

Dealing with Gear Malfunctions :: Equalizing Ears – Eustachian Tube Balloon Dilation



H-Ray Mag

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April 2024
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Tech Concert
Plura Cave

Melanesia
Vanuatu

UW Photo
**Tones &
Tonality**

Sharks
**Behavioral
Complexity**

Interview
Paul Toomer

UW Macro
Positioning

EAST ASIA

South Korea

COVER PHOTO BY DREW HOLDER



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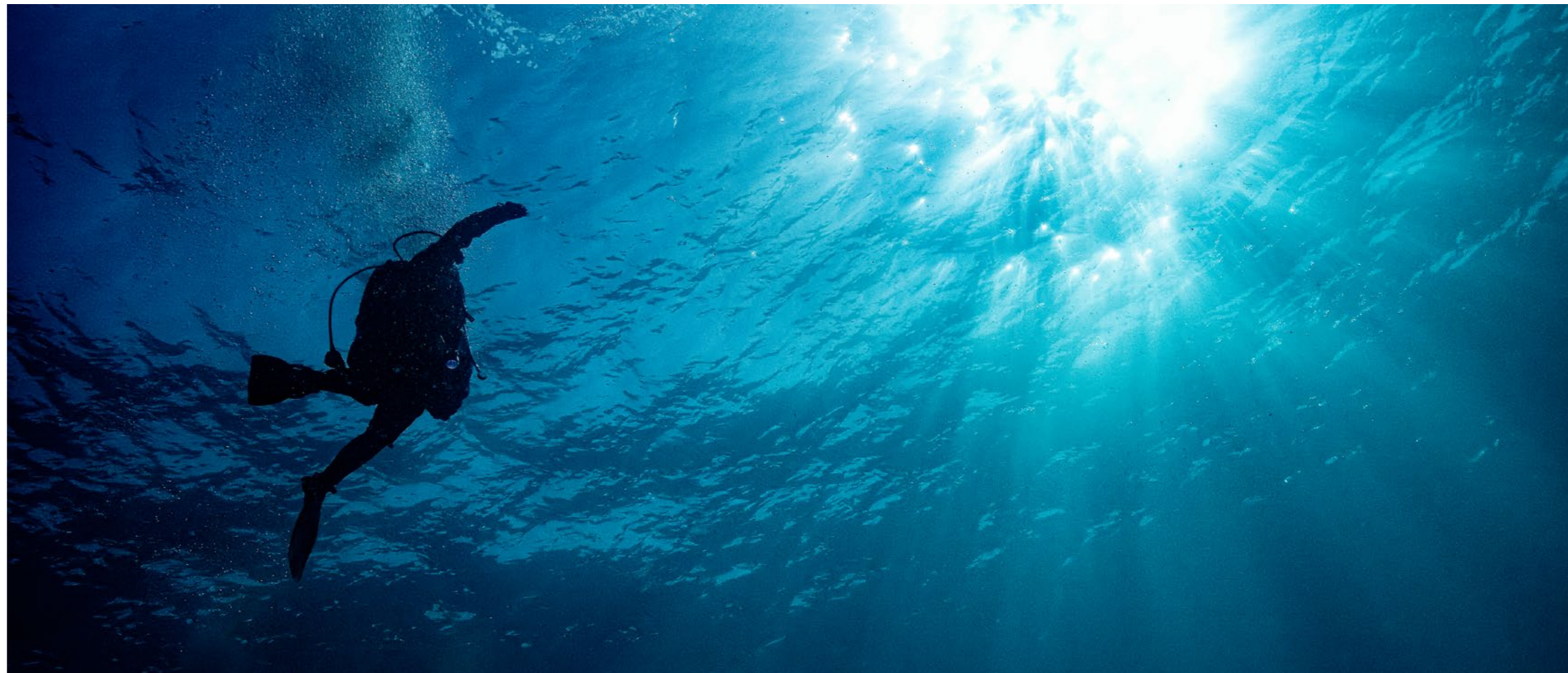
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Hermisenda emurai, at Pohang, South Korea
Photo by Drew Holder ([Instagram.com/h20_life_below](https://www.instagram.com/h20_life_below))

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Diver on safety stop at Pohang, South Korea. Photo by Drew Holder



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For the love of our families

As we were finalising this issue, we received the tragic news of **Jared Hires' passing in Plura Cave** in Norway—a location we coincidentally feature in this edition. At just 33, the Dive Rite CEO leaves behind his wife, his young son and daughter, his mother and his father, the dive industry stalwart Lamar Hires, whom we have also profiled in our magazine. The Hires family is one I hold in high regard, and this news has left me deeply saddened.

According to experts in diving accident analysis, this tragic accident was **likely caused by a medical event** and the predisposition of the diver—not equipment failure.

Throughout my career in dive magazine publishing, I have generally refrained from dwelling on the mishaps or fatalities within diving, other than to acknowledge the loss of notable individuals under tragic circumstances.

Drawing a parallel with motor-ing, driving can also be perilous. However, whilst fatalities can occur in traffic, most of us manage our daily commutes, enjoy leisurely drives and weekend excursions to the forest, or holiday road trips with family and friends, in relative safety. If I were to edit a motoring magazine, the emphasis would be on car

reviews, mechanical insights, motorsports, and the joys of vehicular travel, not delving into accidents, yet still maintaining a firm focus on safe driving practices.

In this edition, we feature my interview with RAID's CEO, **Paul Toomer**. Over the years, I have been privileged to have extensive discussions with him. A recurring theme in these discussions was the profound responsibility we have as divers to return to our families unharmed. This imperative guides every aspect of my dive preparation and risk assessment. At the risk of sounding like a broken record, it is a duty of care we owe to our loved ones to exercise prudence, make sound choices, and be willing to withdraw when the situation is amiss.

It is neither fair nor responsible to leave our families in a state of worry, or worse, grappling with the aftermath of an injury or the profound grief of loss. Stepping back when conditions are doubtful, choosing an alternative approach, or abstaining altogether, ensures that we can enjoy future dives. Prioritising safety today affords us the promise of tomorrow's underwater adventures.

Safety goes beyond the robotic adherence to strict rules and meticulous protocols; it also involves a deep

dive into one's psyche, an exploration into one's mental landscape, highlighting our innate vulnerability to errors. This journey into understanding human behaviour is as intriguing as it is vital, and it is interesting.

Many have been entertained by the artistry of magicians on stage, and some of us have perhaps suffered the cunning misdirection of pickpockets. Both skilfully exploit our cognitive blind spots. These blind spots may also be a risk factor when diving.

As regular viewers of the popular documentary series *Air Crash Investigation* (Mayday) will have learnt, it is the unnoticed slip, the human oversight, that often precedes mishaps, leading to significant incidents even among very experienced flight crews.

Susceptibility to error is an inherent human trait; we can all be tricked, deceived, distracted, or make mistakes. No one is immune.

However, by recognising and understanding the root causes of mishaps, we can design and implement safety measures to mitigate risk.

— Peter Symes
Publisher & Editor-in-Chief

NEWS

from the deep

Edited by
Peter Symes



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Colossal Coral Reef Discovered

A newly mapped deep-sea coral reef extends from Florida to South Carolina, covering around 310 miles in length and 68 miles in width.

Researchers have charted a colossal deep-sea coral reef system off the southeastern coast of the United States. Described as an underwater metropolis of a “million mounds”, this vast network stretches across the continental shelf

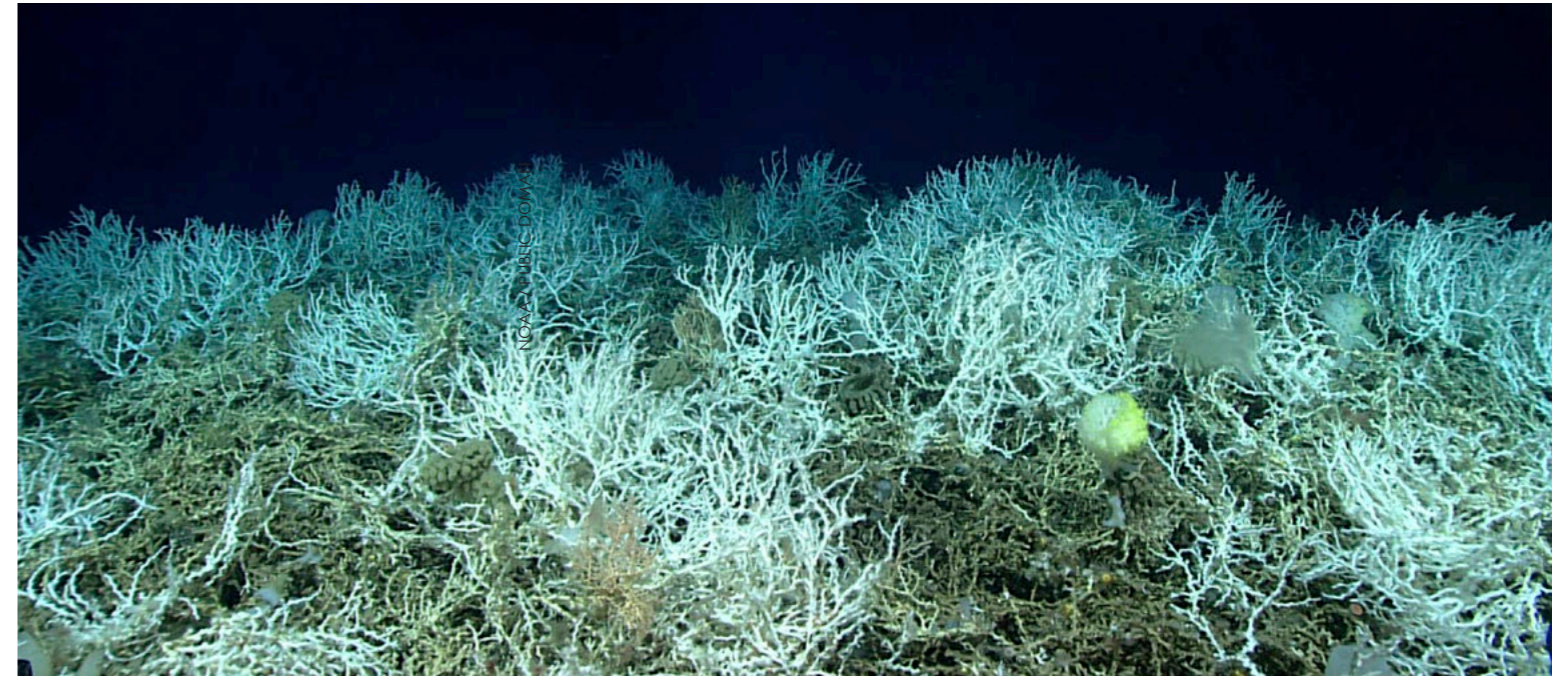
and heralds a new chapter in ocean exploration.

The mapping of this coral reef, a feat accomplished through advanced 3D imaging technology, is a landmark in maritime science, underscoring the vast, uncharted territories that still lie hidden beneath the waves.

A subaquatic frontier
The discovery, led by the Ocean Exploration Trust aboard the NOAA vessel

Okeanos Explorer, was made possible by advanced mapping technologies. Stretching from Florida to North Carolina, this region, once a blank spot on nautical maps, has been transformed into a detailed topographic landscape revealing the rich coral ecosystem.

This extensive deep-sea coral metropolis, comprising millions of coral mounds, is hailed as one of the largest of its kind to date. With some coral mounds rising over 100ft from the ocean floor, these structures offer a sanctuary to a multitude of marine species, many of which may be new to science.



THIS PAGE: Views of the vast 310-mile-long deep-sea reef of scleractinian coral *Desmophyllum pertusum* (previously called *Lophelia pertusa*) that was discovered off the US East Coast.

Conservation

Mapping this hidden reef system is crucial for conservation.

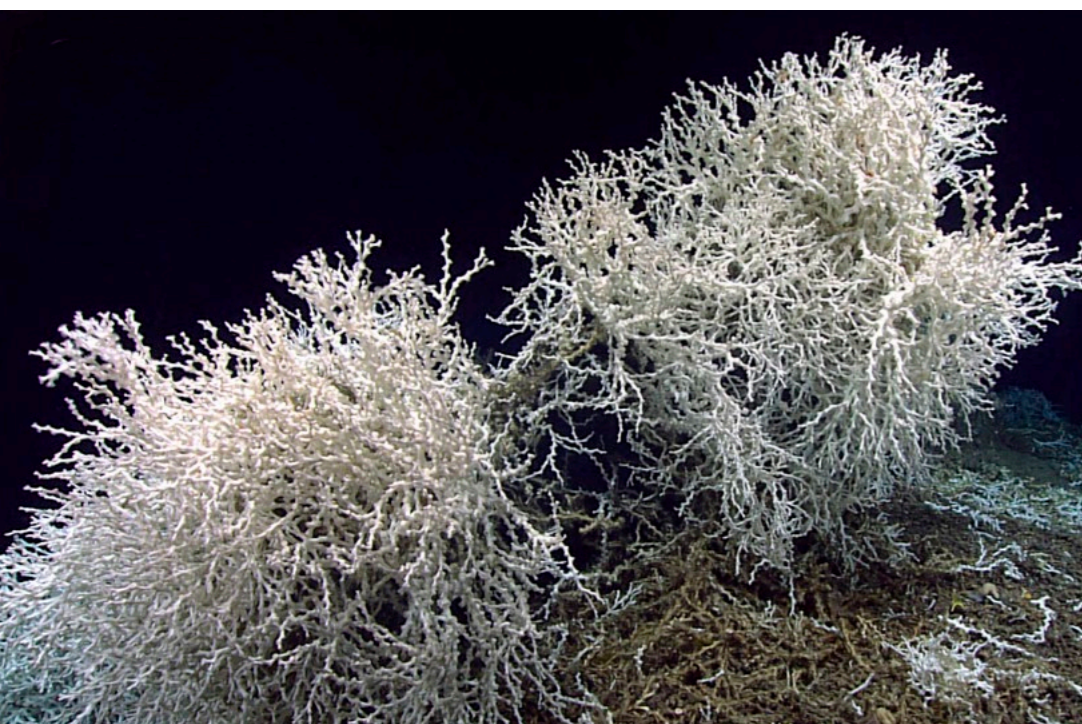
Understanding the topography and biodiversity of these reefs is essential to protect them from human-induced threats and climate change. Moreover, deep-sea corals are known for their longevity and can provide key insights into past ocean conditions, which are vital for studying the health of our oceans.

With vast areas of our oceans still uncharted, every discovery like this is a reminder of the natural wonders that lie beneath the waves, waiting to be discovered and protected for future generations. ■

FACT FILE

Dense thickets of the reef-building coral *Desmophyllum pertusum* (formerly known as *Lophelia pertusa*) make up most of the deep-sea coral reef habitat found on the Blake Plateau in the Atlantic Ocean. The white colour is healthy—deep-sea corals do not rely on symbiotic algae, so they cannot bleach. ■

SOURCES: NOAA OCEAN EXPLORATION, GEOMATICS JOURNAL



Edited by Peter Symes

Kelp forest within the Marine Protected Area of the Channel Islands in California.



BRETT SEYMOUR / US NATIONAL PARK SERVICE / PUBLIC DOMAIN

Kelp Forests Flourished Off US Pacific Coast as Early as 32 Million Years Ago

A study by the University of California, Berkeley, has shown that these underwater ecosystems have been a part of the ocean landscape for much longer than the scientific community once thought.

Ground-breaking research has revealed that Pacific kelp forests are much older than previously thought, reshaping our knowledge of marine ecosystems.

Originally thought to be a relatively recent occurrence in ocean history, kelp forests are now considered ancient entities, with origins dating back millions of years. This revelation

comes from the analysis of fossil records and advances in dating techniques, allowing scientists to peer back through time.

Cradle of biodiversity

Kelp forests are not only remarkable for their age, but also for their role as cradles of biodiversity. These lush underwater forests provide shelter, food and breeding grounds for countless marine species. Their longevity suggests that they have supported diverse life forms for much longer, playing a crucial role in the evolution and sustenance of marine life as we know it.

Palaeobotanist Cindy Looy, noted, however, that the diversity of invertebrates found within the 32-million-year-old

fossilised holdfast was not as high as that found inside a kelp holdfast today.

The newfound antiquity of Pacific kelp forests compels a re-evaluation of marine ecosystem dynamics throughout history. It is a discovery that not only piques the curiosity of marine biologists, but also highlights the resilience and importance of these underwater treasures.

Understanding the age of these kelp forests is critical for conservation efforts. It underlines the importance of preserving these environments, which have weathered eons but are now threatened by climate change and human activities. ■ SOURCE: UNIVERSITY OF CALIFORNIA, BERKELEY

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Hawksbill Turtles in the Indian Ocean Rely on Deep, Remote Habitats

Recent studies illuminate the elusive feeding habits of hawksbill sea turtles, offering insights into their survival and the conservation efforts needed to protect these marine creatures.

Recent studies have employed sophisticated satellite tracking technology to follow hawksbill sea turtles to their most frequented feeding grounds in the Indian Ocean. These advances have allowed re-

searchers to gain unprecedented insights into the turtles' precise movements and behaviours at depths previously unobserved.

Contrary to the assumption that these turtles feed exclusively in shallow reefs, the findings indicate that their feeding habits extend to the deep seabed. This adaptability in feeding behaviour underscores the resilience of the turtles and the complexity of their habitat needs, highlighting the importance of diverse conservation strategies.

Understanding the hawksbill sea turtles' reliance on both shallow and deep-sea environments is critical to conservation efforts. Protecting their habitats requires comprehensive strategies that encompass the full range of their feeding grounds, from coral reefs to deep-sea beds.

The study opens up new avenues for research and suggests that the conservation of hawksbill turtles is a multifaceted challenge.

While there are a few anecdotal observations, the importance of mesophotic depths and submerged banks for foraging marine megafauna such as sharks, turtles, and marine mammals is largely unknown. For these groups, one important way of identifying key areas for conservation is through satellite tracking, which allows animals to be followed regardless of wherever they move. ■

SOURCE: SCIENCE ADVANCES



CAROLINE S. ROGERS / NOAA / PUBLIC DOMAIN

The hawksbill sea turtle's elongated, tapered head ends in a beak-like mouth—from which its common name is derived.

Edited by Peter Symes

Soaring insurance rates threaten the economic well-being and family life of dive business owners and employees. Many operators are forced to pass on these increased costs to their customers.



Dive Boat Act Proposes Relief for US Dive Operators

The proposed Dive Boat Act seeks to mitigate the impact of the Small Passenger Vessel Act on US-based dive operators facing rising insurance costs and extended liability periods.

The enactment of the Small Passenger Vessel Act (SPVA) in 2022 amended US maritime law, affecting the liability of small passenger vessel owners for safety violations that lead to accidents. This legislation, a response to the **Conception disaster**, has resulted in changes to the liability provisions for dive vessels, including day boats and live-

boards, removing previous liability caps and extending the period for filing claims to two years.

Soaring insurance premiums
The broad wording of the SPVA has unfortunately placed a significant burden on the dive industry. The diversion of funds from critical maintenance, safety equipment and training to soaring insurance premiums due to the risk of legal action, which is detrimental to the industry.

These insurance rate increases threaten the economic well-being and family life of dive business owners and employees. Many operators are forced to pass on these increased costs to their customers.

Dive Boat Act
In response, the Dive Boat Act has been proposed to alleviate some of this pressure by protecting vessels that comply with safety regulations from the burden of unlimited liability for incidents that may have occurred up to two years ago.

There's a window of opportunity in the US House Committee on Transportation & Infrastructure and the Senate Commerce Committee to include the Dive Boat Act in the bills currently being drafted to authorise the continued operation of the US Coast Guard within this legislative year.

DEMA is actively engaging with Members of the US Congress to secure insurance premium relief for

dive operators. Representing over 1,400 dive businesses, the association is lobbying for changes to the SPVA to alleviate the unforeseen consequences and escalating insurance costs faced by retailers, manufacturers, training organisations and dive tour operators.

Representative Bean, a member of the House Subcommittee on Coast Guard and Maritime Transportation, has introduced an amendment for the Dive Boat Act in 2023. Rep. Bean is committed to a bipartisan approach to solving this pressing issue and is actively seeking an appropriate legislative vehicle for this important amendment. ■

SOURCES: DEMA, US CONGRESS

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Florida Shipwreck Identified as the 50-gun Frigate HMS Tyger

Maritime historians and archaeologists, following years of meticulous research and underwater exploration, have confirmed the identity of the HMS Tyger. The ship, originally launched in 1741, played a pivotal role in British naval operations before succumbing to a fiery end in 1742.

Key evidence

The breakthrough came through the analysis of con-

struction features, artefacts recovered from the site, and archival records. Notably, the ship's distinctive cannon and the unique composition of its timbers provided irrefutable evidence, aligning perfectly with historical accounts of the Tyger's construction and its untimely demise.

A glimpse into the past

The Tyger's resting place, now a submerged relic, offers an unprecedented glimpse into 18th-century naval warfare and shipbuilding techniques. Artefacts recovered from the wreck, including personal items

of the crew and weaponry, tell a story of life at sea, the hardships encountered, and the technological advancements of the time.

The identification of the HMS Tyger is not just a triumph of archaeological endeavour but also a poignant reminder of the perils of maritime exploration and warfare. It underscores the advances in naval engineering and the strategic importance of naval power in shaping world history. ■

SOURCES: US NATIONAL PARK SERVICE, INTERNATIONAL JOURNAL OF NAUTICAL ARCHAEOLOGY

BRETT SEYMOUR, NPS / VIA PRESS RELEASE

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ABOUT HMS TYGER

"HMS Tyger, often spelt Tiger, was a 38-gun fourth-rate frigate of the Royal Navy, built by Peter Pett II at Woolwich and launched in 1647. The term 'frigate' at that time referred to a method of construction rather than a role, which would not be developed until the following century ... Tyger served in many actions during a career spanning nearly 100 years, including the Siege of Colchester during the English Civil War, the pursuit of Prince Rupert to the West Indies, and the First and Second Anglo-Dutch Wars ... In December 1741, Tyger was assigned to blockade duty off the western tip of Cuba, under the command of Captain Edward Herbert ... On 11 January,

the Tyger approached low-lying islands. The officers became confused, first correctly identifying the islands as the Dry Tortugas, then mistaking them for the Reques Keys on the Grand Bahama Bank. That night the ship ran

aground on a reef. The ship was successfully backed off the reef, but there was no anchor ready to be dropped, and the ship ran aground on the reef again, this time for good."

— Wikipedia



A National Park Service diver documents one of five coral-encrusted cannons found during a recent archaeological survey in Dry Tortugas National Park.

BRETT SEYMOUR, NPS / VIA PRESS RELEASE





Steamship Milwaukee

1886 Steamship “Milwaukee” Found Remarkably Intact in Lake Michigan

Michigan Shipwreck Research Association announces the discovery of the steamship Milwaukee, lost in 1886, now found intact in deep waters.

The Michigan Shipwreck Research Association (MSRA) has uncovered the remarkably preserved steamship *Milwaukee*,

which vanished in 1886 after a collision and has been resting in 360ft (100m) of water for over a century.

MSRA located the *Milwaukee* in June 2023 using side-scan sonar and documented it extensively with an ROV. Still, the discovery was only revealed to an enthralled audience in a live announcement during their annual film festival.

Valerie van Heest, along with her husband Jack van Heest, led the coordinated search efforts, culminating in this, the 19th shipwreck discovery for the MSRA team, off the shores of western Michigan. The MSRA aims to share these historical discoveries with the public through various educational mediums.

The ship's saga
The *Milwaukee's* career spanned 18 years, during

which it served as a passenger and cargo vessel on the Great Lakes. Originally, the 135ft vessel had three decks, two designed for freight and one for passengers. But after the Wall Street panic of 1873, and changes in transportation infrastructure, the ship was repurposed as a steam barge, continuing to transport goods, such as lumber and iron, across Lake Michigan until its demise.

Collision
The steamship met its tragic end on a calm but smoke-obscured night when it collided with another vessel bearing a striking resemblance to the *C. Hickox*.

On 9 July 1868, historical reports detail that the *Milwaukee* embarked on a voyage towards Muskegon, Michigan, to collect a lumber consignment. At the same time, the *C. Hickox* set sail from Muskegon to Chicago, hauling a similar cargo and accompanied by a laden schooner barge.

The day was marked by tranquillity on the lake, but the skies

were clouded by smoke from wildfires in Wisconsin, a precursor to an unfortunate maritime convergence. Despite the sudden descent of a dense fog, which shrouded their visibility, neither captain reduced speed.

Maritime regulations dictated that Captain Armstrong of the *Milwaukee* and Captain O'Day of the *C. Hickox* should have moderated their speed, navigated to the right, and signalled their intentions with their steam whistles.

The situation escalated when Captain O'Day, attempting to avert disaster, found the whistle's pull chain snapped in his hand, leaving him unable to signal his manoeuvre. This led to the inevitable collision, with the *C. Hickox* striking the *Milwaukee* with devastating impact.

Despite the crew's attempts to save the *Milwaukee*, it succumbed to the damage and sank, with all on board surviving the ordeal. ■ SOURCE: MICHIGAN SHIPWRECK RESEARCH ASSOCIATION PRESS RELEASE



Illustration of steamship Milwaukee wreck site



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Shipwreck MILWAUKEE
Michigan Shipwreck Research Association Illustration by Valerie van Heest



Historical photo of two German Type UC II submarines similar in make to the *UC-18*

WWI German Submarine Located

A four-year search culminates in Guernsey divers locating the WWI German submarine *UC-18* in the English Channel off the coast of Guernsey.

The discovery was no small feat. After a persistent search that spanned several years, the submarine, which had been lost to the depths since November 1917, was identified through diligent research, underwater surveys and the collation of historical data.

SM *UC-18* was a German Type UC II minelaying submarine or

U-boat in the German Imperial Navy (German: Kaiserliche Marine) during World War I. In six patrols, *UC-18* was credited with sinking 34 ships, either by torpedo or by mines laid. *UC-18* was sunk by the British Q ship HMS *Lady Olive* on 19 February 1917. These two vessels allegedly destroyed one another in a famous WWI battle. It is the only known altercation where a submarine and a Royal Navy ship sank each other.

Lying in more than 70m of water, the wreck of *UC-18* and that of which the divers believe to be HMS *Lady Olive* have been located 40

miles west of their historically recorded position of 12 miles south of Guernsey.

The find has been filmed for a BBC documentary that will air on the BBC in June. Underwater filmmaker Karl Taylor told the BBC that he was elated by the find and the project had been "very demanding" with deep dives in very low light.

French authorities have since closed the *UC-18*'s location to divers as it is a designated war grave. ■ SOURCE: BBC NEWS

US Calls on Fishermen to Help Preserve Historic Wrecks

The US National Oceanic and Atmospheric Administration (NOAA) has warned boaters to steer clear of 11 shipwrecks, including a WWII minesweeper, in the Stellwagen Bank National Marine Sanctuary off the coast of Massachusetts.

NOAA has called on fishermen to play a key role in preserving underwater historic treasures. To protect these maritime time capsules, NOAA has stressed the importance of avoiding fishing activities around known shipwreck sites.

There are more than 200 wrecks in the sanctuary, according to NOAA, which specifically mentioned the World War II minesweeper USS *Heroic*, the trawler *Josephine Marie* and the 55ft *North Star*, along with eight unnamed ships with their coordinates.

These wrecks, which include naval warships and merchant ships from various eras, are at risk of being lost to time and the tides without concerted conservation efforts. By asking fishermen to avoid these areas, NOAA aims to protect the wrecks as a testament to maritime history for future generations.

A heritage at risk

Among the most significant relics is the World War II minesweeper USS *Heroic* that lies within the Stellwagen Bank National Marine Sanctuary. NOAA's recent appeal seeks to prevent further damage to these sites, emphasizing the role of the wrecks as artificial reefs and historical artefacts.

NOAA's initiative includes working with fishermen to ensure that fishing gear does not compromise the integrity of these wreck sites. The agency has provided detailed information and coordinates to help fishermen avoid these critical areas. ■

SOURCE: NOAA FISHERIES



The steamship *Portland* sank off the coast of Massachusetts in 1898. The *Portland* lies upright on the mud bottom, with its wooden hull nearly intact from the keel up to the main deck level. The vessel's entire superstructure is missing, with only the steam propulsion machinery protruding above deck level.



ROSEMARY E LUNN

Oban Hyperbaric Chamber in Scotland

Oban Hyperbaric Chamber Loses Funding

The National Health Service (NHS) has withdrawn its funding for the Oban Hyperbaric Chamber with immediate effect, leaving the entire west coast of Scotland without an NHS-registered treatment facility, according to the operator.

The abrupt discontinuation of NHS funding for the Oban Hyperbaric Chamber has been confirmed, prompting substantial concern within the diving community. This development effectively leaves the west coast of Scotland without an NHS registered facility to treat

decompression illness, a critical service for divers.

Divers affected by decompression illness will now face transfers to Aberdeen for treatment, raising serious questions about the potential delays in receiving essential hyperbaric oxygen therapy. The current facility in Oban, which stakeholders deem sufficiently equipped, is being sidelined, prompting challenges against this latest NHS decision.

As well as providing hyperbaric treatment, the Oban facility has a dedicated team of five doctors specialising in diving and hyperbaric medicine. This team has historically provided round-

the-clock support to Oban's Accident and Emergency services, co-ordinating urgent care for divers. The withdrawal of funding spells the end of this vital medical resource.

With the withdrawal of NHS backing, emergency support for diving-related incidents along the west coast now falls solely to the Coastguard and the Scottish National Helpline.

The diving community and its supporters are rallying to overturn the decision, with advocates being urged to direct letters of support to Tritonia's email at info@tritoniascot.com. ■

SOURCE: TRITONIA

Egyptian Dive Operators Affected by Regional Unrest

Text by Peter Symes

Despite the conflicts not being close to the main Red Sea dive resorts, many operators we spoke to at the Boot show in Germany reported an increase in cancellations and a noticeable slow-down in bookings.

One operator based in Marsa Alam wrote that after the Boot show they had attended additional exhibitions and met many people who were enthusiastic about diving in Egypt. However, a handful expressed reluctance, choosing not to visit this year due to the political climate.

Sentiment

"This sentiment undeniably

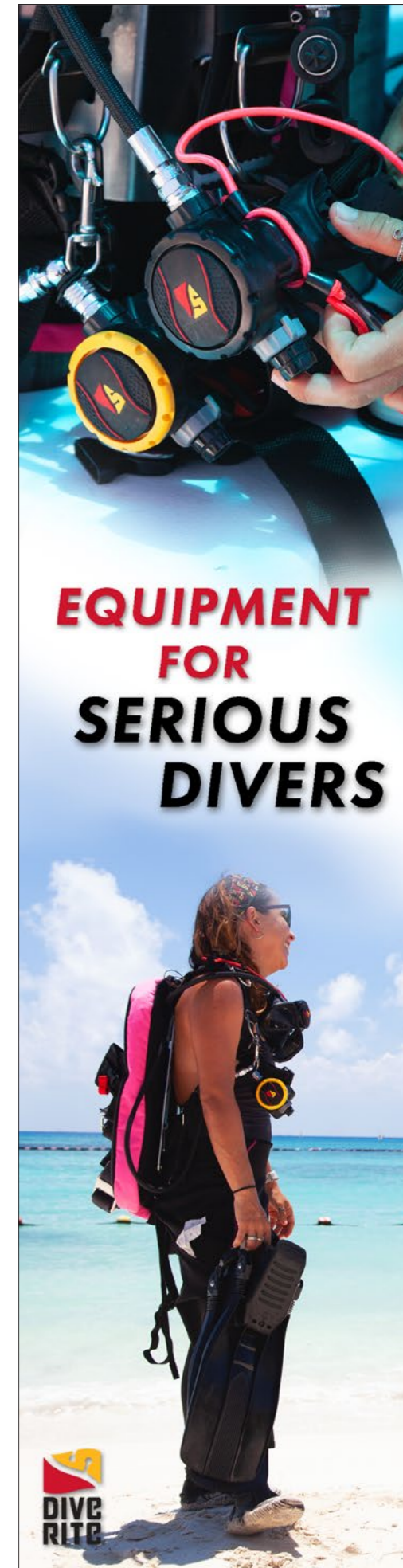
impacts our operations and those working within the tourism sector. While only a few have articulated these concerns directly, there may be others who silently share this perspective, substantially affecting our business. Although the streets are not deserted and some hotels are fully booked, I have personally encountered many cancellations," wrote Rita Khaled of Blue Ocean Dive Centres and Resorts.

"The current atmosphere here is tranquil and secure. The economic conditions in Egypt present a greater challenge to the population than the political situation. We are keenly anticipating the return of tourists and are wholeheartedly dedicated to ensuring their safety and comfort during their stay." ■



PETER SYMES

Marsa Shagra house reef (archive photo)



**EQUIPMENT
FOR
SERIOUS
DIVERS**





Vanuatu

Pacific Island Adventure

Text and photos by Pierre Constant



The Pacific island nation of Vanuatu is a remote destination in Melanesia that offers diverse diving on reefs, wrecks and in freshwater springs that are home to a number of endemic species. Pierre Constant shares his adventure there.

It was a long way from Europe to Vanuatu (formerly the New Hebrides) in the western Pacific Ocean. The Air France flight from Paris took me to Tokyo, where I had to change to an Air Calin flight to Noumea in New Caledonia. When I arrived there two days later, just before midnight, I was jet-lagged—only to discover, with a sigh and some stupor, that one of my checked bags had not appeared on the conveyor belt. Air Calin did not track bags on their computers. Of course, their agents were keen to hand me a “lost” claim form swiftly, so they could get rid of me with a smile.

With a flight to Vanuatu two days later, I was rather stressed. But with a Zen attitude, I tried to get some sleep. The next morning, there was no word from either Air France or Air Calin, who were responsible for my luggage. Late in the afternoon, my luggage was finally delivered to the hotel. Apparently, another passenger

had picked up my bag by mistake and returned it to Air Calin, without so much as a note of apology. The next day, I flew to Port Vila on schedule on an Air Calin flight operated by Air Vanuatu. Frustratingly, I had to pay 22kg in excess baggage fees for my second bag. My trip had definitely gotten off to a hectic start.

About Vanuatu

Located in a time zone 11 hours ahead of UTC, the Y-shaped archipelago of Vanuatu has a total land area of 12,274 sq km and a population of 336,000. It stretches 1,300 km from northwest to southeast and consists of 83 islands. The largest are Espiritu Santo (3,959 sq km), Malakula (2,069 sq km), Efate (980 sq km), Erromango (900 sq km), Ambrym (682 sq km) and Tanna (550 sq km). Mount Tabwemasana on Espiritu Santo is the highest point, with an elevation of 1,879m.

Located in the Southern

Towering hard corals at Twin Bommies (above); Elephant Island as seen from Lonnoc Beach (top left); Frangipani flowers (left); White hibiscus flower, Lonnoc Beach (previous page)



Pandanus trees at sunrise in Pango (above); Traditional sailing canoe at the National Museum of Vanuatu in Port Vila (right)

Hemisphere between New Caledonia and the Solomon Islands, Vanuatu lies between 13°S and 21°S latitude and 166°E to 171°E longitude. It is part of the Australasia-Melanesia region, which includes New Caledonia, Solomon Islands, New Guinea, Fiji, Australia and New Zealand.

Part of the Pacific Ring of Fire, the islands of Vanuatu are of volcanic origin. Due to the tectonic subduction of the Indo-Australian Plate under the Pacific Plate, the first and largest islands of Espiritu Santo, Malakuka and the Torres Group emerged from the ocean on the Pacific Plate 22 million years ago. The younger islands rose up less than five million years ago.

The slow uplift, combined with the formation of fringing coral reefs, means that many of the smaller islands are composed of coral limestone. The eastern half of Santo consists of uplifted Pleistocene coralline limestone covering a land area of 1,600 sq km. It is a region

of many caves and subterranean rivers. Coral terraces and flat coralline islands are common. Vanuatu also has nine active volcanoes, seven on land and two underwater. These include Lopevi (Efate), Mount Yasur (Tanna Island), Mount Garet (Gaua Island), two volcanoes on Ambrym Island and Ambae Volcano. An undersea eruption was recorded in November 2008, with an earthquake measuring 6.4 on the Richter scale.



Prehistoric migrations

For the modern archaeologist (Jean Christophe Galipaud, IRD 2006), the settlement of the Pacific region was the result of two distinct migrations. The first one, which took place during the Pleistocene epoch 80,000 years ago, concerns the Australian continent, New Guinea and the adjacent archipelagos. In the past, these areas were united in a single landmass known as Sahul. There is evidence of human presence in New Guinea 40,000 years ago and in the Bismarck Archipelago 10,000 years later. Past existing land bridges allowed further migration to reach Guadalcanal in the Solomon Islands.

The second migration is associated with small mobile groups of skilled

seafarers originating from Southeast Asia and Taiwan, who appeared in the Bismarck Archipelago 3,500 years ago. They quickly spread to remote Oceanian archipelagoes to the south and east, reaching New Caledonia, Samoa and Tonga 3,000 years ago. There is evidence of their presence in the Santa Cruz Islands (north of Vanuatu) 3,200 years ago, and the distinctive pottery they left is known as "Lapita." Austronesian languages, spoken only in remote Oceania, are associated with the Lapita diaspora.

Early settlements in Vanuatu include those on small offshore islands south of Santo (Aore, Malo), northern Malakula, Efate and Erromango. A characteristic



Guide Oka next to a stalagmite in a cave at Kole (above); Shards of Lapita pottery at Makué site on Aore Island (left); 3,000-year-old Lapita pottery at the National Museum (below)

NASIONAL MUSIUM BLONG VANUATU



The National Museum of Vanuatu in Port Vila (above)

of Lapita pottery was that it was richly decorated. Stunning examples can be seen in the National Museum of Vanuatu in Port Vila.

The early navigators introduced plants, such as edible nut-bearing trees, banana trees, taro and yam. Animals they introduced to Vanuatu included the Pacific rat, chickens, dogs and much later, pigs. An area buried under one metre of sediment at the site of Makué (in northern Aore Island) and excavated in 2002-2006, revealed a seasonal camp for sailors from the Bismarck Archipelago, with many obsidian flakes found that could be traced to the region of Talasea in New Britain (in Papua New Guinea) as well as marine turtles and shell remains.

European contact

The first European contact was made by the Portuguese explorer Pedro Fernandes de Queiros, who sailed for the Spanish crown in April 1606. In search of Terra Australis, he passed by the Banks Islands, then called Espiritu Santo, which he believed to be Australia. The settlement at Big Bay was abandoned after a month, due to poor treatment of the natives and ill health of the crew. French explorer Louis Antoine de Bougainville visited in May 1768 and landed at Ambae, where his men were attacked.

In July-September 1774, James Cook explored the islands, which he christened the New Hebrides, a name that stuck until Vanuatu claimed

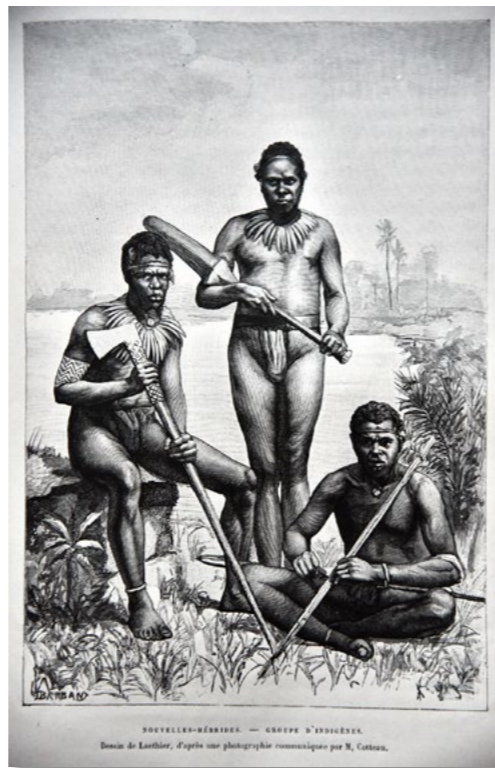


Illustration of Ni-Vanuatu people from the 19th century. Élisée Reclus, *Nouvelle Géographie universelle* (1875-1894).



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Coral reef seashore and Dany Island in the distance, at Turtle Bay

independence. After the mutiny on the HMS *Bounty* in 1789, Captain William Bligh and the rest of his crew sailed through the Banks Islands. Whaling ships made ports of call at Vanuatu between 1804 and 1887, followed by traders seeking sandalwood in Erromango.

Planters from Australia, Fiji and New Caledonia came to Vanuatu in the 1860s in search of laborers. They were known as “blackbirders” and associated with the shameful slave trade and exploitation of the indigenous people. Exposed to poor health and foreign diseases, many Ni-Vanuatu perished. Blackbirding was banned in Australia in 1906.

Roman Catholic and

Protestant missionaries from the London Missionary Society and the Anglican Melanesian Mission travelled to Vanuatu from 1839 onwards. French planters colonized Efate in 1880, leading to the establishment of the Compagnie Calédonienne des Nouvelles Hébrides’ (CCNH) by pro-French Irishman John Higginson. The French government took over the company in 1894. Consequently, French and British interests came into conflict in what became known as the “Anglo-French Condominium,” leading to an agreement for joint administration of the islands.

In the 1920s and 1930s, Vietnamese workers were brought

in from French Indochina to work on the plantations of the New Hebrides. As many as 6,000 were imported.

With the advent of World War II, Britain gained a greater degree of authority. The Australian military stationed a 2,000-strong force at Malakula. Fearing a Japanese invasion of Australia, the United States joined the effort, coming to the rescue in 1942 and establishing bases at Efate and Santo. With the reoccupation of the Solomon Islands in 1943, the Americans withdrew in 1945.

After the war, cattle ranching led to extensive clearing of the Ni-Vanuatu “kastom” or traditional lands. Initiated by Chief Buluk of Big Bay and



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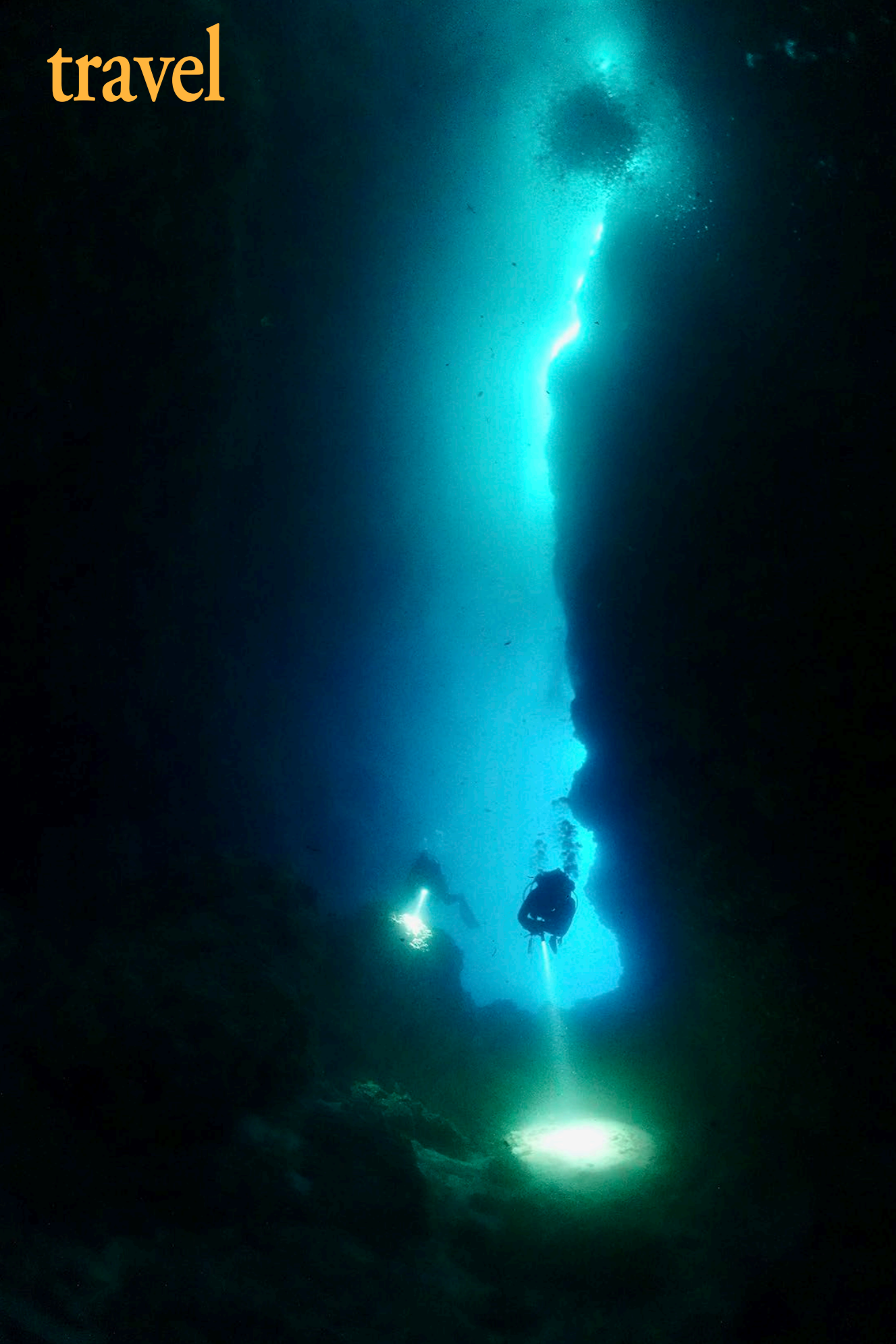


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Divers explore a cleft in the reef at Cathedral, Pango Point



Vanuatu

Bignose unicornfish and damselfish at Kathleen's Reef

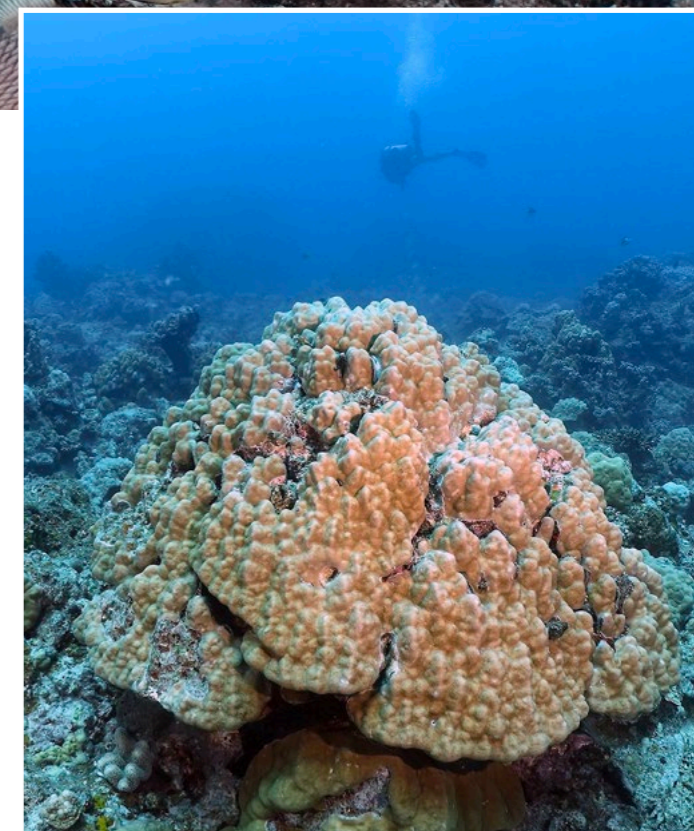
Ni-Vanuatu nationalist politician Jimmy Stevens, the Nagriamel Movement opposed this abuse and pushed for Ni-Vanuatu-led economic development. Slowly, new parties emerged, paving the way for independence in 1980.

Diving at Port Vila

Port Vila is the capital of Vanuatu and the main city in the southwest of Efate Island. The international airport is located just north of the city. Diving takes place in Mele Bay, between Devil's Point to the west and Pango Point to the south. The small dive centre is located

right on the waterfront, on the scenic promenade of the tourist area.

Kathleen's Reef and Abyss. The dive boat took me on a 15-minute ride to the dive site of Kathleen's Reef. It was a coral mound with blue water and great visibility. But a thought flashed through my mind: Where are all the fish? The site looked deserted, although I did encounter a small school of bignose unicorns (*Naso vlamingii*), with a few fusiliers in the shallows. The nearby site of Abyss also had little fish life, but the hard coral colonies were impressive, consisting of staghorn coral, large plates



Coral bommie at Twin Bommies





Red soldierfish in swim-through at Twin Bommies (above); Black-blotched porcupinefish at Twin Bommies (top centre); Orange-fin anemonefish at Abyss (centre); Diver and bubble coral at Abyss (top right); Divers with bignose unicornfish, damselfish and pyramid butterflyfish at Kathleen's Reef (bottom right); Sailfin tang at Kathleen's Reef (right)

of table coral, and bubble coral. The water temperature was a warm 28°C.

Cathedral. The next day I wanted to dive at Cathedral and Twin Bommies, which had been recommended by one of the older dive guides at the dive centre. The first site was at Pango Point, where a strong swell was pounding the reef. Underwater, the visibility was cloudy with lots of sand and particles stirred up. The twist here was a vertical cleft in the reef structure that led to a cave

that one entered at a depth of 22m. The idea was to go up into a chimney to a round pool below the surface. In good conditions, this offered great photographic opportunities. Today, the water currents were too erratic. Halfway up, we turned back. It was too risky.

Twin Bommies. Twin Bommies, on the southeast side of the bay, was a scenic dive featuring a diverse coral garden with many hard corals. A giant fluted clam



(*Tridacna squamosa*) was nestled on the edge of the drop-off, which was carved with many caves, hosting Spondylus oysters, little schools of red soldierfish, a mimic (fire) surgeonfish (*Acanthurus pyroferus*), a marbled or black-blotched porcupinefish (*Diodon liturosus*) and the oriental sweetlips (*Plectorhinchus vittatus*).

Wrecks
Star of Russia. Mele Bay is also





Diver on the deck at 30m (top left), below the deck (above) and at the bow (right) of the wreck of the *Star of Russia*; *Tambja morosa* nudibranch (left) and gold-spotted sweetlips (far left) on the *Star of Russia* wreck

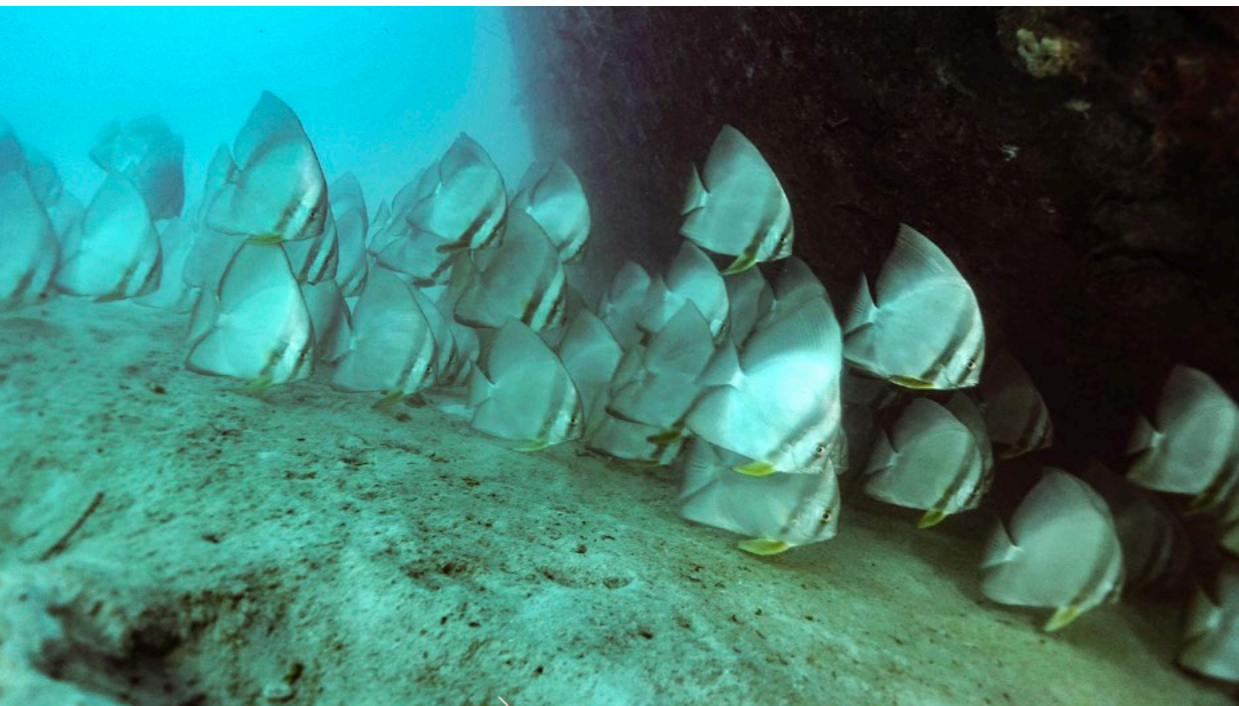


known for a couple of wrecks. The most famous one is the *Star of Russia*. Originally a fully rigged American transport sailing ship built by Harland & Wolff, Ltd. in Belfast in 1874, it was 84m long, 12.3m wide, with three masts and a gross tonnage of 1,981 tons. It was used to transport jute from India to Europe, as well as goods to Australia, where it carried many migrants. Later it was reported to carry coal, wheat and even cement.

Its maiden voyage was on 5 April 1875. In the course of its life, the ship was sold to a few owners, such as the Burns Philp Company in Sydney (1926-1930) and then to French owners. Renamed *Bougainville*, the ship was sent to New Caledonia, where it served as a barge. Eventually, the *Star of Russia* ended up in Port Vila, as a floating warehouse and a copra hulk. It sank in 1953 northwest of the main wharf and now lies in 35m of water,

upright and facing south.

When I dived on this wreck with Ni-Vanuatu dive guide David, the visibility was not clear. A school of bigeye jacks swirled above, which I took as a sign of welcome. Barracudas silhouetted in the distance were rather shy. A school of yellowback fusiliers (*Caesiotes*) cruised past. When I reached the deck, I noticed that the wooden decking had been eaten away. All the steel joists were still in place and the hull



Singular bannerfish and goldspot seabream, *Bougainvillea* (top left); School of longfin batfish on Konanda wreck (above); Fire dartfish, *Bougainvillea* (below)

looked like a giant skeleton.

Suddenly, David pointed to a nudibranch on a metal beam. Black in colour, with an electric blue line across the front and a blue girdle, it was a *Tambja morosa*. Just



my luck! I changed the wide-angle lens on my camera to a macro lens. Zooming in on the creature, it suddenly stood on its foot, facing me, sensing me with its little rhinophores. It was a magical moment of silent communication. Fish life seen

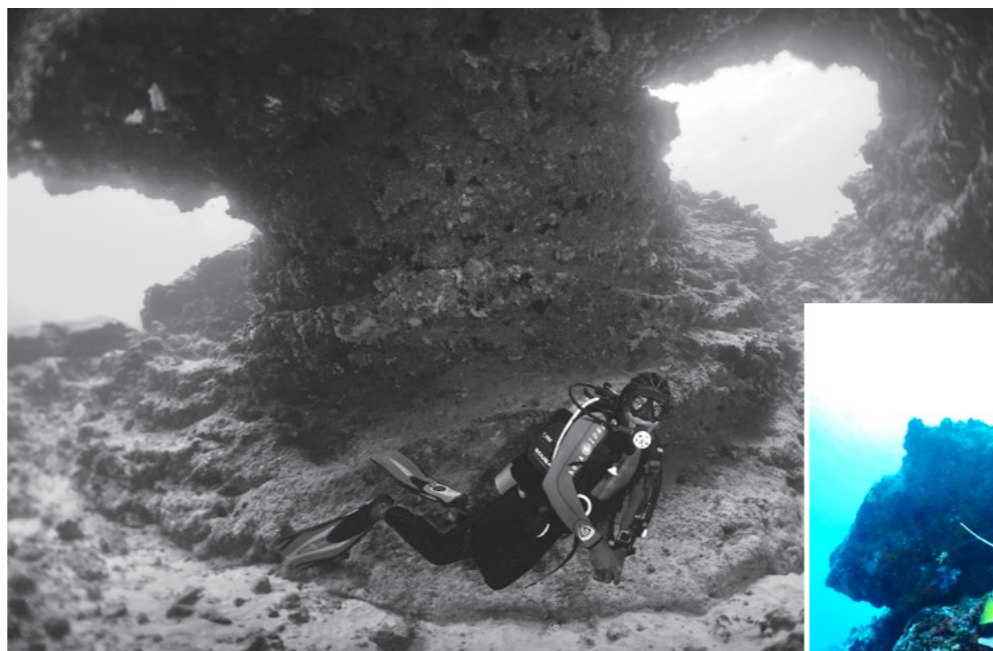
Bow (above) and bridge (top right) of Konanda wreck; Spot-naped butterflyfish (right), *Bougainvillea*

on the wreck included the silver (gold spotted) sweetlips (*Plectorhinchus flavomaculatus*) and blacktail snapper (*Lutjanus fulvus*).

MV Konanda. Another wreck worth considering is the MV Konanda. It was launched on 20 January 1955, from the D&J Boot shipyard

in Alphen, on the River Rhine in the Netherlands. Built for the Adelaide Steamship Company, it was 51m long, 9m wide and had a tonnage of 414 gross tons. It was put into service carrying raw sugar between Cairns, Mourilyan and Goondi in Queensland.

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In 1961, it served as a ferry between Nelson and Wellington in New Zealand. Sold to Captain Athol Rusden of Port Vila, the ship was used around Vanuatu and other South Pacific islands, sometime after 1967. On 7 February 1987, the ship was struck by Cyclone Uma and declared a total loss. In November of the same year, it was scuttled off the island of Ifira, not far from Port Vila's harbour.

The wreck faces south and sits in 26m of water. There are two holds

aft of the bow. Penetration can be made through a starboard door, via a large cabin on the port side. The bow is above. A large school of orange fin or longfin batfish (*Platax pinnatus*) cruised back and forth under the bow. Maximum depth was 27m, for a dive time of 33 minutes.

Office. On my last day of diving, I was taken out of Mele Bay, beyond Pango Point, to a site called Office. At last, I felt a difference, fish were

again to be seen in a maze of canyons and channels. I saw a large school of longfin batfish and a school of bohar or red snapper (*Lutjanus bohar*). Two grey reef sharks appeared shyly, keeping their distance.

A tunnel-like swim-through, with a bent bean shape and double entrance, lent itself to a wide-angle shot. An inquisitive school of bluefin jacks (*Caranx melampygus*) swam

Gorgonian and school of damselfish at Awesome (above); Gorgonian at Office (far left); Diver in swim-through at Office (left); Longfin bannerfish at Awesome (below); Cushion star at Awesome (right)

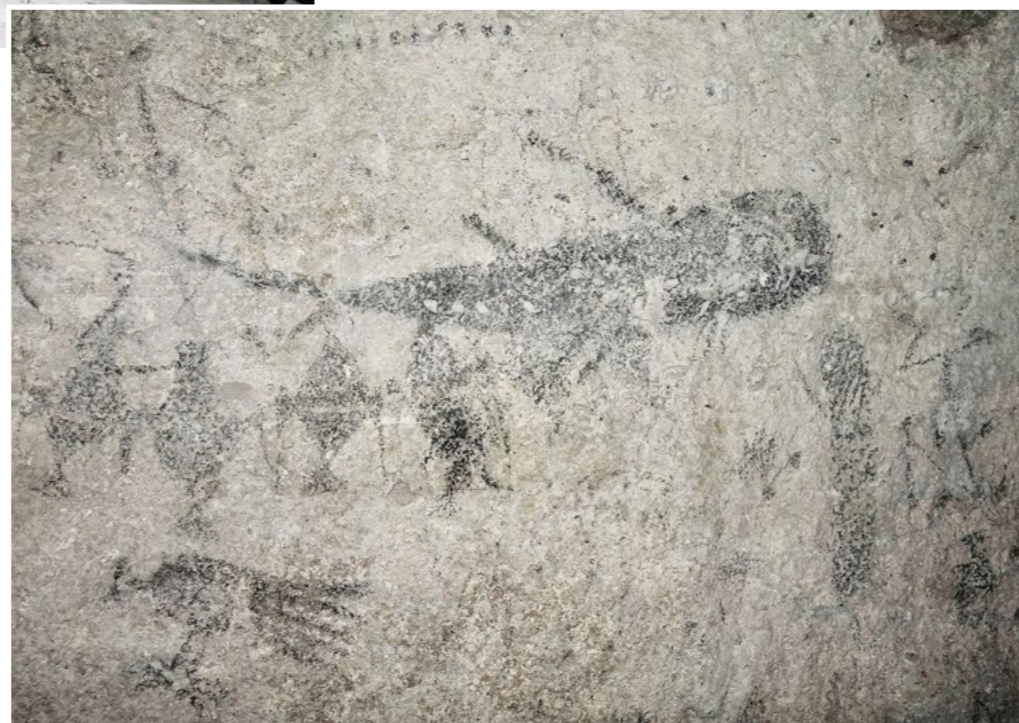
by. A strong southward current was felt at the end of the dive. On surfacing, I found the boatman far away!

My last dive was disappointing; the coral reef was dead and overgrown with reddish-brown filamentous algae.

There was no fish life at all, but crown-of-thorns starfish (*Acanthaster planci*) were hard at work, destroying the reef. The joke of it all: The dive site was named "Awesome"!



Volcanic ash entrance to Fele's Cave on Lelepa Island (far left); Lapita rock engravings inside Fele's Cave (left)—I was later told that it was a 3,000-year-old lunar calendar; Charcoal cave drawings of Chief Roi Mata in Fele's Cave (below); Lapita charcoal cave drawings of a whale and a chicken (centre); Inside Fele's Cave, Lelepa Island (bottom left)



Impressions

After ten dives in Port Vila, my conclusion was grim. Mele Bay had been fished out. Unfortunately, the dive centres do not tell you this, as long as they can sell you dive packages and make some money. It felt like a “booby trap.” On the second day of my arrival in Port Vila, a 1,000-passenger Royal Caribbean cruise ship arrived to drop anchor in Mele Bay for a couple of

days. It was clear to me that big business was coming to Vanuatu.

Topside excursions

When not diving, there are some topside excursions worth doing in Efate. I had read about a historic cave on Lelepa Island. As a bonafide “cave man,” it was of interest to me. “I know a guide who could take you [there],” said David, the dive guide.

We met the fellow the next day as he was racing through the harbour in a speedboat. “It will cost you VUV 9,000 (about US\$78),” he exclaimed. “But I am not free on Monday.” No thank you, I thought.

So, I asked a French-speaking Ni-Vanuatu resident about the “local way” to get to the cave. “You catch a minibus to Au Bon Marché Manples, change to another, heading north to

Lelepa Landing, then cross by boat over to Lelepa Island,” said the local. “In [the village of] Natapao, head left along the coast and walk for 20 minutes... You’ll find Fele’s Cave [there].” So, I did.

In the village, a woman pointed me in the right direction. “You’ll find people there!” she assured me. I strolled through the coastal forest, fringed with pandanus trees, and

suddenly found myself at the foot of a 40m-high cliff of white volcanic ash with undulating layers. It was an eerie place. Not a single soul around. With a headlamp on my forehead, I ventured inside, between large fallen boulders, in a clockwise direction.

There I found a vast round chamber with a high conical ceiling. It was here that Chief Roy Mata was killed by his brother in the 13th century. As a taboo

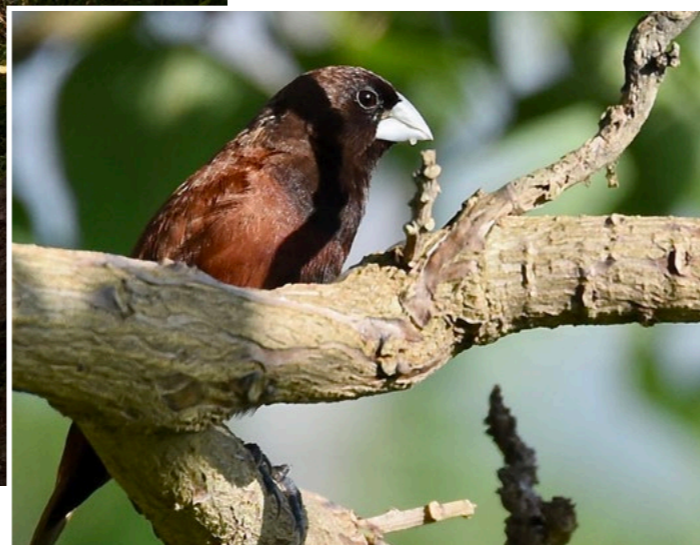


A cove south of Lelepa Island (above)

place, speaking was not allowed. At first, I found nothing but lines of carved small holes in the wall and lines of short black bars made with charcoal underneath. It was “a 3,000-year-old lunar calendar,” I was later told.

As I retraced my steps back to the entrance, I discovered trochus and clam shells on the floor. A fossilised nautilus shell was stuck under a ledge. Finally, to the left of the entrance, black charcoal drawings appeared, including the figure of a whale (a symbol of good luck, announcing the start of the yam planting season), a chicken (for catching fish) and an anthropomorphic figure with raised arms, attributed to Chief Roy Mata himself.

Back in the village, the rain poured down. I took shelter under the house of Manu, the boatman, was offered papaya by his daughter Samantha and had



Sacred kingfisher (top right), chestnut munia (above left), Pacific imperial pigeon (above right) at Palikula Point on Espiritu Santo Island

a lovely chat with the family. They organised tours around the island.

On to Luganville

Being a dedicated diver and traveling “light” with diving and underwater photography equipment in tow, flying between the islands was not an option considering the high cost of domestic flights—not to mention the excess baggage fees. So, I had to take the Vanuatu Ferry from Port Vila to Luganville on Espiritu Santo. The 24-hour crossing was via Malakula Island, further north.

Check-in was supposed to be at 10:00 a.m., but did not actually occur until 11:00 a.m. The scheduled departure was at 12:00 p.m., but it was delayed

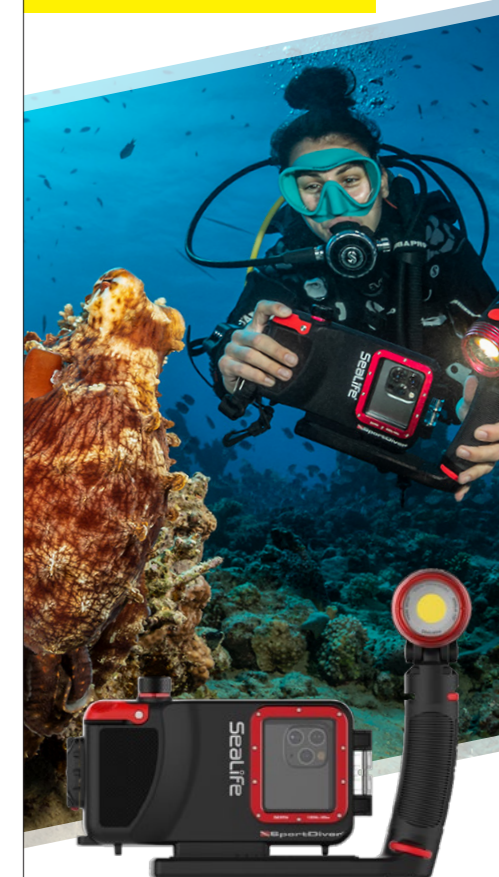
until 2:00 p.m. Waiting time was complimentary, and don’t you dare come up to the ship too early, or you will be firmly told to “get out.”

The air-conditioned passenger lounge had comfortable yellow seats. It was nice and cool to start with but was miserably cold in the middle of the night if you only had a T-shirt on. The boat was full. Passengers slept in the corridors, spreading their mats throughout the passages.

Needless to say, I was the only white fellow on board and felt totally immersed in authentic Ni-Vanuatu culture! After a four-hour stopover in Malakula the next morning, we finally disembarked in Luganville at 2:30 p.m.



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Feather stars, gorgonians and a variety of hard corals at Mavea Island (left and far left); Plates of *Acropora* table coral at Shark Point (bottom left); Hawksbill sea turtle at Mavea Island (centre); White-spotted surgeonfish at Shark Point (bottom centre); Bigeye jacks at Shark Point (below)



Espiritu Santo
My hope was to have a genuine diving experience in Santo, not be a repeat of the Port Vila deception. I chose a place 20km north of Luganville on the

east coast road. It was in Turtle Bay, the site of the old Turtle Bay Airfield during the Pacific War, and close to some attractive blue holes.

Mavea Island. A dive on the north-western tip of Mavea Island offered crystal clear water and a decent reef, but the lack of fish life was still an issue. However, I did encounter

a hawksbill sea turtle, a lone great barracuda, and a red snapper. A French couple with their young son shared the zodiac boat with me. During the interval time, the inflatable

boat began to fill up with water in the back due to excess weight. The wife feared the worst and we wisely returned to base before it was too late! Just in the nick of time.

Shark Point. Morning came and I was alone with the South African dive guide for an outing to Shark Point, on the northeast side of Billota Island, 30 minutes away. A video I had seen ear-



Diver on the wreck of a WWII Vought F4U-1 Corsair (left) at Espiritu Santo; Diver at the nose of the plane (above) and at the tail (right); Glassfish inside the broken tail (bottom left)

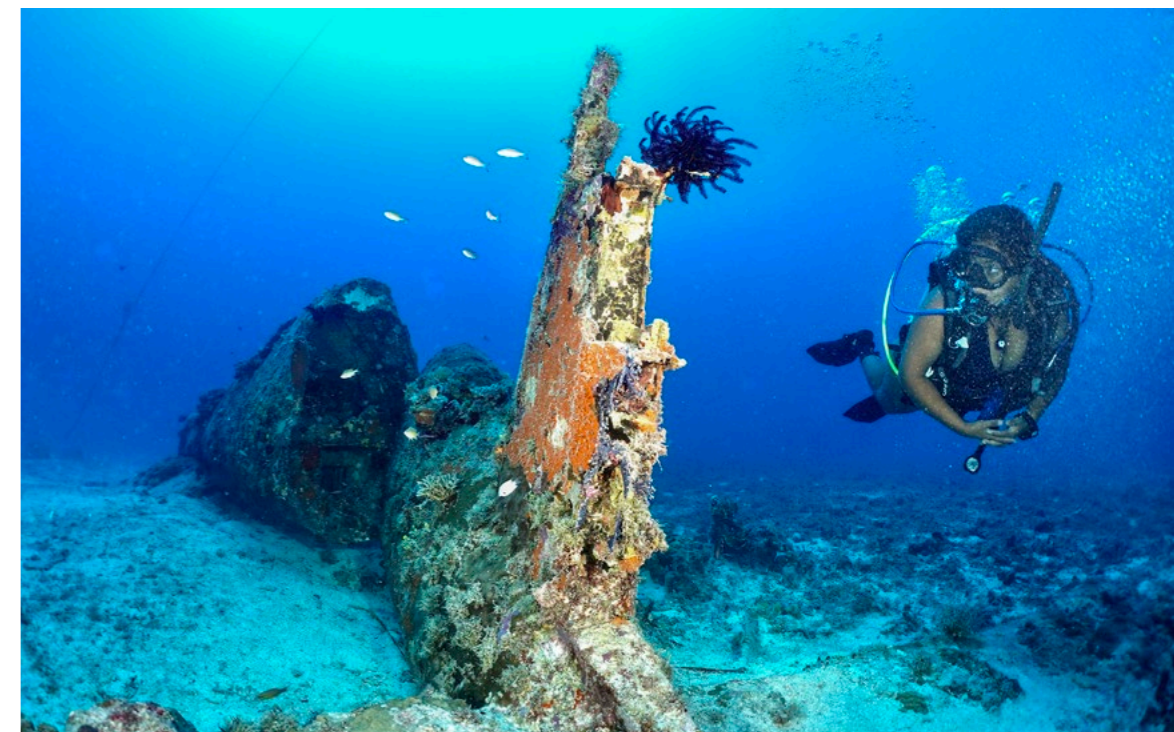


lier had confirmed the presence of silvertip sharks at the site. I was eager to see them, but instead, I saw a timid grey reef shark.

The water was an amazing cobalt blue. The reef was attractive and healthy, full of colour and was carved by numerous gullies. Out of the blue, a school of bigeye jacks (*Caranx sexfasciatus*) came and swirled around me for a minute and then disappeared into the sun, without further ado. It was an exhilarating dive with plenty of time to get some good shots. Schools of neon fusiliers (*Pterocaesio tile*), variable-lined fusiliers (*Caesio varilineata*) and scissor-tailed fusiliers (*Caesio caerulea*)

made furtive appearances. The highlight was a small cloud of white-spotted surgeonfish (*Acanthurus guttatus*) playing hard to get.

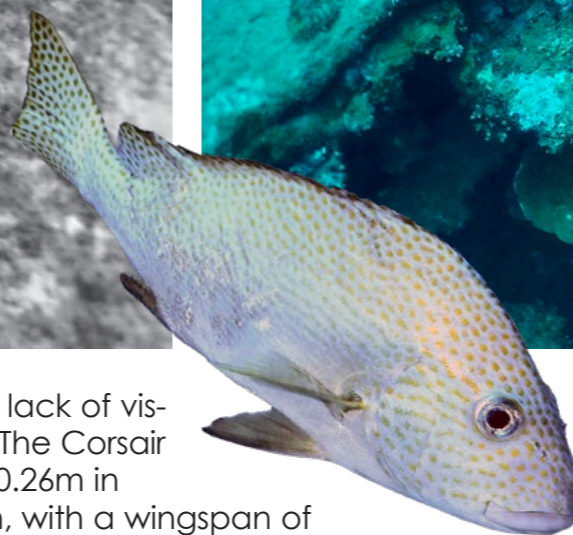
Vought F4U-1 Corsair. On my bucket list was a WWII plane wreck discovered in February 2020 at a depth of over 30m. It was a Vought F4U-1 Corsair fighter used in the Pacific War. It turned out that the Turtle Bay Airfield (Fighter 1) was constructed in late 1942 on a coconut plantation by the "Seabees," also known as the 3rd Naval Construction Battalion of the US Navy. American units of the US Marine Corps (USMC) were



based there in March and April of 1943, and VMF-213/VMF-214 pilots operated the F4U-1 Corsair for their raids on Guadalcanal in the Solomon Islands.

Fierce fighting took place against the Japanese. The F4U Corsair was a highly performing

fighter plane at the time, with an 11 to 1 success rate against the Japanese Zero. The triple-bladed propeller plane had a so-called "bird cage" cockpit, located far back, behind the nose and behind the folding wings. This made landing tricky for pilots due



to the lack of visibility. The Corsair was 10.26m in length, with a wingspan of 12.5m, and was armed with six .5-inch (12.7mm) M2 Browning machine guns, three in each outer wing.

A local named Johnny, the landowner of the site, knew the location of the wreck. However, on arrival at the site, there was no buoy to mark the wreck. "It's around here..." said Johnny, gesturing with his hand. It was like looking for a needle in a haystack!

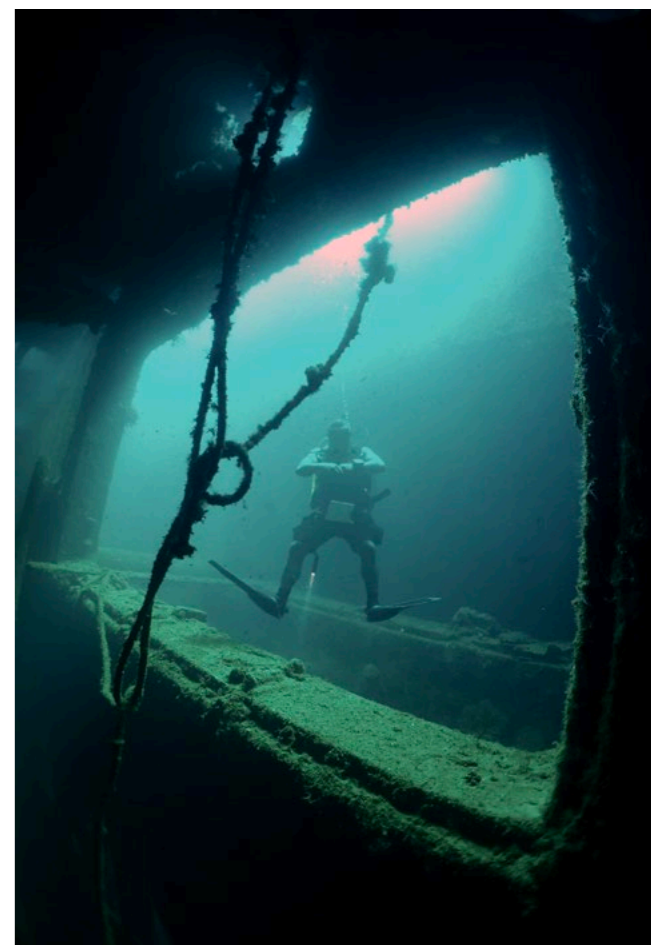
Losing hope for a while, I suggested that the dive guide go in first and have a look around. As luck would have it, just five minutes later, her safety sausage popped up at the surface. She had found the thick, algae-covered rope that led down to the wreck.

I jumped in. The visibility was fair. The whole aircraft was intact, resting on the white sand, facing south-southeast.

Diver on wreck of SS *President Coolidge* (above) and inside the ship (right)

The three blades of the propeller were missing, as the fighter had crashed shortly after take-off from Turtle Bay Airfield, probably due to engine failure or perhaps the loss of the propeller. The tail of the aircraft was broken in front of the tail rudder and twisted to the right. The cockpit glass was gone, as were the dashboard and instruments. The pilot's seat was still there, empty.

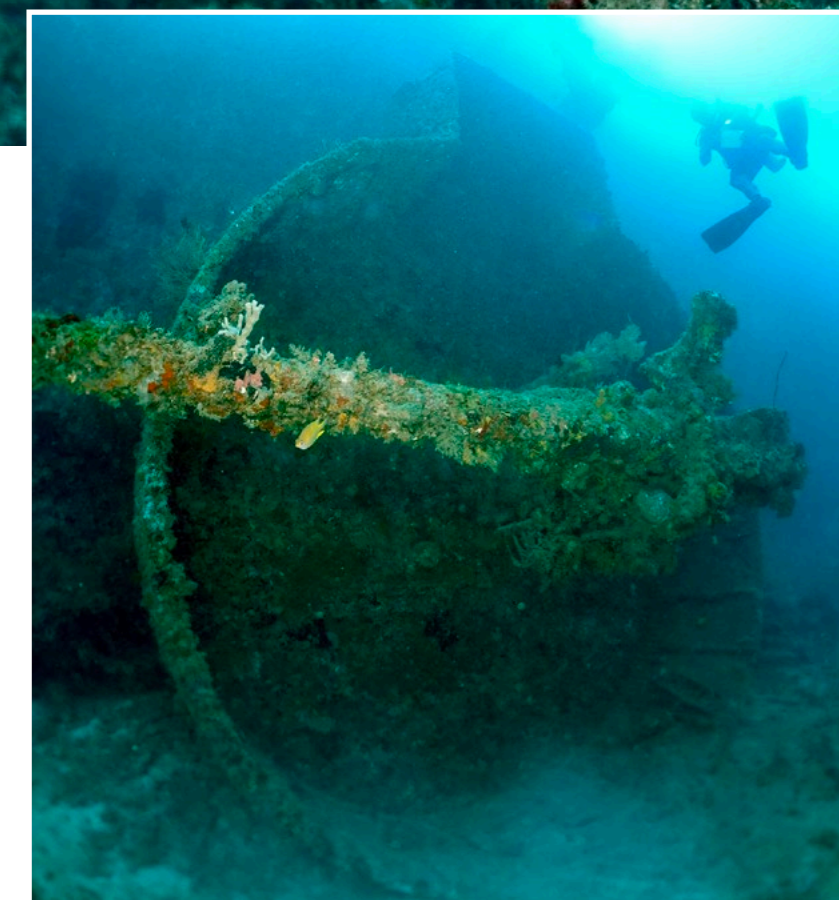
Two friendly groupers were playing hide-and-seek around the nose of the plane. A silvery painted sweetlips (*Diagramma pictum*) zoomed towards me with curiosity. The maximum depth was 32.6m, with a dive time of 30 minutes. The water temperature was 30°C. I estimated the distance from the shore to be about 300m, next to the old airstrip.



View of the Corsair wreck from the rear starboard side (top left); The broken tail twisted to the right (above); Painted sweetlips on the Corsair wreck (centre)



Diver and superstructure (left), a box of shells (above), and diver inside a hold (right) of SS *President Coolidge*



Diver on deck (above), cinnamon clownfish (right), and pearlscale angelfish (centre) on SS *President Coolidge*

SS *President Coolidge*. I did not dive Million \$ Point, because I did not think much of it. As it was so renown, I did a dive on the SS *President Coolidge* instead. However, I was not impressed with this site as the visibility was poor and also because it was too deep. These were the two most famous dive sites in Santo, but far too touristy for me—unfortunately, another obvious “booby trap.”

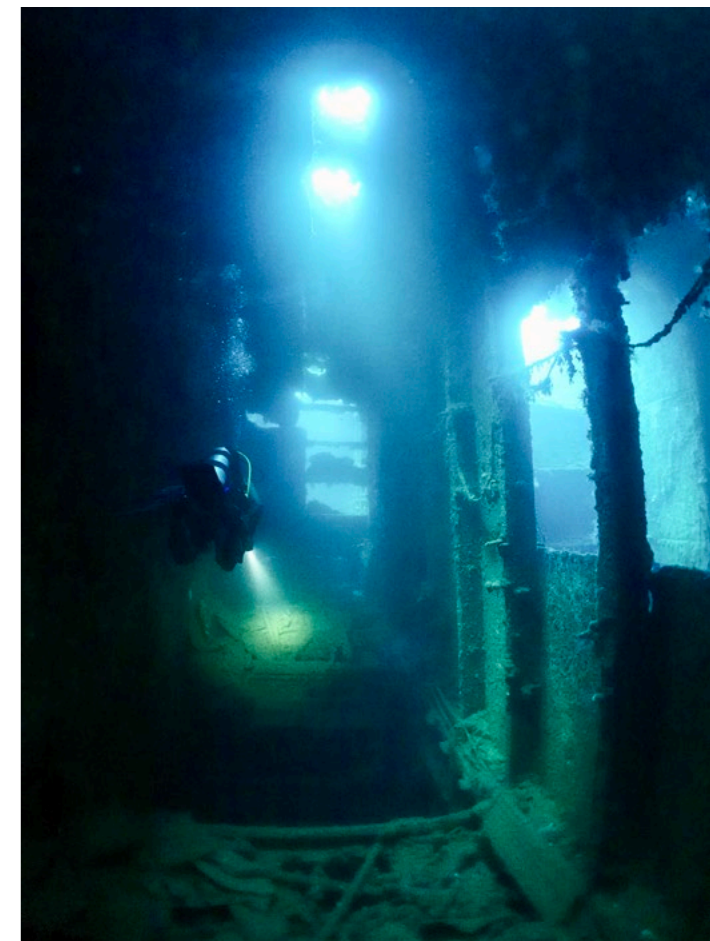
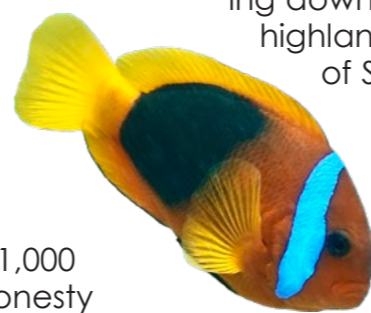
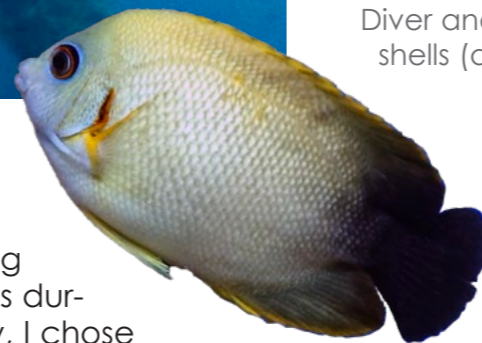
Matevulu Blue Hole. Last but not least on my wish list was the Matevulu Blue Hole, near the overgrown Turtle Bay Airfield. An entrance fee of VUV 1,000 was required in the honesty

box. As it can turn into a public swimming pool for kids during the day, I chose to dive the site early in the morning before 8:00 on a Sunday. This is when all the locals go to church. At a maximum depth of 18.5m, this freshwater spring is the result of rainwater run-off seeping down underground from the highlands on the western side of Santo.

A shorty was recommended here, as the water temperature was 25°C. Amidst the sharply carved limestone rocks, the

bottom was very silty, but there were beds of green moss and pretty underwater plants. What piqued my curiosity was the fish life, which included freshwater and, surprisingly, salt-water species too.

There were inquisitive little schools of spotted scats (*Scatophagus argus*), which were silver and square-shaped, with dark spots. Mangrove red snappers (*Lutjanus argentimaculatus*), which were silver with light bars and red fins, were common. Other species included the rock flagtail (*Kuhlia rupestris*) with black-tipped tail lobes. A school of vermiculate rabbitfish (*Siganus*





Matevulu Blue Hole at Turtle Bay (left); Spotted scat with fallen tree (above and right); Roots and plants create an eerie scene in Matevulu Blue Hole (bottom left).



vermiculatus) skimmed the bottom. I was astonished to meet three silver jacks or white trevally (*Pseudocaranx dentex*) with yellow fins and a prominent keel on the caudal peduncle.

Quite a few logs were found underwater, and there were a lot of roots and grasses along the banks of the blue hole. From Matevulu Blue Hole, a river flowed east and then south into Turtle Bay. Surfacing after a 55-minute dive, I noticed a dusky sleeper (*Eleotris fusca*) close to the edge of a muddy bank. Although I had heard that they might be present, I did not see any freshwater eels.

Endemic species and expeditions

Of the 49 freshwater species in Santo, ten species are endemic. There are also 917 species of marine fishes recorded in

Santo, as of 2006. The ten largest coastal fish families are the Labridae (81 spp.) and Pomacentridae (81 spp.), Gobiidae (72 spp.), Serranidae (49 spp.), Apogonidae (37 spp.), Chaetodontidae (31 spp.), Acanthuridae (28 spp.), Blenniidae (25 spp.), Scaridae and Holocentridae (21 spp. each).

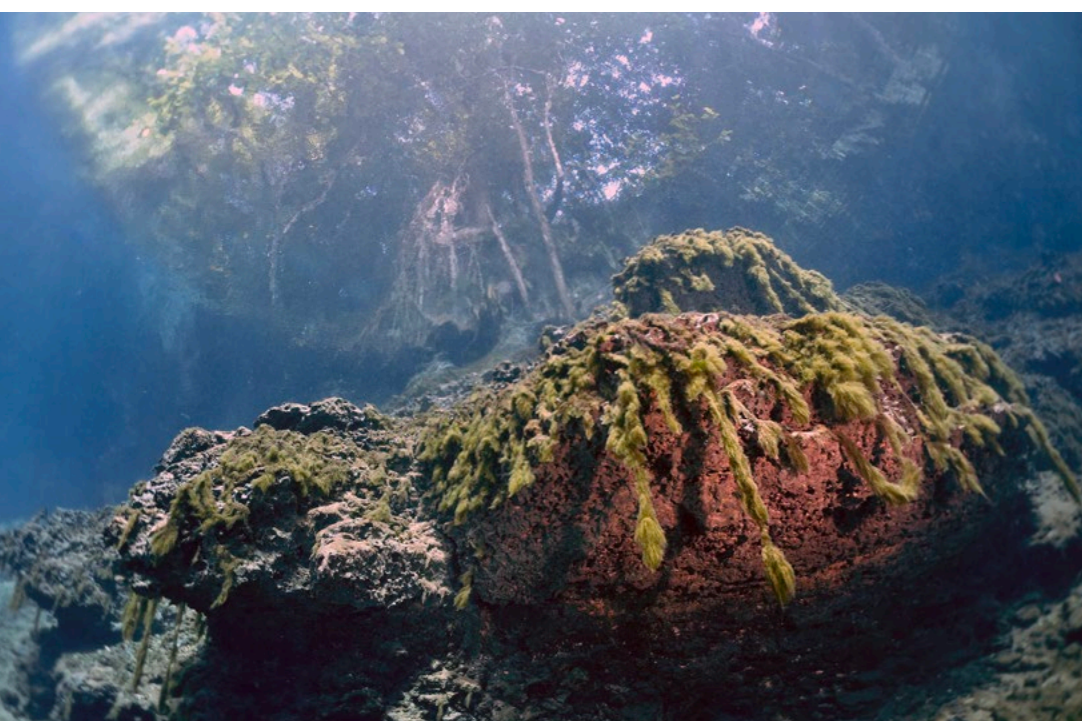
There have been numerous scientific expeditions to Vanuatu over the past 240 years. James Cook was the first to undertake one here (1768-1771), followed by the Frenchman Louis Antoine de Bougainville on *La Boudeuse* and *L'Etoile* in 1768.



The Whitney South Sea Expedition of the American Museum of Natural History took place in 1924. This was followed by the Oxford University Expedition in 1933 and the Royal Society Percy Sladen



School of vermiculate rabbitfish (above), dusky sleeper (right), and spotted scat (centre) in Matevulu Blue Hole



Sunbeams stream down into Matevulu Blue Hole (above); Aquatic plants on limestone rock (left)



Expedition in 1971.

The most recent was the 2006 Santo Expedition, organised by the research institute

for development (IRD) at the Museum d'Histoire Naturelle in Paris, with 233 participants of 24 nationalities, including

155 scientists. With an operational budget of US\$1.1 million, and using the research vessel *Alis*, it covered all aspects of research on land and underwater, including cave diving explorations in the freshwater subterranean systems. A remarkable 572-page book, *The Natural History of Santo*, was published in 2011.

Final thoughts

Seen from the great blue yonder, Vanuatu certainly glistens like a snapshot of paradise. The reality is somewhat different. Either Port Vila or Luganville are tourist destina-

tions in their own right, attracting high-income Australians and New Caledonians.

I got the impression that foreigners were seen as "walking banks." Food and accommodation were by no means cheap, and the cost of living was high, even higher than in New Caledonia. A counter-effect of colonisation, I suppose.

But once you get off the tourist trail, you will find, like a breath of fresh air, how nice, friendly and hospitable the local Ni-Vanuatu are. All you have to do is sit down, entertain them with your time and share some stories. Doors will then be

opened to you with a genuine smile of kindness and curiosity. ■

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

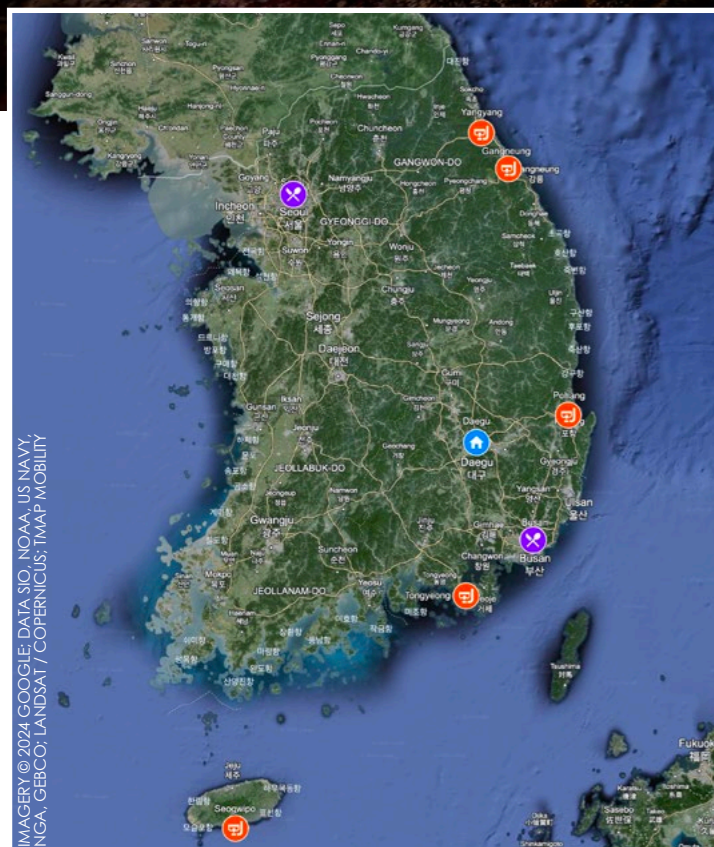
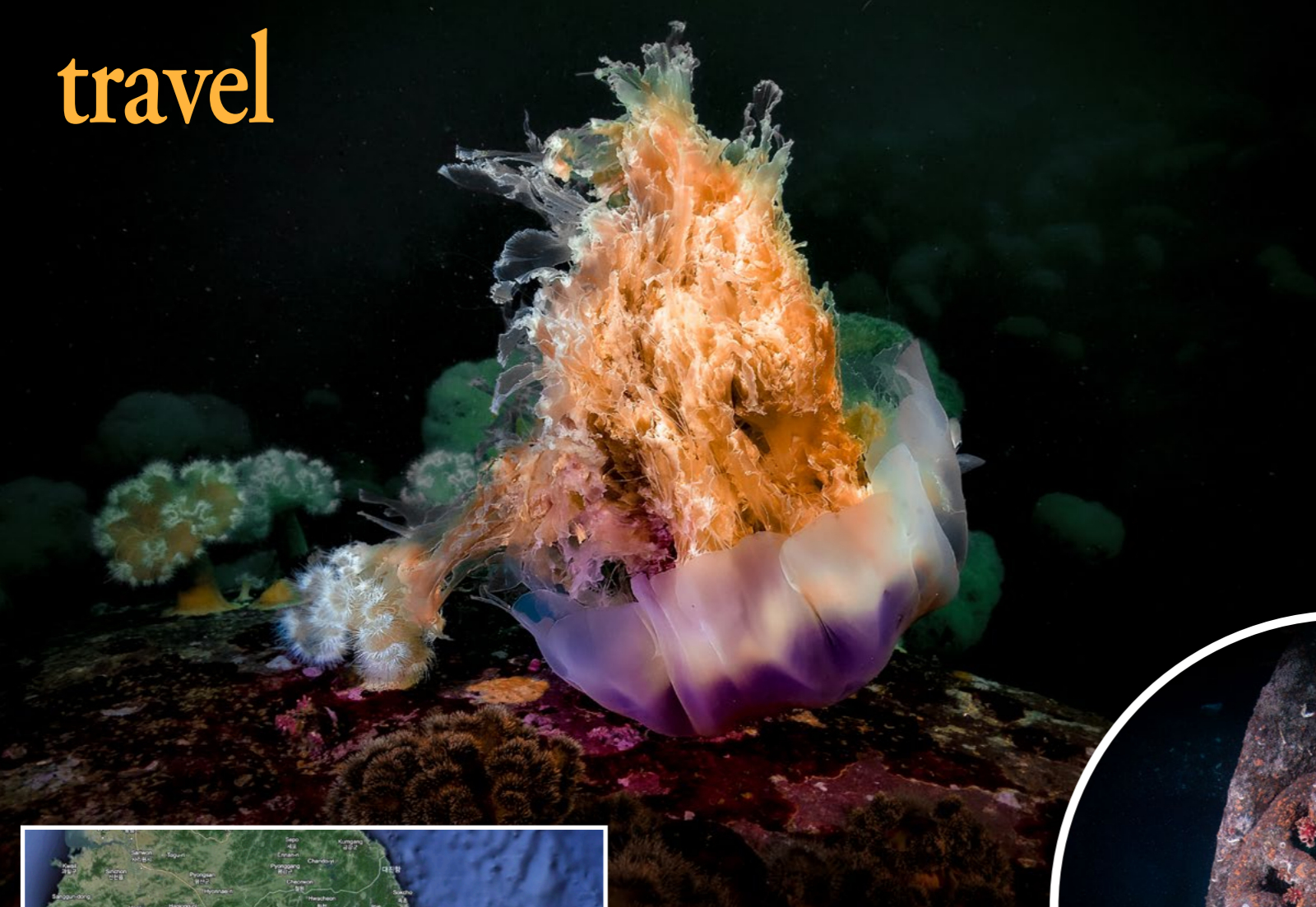
SOURCES:
BOUCHET P, LE GUYADOR H, PASCAL O. (EDS) 2011. *THE NATURAL HISTORY OF SANTO*. IRD EDITIONS, MUSEUM D'HISTOIRE NATURELLE.
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VANUATU TOURISM
WIKIPEDIA.ORG

South Korea

Text and photos
by Drew Holder

*Diving, Nature Trails
& Fine Dining*





Lion's mane jellyfish (top left) and giant plumose anemone (top right) at Yangyang; Anchor chain near the propellers of the *Stella* wreck at Gangneung (center); A beautiful *Sakuraeolis gerberina* nudibranch at Pohang (previous page)

South Korea has a lot to offer underwater photographers, recreational divers, and technical divers, from wall dives and artificial reefs to a variety of marine life and a wide array of nudibranchs, not to mention topside attractions to enjoy between dives, from beautiful nature parks and scenic trails to cultural events and fine dining. Drew Holder gives us an inside look.

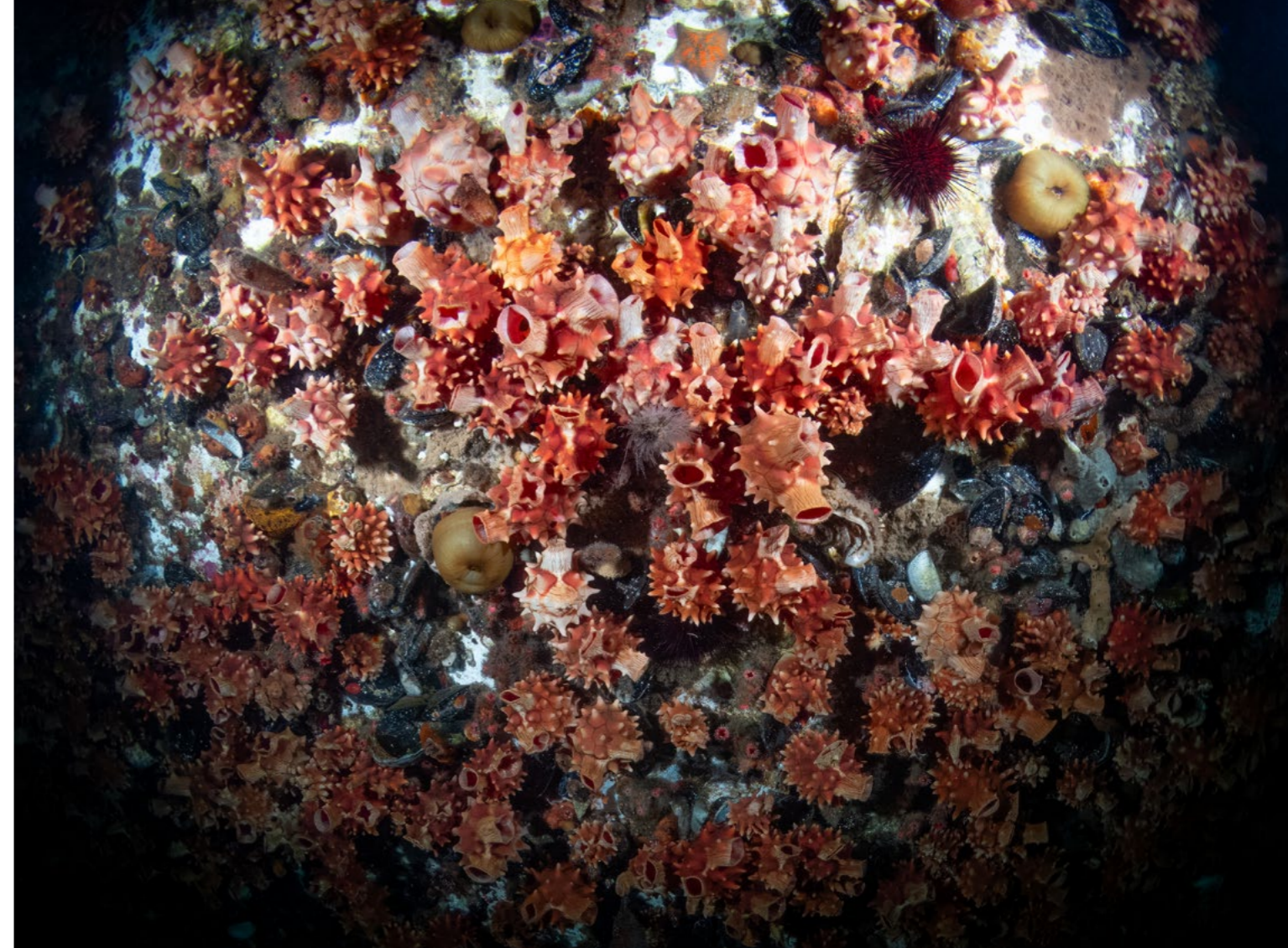
South Korea has been a hidden gem of a dive destination for both my 11-year-old son and me. After living in South Korea for almost two years, we have had the opportunity to explore several areas from Yangyang on the northeast coast down to Jeju Island in the south of the peninsula.

Much of the east coast down to the south coast is rocky coastline with cliffs in many areas. There are several sandy beach areas on the eastern and southern coasts that can facilitate shore diving, but most diving is done by boat. The

Fun topside excursions include one of the many well-maintained trails leading to Udusan Chulreong suspension bridge in Gayasan National Park near Daegu

Map of South Korea showing dive locations mentioned in this article (red dots), Daegu (blue dot), and Seoul and Busan (purple dots) where you can explore 36 Michelin Star and 72 Bib Gourmand restaurants.





King post on the deck of the *Stella* wreck, Gangneung (left); Divers explore the hull of the wreck (top left); Divers explore the hull of the wreck (top left); Communications rack deep inside the wreck (top center); Hundreds of sea pineapples on the hull (top right); Diver on the deck (right)

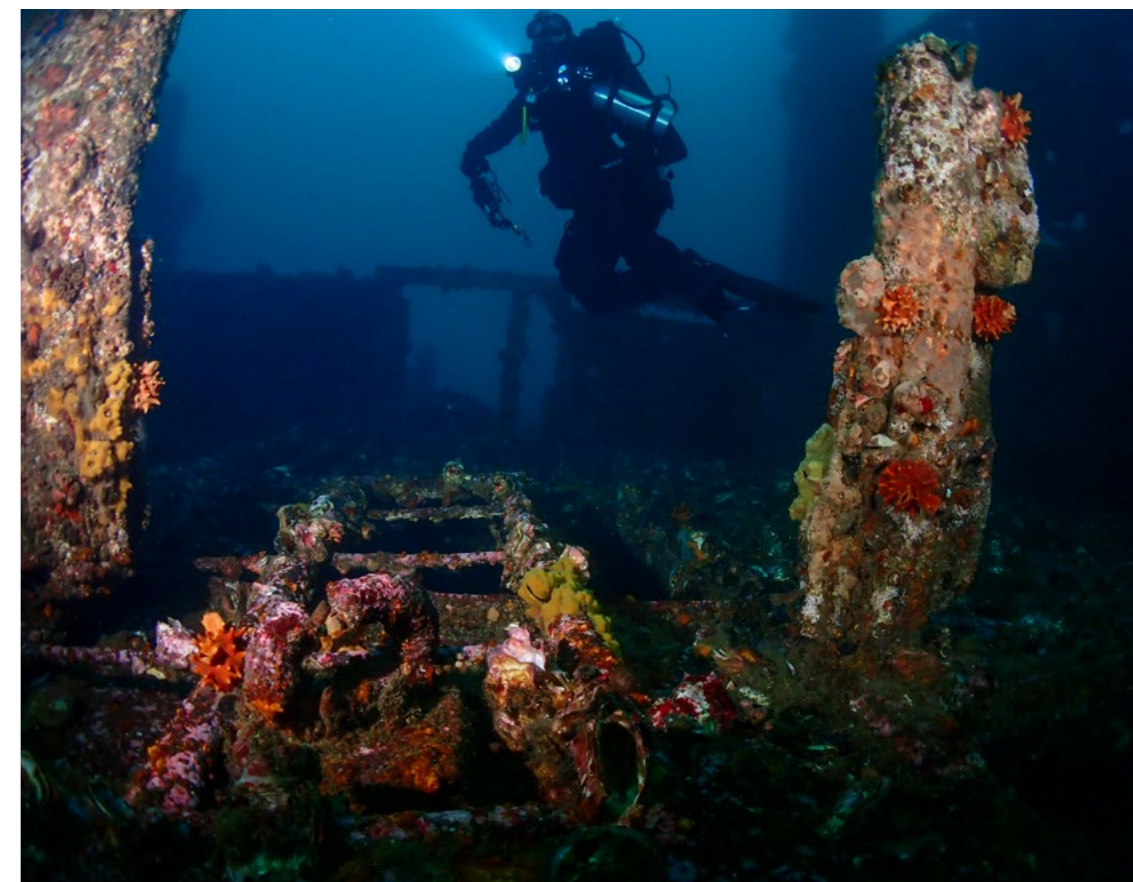
western coast of South Korea has shallower waters with tidal mudflats that do not offer as many diving opportunities. Below are five locations around South Korea and photos of some of the biodiversity that I have seen along the way.

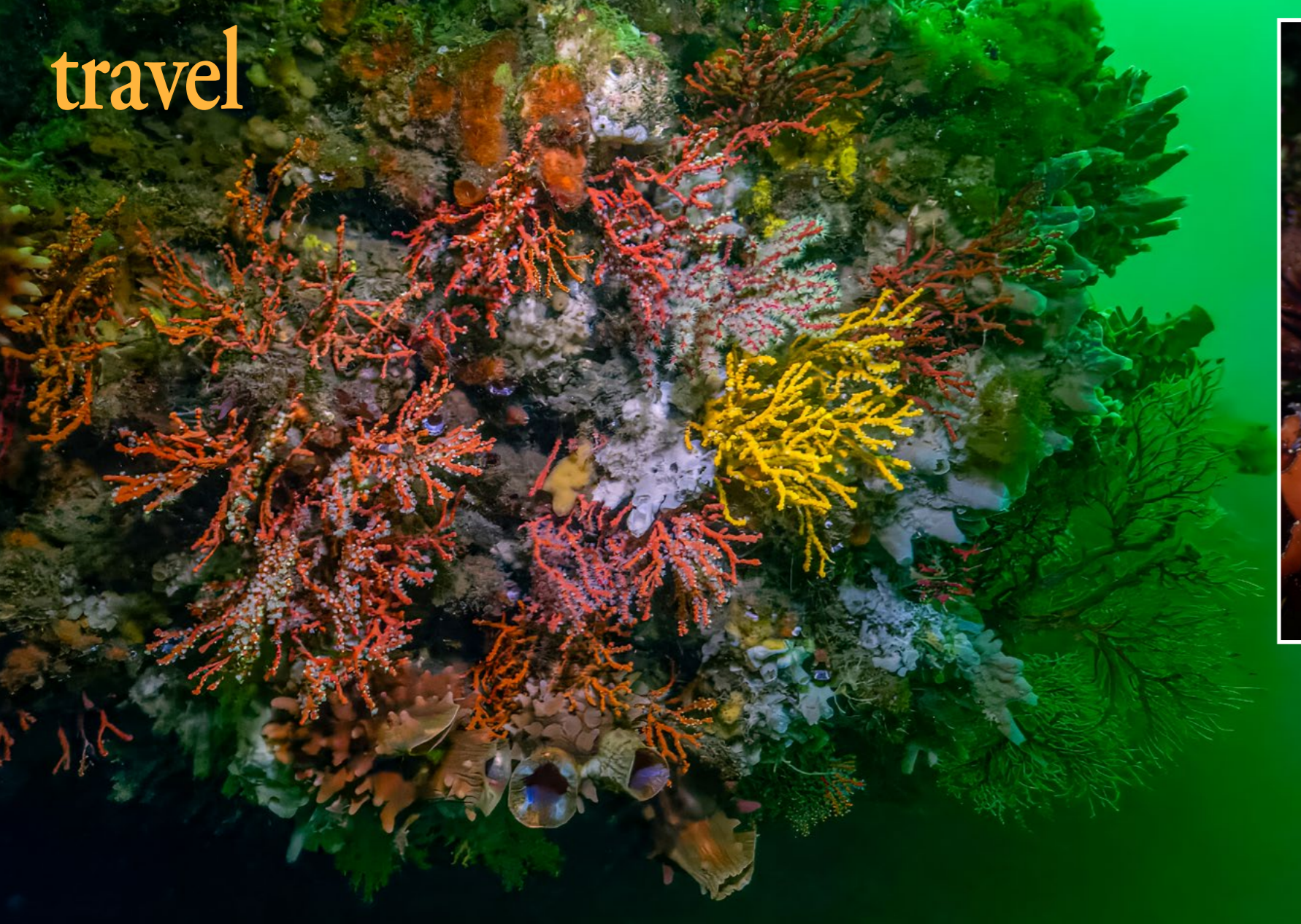
Yangyang. Located on the East Sea, also known as the Sea of Japan, this area offers deeper waters closer to shore. My experience in this area was in November with water temperatures of 52°F (11°C) at a depth of 90ft (~27m). Marine life in this

area includes jellyfish, plumose anemones, and several species of pufferfish.

Gangneung. This area is the home to the *Stella* wreck, a fishing trawler that was sunk as an artificial reef and tourist attraction. The wreck lies in about 100ft (~30m) of water and is frequented by moderate to strong currents. Other artificial reefs such as armored personnel carriers and various types of military equipment can be found in the area.

Pohang. This location became my most frequented area to dive as it was only an hour's drive from where I lived. This area boasts a variety of life with patches of cold-water cor-

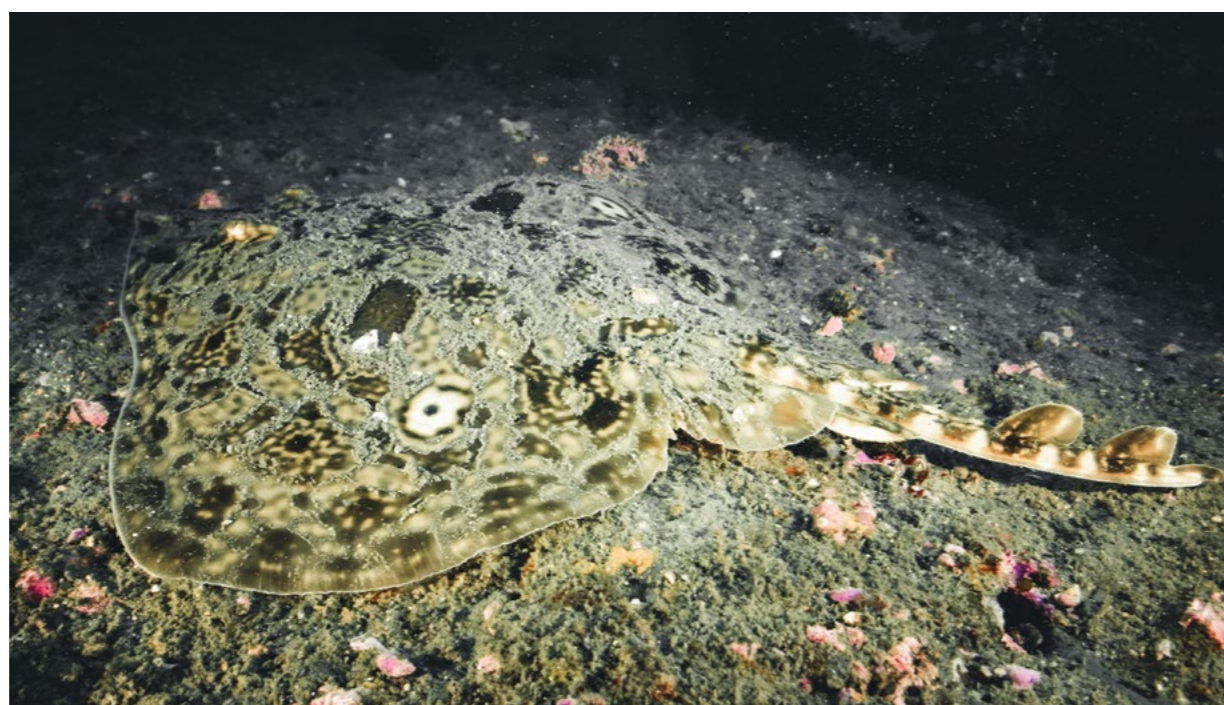




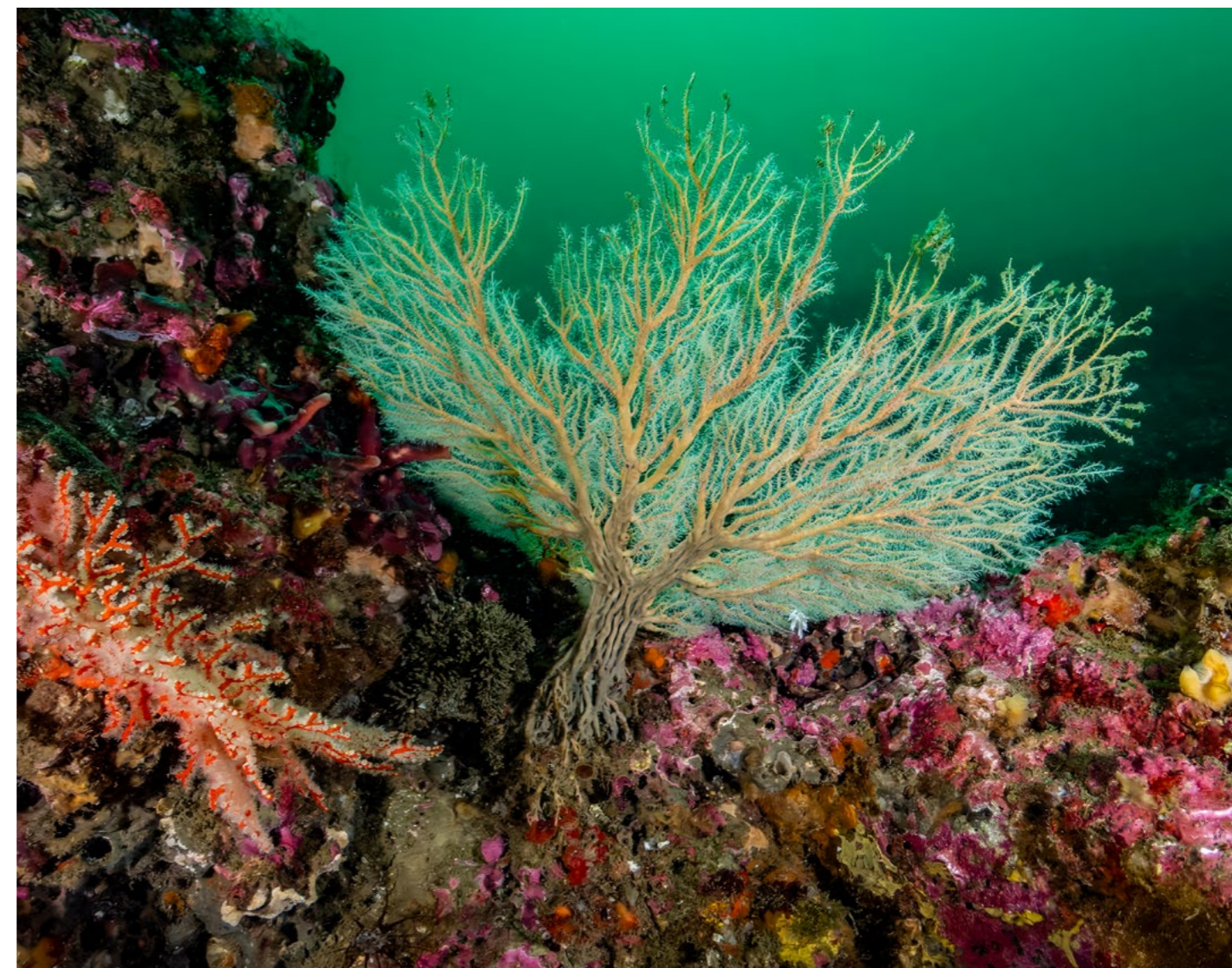
South Korea

Offshore in the East Sea at Pohang: Cuttlefish in a defensive posture (left); Red and yellow corals mixed with tunicates (far left)—in summer, the waters turn green from algae growth; Tree-like corals grow in areas frequented by current (below).

als, many different types of nudibranchs, skates, octopus, and even cuttlefish. Farther offshore, the bottom is composed of some sandy areas that are sandwiched between massive boulders. Some areas have small canyons that look like riverbeds and are unique to swim through. Closer to the shore, there is a large, sheltered harbor that receives less surge, allowing the underwater plant life to thrive. In this kelp habitat, there are many sea hares ranging in size from tennis balls to basketballs.



Large skate resting on the seafloor, offshore in the East Sea at Pohang



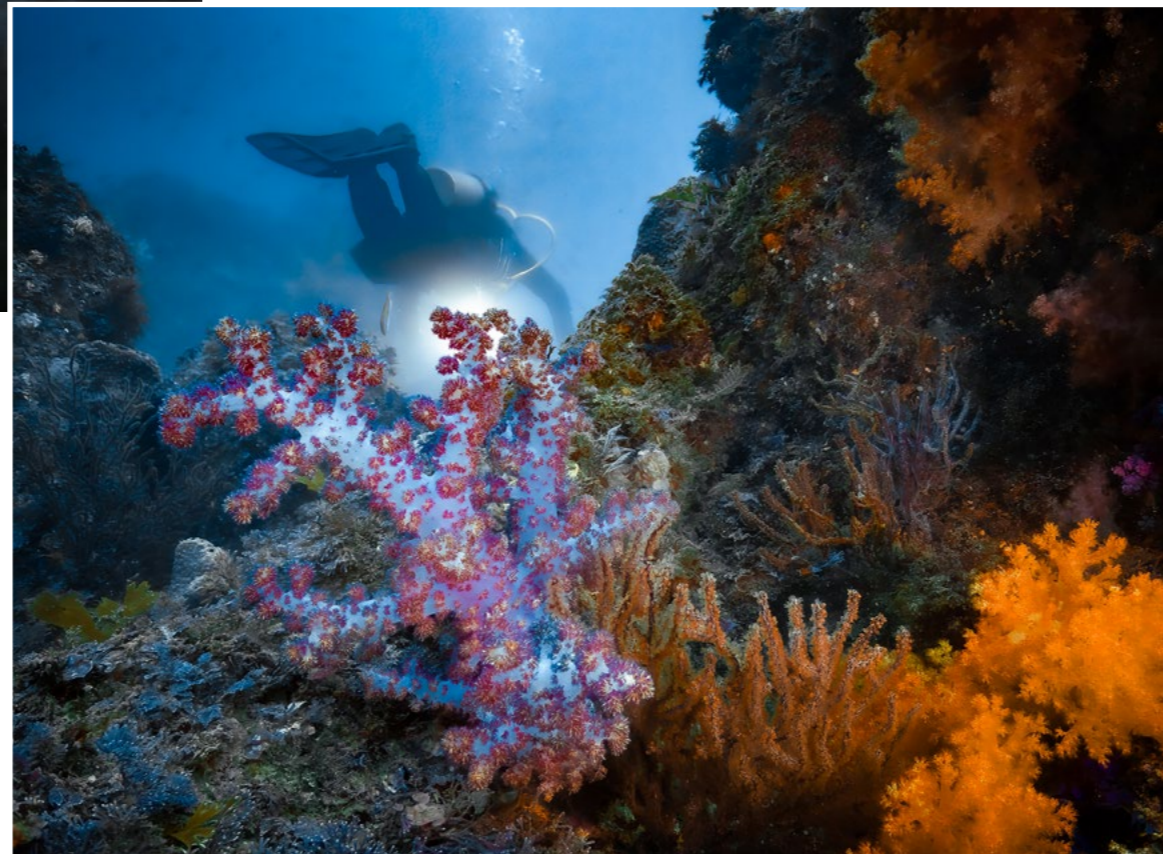
At Tongyeong in the South Sea: Octopus concealing itself under a ledge of barnacles (right); Gold and purple crinoid (far right); Lionfish on rocky reef (center); Curious filefish inspecting my camera lights (below).



Tongyeong. Unlike Yangyang, Gangneung, and Pohang, Tongyeong is in the South Sea. The land features of this area have a multitude of small peninsulas and islands scattered along the southern coast. The dive operator that I used would take divers by boat an hour south, past most of the commercial fishing areas, out to remote islands. The boat would then drop divers off around these small islands for a wall dive type of experience. Here you will find more tropical species of fish, anemones, lionfish, crinoids, and nudibranchs.

Colonies of small anthozoans cover many of the rocks around the various islands in the South Sea at Tongyeong.





Jeju Island. I only had one opportunity to experience diving in Jeju and it was great! Most people fly to Jeju Island, which is south of the Korean peninsula, but I took my family by ferry from Mokpo, on the southwestern coast, and it was far superior to traveling there by air. The four-hour ferry ride was relaxing and felt more like a cruise ship than a ferry. The ferry allows you to take your rental or personal vehicle, and there are restaurants and plenty of activities to do on board.

Once on the island, we traveled to the south side as most of the dive centers are in Seogwipo. I did three dives on my trip, the first two had excellent visibility and amazing soft corals everywhere. For the third dive, I asked the guide if

Colorful soft corals on the rocky reef at Seogwipo, Jeju Island (above and top left); Impressive white variety of black corals at Jeju Island (top center).

At Seogwipo on Jeju Island: Columnar basalt formations on the coastline (above); My son Mark sits on a shelf of solidified volcanic ash that has been eroded by changing water levels over the eons (top right).



With black spots on its white body, this *Chromodoris orientalis* nudibranch resembles a Dalmatian (left).

full of life, covered with thousands of soft corals and tropical fish.

Nudibranchs!

there were any shipwrecks in the area. He said, "Yes, but it will be a difficult dive."

This third dive was amazing, even though the visibility was less than ideal. On this dive, the current was strong, the depth was 130ft (~39m), and there was a tourist submarine lurking in the background behind the haze of the water. However, the wreck itself was

Every dive site I visited in South Korea had nudibranchs. After hundreds of dives in tropical areas of the Pacific, it was always a rare treat to see a nudibranch. It is a different story in the waters of South Korea—the nudibranchs are everywhere! The pictures I present here are just a few of what can be seen, but there are many more out there.



At Pohang: Cherry blossom nudibranch (above); *Hypselodoris festiva* nudibranch, or blue dorid, showing off its vivid blue colors (top right); The Hiro's sea slug is extremely small in size (top left); A type of *Dendrodoris* nudibranch (far left)



An elevator platform is commonly used to lift divers and their gear from the tag line to the dive boat.

Korean style dive boats
The main feature that most dive boats in South Korea have in common (and is the most convenient) is the use of an elevator system instead of ladders to get back on the boat after the dive. These systems use a winch mounted on the top of an elevator that lifts a platform out of the water, carrying one or two divers at a time. Entry into the water, however, remains the standard means, with either a back roll or a giant stride.



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Topside excursions

After almost two years of traveling in South Korea, it is difficult to pick my favorite sites from the many places my family and I have explored. Here are a few places that were exceptional.

Homigot Sunrise Square, located in Pohang, in the easternmost part of the country, is famous for its sculpture of a hand reaching out from the ocean (note the seagull in the photo for scale). As the most easterly point in South Korea, it receives the first sunrise each day. If you



Each winter, an ice mound is “grown” for the ice hill festival at the Biseul Mountain Recreational Forest (left), about an hour’s drive from Daegu; View of the giant hand sculpture and the pier at Homigot Sunrise Square in Pohang (above); Seagulls perch on the tips of the fingers of the hand sculpture overlooking the sea (right).

arrive early enough, you can photograph the sun and the sculpture in the same frame.

Jeju Island has a milder climate than the Korean peninsula and feels much more subtropical. The island has many attractions, with my personal favorite being the geological and volcanic features. There are areas along the coastline where you can see different layers of volcanic ash deposits that span thousands of years, revealed by water erosion. You can also find columnar basalt, a hexagonal lava rock formation created when lava comes in contact with water.



TRAVEL TIPS

Navigation apps. Use one or all of the following while in South Korea: Naver, Kakao, or Waze. (Most apps from outside South Korea will not work.)

Translation apps. Papago seems to give the best results for translating English to Hangul. I have noticed that many of the locals use this as their primary translation app. Google Translate also works, but it may not convey more complex sentences as accurately.

Cell phones. Make sure your cell phone supports LTE data and can operate on bands 3, 8 and 26. If not, South Korea has a robust, free WiFi network throughout the country, enabling you to make calls when within range of a router. ■





Entrance to one of the temples on the top of Biseul Mountain (left); The view from the three-way suspension Udusan Chulreong Bridge at Gayasan National Park was well worth the 30-minute hike up the mountain (right); The scenery and ancient atmosphere at Biseul Mountain made the visit to this area feel otherworldly (below).



Biseul Mountain Recreational Forest. Located about an hour's drive inland, just outside the city of Daegu, this place is a great attraction to see in winter. An ice hill festival is held here annually, for which an ice formation is "grown." It can be seen while hiking in the forest. The hazy forest with ancient temples along the path is a must see.

Gayasan National Park. If you are looking for some crazy scenic views from a three-way suspension bridge, look no further than the Udusan Chulreong bridge in Gayasan National Park. The park is located just west of Daegu. It takes about 30 minutes to hike up a winding staircase to the top of the mountain, which leads

to the wobbly bridge—for those who are not afraid of heights.

Apsan Mountain. Finally, a view from the top of Apsan Mountain, located in Daegu Apsan Park, south of the city. There is an intriguing directional sign here, showing where South Korea sits amongst the rest of the world.

At the summit of Apsan Mountain in Daegu, you can see the city from above as well as this intriguing sign showing directions and distances to cities around the world.

Delicious lunch at the café in the Osulloc Tea Museum in Seogwipo on Jeju Island (below); Tasty Korean-style BBQ (bottom left); A fun, Oreo-decorated cake from a Korean bakery (center)



An array of Korean side dishes called *banchan* (above), placed in the center of the table, is shared among dining companions. (Wikipedia)



Topside Fare: Fine Dining in Seoul & Busan

Text edited by G. Symes

In South Korea, there is plenty to enjoy between dives when it comes to fine dining. There are 36 restaurants in the country that have been awarded Michelin stars, one of the highest honors a restaurant can receive.

While 33 are located in Seoul, three are in Busan on the country's southeastern coast. After diving in the northeast at Yangyang and Gangneung, why not make a stop in Busan for some fine dining on your way south to dive at Tongyeong and Jeju Island?

Bib Gourmand
There are also 15 restaurants in Busan and 57 restaurants in Seoul that have received the Bib Gourmand award for quality cuisine at moderate prices. So, you do not have to break the bank to eat well.

Final thoughts

South Korea never seemed like a bucket list dive destination to me, initially, but I have come to appreciate its beauty after seeing it first-hand. It may not be for the tropical, warm water enthusiast. However, if you want to see unique things and experience



Vegan course at A Flower Blossom on the Rice restaurant in Seoul

Green Star

For eco-conscious diners, there are three restaurants that have received the Green Star, which recognizes sustainable practices that meet both ethical and environmental standards: the Michelin-starred Fiotto in Busan, and Gigas and A Flower Blossom on the Rice in Seoul.

Food tasting tours

There are also a number of

food tours to enjoy in cities across the country, including tours of local food markets, street food stalls, little known cafés, and tours led by local chefs. Explore a taste of **Busan** or a **foodie tour in Seoul**. ■

For more information, see the Michelin Guide at [guide.michelin.com](https://www.michelin.com) or the **K-Food Tour Guide**.

SOURCES: MICHELIN GUIDE, KOREA TOURISM ORGANIZATION

Cuisine

When my family and I moved to South Korea, we really did not know what to expect when it came to food options, but lucky for us, we were in for many delicious treats. We were pleasantly surprised to discover that you did not have to go far in the cities to find a café, a

bakery, or just about any genre of restaurant.

Not only have we come to appreciate the taste of the food, but we have been consistently blown away by the level of detail, craftsmanship, and pride that the chefs put into their creations. South Korea has certainly spoiled our taste buds.

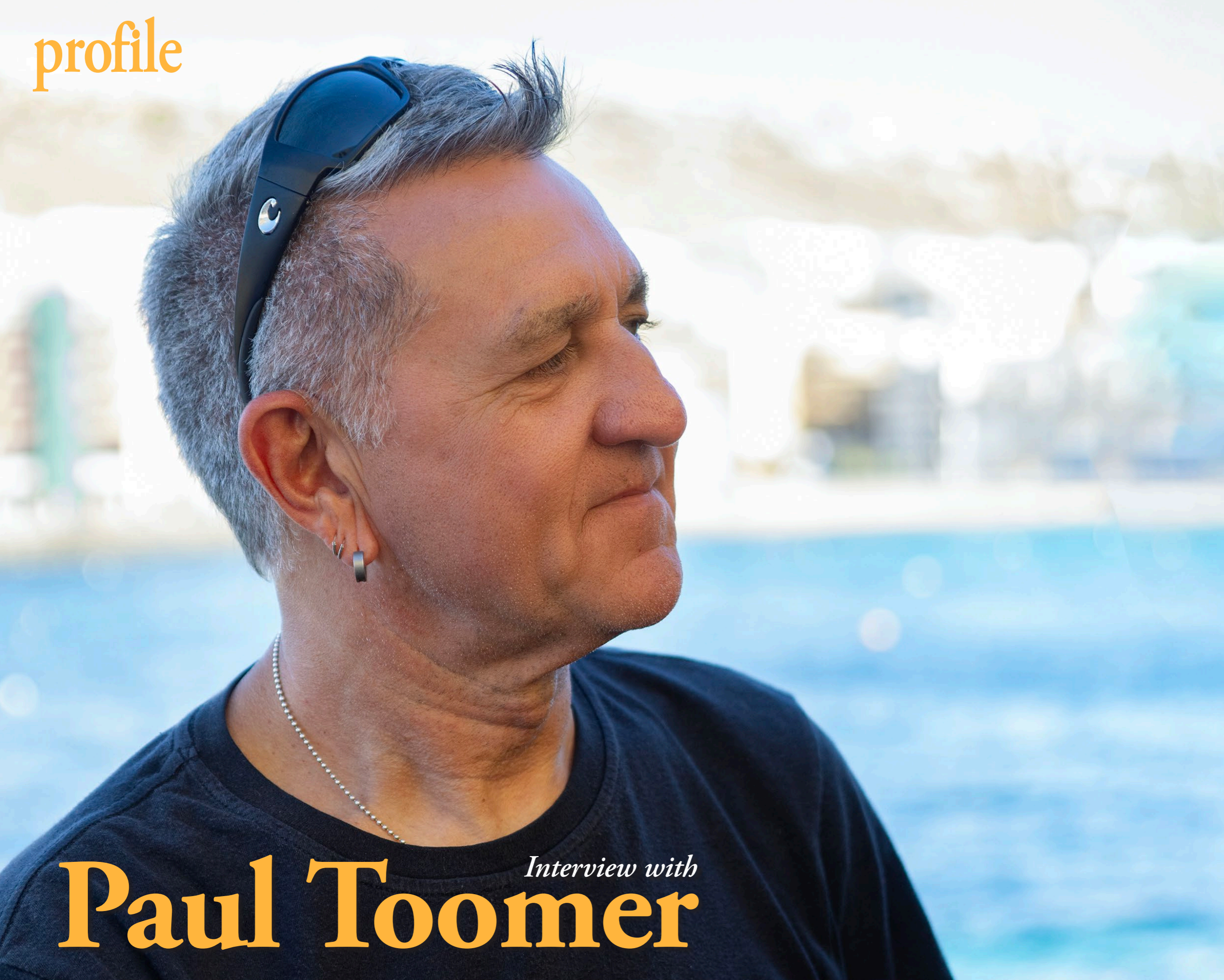
As of early 2024, there are now over 200 Michelin-recognized restaurants in the country, including 36 Michelin-starred restaurants and 72 Bib Gourmand (good, yet moderately priced) establishments in the capital city of Seoul, as well as in Busan on the southeastern coast (- Ed).

a new culture by taking the road less traveled, then go dive in South Korea! ■

Drew Holder is an American underwater photographer based in Daegu, South Korea. Visit: [Instagram.com/h20_life_below](https://www.instagram.com/h20_life_below)

Special thanks go to Yellow Submarine Dive Center in Daegu. Course director, Mr. Lee (aka Red), has helped US and international divers for many years, offering PADI training and guided tours of the East Sea of Korea. Visit: [yellowsubmarinedive.modoo.at](https://www.yellowsubmarinedive.modoo.at) (for English, use your browser's translation tool).





Interview and photos by Peter Symes

Paul Toomer, the CEO of RAID, is a pioneering figure in dive education. With a passion for exploration and safety, he spearheads initiatives to advance dive training worldwide. Peter Symes caught up with him to learn more about his insights and perspectives.

What do you find most rewarding about diving, and how has it enriched your life personally?

PT: Ok, sit down as this may take a while.

I am a diver first and a professional second. Diving not only allows me to share my passion with other divers, but it also allows me to do the one thing we all love the most: exploring. It doesn't matter to me whether I'm on a 6m dive on a single tank or diving an ancient wreck at 130m with a rebreather; I always feel like I'm exploring.

If you were to walk through a game reserve on land, you would probably get eaten by lions, but underwater, you can swim with apex predators, and they are gentle and allow you to see into their world. That's truly incredible. And to see the look on someone's face the first time they see a shark or a dolphin, well, that's just magic.

I love diving, teaching diving, and exploring, but it's not just about the dive, it's about sharing those moments with people you love. I am one of the luckiest divers on the planet, as I have met, dived with, taught, and been taught by some of the most incred-

Interview with
Paul Toomer



Paul Toomer presenting at the Go Diving Show 2024 in the United Kingdom (left). He was one of the speakers at the Rebreather Forum 4 in Malta in 2023 (below).

Paul Toomer

My dream is to leave the industry in a better state than we found it.

What are the main challenges associated with current teaching methods in diving, and what improvements or developments would you like to see in the industry?

PT: Teaching methods are definitely changing, and in many cases for the better. It's always a balance between quantity and quality, right? You can have loads of divers on a course, but will the quality be there? I know so many professionals who have made quality and safety their main focus, and they are extremely successful, and happy too.

I want to see general diving become safer too. Generally, people do not like change, but our industry is rallying together to try and change it up a gear. Look at how many professionals and divers are using a long hose setup in recreational diving. Look at how important buoyancy and trim have become even for new open water divers, not just the tech divers.

I love that we have such inter-agency cooperation as well. A fine example of this is the Rebreather Training Council (RTC). Many of the world's leading agencies have worked diligently together to try and make rebreather diving safer, and this has resulted in many great safety initiatives and also the production of the new rebreather ISO standards.

How can we effectively integrate technology, e-learning, and in-person instruction to enhance dive training?

PT: Just do a RAID course. It's already there, ha, ha.

With e-learning, the landscape of teaching has changed quite a bit as most instructors have moved from delivering a formal presentation with a slide deck to prescriptive teaching where only missed questions are answered.

Instructors are, and always will be, the most important part of any diver's education. Training agencies provide training standards and course materials that guide the instructor in achiev-



ible people. This industry has been very kind to me, that's for sure.

When you acquired RAID, what was your initial vision for the organisation, and how has that vision evolved over time?

PT: I have been an instructor and trainer with many amazing training agencies, and I have been lucky enough to learn with some spectacular people. I wanted to meld all I had seen and learned into one training platform.

When we started writing the training materials, we knew that our legacy was technical and rebreather diving, but we so badly wanted to engage

with the recreational diving community. So, we built, and continue to build, courses that cross the divide and give divers the very latest in technology, equipment, and diving skill advancements. We were the first to bring neutral buoyancy while in trim diving into the mainstream, and to see new open water divers master so easily, what so many perceive as difficult, is utterly amazing.

We have done amazingly well, and we have released some incredible courses and initiatives. My two favourite initiatives are Zero Fee Membership and FREe-Learning. With Zero Fee Membership, we became, and still are, the only professional agency that

does not charge a membership fee to active professionals. The release of FREe-Learning allows anyone who registers with RAID to download virtually all of our course materials for free—everything from Open Water 20 Diver to Hypoxic Trimix Rebreather.

However, there is so much more that I still want to see RAID and myself achieve. I'm never satisfied, and neither are any of our team members. With the team we have at headquarters, and with all the incredible RAIDers who discuss their ideas with us, I think we are going to bring so many more incredible things to this amazing industry. RAID will lead the way.



Paul Toomer advocates the RAID philosophy at dive shows and conferences around the world (left and below).

Recently, however, we have started to receive requests for old-style PowerPoint presentations, which is quite incredible considering we live in such a digital, fast-paced world.

Encouraging try-divers to continue with training and diving can be a challenge. What strategies do you recommend to keep them interested?

PT: This is very difficult, and I know that the entire industry is trying its best to overcome this challenge.

We live in a world where we have a “bucket list” of things we want to do. It is all about instant gratification and I believe many industries are challenged by that. For example, I do a tandem skydive and I am now a skydiver. I go to a skate park, and I get an hour on a board, I am now a skater. So, we should not be surprised that people do a try dive and then consider themselves a diver and that bucket list item is now ticked off.

All of the successful dive centres that I have seen that convert try divers into qualified open water divers and beyond, spend a lot of time nurturing their relationship with the customer and ensuring that the try-dive experience is not only fun but safe.

They follow up and, in some cases, even recommend another dive centre closer to home to make it easier for the student to become a certified diver.

Many try-dive participants will do the experience at the drop of a hat. Perhaps they are on a cruise ship, and the experience is offered at one of the exotic stop-offs. In this case, they do not have time to sign up for the full course and will probably live far away. If the try dive is an official agency-backed

experience, using agency materials, then the agency can follow up and provide information on local dive centres close to where the try diver lives.

One of the big problems we see in the industry is that some dive centres do not use official materials, and when this happens, there is usually no student registration, making it difficult for the training agency to follow up.

Having said that, thousands and thousands of try-dive participants go on to become certified divers.



Diving often involves significant costs and training requirements. Do you believe there are ways to mitigate these barriers, and should efforts be made to do so?

PT: This question comes up all the time.

If I were to reword the question, it would be: “Does diving involve significant costs?” My answer to that would be NO.

As a certified diver you have a passport that allows you to dive over 70% of the planet. How amazing is that?



RAID

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ing the desired outcome.

Instructors not only interact with the student in the water, but they also (in reality) interact verbally to confirm that all knowledge is understood.

At RAID, we have a series of workshops that our instructors must deliver on every course. The workshops are designed to fill in the gaps that a manual simply cannot provide. These range from “What will it be like where we are diving and what will we see?” to equipment and continuing education. While doing this, vital safety information is also discussed.

profile

Toomer discusses dive safety at a meeting on the island of Gozo, following the Rebreather Forum 4 in Malta.

Yes, you need equipment, and you may have to travel to your destination, but how much is spent on equipment and travel in other sports? Skiers, golfers, mountain bikers, and motorcyclists all spend a fortune on their sport. I went to look at a good mountain bike the other day, and it cost GB£5,000 (US\$6,360) and there was absolutely no option for a discount. Yet that store can't get the product in fast enough.

As professional divers and dive store owners, we need finance to stay in business, and lowering course prices often dilutes the quality of the course.

What safety measures and practices do you personally prioritise to ensure a safe and comfortable diving experience? Are there any tips you can share to make diving more enjoyable?

PT: I have many.

My first rule is the "rule of thirds." I apply this not only to my diving gas, but also to other things like preparing for the dive. If I have three issues, I will cancel my dive immediately. It sounds superstitious, but it has worked for me for over 25 years.

When I arrive at the dive site, my first assessments are the "exit" and "entry" points. It's often easy to get into the water, but it may be impossible to get out.

In addition to the above, I ask the team if we are *all* able to rescue each other and get out of the water easily. If the answer is no, then the dive is aborted.

Do you have a role model or a source of inspiration outside of the diving world that has influenced your personal growth and development?

PT: Lots of people have been amazing to me in all the crazy things I've done, but it has to be my dad. I admire everything he has done and all that he has given me. I could write a book on the guy. You think I'm crazy, he makes me look tame—except for the tattoos.

If you could give one piece of advice to your 25-year-old self, what would it be, given your



experiences and insights into the dive industry?

PT: That's easy. I'd tell myself to learn to dive earlier. I did not learn to dive until I was 30, and I am so sad that I missed all those years.

I have no other advice for my 25-year-old self, as everything I have done has been worthwhile, exciting, and hugely enjoyable. I have had, and continue to have, the best life that I could ever wish for, and it's all due to my desire and those around me helping me to achieve it.

When my grandad was dying, he said to me, "It is better to be born lucky than rich," and I was born lucky. That says it all, really. ■

For more information, please visit: diveraid.com.



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Equipment

Edited by
Mats Gunnarsson

PHOTOS COURTESY OF THE MANUFACTURERS

Aqualung Reveal Ultrafit Dive Mask

This comfortable mask offers a snug fit for all face types with its three sizes and adjustable skirt shape. It ensures the mask fits most divers regardless of facial structure. Easily swap lenses via a snap-in frame and a special tool included. The mask is also equipped with pressure-relieving zones placed in the silicone skirt at strategic points to help alleviate pressure from the mask during long dives. aqualung.com



Northern Diver Arctic Survivor Gloves

These 5mm neoprene gloves are suitable for a wide range of diving conditions where you want to keep your hands warm and your gloves securely in place for the duration of the dive. Neotex wrist seals on the Arctic Survivor gloves form a "water lock" system. This seal system ensures no flush from the gloves, keeping your hands warm. The neoprene ensures a comfortable, snug fit for optimum dexterity. HD Arctic Survivor Gloves are finished with liquid-taped seams and a tough silicone overprint for the more heavy-duty user. The extra protection helps to provide a longer lifespan. ndiver.com



Dynamic Nord Dynaskin Wetsuit Series

The German manufacturer's Dynaskin series is a groundbreaking line of wetsuits crafted from 100% recycled, biodegradable material using Polartec technology. Fitting like a second skin, these suits offer unparalleled protection against wind, water, and cold, all while being eco-friendly. The innovative three-layer construction ensures optimal performance in various weather conditions. The outer layer composed of compressed polyester, nylon and elastane repels water while maintaining flexibility. The Windbloc membrane in the mid-layer blocks moisture and airflow at a microscopic level, providing both weather protection and breathability. The inner layer, made of soft polar fleece, retains body heat, and absorbs moisture. Softer and more elastic than neoprene, this wetsuit has neutral buoyancy, perfect for warm water diving, offering comfort and freedom of movement. It is UV and odour resistant, 100% windproof, water repellent, highly breathable, and quick drying. Available in one-piece suits, short and long sleeve shirts, shorts, pants, socks, and hoods, with sizes from XS to 2XL for women and S to 3XL for men. dynamicnord.com



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DE-OX Sub Multigas Colour Digital Analyser

Designed for those who require detailed gas composition analysis, the Sub Multigas Colour digital analyser can identify gas content to the most minute molecule. This versatile device can be paired with an array of sensors for varied applications, including the continuous monitoring of ambient gases, hyperbaric chambers, rebreathers, air quality and more. Standard configurations include oxygen, carbon dioxide, carbon monoxide, humidity and VOCs (volatile organic compounds). It is possible to connect the instrument to many other sensors and to change the configuration of the sensors and instruments. The instrument is installed in an extra strong waterproof box. It is easy to install more sensors on the external panel of the box. The analyser can analyse air quality according to EN 12021

Respiratory equipment—Compressed gases for breathing apparatus requirements. temc.it



Cressi Aquawing Plus

The Aquawing Plus, featuring the innovative modular adjustment system (MAS), is a versatile backplate/wing designed to accommodate various body types (from XS to XL) with its one-size-fits-all approach. It has been engineered for optimal buoyancy when using a single tank.

The wing's lightweight construction does not compromise on stability or safety. It includes an integrated support system on the back for secure single tank attachment, enhancing positioning and balance. Comfort is elevated through mesh material on the shoulder straps and back, which also facilitates quick drying. Additionally, the wing is furnished with two weight pockets and a specialised pocket for storing a surface marker buoy (SMB). cressi.com



Waterproof D7 Evo

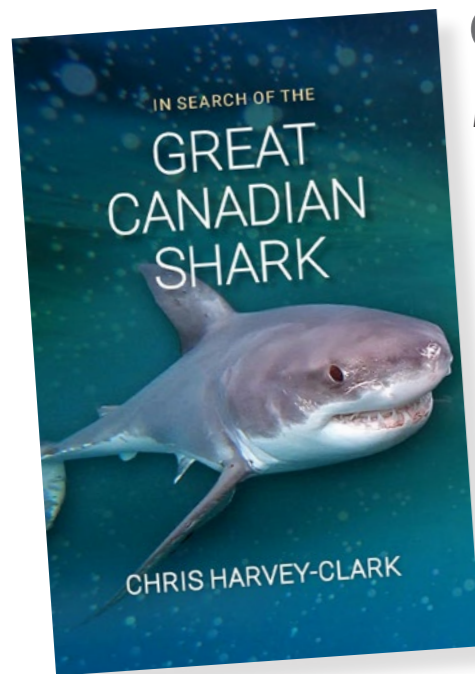
Discover unparalleled advancements in drysuit technology with the D7 Evo by Waterproof. This suit redefines expectations through its exceptional combination of comfort, safety and user-friendly features ensuring an unmatched diving experience. The D7 Evo introduces a patented soft wrist ring system for improved fit, featuring a smart, narrow design with replaceable silicone seals that do not require sewing to the suit's arm. Its lightweight system includes a visual indicator for correct fitting, ensuring it is watertight. Additionally, it is equipped with the SI Tech Quick Neck System and valves. The suit also incorporates a flexible YKK Aquaseal Plastic drysuit zip for easier donning and doffing. Material enhancements include Nylotech with Kevlar reinforcements and an extra zip pocket for storing dive tables, checklists and more. waterproof.eu

Aqualung Axiom i3+

What is new about the Axiom i3+ is that divers can easily adjust buoyancy with a simple side lever. Pull the lever up and air fills the BCD in large or small amounts as needed. Push the lever down and air is released, regardless of body position. With its built-in i3+ filling and deflation system, adjusting your buoyancy has never been easier than with this BCD. A thin internal strap rack that secures the BCD tightly to your body prevents the tank from shifting on your back. It distributes the weight evenly by keeping the tank closer to your centre of gravity, making it easier to dive with good trim. The wing/bladder tightening system makes you more streamlined and reduces drag in the water as you swim. aqualung.com



Edited by G. Symes



Canada

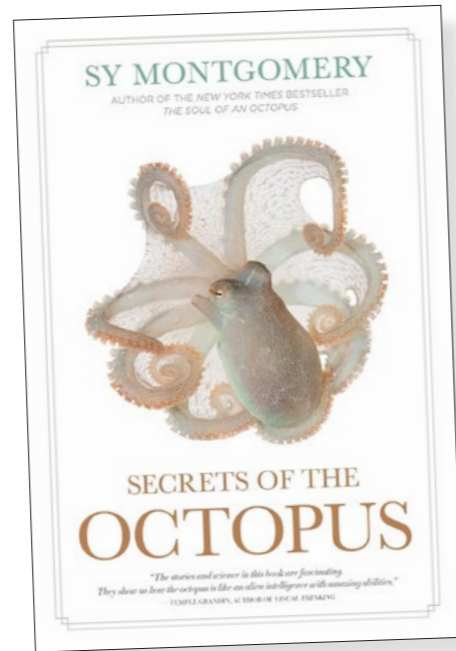
In Search of the Great Canadian Shark, by Chris Harvey-Clark

From his early days as a marine biologist to his groundbreaking research on Greenland sharks and the great white shark, Dr Chris Harvey-Clark offers a capti-

tivating glimpse into

Canada's oceanic realms. His narrative delves into his diverse diving expeditions, detailing encounters with sharks, torpedo rays, endangered northern right whales and other megafauna in Canadian waters. This book brims with intriguing biological insights and tales, unveiling the hidden lives of marine creatures and chronicling the author's deepening fascination with the sea. With the impact of climate change, he reveals the evolving underwater world and the amazing aquatic animals that inhabit it.

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Date: 15 March 2024
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ISBN-13: 978-1990770517

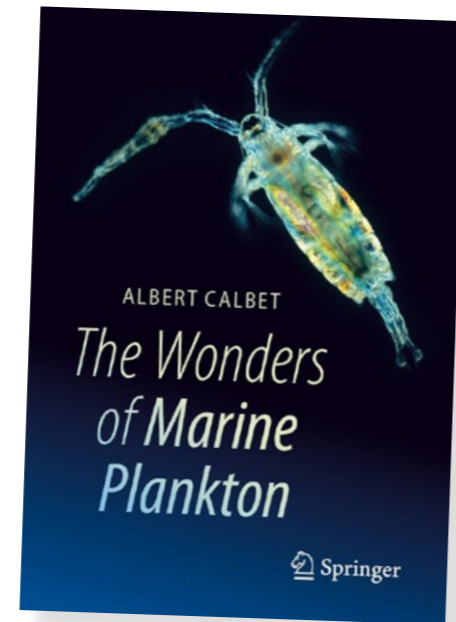


Octopuses

Secrets of the Octopus, by Sy Montgomery

Exciting revelations confirm that the octopus is among nature's most intelligent creatures. The book is filled with stunning images, gives us a closer look at these enigmatic beings, and delves into the mesmerizing underwater world of the octopus. It reveals the critter's amazing shape-shifting abilities, genetic adaptability, and devoted maternal care, as well as how its large, adept brain inhabits not just its head, but its entire body. Renowned author Sy Montgomery, hailed as the "octopus whisperer," offers compelling narratives of scientists advancing octopus research and conservation. It is a delightful read for aquatic animal enthusiasts, offering astonishing visuals and enchanting storytelling.

Publisher: National Geographic
Date: 19 March 2024
Hardcover: 192 pages
ISBN-10: 1426223722
ISBN-13: 978-1426223723

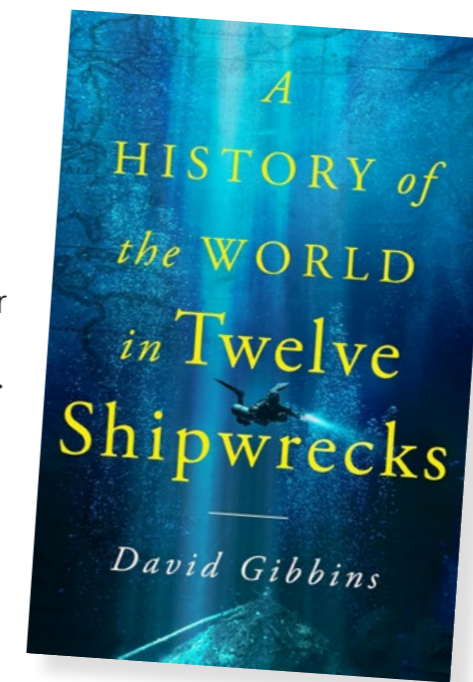


Plankton

The Wonders of Marine Plankton, by Albert Calbet

Despite their tiny size, marine plankton are vital to marine food webs, facilitating nutrient release through predation and sustaining microalgae populations. Ubiquitous in both the oceans and freshwaters, they support terrestrial life and oxygen production. A mere spoonful of seawater teems with millions of viruses, bacteria, and diverse microorganisms. This book aims to bring scientific knowledge to the masses by offering a captivating journey into the realm of marine plankton. Through engaging storytelling and vivid illustrations, readers gain insight into plankton's role in ecosystems, diverse forms and critical impact on global health.

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Date: 22 February 2024
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ISBN-13: 978-3031507656

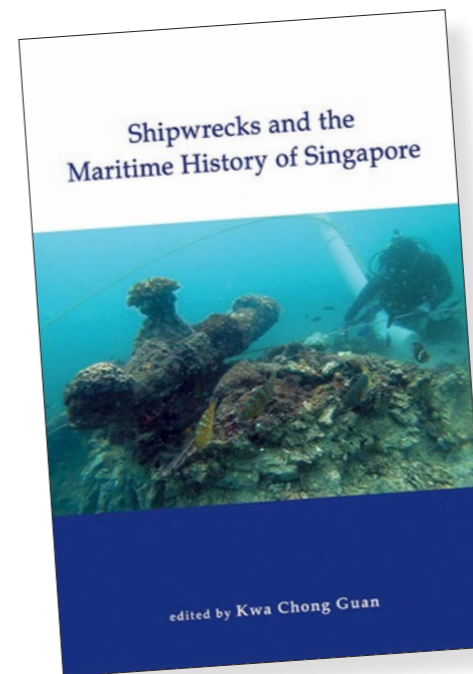


Shipwrecks

A History of the World in Twelve Shipwrecks, by David Gibbins

In this absorbing narrative by esteemed underwater archaeologist David Gibbins, the history of humanity unfolds through the excavation of 12 significant shipwrecks, including the Viking warship of King Cnut, Henry VIII's *Mary Rose*, the doomed HMS *Terror* of Captain John Franklin, and SS *Gairsoppa*. These sunken vessels, preserved in their underwater cocoons, unveil tales of past civilizations. Gibbins masterfully weaves together these stories to reveal not only the ships' journeys and cargo but also the global spread of people, beliefs, and knowledge. Drawing on his extensive experience, Gibbins demonstrates how underwater treasures offer new insights into our world's history.

Publisher: St. Martin's Press
Date: 2 April 2024
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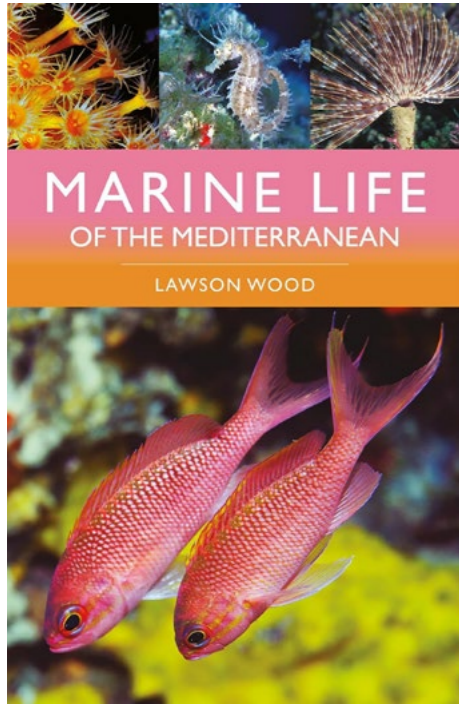
Singapore Wrecks

Shipwrecks and the Maritime History of Singapore, by Kwa Chong Guan

The National Heritage Board announced the completion of a six-year maritime archaeology project in Singapore waters in June 2021. The excavation, led by the Archaeology Unit of the ISEAS – Yusof Ishak Institute, uncovered two shipwrecks. In this book are the findings and essays on Singapore's maritime past, highlighting its global connections from the 14th to 18th centuries. The shipwrecks prompt a reevaluation of Singapore's historical narrative, emphasizing its maritime influence.

Publisher: ISEAS – Yusof Ishak Institute
Date: 31 January 2024
Hardcover: 126 pages
ISBN-10: 9815104276
ISBN-13: 978-9815104271





The Med

Marine Life of the Mediterranean,
by Lawson Wood

This photographic ID guide to around 400 common species of marine life found in the Mediterranean, covers fish, invertebrates, corals, plants and megafauna. It is a handy-sized guide of around 175 pages, filled with superb photographic identification of all the main species and illustrations of the fish families. This book is a perfect and essential pocket guide for divers and snorkellers, which

will expand your interest in the Mediterranean. Special mention has been made of the widening and dredging of the Suez Canal and how this has irrevocably altered the balance of marine life in the eastern Mediterranean. Similar to the lionfish invasion in the Caribbean, the Mediterranean is also suffering a similar fate, yet many other species of fish from the Red Sea, which are the lionfish's natural predators, have also passed through the Suez Canal. Despite this, the Mediterranean, which covers all of the area from Gibraltar to the shores of Israel and the Adriatic, has long been the most popular tourism destination for divers, as its warm clear waters are incredibly productive with marine life.

Publisher: **Bloomsbury Wildlife**
Date: 9 July 2024
Paperback: 176 pages
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ISBN-13: 978-1399411707

Scuba Diving Operational Risk Management

by Claudio Gino Ferreri, BSc

Review by Peter Symes

An SAS approach to principles, techniques and application in recreational and technical diving.

A deeper understanding of safety concepts will make us both better and safer divers. So, it is no coincidence that I chose to review this book, written by elite soldier Claudio Gino Ferreri, who was a member of the Australian SAS. He is also a sport and technical diver and is active in the recreational diving industry.

The book uses a lot of easily recognisable scenarios and types of dives that most of us can relate to for case stories, such as a wreck dive to 30m, and goes through how to analyse and best manage risk. Most of it actually seems pretty obvious and not complicated as he goes through the examples of the mindset you should adopt. In short, you think through the entire dive plan well in advance, asking yourself what could possibly go wrong or what problems might arise and how you intend to deal with them. In a way, the book is a little self-study course on how to plan and execute your dives more safely, including how to be better prepared for different scenarios that may arise when things do not go as planned.

It is relatively easy to read for non-native English speakers and the language is not technical. The style can be a little dry, but the strength of the book is all the examples, accompanied by charts and decision diagrams. The paperback edition is around 180 pages, divided into 15 chapters, so it is not a heavy volume to digest.

The book is also divided into two main parts: Part I, which covers theory and examples, and a shorter Part II, which offers some analysis tools in the form of Word templates and Excel spreadsheets

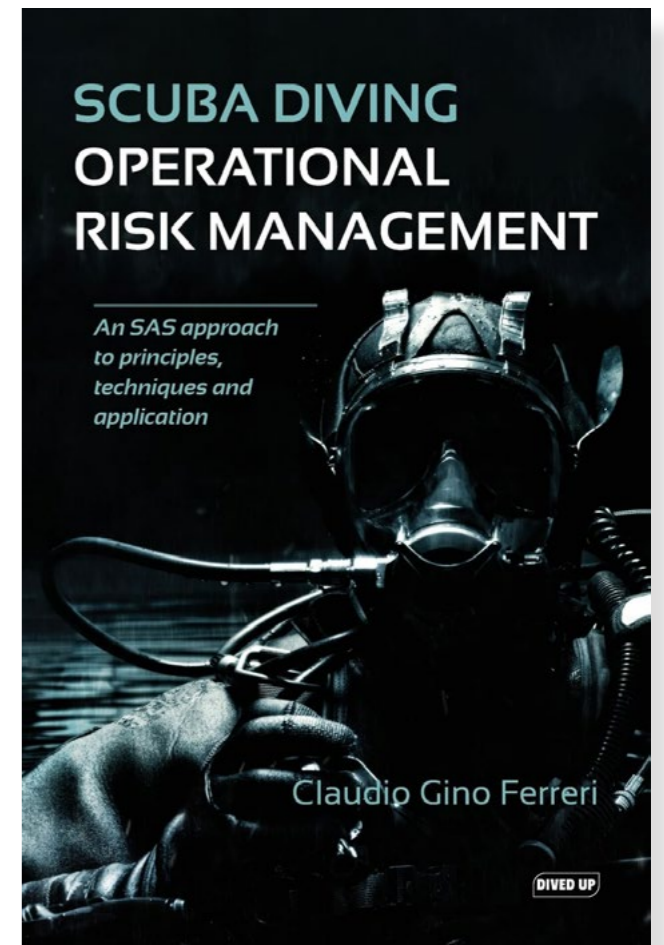
that can be downloaded for free via a link or QR code. Some of the files are simple reminders or checklists, others are risk assessment forms, another is a template for a dive plan, and so on. No complicated or expensive software, just useful tools.

The book is available in paperback, digital editions for Kindle, Apple Books and Google Play, as well as Epub and PDF formats. Go to: **Dived Up Publications**

About the author

Claudio Gino Ferreri BSc (Security) has made risk management his life's work, having dived as a member of the Australian SAS and been a permanent acting police senior sergeant with the Western Australia counterterrorism and bomb disposal teams as well as a government security manager for the Anti-Corruption Commission and the Corruption and Crime Commission. He holds recreational diving qualifications to TDI Trimix level and has served as a committee member and diving officer for the Underwater Explorers Club of Western Australia.

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AppleBooks **Link**



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Text by Simon Pridmore

In the second of a two-part series, Simon Pridmore describes a few more equipment-related problems that divers commonly encounter and offers some ideas on how to avoid or deal with them.

For the many dives we do that are uneventful, there is always the odd dive where something takes place that reminds us of our vulnerability. This often involves the failure of a piece of equipment, and many of us are guilty of not thinking too deeply about what to do if something goes wrong, or how to prevent it from happening in the first place.

In this, the second of two articles on the subject, I run through a few problems that you will probably find yourself having to deal with at some point in your diving career and run through some precautions to take and drills to practice, so you can be as well prepared as possible. Technical divers refer to this process as planning for the “what-ifs.”

Trials & Tribulations

Part 2: Dealing with Gear Malfunctions

Broken mask strap

Do you remember having to do the mask flood and removal and replacement drills during your beginners’ course? How could you ever forget, right? Do you remember hating

them and thinking afterwards, “Thank goodness that is over, I’ll never have to do that again,” and knowing that even though you managed to get it all done, there was a good chance that you might freak out if you ever

lost your mask on a real dive?

If so, then the first part of this article is especially for you. There was a serious purpose to those drills. They were not devised just to give you a hard time. On any dive, your mask strap

can snap, or a wild fin kick from your buddy can separate you from your face furniture, with one blow. You might catch your mask as it flies off, or your buddy might retrieve it for you and hand it back to you apologeti-





ILLUSTRATION: G. SYMES/MIDJOURNEY

A New Dive Book from Simon Pridmore

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

— David Strike, Oztek & Tekdive Convenor

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

— Kevin Gurr, Technical Diving Inventor & Innovator

"It will take some doing to better this account of tech's first steps...

as no matter how much you know or think you know; you will still find many obscure historical gems..."

— Kevin Denlay, Early Adopter & Wreck Finder

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

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

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

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

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



cally. But there is no guarantee that this will happen.

Losing your mask is not a serious problem, in itself. You will be visually impaired, but you can still tell up from down. Just gather your thoughts and make a slow, careful ascent to the surface, breathing from your regulator as normal and remembering not to inhale through your nose.

However, losing control of yourself and panicking when you lose your mask, and bolting to the surface when it happens, could cause you major harm. So, you need to be certain you will not panic. And there is

only one way to make sure of it.

In a pool or shallow water, remove your mask at the surface, then descend and swim along for a few minutes, staying calm and breathing through the regulator, before ascending again. Squeeze your nose closed with your fingers on the first few attempts if you must. While you are underwater, look at how you can still see the larger numbers on your dive computer and pressure gauge. Notice how the design of your regulator's second stage diverts the bubbles away from your nose and eyes.

Everyone can do this. It just takes

practice, then more practice. The confidence boost that mastering this skill gives you, especially if you previously thought it was impossible, is enormous.

Loose or lost weight-belt

It is important that your weight belt does not fall off during a dive. Hold on to it at the buckle when you enter the water and check that the buckle is still tight and that the belt is correctly positioned around your waist, before descending.

OK, so most people do this anyway. However, as you descend, the

increasing water pressure at depth will compress the neoprene in your wetsuit and your weight belt will become looser. So, remember to reach down and tighten your weight belt a little once you arrive at depth. Of course, once you have done this, you may find that the belt becomes tight when you return to the shallows. If so, just relax the buckle again.

There is also the chance of a runaway ascent if your weight belt comes off. To minimise the danger that this presents, do the following three things.

1. Buy a BCD with little integral buoyancy—that is, a BCD that will give you sufficient buoyancy on the surface when you inflate it, but when deflated, does not require a large amount of extra weight to get it underwater with you.
2. Practice releasing the air from your BCD quickly. Know where the dumps are and the best body position to adopt to make sure no air is trapped inside.
3. Do a check to make sure you are not diving overweighted. At the



end of a dive, at 5m, with 50 bar in your cylinder, empty your BCD and hold your breath briefly. If you sink, you have too much weight.

BCD failure

BCDs are highly reliable, but they can fail in a couple of ways that you may not have considered.

It is a great advantage to be able to add air to the BCD directly from the cylinder via the low-pressure inflator hose, but the valve at the BCD end of this hose can corrode and fail, allowing air to seep into the BCD automatically. A sign that this is happening is if you find yourself constant-

ly having to dump air when you have not added any.

Keep the valve corrosion-free by wiping it clean with a little white vinegar on a cotton bud. If the valve is already corroded, it may be too late for vinegar. Ask a dive centre to replace it with a new one.

If you are using rented equipment, and the valve is auto-inflating your BCD, then the solution is to disconnect the hose underwater, dump the air and then inflate the BCD orally whenever you need to and after you get to the surface. This is another good skill to practise.

Shocking as it may be to contem-



plate, you also need to be prepared for your BCD to stop functioning as a flotation device. BCDs are made of tough material that is hard to pierce, but the fabric can become worn and fragile with frequent exposure to the sea and sun.

The real potential failure points in a BCD, however, are the dump valves, which are made of plastic that can develop cracks over time and with the sort of rough treatment that scuba diving gear usually gets. The cracks are often difficult to see, and the first sign of a problem is usually bubbles escaping from the fitting. But sometimes there is no warning. I have seen an apparently perfect shoulder dump valve shear off completely when the BCD was inflated underwater.

If this happens, your BCD immediately becomes useless as a buoyancy device and the dive is over. Swim to the surface, dumping some weight along the way if you need to, and once you are at the surface, dump all your weight to stay buoyant.

Rolling into the deep without air

When you start diving, you think that it will never be possible for you to start a dive without a functioning air supply.

"One thing I will always do," you promise yourself, "is make sure I have air to breathe, and everything is working perfectly before I go into the water."

Then, one day, it happens.

You drop into the water with your cylinder valve closed. Every diver has done this. If you have been diving for a while, you will have experienced this at least once. Without going into the many reasons why, here is how to make sure it never happens to you again.

As you will notice, there are several checks and balances in this process, but it quickly becomes instinctive.

1. When assembling your gear, turn the cylinder valve all the way open, as far as it will go.
2. Put your gear on and, still on the beach or the boat, put the regulator in your mouth and take at least four full breaths. Why four?





PETER SYMES

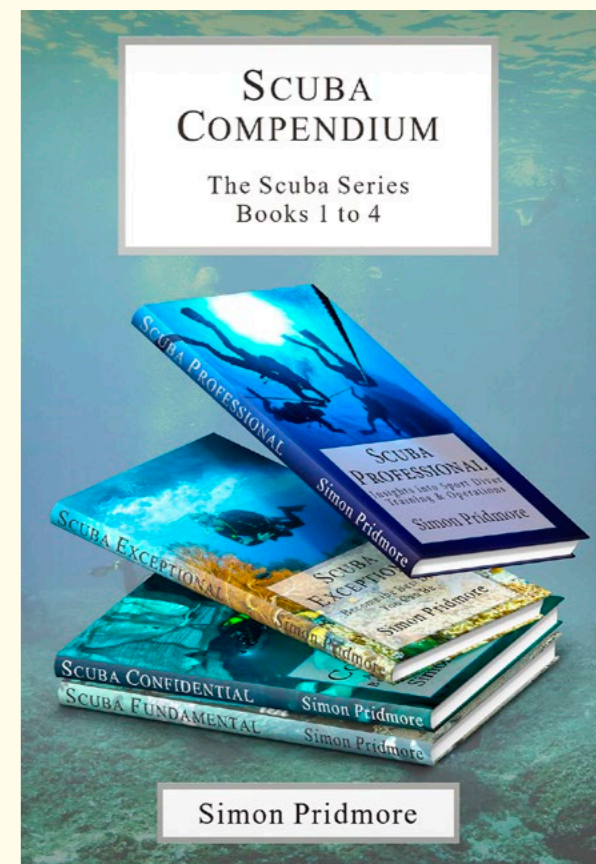
NEW 4 in 1!

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

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

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

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



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

E-book File Size: 5298 KB
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simonpridmore.com

Simon Pridmore is the author of the international bestsellers Scuba Fundamental: Start Diving the Right Way, Scuba Confidential: An Insider's Guide to Becoming a Better Diver, Scuba Exceptional: Become the Best Diver You Can Be, and Scuba Professional: Insights into Sport Diver Training & Operations, which are now available in a compendium. He is also the co-author of the Diving & Snorkeling Guide to Bali and the

*Diving & Snorkeling Guide to Raja Ampat & Northeast Indonesia. His recent published books include The Diver Who Fell From The Sky, Dive into Taiwan, Scuba Physiological: Think You Know All About Scuba Medicine? Think Again! and the Dining with Divers series of cookbooks. For more information, please visit his website at: **SimonPridmore.com**.*

- Because if your valve has somehow been closed again since you opened it, it will take you four breaths to clear all the air in your regulator hoses, and you will get a horrible empty, sucking sensation on the back of the fourth breath. It is better to encounter this on the beach or boat than when you are underwater.
3. Watch your pressure gauge as you breathe. The needle should not move. If it moves, your valve is shut or not completely open.
 4. If the regulator does not breathe easily and/or the pressure gauge

needle is moving, reach behind you and open your valve fully.

5. Don't let anyone else touch the cylinder valve after that. If anyone does touch your valve, then go through steps 2, 3 and 4 again before you go into the water.
6. Sometimes, dive conditions require that you enter the water negatively buoyant and descend immediately. If this is not the case, always go in positively buoyant with your regulator in your mouth and take a few more breaths on the surface before you go down.

7. Finally, if, despite all of the above, you ever find yourself with a vacuum in your regulator as you descend, you must know how to open your cylinder valve underwater. The usual technique is to reach down and behind you with your left hand and push the base of your cylinder upwards. Then reach behind your neck with your right hand, grasp the valve firmly and turn it away from you.

Again, practice, practice, practice—until you can do it perfectly. ■

Read Part I of this series at: **xray-mag.com/content/trials-tribulations-part-i**.



Chronic pressure equalisation challenges can often be resolved with a minor surgical procedure.

Text and photos by Peter Symes

It can be devastating to your diving career if you are unable to equalise or have a lot of trouble doing so. The underlying cause may be a narrow Eustachian tube, which connects the inner ear to the pharynx. Fortunately, this can be treated. Peter Symes reports.

We are all created uniquely, and some of us have Eustachian tubes so narrow that even the simplest equalisation becomes difficult or even impossible. Of course, being able to equalise is essential if you want to dive, but even non-divers can also be troubled by the inability to equalise.

Travelling by plane, for example, may be out of the question, but even something as simple as travelling by underground or subway, where there is a change in pressure as you enter and exit the tunnel, can cause so much discomfort that some people avoid using public transport altogether. Fortunately, there is a solution, or rather a treatment.

The treatment

It was a wintry morning on the outskirts of Copenhagen when I made my way to Charlottenlund Private Hospital, which specialises in ear, nose, and throat treatments, where I was about to witness a balloon dilation of the Eustachian tube.

This is a procedure that creates a better passage by widening the Eustachian tube so that equalisation can take place, and it is performed by inserting a thin probe into the tube where it opens at the back of the throat. The thin probe is hollow and contains a small balloon that is insert-

ed into the Eustachian tube. Once inserted, the balloon comes out of the probe and expands as saline solution is pumped into it under high pressure, widening the Eustachian tube in the process.

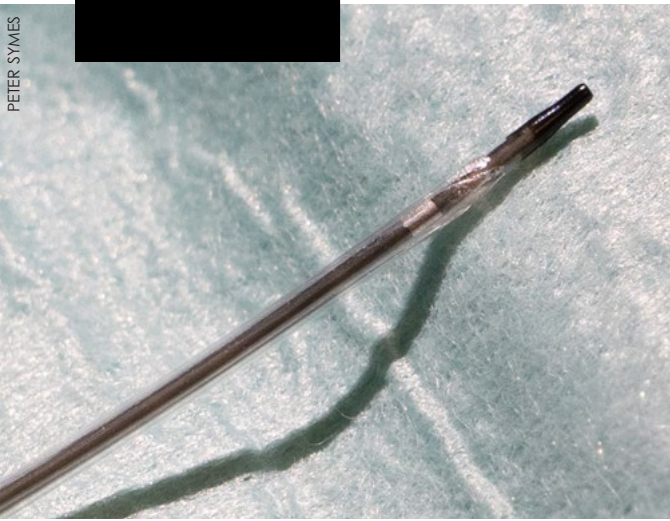
My own experience at hospitals has, thankfully, been largely limited

to various emergency room visits, scans, and outpatient examinations at the main public hospitals, so I did not really know where to go or what to expect. But Google Maps on my mobile phone quickly put me on the right track, and I took the lift to the third floor of the modern office com-



Trouble with Equalising Ears *Eustachian Tube Balloon Dilation*

PETER SYMES



PETER SYMES

Today's patient, Felicia, first had a catheter placed in the back of her hand through which the initial anaesthetic was administered (right); The balloon probe is thinner than a knitting needle (left). The probe was inserted through the nasal cavity until it reached the opening of the Eustachian tube at the back of the throat (above).



PETER SYMES

plex, conveniently located close to Charlottenlund train station.

I entered the bright and friendly premises and saw that the waiting room was filled with a mix of patients of different ages, who I assumed were there for an examination, treatment, or follow-up consultation.

I was ushered into the staff lunchroom to wait for the operation I was about to witness. The atmosphere was pleasant, and the staff were friendly and joking with each other, which I took as a good sign.

Today's patient, Felicia, who was not a diver herself, but who was one of those who experienced discomfort when travelling on public transport, had given me permission to observe her operation. She was now being readied for the operation, while being briefed by the physician and head of the clinic, Dr Jacob Fisker, who is also a dive doctor.

Among other things, he explained that the procedure itself only took about two minutes for each ear, but that it had to be done under general anaesthetic because it would be too uncomfortable and painful for the

patient to lie still. It reminded me of the time I had my tonsils removed as a child.

The procedure

The operating theatre was full of technology and equipment. First, an intravenous catheter was inserted into the patient's hand to administer drugs that make up the initial anaesthetic. Once the patient was unconscious, an endotracheal tube was inserted into the airway to allow the anaesthetist to ventilate the patient, as she would not be able to breathe on her own under general anaesthetic. In this case, a special tube was used that did not block access to the area of the pharynx that needed to be reached. All this took just a few minutes.

The atmosphere was calm and professional as Dr Fisker guided the thin probe through the nasal cavity and found the entrance to the Eustachian tube at the back of the throat. The probe was equipped with a video camera, so I could easily follow the procedure on a large monitor behind the surgical team. Still, I could not quite figure out how he so adeptly

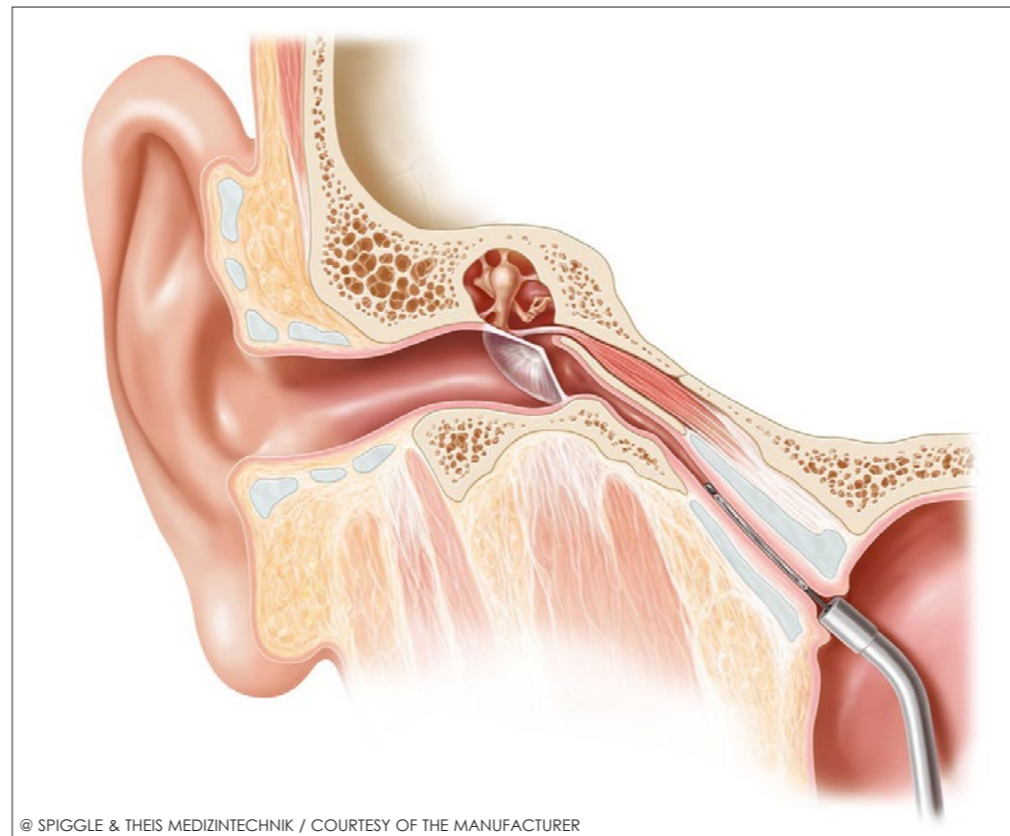
manoeuvred the probe behind the right fold in the mucosa and into the tube—but then again, he was the expert, and what did I know?

The balloon was now inside the Eustachian tube and Dr Fisker's assis-

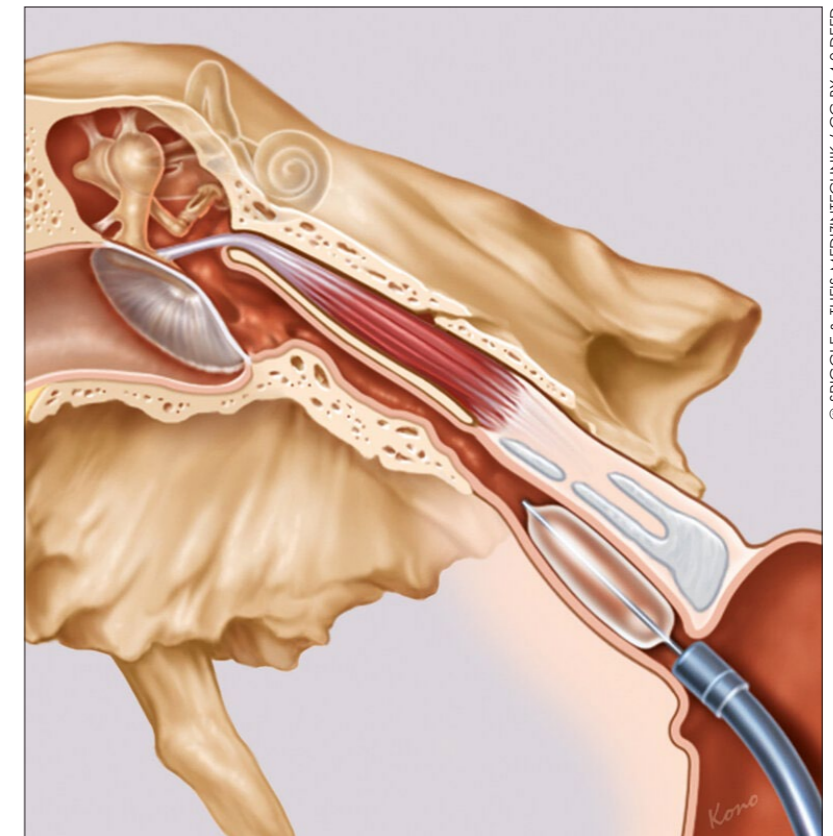
tant held a small device to increase the pressure in the balloon, which was filled with sterile saline. It was fitted with a small manometer, not unlike the ones we use in diving, so I could watch the gauge reading as the pressure was

gradually increased to 10 bar, which forcefully pushed apart the walls of the Eustachian tube and crushed some of the surrounding cartilage.

The balloon was then left in place for a moment while two minutes



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Diagrams showing how the balloon is inserted and expanded inside the Eustachian tube.





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On the monitor, Dr Jacob Fisker could see where the probe, which was equipped with video and light, was located so that he could guide it to the right place (above). The tip of the probe can be seen in the upper left at the entrance to the Eustachian tube of the right ear. Compare this with the diagram on the previous page. Dr Fisker's assistant increases the pressure that expands the balloon once it has been inserted. The pressure can be read on the manometer (left).

were counted down, after which it was pulled out again. And that was it for that ear. The procedure was then repeated on the other ear. There was not much to be seen after this, apart from a small amount of blood oozing out. The patient was then brought out of the anaesthetic, pretty much in reverse order. It was not long before she opened her eyes, and I heard a drowsy murmur: "Are we done already?"

Well, yes, that was it—except that Felicia was naturally a bit woozy after the anaesthetic and needed some time to fully recover and get her bearings.

After surgery, patients need to equalise 50 to 100 times a day to keep the passage open. Unlike bal-

loon dilation of coronary arteries and the like, a stent, which is a small hollow spring placed in the artery to keep it dilated, cannot be placed in the Eustachian tube. The patient simply has to keep the passage open and prevent it from collapsing again by performing a Valsalva manoeuvre many times a day. I suppose it quickly becomes a habit that you do not think much about.

I have since heard from Felicia that she has no pain or discomfort and is now just waiting for a check-up in a few months' time.

Marie's story

This article came about after I was contacted last year by Marie Carlé, co-owner of the Danish dive travel agency Emocean Travel, who had

also undergone a similar operation after suffering various problems with her ears while diving.

She explained that when she was 20 years old, she travelled to Thailand, where she intended to get certified, but had to give it up and go snorkelling instead because she was just unable to equalise. Fifteen years later, however, she did manage to complete a PADI Open Water Diver course, but not without many trials and considerable pain.

Marie wrote: "For the next two years I dived a lot. I travelled to South Africa, the Philippines, the United States, Bali, and countless times to the Red Sea to dive. I racked up 200 dives pretty quickly, but it was always with me. Initially, I swam above everyone else at 2 to

3 metres of depth for the first 10 to 15 minutes of the dive, after which I slowly got down to 10 metres, where the pain disappeared. I came up with various little tricks, such as sucking the condensation out of my regulator and swallowing it while moving my jaw back and forth."

Marie had tried everything and had been to many ear specialists who told her she just needed to practise equalisation. She also tried Otrivin, steroid sprays and more. But none of it helped. Then she met Dr Fisker in an unrelated matter regarding her children's ear problems and learnt about balloon dilation, which she had never heard of.

After a similar operation, Marie was suddenly able to equalise, but then had to undergo another bal-



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“Pop!” Equalising by using the Valsalva manoeuvre should be effortless.

loon dilation on her left ear afterwards. Marie said she has since done hundreds of dives without any equalisation issues. “I have done another 400 dives on group trips and go down to 10 metres faster than any of the others! I barely move my jaw for my ears to pop just fine. And best of all, I am pain free!”

Another problem solved

Marie did not get off so lightly, however, as some time later her left eardrum burst at a depth of three metres during a liveaboard trip in the Red Sea.

Marie's eardrum had become very thin, probably due to a lot of middle ear infections as a child, combined with many subsequent strains caused by equalisation problems over the years. But there was a solution for that, too. Marie simply had her eardrum repaired by transplanting a piece of cartilage from her ears and within six weeks of surgery she was able to dive again.

The fact that Marie had multiple problems with her ears is quite unusual and it should be emphasised that the two cases

or problems have nothing to do with each other. However, her story illustrates that there are several different treatments available to help divers with ear problems, even if you think there is nothing that can be done and you fear that your diving career is over.

The lesson to be learnt from these stories, however, is that you can dive again, even if you have struggled with these chronic problems or have had an accident. You just need to know that treatment is available and where to go to get it. ■

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Text by Ila France Porcher

Beneath the shimmering ocean surface lies a realm shrouded in mystery and intrigue. Among its most iconic inhabitants are the sharks—majestic predators that have roamed the seas for over 400 million years. Long revered and feared by humans, these creatures have been depicted as ruthless killing machines, driven solely by instinct and primitive urges. However, recent scientific efforts have begun to unravel the complexities of their behaviour, challenging age-old perceptions, and revealing a world of intelligence and sophistication hidden beneath the waves. Ila France Porcher reports.

At the forefront of this paradigm shift is a groundbreaking **study** led by renowned marine biologist and ethologist A. Peter Klimley and his

team of researchers, including Eric E.G. Clua, Harold L. Pratt Jr. and myself. Our comprehensive ethogram of the chondrichthyan fishes is helping to dispel the myths surrounding this diverse group that includes sharks, rays and chimaeras.

The myth of the mindless predator

For decades, sharks have been cast as ancient and primitive predators, driven solely by instinct. This narrative has been reinforced by media portrayals, notably in documentaries such as *Blue Water, White Death*, *Dis-*

covery's Shark Week, and the iconic film *Jaws*, which have contributed to the public's perception of sharks as bloodthirsty and virtually mindless creatures. The practice of using ground fish, meat or blood to lure sharks to dive cages and make them open their jaws for human observa-

tion and filming has not only influenced public perception but has also shaped the scientific community's view of sharks as simple creatures with limited behavioural complexity.

This consensus has persisted throughout much of the careers of the study's authors, hindering a deep-

Behavioural Complexity *of Sharks*



I was a little apprehensive when I first swam over a school of hammerheads, but I took a big breath and propelled myself downward through the school with my long freediving fins . . . The sharks moved aside as I passed them, but stayed within the school, swimming in a polarized manner.

COURTESY OF ALEX ANTONIOUS



er understanding of the true nature of sharks. So, the need to challenge this stereotype and demonstrate the diversity of behaviours within the chondrichthyan group was a driving force behind our team's efforts.

Challenging the fear factor

Due to the widespread belief that sharks were too dangerous for underwater observation, studying sharks in their natural environment was a daunting task for scientists. Klimley was the first researcher to break through this barrier, with his studies of hammerhead sharks schooling around seamounts off California in the 1980s.

To observe the animals in their natural habitat, Klimley dived without scuba gear to depths of 100 to 120ft while videotaping the animals.

He described the experience: "I was a little apprehensive when I first swam over a school of hammerheads, but I took a big breath and propelled myself downward through the school with my long freediving fins. The sharks were only a meter or less to the side of me as I passed

them. When underneath the school, I looked up to see the beautiful silhouette of the school above [me] and then powered myself through the school to the surface, where I took a large breath of air. The sharks moved aside as I passed them, but stayed within the school, swimming in a polarized manner.

"In studying the schools, my dives varied around three minutes with the same amount of time at the surface, breathing deeply (called hyperventilating). I wasn't really scared because scalloped hammerheads have small mouths and feed on fish and squid."

Klimley observed the school members displaying very complex behaviour. The schools were made up of females, which competed with one another to achieve a position at the centre of the schools. The larger females would perform a highly acrobatic behaviour (in diving terms, a "reverse flip with a full twist"), in some instances striking the forward torso of the smaller school members. Just the pulsing light

reflecting off the acrobatic female alone could stimulate the smaller females to move to the periphery of the school.

Male hammerhead sharks would dash into the centre of the schools, thrusting their midsections and rotating their sexual organs in a provocative manner, rotating their claspers at the same time, to pair with the dominant females. Once pairing with a female, the two would leave the schools to mate. This entailed the male performing a "love" bite and inserting his male organ, the clasper, into the female's uterus while sinking down in the water column.

This is just one example of the complex behaviours of sharks. But despite observations such as these, stereotypes persist.

Klimley's comprehensive review of the chondrichthyan behaviour aims to help shift public and scientific perceptions away from fear and the "simple-minded shark" stereotype, and towards an appreciation of the diverse and complex behaviours that these iconic predators actually display.

The school of scalloped hammerhead sharks that Klimley was studying



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The Ethogram: A window into shark behaviour

The ethogram serves as a crucial instrument in understanding the behaviour of wild animals. It comprises a list of behaviours observed in a species or group of species. Each behavioural sequence is named, defined, described in detail, and illustrated.

Konrad Lorenz, a co-founder of ethology and a Nobel laureate in physiology and medicine, emphasised the importance of ethograms as a

crucial first step in field studies of animal behaviour. Klimley, as an ethologist in the line of Nikolaas Tinbergen, Lorenz and Arthur A. Myrberg, Jr., carries their legacy forward by creating an ethogram for the entire group of chondrichthyan fishes.

The ethogram constructed by Klimley and his team is divided into eight categories: maintenance, reproduction, filter feeding, scavenging, predation, social, aggressive and defensive behaviours. The meticulous compilation aims to

enhance inter-observer reliability by providing a standardised reference and vocabulary for researchers interpreting similar behaviours described for different species. Thus, it will promote a deeper understanding of the complex behavioural repertoire of chondrichthyan fishes. The ethogram's construction for the entire taxon of chondrichthyes, encompassing sharks, rays and chimaeras, represents a monumental step forward in understanding their collective behavioural complexity.

The ancient lineage of chondrichthyans

To understand the evolution of shark behaviour, it is essential to delve into the extensive ancestral lineage of chondrichthyans, which stretches back over 400 million years to the Ordovician period. The movements of the Earth's crust during the Permian and Triassic periods, about 200 million years ago, coincided with a significant diversification of cartilaginous fishes. The fragmentation of the single continent of Pangea into Gondwana and Laurasia created new habitats and environmental conditions that led to the evolutionary radiation of sharks into estuaries, bays, the continental shelf and the open ocean.

However, not all early sharks survived the harsh conditions at the end of the Permian. The evolutionary tree of chondrichthyans illustrates a constriction, with ctenacanths likely giving rise to modern sharks or Euselachii. During the Mesozoic and Cenozoic eras, chondrichthyans diversified into 13 orders, including chimaeras, sharks and rays.

The study introduces phylogenetic trees showing the relationships among modern sharks and rays based on both molecular and anatomical similarities. It unveils the intricate

connections between different orders and provides insights into the evolutionary divergence of chondrichthyans. Evolutionary trees based on molecular and anatomical similarities, combined with fossil evidence, contribute to this understanding.

Brainpower beyond the depths

One indicator of intelligence in chondrichthyan fishes is the brain-to-body mass ratio, which is comparable to that of birds and some mammals. But because they move through a vibrating realm in which light

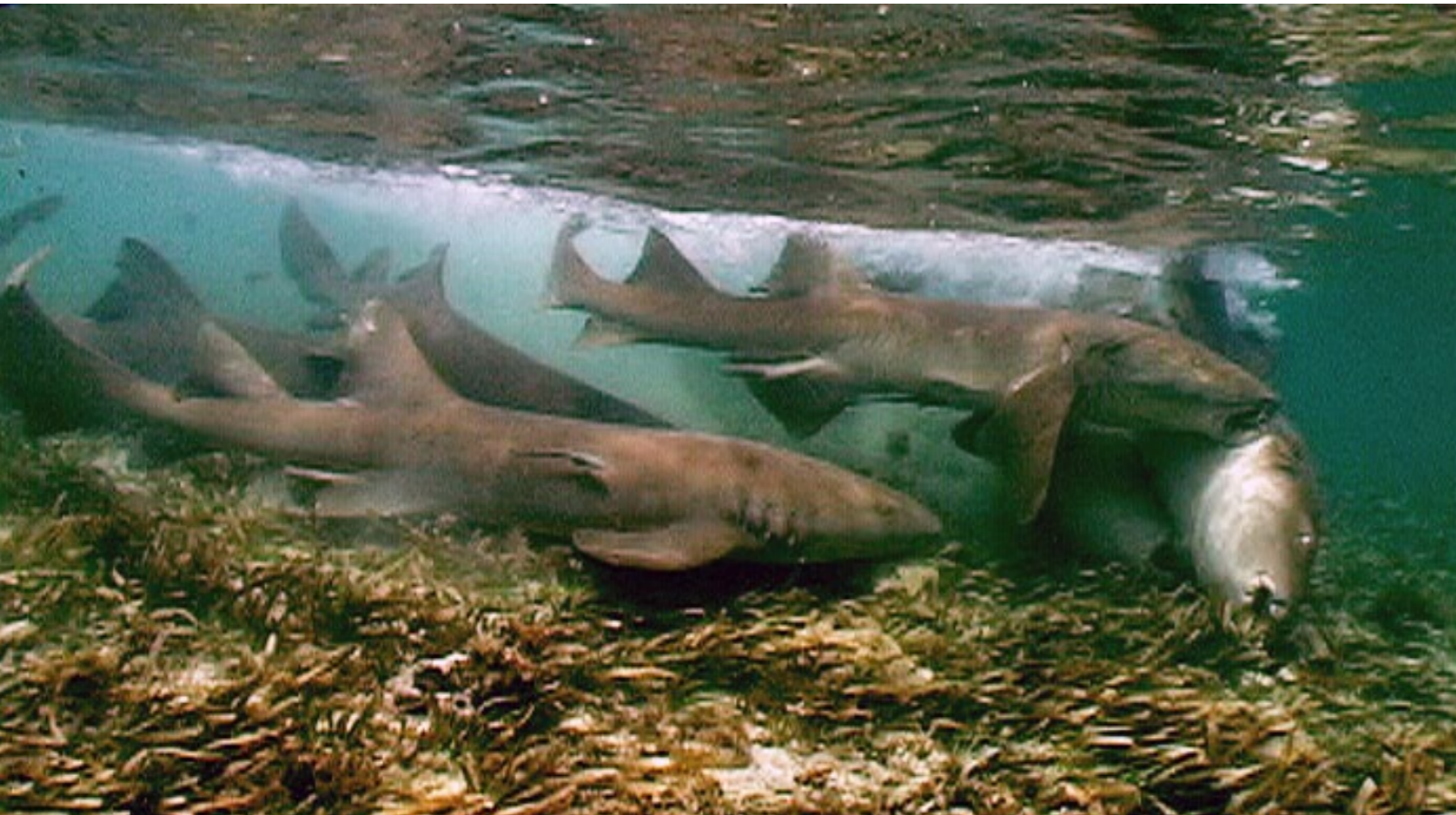
travels less easily than sound, their brains are adapted to perceive their surroundings using specialised senses, particularly the lateral line sense, which directly perceives underwater vibrations.

Because salt water is a conductor, their large cerebellum also plays a crucial role in processing nerve impulses from their electroreceptors. Furthermore, they can also find their way in visually opaque environments by perceiving the local patterns of magnetic fields associated with the seafloor and its contours. The brain-to-

A male nurse shark approaches a female in tonic immobility.



COURTESY OF HAROLD WES PRATT



Five male nurse sharks pursue a female.

shark tales

Blacktip reef sharks in French Polynesia



DOUG FINNEY / CC BY-NC 2.0 DEED

body mass in cartilaginous fish is also indicative of cognition (the term used for thinking in animals), which is suggested by many of their actions.

The study postulates that the more derived sharks and rays in the chondrichthyan lineage have evolved the most diversity and complexity in their behavioural patterns, as reflected in their actions

and in their larger brain-to-body ratios. The study's inclusion of a wide range of behaviours, including some of those observed in captivity, contributes to a holistic understanding of chondrichthyan behavioural diversity.

Ethograms for elasmobranchs
Most ethograms published for elas-

mobranchs in the past have been partial ones, focusing on specific behaviours within a particular study. It is a challenge to publish more comprehensive ethograms due to their length, so they are excluded from journals with limited space.

However, there are journals, such as *Behaviour*, that are willing to devote the space necessary to publish comprehensive ethograms. Therefore, this ethogram was published as the flagship paper in the recent special issue of *Behaviour*, "Elasmobranch cognition and behaviour."

Challenges and future avenues

Despite the groundbreaking insights provided by the ethogram, challenges persist in the study of certain chondrichthyan species. Chimaeras residing in cold temperate and sub-polar waters, as well as deep-sea sharks, elude direct observation due to inhospitable environments. The study advocates for more comprehensive research in both natural and controlled environments, emphasising the importance of expanding our understanding of

these elusive species.

The ethogram review offers a transformative perspective on sharks and their relatives, challenging ingrained myths and unravelling layers of behavioural complexity. From the ancient depths of the oceans to the intricate details of evolutionary trees, the study invites us to appreciate chondrichthyans as intelligent, adaptive creatures, reshaping our understanding of the fascinating world beneath the waves. ■


Download the study [here >>>](#)

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



Illustration of two shark companions travelling together that encounter the researcher.


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PROJECT ASUR / FAIR USE

Shark accidentally caught on a longline.

Innovative Project Aims to Reduce Shark Bycatch

In a bid to safeguard vulnerable shark populations in La Réunion, an EU-funded project is exploring innovative measures to mitigate the accidental capture of sharks by surface longlines.

In La Réunion, an island in the Indian Ocean that is an overseas department and region of France, small-scale fishers often use surface longlines targeting tuna and billfish, but this sometimes leads to the accidental capture of sharks.

The EU-funded ASUR project is researching innovative methods to reduce the incidental catch of sharks by these longlines, bringing together scientists and fishermen to tag and release sharks and to test equipment designed to reduce shark mortality.

Enhancing shark survival

The project evaluates the probability of sur-

vival post-release, scrutinising the variables that contribute to higher survival rates, and testing whether new approaches and tools can decrease mortality. The results indicate that altering longline fishing procedures could significantly increase the survival rates of unintentionally caught sharks.

Researchers discovered that severing the 'branch line' as close to the hook as possible was the most beneficial in enhancing shark survival.

Increased fisher awareness

Additionally, the ASUR project has raised fisher awareness about better handling methods, which can prevent additional stress to sharks that are caught by mistake. The project's findings demonstrate that sharks have up to a 90% better chance of survival if they are freed before being brought aboard vessels, significantly reducing the impact of longline fishing. ■

SOURCE: PROJECT ASUR

Scientists Discover 150 Million-Year-Old Species of Rays

Scientists uncover a new species, *Aellopobatis bavarica*, revealing unprecedented ray diversity in the Jurassic period.

In a groundbreaking study led by the University of Vienna, researchers have unearthed evidence suggesting that the seas of the Jurassic era, some 150 million years ago, teemed with a diversity of ray species far beyond what was previously understood. The discovery of a new species, named *Aellopobatis bavarica*, provides fascinating insights into the evolutionary history of these ancient marine animals.

A dive into the past

The study, published in the esteemed journal *Papers in Palaeontology*, marks a significant leap in our understanding of marine life in the Jurassic period. Fossils of *Aellopobatis bavarica* have been meticulously analysed, revealing unique features that distinguish it from modern rays and its contemporaries alike.

Characterised by its distinct skeletal structure and teeth patterns, *Aellopobatis bavarica* showcases the evolutionary innovation within the ray lineage. This species, found in the Solnhofen limestones of Bavaria, Germany, highlights the adaptive strategies

rays have developed to thrive in their environments.

Implications

The discovery of *Aellopobatis bavarica* challenges previous notions of ray diversity during the Jurassic era, suggesting a complex ecosystem in which these creatures played a significant role.

The find, according to study experts, not only adds to our



TÜRTSCHER ET AL. / CC BY

Aellopobatis bavarica, the newly discovered species, complete fossils of which are only known to come from Germany. This species is also the largest species of all and can grow up to 170cm in size.

knowledge of the diversity of rays throughout this time period but also sheds light on the evolutionary pressures that moulded the marine environments of the era.

The significance of *Aellopobatis bavarica* extends beyond its mere existence; it offers a window into the past, revealing the intricate web of life that existed in our oceans millions of years ago. As scientists continue to unravel the mysteries of the Jurassic seas, each discovery like this brings us closer to understanding the origins and evolution of marine life on Earth. ■ SOURCE: UNIVERSITÄT WIEN



Palaeobiologist and lead author Julia Türtscher at the Bavarian State Collection of Palaeontology and Geology in Munich, where specimens of the new ray species are on display.

PATRICK L. JAMBURA / CC BY

By Ila France Porcher



Tiger Sharks Help Researchers Uncover Seagrass Ecosystem

A team of researchers attached cameras to tiger sharks in their quest to discover the extent and character of the seagrass ecosystems of the Bahamas and found it to be the largest known seagrass expanse.

Their groundbreaking **study**, published in 2022, marks a significant milestone in understanding and preserving vital marine ecosystems that are crucial for mitigating climate change.

Tiger sharks and seagrass
Using innovative techniques, Dr Austin J Gallagher and his team of researchers attached camera-equipped tags to tiger sharks to determine the extent of seagrass beds that support a variety of tiger prey. Their data, collected from 2016 to 2020, not only shed light

on the vast seagrass habitat itself, but also increased the total known global seagrass coverage by more than 40%.

The tiger shark is known for its solitary and predominantly nocturnal hunting habits; the orca is its only natural predator. Its diverse diet includes crustaceans, fish, seals, birds, squid, sea snakes, dolphins and even smaller sharks, and seagrass is one of its preferred habitats.

Seagrasses play a pivotal role in the mitigation of global warming by trapping and storing substantial amounts of carbon in the seafloor. However, the extent and distribution of seagrass beds remain largely unknown which hinders conservation efforts. The identification of this vast seagrass ecosystem in the Bahamas offers a promising avenue for addressing these challenges.

Seagrass as a carbon sink
Integrating spatial estimates, re-

mote sensing data and diver surveys, the researchers estimate that seagrass habitat covers between 66,000 and 92,000 square kilometres across the Bahamas Banks. Sediment core analysis confirmed the blue carbon stocked (carbon stocked in the ocean) within the ecosystem.

Data from the tiger sharks played a crucial role in mapping the seafloor, complementing remote sensing estimates. The method illustrates how valuable information can be obtained by putting small cameras on marine animals to explore some of the uncharted regions of the ocean.

The findings underscore the importance of preserving seagrass ecosystems. As the world grapples with global warming, initiatives such as these offer valuable insights and solutions to safeguard our oceans' health and resilience. ■

SOURCE: NATURE COMMUNICATIONS

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Edited by Peter Symes



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A pair of orcas in the Pacific Northwest. In the Pacific Northwest, there are three types of killer whales: resident, transient, and offshore. Transient orcas are rarely observed. They move quickly through an area feeding on seals and other marine mammals.

Potential New Orca Population in Northeastern Pacific

Researchers from the University of British Columbia (UBC) have uncovered compelling evidence of a potentially new population of killer whales in the Northeastern Pacific, distinct from known orca ecotypes.

This discovery, documented in a recent study published in *Aquatic Mammals*, is based on observations of 49 orcas exhibiting unique hunting behaviours, including predation on sperm whales and sea turtles, off the coasts of

California and Oregon. The study, led by UBC's Josh McInnes and Dr Andrew Trites, highlights nine encounters with these orcas from 1997 to 2021, showcasing their distinctive physical features and predatory patterns. Unlike the resident, transient, and offshore killer whales familiar to these waters, this group exhibits varied dorsal fin shapes and unique saddle patch patterns, akin to those found in tropical killer whales.

Vital clues

A significant indicator of their deep-water habitat is the prevalence of cookiecutter shark (*Isistius brasiliensis*) bite

scars, suggesting these orcas roam far offshore. The name "cookiecutter shark" refers to its feeding method of gouging round plugs, as if cut out with a cookie cutter, out of larger animals. The encounters also recorded unprecedented behaviours, such as attacking sperm whales—a rare event on the West Coast.

The team aims to further explore this population through additional sightings, acoustic data, and DNA samples, potentially rewriting our understanding of killer whale diversity and distribution. ■ SOURCES: UNIVERSITY OF BRITISH COLUMBIA, AQUATIC MAMMALS

Orcas Are Possibly Two Distinct Species

Orcas have long been considered a single global species, with different forms in different regions, known as "ecotypes."

However, scientists have long recognised the differences between resident and transient orcas, known as Bigg's killer whales, in the North Pacific. Resident orcas maintain close-knit family pods and prey on salmon and other marine fish, while Bigg's orcas roam in smaller groups and hunt other marine mammals such as seals and whales.

The transient orcas are named after Canadian scientist Michael

Bigg, who in the 1970s noticed that the two ecotypes did not mix, despite occupying many of the same coastal waters, which is often a sign of different species. He was the first to describe the tell-tale differences between the two ecotypes.

Resident and Bigg's ecotypes can be reliably distinguished by experienced observers at sea and from field observations, photographs, and video, based on external characteristics such as eye and saddle patch pigmentation, dorsal fin size and shape, and differences in body size.

Separate species

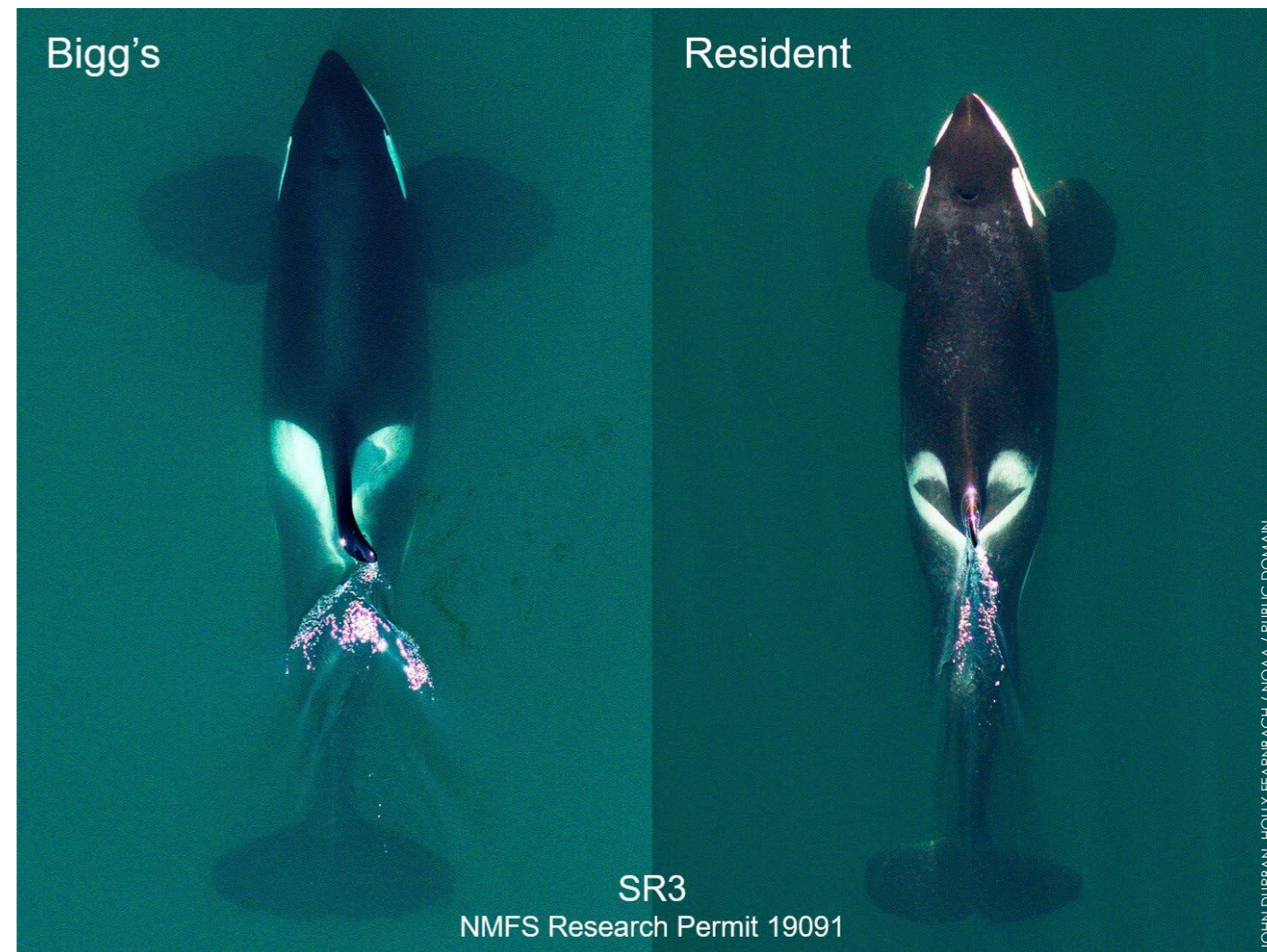
A team of NOAA Fisheries and university scientists compiled

genetic, physical, and behavioural evidence. The data distinguish the Resident and Bigg's orca ecotypes as separate species.

Genetic evidence from previous research suggests that the two populations probably diverged more than 300,000 years ago from different branches of the orca family tree. This makes them some of the most genetically distinct orca ecotypes in the world.

Further analysis of the genomic data supports the conclusion that these groups have developed distinct genetic and cultural identities and occupy separate niches within the same Northwest marine ecosystem. ■

SOURCE: ROYAL SOCIETY OPEN SCIENCE



Aerial images comparing the sizes of adult male Bigg's and resident killer whales, both taken in the Salish Sea off southern Vancouver Island.

SR3
NMFS Research Permit 19091

JOHN DURBAN, HOLLY FEARNBACH / NOAA / PUBLIC DOMAIN



Composer and lead saxophonist Håkon Erlandsen arrives at the concert venue and practises before the big event, as another diver approaches in the water.

Text by Antonio Chilton
Photos by Tomi Mustonen,
Rob Taylor and Pekka Tuuri

On 29 March 2024, the first-ever concert performed in a cave by technical divers took place in Plura Cave in northern Norway. Technical diving instructor Antonio Chilton has the story.



Plura Cave Concert

A Musical Performance by Technical Divers in Norway



Erlandsen with saxophone underwater, en route to perform at the Plura Cave Concert

Plura Valley is a technical and cave diving resort located in northern Norway, just below the Arctic Circle. It has been run by Ina and Jani Santala Jordbru for the last seven years. They host over 1,000 technical and cave dives every

year. The resort is all-inclusive, in terms of diving, with a full technical diving centre attached to cosy Nordic accommodation in the picturesque Plura Valley, with full catering and, of course, a dive-themed bar.

In 2019, Ina and Jani got married inside Plura Cave, which is located on Ina's family farm called Jordbru. With 69 divers in attendance inside the cave, the whole event was a huge success and was also awarded a **Guinness World Record**. This

laid the foundation for the idea of an event inside the cave, so that more people could experience this kind of amazing venue.

The background
The idea for the concert came after

PEKKA TUURI



Ina and Jani Santala Jordbru (left) happily look out over the crowd (above) during their Guinness World Record wedding ceremony. Some of those attending the wedding in Plura Cave in 2019 dressed up in proper suits under their drysuits (right). Kari Silen on trumpet was the first person ever to play live music inside the Plura Cave Chapel (below).

meeting up with some great musicians and event planners. After the success of the wedding, Ina and Jani realised that it would be challenging but technically possible to hold a concert in the cave. However, it would be very demanding in terms of the resources needed to pull it off.

The regional centre of Bodø is the **European Capital of Culture** for 2024, and the **Cave Music** team organising the concert were lucky enough to get the chance to pitch the project to them. With Bodø2024 on board as the main event partner, as well as local and international sponsors, it suddenly became possible to make this crazy idea of an event a reality.

It took four years, but now the **Plura Cave Concert** was scheduled for 29 March 2024, as a part of the "Leave Nothing but Footprints" concept of

the **Bodø2024** European Capital of Culture programme, and the idea was that the team would hold this epic live concert experience in the heart of the mountain for a select few—and at the same time make one of the most inaccessible places in the world accessible to the masses through a live stream of the concert.

Mission

The Plura Cave Concert was about more than just music; by highlighting niche communities and their cultural impact, the team aimed to foster an appreciation for diverse human experiences, forging connections that transcend boundaries and endure through time. The team wanted to explore and showcase cultural depths and celebrate the dedication of those who ventured into these hidden realms.

The music for this concert was composed by **Håkon Erlandsen**, an artist who focuses on expressing the emotions of extreme sports and expeditions through the medium of music. Erlandsen was already renowned for his extraordinary concert locations, holding the record for the world's highest concert, performed on the summit of Mount Everest at 8,848 metres above sea level, and the world's coldest concert, held in Antarctica at a whopping -57°C. He has also worked closely with Yamaha, for whom he is an ambassador, to develop a saxophone tough enough to play in the harshest conditions on earth.

Erlandsen, who has been cave diving since 2019, composed the concert music based on his experience of cave diving. He did this by incorporat-



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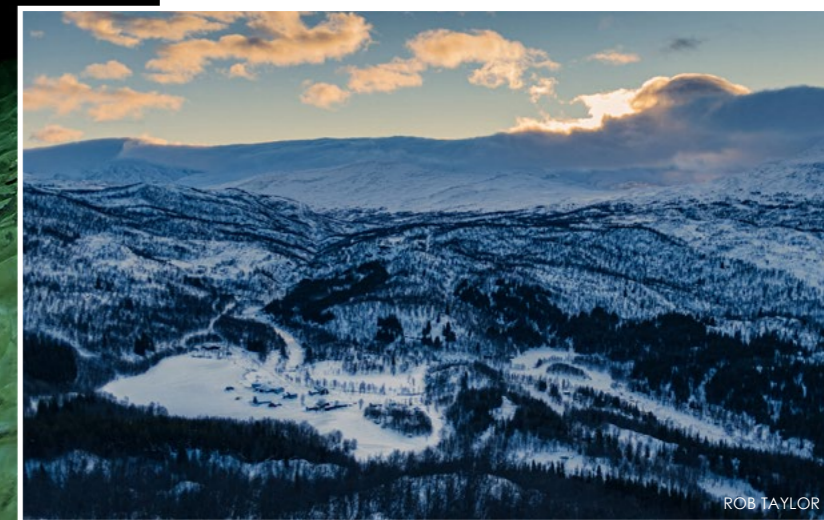
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TOMI MUSTONEN



ROB TAYLOR

View of Plura Valley in winter, at the end of the road, with only wilderness surrounding it (above); Northern lights over Plura Valley in Rana (top right)



PLURA VALLEY

Jani Santala, chief instructor trainer responsible for safety at Plura Valley (above); Santala diving the S-curve in Plura Cave (top left)

ing the sounds of the cave that spoke to him the most, such as the sound of water droplets and the echo of bubbles. He said his aim with this project was to convey the feeling of cave diving to everyone—in his words, “the simultaneous thrill and calmness you experience.” He said he wanted to share the feeling of something being both beautiful and exciting at the same time, by using art to reach a wider audience and share an experience that had previously only been enjoyed by a few.

Preparations

With just three weeks left until the day of the concert, the preparations were

well underway at Plura. In two weeks' time, 25 amazing volunteers, mostly trusted friends and acquaintances from Norway and Finland, would arrive to assist with all aspects of the preparations. They would be involved in laying cables, rigging equipment for transportation into the cave, and helping to prepare the resort for 45 guests, including preparing food, cleaning and organising accommodations, among other things.

One of the technical obstacles to overcome was how to safely transport the instruments through the cave. To solve this, the Cave Music team reached out to the dive equipment manufacturer Santi, who loved

the idea. The Santi team made custom drysuits for the electric bass guitar and double bass, complete with an inflator and dump valve. The Cave Music team were very grateful to Santi for their advice and guidance in understanding the technical requirements, as well as the hours they put in to make one-of-a-kind drysuits, all within a strict time frame.

Dive planning

The lowest point on the way to the air chamber was 32 mfw, so the ambient pressure was 4.2 atm. This factor added some intricate complexities to the dive planning, as some of the loudspeakers had air spaces inside

them and there were concerns about the risk of implosion during transport. The team considered several solutions, such as transporting the speakers in sealed cases (but the cases were not strong enough to withstand 4 atm); wet transport (but this did not mix well with the electronics); and they considered asking Santi for more drysuits, but they were not sure this would solve the pressure issue.

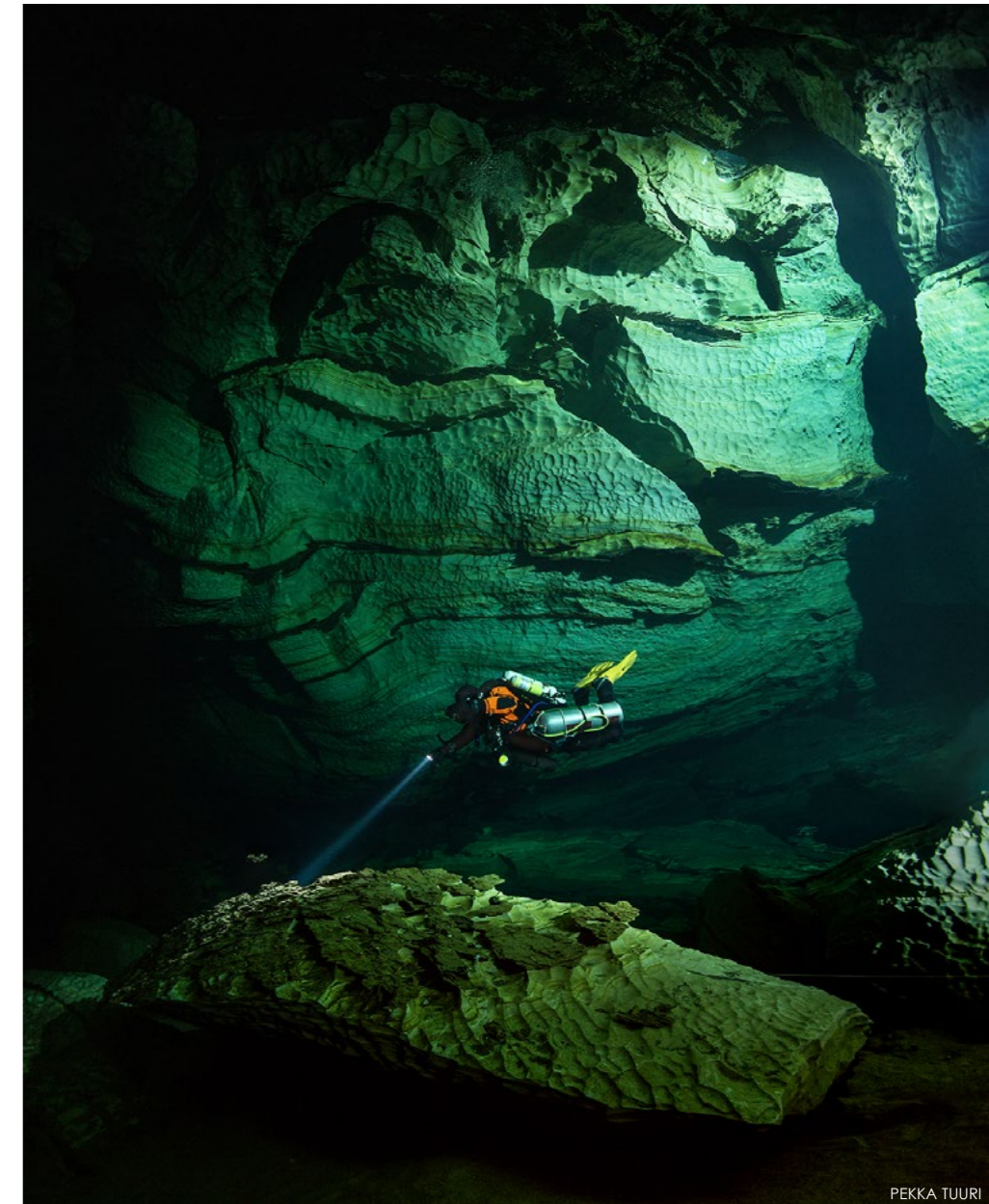
Eventually, they decided that a test was in order. So, they sent their bass player, Davide Bertolini, to the Western Norway University of Applied Sciences. Thanks to the team's friend and contact there, Vegard Sandvik, the university kindly allowed them to

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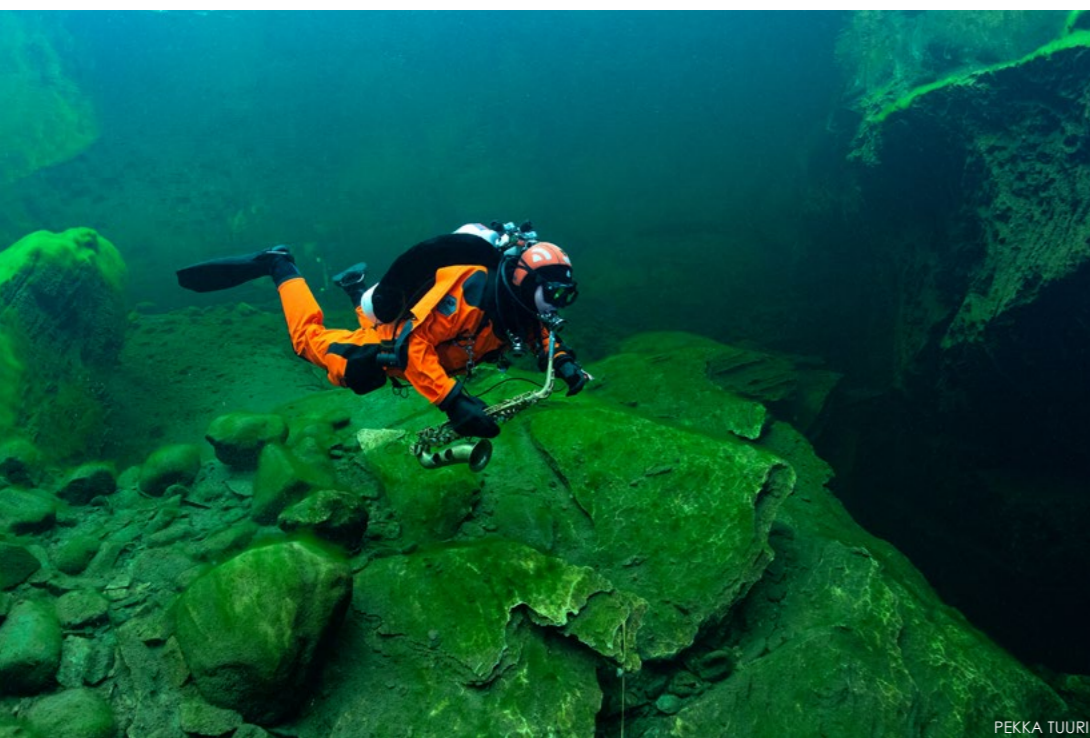




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Erlandsen diving in Plura Cave in northern Norway (above); Erlandsen entering Plura Cave on the way to the Plura Cave Concert (left); Just inside the entrance of Plura Cave, there are massive halls over 10m high and 30m wide (right).

use the hyperbaric chamber to stress test the musician and his instruments. Bertolini confirmed that his basses, a mixer and the loudspeakers would be able to withstand 4.2 atm. In addition to the bass, a brass saxophone was also tested. Given the fresh water in the cave and the metal nature of the saxophone, no special accommodations were needed, except perhaps a towel at the other end of the dive!

Laying the cable

A team of volunteers would be help-

ing to lay more than a kilometre of fibre-optic cable in the cave for the live streaming of the concert. It was a massive task, made even more difficult by the cold water temperature of 4°C, which required thicker gloves and in some cases even mittens—and these made it more difficult to work with the delicate fibre-optic cable. Due to the cold water temperature and open circuit gas constraints, the team would realistically be limited to a maximum of 1.5 to 2 hours per dive. It would therefore take approximately one week for

a team of three divers to install the full length of cable.

For safety reasons, the team decided not to run the fibre-optic cable directly along the mainline, for fear of entanglement of and/or breakage by divers swimming through restrictive areas. Therefore, the cable would be suspended using polystyrene blocks cable-tied to the fibre-optic cable, so that it would float up against the ceiling of the cave and be carefully placed—essentially putting it into a line trap. This would prevent any unwanted contact with concertgoers.



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Power

For the concert, the team would be using Seacraft DPVs, some of which were on loan from the manufacturer. The Seacraft DPVs were critical pieces of equipment for the event. Thanks to their E/O cable, the team would be able to power the entire concert from the scooters, eliminating the need to run another cable through the cave. Everything, from lights, microphones, bass guitars, speakers and mixing boards would be powered by the Seacraft scooters' batteries. There were over 15 different

scooters, totalling over 7kW. This was enough power to run a small house, so for the concert, it would be more than enough for the concert.

A joint effort

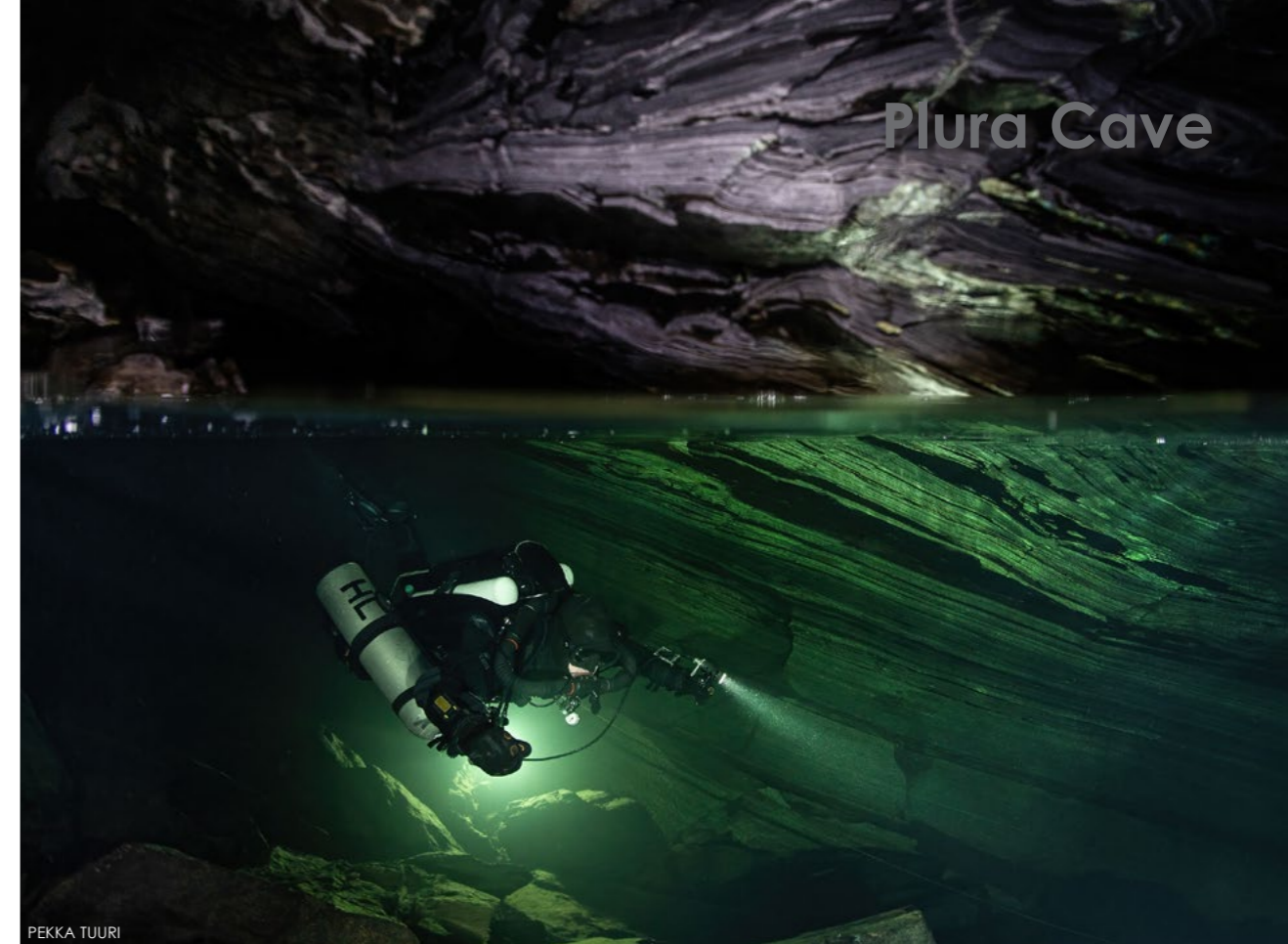
This event would not have been possible without the support of the diving community. The Cave Music team said that it was amazing to see how different brands came together to make it happen.

Since its inception in 2017, Plura Valley has been supported by the dive equipment manufacturer Mares.

For this event, Mares provided safety gear and much needed equipment. One of Mares' main contributions was the regulators for the extra stage tanks, which were staged throughout the cave as a safety measure. XDEEP was another brand that supported the event, providing backplates and harnesses for the volunteers who flew in for the event and were unable to bring all their dive gear.

Live streaming

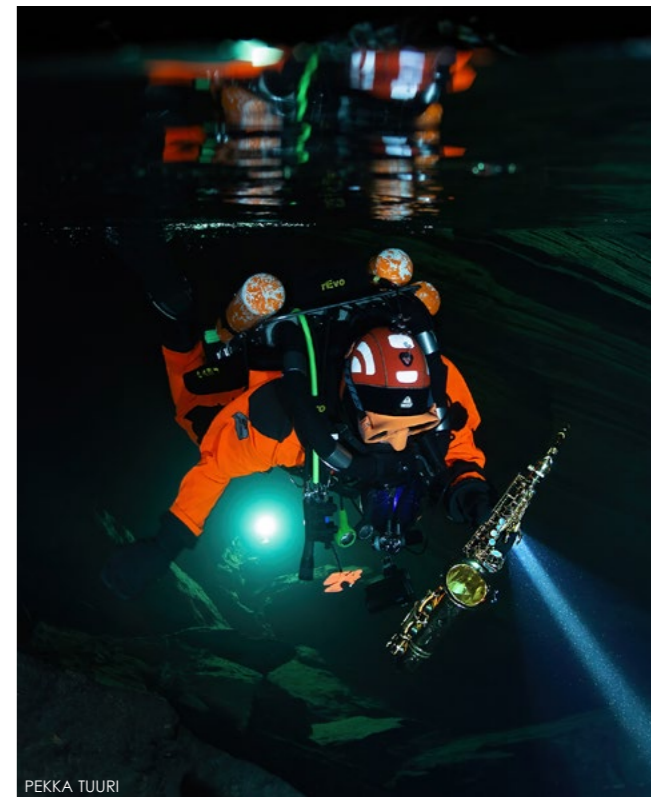
The live stream of the concert started at 1400hrs GMT +1 and lasted for two



Plura Cave

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Erlandsen pauses on his way to the concert venue (left); One of the divers helping out with preparations for the concert enters the Plura Chapel where the concert will be held (above); Erlandsen, with his saxophone, on his way up to the air chamber, 1,500ft inside the mountain (right).



PEKKA TUURI

hours. The concert itself started at 1500hrs local time. The live stream link was made available two days before the event and was hosted on the Cave Music team's **YouTube channel**. Outside the cave, the team set up a large marquee where the concert was streamed on four large screens for those unable to dive to the concert site, such as family members or non-cave qualified members of the diving community.

Inside the cave, the teams of divers arrived at the concert site in a coordinated manner, as directed by the

Cave Music team's command centre. As the concertgoers arrived in the chamber, they were "signed out" of the water to confirm that they had reached the site safely. They then





PEKKA TUURI

Erlandsen arrives at the concert venue and practises before the big event.

took their seats in the cave chamber, which was formed like an amphitheatre with tiered rocks for the audience to sit on.

With a mix of open-circuit and closed-circuit divers in the audience, the Cave Music team also had to consider the doffing and donning of equipment on arrival and departure. This was managed by a team member who coordinated the storage of equipment. Fortunately, there was no shortage of space, as the chamber itself was over 500m long.

Non-alcoholic drinks were served inside the cave during the event. However, the Cave Music team were careful not to serve too much liquid

to the audience members, as although the team at Plura were very talented, transporting a porta-potty into the chamber was beyond their purview! At the end of the concert, the divers returned to the surface for dinner and celebrations to round off an amazing day and achievement. ■

To watch the steamed video, go to: **Cave Concert Stream**. To see a map of the cave, go to: **Map of Plura Cave**. For more information, please visit: **Plura Valley**.

The Cave Music team would like to thank its partners Plura Valley, Bødo2024 European Capital of

Culture, Smelte Digelen, and Äänirasia; dive brands **Mares, Santi, Seacraft, Xdeep**; sponsors Rana Gruber, Strand Shipping, Kunnskapsparken Helgeland, Rana Utvikling, Cargill, Mo i Rana, Sparebankstiftelsen Helgeland, and SpareBank Helgeland; Vegard Sandvik and Western Norway University of Applied Sciences; composer and lead saxophonist Håkon Erlansen, bassist Davide Bertolini and all the musicians, divers, volunteers and audience members who made the concert possible.

Antonio Chilton is a technical diving instructor and full cave diver at Plura Valley. Visit **Instagram @antonio.chilton**.

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The shot after waiting for the moray to get into position.

Text and photos by Cristian Umili

Macro underwater photography comes with some challenges, particularly when positioning a subject in the frame. Cristian Umili offers some advice and tips to improve your macro images.



Photograph of the situation as soon as the moray eels were found.



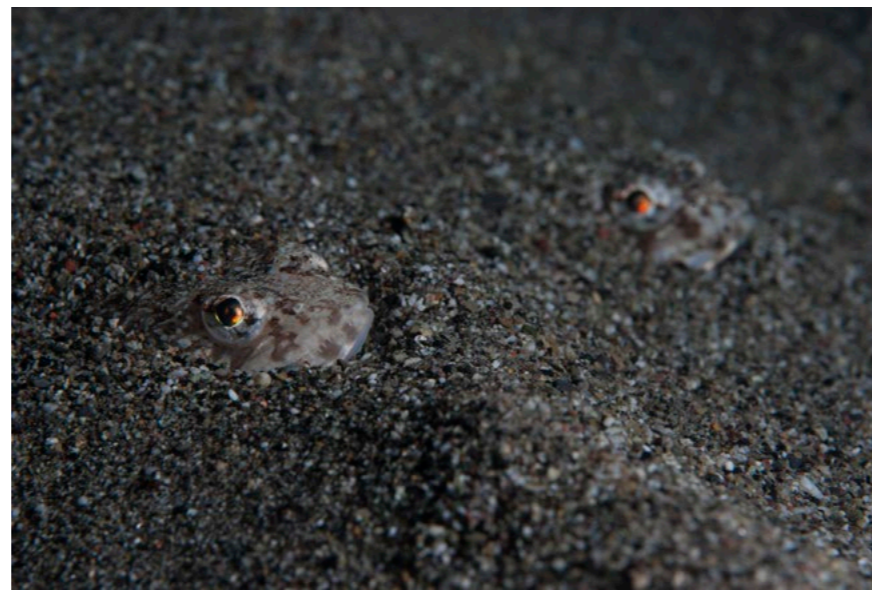
Positioning Subjects

in UW Macro Photography

Taking macro photos underwater, in the beginning, can result in images that do not capture the impact of the subject as seen during your dive. This is often due to the photographer being too far away from

the subject, shooting the subject from the wrong angle, or not waiting for the fish or other marine species to move into the best and most photogenic position.

The photographer's position
The first thing we need to understand is how to position ourselves in the water, i.e. our position in relation to the subject. If we position ourselves too high above the



The position of the photographer/camera is too high in relation to the subject.

The position of the photographer/camera is at the same level as the subject but too far away.

subject, we will be shooting from above, looking down, which will flatten the subject, and if the subject is well camouflaged, it will further blend into its surroundings, making it difficult to see in the picture. Another very common mistake is not getting close enough, which makes the subject too small

in the picture.

To avoid this problem, always remember to place your camera at least at the same level as your subject, and that the subject is large enough to fill the viewfinder for a good visual effect. This has secondary benefits, such as making lighting easier and reducing

the risk of your hovering over the subject having a negative impact on the image.

Waiting for the right position

Under water, subjects often move or are moved by the current. Even a subject that appears, at first glance, to be moving slowly

The position of the photographer/camera is now close enough to the subject.



Photo taken as soon as I found the subject.



In this shot, I waited for it to come closer.

After waiting a little longer, here is the fish in the desired position.



After waiting for it to move on, it came into a good position for me to photograph it, but the current had caused the rhinophores on its head to droop.

(such as a nudibranch) will move quickly in your viewfinder if you frame it at a good magnification. Sometimes we get lucky, and the animal we want to photograph is already in a favorable position, sometimes not. If we encounter the second scenario, we will have to stop and observe the behavior, and if the animal is moving, it is best to wait for it to

move into the desired position.

If we are unfamiliar with the species that we are photographing, we can stop after the first shot and observe how it moves. We can then position ourselves better for the shot or change the angle or position of the camera to frame the subject better and create a more compelling and dynamic photograph.



After waiting a moment longer, the nudibranch had raised its head and its rhinophores were raised, creating a more dynamic and interesting shot.

Positioning

Sometimes you find subjects in odd positions, like this nudibranch, which was in a curious position, but the background made it barely visible.



This photo of a nudibranch walking on the head of a scorpionfish—a strange and almost comical situation—was taken as a whole, but it remains a shot that lacks personality.

Getting closer and giving more prominence to the nudibranch in action, and only partially capturing the scorpionfish, make for a more interesting shot.



Focus on one subject

Sometimes on a dive, we will come across certain scenes where several animals of different species are involved. However, taking a shot of the whole scene often does not translate well into a photograph, and we end up with a confused image.

To improve this, we can move in closer and photograph only part of the scene, giving more importance to one subject and less to another. When photographing only part of the secondary subject, we must be careful to give the photo a pleasing crop that makes it clear what the secondary subject is.

Conclusion

With a little patience and

practice, photographers can improve their macro shots by changing their own position as well as the camera's. Getting to know your subject and waiting for it to move into a good position will result in better images. ■

Cristian Umili has been taking underwater photographs since 1990, starting with a Nikonos camera and today with digital reflex cameras. Since 2004, he has been a commercial photographer, with clients such as Seac Sub, Scubapro and Cressi Sub. A member of the Ocean Artist Society, he is represented by Mondadori Portfolio and collaborates with Scubazone. Please visit: cristianumili.com



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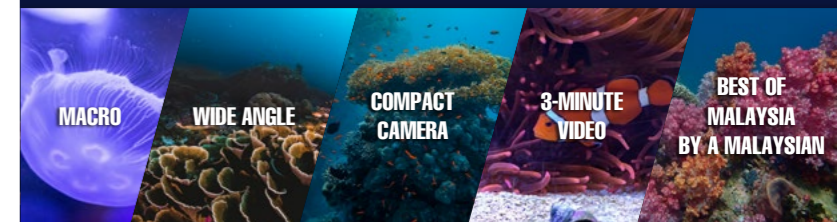
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Underwater Photographer of the Year 2024: *Whale Bones*, by Alex Dawson, Sweden (right)

Behavior Category Winner: *The End of the Baitball*, by Rafael Fernandez Caballero, Spain (below)

Portrait Category Winner: *Grey Whale Connection*, by Rafael Fernandez Caballero, Spain (center)

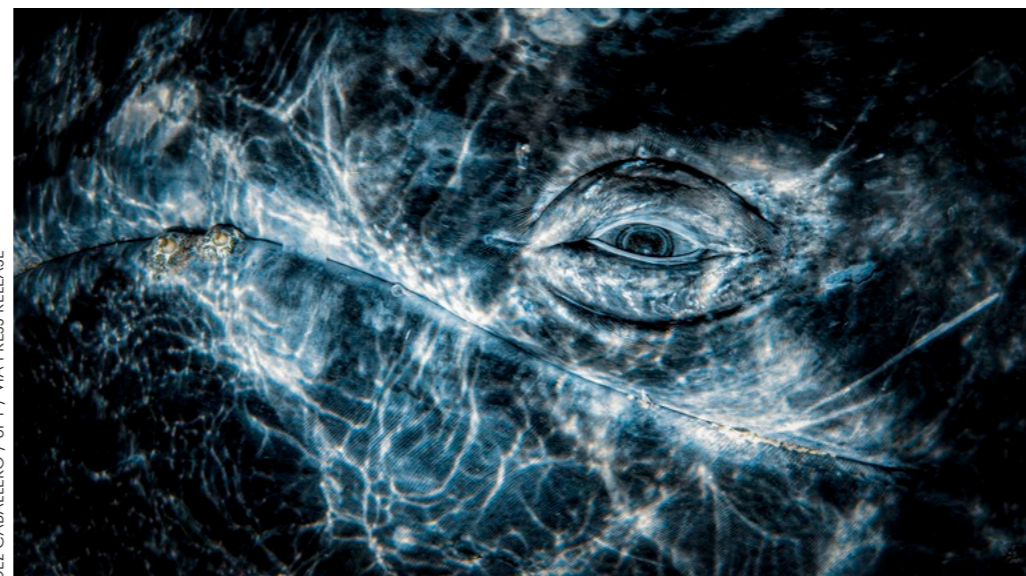
Underwater Photographer of the Year 2024 Winners

A poignant image capturing a freediver surveying the aftermath of whaling has earned Alex Dawson from Sweden the prestigious title of Underwater Photographer of the Year 2024. Dawson's captivating photograph, entitled *Whale Bones*, emerged victorious from a pool of 6,500 submissions by underwater photographers hailing from diverse corners of the globe.

"*Whale Bones* was photographed in the toughest conditions," said Alex Mustard, chair of the judging panel, "as a breath-hold diver descends below the Greenland ice sheet to bear witness to the carcasses. The composition invites us to consider our impact on the great creatures of this planet. Since the rise of humans, wild animals have declined by 85%. Today, just 4% of mammals are wildlife, the remaining 96% are humans and our livestock. Our way needs to change to find a balance with nature."



ALEX DAWSON / UPI / VIA PRESS RELEASE



RAFAEL FERNANDEZ CABALLERO / UPI / VIA PRESS RELEASE

Whales took center stage among this year's victorious images, with Spanish photographer Rafael Fernandez Caballero clinching two categories with his captivating portrayals of these majestic ocean dwellers: a close-up of a grey whale's eye and a dynamic

shot capturing a Bryde's whale engulfing an entire bait ball, both captured in the breath-taking backdrop of Magdalena Bay, Baja California, Mexico. Fernandez Caballero seized the moment for *Grey Whale Connection* while adrift in a small boat, positioning his cam-

era over the water's edge to capture the inquisitive whale. For *The End of a Baitball*, he immersed himself underwater, ensuring he was precisely positioned to photograph the whale lunging.

"The photo shows the high-speed attack," he said, "with the whale engulfing hundreds of kilograms of sardines in one bite—simply unforgettable to see predation on such a scale."

Up & Coming award

Lisa Stengel from the United States secured the title of Up & Coming Underwater Photographer of the Year 2024 for her mesmerizing depiction of a mahi-mahi capturing a sardine in the waters of Mexico. Stengel expertly captured the fleeting moment with precision and finesse by using her hear-

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Up & Coming Underwater Photographer of the Year 2024: *Window of Opportunity*, by Lisa Stengel, United States (right)



NUNO SÁ / UPIY / VIA PRESS RELEASE

Save Our Seas Foundation Marine Conservation Photographer of the Year 2024: *Saving Goliath*, by Nuno Sá, Portugal (above)

ing and a very fast shutter speed. "If you listen there's an enormous amount of sound in the ocean," she said. "The action was too fast to see, so I homed in on the sound of the attacks with my camera to capture this special moment."

"It is such an exciting time in underwater photography because photographers are capturing such amazing new images, by visiting new locations and using the latest cameras," said judge Alex Mustard. "Until this year I'd hardly ever see a photo of a mahi mahi, now Lisa has photographed one hunting, action that plays out in the blink of an eye."

British award

As the Underwater Photographer of the Year contest is based in the United Kingdom, the British Underwater Photographer of the Year 2024 award went to Jenny Stock for her image *Star Attraction*, which features frequently over-

looked species of British wildlife.

As she explored Scotland's western coast, Stock said "in the dark green depths my torch picked out the vivid colors of a living carpet of thousands of brittle stars, each with a different pattern. I was happily snapping away, when I spotted this purple sea urchin and I got really excited."

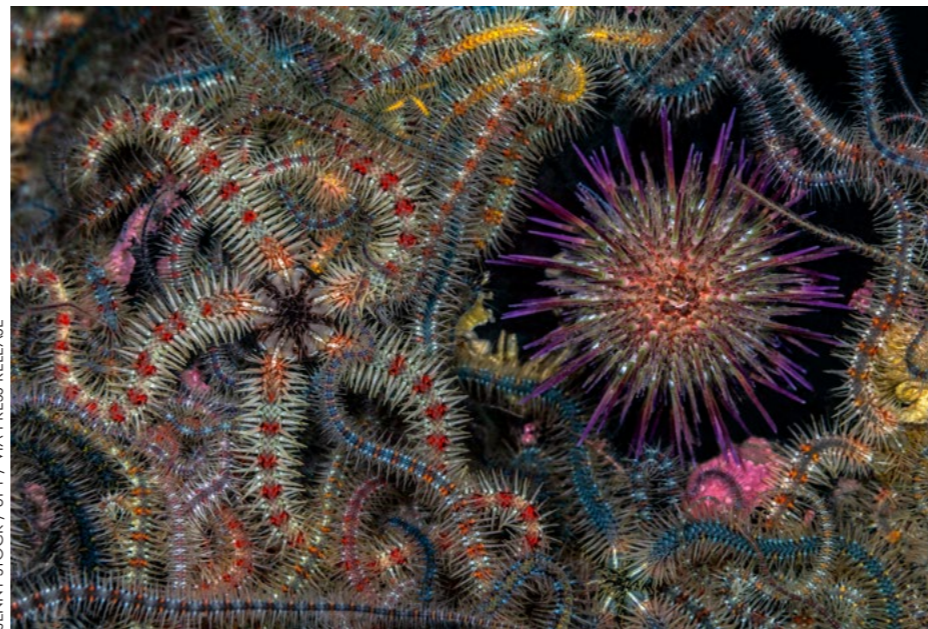
Marine Conservation award

In the same competition, the Save Our Seas Foundation Marine Conservation Photographer of the Year 2024 award went to Portuguese photographer, Nuno Sá, for his photo *Saving Goliath*, which was taken in Portugal. A stranded sperm whale and beachgoers attempting to save it is captured in Sá's photo. The image inspires hope in people's concern for the oceans but underscores the necessity for substantial, transformative actions.

"The whale had been struck by a ship and its fate was sealed," said



LISA STENDEL / UPIY / VIA PRESS RELEASE



JENNY STOCK / UPIY / VIA PRESS RELEASE

British Underwater Photographer of the Year 2024: *Star Attraction*, by Jenny Stock, United Kingdom (left)

Sá. "An estimated 20,000 whales are killed every year, and many more injured, after being struck by ships—and few people even realize that it happens."

About UPY

The Underwater Photographer of the Year, held annually in the United Kingdom, commemorates subaquatic photography across oceans, lakes, rivers, and pools, drawing global submissions. With 13 categories encompassing Macro, Wide Angle, Behavior, and Wreck photography,

showcase. Winners were revealed at a ceremony in Mayfair, London, graciously hosted by The Crown Estate, with judges including renowned underwater photographers Peter Rowlands, Tobias Friedrich, and Dr Alexander Mustard MBE.

The Marine Conservation category of UPY was sponsored by The Save Our Seas Foundation, which is dedicated to the protection of life in the oceans, especially sharks and rays. ■

For more information, visit: underwaterphotographeroftheyear.com.

Update On Diving Medicine

Gary Rose, MD, Tour Leader

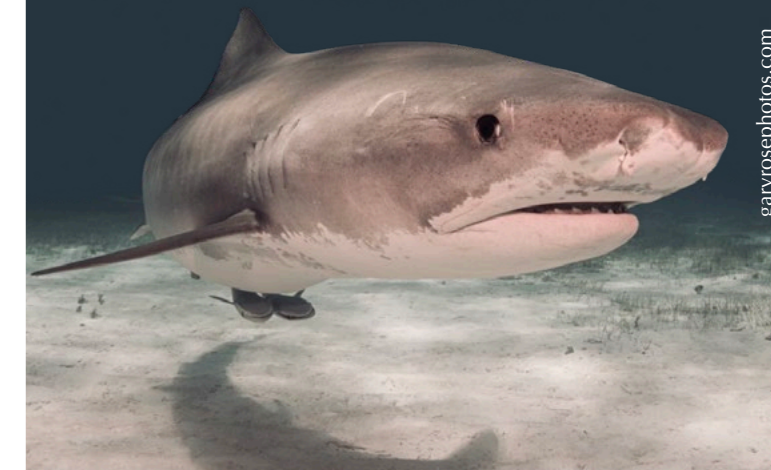
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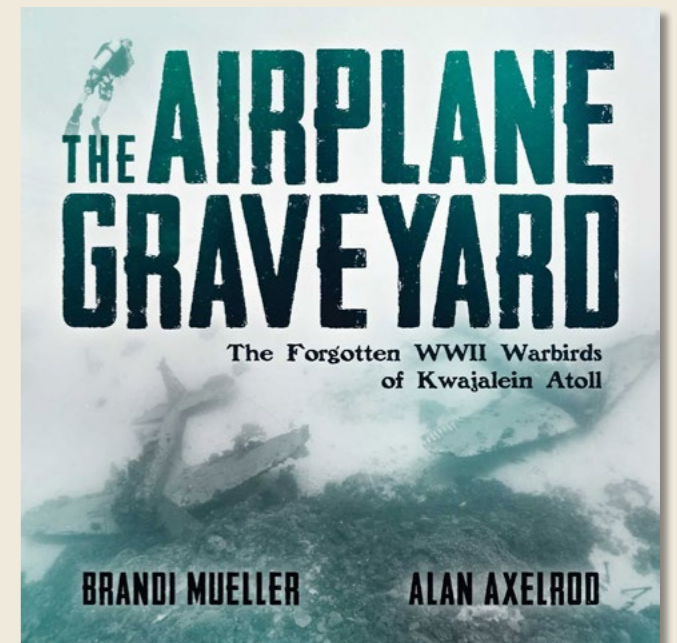
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Tones & Tonality

Contributors' Picks

Text and photos by John A. Ares, Scott Bennett, Sheryl Checkman, Anita George-Ares, Kate Jonker, Brandi Mueller, Gary Rose and Olga Torrey

We asked our contributors to share their favorite underwater photos that showcase tones and tonality, and they returned with a range of wide-angle and macro shots featuring a variety of marine life, reefs and topography. Here, *X-Ray Mag* contributors share their chosen images from the cenotes of Mexico to the tropical waters of the Marshall Islands, Chuuk Lagoon, Palau, the Philippines, Indonesia, Malaysia and the Maldives to the subtropical and temperate waters of New Zealand, South Africa and the US East Coast.



Bigeye jacks, Sipadan—cool tones (left). Gear: Nikon D200 camera, Sigma 10-20mm lens at 10mm, Hugyfot housing, two Ikelite D125 strobes. Exposure: ISO 100, f/6.3, 1/80s.



Cenote sunbeams, Mexico—green tones (previous page). Gear: Nikon D850 camera, Nikon 15mm lens, Seacam housing, two Inon Z-330 strobes. Exposure: ISO 500, f/9, 1/60s.

Subtle to Vibrant

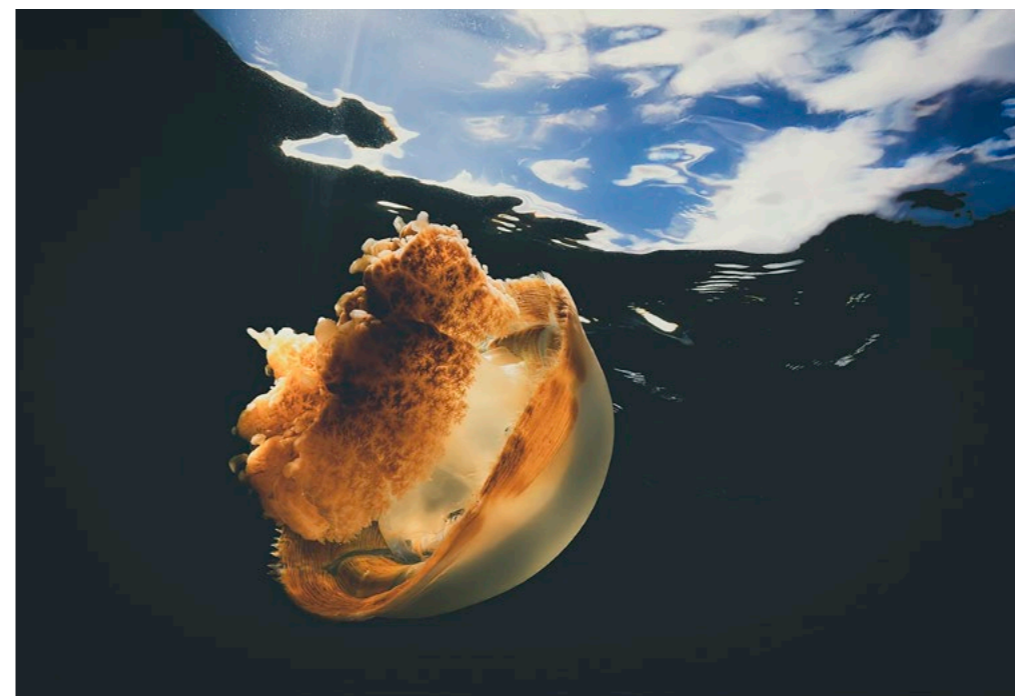
Text and photos by Scott Bennett

Malaysia's Sipadan Island is renowned for its massive numbers of schooling fish. Upon discovering the bigeye jacks at Barracuda Point, I wanted an image of the fish filling the frame. Approaching as slowly as possible, I set both strobes to half power to avoid overexposure. After firing off several shots, I found a composition where the layers of moving fish created distinctive foreground and background elements. The shimmering fish contrasted sharply with the water, generating a study in blue and silver (top left image). To accentuate the cool tones, I used the Cool Ocean preset filter in ON1

Effects software with some additional sharpening added. The cenotes of Mexico's Yucatan Peninsula had long been on my diving bucket list, and they did not disappoint! The striking geological features combined with gin-clear visibility created a myriad of photo opportunities. However, some of my favourite images were created in the pools where one entered the water (see previous page). Here, sunlight filtered through the tropical vegetation above, creating ethereal beams of light that pierced the shallows. With the camera pointed upwards, my 15mm lenses captured both the dancing rays and the ripples on the surface above. The entire scene was rendered in hues of green, with the con-

centric surface patterns contrasting sharply with the richly textured rock. Effects in Adobe Camera RAW were used to enhance the texture, with additional sharpening applied using Topaz software.

The Poor Knights Islands of New Zealand are one of my all-time favourite dive destinations, with a beguiling fusion of temperate and subtropical species. Despite the lack of large corals, every surface is ablaze with colour. Tiny jewel anemones proved particularly photogenic, creating elaborate patchworks encompassing the sheer rock faces. After taking a few wide shots, I decided to move in closer, allowing the vibrant reds and magentas to dominate the frame. A sliver of blue at the bottom left and a



Jewel anemones, New Zealand—warm tones (above). Gear: Nikon D810 camera, Nikon 16-35mm lens at 26mm, Seacam housing, two Ikelite D160 strobes. Exposure: ISO 400, f/20, 1/200s.

Golden jellyfish, Palau—gold tones and blue tones in one image (left). Gear: Nikon D7100 camera, Sigma 10-20mm lens at 13mm, two Ikelite D160 strobes. Exposure: ISO 250, f/20, 1/80s.

lone sea urchin provided some contrast. To enhance the surreal effect, I used the Cinema preset in ON1 Effects software before finishing with some additional sharpening and texture adjustments in Adobe Camera Raw.

Palau's Jellyfish Lake is a truly unique destination that comes

with a plethora of photographic challenges. I had first visited 15 years ago with a Nikonos V camera, but the images were less than triumphant. Now armed with a digital SLR, I was eager for another opportunity. After getting some wide-angle images, I wanted to capture a close-up of a single jellyfish at

the surface with the sky behind it. With my freediving skills woefully lacking, this quickly proved easier said than done. I devised a solution by positioning my camera directly beneath the jellyfish and pointing upwards. I used two strobes to illuminate the underside to balance with the ambient light from the sky above. The orange/yellow of the jellyfish provided an interesting contrast to the blue sky. To emphasize the effect, I used the Colour Grade preset filter in ON1 Effects. See more [here](#).



Photo 1. (above) Hard-hat diver, Dutch Springs, Pennsylvania, USA. Gear: Canon EOS Rebel T1i camera, Sigma 11-18mm f/2.8 lens at 12mm, Ikelite housing, twin Ikelite DS161 strobes. Exposure: ISO 400, f/8, 1/125s.

Enhancing Tones

Text and photos by John A. Ares

The tones in the images that we capture can be rendered as pleasingly as we saw them on the dive, or they may need to be enhanced to convey the feeling that we had when we photographed the scene.

The hard-hat diver in Photo 1 was photographed as part of a “History of Diving” event in a lake in Pennsylvania. Given the historical nature of the dive gear, it was natural that the image would be sepia toned. The color was applied using Nik Silver Efex Pro software. Under Toning in the Finishing Adjustments panel, the Sepia option was selected and adjusted to achieve the desired effect.

Sometimes, a photo taken with available light and a blue background does not represent the scene as we saw it



Tones

Photo 2. (left) Four whale sharks, Oslob, Cebu, Philippines. Gear: Canon 10D camera, Canon EF-S 10-18mm f/4.5-5.6 IS STM lens at 10mm, Ikelite housing, available light. Exposure: ISO 400, f/6.3, 1/500s.

Photo 3. (below) Bubble coral with shrimp, Anilao, Philippines. Gear: Canon EOS Rebel T1i camera, Canon 100mm f/2.8 Macro USM lens, Ikelite housing, twin Ikelite DS161 strobes. Exposure: ISO 400, f/32, 1/125s.

or the feeling we had when we photographed it. The photo of the whale sharks in Photo 2 begged for a cyanotype treatment to enhance it. Again, using the Nik Silver Efex Pro plug-in, the Cyanotype option under Toning in the Finishing Adjustments panel was applied, using the slider to adjust the image.

Most of the time, we try to produce photos that are colorful and fully saturated. The colors illustrate what we find attractive underwater. Rarely on reefs do we find subtlety among certain colors. The mostly white-tinted bubble coral in Photo 3 did not benefit from being turned into a purely black-and-white image. The subtle tones of the white and off-white areas, along with the small splash of color from the shrimp, made for an effect that would have been ruined by heavier treatments in post-production. Visit: JohnAres.com





Warhol-esque triptych of a tawny nurse shark at Dhiggiri Island in the Maldives. Left to right: Sepia, cool purple, and blue-green tones. Gear: Olympus TG-5 camera with 4.5mm lens, Olympus PT-059 housing, available light. Exposure: ISO 160, f/8.0, 1/320s.

Shark Triptych

Text and photos by Sheryl Checkman

During a late afternoon nurse shark dive at Dhiggiri Island in Vaavu Atoll on my recent trip to the Maldives, I knelt on the sandy bottom and watched as dozens of tawny nurse sharks swam above and beside me. There was one particular shark that swam directly above me, baring its mouth full of teeth in what looked like a grin in anticipation of an easy snack. I chose this shark portrait for my tonal exploration because of its unusual perspective and Warhol-esque feel.

To get these effects, I first adjusted the exposure, highlights and shadows in Lightroom, then brought the photo into Nik Collection's Color Efex Pro 4 software, where I was able to play around with the various color variations seen here. Each version gives both the shark and the photo a very different look, from the warm, vintage-looking sepia version to the more pop, poster-like versions in color. Visit: [Instagram.com/SherylCheckman](https://www.instagram.com/SherylCheckman)



ANITA GEORGE-ARES

Photo 1. (right) Boo Windows, Raja Ampat, Indonesia. Gear: Canon EOS Rebel SL1 camera, Canon EF-S 18-55mm f/3.5-5.6 IS STM lens at 18mm, Ikelite housing, Bigblue VL4200P video light and natural light. Exposure: ISO 200, f/11, 1/160s.

Photo 2. (left) Tomato anemonefish and anemone, Dumaguete, Philippines. Gear: Canon EOS Rebel XTi camera, Canon EF-S 60mm f/2.8 Macro USM lens, Ikelite housing, twin Ikelite DS161 strobes. Exposure: ISO 200, f/11, 1/200s.

Photo 3. (below) Cardinalfish and anemone, Dumaguete, Philippines. Gear: Canon EOS Rebel XTi camera, Canon EF 50mm f/2.5 compact macro lens, Ikelite housing, twin Ikelite DS161 strobes. Exposure: ISO 200, f/11, 1/200s.

ANITA GEORGE-ARES



ANITA GEORGE-ARES



Cool and Warm Tones

Text and photos by Anita George-Ares, PhD

Boo Windows is a famous dive site off Boo Island in South Raja Ampat, Indonesia. The Windows are large openings in a rock formation that extends from the surface down to the reef. We were warned not to swim through the Windows during our dive as there was a strong current on the other side. The Windows were lit only by my video light and sunlight. The resulting low-key image has cool blue tones (Photo 1).

Warm, orange tones predominate the subjects and backgrounds in Photos 2 and

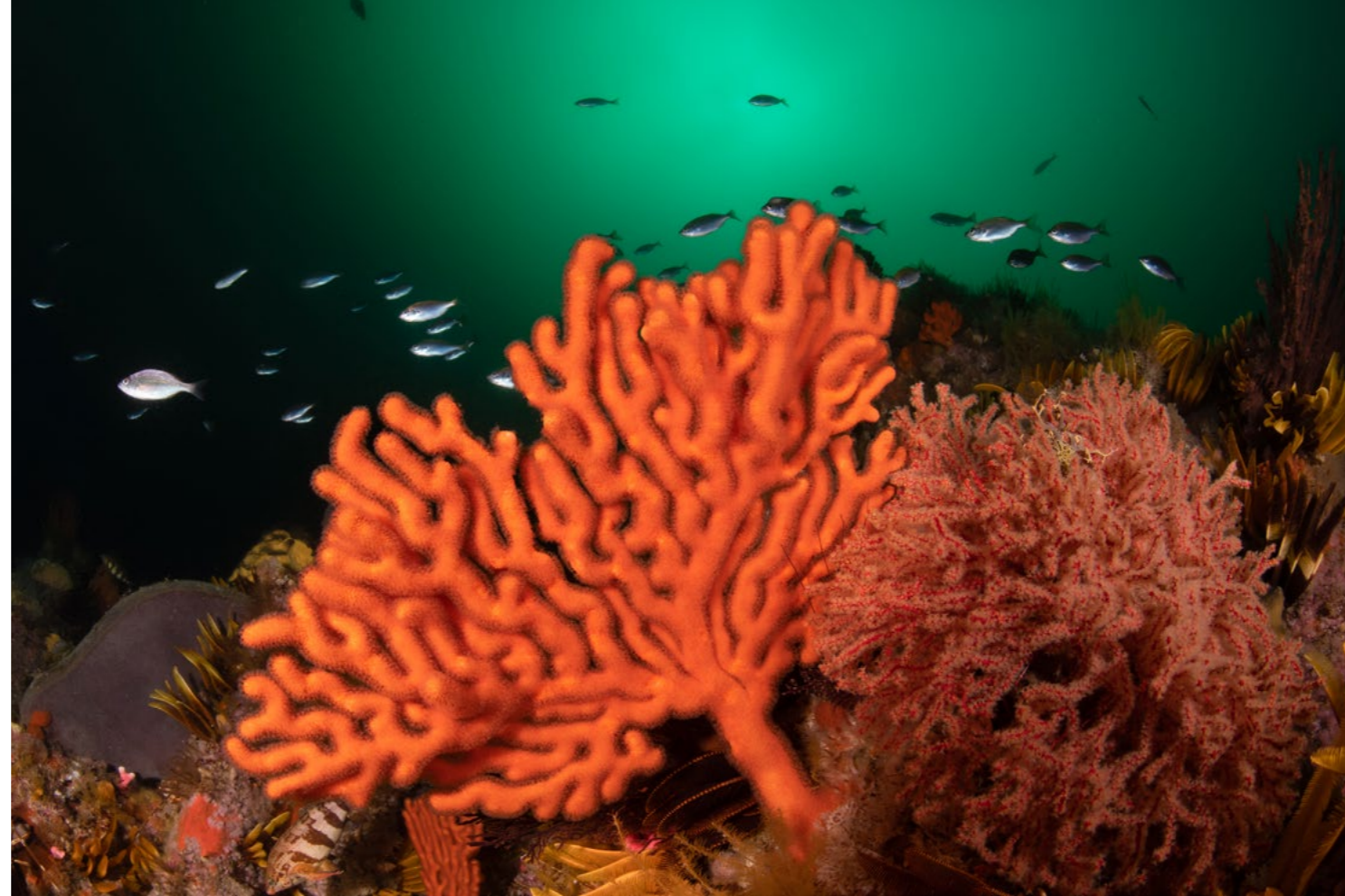
3. The male tomato anemonefish in Photo 2 has a reddish orange body. The anemone tentacles that surround the fish have a brownish-orange tone.

The majority of cardinalfish in Photo 3 are Moluccan cardinalfish, easily identified by the white spot behind the dorsal fin. A few Wassinki and yellow-striped cardinalfish are present in the right half of the image. The Moluccan cardinalfish have brownish-orange bodies with reddish-orange fins. The anemone tentacles are reddish orange except for the yellowish-orange tentacles in the upper left corner of the image. Visit: [facebook.com/profile.php?id=100016947967639](https://www.facebook.com/profile.php?id=100016947967639)



Kelp forest, Rooi Els, Cape Town, South Africa (above). Using shadows and highlights to create contrast and depth can add an air of mystery to an image. Gear: Canon EOS R5 camera, 8-15mm fisheye lens, Marelux housing, SUPE D-Pro strobes. Exposure: ISO 200, f/13, 1/200s.

Orange sea fans and crinoids at Steenbras Deep, Gordon's Bay, South Africa (top centre). Use tonality to create contrast in your images. I used tones of orange and pink to contrast my subject against the graduating tones of green in the temperate waters. Keep an eye out for contrasting tones. Gear: Canon EOS R5 camera, 8-15mm fisheye lens, Marelux housing, SUPE D-Pro strobes. Exposure: ISO 400, f/8, 1/100s.



Mastering Tones and Tonality

Text and photos by Kate Jonker

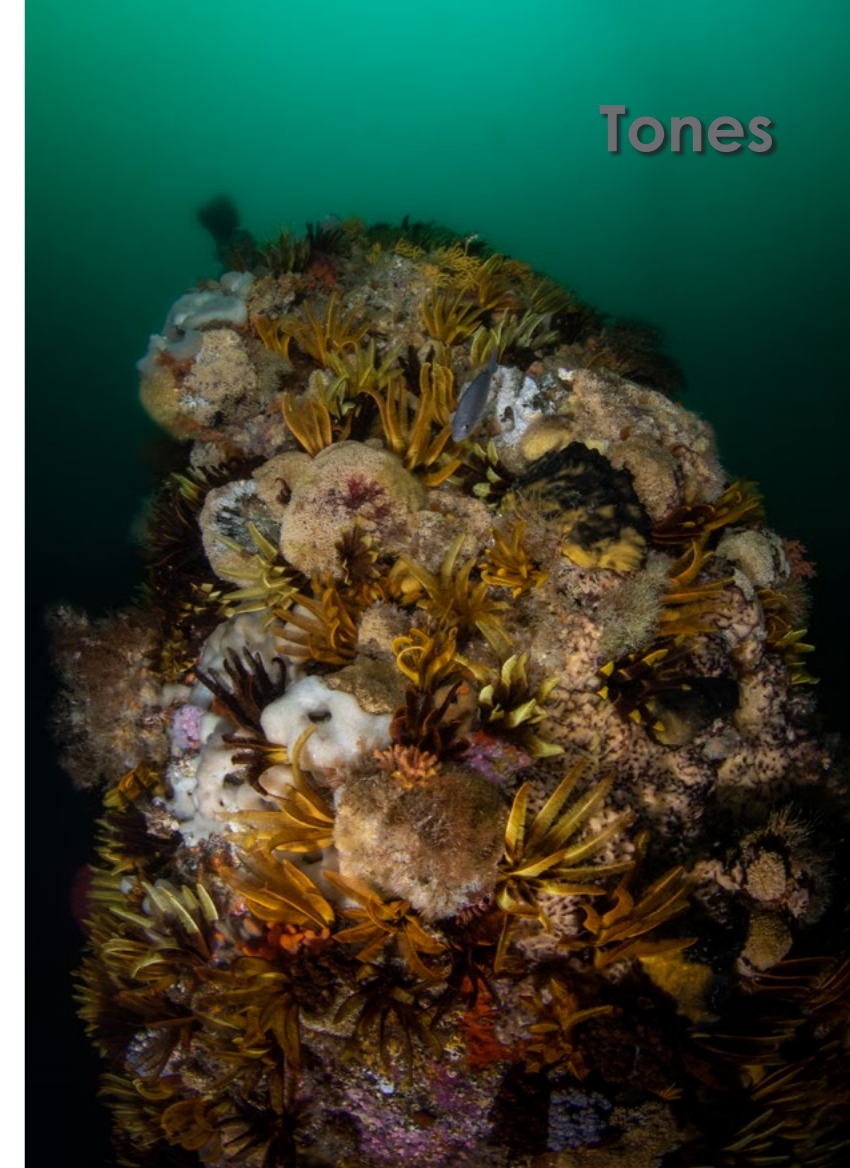
In the world of underwater photography, mastering tones and tonality can elevate your underwater images from ordinary photographs to extraordinary works of art. It is the key to captivating underwater photography.

Tones are related to the distribution of light and dark areas in a photograph, while tonality encompasses the range of these tones as different hues and how they blend together.

Beneath the surface, light behaves in its own unique way, creating different tones. Water acts as a natural filter, and the quality and clarity of light is influenced by how calm and clear the water is. By carefully observing how light in the water interacts with your subject and its surroundings, you can manipulate shadows and highlights to create compelling contrasts and depth.



To master tonality, you need to be aware of the colours and their hues within your underwater world. Using rich or contrasting hues can enhance the mood and assist with storytelling within your images. Whether you are capturing the bright colours of a coral reef or the dark depths of the ocean, the use of tones and tonality can breathe life into your underwater images. Visit: katejonker.com



Reef scene, Simon's Town, South Africa (above). Use different tones of yellow, orange and ochre to complement the shades of green, which gradually become darker as we travel deeper into temperate waters. Keep an eye out for tones that complement each other to create artistic images. Gear: Canon EOS 7D Mark II camera, Tokina 10-17mm fish-eye lens, Sea&Sea housing, Inon Z-240 strobes. Exposure: ISO 320, f/8, 1/125s.

Super klipfish, *Clinus superciliosus*, Stone Dog, Gordon's Bay, South Africa (centre). Tonality can be used in macro underwater photography to create images that are gentle and pleasing to the eye. I used an open aperture to blur the green, turquoise, orange and pink hues of this super klipfish, creating an image that is more than just a scientific or ID type shot. Gear: Canon EOS R5 camera, 100mm macro lens, Marelux housing, SUPE D-Pro strobes. Exposure: ISO 200, f/5.6, 1/200s.



Aichi E13A "Jake," Truk Lagoon (Chuuk), Micronesia (above). Gear: Nikon D850 camera, 8-15mm fisheye lens, Ikelite housing, dual Ikelite DS230 strobes. Exposure: ISO 250, f/8, 1/125s.

Tropical Wrecks

Text and photos by Brandi Mueller

The topic of tones and tonality got me excited to go back and revamp some older images of my favorite subject: underwater airplanes. Shooting tropical wrecks in color is one way to show the vibrant marine life that covers the wrecks, such as the Aichi E13A "Jake" airplane, encrusted with red sponges and swarming with glittering fish, in the photo above.

But sometimes wide-angle images of large objects end up very blue, with little definition. To overcome this, I often convert wrecks, particularly WWII wrecks, to black and white to add contrast within the image and to give the viewer a



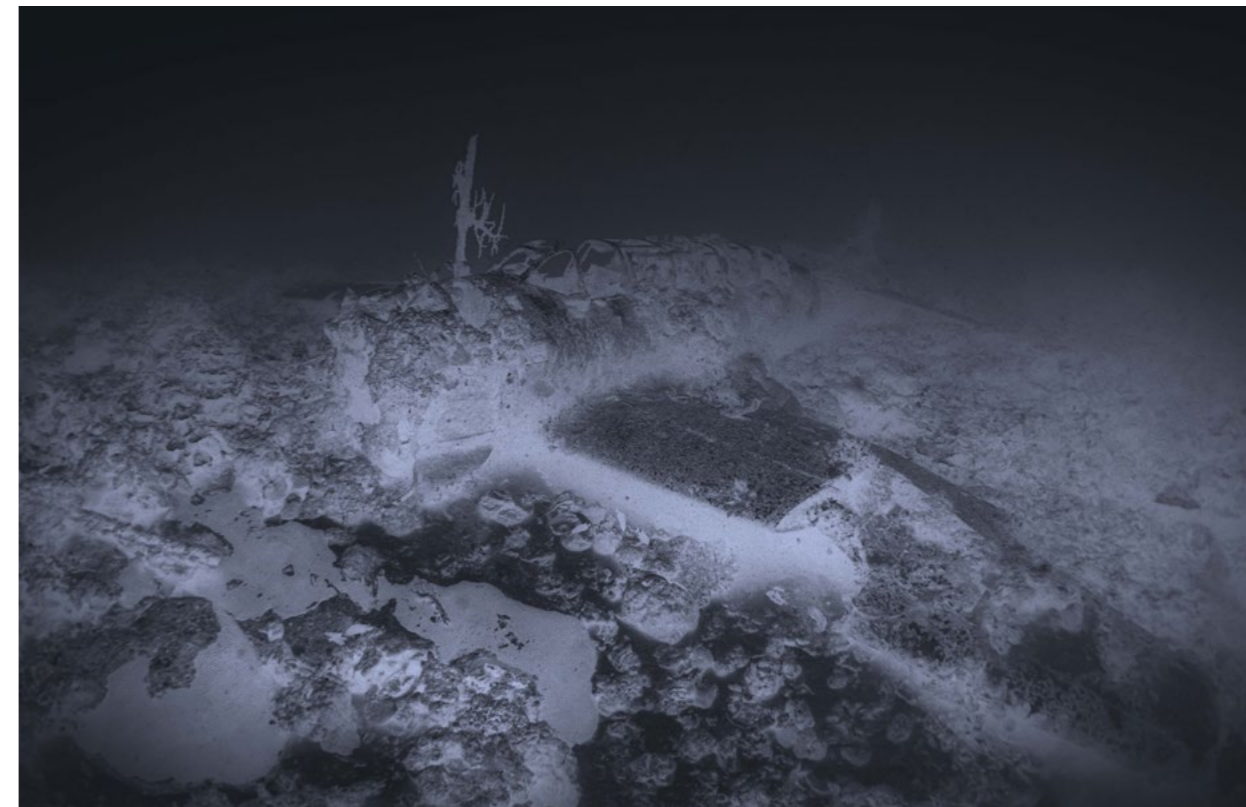
sense of age and the passage of time. It was a really fun challenge to take things a few steps further and convert an image of a massive Martin PBM Mariner to sepia in an attempt to show

the aging process of time. I also find it fascinating that the sepia pigment comes from cuttlefish ink, so it seems fitting for underwater images. For the image of a Nakajima C6N



Aichi E13A "Jake," Truk Lagoon (Chuuk), Micronesia (left). Gear: Nikon D850 camera, 8-15mm fisheye lens, Ikelite housing, available light. Exposure: ISO 250, f/6, 1/100s.

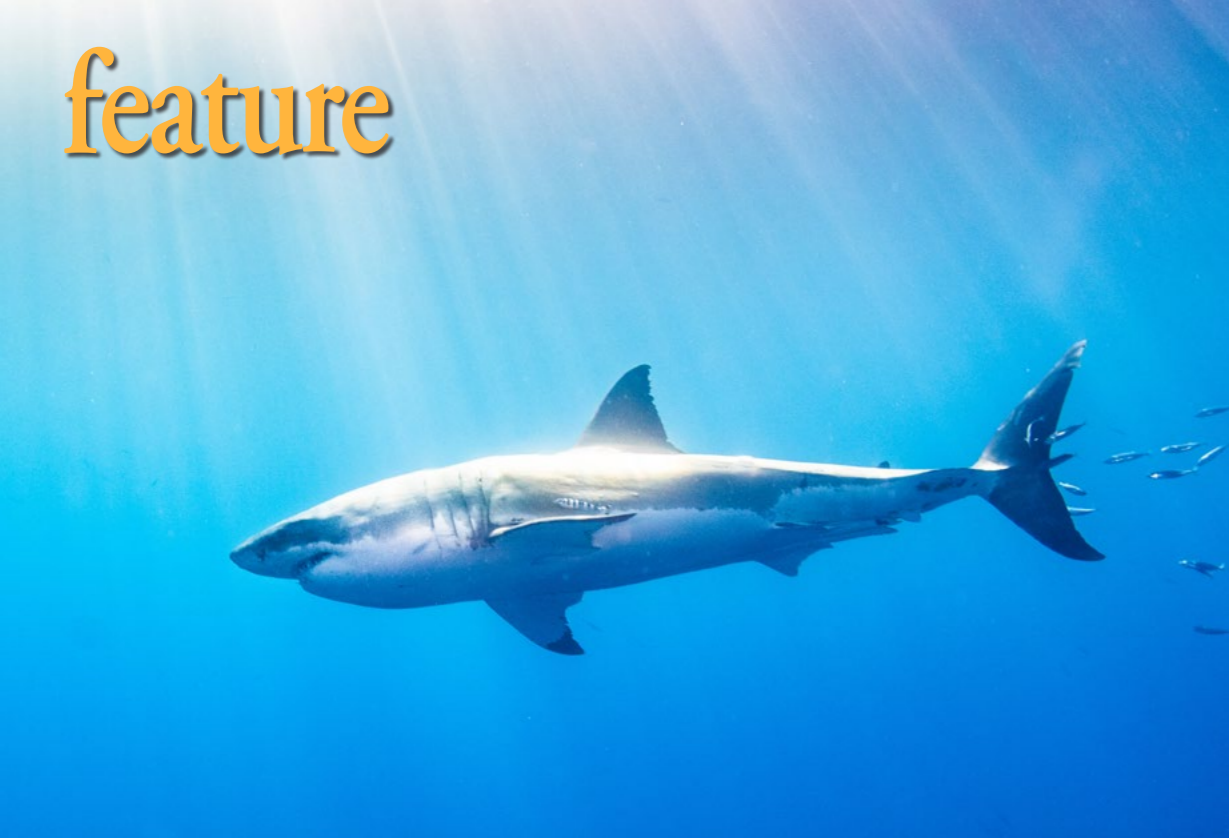
Nakajima C6N "Myrt," Truk Lagoon (Chuuk), Micronesia (below). Gear: Nikon D850 camera, 8-15mm fish-eye lens, Ikelite housing, available light. Exposure: ISO 320, f/7.1, 1/100s.



Martin PBM Mariner, Kwajalein Atoll, Marshall Islands (center). Gear: Nikon D850 camera, 8-15mm fisheye lens, Ikelite housing, available light. Exposure: ISO 400, f/7.1, 1/100s.

Tones





Great white shark, Guadalupe Island, Mexico. Gear: Nikon D500 camera, Tokina 10-17mm lens, Nauticam housing, Inon Z-330 strobe. Exposure: ISO 320, f/11, 1/125s, FL 17.

Photo 1. (top left) The original photo is a little hazy and flat prior to post-production processing.

Photo 2. (left) Decreased exposure, increased clarity, increased vibrance. Enhances cathedral lighting and drama.

Photo 3. (center) Adjusted tint to green to look more like a bad viz day. Maintained dramatic lighting.

Photo 4. (below) Converted to black and white to enhance cathedral lighting, reflection of light off skin, and drama.

Changing Tones

Text and photos by Gary Rose, MD

Much of the fun of underwater photography is in the post-processing. Just like with any form of art, the touch-ups, additions, deletions, and tonal changes can alter the entire photographic expression. A mood can be set, ambience softened, light hardened. The choices are infinite. With the use of a single photo, I will demonstrate.

Photo 1 is an average photo of a great white shark taken at Guadalupe Island, Mexico. The photo is hazy and has a somewhat flat quality. The viewer can easily see a potential to sharpen this up and highlight the background cathedral lighting, as well as spotlight the fabulous glow of the midday light reflecting off the dorsal skin of the great white.

In Photo 2, I first decreased the exposure, which immediately focused and emphasized the background cathedral lighting. Tweaking a little more, I increased the clarity and vibrance, and added a touch of blue tint, which enhanced the rich blue



tones of the negative space of the surrounding tropical Pacific Ocean.

In Photo 3, I shifted the tint from blue to green to recreate the effects of a low-visibility dive, just to see how it would turn out. Notice that the cathedral lighting and reflection of light on

the great white shark is maintained. This small change in color tone created an entirely different and natural feel.

I always love converting my images to black and white, especially those with dramatic lighting. To do this, I just completely desaturate the photo. In



Photo 4, I also boosted up the texture, clarity, and vibrance to add additional drama to this photo. The cathedral lighting pops. The reflective light bathes the great white and forms a magnificent corona, which creates a spiritual emotion.

While playing with tonal qualities, the underwater photographer can create an extraordinary number of visual, emotional, and spiritual results. Color, or lack thereof, and tone provide an extensive palette to create, and then recreate. Visit: garyrosephotos.com



Tones



Giant Pacific manta ray, Revillagigedo Archipelago (Socorro), Mexico—cyanotype tone (above), old-style photographic tone (top left), and sepia tone (bottom left). Camera gear: Olympus OM-D E-M5 camera with 7-14mm lens, Nauticam NA-EM5 housing, Sea&Sea YS-D1 strobes. Exposure: ISO 320, f/8, 1/80s.

Nostalgia and Expression

Text and photos by Olga Torrey

I was excited to board the live-aboard headed to Socorro Island to dive with the giant Pacific manta rays. I had never had the opportunity to see them before this trip.

They are the largest of the rays and the most mesmerizing creatures in the sea. During our time with them, the mantas interacted with me and the other divers! I recorded this unforgettable experience with

my camera.

Black-and-white photography works best with a strong primary element in the image. Adding tonality evokes different feelings. I chose three tones to express my feelings about the experience with the manta rays.

In postproduction, I converted the original photo to black and white and added a sepia tone, which evoked strong feelings of nostalgia and made me want to swim with the mantas again. Then I applied a cyanotype tone to the black-and-

white image to express the soothing, calming, and nurturing emotions I experienced while diving with them. I remember that after my last dive with the mantas, there was a feeling of sadness and a longing for more.

Finally, I applied an old-style photographic tone to express the power and elegance of these majestic animals, as well as their historical importance in the natural world. Applying different tones helped me tell the story behind the scenes. Please visit: fitimage.nyc

