual investigation of a marine mammal entirely from above the surface!

X-RAY MAG: *What are your thoughts on ocean conservation and coral reef management and how does your artwork relate to these issues?*

MA: Much of my life's work has been connected with conservation, and many of my principal subjects—the Arabian leopard, European bison and Przewalski horse, for example—are, or have been, a hair's breadth from extinction. I have had little direct connection with the coral reefs, but

a good friend devoted ten years of her life to sailing the world's oceans monitoring the shocking devastation wreaked by warming seas, so I was aware of these issues long before they became common knowledge.

The bay that I grew up in was at the forefront of a fierce battle between conservation and local employment when the fish farming industry began to install salmon rings locally, so I am also aware of the political difficulties surrounding all attempts at environmental protection. In Svalbard, I was part of a team clearing plastic from the shore on uninhabited islands hundreds of miles from the nearest human population. As these issues loom larger and larger in the public consciousness, I think the tide is finally turning and am hopeful that dramatic and long overdue action will finally take place to combat the destruction wrought on the planet's oceans by human activity.



Dark Water,
watercolour on paper,
29 x 39cm, by Mark
Adlington



Otter Study II – "Talisker"
watercolour on paper,
28 x 38cm, by Mark
Adlington



Gold
watercolour on paper,
56 x 38cm, by Mark
Adlington



Perfect, watercolour
on paper, 29 x 39cm, by
Mark Adlington

X-RAY MAG: What is the message or experience you want viewers of your artwork to have or understand?

MA: I am endlessly amazed by wild animals, and have infinite patience when it comes to looking for or observing them. So while, like all artists, my principal concerns in the studio are often abstract or formal ones, and the solving of painterly conundrums, I suppose that what I am trying to communicate is my own complete passion, respect and wonder in the presence of these miraculous creatures. And because I work in series, sometimes focussing on one species for many years at a time, I think, at best, there is an almost shamanic element to my practice, which I would hope communicates itself to the viewer.

X-RAY MAG: What are the challenges and benefits of being an artist today?

MA: In many ways, the challenges and benefits of being an artist today remain much as they always have been: the probability of relative impecuniousness, balanced with the freedom (and loneliness) of working for and by yourself. I would say that the Internet and the advent of social media have made it far easier to bring artwork to new and like-minded audiences than ever before. So, despite the time drain and additional pressure of platforms like Instagram and Facebook, for artists—especially artists with specific subject matter—they can be uniquely useful.

X-RAY MAG: How do people respond to your works?

MA: Following on from the previous question, I would say that until the advent of social media, one of the sadnesses of being a painter, and selling works through a gallery, was that you almost never got to see the effect that the work had on people. Now, all of that has changed, of course, and I have made wonderful contacts and friends in remote places across the world entirely through images of paintings shared on mobile

phones. Many years ago, when it was a very avant-garde idea, the gallery sent out a video instead of a catalogue to promote an exhibition I made

about the endangered alpine ibex. The combination of mountain-climbing adventure, wildlife, and an adult making a huge mess in a studio, proved irresistible to kids. I know for a fact that the film was a massive hit with the under-fives, as parents told me they had to run it again and again. My last exhibition, which was a series of large portraits of specific wild African elephants I had got to know in Kenya, was described many times as "moving," which I, in turn, was very moved by.

X-RAY MAG: What are your upcoming projects or events?

MA: I am currently on the final year of a long project working with lions, which I have been studying in Namibia and Kenya, and hope to bring out a book and exhibition next year. Somewhere in my mind's eye though, I can already see a book on the Celtic shore of my childhood, which will focus again on seals above and below the surface. So, watch this space! ■

Follow the artist on [instagram.com/markadlington](https://www.instagram.com/markadlington) or visit his website at: markadlington.com. To order prints, visit: magnoliabox.com, greatbigcanvas.com, myartprints.co.uk. In the USA: allposters.com, art.com, fineartamerica.com.