



GLOBAL EDITION
December 2023
Number 122

Bali
Garden of the Gods

Tech
Nuttlar Slate Mine

Marshall Islands
Ebadon

Contributors' Picks
Framing a Subject

UW Photo
Generative Fill

M A R S H A L L I S L A N D S

Bikini Atoll

COVER PHOTO BY BRANDI MUELLER

DIRECTORY

X-RAY MAG is published by AquaScope Media ApS
 © X-RAY MAG / AquaScope Media ApS
 Copenhagen, Denmark
xray-mag.com

PUBLISHER & EDITOR-IN-CHIEF
 Peter Symes
Editor@xray-mag.com

IN MEMORIAM
 Michael Symes, M.Sc., Senior Editor
 Barb Roy, Associate Editor

PUBLISHER, MANAGING EDITOR & CREATIVE DIRECTOR
 Gunild Symes
Gunild@xray-mag.com

SECTION EDITORS
 Andrey Bizyukin, PhD – *Features*
 Larry Cohen – *Photo & Video*
 Catherine GS Lim – *News, Books*
 Michael Menduno – *Tech*
 Ila France Porcher – *Sharks*

LAYOUT ASSISTANCE
 Sine Kristiansen

COLUMNISTS
 Matt Jevon – *Opinions*
 Steve Lewis – *Opinions*
 Gareth Lock – *Training*
 Ila France Porcher – *Shark Tales*
 Mark Powell – *Tech Talk*
 Simon Pridmore – *Opinions*
 Rico Besserdich – *UW Photo*
 Lawson Wood – *UW Photo*

ASSOCIATE EDITORS
 Scott Bennett, Toronto
Scott@xray-mag.com
 Catherine GS Lim, Singapore
Cat@xray-mag.com
 Matthew Meier, San Diego
Matt@xray-mag.com
 Michael Menduno, Berkeley
Michael@xray-mag.com

CONTRIBUTORS THIS ISSUE
 Mike Ange
 John A. Ares
 Emily Chan
 Sheryl Checkman
 Larry Cohen
 Anita George-Ares, PhD
 Kate Jonker
 Dan Kenny
 Catherine GS Lim
 Matthew Meier
 Lorenzo Moscia
 Brandi Mueller
 Ila France Porcher
 Simon Pridmore
 Sofie Pridmore
 Tim Rock
 Gary Rose, MD
 Michael Rothschild, MD
 Kurt Storms
 Gunild Symes
 Peter Symes
 Olga Torrey
 Claudia Weber-Gebert
 Alan Williams

Russia - Moscow
 Andrey Bizyukin, PhD
Andrey@xray-mag.com
 Svetlana Murashkina, PhD
Svetlana@xray-mag.com

Sweden
 Lelle Malmström
Lelle@xray-mag.com

ASSISTANT EDITORS
 Rosemary E. Lunn, London
Roz@xray-mag.com
 Don Silcock, Sydney + Bali
Don@xray-mag.com

USA
 Larry Cohen, New York City
Larry@xray-mag.com

ADVERTISING ASIA-PACIFIC
 Juliette Myers, Sydney
Juliette@xray-mag.com

UNITED KINGDOM
 Rosemary E. Lunn, London
Roz@xray-mag.com

USA & INTERNATIONAL
 Matthew Meier, San Diego
Matt@xray-mag.com

Contacts page: Xray-Mag.com

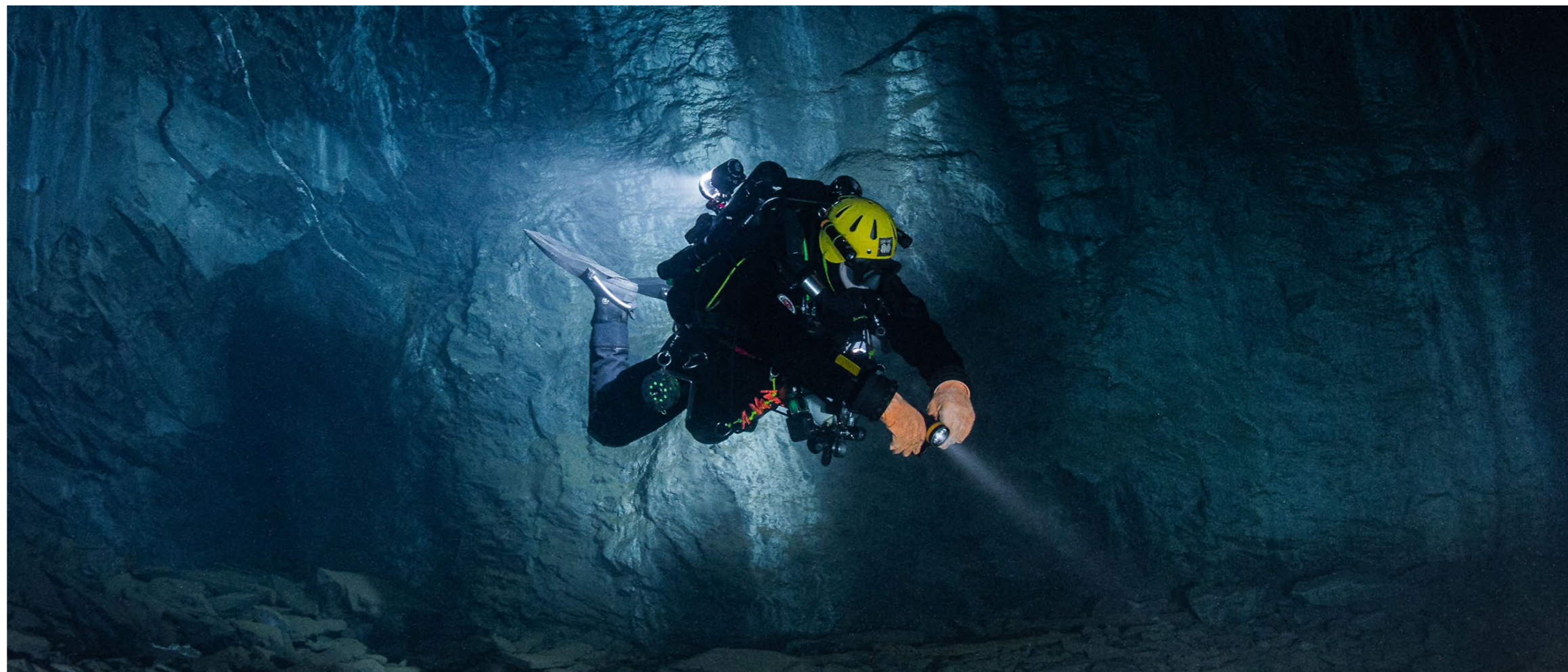
SUBSCRIPTION

X-RAY MAG International Edition in English is FREE
 To subscribe, go to: xray-mag.com/Subscription

COVER PHOTO: *Amphiprion tricinctus* in anemone on blast gauge tower, USS *Saratoga*, Bikini Atoll, Marshall Islands.
 Photo by Brandi Mueller (brandiunderwater.com)

contents

Diver in Nuttlar slate mine, North Rhine-Westphalia, Germany. Photo by Kurt Storms



12
 SAFEGUARDING MARINE ARTEFACTS
 EDITED BY CATHERINE GS LIM

18
 BIKINI ATOLL MARSHALL ISLANDS
 BY BRANDI MUELLER

34
 GARDEN OF THE GODS BALI, INDONESIA
 BY CLAUDIA WEBER-GEBERT

42
 SEA TURTLE HATCHERY PEMUTERAN
 BY CLAUDIA WEBER-GEBERT

50
 FRAMING IN UNDERWATER PHOTOGRAPHY
 CONTRIBUTORS' PICKS

67
 EBADON & RISING SEAS MARSHALL ISLANDS
 BY LORENZO MOSCIA, WITH DAN KENNY

78
 TECH: NUTTLAR SLATE MINE IN GERMANY
 BY KURT STORMS

plus...
 EDITORIAL 3
 NEWS 4
 WRECK NEWS 15
 EQUIPMENT 61
 BOOKS & MEDIA 62
 MARINE MAMMALS 72
 SHARK NEWS 73
 SQUID NEWS 76
 PHOTO NEWS 88

columns...

63
 SCUBA CONFIDENTIAL: HIP, HIP... HOORAY!
 BY SIMON PRIDMORE

83
 UW PHOTO: GENERATIVE FILL
 BY MICHAEL ROTHSCHILD

89
 PORTFOLIO: ALAN WILLIAMS
 INTERVIEW BY G. SYMES

Not yet subscribed to X-RAY MAG? Sign up now! It's FREE! QUICK! EASY! Click here...

SCANDINAVIA'S BIGGEST DIVE SHOW

DykMassan

The Scandinavian Dive Show



GOTHENBURG

WIN DIVE TRIPS | TRY DIVE | SEMINARS | WORKSHOPS
APNEA CONTEST | DIVE TRAVEL | DIVER'S PUB
PHOTO COMPETIONS | TECH DIVING | EDUCATION
DIVE EQUIPMENT | DIVE CENTRES

SVENSKA MÄSSAN
FEBRUARY 9-11, 2024

For more info go to dykmassan.se

© Magnus Edvardsson

editorial

A Return to the “Old Normal” in the Dive Industry

We have recently returned from another DEMA Show, and it is heartening to witness the dive industry's resurgence following the pandemic. The show felt like a return to the “old normal.” However, there is an intriguing duality at play here—the old is becoming the new normal in the dive industry.

With nearly three decades of experience in the dive industry, I may be considered a senior member by conventional standards. Yet, at many dive shows, it does not quite feel that way. Amid the attendees, you will find plenty of grey hair, a few walkers, and even some mobility scooters.

It is no secret that the dive industry faces a significant demographic challenge. The older generation proudly identifies as divers, while younger cohorts often view diving as an item on a checklist, a fleeting experience during vacations. This dwindling retention of divers, who do not progress in their certifications or continue to explore the underwater world beyond occasional

holidays, has long eroded the industry's economic foundation.

So, what has changed? One argument suggests that activities and lifestyle preferences fluctuate in popularity, and diving may have peaked around the turn of the century before gradually declining. While this may hold some truth, I find there is a deeper factor at play.

When my generation, now in our middle years, were children, diving was an unattainable fantasy. Seeing it on TV felt like watching science fiction, igniting our dreams. As dive training gradually became accessible, a door to those dreams began to crack open. As a university student with limited funds, I joined a dive club, piecing together my gear through borrowed, ill-fitting equipment. It took months of club meetings and Tuesday evening training sessions in a public swimming pool before we earned our coveted C-cards.

We were immensely proud because, at that time, certification was a significant achieve-

ment, a symbol of prestige. However, just a decade later, you could be at a dinner table, and Aunt Agatha might casually mention her PADI Open Water certification from a trip to Thailand, and no one would bat an eyelid. That is when diving lost its allure for the younger generations, sowing the seeds of its decline.

How do we make diving cool again? I don't have all the answers, but there are promising signs of a resurgence in some regions, particularly in Asia and pockets of Europe. Additionally, younger divers are increasingly championing environmental causes, participating in underwater clean-ups, coral planting, and reef restoration efforts. It is not just cool; it adds a profound new dimension to being a diver, and that is something to be optimistic about in the ever-evolving world of diving.

— Peter Symes
Publisher & Editor-in-Chief

from the deep

NEWS

Edited by
Catherine GS Lim

Portable coral factories to be developed

Imagine portable coral aquariums being established in remote areas to propagate young corals.... can this be a solution to the decline of coral reefs worldwide?

To safeguard the survival of coral reefs around the world, portable aquariums can be set up in remote areas to propagate young corals that can be used for reef restoration.

Known as ReefSeed, this containerised system is being developed by Australian Institute of

Marine Science (AIMS) in collaboration with the Maldives Marine Research Institute (MMRI).

Each of these portable aquariums can propagate up to 100,000 young corals at a time. According to AIMS Coral Reproduction and Aquaculture Research Team Leader Dr Muhammad Abdul Wahab, ReefSeed's portability enabled it to be set up next to a beach, drawing water from the ocean and using an independent power source for filtration, pumps and temperature control.

ReefSeed will be deployed in the Maldives in 2025. To this end,

during the 2024 autumn spawning, MMRI marine biologists and technicians will work alongside the AIMS team in AIMS' **National Sea Simulator** to learn how to conduct large-scale coral spawning and production methods to generate coral larvae for restoration.

Deployment devices

These conservation methods had been developed under the Australian Government's Reef Restoration and Adaptation Program (RRAP), in which coral larvae are being settled onto sheets and then assembled into deployment devices.

"These devices have been engineered to maximise coral survival rates, with protective features to limit mortality from grazing herbivore fish. They are used to deploy the corals on carefully selected reefs to help drive restoration," said Dr Abdul Wahab.

ReefSeed was among 14 projects from 20 nations that were awarded funds this year by the **Coral Research and Development Accelerator Platform (CORDAP)** to help secure the future of coral reefs in light of climate change and other environmental pressures. ■ SOURCE: AIMS



© AIMS 1996 / CREATIVE COMMONS ATTRIBUTION 4.0 AUSTRALIA LICENCE

DAN
DIVERS ALERT NETWORK

WE ARE YOUR DIVE SAFETY ASSOCIATION

MEMBER BENEFITS

- 24/7 Emergency Hotline
- Medical Information Line
- DAN *TravelAssist*® Benefits
- Online Safety Resources
- *Alert Diver*® Magazine
- Access To Purchase DAN Dive Accident Insurance
- Medical & Safety Consultations

DAN membership includes automatic enrollment in DAN *TravelAssist*® and this is only a brief description of the coverages available under that program. Refer to the DAN member benefit handbook for reductions, limitations, exclusions, definitions, and termination provisions. Coverage may vary by state or may not be available in all states. DAN membership alone does not provide coverage for costs of a dive accident; dive accident insurance must be purchased separately for each member.

JOIN TODAY
DAN.org/Join



Edited by
G. Symes

A variety of *Acropora* corals at Lighthouse Reef in Palau where researchers from CSIRO, UQ and PICRC saw rapid coral recovery with the release of dormant coral "seed banks" after a super typhoon in 2012.



MARK PRIEST © COPYRIGHT CSIRO AUSTRALIA

Corals store dormant "seed banks" like forests do

CSIRO scientists made a groundbreaking discovery about coral reefs during a seven-year study in Palau. Despite a super typhoon in 2012 that caused significant damage to eastern reefs, the team observed an unexpected and rapid recovery.

Initially slow, the recovery puzzled scientists in the study, led by marine ecologist Dr Christopher Doropoulos and research co-lead Dr George Roff, together with team members from the University of Queensland and Palau International Coral Reef Center, who expected regeneration to

follow traditional patterns, driven by coral spawning events. These events involve the synchronized release of eggs and sperm into the water, leading to the dispersal of coral larvae that settle onto impacted reefs. However, the Palau reefs showed no new coral recruitment for the first four years after the typhoon.

Dormant coral

Upon closer inspection, the team discovered a novel mechanism for recovery: dormant coral "seed banks." Hidden within the coral framework, these dormant recruits remained inactive until the disturbance removed adult corals, triggering their germination. Doropoulos compared this

to the dormancy observed in plant seed banks.

"We've known about dormancy in seed banks in plants for a long time. This is when plants release a mass of seeds that can sit in the soil for decades, waiting for the right conditions to germinate. It happens in seagrass too. But this is the first time we've seen or conceptualized it in coral," said Doropoulos.

Environmental cues

The study highlighted the importance of environmental cues, such as variations in light, water flow, and reduced competition from algae and adult corals, in activating the coral seed banks. Doropoulos emphasized the significance of understand-

ing these mechanisms, stating, "This is a now-known mechanism by which reefs recover from disturbances."

Further research in the North West of Western Australia challenged preconceived notions about coral recovery. A two-year study examined degraded reefs in the UNESCO Ningaloo Marine Park and neighboring Exmouth Gulf following a mass bleaching event and cyclones. Doropoulos stressed the need to comprehend the dynamics of reef systems before restoration efforts, questioning the natural potential for recovery and identifying limiting factors.

Thriving in marginal reefs

Contrary to expectations, the study revealed that coral cultured in clear-water conditions could thrive in marginal, turbid reefs. Factors affecting recovery included competition with algae and sediment smothering new coral recruits. The comprehensive research integrated laboratory experiments, larval culturing, reef deployment, field monitoring, remote sensing and

larval dispersal modeling.

Coral larvae were cultured on tiles placed in different reef environments, and their growth was monitored over 18 months. Excitingly, the team observed coral growth from 3mm to 150mm in marginal conditions, challenging previous assumptions. Doropoulos

highlighted the implications for conservation and management strategies, especially in establishing new marine parks, stating, "These findings will help inform conservation and management strategies for agencies during the establishment of a new marine park in the Exmouth Gulf." ■ SOURCES: CSIRO



Christopher Doropoulos monitors and maps the growth and survival of juvenile corals in Ningaloo Marine Park and the Exmouth Gulf.

KINAW SALEE © COPYRIGHT CSIRO AUSTRALIA

The Coral Reef Breakthrough seeks to protect at least 125,000 square kilometres of shallow-water tropical coral reefs.

Coral Reef Breakthrough: An initiative to safeguard the world's coral reefs

The recently launched Coral Reef Breakthrough is an ambitious global initiative fighting to rescue coral reefs from extinction, protecting marine life and the livelihoods of millions.

Coral reefs are essential for marine biodiversity and climate resilience, supporting at least a quarter of marine species and offering ecosystem services worth up to US\$9.9 trillion annually. More than a billion people, including vulnerable coastal communities, depend on them for their livelihoods.

Today, these vital ecosystems are under threat due to the climate crisis and human activities, and time is running out to protect them.

Enter the **Coral Reef Breakthrough**. This initiative aims to secure the future of at least 125,000 sq km of shallow-water tropical coral reefs with investments of at least US\$12 billion by 2030. It has been launched by the International Coral Reef Initiative (ICRI), in partnership with the Global

Fund for Coral Reefs (GFCR) and the High-Level Climate Champions (HLCC).

The Coral Reef Breakthrough focuses on the following:

Stopping drivers of loss: Mitigating local factors contributing to loss, including land-based sources of pollution, destructive coastal development and overfishing.

Doubling areas of protected coral reefs: Bolstering resilience-based coral reef conservation efforts by aligning with and transcending global coastal protection targets.

Accelerating restoration: Implementing innovative, climate-smart designs to aid coral adaptation and restore 30 percent of degraded reefs by 2030.

Securing investments: Mobilising at least US\$12 billion by 2030 from public and private sources for the conservation and restoration of coral reef ecosystems.



MAREK OKON / UNSPLASH LICENSE

The Coral Reef Breakthrough is based on science-based, measurable goals, developed with input from a dedicated working group of over 30 leading coral reef experts.

Designed to prevent the functional extinction of coral reef systems globally, it seeks to catalyse public and private financial support to activate proven solutions and align actions with global targets like the Sharm-El Sheikh Adaptation Agenda and the Kunming-Montreal Global Biodiversity Framework.

“Meeting the targets of the Coral Breakthrough will be vital to the safeguarding of coral. Thus, at this testing time for our place on Planet Earth, we are calling on public and private sector leaders to take action to achieve the Coral Breakthrough’s targets and secure the longevity of coral reefs,” said Ambassador Peter Thomson, UN Secretary-General’s Special Envoy for the Ocean.

“Coral reefs are more than just beautiful; they are our lifelines.”

— H.E. Razan Al Mubarak, UN Climate Change High-Level Champion for COP28

Pierre Bardoux, Director of the GFCR, United Nations Global Team added, “To help deliver on Breakthrough targets, GFCR will scale capital support and private investment for reef-positive solutions, including sustainable fisheries and aquaculture, ecotourism, marine plastic recycling, mooring systems, wastewater treatment, natural fertilisers, and coral reef restoration. Efforts such as these represent innovative finance pathways unlocking greater resources to meet the goals of the Coral Reef Breakthrough.” ■

SOURCE: INTERNATIONAL CORAL REEF INITIATIVE



BIGGEST DISPLAY

AIR INTEGRATED

AIR-NITROX-TRIMIX-CCR

LSK INTERFACE

VIBRATION ALARM



www.ratio-computers.com



A pyramid-shaped "tree-reef" constructed with six pear trees.



ERIK HOEKENDIJK

Reefs made from sunken pear trees

In the Dutch Wadden Sea, a ground-breaking study shows how sunken trees may become a cost-effective and efficient tool for reef restoration, offering a glimmer of hope for our threatened oceans.

Reefs are vital centres of marine biodiversity. Yet, human activities like overfishing, deep-sea mining, dredging and trawling have led to their significant decline worldwide. Hence, there is an urgent need to implement efficient restoration initiatives to restore biodiversity.

A recent study published in *Frontiers in Marine Science* reveals an unexpected ally in this mission: fruit trees. The study, conducted in the Dutch Wadden Sea, involved sinking felled pear trees into the sea to reconstruct reefs and enhance local marine biodiversity.

ERIK HOEKENDIJK



Seventy or so cuttlefish eggs attached individually to a pear-tree reef structure.

Mimicking nature's process
Lead author Jon Dickson, a PhD candidate at the Royal Netherlands Institute for Sea Research, explained: "Before humans domesticated the landscape with agriculture, logging, and river controls, trees fell into rivers in large numbers and were washed out to sea. We know that such sunken wood has been present in marine ecosystems

since the Jurassic, providing a home, shelter, and food for marine animals."
The study, which took place in April 2022, produced promising results. In it, researchers crafted 32 pyramid-like structures from 192 felled pear trees. These "tree-reefs" were fixed with concrete bases and anchored to the soft sea bottom at four locations, at depths ranging from three to four meters. Some of them were brought up at regular intervals so the researchers could monitor the amount of life that grew on them.

Unprecedented revival

One of the most astonishing revelations of this experiment was the rapid colonization of

MALAYSIA INTERNATIONAL DIVE EXPO
7-9 JUNE 2024
MALAYSIA INTERNATIONAL TRADE AND EXHIBITION CENTRE - MITEC KL

EXHIBITION HIGHLIGHTS

- 01 Forum Dialogue
- 02 Photo Competition (LBO)
- 03 Dive Talk
- 04 Dive Courses
- 05 Dive Packages
- 06 Sailing and Boating
- 07 Watersport
- 08 Kids Zone
- 09 Pool Try-Dive

For more information, contact us 603 7980 9902 or email info@mide.com.my

MIDEXPO
 MIDEXPO
 MIDEXPO

tree-reefs. After six months, the tree-reefs witnessed a profusion of sessile animals and algae, including barnacles, hydroid polyps, bryozoa, sea grapes, sea lettuce and sea stars.

"When we brought up the first reefs after four months, one of the things we saw was a lot of tunicates growing on the wood. Now, after 16 months, many of the small and medium-sized individuals have been eaten by 'something.' The remaining ones have grown very large. Whatever that 'something' is, we cannot yet say, but we believe it to be larger predatory fish."

From barren to abundant
The structures also became a

haven for a rich variety of marine life, including fish and crustaceans. They even sheltered more fish than the surrounding control areas.

According to Dickson, "The reefs are hosting five times the number of fish compared to nearby sand flats, and three times as many species!"

In total, six fish species (including whiting-pout, common goby and European eel) and four crustacean species were observed. In comparison, control sites located 200 meters away showed less biodiversity.

Interestingly, each organism exhibited a preference for specific heights, thereby creating a fascinating vertical diversity.

Glimpse of hope for reef restoration

This study provides an innovative approach to reef restoration, offering the promise of reinvigorating threatened underwater ecosystems. Further investigations will be needed to determine the effectiveness of tree-reefs in other regions and to understand the long-term ecological impact as the trees biodegrade.

Nonetheless, this method holds the potential to breathe new life into our ailing oceans, revitalizing their essential biodiversity and fostering hope for the future. ■

SOURCE: FRONTIERS IN MARINE SCIENCE

Edited by
G. Symes



See the **video interview** with Hj Syed Abd Rahman, Chairman of Accessible Tourism for Malaysia, Diveheart Malaysia Ambassador and founder of Kids Scuba Malaysia (above). Participants and volunteers pose for photos during the Diveheart Adaptive program in September at Borneo Divers on Mamutik Island, located just off the coast of Kota Kinabalu, Malaysia (left and right). See the **event video** with Rahman and Diveheart founder Jim Elliot (top right).



Diveheart adaptive diving event held in Kota Kinabalu

For the first time, Kota Kinabalu in Sabah, Malaysia, hosted an adaptive diving program for disabled people, run by Diveheart, with the assistance of volunteers from several countries. The event took place at Mamutik Island on 4-5 September.

Founded by Jim Elliot in Chicago, Diveheart's mission is to build confidence, self-esteem and independence in children, adults and veterans with disabilities through scuba diving and scuba therapy, said Hj Syed Abd Rahman, Diveheart Malaysia Ambassador and founder of Kids Scuba Malaysia.

"The vision is to instill the 'can do' spirit in participants, inspiring them to take on challenges that they may not have considered out of fear. Using

zero gravity and the adventure paradigm, we help participants believe that if they can scuba dive, they can do anything," said Rahman, in a nod to Diveheart's slogan, "Imagine the Possibilities," which encourages participants to conquer their fears.

In promoting accessible tourism in Malaysia, Diveheart has extended the opportunity for wheelchair users to enjoy the beautiful islands of the marine park in Sabah, which is part of a new initiative implemented by Rahman as Chairman of Accessible Tourism for Malaysia. See the video interview with Rahman at: youtu.be/WWgjQCvAXXY?si=OajfOvzCiE20SLzf.

Ernest Teo, Diveheart Borneo's lead instructor, said it was greatly rewarding to see participants being able to "stand up" for the first time underwater, helping individuals identify with being a diver, rather than being disabled.

Dive center and volunteers
Over the two-day program, medical professionals, doctors and volunteers met to train and assist five people with disabilities during the Adaptive Scuba discovery program held at Borneo Divers Dive Academy & Leisure Centre on Mamutik Island. A first for the dive center, manager Tasha Yong said the center was grateful to Diveheart for training staff for the program. "With this event it gives us awareness and opens up more knowledge on how to provide better facilities for people of different abilities."

Rehabilitation medical specialists from Universiti Malaya Medical Centre (UMMC) were also present, including UMMC Director, Prof Dr Nazirah Hasnan, as well as Dr Thor Ju An from Queen Elizabeth Hospital Kota Kinabalu and PADI regional manager and course director Mark Hedger, along with over 40 volunteers from Malaysia,

India, Singapore, Brunei, Australia, Netherlands and the United States.

Emotional experience
One of the participants, Iziani Hayati Abbas, who has been wheelchair-bound her whole life, having been diagnosed with spina bifida at birth, said the experience was educational, memorable and emotional, as she never expected to be able to scuba dive. "It is beautiful and a whole new world opened up for me when I was diving," she said.

Another participant, Lidwina Isidore Andilah, who was paralyzed from the waist down after a fall that injured her spine at the age of five, said diving had long been a dream of hers after trying extreme sports such as paragliding and rafting despite her disability, but said she did not know how to go about it or who could

cater to her disability. "For others like me out there, don't be afraid to try new things because we can do what others can do too. We just need more help getting there," she said.

Fellow participant, Nurizzati Zahidah Hasanudin, who mentioned that five to six volunteers had aided each disabled participant to go out to sea, do a dive and return to shore, experienced excitement and happiness during the event and wanted to do it again. "...I know that with the right trainers from Diveheart, guidance and support from qualified volunteers, we too can do much more than just sitting in our wheelchairs," she said. ■

Visit: diveheart.org. See event video: youtube.com/watch?v=47fv2mwBKoY.
SOURCES: KIDS SCUBA PRESS RELEASE, ELTON GOMEZ / THE BORNEO POST

CLOCKWISE: Delicious gumbo in New Orleans; Our American associate editor and account representative Matthew Meier and his wife and our US associate, Jennifer, chat with Tim Hochgrebe of Underwater Australia in the X-Ray Mag booth at the DEMA Show; DAN party at The Sugar Mill; Our associate editor and representative in Sweden, Lelle Malmström, chats with Danish colleague René Nielsen of Dykkercentret; Exhibitor with comical shark head gear (centre)



DEMA 2023: Back to Normal

Text and photos by Peter Symes

The 47th annual DEMA Show was back in New Orleans after a 21-year break, and it was a welcome revisit. After years of Covid-related cancellations and restrictions, as well as experiments with virtual expos and other workarounds, the show seemed to have finally stepped out of the long shadow of the pandemic.

It was an upbeat and vibrant edition, reminiscent of how it used to be in its heyday in the late 1990s, when it peaked and only got bigger from year to year. Even the social events and various parties were plentiful and back at full strength—at least, that was my impression.

That is not to say that the show and the dive industry have not changed since DEMA was last held in the Big Easy (New Orleans' nickname). More than two decades have passed since then, so of course, they have.

Travel and destinations

As with most other dive shows, there has been a general shift from featuring new equipment and travel in equal measure, to becoming predominantly focused on travel and destinations. This development is, in part, due to the fact that one no longer needs to travel to dive shows to see new dive equipment presented—and bring back thick wads of press information. This function has long since been replaced by Dropbox, WeSend, Google Drive and other file-transfer services, which enable the transfer of press materials, including high-resolution images and videos, at any point in time.

There also seems to be a bit of a drought regarding new dive equipment, innovation and technological advances. Perhaps the bulk of dive equipment has long since reached maturation and can only be tweaked a little here and there. How much more can one improve upon a wetsuit, BCD or dive mask, after all? It just seems to be about new colours and shapes, mostly.

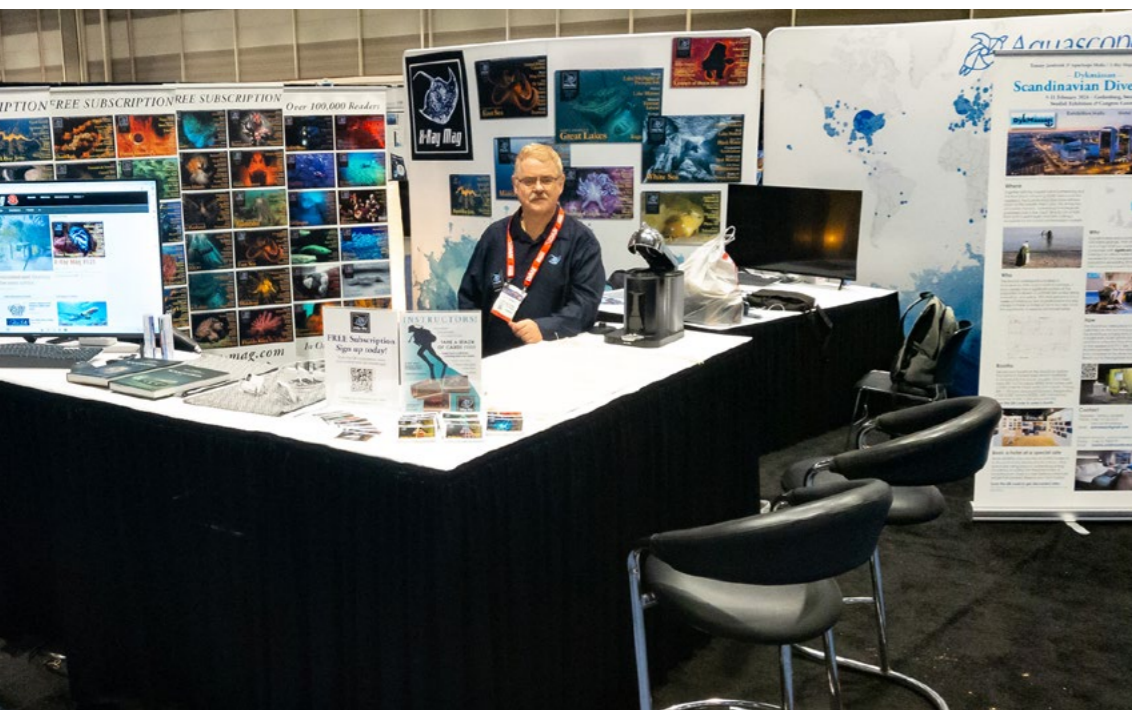
Networking

In any case, with the need to provide a stage for new gear



largely, but not entirely, out of the way, successive DEMA shows have become steadily more focused on networking, which is a development I find quite useful. One lesson we can draw from the Covid years is that Zoom meetings, virtual events and online venues are not about to replace face-to-face meetings any time soon. They were little more than useful stop-gap measures, for the time being—and a valuable learning experience.

Dive operators and travel agents were present in strength at the DEMA Show, mostly famil-



Our associate editor and regular contributor from Canada, Scott Bennett, was present to speak with visitors at the X-Ray Mag booth.

THIS PAGE:
Scenes from New Orleans' Bourbon Street and French Quarter



TERIC X SWIFT

YOUR ULTIMATE DIVE COMPUTER SYSTEM



SHEARWATER
Powerful • Simple • Reliable

Scan to find a dealer near you.
www.shearwater.com

iar faces but also a couple of new entrants—although, I did not spot any new destinations or locations this year. However, that may be too much to ask so soon after the pandemic, which sucked many coffers dry.

If I had to pinpoint the main characteristic and function of this show, it would be networking and meetings. At our own booth, there was a steady stream of both former contacts catching up and new names presenting their wares or services. Suffice it to say, I did not manage to squeeze in any lunch breaks during the whole event.

As always, it is difficult to precisely assess the outcome of the event and the return on investment in attending, as one needs to follow up on talks and negotiations over the months to come. It has always been a long game, doing business in this industry, and that has not changed much over the years.

Location and venue

It was also nice to have a change of location and venue. Regarding the latter, the convention centre in New Orleans is quite centrally located, alongside the Mississippi River and



close to the French Quarter. In our case, we just had to cross the street from our hotel condo to get to the show. So, for once, we did not need to rent a car, which was another bonus this year.

The expo hall was a tad on the oblong size, but not as bad as the dreaded “bowling alley” of the South Hall at the convention centre in Las Vegas, where DEMA is heading next. Regarding the show returning to New Orleans and breaking up the usual pendular motion between Orlando and Las Vegas, I think it was a nice of change of pace. From a purely professional standpoint, the need for a change of scenery should not really play a

role, but we are all humans after all, and it was good to see something different.

Food was also significantly better in this city. Even the run-down and somewhat dodgy-looking pizzeria we visited on our first night, after a late arrival and check-in, served some of the best pizzas any of us could recall having—and it just got better from there. Food was delicious everywhere we went, even in small, non-descript, side-



street joints. As for the downtown area and French Quarter, it surely had character, and plenty of outlandish characters as well, in par-

ticular along the famed Bourbon Street, where a lot of crazy stuff could be seen and purchased. Let's leave it at that. ■

DEMA 2023: The tech community's farewell party for Bret Gilliam

Text by Mike Ange
Photos by Peter Symes

Fair winds and following seas, Bret Gilliam—The technical diving community celebrates his life and contributions.

Bret Gilliam was a larger-than-life personality—dare we say, character—in the dive industry. Over a 50-year career, he was involved with several dive-industry firsts, holding a number of influential postings, including serving on the boards of NAUI and IANTD, as well as CEO of TDI. But he was most known for being a co-founder of what would become the largest

technical diver training agency in the world, TDI.

Bret was an idea guy, skilled at removing obstacles and even more skilled at finding the right team to get things done. His team building resulted in a global community of friends, with cutting edge knowledge in dive physiology, technology, and training development, who were, in the early days, the out-of-the-box thinkers making waves in our industry.

It is perhaps no coincidence that TDI was formed just a year after DEMA took the unprecedented step of prohibiting nitrox production gear from being displayed at the show.



Bret was no doubt a controversial character, but the turnout at his celebration of life demonstrated his influence on our industry in general, the technical industry, more specifically, and the dynamic community that built itself around that hub.

Bourbon Street

So, where do you have a celebration of life for a figure larger than life? Just off the legendary Bourbon Street in New Orleans is perhaps as good as it gets. Over the decades, much dive business has been conducted in the convention center as well as the numerous bars of this legendary party city. In fact, New Orleans was the location of the DEMA Show the year that



TDI was fully formed, in 1994. It would also be the location that formally launched SDI in 1999, and where ERDI, the public safety segment of ITI, was formulated in the same year. So, the Tin Roof on Bourbon Street was a very appropriate location to celebrate the life of one of the founders and a luminary of SDI/TDI/ERDI.

Coupled with TDI's traditional DEMA Tech Party, the rooms were standing room only, filled with tech divers, "wanna-be" tech divers, and several of Bret's friends and acquaintances from around the globe. A former magazine partner of Bret's, Fred Garth, delivered a eulogy that caught the essence of Bret's impact on many of us and generated the only moments of semi-silence in the room. Ending the eulogy, with a raised glass to get the party restarted,

was his longtime friend and folk music legend Jonathan Edwards, who played a few songs for the crowd.

Tall tales

People who had known Bret personally were given a VIP arm band, providing nearly unlimited drinks, albeit on condition that they would share stories with anyone who asked about Bret—and many tall tales were certainly told. Who knows, some of them were perhaps even true.

Gathering to imbibe and tell the tales of dead divers, whom we knew, was almost a rite of passage in the early days of technical diving. Following in that tradition, the celebration of life was not a somber affair, but a typical event for this industry segment—with too much alcohol, larger-than-life sea stories

and some pleasant reflections on Bret's life. Friends, who had not seen each other in years, reconnected again—in many cases, solely by Bret's celebration of life. Bret loved a party, and TDI gave him the send-off he would have wanted.

His passing, at what we hope is the end of a tough couple of years for the tech training community, also marks the passing of an era. In the past two years, we have lost notable people in the field, including Tom Mount, Joe Odom and Bret Gilliam. Somewhere, they are sitting (probably with glasses of red wine), looking down and asking, "OK, what's next?" The torch has been passed, but let us hope it has not been dropped, because there is still much intrepid exploration and technical development to be done. ■



Edited by
Catherine GS Lim

This bellarmine jug, produced near Cologne, was found on the seabed at the *Klein Hollandia* wreck site.



JAMES CLARK

JAMES CLARK

Beneath the waves, England's wrecks are in peril from looters. To counter this, an innovative scheme involving innovative forensic marking technology is poised to rewrite the story of underwater heritage protection.

English shipwrecks, submerged for centuries off the coast, hold the secrets of history in the form of artefacts like cannons. However, organised looting poses a significant threat.

To counter this, Historic England and British specialist contractor MSDS Marine have embarked on a ground-breaking project involving underwater



Safeguarding Maritime Artefacts



MSDS MARINE / MARTIN DAVIES

Gunsmith's name on a bronze cannon found at the wreck site of the 17th-century Dutch warship *Klein Hollandia*

forensic tagging technology. This technology, developed over eight years, traces its roots to methods used to protect heritage assets on land. It is applied directly to the marine artefacts and wrecks by divers, and had been trialled on dives this summer.

Hefin Meara, a maritime archaeologist at Historic England, explained how it works: "We

mark all the vulnerable objects, such as bronze guns that are a tempting target with a resale value on the illicit market. By marking specific parts of objects, it makes them easy to track. It is going to be a game-changer for protecting sites."

Keep tabs on underwater artefacts
This covert marking technology,

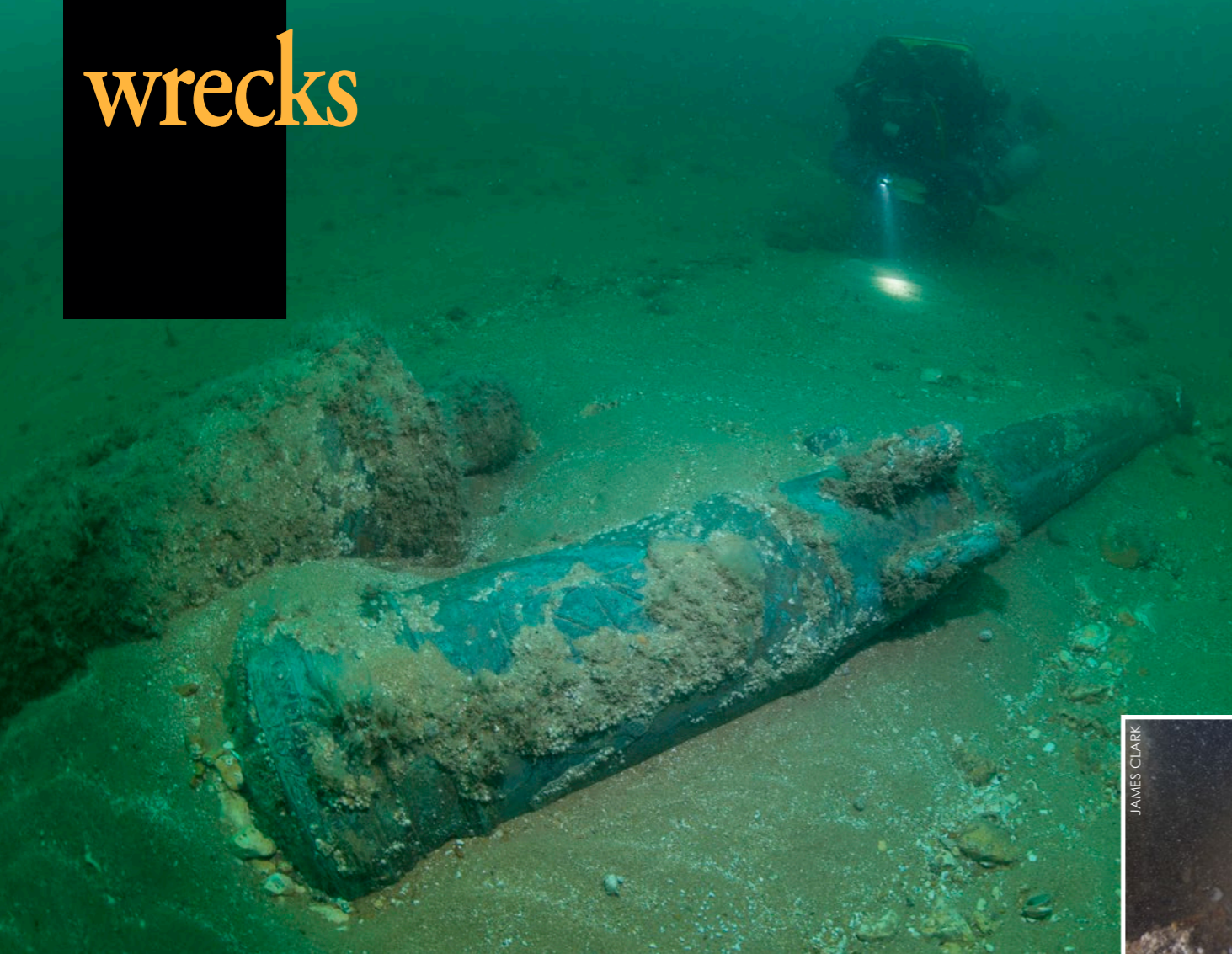


MARTIN DAVIES

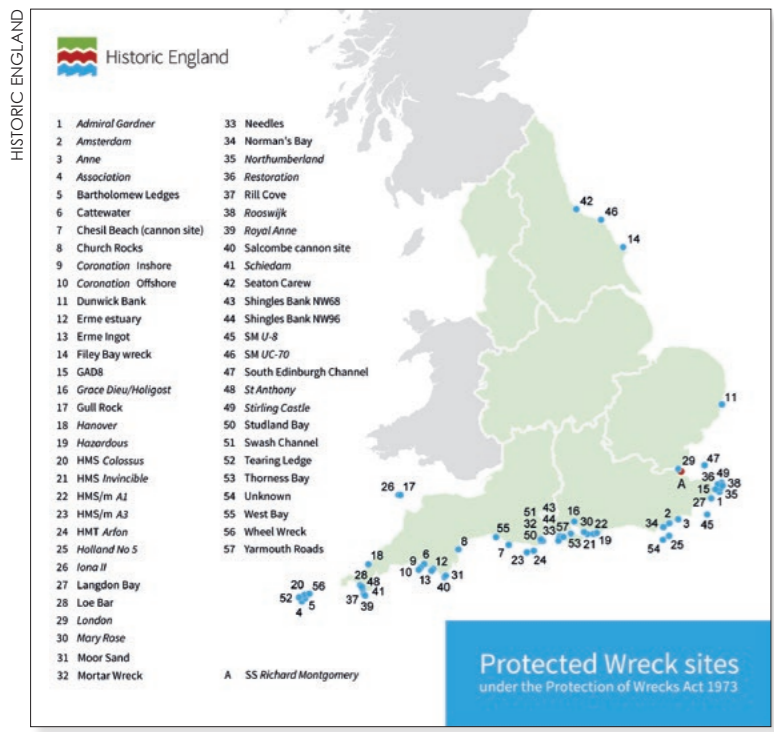
The date "1670" on a gun at the *Klein Hollandia* wreck site

Diver applying a protective marking solution at the protected wreck site of *Klein Hollandia*.





Diver with two guns found at the *Klein Hollandia* wreck site (above); Diver applying a protective marking solution to a bronze cannon on the protected wreck site of the *Klein Hollandia* (top right); Congor eel in one of the bronze guns at the site (centre)



similar to products used to mark lead on church roofs to prevent theft, ensures that the artefacts can be traced every step of the way, from illicit divers to the middlemen involved in their sale.

Normally, artefacts pilfered from these sites often end up with false provenance claims, making them harder to trace and recover. Now, with this marking technology, potential thieves are sent a clear message: underwater artefacts from protected wreck sites are "too hot to handle."

Meara said: "The deterrent value is massive. And if the worst happens and someone does steal something, this should help us to get the material back and to prosecute."

Historical significance

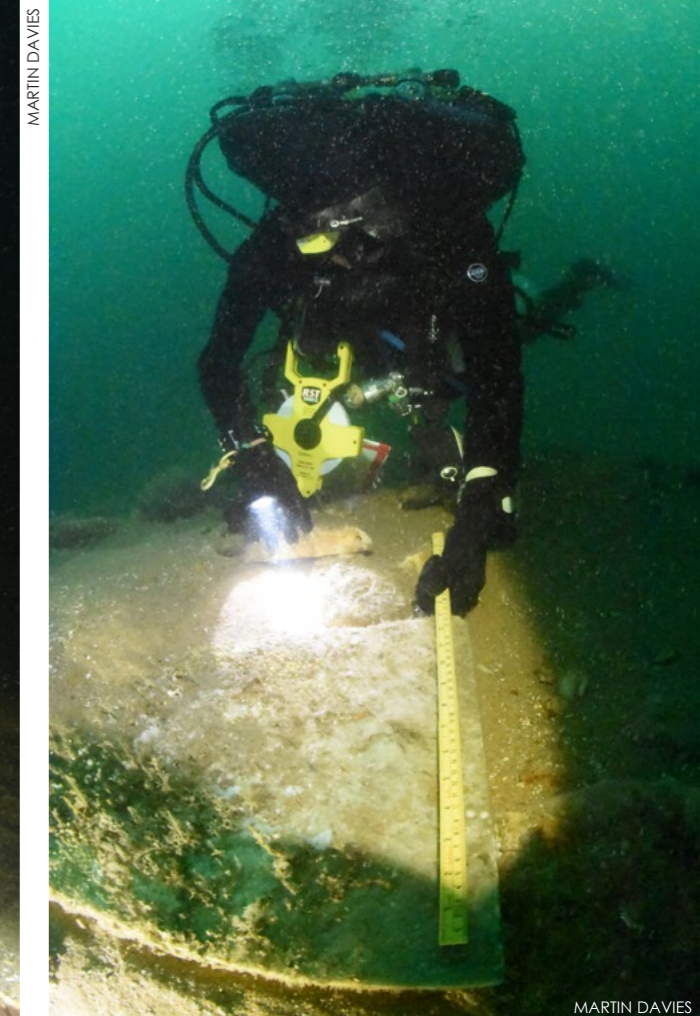
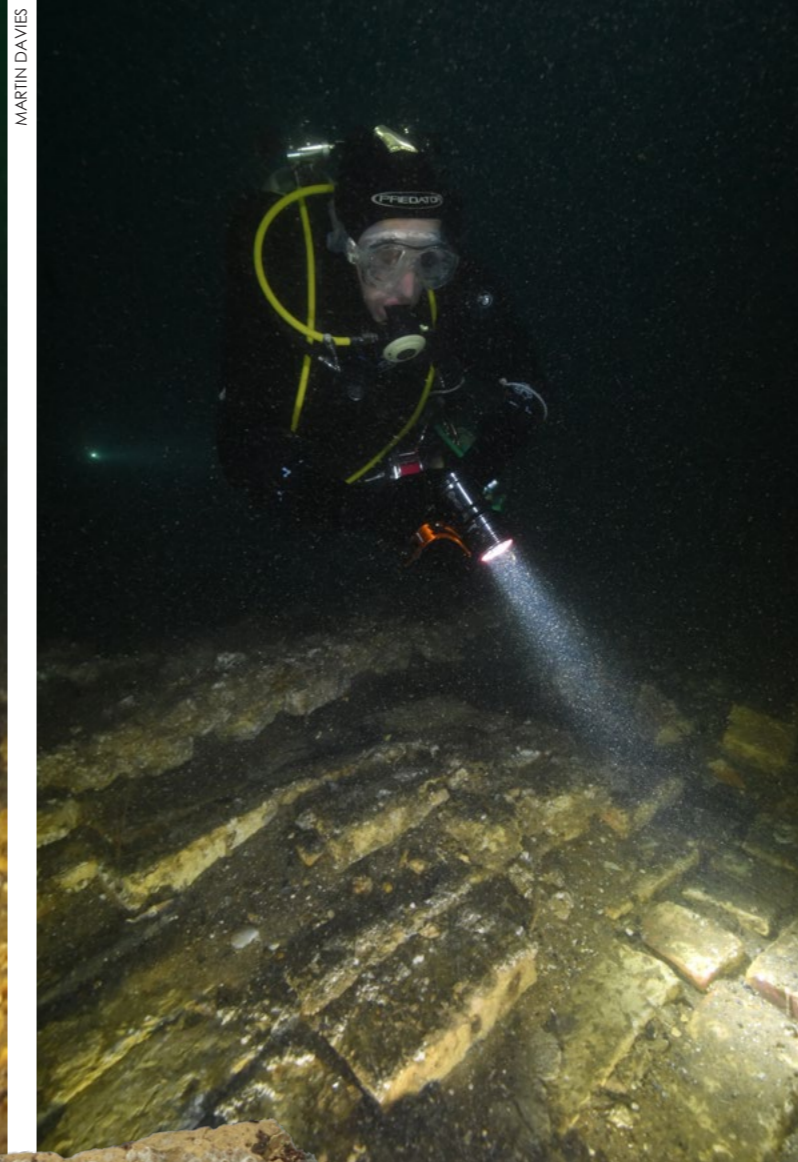
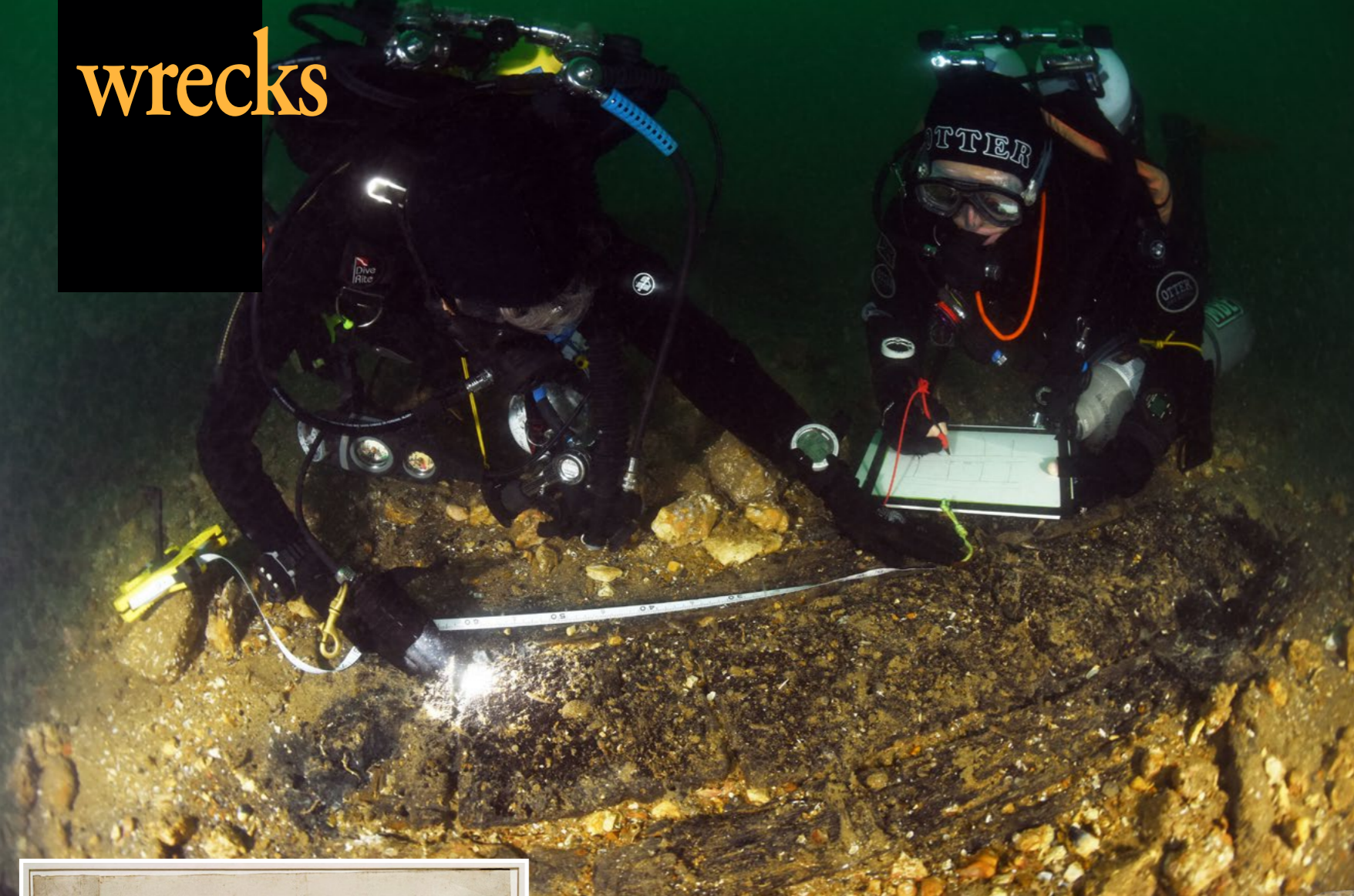
Duncan Wilson, Chief Executive of Historic England, emphasised the importance of this collaboration: "Our nationally important shipwrecks tell the story of England's maritime past. Underwater forensic marking of artefacts is a great leap forward in helping to protect them. [...] International collaboration like this is so important for preserving our shared maritime heritage."

The initiative not only protects wrecks and artefacts like cannons but also the underwater archaeology sites that hold substantial historical and archaeological



An underwater sign warns visiting divers that a site is forensically marked.

wrecks



NAS diver examines the brick galley floor of the shipwreck (left); Diver recording marble tile (above)



A 17th-century drawing of a two-decker, most likely the Dutch ship *Klein Hollandia*, by Willem van de Velde the elder

Nautical Archaeology Society (NAS) divers measure timbers at the *Klein Hollandia* wreck site (above)

value. Of the 37,000 known shipwrecks off England's coast, 57 are granted the highest level of protection. They can only be dived by licensed divers, and their contents are safeguarded by law. The 50th anniversary of the Protection of Wrecks Act 1973, which provides the highest level of protection to these wrecks, is being marked this year.

Klein Hollandia
One of the shipwrecks being marked is the *Klein Hollandia*, a 17th-century Dutch warship. This vessel, which engaged in significant battles during the Second Anglo-Dutch War (1665-1667), has great historical value and offers insights into shipbuilding and warship

activities during the 17th century. The dive in September 2023 provided maritime archaeologists with an opportunity to document the surviving features of the wreck, revealing unique elements such as a double layer of well-preserved oak planking on its hull and possibly two additional layers of planking made from coniferous wood. The forensic marking project, which began in 2018, was funded by Historic England and the Cultural Heritage



Bricks found at the wreck site of the *Klein Hollandia* (centre); Marble tile found at the wreck site (right)

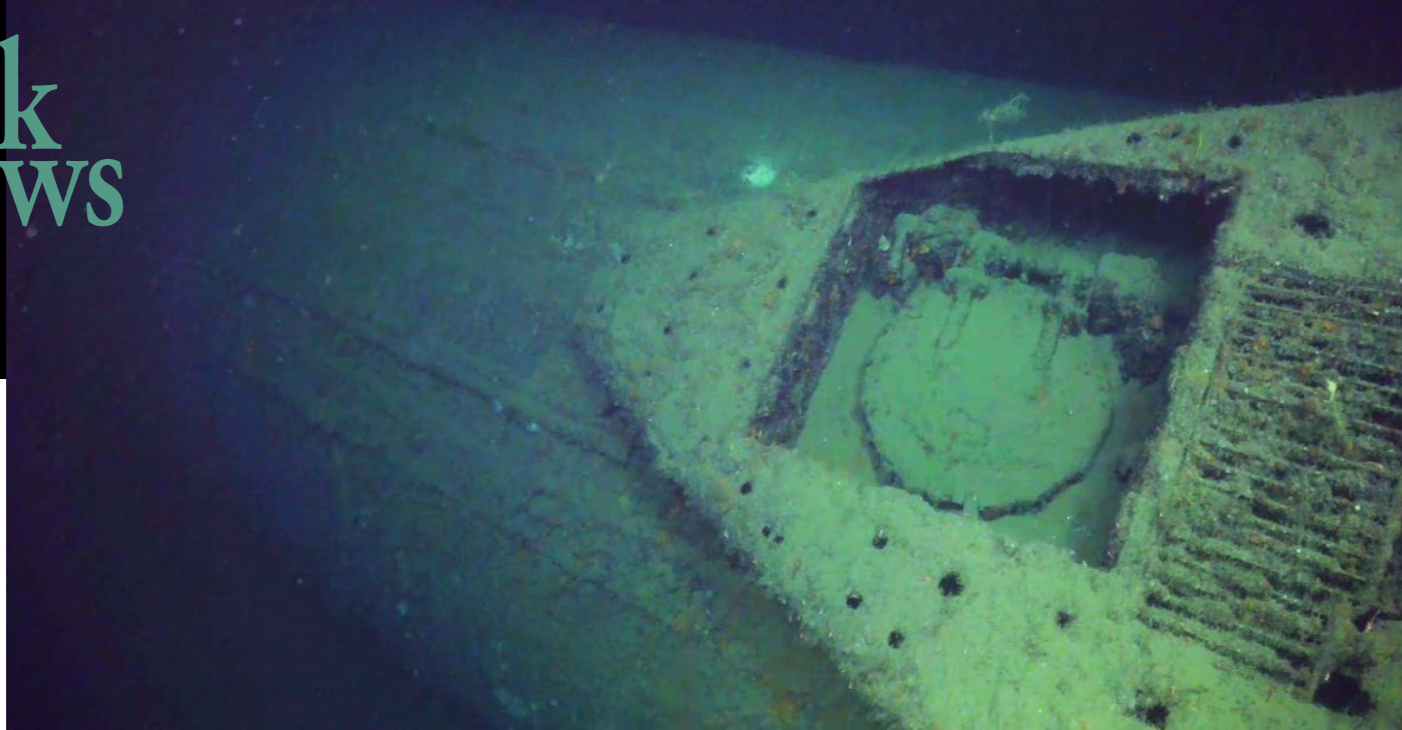
Agency of the Netherlands. It safeguards not only Britain's maritime artefacts but also the rich maritime history of England,

ensuring that it remains intact for generations to come. ■ SOURCES: HISTORIC ENGLAND, NAUTICAL ARCHAEOLOGY SOCIETY



Edited by Peter Symes

Hull of the missing submarine, HMS *Thistle*, which was torpedoed by a German sub in April 1940



COURTESY OF THE INSTITUTE FOR MARINE RESEARCH

British WWII sub found off Norway

Discovery sheds light on a wartime mystery, revealing the final resting place of a vessel lost during the Second World War.

The waters off the coast of Norway have unveiled a long-hidden secret. The wreckage of the British submarine HMS *Thistle*, which sank during World War II, has been discovered after 83 years.

The discovery was made by Norway's Institute of Marine Research and the MAREANO program during a routine seabed mapping cruise. The submarine's identification was confirmed only recently, following a subsequent cruise.

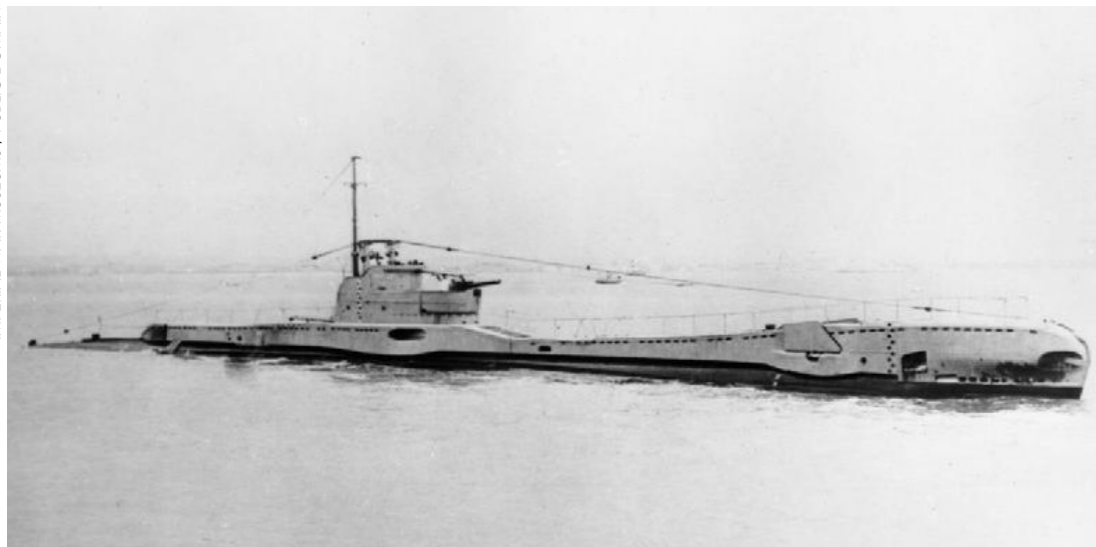
The HMS *Thistle* embarked on its final voyage on 10 April 1940. Tragically, it was torpedoed by a German submarine, leading to the loss of all 53 crew members on board.

The exact location of the sinking had remained uncertain due to navigational methods of the time, which relied on bearings and squares rather than today's GPS technology. This made the submarine's last surface position ambiguous, and it was unclear how far it might have drifted before settling on the ocean floor.

The wreck now lies approximately 525 feet deep near Rogaland. Alongside HMS *Thistle*, six other wrecks were observed during the spring cruise, with only one being previously identified. The area also revealed lost shipping containers and what is believed to be an aircraft engine from the war era.

Given its wartime sinking, HMS *Thistle* is considered a war grave. As such, the British Royal Navy retains ownership rights under maritime law, ensuring the site's protection and respect. See the **video**.

■ SOURCE: MAREANO / INSTITUTE OF MARINE RESEARCH



IMPERIAL WAR MUSEUMS / PUBLIC DOMAIN

Researchers from Norway's Institute of Marine Research discovered the remains of HMS *Thistle* off the coast of Norway earlier this year.



D7X

NYLOTECH



#FACINGREALITY
WWW.WATERPROOF.EU





Skylight to engine room on *Huronton* wreck

WWI-era freighter wreck located in Lake Superior

Discovery of the *Huronton* wreck in Lake Superior by the Great Lakes Shipwreck Historical Society sheds light on a century-old maritime mystery.

The *Huronton* was a steel bulk freighter. It was designed to transport large quantities of bulk cargo, such as coal, grain or ore. These types of vessels are characterized by large, open holds and are specifically built to handle and transport unpackaged bulk cargo efficiently across water bodies.

The *Huronton*, in particular, was navigating Lake Superior during its time of operation in the early 20th century.

Collision

On a fog-laden day in October 1923, intensified by forest fire smoke, the 238-foot-long steel bulk freighter *Huronton* was navigating Lake Superior. Its journey was abruptly halted by the 416-foot-long bulk freighter *Cetus*. The dense fog led to a devastating collision. The impact was so severe that the bow of the *Cetus* tore a massive hole in the *Huronton*'s port

side, momentarily locking the two ships together.

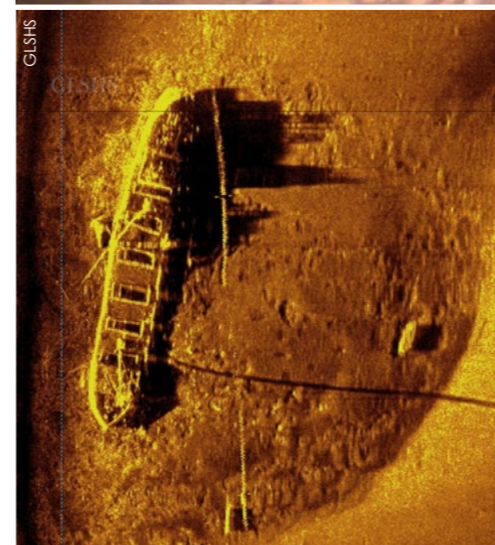
Bravery Amidst Chaos

Quick thinking by the *Cetus*'s captain saved many lives. By moving forward, he "plugged" the gash in the *Huronton*, allowing its crew to evacuate. In a heart-wrenching moment, the crew's bulldog mascot was left behind. First Mate Dick Simpell's courageous act of returning to the sinking ship to rescue the dog became a poignant part of *Huronton*'s legacy.

Discovery Deep Below

Bruce Lynn, GLSHS Executive Director, highlighted the significance of the find, noting the thrill of being the first to view the shipwreck after a century. The ship's location, deep within an 800-foot hole in the lake, posed challenges. Darryl Ertel, Director of Marine Operations, described the discovery as a moment of revelation, spotting the shipwreck in a small, deep recess of the lake.

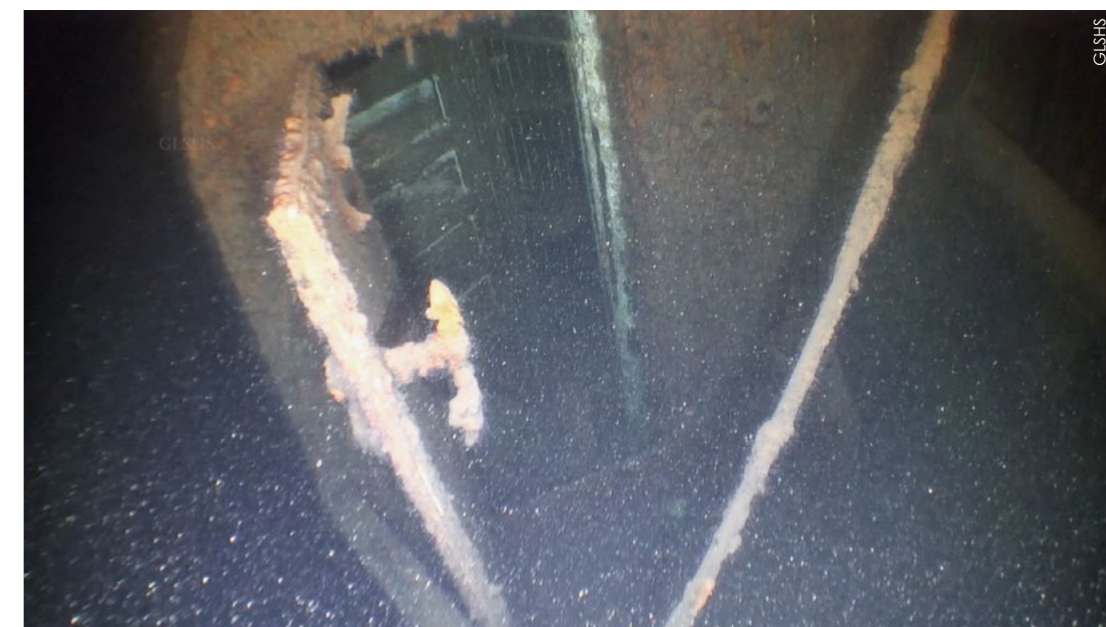
The *Huronton*'s discovery is more than just a historical find; it is a testament to the bravery and re-



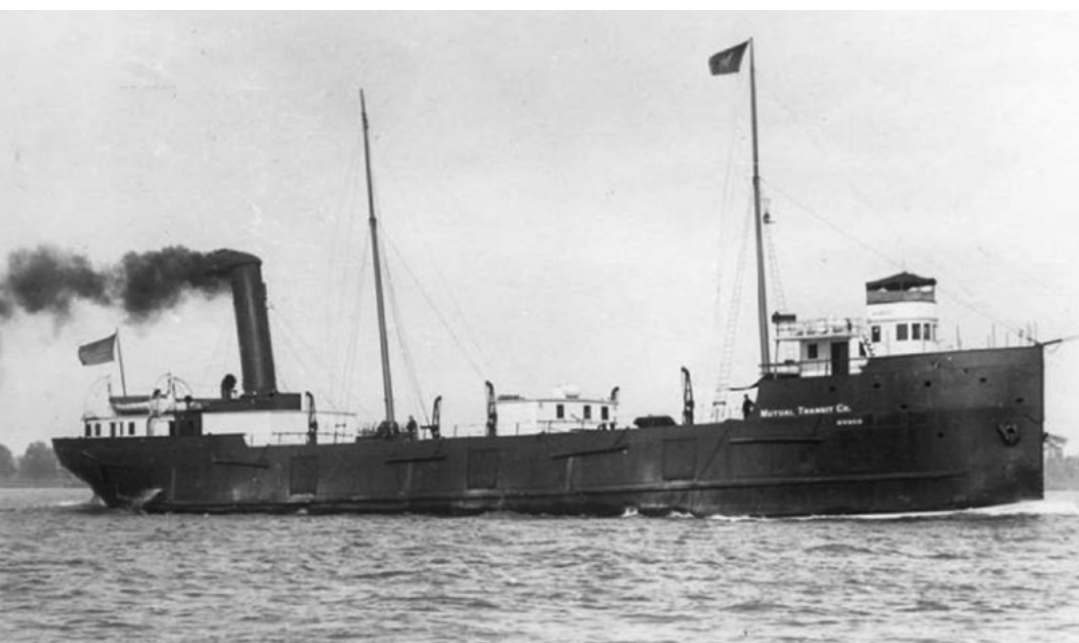
silience of those who sailed Lake Superior's unpredictable waters. It serves as a poignant reminder of the maritime history embedded within the Great Lakes. See the **video** ■ SOURCE: GREAT LAKES SHIPWRECK HISTORICAL SOCIETY

Finding any shipwreck is exciting. But to think that we're the first human eyes to look at this vessel 100 years after it sank, not many people have the opportunity to do that.

— Bruce Lynn, Executive Director, Great Lakes Shipwreck Historical Society



Collision area where the *Huronton* broke in half (top); Sonar scan of the *Huronton* (centre); View into the open door at the stern (above); Skylight to the dining room (left)



The steel bulk freighter *Huronton* sank in Lake Superior on 11 October 1923.

COURTESY OF THE GREAT LAKES SHIPWRECK HISTORICAL SOCIETY



PHOTO SALVO EMMA

Third-century Marausa 2 wreck at 1.8m depth, located 91m off Marausa, Sicily (above); Research divers excavate the wreck with a cargo of numerous amphorae and artefacts of exquisite workmanship (right).

Roman shipwreck Marausa 2 recovered intact off Sicily's coast

Late 3rd-century shipwreck raised whole, a first for Roman maritime archaeology

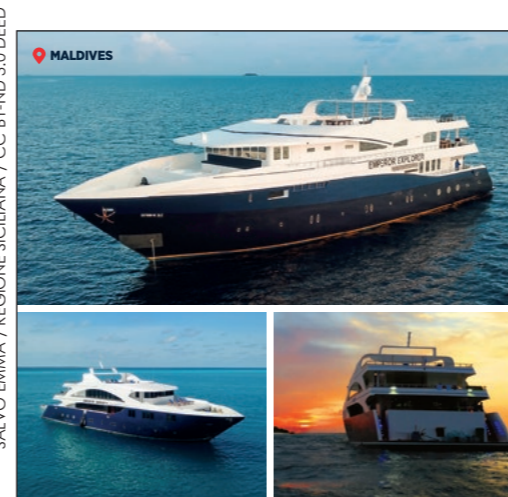
In an unprecedented archaeological feat, a shipwreck known as *Marausa 2*, which sank off Marausa, Sicily, in the late 3rd century, has been meticulously recovered from the seabed in its entirety. This marks the first instance a Roman ship has been raised in its complete form, as opposed to being retrieved piece by piece.

Discovery

The discovery of *Marausa 2* took place in July 2020, a mere 91m (300ft) from the shore. Submerged less than 1.8m (6ft) underwater, its name comes from its resemblance to another wreck from the same era that was found half a kilometre (a third of a mile) away in 1999. The earlier wreck, along with its cargo of amphorae filled with dried fruit, was retrieved in 2011 and is now displayed at the Museo Archeologico Baglio Anselmi in Marsala.

Well preserved

Marausa 2 is in an impressive state of preservation, even surpassing that of its predecessor. The ship measures approximately 12m (40ft) in length and 4m (13ft) in width. A significant number of transport amphorae were found within the hull; many of them were fragmented. Intriguingly, within these broken vessels, archaeologists unearthed artefacts of such exceptional quality and rarity that they have been deemed unparalleled globally. However, spe-



THE DIVER'S CHOICE FOR 30 YEARS

AWARD WINNING SERVICE SINCE 1992



PHOTO SALVO EMMA

cifics about these artefacts remain under wraps.

Recovery

The condition of the ship's timber enabled its whole recovery. The operation, initiated in June, was supervised by the Superintendency of the Sea for Sicily. After thorough documentation and excavation, all loose materials and cargo were removed. This was followed by sediment vacuuming. Engineers crafted a bespoke

metal structure to safeguard the wreck. The ship was then enveloped in a grid, ensuring the preservation of all archaeological materials. Using flotation devices, the wreck was gently brought to the surface.

Restoration

Subsequently, the encased wreck was towed approximately 32km (2mi) along the coast to Marsala's port. On 4 October, it was moved to the Museo Archeologico Baglio

Anselmi, where it now resides in a freshwater pool. Following desalination and wood stabilisation, it will undergo public restoration at the museum's laboratory. The extensive restoration process is expected to span several years. Upon completion, the ship and its cargo will be showcased in a dedicated museum space within the Trapani province. ■ SOURCE: REGIONE SICILIANA

See the **video**.



The Marshall Islands'

Bikini Atoll

A Journey into its History & Wrecks

Text and photos by Brandi Mueller



A far-flung location in the Pacific, which can only be reached via liveaboard, Bikini Atoll in the Marshall Islands is the site of a fleet of WWII wrecks. Sunk during post-war nuclear testing, the wrecks are now encrusted with marine life. Brandi Mueller shares her adventure there.

Bikini Atoll is arguably one of the most remote and adventurous dive locations left on Earth. It is literally in the middle of the Pacific Ocean; depths here allow only trained technical divers to reach the wrecks and the atoll feels (and has been) abandoned and deserted in every way.

But Master Liveaboards has returned to the location, post-Covid, to bring divers to the wrecks in luxury and comfort—even with internet connection to the outside world via Starlink. I cannot think of a better way to dive this bucket-list location.

Just a tiny green speck within the expanse of the Pacific Ocean—but with a unique history, unlike any other—the islands of Bikini Atoll make up barely two square miles (5 sq km) of land, which encircle a lagoon that is 25 by 15 miles wide (40 by 24km). Averaging only seven feet (2.1m) above sea level, the islands are small, but their history is huge. Chosen for its remoteness, this atoll (which few can point out on a map) will forever be

part of history, as the location for the first public testing of nuclear weapons.

The lagoon now holds a technical diver's dream for wreck diving. With a seafloor depth of 165ft (50m), fourteen ships and submarines, which played important roles in WWII, rest peacefully under the vibrant, warm blue waters; but the war did not send them there, *Operation Crossroads* did.

Following the American nuclear bombing of Hiroshima and Nagasaki, which led to the end of WWII, it was decided that tests should be carried out to see just what this new technology could do. A target of 95 ships was set, which included four US battleships, two aircraft carriers, two cruisers, eleven destroyers, eight sub-



Gun on USS *Lamson* (above): Drone shot of *Prinz Eugen* (top left); Coastline of Bikini Island (previous page)



Bikini bar (top left); *Pacific Master's* skiff at Bikini Island (above); The view from the Bikini Bar of a ship departing with temporary island residents (left)



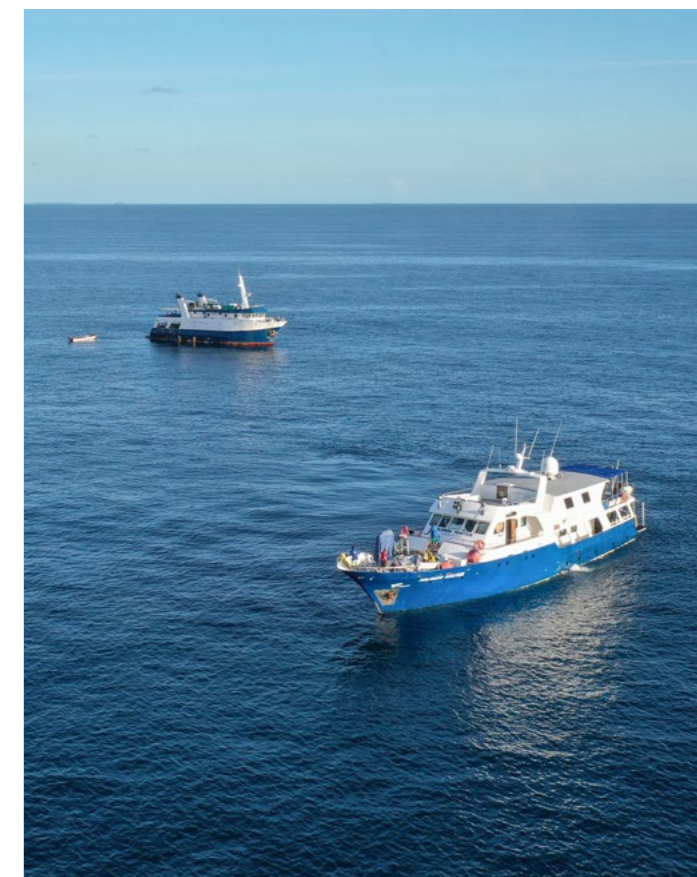
were staged on the aircraft carrier. All this was done to see the aftermath effect that a nuclear bomb might have on a ship at sea. The damage, as a function of distance from the blast center, would also be measured. The results of that testing have left an underwater shipwreck playground for divers who are willing to make the voyage.

The journey

Master Liveaboards started making Bikini accessible to divers in 2018, but it was just for two seasons as... well, we all know what happened in 2020 (ed. – the coronavirus pandemic hit, and operations had to cease). After almost three years of being closed, the Marshall Islands was one of the last countries to open post-Covid.

Getting to isolated Bikini Atoll is not easy, and the 250-mile (360km) journey from Kwajalein Atoll to Bikini Atoll is best done in the summer months, when conditions are more likely to be calmer. Master Liveaboards resumed its trips to this far-flung destination in the spring of 2023, sending two of its boats, the *Pacific Master* and the *Truk Master*—likely catching up with all those passengers who have been waiting, since before Covid times, to go on the dive trip of their dreams. I was one of those passengers who was scheduled to go on what would be my second trip to Bikini Atoll, back in the summer of 2020—a time that seems so long ago, it might have been a different era.

The long journey to Bikini Atoll—or what I lovingly refer to as “the middle



Pacific Master and *Truk Master* off Ebeye Island waiting for guests to arrive

marines, numerous amphibious and auxiliary vessels, plus three surrendered German and Japanese warships.

The goal was to investigate the effects of nuclear weapons on war-

ships. To do this, the ships were set up as if actively on duty and fully loaded. Fuel was left in the tanks, bombs and other weapons were within the holds and on decks, and airplanes





Bikini Atoll is located in the Marshall Islands (left); Drone shot of *Prinz Eugen* (above)

of the middle of nowhere”—started for me in Chicago. My route included flying to Denver, then Honolulu, spending a night in Honolulu, and then setting out the next morning on United’s “Island Hopper” flight, which runs from Honolulu to Guam twice a week, stopping at five Marshall and Micronesian islands on the way.

My flight out of Denver had maintenance issues, and as the hours ticked on, I started getting worried that I might not even make it to Honolulu in time for my flight to Kwajalein, which only occurred twice a week. In the end, the flight was eight hours delayed, and I arrived in Honolulu around 3 a.m., with my next flight departing at 7 a.m.

Thankfully, there was plenty of time to make the flight, but no time to get the sleep and shower I had hoped for at a Honolulu hotel I had booked. But I was happy not to miss the flight, and I tried to keep my eyes open as I stayed awake all night for that morning flight.

On to Kwajalein

Departing soon after the sun came up, we left Honolulu and headed west. The flight stopped at Majuro and continued on to Kwajalein, where we disembarked. Kwajalein Island is part of the US Army Garrison Kwajalein Atoll, a secure military base. With papers in hand explaining our reason for getting off the plane, we were led

to a holding area where Army personnel looked at our passports and papers, and stamped us through. We collected our luggage and were bussed to a ferry pier where Craig Johnson, a captain from Master Liveboards, was waiting for us.

The unthinkable happened and a few passengers did not receive their luggage, which made me cringe for them. Would they be able to get it back at all? Usually, the boat headed straight for Bikini (a 30-hour journey from Kwajalein), and the next day’s flight would be coming from Guam, not from Honolulu, where presumably the bags had been left. They chatted with Craig, and he started to form a plan.



TRAVEL WITH DAN

When you’re ready to explore, go with DAN travel insurance.



HELP PROTECT ONE SPECIAL ADVENTURE

Provides coverage for one special adventure against certain unforeseen events along the way. Budget-friendly rates make it the perfect companion for a quick road trip or international dive travel.

Starting around \$87 per trip*



ENJOY ADDED PROTECTION ALL YEAR LONG

Provides coverage for you on every trip you take during the year any time you travel 100 miles or more from home, round trip. Budget-friendly rates make it ideal for frequent business or vacation travelers.

Starting around \$309 per year*

Travel Protection Plans are administered by Customized Services Administrators, Inc., CA Lic. No. 821931, located in San Diego, CA and doing business as CSA Travel Protection and Insurance Services and Generali Global Assistance & Insurance Services. Plans are available to residents of the U.S. but may not be available in all jurisdictions. Benefits and services are described on a general basis; certain conditions and exclusions apply. Travel Retailers may not be licensed to sell insurance in all states, and are not authorized to answer technical questions about the benefits, exclusions, and conditions of this insurance and cannot evaluate the adequacy of your existing insurance. This Plan provides insurance coverage for your trip that applies only during the covered trip. You may have coverage from other sources that provides you with similar benefits but may be subject to different restrictions depending upon your other coverages. You may wish to compare the terms of this Plan with your existing life, health, home and automobile policies. The purchase of this Plan is not required in order to purchase any other travel product or service offered to you by your travel retailers. Travel retailers receive payment from CSA related to the offer of travel insurance. If you have any questions about your current coverage, call your insurer, insurance agent or broker. This notice provides general information on CSA’s products and services only. The information contained herein is not part of an insurance policy and may not be used to modify any insurance policy that might be issued. In the event the actual policy forms are inconsistent with any information provided herein, the language of the policy forms shall govern.

Travel insurance coverages are underwritten by: Generali U.S. Branch, New York, NY; NAIC #11231. Generali US Branch operates under the following names: Generali Assicurazioni Generali S.P.A. (U.S. Branch) in California, Assicurazioni Generali—U.S. Branch in Colorado, Generali U.S. Branch DBA The General Insurance Company of Trieste & Venice in Oregon, and The General Insurance Company of Trieste and Venice—U.S. Branch in Virginia. Generali US Branch is admitted or licensed to do business in all states and the District of Columbia.

The price for the travel protection plan includes the travel insurance premium and a separate fee for non-insurance travel assistance services.

*Visit DAN.org/Travel to get an instant quote for specific rates and details. Underwritten by Generali U.S. Branch.



DAN.org/Travel

Pacific Master and Truk Master off Ebeye Island (right); Technical divers prepare to dive (below); The cruise director giving a briefing (bottom left); Pacific Master dive deck (center); Getting ready to dive off the Pacific Master (bottom right)



The ferry boat arrived, and we got underway for a 20-minute ride to Ebeye Island, where most of the local Marshallese, who worked on the Army base, lived with their families. Once on Ebeye, the crew of the Pacific Master met us with a flatbed truck to load our luggage and transport it to the liveaboard, which was waiting for us at another pier.

The liveaboard

We boarded the 100ft (30m)

Pacific Master and were shown to our rooms. Accommodating up to 20 passengers in 12 staterooms, the spacious boat had lots of room for dive gear, camera gear, lounging outside or inside in the salon. One of my favorite things about this



boat was that it had four single cabins for those traveling solo. Several cabins had en-suite bathrooms, while other cabins shared bathroom facilities on the main deck.

After seeing our rooms, we moved to the salon for a safety briefing and a few drills, including life-jacket donning. The liability waiver to dive Bikini Atoll was like none other. You must place your initials next to the

box that read, "I understand that the United States government conducted 23 atomic and hydrogen bomb experiences at Bikini Atoll between 1946 and 1958, and that the ships I will dive on at Bikini received radiation from some of the tests," among others.

We set up our dive gear, and I started setting up my camera inside the salon. There was a large charging area for batter-

ies and dry space for camera setup and storage.

Dinner followed, and soon after, most of us were ready for bed. I felt like I had not slept in days.

Normally, the boat would have left for Bikini that evening, but because of the lost luggage, we would be staying at Kwajalein until the next morning and dive the Prinz Eugen. This ship was part of the Bikini nucle-

SeaLife®

Includes
FREE
Sea Dragon
2000F!



SeaLife Micro 3.0 +
Sea Dragon 2000F

micro 3.0™
LIMITED EDITION
**EXPLORER
GIFT SET**

Special MSRP
\$599.95

USA Only. Price may vary in other regions.

Facebook icon SeaLifeCameras Instagram icon SeaLifeCameras
www.SeaLife-Cameras.com



Marine life on the hull (above), stern guns in the sand (right), and divers by upside-down hull of *Prinz Eugen* (left)



ar testing and initially survived the tests but ended up sinking after being towed back to Kwajalein for research.

I thought it was an exceptional decision, to rearrange the schedule to accommodate the passengers whose luggage was delayed. We all crossed our fingers and our toes for them, in hopes that the luggage would arrive the next day.

Prinz Eugen

History. The *Prinz Eugen* was commissioned into the Imperial German Navy in 1940. Named after the 18th-century Austrian general, Prince Eugene of Savoy, the 681ft (207m) *Admiral Hipper*-class heavy cruiser carried a crew of 1,382 men. Alongside the *Bismark*, the *Eugen* was part of Operation Rheinübung in 1941, which attempted to block shipping between England and the Allied

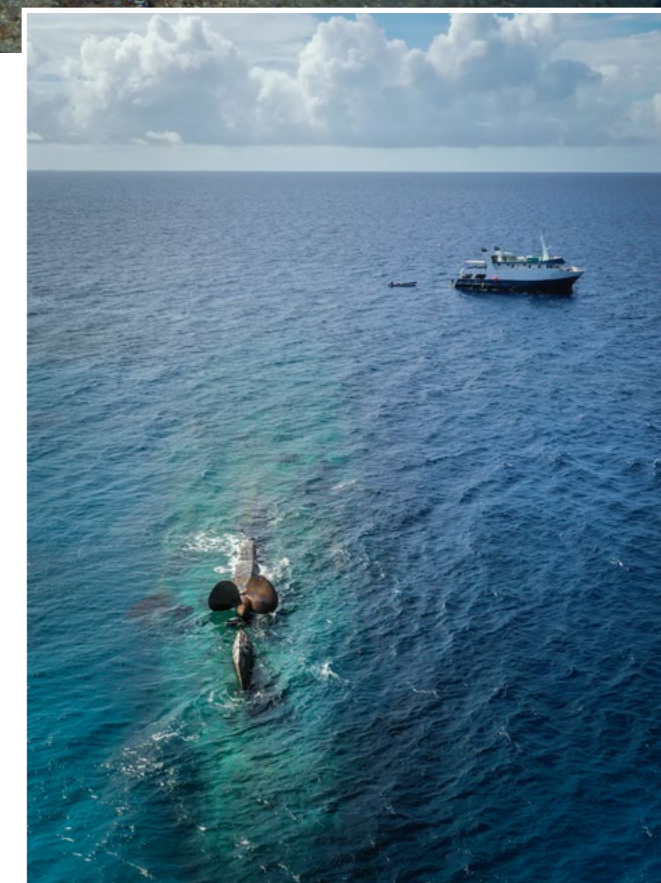
Forces. At the end of World War II, the *Prinz Eugen* was surrendered to the British Royal Navy and transferred to the US Navy as a war prize.

After WWII, the ship then made its way across the Atlantic to the United States, through the Panama Canal into the Pacific Ocean, and finally arrived halfway around the world at Bikini Atoll, to be used in the nuclear testing. The ship survived the Able and Baker bombs, but because it was highly contaminated, the *Prinz Eugen* was towed back to Kwajalein Atoll to be further studied.

Several months later, in Kwajalein, a small leak in the hull was discovered, but the ship was still too radioactive to allow for repairs. In the process of towing the ship out of the lagoon to be skuttled in open ocean, the ship struck Enubuj Island and capsized upside down.

Diving. Jumping off the back of the *Pacific Master*, we followed a marker buoy that led down to the bow of the ship. The *Eugen* rested on a slope, with the bow at the deepest point, and the stern broke the surface, with parts of two propellers and the rudder reaching out of the water. (The third propeller was given to the German Naval Museum at Laboe.) Just seeing the space between the above-water propeller blades and the buoy marking the bow gave one a seemingly unreal view of how large this ship was. It seemed a huge distance between the bow and stern, and it was.

Reaching the sand in front of the ship (around 120ft / 36m), I looked up, and once again, was stunned at the immensity of the ship. The bow seemed to rise up in front of me like a skyscraper. It was possible to swim under the bow, and also penetrate

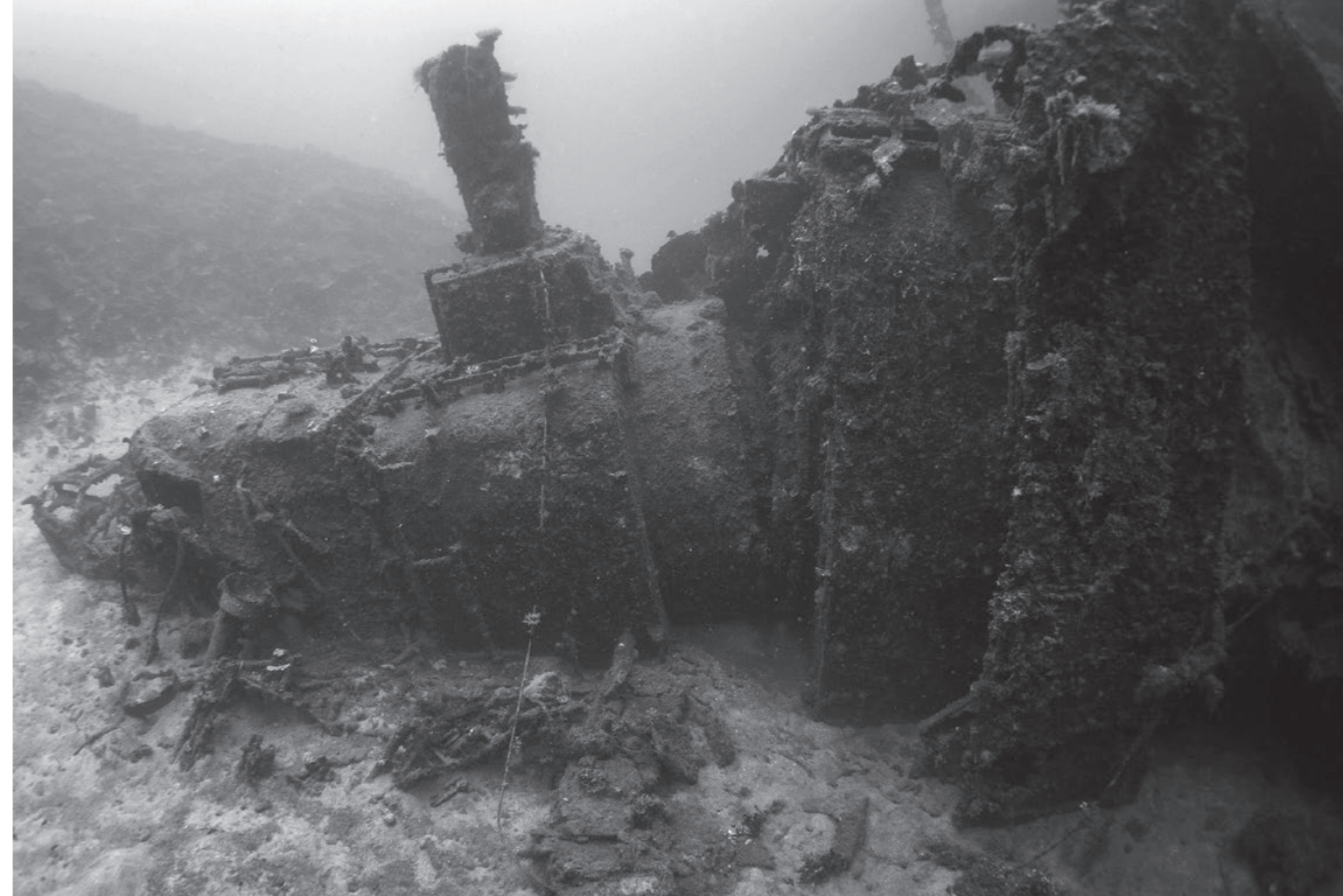
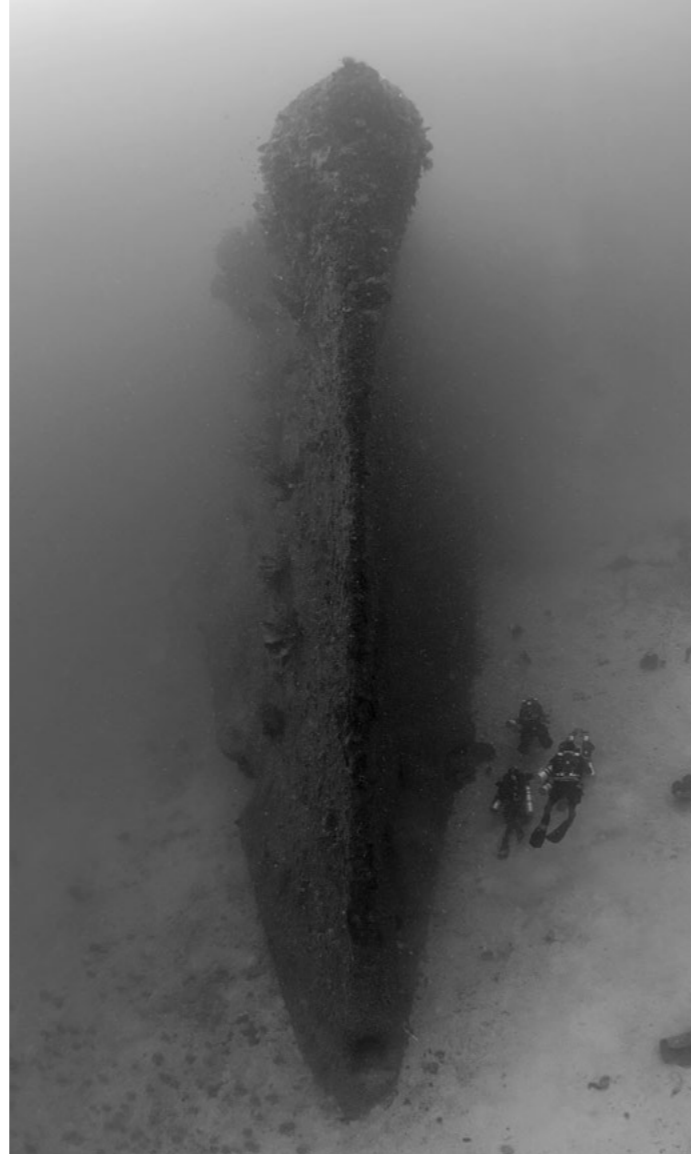


Drone shot of *Prinz Eugen*'s propellers, with *Pacific Master* nearby





LEFT COLUMN: Shoe sole (top) and light bulb (middle) inside the bow, and flippers of diver entering the *Prinz Eugen* (bottom)



Wreckage in the sand (above) and divers by the upside-down bow (left) of the *Prinz Eugen*

into the bow. I followed one of the dive guides in, and because the ship was upside down, light bulbs could be seen under us in a perfect row. There were bathrooms with sinks and toilets. I went back out of the hatch under the bow and swam alongside the ship.

Much had toppled over into the sand, but plenty could still be seen. Peeking into an open porthole, I could see interior rooms with chairs upside down. A torpedo room was easily seen, with at least six stacked torpedoes. Back towards the stern, in shallower waters, an 8-inch deck run lay in the sand. I rounded the stern and glimpsed the propellers, surrounded by a massive school of glittering bait fish. Continuing along the hull, I was amazed by the amount of fish life and coral growing on the wreck.

That afternoon, in what I considered a small miracle, the lost luggage arrived, and the crew from Master Liveboards headed

over to Kwajalein to retrieve it. We had all had an excellent time diving the *Eugen*, and as dinner ended, the liveaboard headed north and west for Bikini Atoll.

Operation Crossroads

In 1946, three Fat Man plutonium implosion-type nuclear weapons were scheduled to be tested in the lagoon of Bikini Atoll. For the first time, media was invited to go half-way around the world and watch these tests—another sign that showed how the United States wanted the world to know how destructive these weapons were. The testing was conducted by the Joint Army/Navy Task Force One.

Not everyone was supportive of this endeavor. Scientists protested that they already knew the effects nuclear weapons had on humans and animals (it was bad). Diplomats protested that this show of power might not lead to adversaries backing



Anemones with anemonefish adorn hull of *Prinz Eugen*



US ARMY PHOTOGRAPHIC SIGNAL CORPS / WIKIMEDIA / PUBLIC DOMAIN

down, but instead cause them to ramp up their weapons production and development.

Animal rights activists also joined in the protests, because the National Cancer Institute wanted to do tests on animals, including pigs, guinea pigs, goats, rats, mice and even grains containing insects. Not to mention, some protested that over US\$450 million dollars' worth of target ships would likely be destroyed (although, counterprotests pointed out that most of these ships were old, and their value was a lot less as scrap metal).

One of the reasons for selecting Bikini was that it

was "mostly" uninhabited. But "mostly" meant that 167 people still lived there. Prior to the nuclear tests, they were asked to leave their island "for the good of mankind and to end all world wars." They were moved to Rongerik Atoll, an island close by. When the Navy commodore in charge came to ask the people to leave, he also brought a film crew, and several retakes were staged to show the Bikinians agreeing to this eviction. They had been told they could return home shortly after the testing, but this turned out to be very untrue, as the island is still uninhabitable to this day.

The first bomb, Test Able, was dropped on 1 July 1946 from a B-29 Superfortress. It was detonated at 520ft (158m) above the target fleet and was similar to the Hiroshima bomb drop. Able missed its target by 2,130ft (650m); it has never been determined why. USS Nevada was intended to be its main target (and it was even painted orange and white so it would stand out); but instead, Able hit closer to USS Gilliam. In the end, five ships were sunk: USS Gilliam, USS Carlisle, USS Anderson, USS Lamson and the first foreign vessel, IJN Sakawa. There was almost disappointment about the lack of media-

worthy hype that the first bomb created.

The second bomb, Test Baker, was planned to be detonated on 25 July 1946, at 90ft (27m) below the ocean surface, under USS LSM-60. The LSM-60 was presumed to be vaporized, and no part of it has ever been identified. The underwater detonation led to very unique circumstances; the underwater fireball became an expanding hot gas bubble that hit the sea floor and the surface at the same time. The force underwater damaged the hulls of ships from below, and when the gas bubble hit the surface, it sent two million tons of spray and seabed sand into the air, in the form of a 6,000ft (1,828m) tall, hollow column with 300ft (91m) thick walls.

Underwater, the gas bubble hit the seafloor and created a crater that caused a tsunami, which made a wave that lifted ships as high as 94ft (28m). Then, the waterfall of spray came down and washed the entire test fleet in radioactivity.

The press and media had wanted something to write home about, and they got it. Ten ships were sunk, including



NASA / WIKIMEDIA / PUBLIC DOMAIN

Bikini Atoll

Landsat satellite image of Bikini Atoll in the Marshall Islands (left); Colorized photo of the 21-kiloton underwater nuclear weapons effects test, known as Operation Crossroads (Event Baker), conducted at Bikini Atoll in 1946 (far left); Aerial view of mushroom cloud from atomic bomb Able, 1 July 1946 (below)

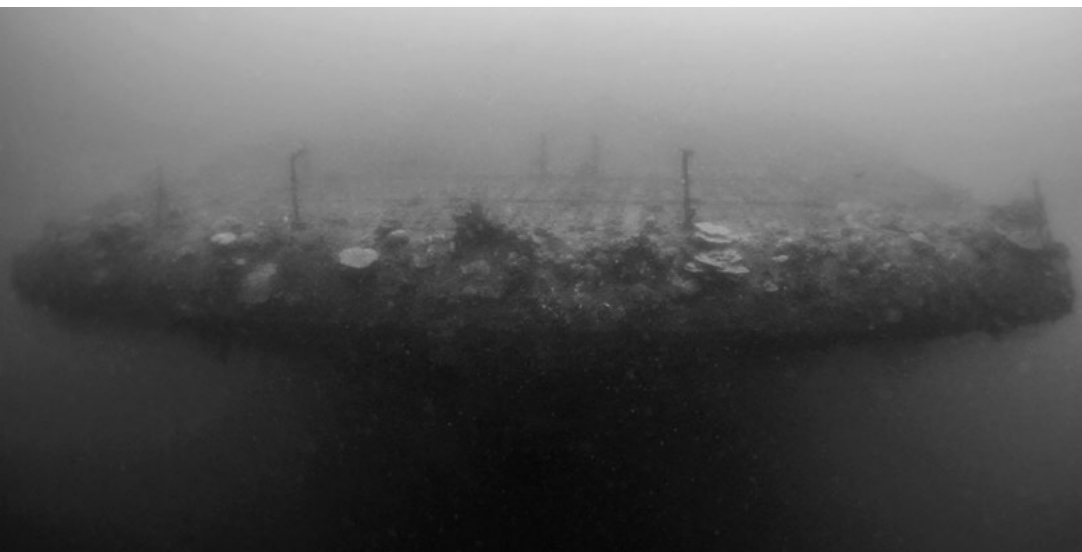


USAAF / WIKIMEDIA / PUBLIC DOMAIN





Bikini Atoll



Turtle on the bow (top left), inside the Flag Bridge (top right), sink (far right), gauges (center), and the bow of USS Saratoga (above)



the LSM-60, USS Arkansas, USS Pilotfish, USS Saratoga, YO-160, HIJMS Nagato, USS Skipjack (which was later raised for research), USS Apogon and ARDC-13 mobile dry dock. The Prinz Eugen was also considered sunk by Baker, even though it did so five months later. Plus, the entire target field was washed

in radiation. The third test, Charlie, was cancelled.

The wrecks of Bikini

USS Saratoga. Arriving in the middle of the night, we woke up to a fiery-orange sunrise, ready to dive the Saratoga. A darling of the US Navy, the "Sara" was one of the world's

first aircraft carriers. The 39,000-ton Lexington-class aircraft carrier is 888ft (270m) long with a 105ft (32m) beam and had been decked out for the tests.

During preparations before the dive, the Pacific Master's crew members were fantastic. They carried stage tanks and cameras to the dive deck.

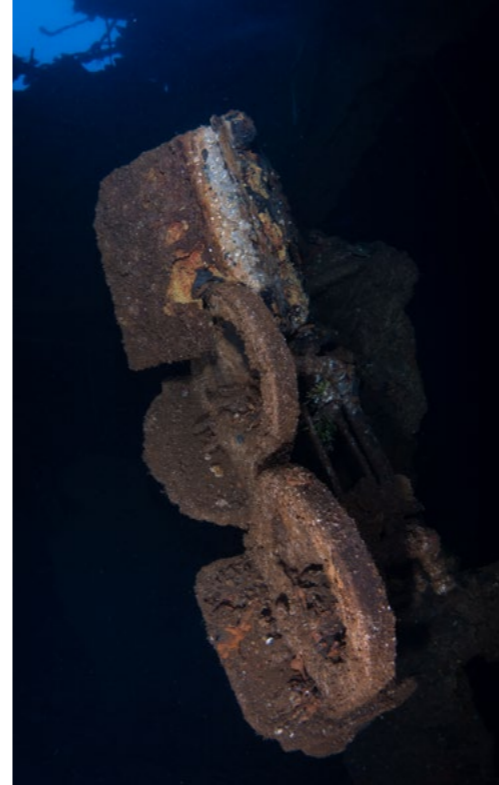
They helped us clip on tanks and passed gear into the water. One could get used to such service.

I jumped off the platform and started to make my way down to the Sara. Visibility was not ideal, probably due to a big storm a few weeks before. I was the first person in the water,

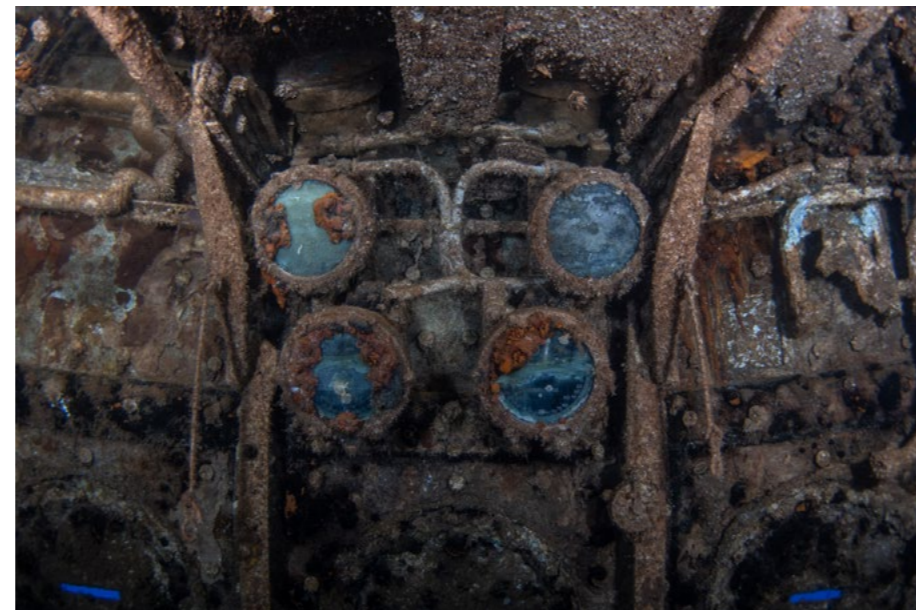
and while descending down the mooring line, I noticed something gray out of the corner of my eye. Then, it swam right in front of me—a curious reef shark. I looked around and saw I had an entourage of sharks following me to the ship.

There is just something about the size of an aircraft carrier underwater that is almost unfathomable. As I got closer, the shadow of the ship in the blue waters grew until it was all that was below me—just a massive ship.





Bikini Atoll



1ST ROW, LEFT TO RIGHT: Sharks on USS *Saratoga*; Sinks that have fallen down sideways in the wreck; Helm area inside the Flag Bridge

2ND ROW, LEFT TO RIGHT: Large cooking pot; Gauges inside the Flag Bridge; Window covers on the floor inside the Flag Bridge

We were tied up close to the bow, and I swam out in front of the ship to take in how big it was. Instead of a point, like one is used to seeing when looking at a ship from the front, the *Sara's* bow looked like a long line—plenty of space for planes to take off and land.

Parts of the flight deck had collapsed, opening up areas to the floor underneath. I ventured in and saw gauges, panels, toilets and sinks; and at one point, I looked up from under the flight deck and saw the underside of a sea turtle. I went back out onto

the top deck and saw a sea turtle munching happily on sponges growing on the ship.

Moving back towards the flag bridge, I noticed a distinct scientific instrument on the deck. A blast gauge tower (these types of towers were nicknamed “Christmas Trees”) held up a circular object, which was made to measure blast strength. In-between the tower's two large brass plates, there would have been tin foil, and the plates matched up with differently sized circles. If the smaller circles ruptured after a blast, it

was deemed a large blast; if only the bigger circles ruptured, the blast was considered a smaller one.

The flag bridge on the wreck still stood and was an easy swim-through. The helm, compass and other navigational equipment were still intact. The porthole covers on the windows were battle-ready, so minimal light could be seen outside the ship. Other porthole covers rested on the floor. With limited bottom time, I made my way back to the *Pacific Master* to do my deco stop near its hang bars, off the back of the boat.

We did several dives on the *Sara* throughout the week and visited interior spaces, including the machine shop, galley, crew quarters and dive locker, and some divers even went to the famous dentist room. Closer to midship, a plane could still be seen, although it was a bit mangled. Recently, dive guides found the pilot's ditch bag by the plane and opened it up to find collapsible paddles, a canvas object that may have been an inflatable raft of some sort, and other things a pilot might need, should he end up in the water. Three airplanes

were blown off the deck during the blast, and two could be seen off the starboard bow at 165ft (50m).

While underwater wrecks are always in a constant state of decay, there is still plenty to see, and sometimes, when things break up, they reveal new areas to explore and new things to see. One of my favorite things to do on this trip was sitting around in the salon with the other divers, looking over ship plans, and doing research on the internet, trying to find more information that would help us plan our dives. The ship's





Marine life on one of the massive propellers on HIJMS *Nagato* (top left and top right); Deco stop selfie with pilotfish (top center inset); Emergency paddles (above) and gear (left) found in a ditch bag inside a plane on the hanger deck on USS *Saratoga*

plans of the *Saratoga* were always laid out, and we traced our fingers over the places that we had been and contemplated how to get into other spots. It seemed like there were not many places left on the wreck that we could explore and perhaps see something no one else had seen in over 75 years.

HIJMS *Nagato*. HIJMS *Nagato* is probably the next most notable ship in Bikini Atoll. The *Nagato* was the flagship of Admiral Isoroku Yamamoto, commander-in-chief of the Japanese Combined Fleet. This ship sat upside down, with four massive propellers standing out as the first thing we saw upon descent. It was the only Japanese battleship to survive the Pacific War and was taken

over by the United States after its surrender on 30 August 1945. This was the ship from which Yamamoto radioed in the attack on Pearl Harbor in 1941.

When it was launched in 1919, it was the largest and fastest battleship in the world and the first to have 16-inch guns (several of which we swam around). Its mast was modified in the 1930s to a pagoda mast, which rose up 135ft (42m) from the ship. Underwater and upside down, that pagoda mast held the stern of the ship up off the seafloor, allowing divers to get a glimpse of the 16-inch guns sticking out from underneath and get inside some areas of the ship.

The propellers of this ship were my favorite aspect of the wreck; they were huge and covered

with marine growth. Whip corals were so plentiful, it almost looked as if the propellers were growing long, green hair, and fish lived among the coral. More reef sharks appeared and hung around, just checking us out, and we went closer to the seafloor to peek up from under the ship. Lots of guns stuck out, with barrels seemingly pointed at us, telling us, "Don't come any closer." Even as we racked up deco time, it was pleasant to be in the warm tropical waters, with temperatures around 84°F (28°C).

Submarines. Eight submarines were used in Operation Crossroads, three of which were sunk: the *Skipjack*, *Apogon* and *Pilotfish*. During Test Baker, the submarines were staged at different



The liveboard's cruise director poses on the USS *Arkansas* (left and below); Conning tower of the submarine, USS *Pilotfish* (far left)

depths: the *Skipjack* at 150ft (45M), *Apagon* at 100ft (30m) and *Pilotfish* at 56ft (17m). The *Skipjack* was raised to be further studied, but the *Apagon* and the *Pilotfish* remain underwater at Bikini Atoll to this day.

I had already dived the *Apagon* on a previous trip, so I was really excited to dive

submarines were *Balao*-class steel submarines, 312ft (95m) in length, with a 27ft (8m) beam and a height of 47ft (14m).

USS *Arkansas*. The USS *Arkansas* has quite a history, as it was commissioned in 1912. It was present during WWI, when the German High Seas Fleet surren-

dered at Scapa Flow in 1918. It also participated in the invasions of Normandy and provided fire support on Omaha Beach. In 1944, it was sent to the Pacific. Another large ship at 562ft (171m) in length, it sat upside down at 165ft (50m) in the lagoon.

The liveboard's cruise director let me join him on a photo dive to set up lights in some of the guns. Unfortunately, the visibility was not making the photo shoot easy, but even just seeing the lit-up scene was impressive, with the lights shining out of the gun barrels on this amazing ship.

The *Arkansas* was the closest ship to the Baker blast, and the underwater pressure from the bomb crushed the starboard side of the hull from below, causing the vessel to roll portside. The superstructure has never been found; it may have been crushed under the hull or blown off in the blast.

The *Arkansas* was the closest ship to the Baker blast, and the underwater pressure from the bomb crushed the starboard side of the hull from below, causing the vessel to roll portside. The superstructure has never been found; it may have been crushed under the hull or blown off in the blast.



USS Lamson and USS Anderson.

We also dived two of the five ships sunk by Test Able: the destroyers USS *Lamson* and USS *Anderson*. Both were just over 340ft (103m) long. The *Lamson* sat upright, while the *Anderson* rested on its port side.

Built for speed, the low profile of these ships made it easy to see most of each wreck site in one dive, with depths of 120 to 165ft (36 to 50m) in the sand. The *Lamson* had some really neat

guns on the deck, as well as a torpedo launcher, with torpedoes in place and ready to go. The *Anderson*'s bridge sat in the sand, making for a great view of the propellers and rudder, and the superstructure and bridge area lay in the sand.

The islands

Almost as fascinating as the wrecks is Bikini Island. On an afternoon halfway through the trip, we skipped a dive (to help

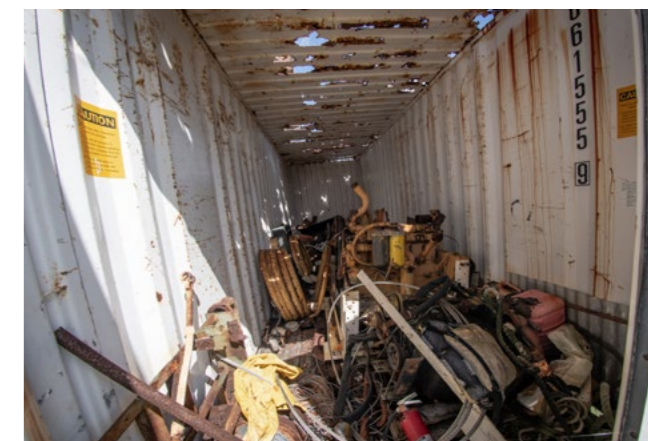
off-gas) and visited the island for a BBQ, which was cooked on board but eaten on the island.

For a place that seems like the ends of the earth, I was surprised we were not the only ones there. The ship that came to pick up the island caretakers and their goods was around, as was a research vessel from Australia, with several tenders. The lagoon felt almost crowded. But there was almost some comfort in knowing we were not completely alone, far

Bikini Atoll



Torpedo launcher with torpedoes (above) and gun (right and top right) on USS *Lamson*



The landing craft taking the employees off the island (above)

away from any other humans. Abandoned multiple times over the years, Bikini Island felt unreal—perhaps more like an empty theater stage set, or a Disney-like spectacle, built to show what might happen after a nuclear apocalypse. Buildings still stood. Doors were open. In the early 2000s, a land-based dive resort was set up, in the hopes of generating money for the Bikini people and to help divers to dive this unique location. But it closed several years later. Oceanfront

hotel rooms remained abandoned today, and the infamous Bikini Bar was still there. Various workshops, broken-down cranes, cars and boats were now a part of the island, with greenery growing around and into them. A maintenance shed stood open, packed full of rusting tools. Rotting cardboard boxes of nails and screws were in a slow state of decay. The dive shop still had a whiteboard with a dive plan for the *Saratoga* on it. We walked around, snap-

ping photos and reveling in how empty the island felt. It was so quiet, I almost felt like I should whisper. We were not the only ones on the island though. But we soon would be. For many years, several people lived on the island for three-month rotations, including island caretakers who were employed to do maintenance work and several employees from the US Department of

Energy who continued to monitor radiation levels. Previous research had shown that short stays were not detrimental to human health. But these stays have recently come to an end, with a landing craft on the beach, loading up all the leftover supplies as well as the people who worked there. **Bikini trust scandal** These workers were supposed

to be paid by the Bikini Council (which also collects payments from divers for permit fees to dive the wrecks). But in 2023, a scandal was uncovered. The once multimillion-dollar trust, set up to assist the displaced Bikini residents and their future generations, was empty. Back in 1982, a resettlement fund of US\$25 million was set up by the United States to support the residents of Bikini,

who still cannot safely return to their homeland today. Another fund was set up in 1987, with funds to go directly into payments to the Bikinians, including an additional US\$90 million. Several million dollars each year was given to the Bikini Council to help provide housing, food and education to Bikini descendants. This fund was administered by the United States.

On Bikini Island, ocean front rooms of the now closed resort (top right); Inside the maintenance shop (above left); Tools, spare parts, and other things left behind (above right). CENTER COLUMN, TOP TO BOTTOM: One of the rooms in the old resort; Walking around the abandoned grounds; Maintenance shop exterior



Plenty of tanks on the back deck (left); Birthday cake surprise (below).

2ND ROW, LEFT TO RIGHT: BBQ at the Bikini Bar; Delicious empanadas; Burger day buffet; Ice cream brownie for dessert



SIREN FLEET

High quality liveaboards on iconic yachts

Indonesia Palau The Philippines

www.sirenfleet.com

Master Liveaboards

Dive the world's most exciting destinations

Bahamas Bikini Atoll French Polynesia
Galapagos The Maldives Papua New Guinea
Red Sea Solomon Islands Truk Lagoon

www.masterliveaboards.com



discovered that less than US\$100,000 remained, and that the money had been spent by Jibas, on land development



In 2016, the elected mayor of the Bikini Council, Anderson Jibas, wanted control of the fund to be in Marshallese hands, not overseen by the United States, which provided the funds. In 2017, it was handed over to the Council, and over US\$59 million was in the account. Withdrawal limits were lifted and auditing by the United States was concluded. In the spring of 2023, it was

in Hawaii as well as on ships, planes and apartment complexes in the Marshall Islands. There were also reports of millions of dollars being deposited into a private Bank of Guam account for "council operations," which Jibas later denied. The men packing their bags on Bikini Island told us they were no longer being paid. The atoll may truly be abandoned for now, other than for

a few wayward scuba divers who journey halfway across the world to see this place. Yet again, the still-displaced Bikinian people seem to never be able to catch a break.

Deserted and stranded

A few islands down from Bikini Island was the island where the old runway was located. Grass grew tall over the flat area, and once again, I had a feeling of being in some sort of movie set. The airport check-in counter was still there. But there were no workers. Behind the counter were luggage tags for destinations, including KWA (Kwajalein), MAJ (Majuro) and

HNL (Honolulu). One might think for a second that we were just waiting for a delayed plane, which was a little ironic, because the last group of divers who stayed at the land-based operation did just that. Air Marshall Islands, the local airline, just closed one day and left them stranded on Bikini. It was several weeks before a US ship came to rescue them.

Is it safe?

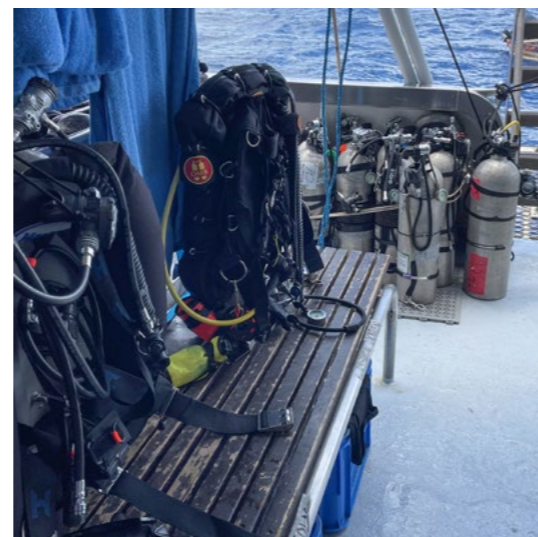
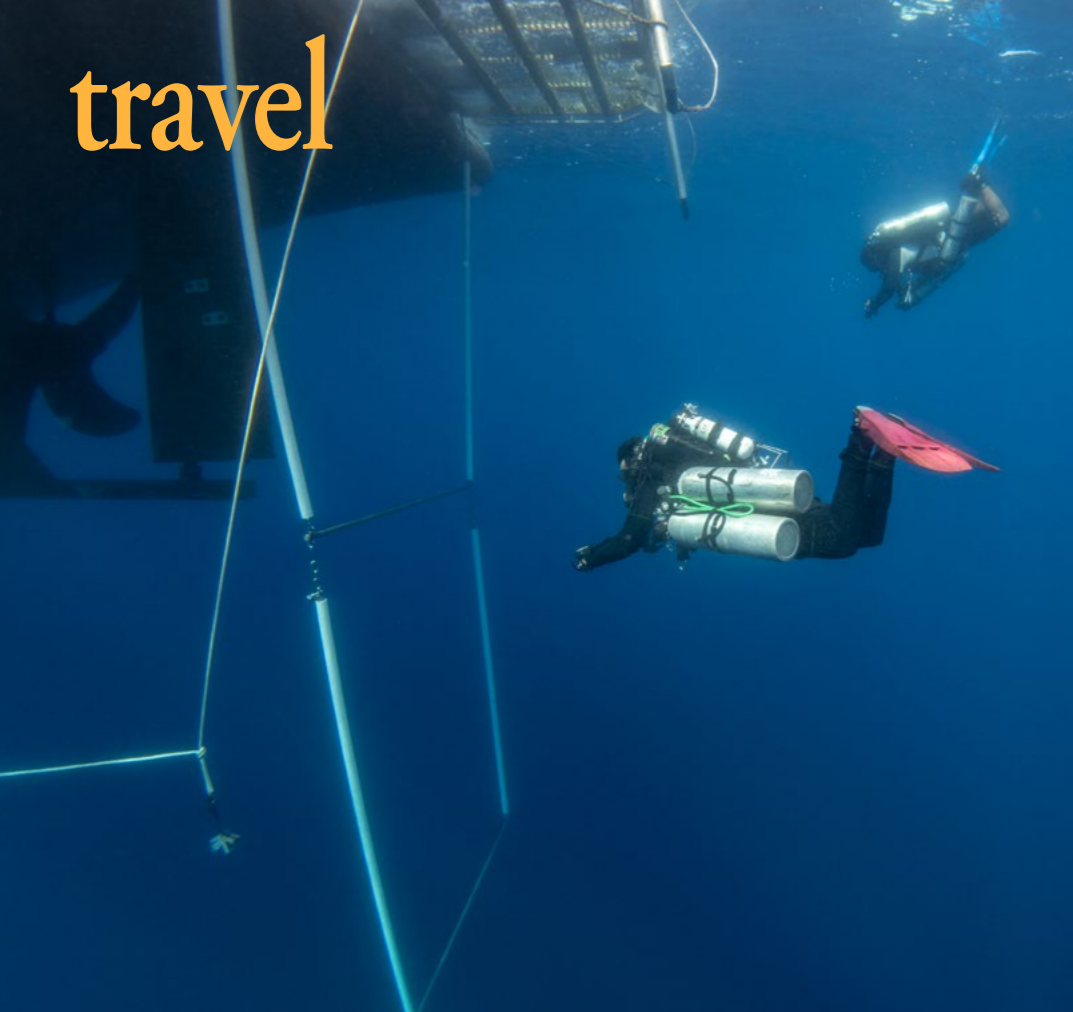
The two tests of Operation Crossroads were only the beginning. Between 1946 and 1958, 67 nuclear weapons were tested in the Marshall Islands.

The question always arises: Is it safe to dive the wrecks of Bikini and visit the island? According to research done by the US Department of Energy and Lawrence Livermore Laboratories, short visits to the area are fine. The general environment poses no radiological danger; however, consuming island-grown food (or island animals that eat island-grown food) for long periods of time might still be a danger. Don't eat the coconuts.

Remote conditions

Operating a liveaboard in this remote and isolated location must be tremendously difficult.

I walked through the store on Ebeye, where most of the food for the boat was purchased, and there were very limited options and very limited amounts of food. I would say the food was not the best I have ever had on a liveaboard, but when you consider how difficult it is to even get food, I was amazed by what the chef could do with such limited options. We had mini slider burgers and curries, and even empanadas one night. Ice cream was plentiful, and like most liveaboards, this was



Hang bar and lines on the *Pacific Master* make deco stops easy (top left); Dive guide gives a wreck briefing (top center); Dive equipment on deck (left); Bikini Atoll sunset (above); Divers ready for a dive (lower left).



I am on dive trips, but there was something nice in being able to check in with friends and family back home, occasionally, over the long trip. There was a charge for this, but I felt it was completely acceptable.

All too soon, it was time to make the 30-hour journey back to Kwajalein, and we were lucky to have fantastic weather for the crossing. The day underway was spent editing photos, packing and

chatting about our return trips. Back on Ebeye, we enjoyed our last night aboard and woke up on the last morning to manta rays swimming alongside the boat. Then, it was time to start the long journey back home.

Tech certification

Master Liveboard's Bikini Atoll itin-

eraries require all divers to be tech-certified to the equivalent of PADI Tec 50 or higher. There is no medical care available in Bikini and only limited care in Majuro, with no hyperbaric facilities. Divers need to keep in mind the remoteness of the location and the distance they will be from medical care when planning and carrying out dives. Diving conservatively is highly recommended.

While it is certainly a time-consuming and expensive endeavor, I think visiting Bikini Atoll, diving the wrecks, and bringing back the stories from this abandoned part of the planet is important—to remind the outside world of what happened here and to prevent future catastrophes. For trained technical divers who are historical-wreck enthusiasts, it is a playground with some of the most fascinating wrecks on Earth, including their histories from before the vessels were used in Operation Crossroads and their legacy as

ships sunk in peacetime, by nuclear weapons. There is nowhere and nothing else quite like it. ■

Special thanks go to Master Liveboards for their support, and for continuing to run trips to this remote and amazing destination. For more information, please visit: masterliveboards.com.

*Brandi Mueller is an American photographer, writer, captain and scuba instructor, who is based in Micronesia half of the year and traveling the rest. She is the author of the book, *The Airplane Graveyard*. You can see more of her work at: brandiunderwater.com.*

REFERENCE:

MCKENZIE, P. (2023, MAY 3). \$59 MILLION, GONE: HOW BIKINI ATOLL LEADERS BLEW THROUGH U.S. TRUST FUND. THE NEW YORK TIMES. [HTTPS://WWW.NYTIMES.COM/2023/05/03/WORLD/ASIA/BIKINI-ATOLL-RESETTLEMENT-FUND.HTML](https://www.nytimes.com/2023/05/03/world/asia/bikini-atoll-resettlement-fund.html)

THE AIRPLANE GRAVEYARD
The Forgotten WWII Warbirds of Kwajalein Atoll
BRANDI MUELLER ALAN AXELROD

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





Garden of the Gods

Artistic Reef Gardening Project in Pemuteran

Text by Claudia Weber-Gebert
Photos by Claudia Weber-Gebert
and Emily Chan



CLAUDIA WEBER-GEBERT

Granulated sea star, pulse coral, sponges (above) and large sea fan (previous page) on reef at Pemuteran

Established in 2014, Garden of the Gods is the latest in a series reef gardening projects in Pemuteran, Indonesia, which have been running since 2000, and is one of the largest in the world, in terms of area—as big as all comparable projects combined! Claudia Weber-Gebert gives us an inside look.

The founders of the project, Cassandra Dragon and Chris Brown, told me about the project

in detail. In 1990, Chris, who is an Australian, came to Bali, making a new home for himself in Pemuteran and establishing the Reef Seen Divers' Resort. At that time, the reefs had already been partially destroyed by dynamite and cyanide fishing for aquarium fish. The abundance of fish decreased, but it was not too late.

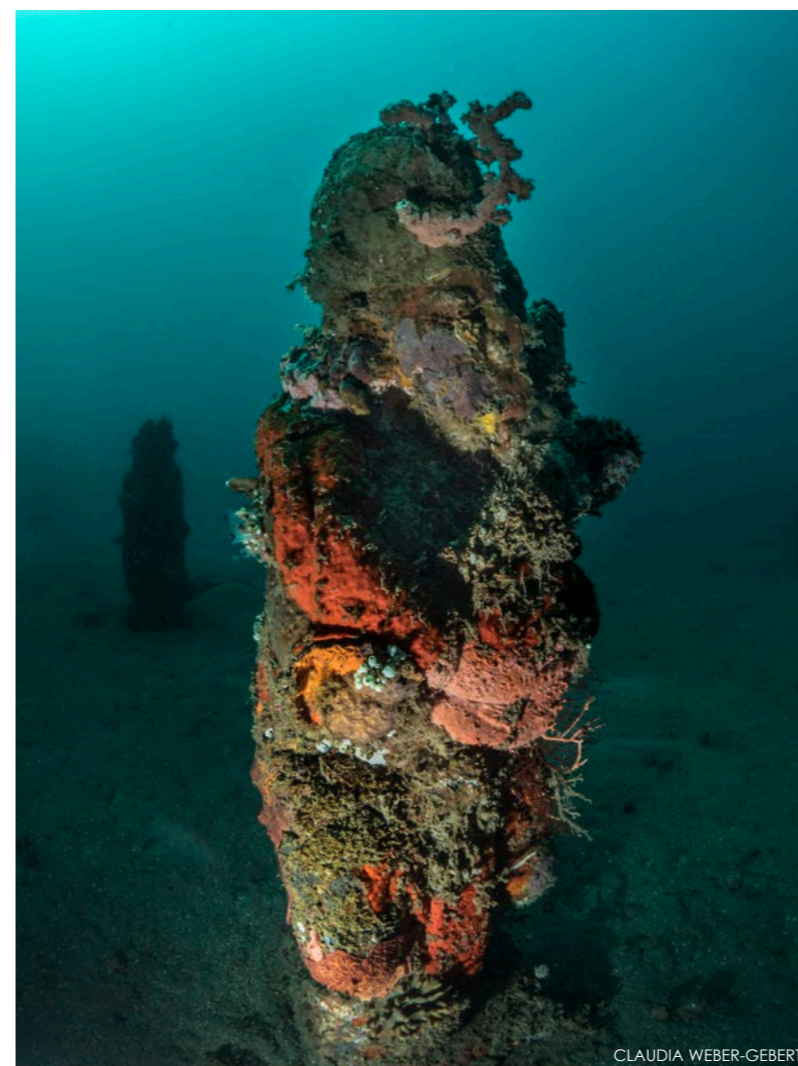
Chris convinced local fishermen that fish on a plate was less profitable in the long run than live fish, which delighted diving tourists and created jobs in the tourism industry. In cooperation with the local fishermen, residents and

authorities, Chris and his team were able to stop cyanide and dynamite fishing and got things rolling for reef restoration, creating a win-win situation for everyone... and ultimately, also for nature. (Read an excerpt about the Pemuteran Artificial Reef Project in Bali from the Global Coral Reef Alliance at globalcoral.org.)

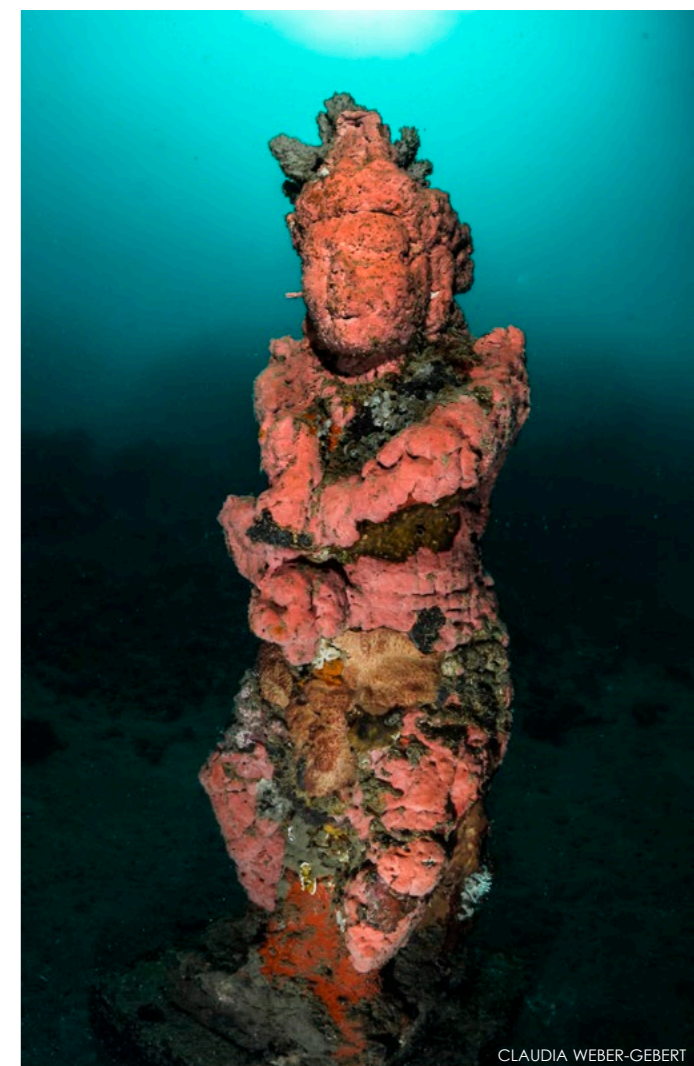
As the founder of the pioneering dive centre in Pemuteran in 1991, Chris is not only involved in reef gardening projects but has also been in charge of a sea turtle hatchery station, a non-profit project, since 1992. He has



CLAUDIA WEBER-GEBERT



CLAUDIA WEBER-GEBERT



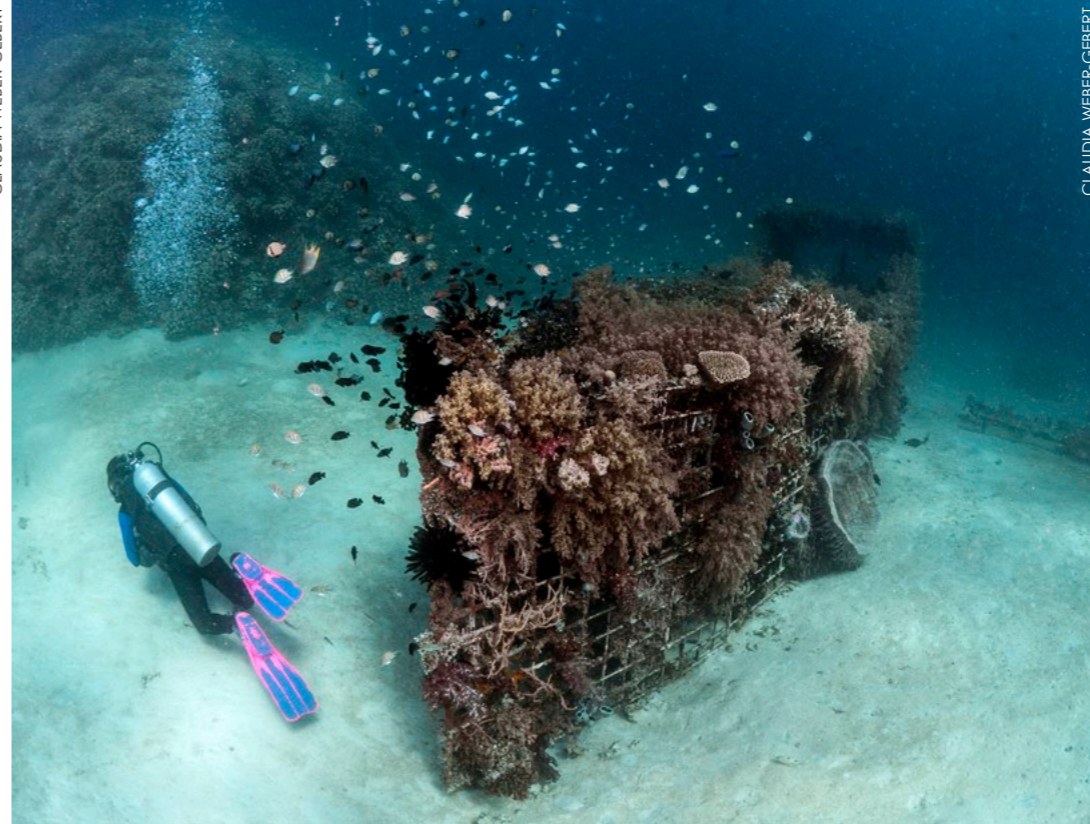
CLAUDIA WEBER-GEBERT

Coral-encrusted statues at Garden of the Gods (above left and right), located in Pemuteran (top right)





CLAUDIA WEBER-GERBERT



CLAUDIA WEBER-GERBERT

Pemuteran

Views of Bio-Wreck (left, far left and below), a reef gardening project installed at Reef Seen Divers' Resort in 2005, which is now densely colonised with a variety of corals, attracting schools of fish and other marine life, as well as divers; Chris Brown, founder of Reef Seen Divers' Resort, and underwater photographer Cassandra Dragon, worked together on the concept for the Garden of the Gods (bottom left).

organised and set up a number of projects since then, and these can also be dived. Here too, one can observe the success of these sites, such as the Bio-Wreck, which was installed in 2005 and is now in no way inferior to a natural reef. When I visited, I was overwhelmed by the abundance of fish around this artificial reef!

CLAUDIA WEBER-GERBERT



Back to the Garden of the Gods

The Garden of the Gods site was created in 2014 to take the pressure off the still fragile reefs and create a dive site that included both reef construction and a Balinese temple park, which would be popular with tourists—providing diving and sightseeing at the same time, so to speak.

The inspiration for idea came from Cassandra Dragon, who worked diligently to open doors for Chris to construct the Garden of the Gods. Since it was a nonprofit project, financial support had to be sought.

In the project plans, nine statues of Balinese gods, including Brahma, Rudra, Mahadeva, Sangkara,

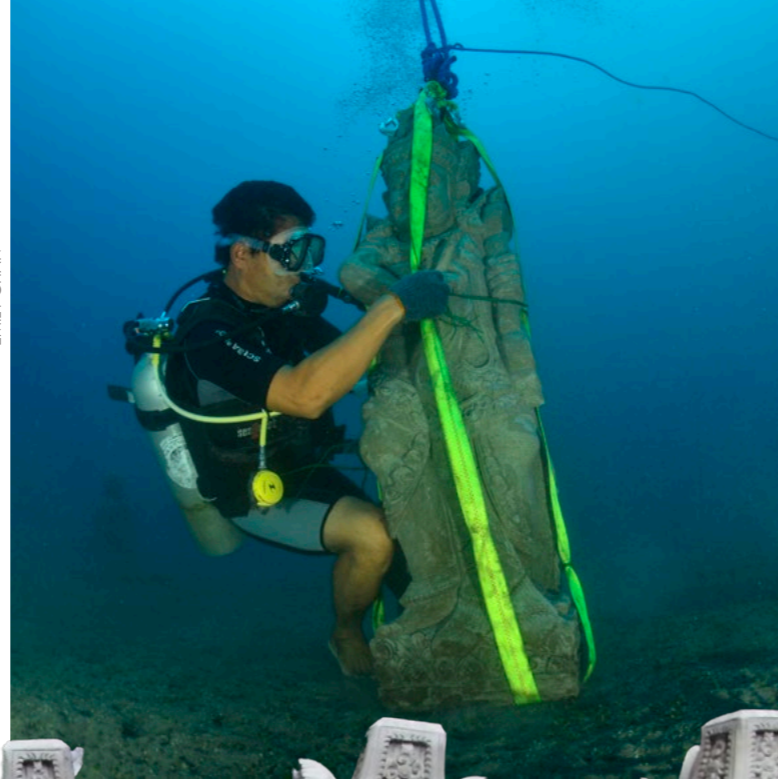
CLAUDIA WEBER-GERBERT



Back in 2014, locals and area divers helped to install statues for the Garden of the Gods (right and below); Map of Garden of the Gods at Pemuteran (bottom left); Statues created by traditional Balinese stonemasons, before their sinking (centre and bottom right)



EMILY CHAN



EMILY CHAN



EMILY CHAN



EMILY CHAN



EMILY CHAN

Vishnu, Sambhu, Iswara and Mahesora, would be arranged in a circle, according to Balinese custom. The arrangement corresponded with the eight wind directions, according to the wind rose of a compass. In the centre was Shiva sitting on a turtle—watching over the sea turtle hatchery.

In addition, statues of musicians, Balinese dancers, turtles, lanterns, fountains and fish would also be set up, so a lifelike scene would be created. The entrance, of course, would be flanked by two guards and there would also be two benches—just like in a Balinese

temple park.

After the plan was drawn, a model was set up in front of the Reef Seen Divers' Resort, to better represent the project and find sponsors. The project was financed and implemented with donations and the help of friends.

Platform with pulley system used to lower the statues

EMILY CHAN





EMILY CHAN



EMILY CHAN

Newly installed statue of Dewa Iswara (above); Divers work to install one of the statues (top left).



EMILY CHAN



EMILY CHAN

The statues were made by a traditional Balinese stonemasonry, from a mixture of cement and local sand from Ubud, as well as an aggregate to make the mixture waterproof. The surface of the cement mixture was relative-

Installation

After all the statues had been transported to Pemuteran by truck, the construction of the garden could begin. The statues were inaugurated in an

Chris Brown with model of Garden of the Gods, in 2014 (above); Official ceremony with local officials and priest's blessing held before statues were sunk (left); Newly installed statue of Shiva sitting on a turtle (right)

ly smooth but not very hard. This was not so with the benches, fountains and lanterns, which were carved from black lava rock. Their surface was porous, but very hard.

official ceremony with a priest and local authorities. Only then could they be sunk on the spot, with a great deal of effort. It was not so easy, because the statues had significant weight. In addition, they had to be set up according to the schematic plan. So, Chris built a platform with an opening in the middle and a pulley on top.

First, the terrain was surveyed, and the positions were marked; then, the buoys were added. Loaded onto the platform and towed to the site by boat, each individual statue was then placed on a stable base, exactly as the plan stipulated.

Buddy Dive
Bonairc

Your Buddies

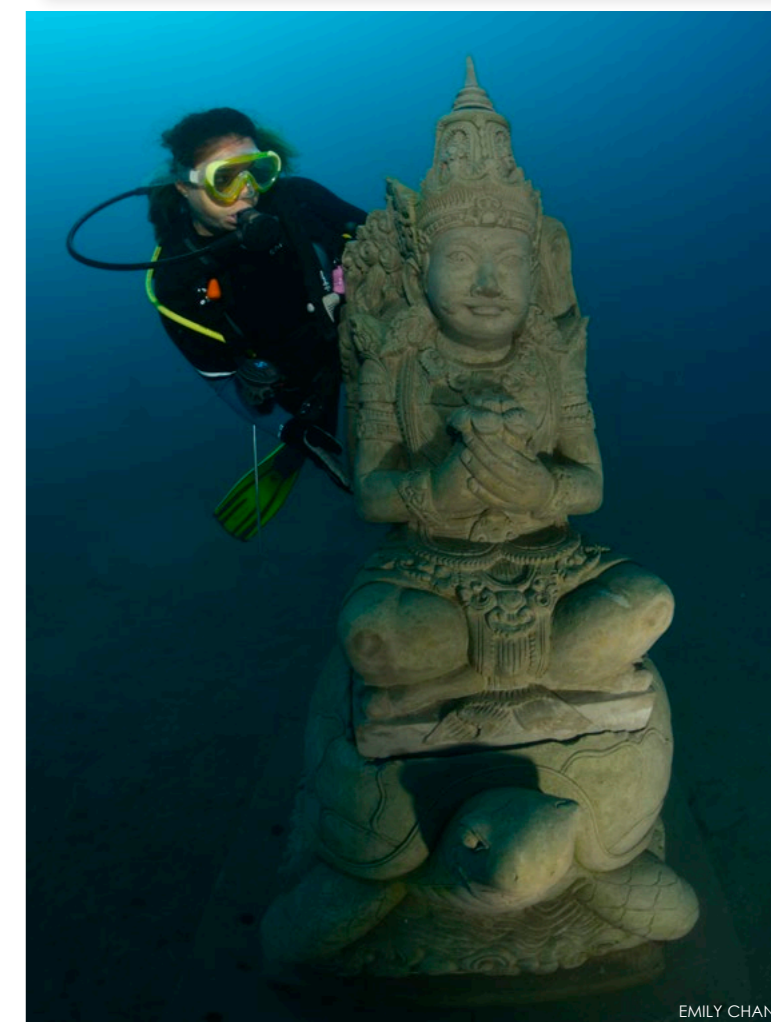
Wish you Happy Holidays

Gift the perfect Christmas present to your buddies. Give them unlimited diving on the beautiful reefs of Bonairc! Surf to www.buddydive.com/rates-specials for specials, rates and availability.

Buddy Dive
Bonairc

BELMAR
Bonairc

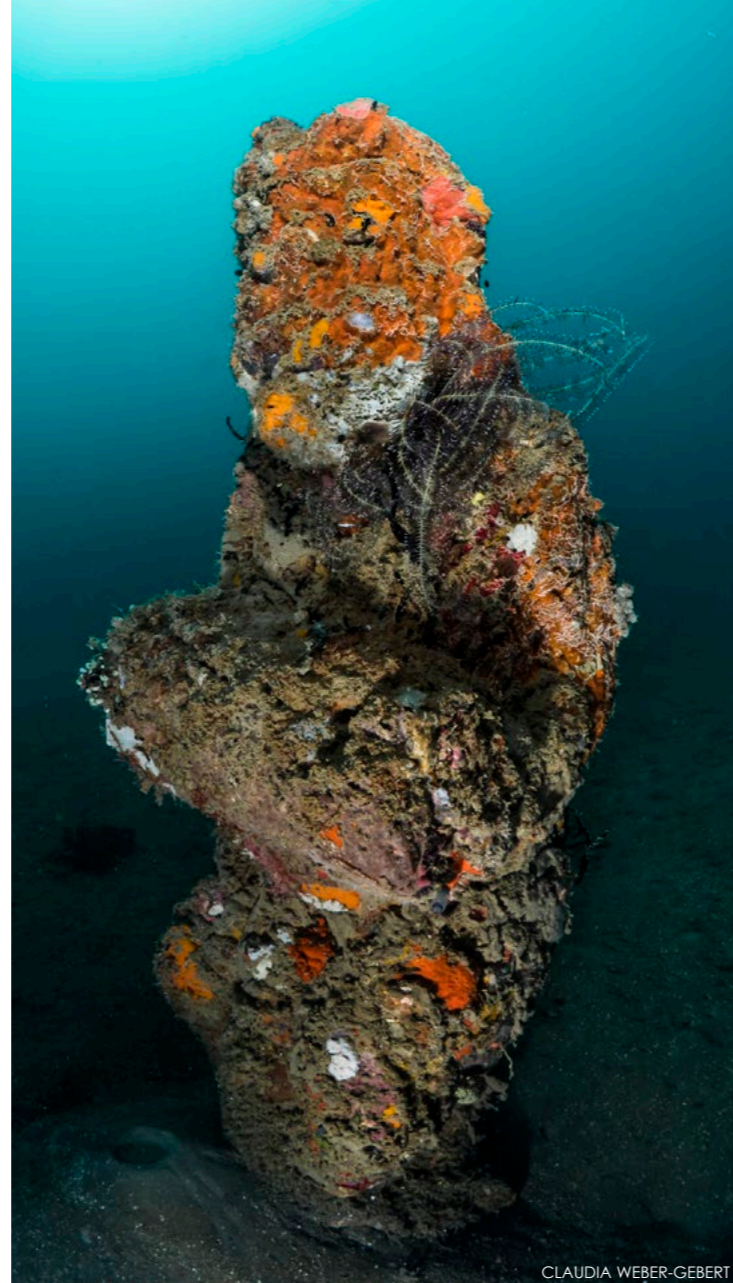
RESERVATIONS: +599 717 5080
WWW.BUDDYDIVE.COM
INFO@BUDDYDIVE.COM



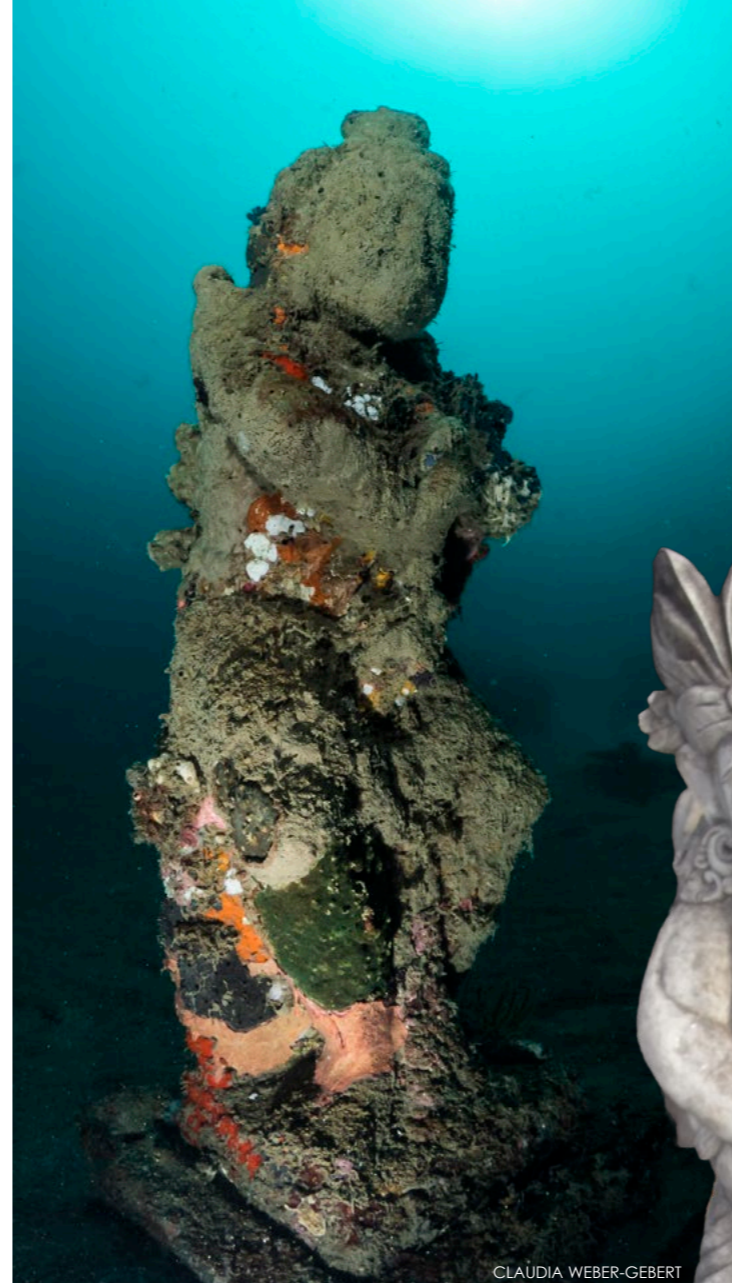
EMILY CHAN



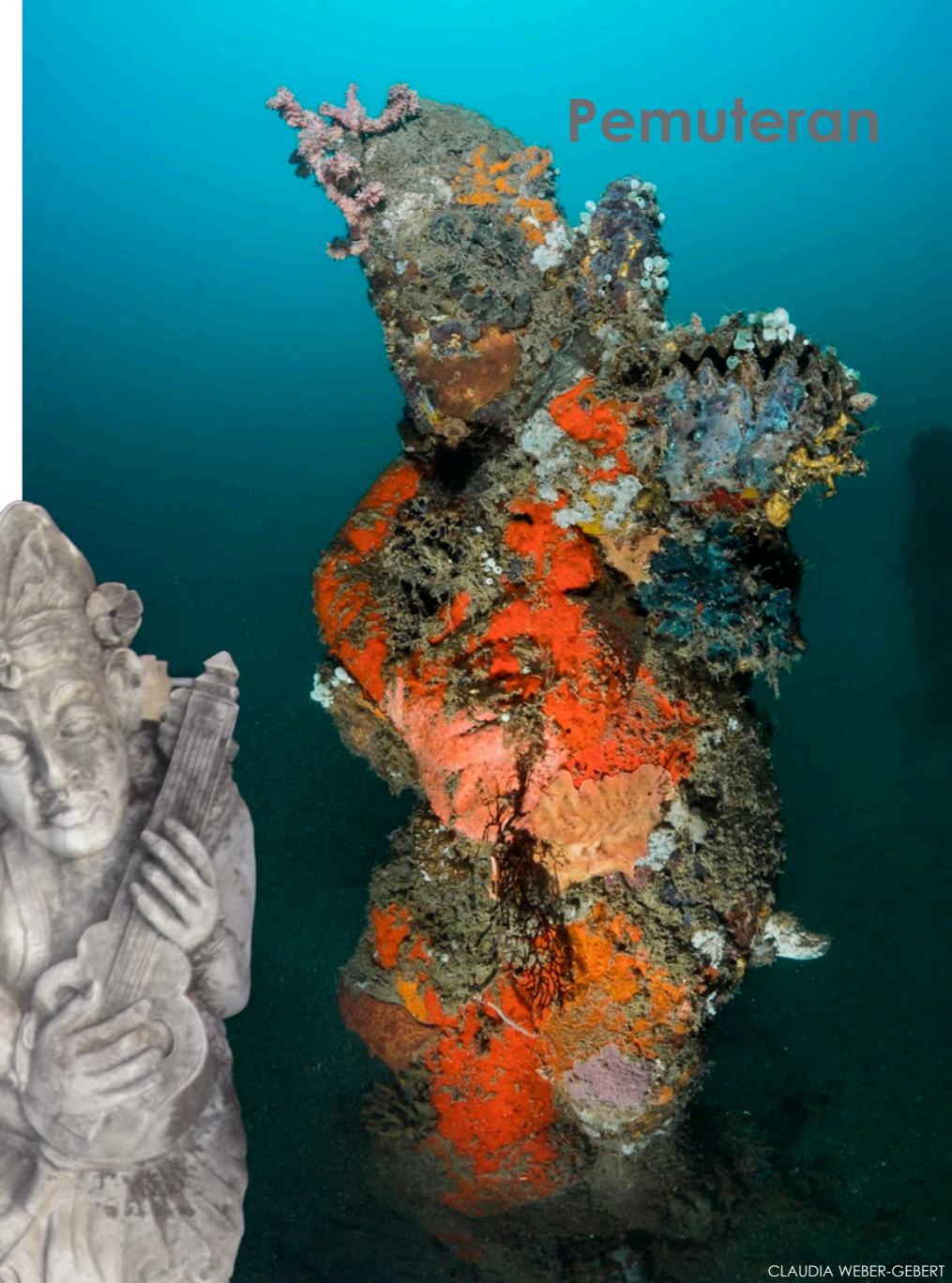
CLAUDIA WEBER-GEBERT



CLAUDIA WEBER-GEBERT



CLAUDIA WEBER-GEBERT



CLAUDIA WEBER-GEBERT



CLAUDIA WEBER-GEBERT



EMILY CHAN

ON THIS PAGE: Various Garden of the Gods statues now coral-encrusted; Original musician statue (right) is now coral-encrusted (far top right); Giant frogfish on reef at Pemuteran (bottom left)

It may sound easy, but it required a lot of manpower. Since water is known to have no beams, and the statues hung on 20m long straps, divers had to be deployed on the seabed. All the employees of the dive centre from the Reef Seen Resort took part, as well as divers and helpers who were friends. It took four days to set up all the statues.

The photos in this article, showing the installation of the statues in 2014, were provided by Emily Chan, a friend of Cassandra, who documented everything. See the video about the project and the construction underwater at: youtu.be/wrzgncYfil?si=RbEDTze4-cBrV_WN.

Successful results

The effort was definitely worth it. Many divers have already gotten to know and love this dive site. A dive at the Garden of the Gods is a leisurely stroll through a tranquil temple complex, so to speak. Starting at the buoy at 8m and diving down to 22m, the park is accessible to all visitors.

A sea turtle statue leads to the entrance with the two guardian statues, and from there, divers can explore the rest of the statues during the dive. At the end, you can continue diving towards the beach or surface back to the buoy.

Marine life

With the passage of time, of course, the statues no longer look like how they did on the first day of their installation. Some are hardly recognisable. Overgrown with sponges, corals, mussels and algae, they offer homes for many small fish. This, in turn, attracts



CLAUDIA WEBER-GEBERT

Goniobranchus leopardus nudibranch



CLAUDIA WEBER-GEBERT



CLAUDIA WEBER-GEBERT



CLAUDIA WEBER-GEBERT

Reef gardening projects (above left and right)

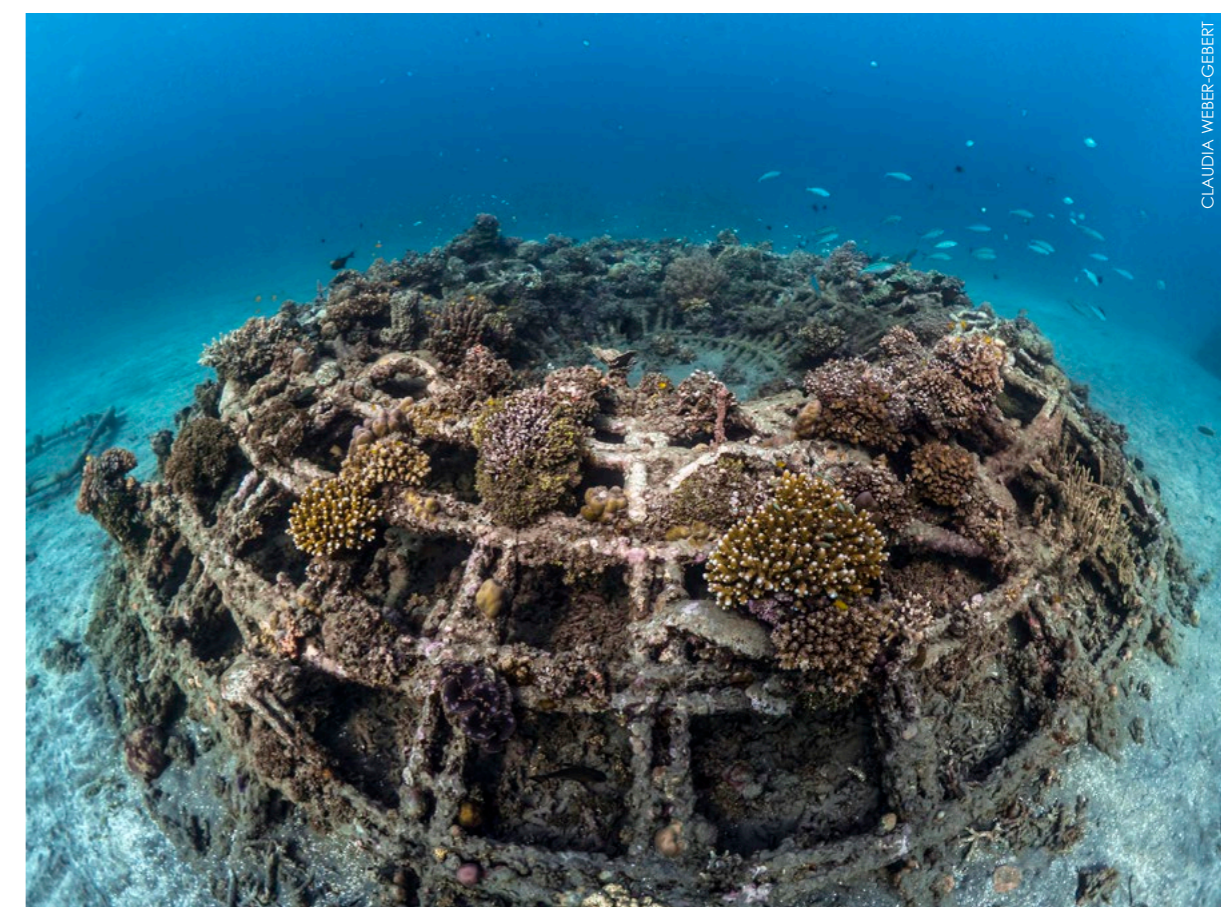
larger fish, and rays fly across the sand amongst the statues, as shoals of fish swim by overhead.

The variety of marine life that has emerged on and amongst the bare statues, within just nine years, is remarkable. The artworks have been reworked by Mother Nature and are now truly colourful. In varying forms, the Balinese gods now stand serenely in their garden park, with their stable bases covered in sediment. See the **video**.

From time to time, the statues have to be straightened, because fish undermine them, and then they threaten to topple. And yet, one has the impression that the energies of the gods are still there and at work—it is a holy place... a temple.

Future plans

With all these projects, Chris and his colleagues have proven that reef gardening can work. So, what plans are there for further developments at Reef Seen Divers' Resort? One important goal that all we divers can help with is restoring reefs that have been damaged. But how can one do this? This is what Chris wants to focus on, going forward.



CLAUDIA WEBER-GEBERT

Beach front and house reef at Reef Seen Divers' Resort

This coral-encrusted dome is another reef gardening project



CLAUDIA WEBER-GEBERT

Beach front and house reef at Reef Seen Divers' Resort (above); Sea fans on reef at Pemuteran (left); Large bright red sea fan at Pemuteran (right)



CLAUDIA WEBER-GEBERT

CLAUDIA WEBER-GEBERT

CLAUDIA WEBER-GEBERT

He wants to train divers on how to reintegrate fallen coral fragments back into the reef, so they can continue to grow there. Because if these fragments remain on the sea bottom, covered in sand, they will die off eventually. But if one knows what one can do to save them, these pieces of coral can survive.

Reintegrating reef fragments

It is actually quite simple. I watched it being done, and also tried putting a fragment back in the reef myself—and it feels good! Anyone interested in learning this can contact Chris or his staff and book a work-

shop in Pemuteran. After the workshop, you will be able to help reintegrate broken corals back into the reef, worldwide. In my opinion, this is the duty of every diver!

The Reef Seen Divers' Resort has eight rooms, making it ideal for small groups. Alongside the workshop, you can also admire the beautiful reefs, dive at the current coral gardening projects, visit the sea turtle hatchery, sponsor a sea turtle and release it into the sea—and, of course, get to know Bali.

Chris is available almost every day for conversations about coral restoration and the development of the various conservation projects.

On Saturdays and Sundays, young Balinese dancers train at the resort, and young musicians present themselves on stage in the garden. With Chris at the helm, there is always something going on at Reef Seen in Pemuteran! ■

Claudia Weber-Gebert is an advanced diver, underwater photographer and dive writer based in Germany. Her latest book, Maare, Quellen, Wasserfälle: Die faszinierende Unterwasserwelt der Vulkaneifel (Maars, Springs, Waterfalls: The Fascinating Underwater World of the Volcanic Eifel), is available at eifelbildverlag.de. For

more information, please visit: design-buero.org/Unterwasser-Fotografie

SOURCE: "PEMUTERAN ARTIFICIAL REEF PROJECT, KARANG LESTARI PEMUTERAN, BALI." INDONESIA GLOBAL CORAL REEF ALLIANCE. GLOBALCORAL.ORG

Giant frogfish at Pemuteran



Sea Turtle Hatchery *in Pemuteran*

A Hundredfold Increase in Survival Rates

Text and photos by Claudia Weber-Gebert





Juvenile sea turtles feeding on small fish (above) and daily schedule (left) at the Turtle Project sanctuary (above)

A sea turtle hatchery in Pemuteran, Indonesia, established by Reef Seen Divers' Resort founder, Chris Brown, has provided a sanctuary for endangered baby turtles to hatch and grow large enough to be released into the sea with better chances of survival. Claudia Weber-Gebert has the story.

When Chris Brown came to Pemuteran on Bali for the first time in 1990, he ended up staying. He said, "It just happened," and in the end, it was probably the best

thing that could have happened. From the very first hour, he felt at home here and immediately started becoming active in the conservation of its nature and, above all, taking care of the underwater world.

His initial plan was to run a dive resort, bringing divers to this lesser-known side of Bali, with all its wonderful reefs. But he also saw that there were plenty of sea turtle nests on the beach, and the locals would clear them out to sell the eggs at the market. With the low income of the people who lived here at that time, it was quite understandable; besides, consuming turtle eggs was a local tradition.

This practice has been outlawed by authorities for a long time and is now considered poaching; however, it has to be monitored, as poaching still occurs, albeit very rarely. Back then, Chris started rewarding the locals for turtle eggs, buying them at a price higher than what they could get at the market. And so, the foundation for the turtle station was laid, with the consent of the Balinese authorities.

Without further ado, everything needed was built and fenced in, behind the dive centre at Reef Seen. Since then, the project has been very successful—a nonprofit project financed by donations,



Juvenile turtle released into the sea (above and previous page)

EGGS		EGGS	
DATE/NEST			
21-4-23	17	168	Ganesha
03-5-23	18	174	Taman Sari
07-5-23	19	133	Matahari
11-5-23	20	130	Matahari
18-5-23	21	164	Ganesha
21-5-23	22	95	Matahari



BERJAYA
HOTELS & RESORTS

UNDERWATER ADVENTURES WITH BERJAYA

Take your dive vacation to the East Coast of Peninsular Malaysia and plunge into the beautiful deep blue of Berjaya Tioman Resort as well as The Taaras Beach & Spa Resort, Redang Island. Both resorts are renowned for their clear waters, visually stunning corals, and diverse marine life.

The Taaras Beach & Spa Resort | Berjaya Tioman Resort

Scan QR codes to discover more.

QR 1: Dive sites at The Taaras Beach & Spa Resort

QR 2: Dive sites at Berjaya Tioman Resort

www.berjahotel.com



Sea turtle egg collection data on blackboard (top left); Nests of reburied sea turtle eggs at the sanctuary (above)

daily tours and wonderful activities, such as the release of baby turtles into the sea.

Eggs and hatchlings

Sea turtles lay their eggs on the beach during the nesting season from January to May—mostly on the nights around a full moon. Then, local fishermen usually go around checking the beaches at night for turtle nests. If they find any, they would report them to Chris and his staff. They then professionally dig up the nest and bury it at the station. Everything is documented in detail, including species, number of eggs and date, and then the fishermen receive a fee for every turtle clutch. It is a win-win situation, which benefits the sea turtles, in particular.

In this way, local fishermen have learnt that live turtles in the sea

are more profitable than selling their eggs in the market. Tourists and dive resorts bring in money—and who would not want to see a big sea turtle underwater? Every diver knows the magical attraction these animals have.

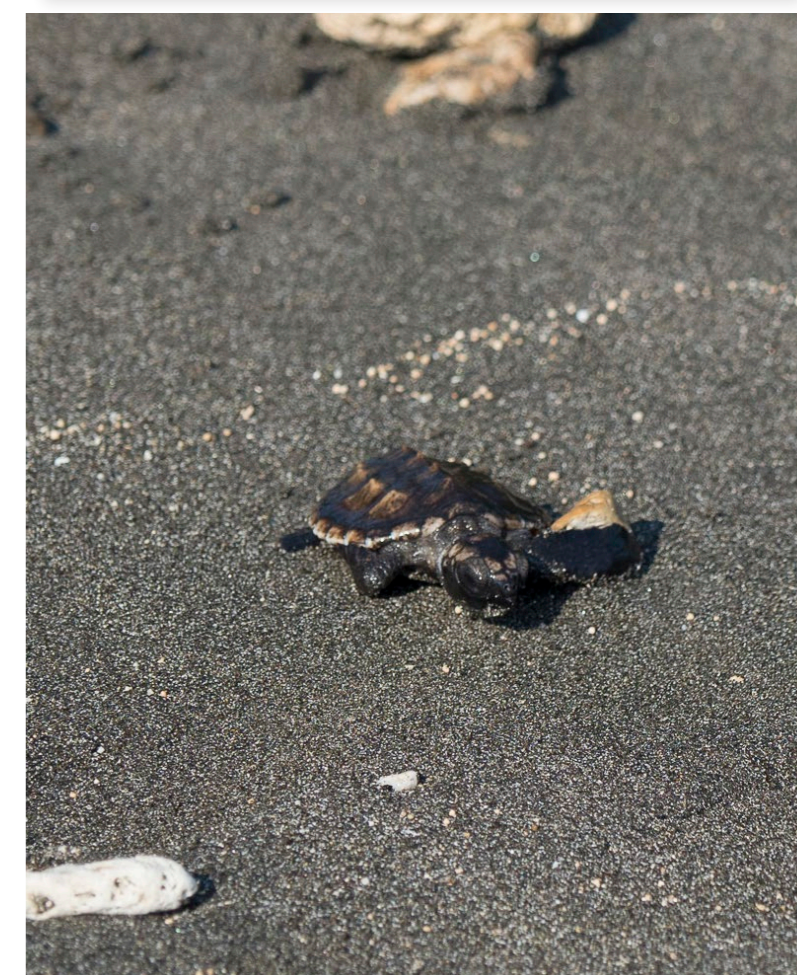
In this region, there are four species of sea turtles. Three of these species come to the beaches to lay their eggs: green, hawksbill and olive ridley sea turtles. The giant leatherback turtles pass by in the sea, but do not lay eggs.

After hatching from the sand at the safe station, the small baby turtles are not immediately sent to the beach to disappear into the sea; instead, they are placed in a pool with seawater and stay there for three months. Now, some of you may wonder why this is done. Chris and his team's 30-plus years of experience explain why.

Threats

In nature, most small sea turtles fall victim to predators in the first few days of life, whether it be predatory crabs or hungry seabirds attacking them on the beach as they make their way to the water. There is no mercy and no escape. Once in the water, their odds are still pretty slim. With threats from fish, birds, fishing nets and boat propellers, only one in 1,000 baby sea turtles survive!

The station at Reef Seen has four pools for different sea turtles, depending on their age. There is one additional large pool, which was originally built for injured adult turtles, but is now the home of "Buddy" (more on that later). It is fascinating just to watch the little baby turtles scurry about. When I was a guest at the resort, I went to the pools several times a day. They just fascinated me.



Baby sea turtle heads to the sea after release

Collected eggs are reburied at the sanctuary





Baby sea turtles in one of the pools at the Turtle Project sanctuary (above); The juvenile turtles are fed small fish (right).

Care of young turtles

Feeding time is at 4:30 p.m. Most visitors, who would have received all the information imaginable about the different species from the trained staff, go to the station to see the rearing of the tiny creatures, up to their release to freedom. The numbers for the current season are listed on boards.

They are fed small fish, which the turtle babies fight over, because in nature, they would normally drift with the currents somewhere in the ocean as loners. The small fish are brought in by local fishermen, another

source of income for them. But in nature, the sea turtle babies would normally have to look for food themselves, which is becoming increasingly scarce in today's world.

After three months in the tank, the little ones have grown significantly and become strong. Here, the weaker animals have also had a chance to get enough food and to grow up. But the enormous effort has been worth it, because the chances of survival for these small sea turtles increases a hundredfold: From



one in 1,000 to one in 10. This answers the question of why the newly hatched sea turtles are not immediately released into the sea.

All species of sea turtles are threatened, some more, some



Don't just dream it, live it!



Maldives BLUE FORCE ONE

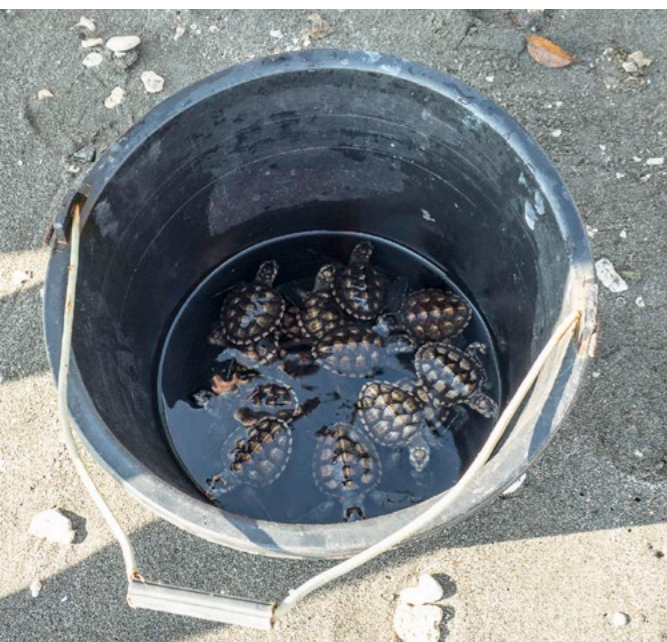


Red Sea BLUE FORCE 2



Maldives BLUE FORCE 3

www.blueforcefleet.com



Sea turtles are released into the sea (above) once they grow large enough in a pool (right) to evade predators.

Releasing the turtles

It is a particularly emotional experience when you release one or more of these little baby turtles on the beach into the open sea. This experience is offered early in the morning when there are not many boats around. I was able to be there several times for this and observe the people participating. I could see their great joy and emotion, with tears in my own eyes from the emotional moment.

Everyone had a smartphone in hand to capture that special moment when, driven by instinct, the little creatures immediately rushed towards the water and dived into the sea. It infected both young and old alike,



with great joy and awe, when these animals disappeared into the vastness of the ocean. We saw the turtles poke their little heads out of the water just a few more times to breathe, and then they were gone. Hopefully, in 20 years, they will come back to this very beach and lay their eggs here.

Children, in particular, were quite enthusiastic about this experience.

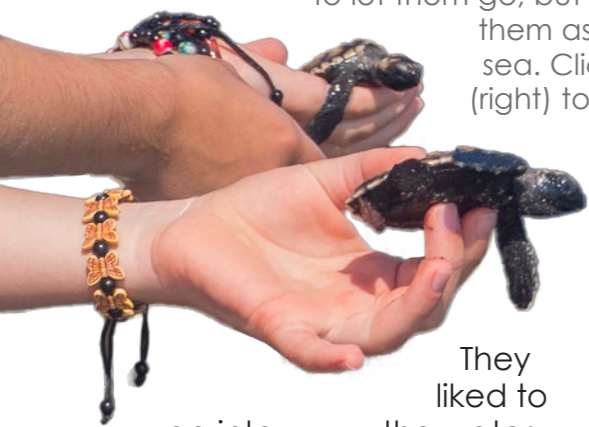
Releasing turtles is a popular activity with visitors. The turtles are carried in a bucket (far left) to the beach where they are released and scurry to the water to reach the sea (above).

less; many are close to extinction. In this respect, every animal counts, and each needs a better chance of survival.





While the experience of releasing baby sea turtles was a profound experience for all who participated, children were especially affected and expressed great joy in interacting with the baby turtles, perhaps finding it hard to let them go, but in the end, watched them as they headed out to sea. Click on the screenshot (right) to see my video of the event at: youtu.be/FCQivIM1Mc4



They liked to go into the water themselves and would have preferred not to let the little turtles go, but rather to hold them tight. But that is nature. The little turtles know exactly what to do—some faster than others, some a little hesitant. But then, the wilderness calls...

The children would never forget this experience, and it is certain these kids will spend the rest of their lives protecting sea

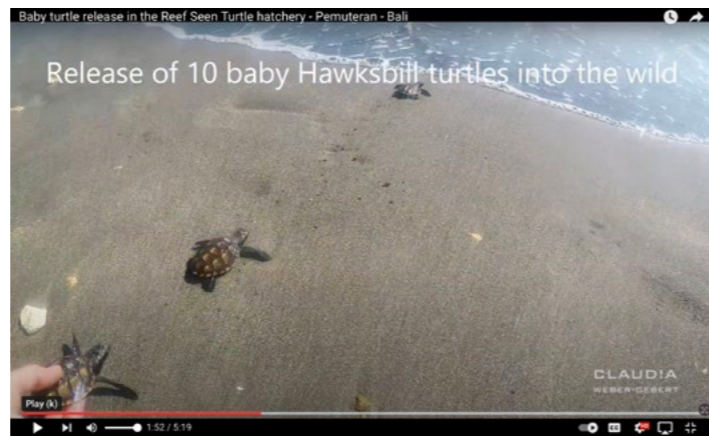
turtles. Educational, emotional and moving—it grabs everyone who experiences it.

For the lucky “godparents” left on the beach, there is a certificate of release with their own name and, of course, the name of the turtle. It is not only a nice reminder, but also the necessary documentation for the authorities. Of course, I also released baby turtles into the sea myself—a small troop of ten little fighters. I documented everything and was moved to tears. It was maybe a once-

in-a-lifetime event—you never know—with the hope that more than one of the little creatures would survive, grow big and strong, and conquer the world’s oceans.

To get an impression of the turtle release, watch my video at: youtu.be/FCQivIM1Mc4.

Since last year, there has been an incubator at the station. In tandem with the natural sand pit, eggs have also been hatched in the incubator. It would be interesting to know which method is more success-



**KOMODO
RAJA AMPAT
AMBON
ALOR
SPICE ISLANDS
TRITON BAY
HALMAHERA
SULAWESI
BORNEO
FORGOTTEN ISLANDS**

- ✓ 5 STAR SERVICE
- ✓ LUXURY CABINS
- ✓ GOURMET FOOD
- ✓ MASSAGE & SPA

**23 CREW TO MAX 16 GUESTS
5 DIVE GUIDES
WESTERN CRUISE DIRECTORS**



WWW.THEARENUI.COM / INFO@THEARENUI.COM



Juvenile sea turtles in a pool at the sanctuary (top left); A visitor favourite, Buddy (above), the 19-year-old sea turtle who was rescued by a local child when he was just a baby and brought to the sanctuary when he grew too big to keep, has remained since he never learned how to fend for himself in the wild; Incubator for sea turtle eggs (left); Collected turtle eggs in the incubator (far left)

ful for hatching sea turtles. Unfortunately, there are no results on this yet.

Buddy, the sea turtle

And now, back to "Buddy," the big turtle in the tank. Many may think it is not okay to keep him there, that it is animal cruelty, but here is the story. A little girl found Buddy as a newly hatched baby olive ridley sea turtle, stuck in a bush at the side of the

beach. He would never have survived if that girl had not taken him in. At home, tiny Buddy was placed in a bowl of seawater, and the child kept him as a pet. That went well for a few years, until at some point, there was no longer a large enough container for him, because Buddy had grown.

Then the question came as to whether Buddy could be admitted to the Turtle Hatchery Station at Reef Seen, because after all his time in

the sea. He had never learnt how to take care of himself.

Today, Buddy is 19 years old and has been at the Reef Seen station since 2010. He is very large for his age, which means that he was able to put on weight faster than his counterparts in the wild. He is fed sardines, and his water is refreshed daily. Buddy is a visitor favourite. He loves being scratched on his carapace. He is a hands-on turtle, an ambassador for his species, a symbol of the hope that visitors would realise that his kind are endangered and need to be protected.

captivity, Buddy could no longer simply be released into

Of course, questions arise as to whether one could at least build him a larger tank or separate an area in the sea with nets. I had also thought it myself and spoke at length about it with Chris. Here are the reasons why not.

Experience has shown that turtles cannot be kept in nets in the sea. Their instinct when in the sea leads them to repeatedly swim against these nets to escape, so this is not really an alternative, as they can seriously injure themselves in the process.

A large tank is certainly a good idea but would cost a lot of money. The Turtle Hatchery Station is self-supported through visitor admissions and donations. Admissions fund the amount that fishermen receive for reporting nests. Even if donations could raise enough

money, the Turtle Hatchery's current high standing with the local population would certainly come into question, because investing thousands of dollars on a single turtle, while people still live in bamboo huts not far away, would not be well received. As a foreigner, one always has to keep the local situation in mind and consider it. What we take for granted may be far from being the case, locally.

Besides, Buddy grew up in captivity. He has never known the open sea and may not even know that he might be missing something. Instead, he enjoys showing visitors his shell, being scrubbed, and being fed sardines every day, like in Cockaigne (the land of plenty). So, these are the reasons why it is the way it is.



Turtle Hatchery

Over the past 30 years, the sea turtle sanctuary has helped more animals survive. Three sea turtle species lay their eggs on the local beaches: green, hawksbill and olive ridley sea turtles.

Pushback

There are envious people everywhere. In fact, a few years ago, a local NGO officer arrived at the Reef Seen station with armed forestry rangers and an arrest warrant for “illegally keeping protected species” on the property. After hearing the full story from Chris, local villagers and village authorities, plus some phone calls from the relevant government officials, the forestry rangers finally took their leave.

Everything that takes place at the sea turtle sanctuary has been approved by the authorities. Fostering sea turtles at the sanctuary is not considered poaching at all, since the animals are later released into the sea.

With over 30 years of experience in the sea turtle station, a lot of knowledge has come together, even though Chris is not a scientist. It has worked; more animals survive than if the station did not exist. Tradition has been changed in Pemuteran; turtle eggs go to the station and not to the market. And with everything going well, Chris has new plans.

Future plans

In the future, students from universities in Australia and Indonesia would be able to come here and scientifically prove what Chris and his team have learnt and put into action at the Reef Seen turtle station. It is a perfect opportunity for budding marine biologists to study sea turtles

and maybe find ways to help them even more. The sea turtles’ orientation to Earth’s magnetic field, for instance, has not yet been researched much; with chips or micro-transmitters, new insights may certainly be found here. To this end, initial contacts have already been made.

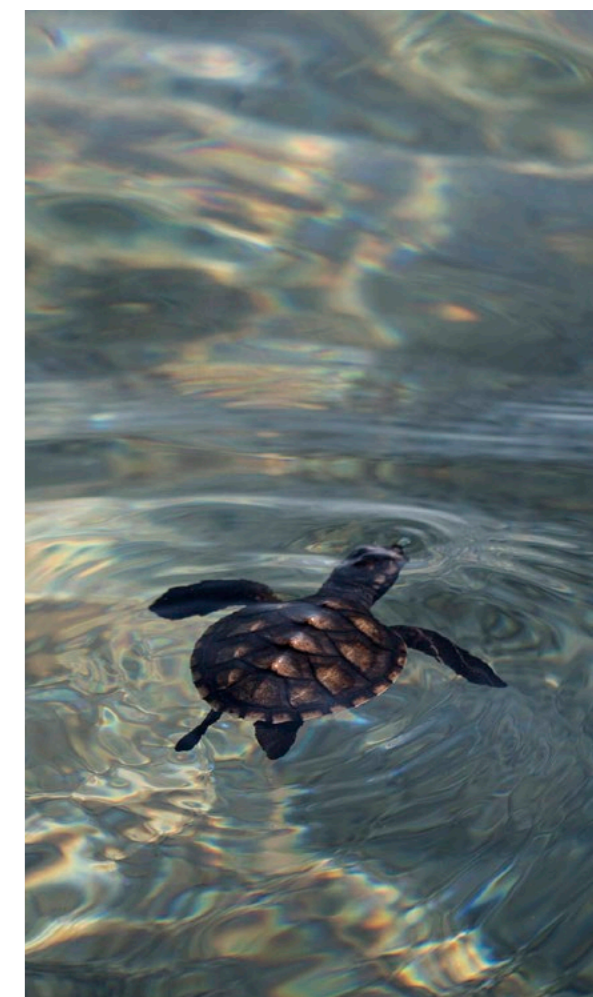
As Chris told me, a few weeks ago, he wanted to give up everything and sell the resort, due to health reasons. There were many discussions with potential buyers. It was difficult to find someone who would continue his projects—both the turtle station and reef gardening—and retain the current staff. Indeed, it would not be a good feeling if there was no guarantee that everything could continue to exist the same way it does today.

A conversation with a buyer was the deciding factor in his decision to continue with Reef Seen himself, as there was a great possibility that a future buyer would just bulldoze everything to the ground, just so they could build a “fancy” new resort—no more environmental and community programmes. “Life is not about money, but the hours you live and what you do with your life” is what really matters.

And so, Chris perseveres on, with the support of his entire team, who lovingly and responsibly keep the resort running. Besides, no one can say better than he why this project is so important, and why he has put three decades of his life into it. I am already looking forward to

my next visit to the Reef Seen Divers’ Resort and many more interesting conversations with Chris, over a cup of coffee and delicious banana pancakes for breakfast! ■

*Claudia Weber-Gebert is an advanced diver, underwater photographer and dive writer based in Germany. Her latest book, Maare, Quellen, Wasserfälle: Die faszinierende Unterwasserwelt der Vulkaneifel (Maars, Springs, Waterfalls: The Fascinating Underwater World of the Volcanic Eifel), is available at eifelbildverlag.de. For more information, please visit: design-buero.org/ **Unterwasser-Fotografie.***





Contributors' Picks •
Framing
in Underwater Photography

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

What does a “frame within a frame” look like in underwater photography? We asked our contributors to share their favorite photos that use “framing” to draw attention to the subject in the image, and they came back with a range of macro to wide-angle shots, featuring a variety of marine life, as well as divers, in wrecks and on reefs. Here, *X-Ray Mag* contributors share their favorite images from the tropical waters of Fiji, Papua New Guinea, the Philippines, Indonesia, the Red Sea, Turks and Caicos Islands, the Cayman Islands, and the Revillagigedo Archipelago to the subtropical and temperate waters of South Africa and the US East Coast.



Using a softer foreground to frame the subject (left). Cape triplefin, *Cremnochorites capensis*, Exposure: ISO 200, f/25, 1/250

Using a contrasting background to frame the subject (below). Fiery nudibranch, *Okenia amoenua*, Exposure: ISO 100, f/25, 1/250s

Both photos were shot at Steenbras River Mouth, Gordon's Bay, South Africa, using a Nikon D850 camera, Nikon 60mm macro lens, Isotta housing, two SUPE D-Max strobes.

The topography of reefs can be used to frame the subject (previous page). Common octopus, Drop Zone, Gordon's Bay, South Africa. Gear: Sony A6400 camera, Tokina 10-17mm fish-eye lens, two Inon Z-240 strobes. Exposure: ISO 320, f/13, 1/60s



Contrasting marine life can serve as a great background to frame your subject, making it the star of the show (top left). Orang-utan crab, *Achaeus japonicus*, on bubble coral, *Plerogyra sinuosa*, Lembeh Strait, Indonesia. Gear: Sony A6400 camera, Sony 16-50mm zoom lens, two Inon Z-240 strobes. Exposure: ISO 320, f/18, 1/200s

Framing in UW Photography

Text and photos by Kate Jonker

Framing in underwater photography is an art that can elevate your shots from the ordinary to the extraordinary. In the world beneath the waves, framing can be crafted from various natural underwater elements, creating a sense of balance, and drawing the viewer's attention to the main subject.

One technique I particularly love is using colours and textures as frames. In underwater photography, the vibrant hues and variety of textures can serve as striking natural frames for your subjects. Imagine your subject framed by a backdrop of contrasting colour.

Framing with light is another great tool. By using a snoot to focus light on your subject while keeping the background in shadow, you make your subject shine as the star of the show.

Even the reef and marine life can play a role in framing. The natural architecture of the underwater world such as the shadow of reefs, the leading lines of sea fans or corals, or tiny nooks and crannies can be utilised to frame your subjects creatively.

For softer foreground framing, you can use swaying kelp, sea fans, soft corals or other marine life. A shall-



low depth of field can blur the foreground, emphasising your subject.

Mastering the art of framing is a useful technique for creating captivating and memorable underwater images. It is a skill that can be learnt and used to turn an ordinary underwater photo into an extraordinary work of art. Visit: katejonker.com

Using the light of a snoot to frame a subject against a black background. Horned blenny, Blousteen, Gordon's Bay, South Africa. Gear: Canon R5 camera, Canon 100mm macro lens, Marelux MX-R5 housing, Inon Z-240 strobe, Marelux SOFT Pro snoot. Exposure: ISO 320, f/20, 1/200s





Photo 1. (above) Taveuni, Fiji swim-through. Exposure: ISO 800, f/4.5, 160s; Photo 2. (top right) Dunraven wreck, Red Sea. Exposure: ISO 400, f/7.1, 160s; Photo 3. (right) Thistlegorm wreck, Red Sea. Exposure: ISO 400, f/4.5, 160s; Photo 4. (left) Carnatic wreck, Red Sea. Exposure: ISO 400, f/4.5, 160s. Gear used for all images: Canon Rebel SL1 in an Ikelite housing, EF-S 10-18mm f/4.5-5.6 IS STM lens at 10mm, twin Ikelite DS-161 strobes.

Shipwrecks

Text and photos by John A. Ares

Possibly the two most important aspects of making photographs involves composition and lighting. Framing is an element of composition. Shipwrecks and swim-throughs are natural candidates for "framing."

In Photo 1, the two divers enhance Fiji's spectacular corals. The wall is lit by two strobes to highlight the colors of the reef. In Photo 2, two divers approach the wreck of the *Dunraven*. The Red Sea has

many wrecks that have easy penetration, but you must follow a dive guide.

Wrecks are fish magnets. Photo 3 shows a cluster of fish inside the wreck of the *Thistlegorm*. The *Thistlegorm* was sunk in WWII by a dive bomber. It is one of the most popular wrecks in the world. The *Carnatic* wreck (Photo 4) lies on its side and presents multiple perspectives for framing. The view of portholes at the top and crossbeams down below, present a striking colorful design. The two streams of fish provide the last glittering element to add movement to the composition. Visit: JohnAres.com





Photo 1 (right). Grouper framed by a school of snappers, Great Wall West in Little Cayman. Gear: Olympus OM-D E-M5 Mark II camera, Olympus M.9-18mm f/4.0-5.6 lens at 15mm, Olympus PT-EP13 housing, Sea&Sea YS-D1 strobes. Exposure: ISO 200, f/5.6, 1/125s

Photo 2 (left). Grouper and sea fan, Great Wall West, Little Cayman. Gear: Olympus OM-D E-M5 Mark II camera, Olympus M.9-18mm f/4.0-5.6 lens at 18mm, Olympus PT-EP13 housing, Sea&Sea YS-D1 strobes. Exposure: ISO 200, f/9.0, 1/125s

Photo 3 (below). Grouper staring out from a crevasse, at Providenciales in the Turks and Caicos. Gear: Canon PowerShot SD700 IS, 5.8-23.2mm lens, single strobe. Exposure: ISO 233, f/4.0, 1/60s



Groupers

Text and photos by Sheryl Checkman

There are many ways that a photographer can draw attention to a subject in a photographic composition. Framing the subject within elements of its environment is one. In nature, and in the underwater realm in particular, this sometimes happens as a happy coincidence, as in the photo of a grouper taken at Great Wall West in Little Cayman (Photo 1). A school of yellow-tail snapper on the right and the reef on the left, naturally frame the grouper, giving no doubt as to what the subject of this composition is.

Another grouper, also shot on the Great Wall West that same day (Photo 2), shows more of a textural framing. The grouper in this shot is positioned in-between the purple sea fan and soft coral Atlantic sea plumes. I chose to convert this shot to black and white in order to highlight how the different textures help to frame the shot.

Another framing technique uses light to separate a subject from a busy background by illuminating the subject and keeping the background dark. In



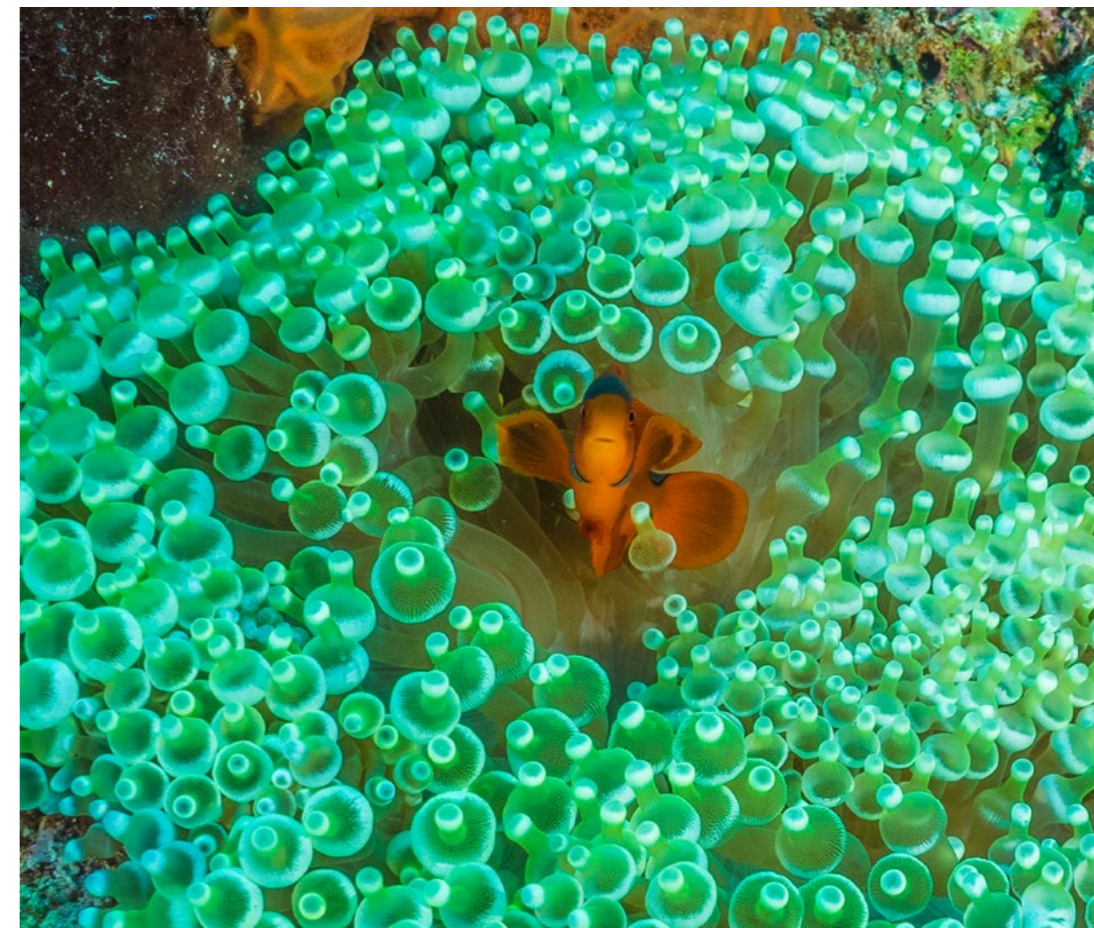
the Turks and Caicos, on a night dive at Cathedral, I photographed another grouper, peering out from a crevasse in the reef (Photo 3). The one strobe that I was using, with my point-and-shoot camera, illuminated both the grouper and the reef on the right, isolating them from the dark background. Visit: [Instagram.com/sherylcheckman](https://www.instagram.com/sherylcheckman)



Diver (right) swims through "The Arch," Papua New Guinea. Gear: Olympus OM-D E-M1 camera, Olympus 9-18mm f/4-5.6 Lens, Aquatica housing, Sea&Sea YS-D1 strobes. Exposure: ISO 200, f/5.6, 1/60s

Anemonefish (bottom right) framed by bubble anemones, Widu Harbour, Papua New Guinea. Gear: Olympus OM-D E-M1 camera, Olympus 60mm f/2.8 macro lens, Aquatica housing, Sea&Sea YS-D1 strobes. Exposure: ISO 200, f/13, 1/250s

Crab (below) in sponge, Widu Harbour, Papua New Guinea. Gear: Olympus OM-D E-M1 camera, Olympus 60mm f/2.8 macro lens, Aquatica housing, Sea&Sea YS-D1 strobes. Exposure: ISO 200, f/8, 1/250s



Renata Rojas (above), Dahab, Egypt. Gear: Olympus E-330 with 7-14mm lens, Olympus housing, Sea&Sea YS-01 strobes. Exposure: ISO 200, f/8, 1/100s

Walls, Arches, Nests and Hideaways

Text and photos by Larry Cohen

I often use a frame around the subject in my photographs, both on land and underwater. The marine environment offers many structures to use as frames when photographing marine life and divers.

When shore diving in Dahab, Egypt, I observed a wall covered with colorful

pink growth. I signaled to fellow diver, Renata Rojas, to position herself by the opening in the wall. She wore a pink mask that perfectly matched the environment used as a frame.

The Arch in Papua New Guinea is a magnificent dive site, which I reached via the liveaboard boat *Febrina*. The massive Arch is covered with sponges and other marine growth. This structure is the perfect frame when photographing a diver.

The liveaboard also visited Widu Harbour. This area has an abundant amount of macro life. I captured an anemonefish framed in a bubble anemone at this location. Anemonefish make their nests in anemones for protection.

At Widu Harbour, I had to pay attention to the small details. I spotted a tiny crab hiding in a sponge. The sponge created a frame, so that in the image, the viewer's eye is led to the crab. Visit: liquidimagesuw.com



ANITA GEORGE-ARES



ANITA GEORGE-ARES



ANITA GEORGE-ARES

Shapes of Frames

Text and photos by
Anita George-Ares, PhD

A blackbar chromis shelters in coral in Photo 1. The branching coral frames the chromis and adds depth and texture to the image. The coral's warm color complements the warm color of the chromis.

A coral hermit crab remains in its burrow while filtering plankton with its large, feathery antennae (Photo 2). The pink coral creates a wide, elliptical frame around the hermit crab. The white border of the pink coral complements the white markings on the crab's legs.

The cargo ship *Giannis D* hit a reef in the Red Sea and sank in 1983. While I was inside

the wreck (Photo 3), I came upon a diver shining his light on his gauge and took this image. Although the diver had positioned himself so that he was framed by the open hatch of the wreck, this was a candid shot.

A peacock mantis shrimp guards the entrance of its burrow in Photo 4. The coral fragments create a circular frame around the mantis shrimp. A second frame of dark negative space surrounds the colorful body of the mantis shrimp. The dark negative space provides contrast and depth to the image. Visit: [facebook.com/profile.php?id=100016947967639](https://www.facebook.com/profile.php?id=100016947967639)

Photo 1. (left) Blackbar chromis, North Sulawesi, Indonesia. Gear: Canon EOS Rebel SL1 camera, Canon EF-S 60mm f/2.8 Macro USM lens, Ikelite housing, two Ikelite DS161 strobes. Exposure: ISO 200, f/11, 1/160s

Photo 2. (above) Coral hermit crab, North Sulawesi, Indonesia. Gear: Canon EOS Rebel SL1 camera, Canon EF-S 60mm f/2.8 Macro USM lens, Ikelite housing, two Ikelite DS161 strobes. Exposure: ISO 200, f/11, 1/200s

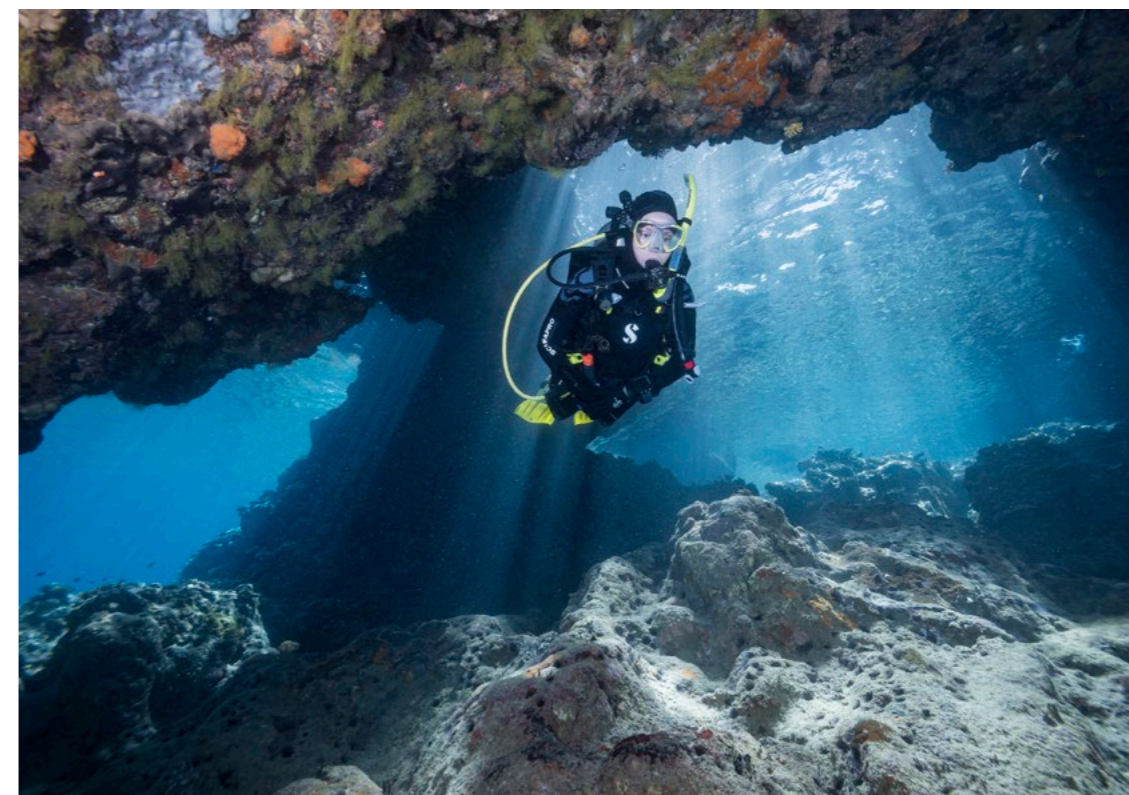
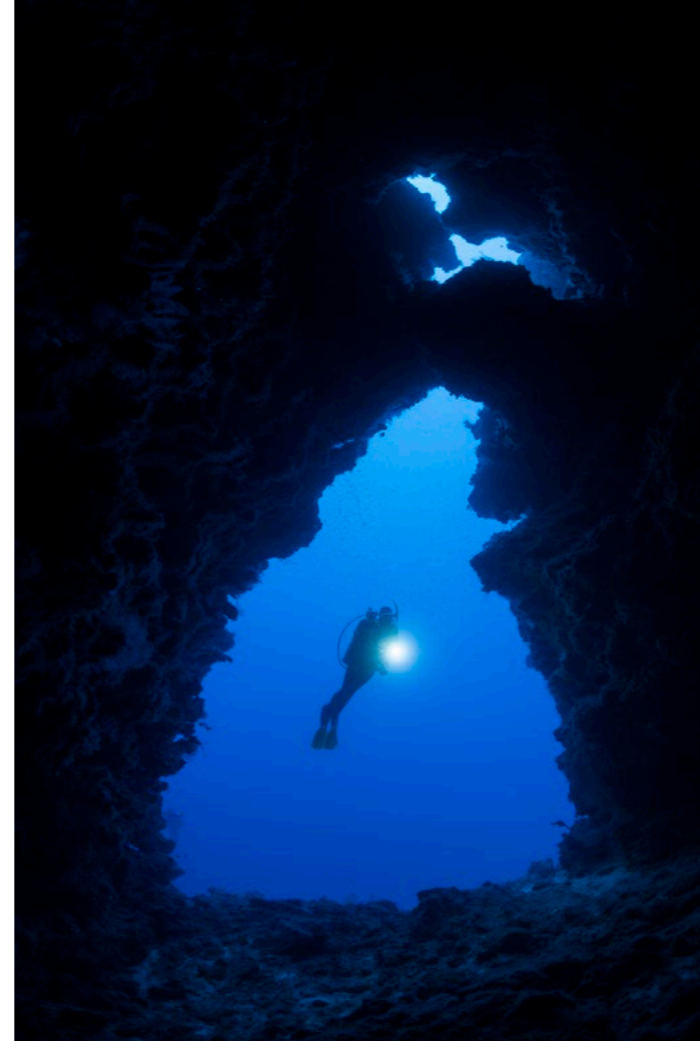
Photo 3. (top right) Diver, Red Sea, Egypt. Gear: Canon EOS Rebel SL1 camera, Canon EF-S 18-55mm f/3.5-5.6 IS STM lens at 18mm, Ikelite housing, two Ikelite DS161 strobes. Exposure: ISO 800, f/11, 1/160s

Photo 4. (right) Peacock mantis shrimp, Puerto Galera, Philippines. Gear: Canon EOS Digital Rebel XTi camera, Canon EF 50mm f/2.5 compact macro lens, Ikelite housing, two Ikelite DS161 strobes. Exposure: ISO 200, f/11, 1/200s



ANITA GEORGE-ARES



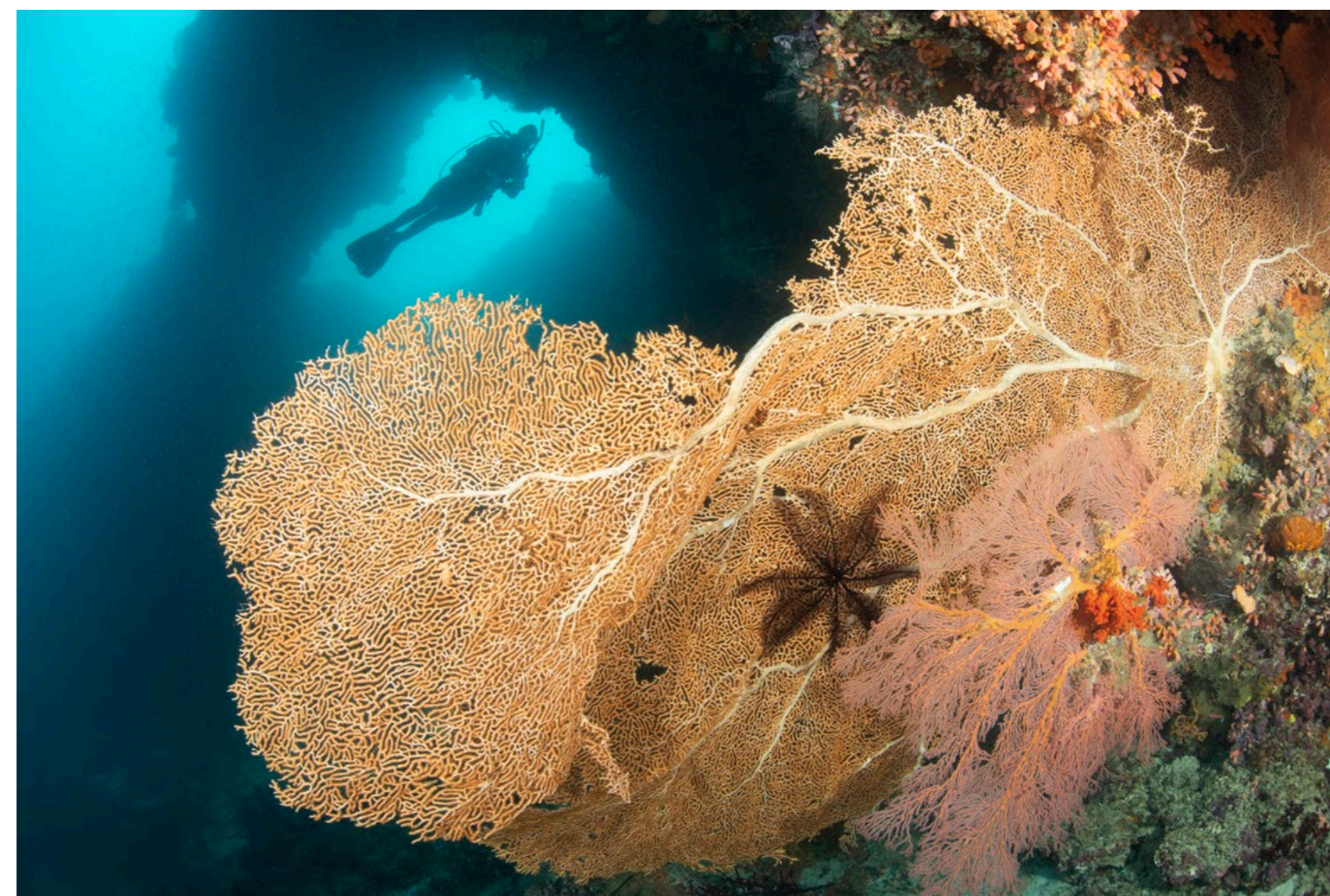


Framing

Diver (left) swimming among sun rays streaming through a shallow underwater lava tube, Taveuni, Fiji. Gear: Nikon D810 camera, Nikon 16-35mm lens, Subal housing, Sea&Sea YS-250 strobes. Exposure: ISO 200, f/6.3, 1/160s

Diver (above) hovering in the opening of a large underwater cavern, Taveuni, Fiji. Gear: Nikon D810 camera, Sigma 15mm fisheye lens, Subal housing, Sea&Sea YS-250 strobes. Exposure: ISO 800, f/8, 1/30s

Diver (left) peering through the gap between a pair of large, red sea fans growing from the vertical wall of a pinnacle, Beqa Lagoon, Fiji. Gear: Nikon D810 camera, Nikon 16-35mm lens, Subal housing, Sea&Sea YS-250 strobes. Exposure: ISO 800, f/8, 1/160s



Diver in silhouette against an opening in the coral reef at Hole in the Wall dive site, with a large, orange sea fan in the foreground, Hatta Island, Banda Sea, Indonesia. Gear: Nikon D810 camera, Sigma 15mm fisheye lens, Subal housing, Sea&Sea YS-250 strobes. Exposure: ISO 200, f/7.1, 1/125s

Framing with Structure, Sea Life and Space

Text and photos by Matthew Meier

For this assignment, I selected images in which I literally framed the subject—in this case, my better half and underwater model, Jennifer—by either structure, sea life or negative space, to better highlight the scuba diver in the scene. Framing helps define the composition, and happily, my wife and dive buddy is willing to pose almost anywhere I ask once I discover such backdrops. We have worked on a

variety of hand signals, so we can communicate underwater, and she has gotten very good at holding position, even in a stiff current.

Then, it is just a matter of timing my shots to minimize her exhaust bubbles and taking several exposures to be certain I have something that is usable. Not every scenario is productive, and we have certainly swum away from more than a few photo opportunities that ultimately did not work for one reason or another. Here, I present the results of photo shoots that produced successful images. Visit: MatthewMeierphoto.com





All photos were taken in Coron, Philippines, with a Nikon D850 camera with 8-15mm fisheye lens, in an Ikelite housing with dual DS161 Ikelite strobes. Diver in propeller shaft tunnel, *Okikawa Maru* (above). Exposure: ISO 400, f/6.3, 1/125s; Diver inside the *Okikawa Maru* (right); Exposure: ISO 400, f/6.3, 1/80s

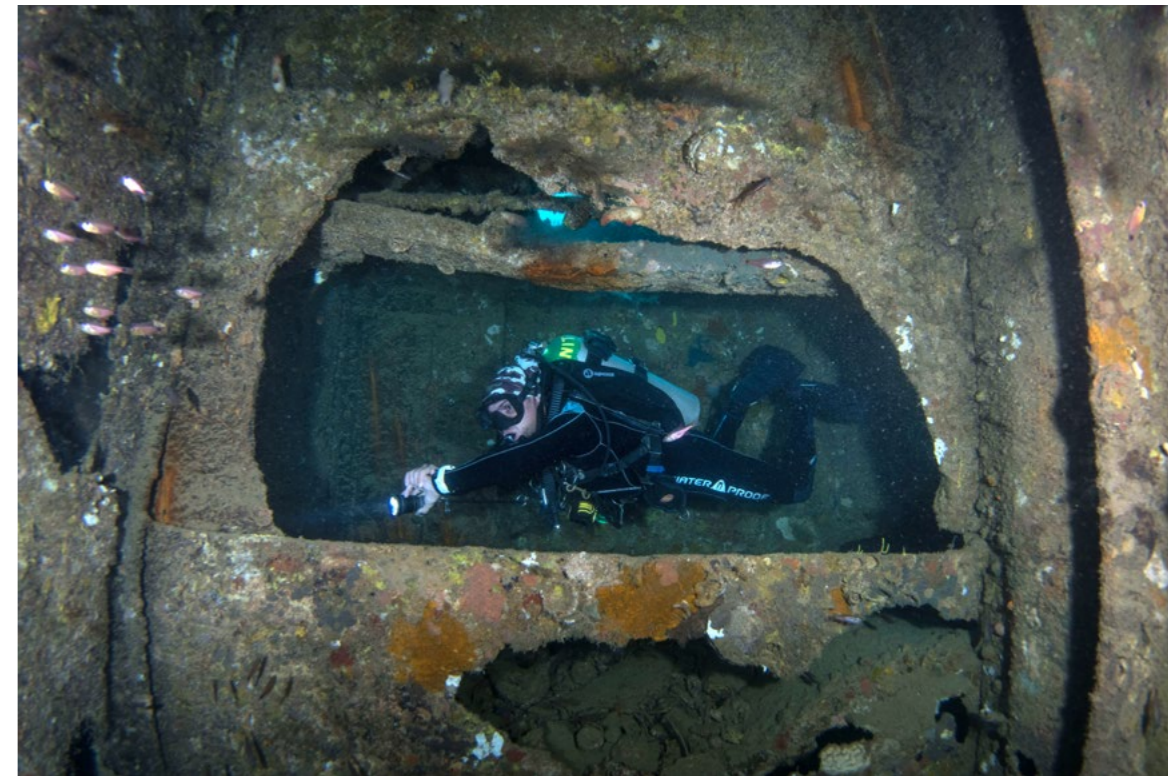
A Photo Within a Photo

Text and photos by Brandi Mueller

Some of my favorite underwater (and topside) images frame the subject, as if the photo is already inside another photo. Wrecks are often full of places where the framing technique can be used. I love to show the contrast of something that used to be above water, which is now in a submerged environment, by showing a diver swimming within it. My intent is to show the viewer that these ships are not where they are supposed to be. Windows, structural beams and machinery can frame divers, as can passageways.

These shots are from the Japanese WWII wrecks that sank in Coron Bay in the Philippines in 1944. They have been underwater for over 75 years, and there are still places on these wrecks that are safe enough to swim through; but as the ocean degrades the wrecks, more areas open up and can be used to frame a diver.

For example, the propeller shaft of the *Okikawa Maru* has been salvaged, but the tunnel still allows divers to pass through it. Places on the ship where passengers may have walked are now ideal swim-throughs for wreck divers. The wrecks of Coron are a photographer's dream, with plenty of frames and abundant marine life. Visit: brandiunderwater.com



Diver in the *Ekkai Maru*. Exposure: ISO 400, f/9, 1/80s

Diver in *Morazan Maru*. Exposure: ISO 400, f/7.1, 1/80s





Gear for all photos: Nikon D500 camera, Tokina 10-17mm lens, Nauticam housing, Inon Z-330 strobes.

Photo 1. (left) Goliath grouper divas. The unusual polygonal framing balances the disproportionate weight of the left side of the photo. Exposure: ISO 200, FL 17, f/11, 1/125s

Photo 2. (right) Snell's window with lemon shark. Sunny days with clear water provide a great opportunity to highlight a subject. Exposure: ISO 200, FL 10, f/18, 1/125s

Photo 4. (below) Whitetip sharks, Roca Partida. The steep one-mile vertical wall, pockmarked with small "cavelets," provides unusual, rocky and colorful framing. Exposure: ISO 200, FL 10, f/8, 1/125s



Not Your Usual Framing

Text and photos by Gary Rose, MD

Whenever I go on a photo shoot, I consider many factors to highlight my subject and to draw the viewer to the intention of my capture. In addition to lighting, negative space, rule of thirds, the Fibonacci sequence and the law of inverse proportion, I also like to consider framing, when appropriate.

While diving the Jupiter Wreck Trek in Florida during the annual goliath grouper aggregation (end of August to early September), I came across these huge divas (Photo 1). The tilted angle of the wreck and the sandy bottom created a natural stage for this underwater performance. The unusual polygonal framing balances the disproportionate weight of the left side of the photo. Being aware of your surroundings and recognizing these wonderful setups will greatly augment your photographic armamentarium.

As divers, we almost always look straight ahead and downward. It is

important to remind oneself to look up, from time to time. So many wonderful things happen above us. For example, I was able to see this stunning view above me, and capture the brilliant sunburst illuminating a lemon shark—all "framed" by Snell's window (Photo 2). I also added just a hint of light from my strobes, to eliminate any coarse shadows.

When diving on, and in, shipwrecks, there are many opportunities to frame a subject. Classically, we see another diver, or fish, framed by a porthole or doorway. Photo 3 was shot within the confines of the *Hoyt Vandenberg* in Key West, Florida. It is the second largest artificial reef in the world. The "Vandy" has 11 floors and is two football fields long. Do not dive inside this wreck without thorough knowledge of its layout, or without a local guide.

In this photo, I decided to break one



of the rules of underwater photography: "Do not photograph your subject from the rear, as it swims away." In the image, the long, narrow, lightless corridor, with a clean sandy bottom, perfectly frames this diver (my son Ryan) and shows off his wreck-diving skill—streamlined, centered, knees bent, with fins high to avoid disturbing silt with a resultant whiteout. It appears as if he is floating in air.

México's Roca Partida is part of the Revillagigedo Archipelago (240mi

southwest of Cabo San Lucas). One of its many amazing geological wonders is that it is a little over 300ft long and 26ft wide and drops off one mile to the ocean floor. It is a veritable aquarium of blue-water, open-ocean life. One of its key attractions are the multiple "cavelets" that pockmark the steep vertical walls of Roca and are almost always occupied by whitetip sharks. The rocky walls and dazzling colorful corals create beautiful and varied framing (Photo 4).

It is challenging to explore framing with a creative eye and go above and beyond the usual portholes, windows and doorways. When diving, seize the opportunity to shut off your logical left brain and open your imaginative right brain. Perhaps, you might even improve your frame of mind while diving. Visit: garyrosephotos.com



Photo 3. Inside the *Hoyt Vandenberg*. The narrow and tunnel-like passageways of shipwrecks provide great ready-made framing. Exposure: ISO 200, FL 11, f/8, 1/125s





Photo 1. (above) *Stolt Dagali* wreck, New Jersey, USA. Gear: Canon EOS 7D Mark II camera, Tokina 10-17mm fisheye lens at 10 mm, Nauticam housing, dual Inon Z-330 strobes. Exposure: ISO 640, f/9, 1/40s

The Process of Surrounding

Text and photos by
Michael Rothschild, MD

While the subject is, by definition, the main point in the story that any image is telling, what *surrounds* the subject can make all the difference. Framing is that process of surrounding—using visual elements and light to draw the viewer’s eye to the subject, or to add to the story by providing context.

The diver in Photo 1 is peeking out of the rusty interior of a shipwreck, with his hands further framing the margins of a possible exit route, pushing away entanglement hazards. The diver in Photo 2 is on the same wreck but not in a con-

finied space. She is outside where the bright green water lit by ambient sunlight makes a nice contrast to a part of the wreck that was once an actual frame around a window. In Photo 3, the exposed ribs of the ship’s hull make the diver look like a bird in a cage, with a long exposure to bring out some detail in the far background. And the two little blennies in Photo 4 have found a

cozy home in a piece of cut pipe, which both frames the subjects and protects them from predators. Visit: dive.rothschilddesign.com



Framing

Photo 2. (left) *Stolt Dagali* wreck, New Jersey, USA. Gear: Canon EOS 7D camera, Tokina 10-17mm fisheye lens at 10 mm, Nauticam housing, dual Inon Z-240 strobes. Exposure: ISO 500, f/13, 1/60s



Photo 3. (above) *Great Isaac* wreck, New Jersey, USA. Gear: Canon EOS 7D Mark II camera, Tokina 10-17 fisheye lens at 10mm, Nauticam housing, dual Inon Z-330 strobes. Exposure: ISO 400, f/11, 1/8s; Photo 4. (center) Manasquan River railroad bridge, Point Pleasant, New Jersey, USA. Gear: Canon EOS 7D Mark II camera, Tamron 60mm macro lens, Nauticam housing, dual Inon Z-330 strobes. Exposure: ISO 160, f/7.1, 1/160s





Serendipitous Shots

Text and photos by Olga Torrey

Joelle's Reef in Kimbe Bay, Papua New Guinea, was formed as an outer-edge sea mount. This dive site was rich in marine life. When I finished my dive there and was swimming toward my dive guide to do a safety stop before surfacing, I noticed a giant moray eel's head poking out of a soft yellow coral at

the mount's edge. I could not resist turning back and taking a photo. The eel's face was nicely framed and decorated by the rich texture of the coral (Photo 1).

The *Phyllidiella pustulosa* nudibranch in Photo 2 entered the yellow sponge through the osculum, a large opening on the outside of a living sponge, which excretes waste. It perfectly framed the oval elongated body of this clustered nudibranch.

The lemon damselfish, *Pomacentrus moluccensis*, in Photo 3 is a small, beautiful fish that can grow up to four inches in length. The fish belongs to a diurnal species, which feeds on algae and planktonic crustaceans. I waited patiently for the camera-shy fish to come out of its coral shelter. To my delight, the fish appeared, framed inside the tiny space, with a curious look on its face. Visit: fitimage.nyc

Photo 1. Giant moray, Joelle's Reef, Kimbe Bay, Papua New Guinea (top right). Gear: Olympus E-M5 camera, Olympus 60mm f/2.8 macro lens, Nauticam housing, dual Sea&Sea YS-D1 strobes. Exposure: ISO 320, f/13, 1/80s

Photo 2. *Phyllidiella pustulosa* nudibranch, Maloopa, Kimbe Bay, Papua New Guinea (above). Gear: Olympus E-M5 camera, Olympus 60mm f/2.8 macro lens, Nauticam housing, Sea&Sea YS-D1 strobes. Exposure: ISO 400, f/14, 1/80s

Photo 3. Lemon damselfish, Tufi house reef, Papua New Guinea (right) Gear: Olympus E-M5 camera, Olympus 60mm f/2.8 macro lens, Nauticam housing, dual Sea&Sea YS-D1 strobes. Exposure: ISO 250, f/9, 1/100s



Equipment

Edited by
Peter Symes

Dive Rite Slide Lock 2 Reel

The Slide Lock 2 from Dive Rite combines the innovative features and tight tolerances found in the new Azimuth series of reels with the familiar single-handed operation characteristic of the reliable Slide Lock reel series. Crafted from high-precision CNC-machined acetal and stainless-steel components, this reel mirrors the Azimuth's ergonomic, low-profile design. However, it preserves the distinctive "thumb flick" locking and unlocking mechanism from the original Slide Lock series. Comes in a versatile 200ft (60m) size (which suits various applications such as cave primary or safety reel, wreck diving, and deploying lift bags and markers) as well as a 400ft (120m) size (for standard use as a primary cave reel, ideal for extended exploration of underwater environments). Stainless-steel double bolt snap included. diverite.com



Abingdon Marina 2.0

Abingdon Co., the female-founded watch company, has unveiled the Marina 2.0, an upgraded dive watch designed for female divers. Responding to customer feedback, it features a lightweight sandblasted titanium case and band to minimize reflectiveness and avoid attracting sea life. The case is slimmed down to 12.5mm, with a new logo inspired by Norse mythology. Mother-of-pearl dial colors include Reef Red, Yellow Snapper, Caribbean Green, Marina Bahama Blue, Pacific Purple, Belize Black, and Yacht. Features include water resistance up to 660ft, unidirectional diver's outer bezel, sapphire crystal, Miyota 8215 automatic movement, and SuperLuminova coatings for low-light visibility. abingdonco.com



Fourth Element Seeker Mask

The Cornwall-based manufacturer states that its new Seeker mask was designed with two main objectives: maximise the diver's field of vision to be as close as possible to the experience of not wearing a mask, using a single lens, and to fit nearly everyone. The low-volume construction enables effortless equalization and clearing, offering a brighter and broader view of the underwater world. Its soft silicone skirt and unique facial geometry ensure a comfortable, universal fit, making it suitable for nearly everyone. You can choose between two lens options, Clarity and Contrast, for optimal visibility. Plus, it is eco-conscious, compatible with recycled elastic straps, and comes with a sleek low-profile case for added durability and convenience. Dive with unmatched clarity and comfort with the Seeker mask. fourthelement.com



Dynamic Nord RS-series drysuit

"Cozy and warm in cold water," according to the manufacturer, the new RS-series drysuit is made of 350gr/m² ripstop, anti-tear fabric for great durability and resistance. The design of the suit allows for complete freedom of movement and prevents excess air from moving inside the suit. It has a TiZip zipper, which is protected by a flap from the shoulder to the hip; adjustable exhaust valve; and the high-performance inflation valve can be upgraded to connect with a canister for electrically heated underwear. Features include wrist seals that are HD bottlenecks made of high-strength latex; 3mm neoprene neck seal, giving extra thermal protection; 8mm neoprene hood with air escape system; and two leg pockets that can be fitted using the multipurpose Molle system. The boots of the drysuit are made of 3mm double-sided, cross-layered neoprene, with ankle straps, fin stoppers and a protective but very flexible sole. dynamicnord.com



Dynamic Nord RF-40 open heel fins

The new RF-40 open fin delivers effortless propulsion, according to the manufacturer. With a new dynamic design and shape that ensures optimal effectiveness and comfort, power transfers efficiently from foot to sole to blade for higher propulsion, allowing maneuverability and stability during a range of kicks, from recreational to technical, with a minimum of fatigue. It has a smart bungee strap for minute adjustments without the need for tools, so you can use them with both wet and drysuits. Comes in blue, gray, orange, purple, red and yellow, with unisex sizes M, L, and XL. dynamicnord.com

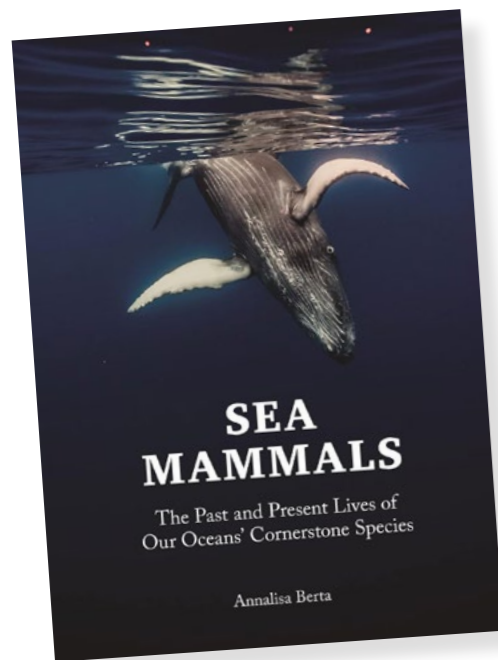


Garmin Descent G1 Solar Ocean Edition

This dive computer is solar-charged and constructed from recycled ocean-bound plastics. It is designed for durability, featuring a solar-charged display, reinforced polymer case, and scratch-resistant sapphire lens, providing up to an impressive 124 days of battery life in smartwatch mode. This versatile device offers multiple dive modes, including options for single and multiple gas dives (nitrox and trimix), gauge, apnea, apnea hunt, and closed-circuit rebreather. You can also customize screens for each dive mode to display the data you prefer. It comes with a built-in 3-axis compass, has a depth rating of up to 100m, and complies with US military 810 standards. The dive log has a capacity for up to 200 dives, and you can easily review them using the Garmin Dive app. Beyond diving, this computer supports over 30 sports apps and offers advanced training features, making it a versatile companion for various activities. garmin.com



Edited by
Catherine GS Lim

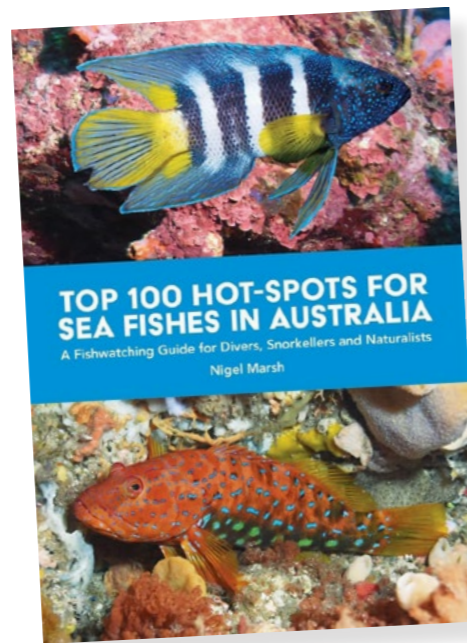


Marine Mammals

Sea Mammals: The Past and Present Lives of Our Oceans' Cornerstone Species, by Annalisa Berta

This book presents a lavishly illustrated exploration of the world of living and extinct sea mammals. From the sociable narwhal to the iconic polar bear, paleontologist Annalisa Berta spotlights over 50 species with themed chapters, detailed profiles, stunning photographs and paleo-illustrations of extinct species. She delves into their evolution, anatomy, behaviour, habitats and conservation, providing valuable insights into the intricate marine ecosystems these mammals influence. The book serves as an engaging introduction, celebrating the richness of sea mammal life and their importance in our oceans.

Publisher: Princeton University Press
Date: 26 September 2023
Hardcover: 224 pages
ISBN-10: 069123664X
ISBN-13: 978-0691236643

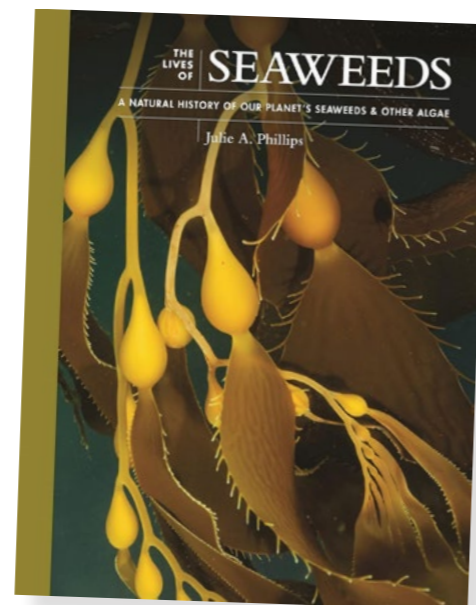


Australia

Top 100 Hot-Spots for Sea Fishes in Australia: A fishwatching guide for divers, snorkellers and naturalists, by Nigel Marsh

Australia is home to over 5,000 fish species, making it an ideal destination for fishwatching. This book is the first-ever guide to fishwatching in Australia. Targetted at divers, snorkellers and naturalists, it highlights 100 hot spots where a diverse range of fish species can be observed. It is both a fish identification guide and a dive site guide. Readers can learn about Australia's fish species, the best places to see them and how to find them.

Publisher: New Holland Publishers
Date: 6 November 2023
Paperback: 240 pages
ISBN-10: 1921073187
ISBN-13: 978-1921073182

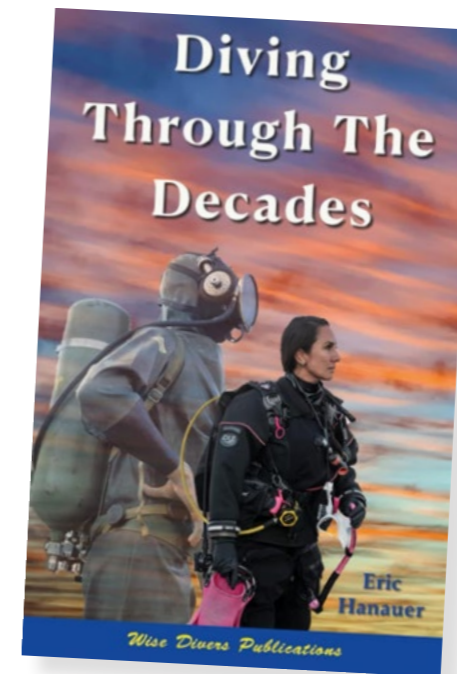


Seaweed

The Lives of Seaweeds: A Natural History of Our Planet's Seaweeds & Other Algae, by Julie A. Phillips

This book illuminates the foundational role of algae in marine ecosystems and their diverse applications. Serving as the basis for marine food webs, algae's potential extends to biofuel, biodegradable packaging, nutrition and medicinal properties. The book, enriched with captivating visuals, delves into the unique characteristics, evolution, morphology, life histories, ecology and versatile uses of seaweeds and algae. Accessible and informative, it is a must-read for naturalists and marine-life enthusiasts.

Publisher: Princeton University Press
Date: 21 November 2023
Hardcover: 288 pages
ISBN-10: 0691228558
ISBN-13: 978-0691228556

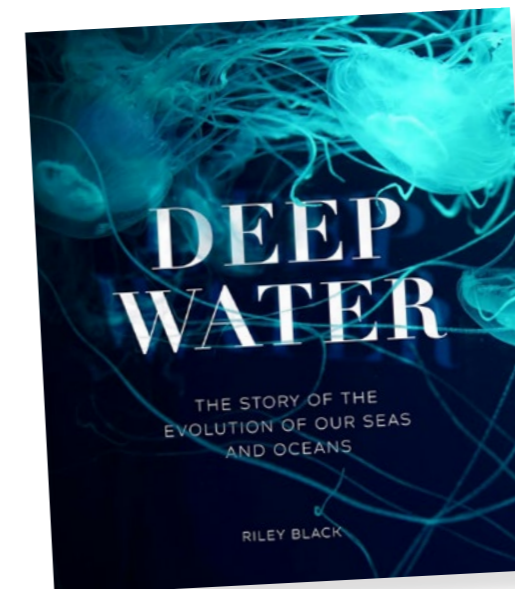


Dive History

Diving Through The Decades, by Eric Hanauer

Written by a diving historian, this book offers an immersive, decade-by-decade exploration of scuba diving's evolution, highlighting key inventions, events and pioneers. Spanning from the 1930s, it presents a comprehensive history enriched with personal stories, historical photographs and insightful interviews with diving pioneers. Collected over 40 years, these firsthand accounts provide an intimate experience for enthusiasts, transforming the book into a captivating adventure alongside the individuals and innovations that have shaped the scuba-diving world.

ASIN: B0BW2CNK5H
Publisher: Independently published
Date: 15 February 2023
Paperback: 327 pages
ISBN-13: 979-8366009515



Deep Sea

Deep Water: The Story of the Evolution of Our Seas and Oceans, by Riley Black

The deep sea is a realm that has intrigued humanity for millennia. This book dives headlong into this realm, exploring the evolution of ancient life forms, the transformation of the environment, and its current inhabitants (which include horseshoe crabs, extinct marine sloths and giant jellyfish). In short, it shines a spotlight on the deep sea's origins, evolution and future prospects.

Publisher: Welbeck Publishing
Date: 6 October 2023
Hardcover : 224 pages
ISBN-10: 1802792589
ISBN-13: 978-1802792584

Author doing an unusual exercise for physical therapy after hip replacement (right); X-ray of author's hip (below)

Text by Simon Pridmore
Photos by Simon Pridmore,
Sofie Pridmore and Tim Rock

How does one return to diving after hip replacement surgery? Simon Pridmore speaks from experience and gives an insight into how he used scuba diving in his physical rehabilitation.

COURTESY OF SIMON PRIDMORE



Hip, Hip... Hooray!

Benefits of Scuba Diving in Hip Replacement Therapy

© TIM ROCK / DOUBLEBLUEIMAGES.COM

It was not a lifetime of diving that wore out the cartilage around my right hip joint. It was three or four football matches a week, from my early teens up to about the age of 40. The pain arrived about 20 years after my

last match. It did not stop me diving, but it made it uncomfortable. I adapted my finning technique to favour my "good" leg, I made sure I did not have to walk with a tank on my back for longer than was neces-

sary, and I led with my left leg when climbing boat ladders.

Towards the end of the downtime bestowed on us all recently by the pandemic, I decided to talk to a surgeon about having a hip

replacement operation. I had been hesitating over it for a while, but during Covid, hikes in Hong Kong's hills had replaced diving as my regular form of exercise, and it would take a good three days after a hike before





© TIM ROCK / DOUBLEBLUEIMAGES.COM

I stopped hobbling. This could not continue. Something had to be done. So, I sought the advice of Jason Brockwell, Hong Kong's top hip surgeon and a keen diver himself.

He told me not to wait and that I should have had the operation several yesterdays before. He also introduced me to Yvonne, a marine biologist who had had the operation a year earlier. She was very positive and described the operation as a "new lease of life."

By chance, around the same time, I also bumped into Steve, a Hong Kong course director I used to work with, whom I had not seen for 30 years. We went for a coffee in the Landmark Starbucks and, as he sat down opposite me, I noticed that he flexed his right leg out and back again. I joked that it looked like he was doing a hip exercise—I had been checking out YouTube videos—and he told me that was exactly what he was doing. He had had his

hip replaced three months before.

In his case, it really was scuba diving that robbed him of his hip cartilage. He is not tall enough to hang tanks off the end of his arms as he moves them around, so he would always lean to one side, hitching his hip up, as he walked them from one place to another. Forty years of doing that had left him in arthritic agony.

Steve also advised me to delay no more, so in July 2022, I had the operation. When I signed up, I asked the surgeon if he thought I would be OK to dive three months later, as we were running a dive liveaboard charter in October in Papua New Guinea's Bismarck Sea. He was optimistic and told me that he and Sophie Raine, a physiotherapist on his team, would prepare me as well as they could.

After surgery

After the operation, on Jason's direction, I spent six weeks doing as little as

possible to give the muscles and tendons that had been cut and re-sewn time to reconnect, and Sophie just gave me some gentle daily drills to prevent blood clots from forming and to get the new hip joint moving a little.

Then, I had an X-ray to make sure all was well and started exercising in earnest. Sophie recommended focusing on hip mobility rather than strength, as my primary aim was to get ready for diving, rather than running or jumping. That would come later. But, of course, the more I walked, the stronger I became, and, over the following six weeks, I could do long walks on flat ground comfortably.

I was assigned some pool work too and the first time I tried using a strong frog kick, I found that as I extended my right leg as far as it would go, I would get a sharp pain close to the hip joint. It turned out that this was all down to a tight gluteus medius, and a sports massage took care of the problem.

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 perseverance, 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**

By the time we left for the trip, I was able to carry 15kgs of scuba gear on my back down the hill to the ferry pier. Twenty-four hours—comprising one ferry and one bus trip, two flights and a long and very bouncy ride in the back of a van—later, we arrived. My hip felt fine, despite long periods of sitting still and getting jolted around on the last leg of the journey.

But how would the diving go?

Diving

On the first couple of days, the dives were gentle, comprising an hour or so of relaxing reef exploration, almost

completely current-free. Entry was via a giant stride from the back of the main boat and exit from the water was via a heavy-duty six-step ladder, followed by five shallow steps from the dive platform to the gearing-up benches.

I toyed with the idea of asking the crew to help me remove my equipment in the water, so I could climb the ladder unburdened, but my ego intruded, and I decided instead to climb the ladder left leg first, bringing my right leg up to join it on each step before moving up to the next. There were handholds all the way up, so I could also use these for support. This meant I was not placing all my body



After physical therapy and training, the author was able to load up with gear and head down a steep slope to the ferry (below); Boat traffic in the Bismarck Sea (right)



weight—plus a 12-litre aluminium scuba cylinder and 3kgs of lead—on my right leg at any point in the climb. The strategy worked well. I felt no discomfort at all.

In the beginning, I swam with a limited frog kick, then increased my range of movement bit by bit. I sensed a little pressure occasionally during this process, but nothing that

could be described as painful. Soon, I was frog-kicking normally, so I started experimenting with other fin kicks—flutter, modified flutter, cave frog, helicopter turns, cave helicopter turns—everything I could think of. I found nothing I could not do and—even better news—after the dive, I had no muscles complaining about what I had put them through—not even my gluteus medius.

Challenging current

On the morning of day three, I found myself jogging up the internal stairs from the cabins to the dining room for breakfast. It was only when I reached the top that I realised I had not jogged up a staircase for five years!

Later that day, my buddy and I did a giant stride off the stern into a ripping current and grabbed onto the tagline. The place we needed to be was on a reef point, in front of the boat. We had two choices. We could either drop to the seabed and pull and glide our way forward, using the

contours to give us shelter from the current; or we could fin along the tagline just under the surface to the bow, then follow the mooring line, hand-over-hand to the seabed.

The problem with option one was that the reef top was very rich, with fragile corals overlaying each other and very few bare patches of rock or sand to pull and glide across. There was a risk that staying low to get shelter from the current might bring our fins into occasional contact with the corals. This I wanted to avoid.

So, it had to be option two. Before the hip operation, even with my bad hip, the swim against the current along the tagline would not have presented any problem. Now, I knew it would be the most significant test of my strength and endurance so far. I signalled to my buddy. She agreed and we set off.

Getting there

It was slow going at first, but I switched fin strokes from time to time and made

NEW 4 in 1!

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

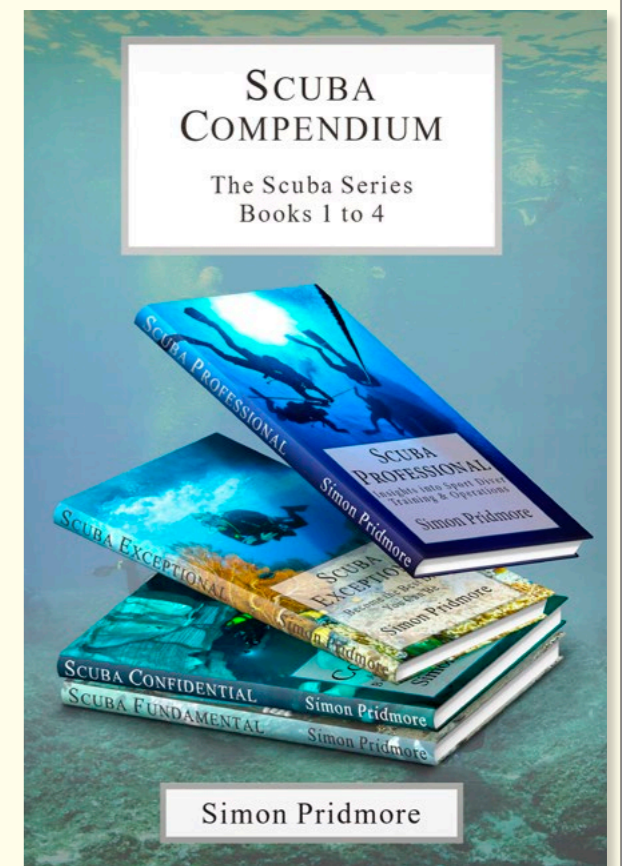
- *Scuba Fundamental – Start Diving the Right Way*
- *Scuba Confidential – An Insider's Guide to Becoming a Better Diver*
- *Scuba Exceptional – Become the Best Diver You Can Be, and*
- *Scuba Professional – Insights into Sport Diver Training & Operations*

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

constant progress. Arriving at the mooring line, we descended fast. I was anticipating what we would find when we eventually arrived at the sweet spot where the point jutted farthest out into the blue. There would be schools of predatory fish such as black snapper, bluefin trevally and mackerel chasing and feeding on large schools of small fry or just hanging in the “wind,” facing the flow.

It was just a matter of getting there. From the mooring point, we headed



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

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

simonpridmore.com

out along and down the wall. There were rocky handholds that I could use to pull myself along to take the strain off my legs a little, but there were still sections where I had to kick hard for a few seconds to bridge the gap. Finally, we made it and found a chunk of bare rock to cling onto as we watched the excitement going on all around us.

The ocean from the surface to the deep blue depths was suffused with life. Fusiliers raced up and down the



SOPIE PRIDMORE

wall like in a chariot race in a Roman circus; predators were carrying out their usual lightning raids on the confused conglomerations of “little-‘uns,” which were dodging and diving in unison to avoid becoming a mid-morning snack, and occasional passers-by, such as Māori wrasse, dogtooth tuna

and oriental sweetlips, were coming in to join the fray. That evening, I ached, but only in both quadriceps. However, the following morning, my right hip felt tight, and I spent the first dive (just after dawn) flexing and stretching my hip and butt muscles. The tightness continued all day,

Author taking a giant stride, leading with his new hip (left); Video screenshot of author doing hip exercises underwater (below)

so I took some Panadol and continued practising extensions and flexes. At the end of the last dive that day, I tried coming up the ladder normally and found I had the strength to do it. Neither my hip nor my muscles raised any objection.

Wave action

Two days later, we dived down onto a deep pinnacle to watch a school of barracuda circling around in the blue. It was calm when we set out, but by the time we surfaced, the weather had changed, a storm was coming in and the sea was getting rough. Exit from the ocean needed to be as usual via the boat ladder, which was slamming up and down as big waves struck the stern.

At first sight, in conditions like these, it seems impossible that you will be able to exit safely. But the ocean has a rhythm and there are moments between waves when the ladder is stable, and you can get onto it. You then grip it tightly, so that when the next wave comes, you will not be torn off and chucked back into the churning spume behind the boat. Then, you can use the next period of calm to scoot up the ladder and onto the dive deck. If you are lucky—and nimble—you get there, grab on, and climb up in one continuous movement.

Timing and speed are required. There is no dawdling allowed. You wait patiently just out of range of the ladder as it does its rising-up-and-crashing-down thing, wait for an oppor-

tunity, make your decision, and go for it. Good dive boat ladders are designed so you can climb up them with fins on. This one was a good dive boat ladder—although I could see a pesky loose length of line halfway up that looked like a potential trip wire. I measured the gap between waves and thought that I would have enough time when the moment arrived to get on, get up and get gone in one push. But I would have to climb up normally—left foot on one rung, right foot on the next and so on. Speed, as they say, would be of the essence.

So that was what I did. I waited for a patch of calm, glanced behind me, saw that there was no major swell bearing down and finned hard for the stern. I grabbed the central

pillar on the ladder with both hands, swung my fins onto the bottom rung and shot up the steps like a rat scabbling up a drainpipe, avoiding the trailing line and arriving on deck just in time to get a good grip on the railing before the next wave hit.

Home safe.

My buddy arrived on board via a similar route shortly afterwards and saw me standing waiting for her with a big smile on my face.

“I saw that,” she said. “Nothing wrong with your hip now.”

The healing power of scuba diving! I felt like cheering out loud. ■

Simon Pridmore is the author of the international bestsell-

Hip Therapy

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



© TIM ROCK / DOUBLEBLUEIMAGES.COM





Text by Lorenzo Moscia, with Dan Kenney
Photos and video by Lorenzo Moscia

The distant northwestern Pacific island of Ebadon is one of the most pristine locations left on earth. It is also facing rapid and imminent destruction from increasing storm surge and overwash events driven by man-made climate change. The people of Ebadon, who contribute the least to climate change, will be among the first to be driven from their ancestral lands because of it. Photographer Lorenzo Moscia went to Ebadon to document the building of a climate-change research station and shares his experience there.

The **video documentary** about Ebadon Island is a kind of short travel diary made with the aim of documenting the construction of a laboratory to study the effects of climate change in one of the most remote places on the planet, located in a chain of 92 islets and islands that make up Kwajalein Atoll in the Republic of the Marshall Islands.

To reach the small island of Ebadon, I left Honolulu with a group of specialists on a flight called the Island Hopper, which connects Hawaii with the island of Guam at the opposite



Beach scene at Ebadon Island, located in the Marshall Islands (above); Construction of the research station (top left); Collecting dead coral on the reef at Ebadon (right)

end of the Pacific, stopping at several remote Pacific islands on the way. Located roughly halfway between Hawaii and Australia, it takes most of a day to get to Ebadon from the closest airport on Kwajalein Island using the small workboats that ply the often-rough waters of the lagoon and nearby ocean.

The group included my long-time friend Dr Eric Rasmussen, an American physician specializing in global disaster response methods and

their intersection with modern medical ethics; Dan Kenney, the engineer and designer of this laboratory; his wife Veronica, a science teacher who led the island's children in discovering the science of their waters and how it affects their daily lives; and Gregg Nakano, a US Naval Academy graduate and former US Marine Corps officer who spent additional years in the field with the US Agency for International Development (USAID) and has extensive experi-

Ebadon *& Rising Seas*

Building a Climate-Change Research Station





Over-under shot of freediver and staghorn coral (top left); Sea turtle and local children (top right); Tank used as a church bell (right); Local kids spearfishing for dinner (left)

Chair), and two cadets from the US Coast Guard Academy, spending their summer internship with Pacific Allies, a sister organization.

Our transitory stop was the island of Kwajalein from where we transferred to the mayor's small workboat and traveled another 75 miles across a combination of open ocean and the largest coral atoll lagoon in the world to reach Ebadon. We reached our destination after four and a half hours of being tossed around in the waves, and after transferring all our equipment from the workboat to smaller boats (*pangas*) more suitable for crossing the reef. As we passed through the narrow channel at the southern end of the island, we heard the singing from a multitude of voices that cast out over the lagoon. A few meters farther around the point, we saw the entirety of the island's population, from the youngest baby to the eldest resident, gathered

together on the beach to welcome us and introduce us as friends to the spirits of their ancestors.

Upon stepping onto the beach, we were greeted by the inhabitants who placed necklaces of flowers around our necks, while two of them sang a song and played a keyboard connected to a generator. Our welcome could not have been warmer.

The only means of locomotion on this island are one's own legs and a couple of old bicycles that are used in turn by the 60 or so permanent inhabitants. It takes less than two hours to walk the entire perimeter of the island. As we set up camp that evening in tents and in hammocks among the breadfruit, palm and pandanus trees along the beach, the stars and Milky Way came out in a starkness and clarity that can only be seen far out to the ocean and high on remote mountain tops. It was at that moment that we

felt the true isolation and pureness of our location.

Our schedule, which initially envisaged a two-week stay to build and activate the laboratory, was greatly reduced due to a wave of bad weather in the United States, which forced United Airlines to cancel more than 630 flights (including ours from Hawaii to Kwajalein). Our 14-day build schedule was reduced to seven. We arrived on a Saturday evening with no time to lose. Our hopes of an early start the next morning were dashed when the island elders stated that we were now considered "family," and so, there would be no work on Sunday, the Sabbath, by us or the islanders. With many promises of all the help we would need starting early on Monday, we settled into a Sunday of adapting to the hot, humid climate, and getting to know our new family.



Sunday morning started with a call to church service by the ringing of an empty oxygen cylinder hanging from a tree, which served as a bell, sounding clearly across the entire island,

ence in humanitarian aid. Others with us included Peter Cloutier, a marine biologist and professor of development and human security (USAID

feature

CLOCKWISE: EPS modules used to build the foundation; Locals gather and burn coconut shells for the building cement; Erecting the modular walls; US Navy cadets at work; Drilling holes for the building stilts



and hammered by a man wearing over-the-head hearing protection. The rest of us standing close by were not so lucky. That bell was as effective as any belfry of any church in my hometown of Rome, Italy.

In the afternoon, the two cadets from the US Coast Guard Academy successfully snuck in some “work” by starting to map the island for Google Streetview under the guise of “taking a walk,” accompanied by a singing and laughing group of youth from the island. Of the approximately 60 islanders on Ebaddon, over half were under 18 years old.

Goals and editing

My mission was to ensure that the collective effort, unity and practicality of this construction was conveyed to an

audience that now, in the vast majority of cases, no longer takes the time to deeply analyze what they see. Viewers often have an attention span that lasts no more than a handful of minutes, limiting their ability to enjoy and understand a documentary.

In the editing phase, I was guided by the images I had collected. The good thing was that I already had a

script in front of me with a beginning and an end: the construction of the climate lab.

I also wanted to include an intimate look at the soul of the island—its inhabitants—and how they go about their days. I wanted to capture the challenge and beauty of living on a strip of land surrounded by the sea where the days are marked by the

tides and the wind, the rain, the salty air that corrodes everything, and the oppressive humidity. In this way, we learn to respect and listen to the island which, with its rhythms, gives us so much, protects us, and reminds us how small we are, compared to nature—but also how much damage we can do to it, if we are caught up in excessive consumerism and the indiscriminate use of resources.

The children here are trained to fish both from the shore and by freediving, to eat coconuts and pandanus, and to know every single inch of the island. In addition to studying in the local school, we noted that, by growing up on this isolated island, the village kids acquire a kind of intelligence, experience and perspective that will mark the difference between them and those on the continent.

One aim of the video was to document the construction of the laboratory. I therefore wanted to dedicate a small space to explore the local human aspect; this I tried to do 5 minutes and 15 seconds into the video, where I collected the heart-breaking and melancholic opinion of an

elderly man, one of the island's *Alep*, a word which translates best as “protector of the island and its people.”

Life on the island

After a couple of days, one begins to live according to the rhythm of the island and its people. There was a sense of intense isolation, though we occasionally received visits from the inhabitants of the neighboring island, Mejjatto.

On another strip of island not far away and at just a few feet above the ocean, there was a dilapidated concrete airstrip dating back to the Japanese occupation prior to World War II, which allows, once a week, the landing of a small twin-propeller aircraft from Kwajalein. This flight is often cancelled due to technical problems, storms and crew shortages, which indeed happened during our stay.

Some of us slept in hammocks, others in tents. I, with the “excuse” of having to protect my equipment from the unexpected downpours characteristic of this remote corner of the tropical Pacific, had the privilege of being able to take shelter inside the stilt house,





which is normally a kind of hospital. A couple of small generators were the main source of electricity and powered a pump for running water a couple of times per day. Ebadon is unique when compared to the islands surrounding it, as the convex shape formed in the tuff and fossilized coral of the island's structure created a fresh-water aquifer fed from rain and coral-sand-filtered ocean water. Mejjatto, which hosts a population roughly three times the size of Ebadon, can be walked to with enormous effort at low tide and has only rainwater catchment for drinking water, frequently experiencing severe drought. The community constantly looked after us and each other, providing clean water and sharing meals with the team.

The research station

The most important characteristic of

the research station we were building, which was entirely designed by Dan Kenney, was the ease of transport and assembly of its expanded polystyrene (EPS) modules, which were encapsulated in a reinforced cement partially made from local materials to make the shell of the station. The result was similar to the shell of a turtle where thin, hard surfaces are bound together with a lightweight, durable core. It was strong, waterproof and resilient. To better match the local climate and architecture, Dan adapted the shape of the structure to historic sketches of Marshallese homes in the 1800s, which were defined by their sharply peaked roofs and low side walls.

One can, of course, argue that EPS is not a truly "green" building material, but these EPS building walls are not the same as single-use plastic cups. EPS has practically infinite durability

and is light enough to be easily moved from place to place as sea levels rise. For most of us, EPS is another name for styrofoam, but that is not really a fair comparison. One of our worst environmental pollutants are the disposable plastics, which take decades to degrade. The styrofoam from single-use applications often ends up in the sea as a long-term contaminant.

This building system, on the other hand, creates simple, modular, cheap, cool and durable homes that are designed to last for decades. The technique most closely resembles the structural insulated panels popular in northern Canada and the Scandinavian countries. Although, instead of sandwiching the foam between two sheets of pressboard or mineral board, like in structural insulated panels (SIPs), the entire structure is assembled in foam, then



CLOCKWISE: Gathering dead coral for the cement; Local elder and Alep ("protector of the island"); Erecting the walls of the station; Local mother and child

coated monolithically with fiber-reinforced cement mixed with local sand. The foam can easily be cut from the cement skins using a handheld hot wire system and recycled, should the structure deteriorate. Last year, Dan and Eric had built similar EPS homes in Ukraine for families displaced by the war.

I had the privilege of being able to document that construction as well, and the assembly resulted in much less than two percent by volume of building waste—the lowest waste of any construction process found in our research. Dan's and Eric's thoughts

were that if we are able to build with a material such as EPS, we should use recycled material as much as is practical and design these structures for a minimum lifespan of five decades. A limewash was manufactured from locally processed seashells and vegetable oils to protect the exterior of the shelter and create a bright, white exterior similar to what we have in the Mediterranean regions of Italy.

Inside the research station on Ebadon, we left a computer with the complete Wikipedia, world travel atlas, English language lessons, and a nearly complete Khan Academy, available wirelessly to any browser nearby.



LEFT TO RIGHT: Construction on the research station; Freediving on the reef; Local children; Sunset over Ebadon

The first site we selected for the station was in the shadow of a giant pandanus tree, located only a few meters from the lagoon shore. Once the elders were told that our station system had a satellite internet connection that cast a mesh Wi-Fi network over a few hundred yards or so, they asked us to reconsider the location, moving it about 150 meters inland, so that the network would include the local school. We did so, and the children of the island have been encouraged to use the Wi-Fi freely, using basic laptops provided by the Kwajalein government. Until now, lessons and information had been distributed on flash drives.

The research station has an additional set of long-range wireless connections to solar and battery-operated sensors installed around the island that measure the temperature, salinity and height of the nearby ocean, and it can transmit daily photographs from the reef to the University of Hawaii. This long-range sensor network is available for any KASL researcher to add sensors, and covers most of the

7-mile-long and 1.5-mile-wide shallow tidal lagoon. A nine-sensor weather station transmits atmospheric conditions twice per hour to KASL servers in California.

The people

The warmth, hospitality, humor, thoughtfulness and uncomplicated nature of the islanders makes them memorable. They face daily obstacles, but they are smart, hard-working and optimistic that they will be able to rise above any challenge if they remember who they are, incorporate ideas from everywhere, and stick together. It was a unique experience solving the challenges of building in such an isolated environment alongside them, seeing them working so closely together and expressing their interest in how we elevated the structure and built with such basic tools and materials. We knew that we were successful in our mission when, on the

last full day of the build, and with substantial plastering work left to do to finish the roof and garden deck, the islanders fully took over the work and labored deep into the night and early morning, to surprise Dan and the rest of the team with a finished structure the next day.

The day of our departure was intensely emotional. We had brought them tools and ideas that were of immediate help to them, and they were grateful for the chance to learn. They, in turn, had reminded us of the value of a place-based community, the importance of providing for one another, the skill of finding solutions when the nearest resources are half a day away, and that the immediate effects of human-caused climate change are already affect-

ing the daily lives of those who have done nothing to cause it. After the christening ceremony for the new research station, the entire village lined up to hug each one of us and then sang to us a song of hope and safe journey as we loaded the small boats for the journey home. ■

See "Ebadon, Marshall Islands": [youtube.com/watch?v=Rr4ZFGtg4Gg](https://www.youtube.com/watch?v=Rr4ZFGtg4Gg)

"Voices from the Heart of the Pacific": [youtube.com/watch?v=OGcQx7nY794](https://www.youtube.com/watch?v=OGcQx7nY794)

Widely published photojournalist Lorenzo Moscia has been a photographer for over 20 years and has just recently decided to follow the little inner voice that has urged him since childhood to get serious about going underwater. In the last two decades, he has worked with Greenpeace as



LORENZO MOSCIA
PHOTOGRAPHER

lorenzomoscia.com

a staff photographer in Chile and Italy. Visit: lorenzomoscia.com.



marine mammals

Edited by
Catherine
GS Lim



PETER SYMES

Manatees up for protection

Manatees may soon be classified as “Endangered,” as federal wildlife authorities review their status, following a petition submitted by environmental organizations.

Federal wildlife authorities are re-evaluating the classification of manatees, a move prompted by mounting issues, most notably the devastating loss of seagrass,

a critical food source for these gentle marine creatures.

A long-overdue review

The US Fish and Wildlife Service recently announced its intention to revisit the categorization of manatees, contemplating a return from “threatened” to “endangered.” This potential reversal would overturn the 2017 decision to reclassify manatees.

Last year, some environmental organizations had collectively

submitted a petition to urge the federal agency to elevate manatees to “Endangered” status.

“Substantial information in the petition indicates that seagrass loss poses a genuine threat to the species, potentially qualifying manatees for endangered status under the Endangered Species Act,” the agency stated in its recent document. “We recognize the merits of the petition, and will launch a comprehensive status review to determine the necessity of the proposed action.”

This decision has been met with approval by the advocates.

Ragan Whitlock, a Florida-based attorney at the Center for Biological Diversity, said, “This is the right call for manatees and everyone who cares about these charming creatures.”

Crucial measures to save the manatees

The ongoing crisis is dire. Florida reported a staggering 1,100 manatee deaths in 2021, a number that decreased to 800 in 2022. This year, although the rate of deaths continued to drop, 476 manatees have already perished as of the previous week, based on data from the Florida

Fish and Wildlife Conservation Commission website.

One of the major contributors to the surge in manatee deaths in 2021 was the loss of seagrass, particularly in regions like the Indian River Lagoon. Manatees, deprived of an adequate food supply, faced starvation. To mitigate the crisis, state and federal wildlife officials had even resorted to feeding lettuce to manatees congregating in warm waters near a Florida Power & Light power plant in Brevard County to prevent further fatalities.

Comprehensive Review

The review encompasses more than seagrass loss. The agency’s document also highlights the need to examine other potential threats, which may include the lack of warm-water refuges for manatees during the winter, coastal construction and boat strikes. It states that the review will be exhaustive, reflecting the urgent need to safeguard manatees and to ensure their protection for future generations. ■

SOURCE: US FISH AND WILDLIFE SERVICE



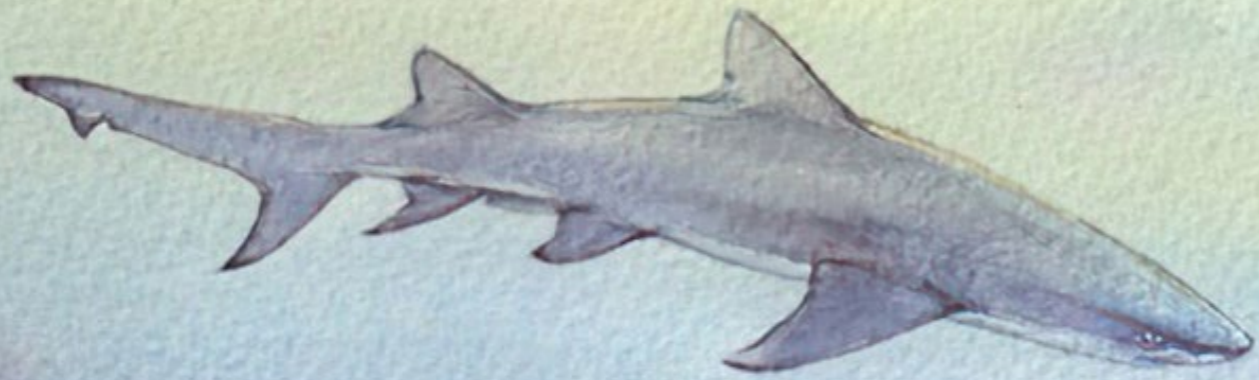
SCUBA DIVE GORDON'S BAY - CAPE TOWN SOUTH AFRICA



www.indigoscuba.com | info@indigoscuba.com
+27 83 268 1851

There are two subspecies of West Indian manatees: the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*)—the latter of which is shown in the photo. In the United States, manatees are protected under the Marine Mammal Protection Act, which prohibits the take (i.e., harass, hunt, capture or kill) of all marine mammals.





ILA FRANCE PORCHER

Papua New Guinea



Reefs, Wrecks, History, Culture
Unbelievable Marine Life
www.orientafricatravel.com
+447736872259 info@orientafrica.com

Enigmatic world of shark and ray behaviour unveiled

Inspired by a perceived need to emphasize shark and ray ethology and to showcase their behavioural complexity and intelligence, a special issue of the Brill journal *Behaviour* has been published, focusing on elasmobranchs.

Elasmobranchs have become lucrative targets with the depletion of traditional fish stocks and the surge in the shark fin trade. Although, in recent decades, much scientific evidence has challenged traditional misconceptions, stereotyped media portrayals persist, and they hinder conservation efforts. So, this **special issue** was created to highlight the complex behaviour and cognition of sharks and rays.

It is organized into three main themes—historical articles, behaviour, and cognition—each contributing to a deeper understanding of elasmobranchs' lives and challenging prevailing misconceptions.

Historical articles

The issue opens with a groundbreaking review by guest editor A. Peter Klimley, et al.: a comprehensive ethogram for chimaeras, sharks and rays. Ethograms are essential for describing animal actions in their natural habitats, and this work was done to aid researchers to characterize future sightings as well as to standardize terminology for future research. Klimley is an ethologist in the line of Nikolaas Tinbergen, Konrad Lorenz and Arthur A. Myrberg Jr., his former professor, who worked for several years with Lorenz in Europe. Klimley carries

their legacy forward by creating an ethogram for the entire group of chondrichthyan fishes, and challenging the notion of sharks as simple feeding machines.

Two historical studies, also by Klimley, follow. The first dives into the social interactions of hammerhead sharks, revealing a complex world of social competition and mating behaviours. Female scalloped hammerheads, for instance, engage in a cork-screw display to establish dominance, while males use torso thrust to compete for mating opportunities. Klimley's study on white sharks unveils agonistic displays and ritualized behaviours, challenging traditional stereotypes of sharks as mindless predators.

It is followed by a critical commentary by guest editor Ila

France Porcher, which questions the validity of the study that claimed to have found dominance-subordination hierarchies in the smooth dogfish. It thus challenges prevailing notions about shark social dynamics.

"The 'Mistaken Identity Hypothesis' for shark bites on humans is an anthropomorphic fallacy," by Eric Emile Germain Clua Ph.D., DVM, delves into the reasons behind the widely accepted hypothesis that sharks mistake swimmers for prey items. Clua proposes a "Natural Exploration Hypothesis," suggesting that observed shark behaviour, including bites

on humans, is a response to the sharks' natural tendency to strike moving objects at the surface, rather than a case of mistaken identity.

Behaviour

The behaviour section is introduced by a fairly complete ethogram for blacktip reef sharks by Ila France Porcher, which describes 35 context-



ILA FRANCE PORCHER

Ila France Porcher

specific behaviour sequences. It not only highlights the flexibility in the behaviour of these sharks but also reveals large individual differences. The behavioural repertoire offers intriguing clues as to the complexity of the sharks' cognitive functions.

The study is, however, disrupted by the arrival of the shark fin industry, which underlines the devastating impact on shark populations of this largely criminal trade.

“Insight into manta ray behaviour using animal-borne Crittercams” by Nicole Pelletier et al. sheds light on the behaviour of manta rays in their natural habitats. The study reveals the importance of social behaviour for these filter-feeding elasmobranchs, with the reef manta ray exhibiting more pronounced social interactions than the giant oceanic manta ray. The study documents new inter-specific interactions between these two species as well as courtship events.



ILA FRANCE PORCHER



ILA FRANCE PORCHER

The article “Could convulsive body shuddering of a white shark near a shark cage be an element of a threat display?” by A. Peter Klimley and Mauricio Hoyos-Padilla challenges common stereotypes by examining agonistic displays of a male white shark near a shark cage. The study emphasizes that even these formidable marine predators display ordinary animal behaviours in response to perceived threats, debunking the sensationalized portrayals in popular media.

Cognition

The cognition section challenges the historical dismissal of elasmobranch mental capacities. Vera Schluessel et al.'s paper, “When the penny drops: sharks outsmart cichlids in serial reversal learning” sets the tone by testing two species—eight cichlids and seven bamboo sharks—in a reversal learning task. The results showcase the sharks' capacity for learning and behavioural flexibility, challenging

the perception of elasmobranchs as instinct-driven creatures.

“Examining individual behavioural variation in wild adult bull sharks (*Carcharhinus leucas*) suggests divergent personalities” by Thomas Matthieu Vignaud et al., takes an ethological approach to analysing boldness-shyness and aggressiveness-placidity in adult bull sharks. The study not only characterizes individual shark personalities but also quantifies the differences in behaviour over time, emphasizing the variation among individuals.

The article “Evidence of long-lasting memory of a free-ranging top marine predator, the bull shark *Carcharhinus leucas*” by Clémentine J. M. Séguigne et al. explores the memory capabilities of sharks. Given their long lifespans, sharks are expected to have good long-term memories, and this study provides evidence supporting this hypothesis. The sharks quickly resumed their attendance when feedings re-

sumed after interruption of shark feedings due to the Covid-19 pandemic.

The special issue concludes on a note of mystery with “Shark evacuation from Mo'orea Island in 2002” by Ila France Porcher. The article recounts a unique event where all blacktip reef sharks and likely other species left their lagoon and ocean ranges for two weeks, thus evading human view without any apparent explanation. The mystery underscores the gaps in our understanding of elasmobranchs' lives and behaviours.

In summary, this special issue not only unveils the behavioural complexity of elasmobranchs but challenges prevailing stereotypes, emphasizing the need for their conservation. The revelations in this collection are poised to inspire further studies and advocate for robust measures to try to safeguard these ancient underwater inhabitants from the intensive ongoing exploitation. ■

“This is an insight into the development of a wonder of nature that we haven’t seen before and may not be able to see again.”

— Gareth Fraser, Professor of Biology, University of Florida

How hammerheads grow their hammers

Researchers provide a unique glimpse into the development of the hammerhead sharks’ iconic skulls, shedding some light on these oceanic marvels.

In an unprecedented study, scientists from the University of Florida (UF) have delved into the development of hammerhead sharks’ skulls, uncovering the process behind their iconic hammer-like shape at the embryonic stage.

Led by UF professor Gareth Fraser, the study focussed on bonnetheads, the smallest among the hammerhead shark species. The species’ abundance in the Gulf of Mexico and the Atlantic Ocean, along with their near-shore presence, made them ideal subjects for the study.

Dramatic emergence

Using a series of images, the study chronicles the astounding transformation that occurs approximately halfway through the gestation of two-inch-long bonnethead shark embryos.

During this pivotal stage, their skulls undergo a dramatic expansion, pushing their still-developing eyes into unnatural positions. In subsequent

weeks, the front of the hammerhead gradually rounds out, shifting backward towards the gills, ultimately giving rise to the distinctive shovel-like shape.

The findings of the study were published in the journal *Developmental Dynamics*.

Challenges faced

Studying hammerhead sharks is a challenge. They give birth to live young, hence it is difficult to observe the development of their embryos. In addition, many hammerhead species are endangered, so the harvesting of sharks for the purpose of studying their young is prohibited.

For this study, the researchers collaborated with partners and

gained access to embryos preserved from bonnetheads caught in other biological studies.

Due to the difficulty of studying hammerhead sharks, the scientists said that such an opportunity to study hammerhead sharks may never arise again.

The future

This study sets the stage for future experiments aimed at unraveling the mechanisms behind the hammerhead’s control over its head shape and the evolutionary significance of its distinctive features. These features are believed to enhance its field of vision and its ability to detect the electrical movements of prey. ■ SOURCE: UNIVERSITY OF FLORIDA



Stages of development in a bonnethead shark embryo

GARETH FRASER / CC BY 4.0 DEED

Live Aboard Trips

DIVE WITH SHARK AND DOLPHINS IN THE BAHAMAS

Tiger Beach and Bimini
TIGER SHARKS, HAMMERHEAD SHARKS, AND DOLPHINS

001 561 589 8642
voice, text, Whatsapp

www.sharkexpedition.com
www.dolphindreamteam.com
inform@dolphindreamteam.com

DOLPHIN DREAM TEAM

Update On Diving Medicine

Gary Rose, MD, Tour Leader

Tiger Beach, Bahamas, May 11-15, 2024

See Tiger Sharks, as well as Hammerheads, Caribbean Reef Sharks, and Lemon Sharks, with Epic Diving.

BOOK NOW:

epicdiving.com/package/cme-course-for-medical-professionals

Anyone can attend and those affiliated as healthcare providers will receive **8 CME/CEU credits**.





SHAWN MILLER



BRANDON RYAN HANNAN



BRANDON RYAN HANNAN

New species: the Ryukyuan pygmy squid, *Idiosepius kijimuna* (above and centre), and Hannan's pygmy squid, *Kodama jujutsu* (top right and right)

Meet two new species of pygmy squid

Two new species of pygmy squid in the waters of Okinawa, Japan have been identified and catalogued, according to a new study.

The deep, emerald waters surrounding Japan's Okinawa Islands are a haven for marine life, and is one of the most biodiverse ecosystems on the planet. Within this vast biodiverse haven, scientists have discovered two new species of pygmy squid lurking beneath the surface: the Ryukyuan pygmy squid and Hannan's pygmy squid.

These two species have now been described and catalogued, with names that connect them to Japan's cultural heritage. Findings have been published in the *Marine Biology* journal.

Of forest fairies and grappling predators

The Ryukyuan pygmy squid (*Idiosepius kijimuna*) takes its name from short, red-haired forest fairies believed to reside in Okinawa's banyan trees. Much like their mythical namesakes, they are tiny and possess a vibrant red hue. They spend their days in the shelter of seagrass beds near the coast.

The other species, Hannan's pygmy squid (*Kodama jujutsu*), belongs to a completely new genus. The name "Kodama" is derived from round-headed spirits rumoured to inhabit ancient trees, their presence signifying the good health of a forest.

In addition, the squid's name—"jujutsu"—alludes to its predatory nature, reminiscent of the Japanese martial art of jiu-jitsu. "Jiu-jitsu revolves

around grappling and using your opponent's strength, and the *Kodama jujutsu* preys on shrimp larger than itself by grappling with its small arms," explained Jeffrey Jolly, from the Marine Climate Change Unit at Okinawa Institute of Science and Technology (OIST).

Needles in oceanic haystack

These fascinating discoveries were not made without challenges. Both species are tiny, with the largest specimen measuring just 12 millimeters. They are also exclusively active at night, and the Ryukyuan appears only during the winter months, complicating their identification and study.

The project to document and understand these incredible species was a joint effort involving scientists from OIST, their colleagues from Japan and Australia, as well as underwater photog-

raphers who captured images of the squids in their natural habitat.

Threats abound

Beyond the tranquil waters of Okinawa, climate change, and human activities like overfishing, land reclamation and soil runoff continue to threaten the delicate ecosystems: these new species of pygmy squids, as well as many other marine species, face a precarious future.

For Jolly, these new findings underscore the importance of taxonomy: "Taxonomy is not as flashy as other sciences, but through naming and char-



JEFFERY JOLLY

acterizing species, it both highlights the amazing diversity of life in the oceans, and it is a reminder that there is so much that we don't know yet." ■

SOURCE: MARINE BIOLOGY



MARK YOKOYAMA / FLICKR / CC BY-NC-ND 2.0

Caribbean reef octopus with arms folded in, close to the body

Octopuses' arms can detect light

Even when their eyes are in the dark, octopuses can “see” light with their arms, according to a recent study by researchers at the Ruppin Academic Center in Israel. After detecting the light, the octopus will pull its arms in, close to its body.

In general, the cephalopod's sense of where its body is in space is quite poor, so this complex instinctive behavior may act to protect the arms from undetected predators nearby, which may mistake the tips of the octopus's arms as fish or worms.

That octopus arms react to light has long been known. Its skin is covered in chromatophores, pigment-filled organs that change color when light falls upon them. They are behind the octopus's color-changing camouflage ability.

Researchers Tal Shomrat and Nir Neshir were studying these chromatophores when they noticed something unusual. “We were using a very strong flashlight and when we illuminated the tip of the arm, it would always pull away. It was very surprising,” said Shomrat. “We shifted our experiment to explore this behavior after we

found out that nobody had described it before.”

Experiments

In their new experiment, they placed an octopus in black tarp-covered tank. While the octopus was in the dark, it was trained to reach an arm through a small opening above to get some pieces of fish. As it was blindly feeling around for the morsels, the scientists randomly shined a bright light on its arm. They found that the octopus would pull its arm away 84 percent of the time, which suggested that through its arm, it was able to sense and react to light, even when it could not see the light with its eyes. “We often

feel the heat from intense light, but for the octopus, this is not the case,” Neshir said. “In our experiments, we checked for changes in temperature and there were not any. The effect is from pure light.”

Further experimentation revealed that the tip of the octopus's arm was the most sensitive to light. In addition, they found that while the chromatophores in a sleeping octopus reacted to light, the octopus did not pull its arms away.

The same was true when muscles at the base of the octopus's arms were disabled.

Higher-level cognition

The findings of the study, which was published in the *Journal of Experimental Biology*, suggest that the octopus's arm senses the light and sends a message to the brain through the nerves in its muscles. Then the brain tells the octopus to move its arm. This sequence was confirmed, when light was shone on a piece of fish, which

the octopus avoided initially, before finally deciding to grab the fish anyway, overriding its instincts.

Eduardo Sampaio, an octopus behavior researcher at the University of Lisbon in Portugal, who was not involved in the study, said, “The fact that this behavior is not a reflex, but instead controlled by higher-level cognition in the brain is fascinating.” ■

SOURCE: LIVE SCIENCE



DOUG FINNEY / FLICKR / CC BY-NC 2.0

Octopus on reef in Curacao



Diver explores the Nuttlar slate mine in Bestwig, Germany (right); Mine cart and pile of slate (below).

Text and photos by Kurt Storms
Edited by G. Symes
and Catherine GS Lim

Nestled in the mountainous area of Bestwig in western Germany is the Nuttlar slate mine, which offers divers an intriguing opportunity to step into the past. Kurt Storms gives us a glimpse of the underwater passages in the mine.



Nuttlar Slate Mine

Mine Diving in North Rhine-Westphalia, Germany



It was time to dive an old slate mine. So, we headed to Sauerland in Germany, where there is a little town called Nuttlar. The town, which has about 1,700 inhabitants, is a district in the municipality of Bestwig, located in northern Hochsauerlandkreis (North

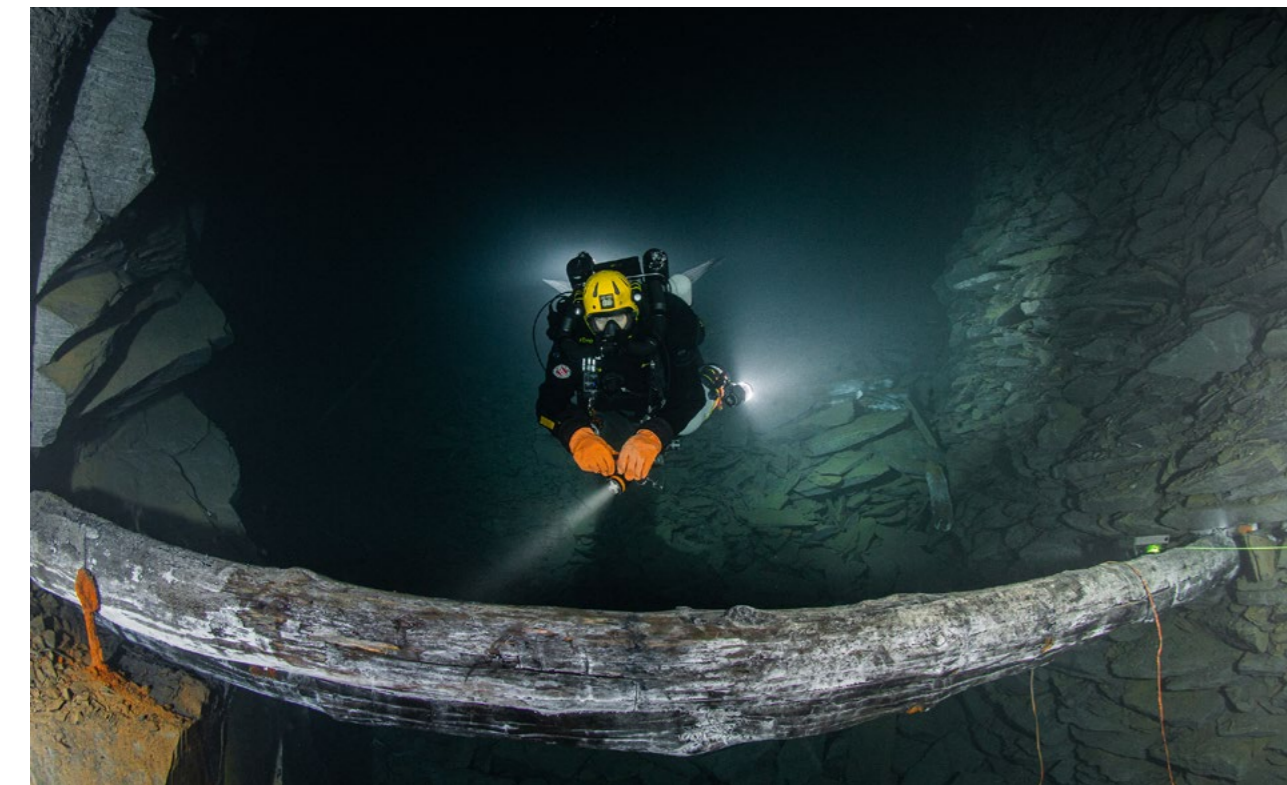
Rhine-Westphalia).

From the middle of the 19th century, Nuttlar's main source of revenue was from slate extraction in the local mine. In 1857, the Gessner company was established by a small group of men. With continual modernisa-

tion, the business developed, so that by 1878, it had gained approval for underground mining. This was the beginning of the Nuttlar slate mine.

By 1900, the number of employees had risen to about 100; this included children and young people who also

worked there. The First World War did not have much impact on slate mining, because the arms industry needed slate to insulate electric moulds. However, due to competition from cheaper slate in Spain and the use of Eternit (fibre cement), slate mining



Wooden beam stretches across a passage.

ceased in 1985.

Today, the Nuttlar slate mine is an enormous labyrinth of mile-long tunnels and huge chambers. After the mine closed and the electricity was turned off, the pumps in the mine stopped pumping out water, and after seven years, the water reached its maximum level. Of the five floors in the mine, the two lower levels are flooded. The passages here have a total length of 12km, with a maximum depth ranging from 14 to 30m.

Getting there

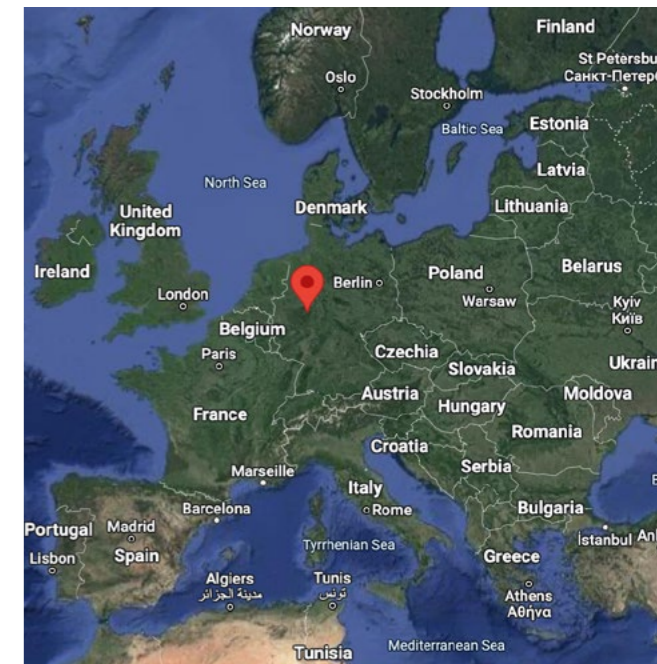
From my hometown of Brussels in Belgium, the drive to Nuttlar took a little over three hours. Travelling with my wife, Caroline, and my dive buddy Willem Verreycken, we departed at 6:30 a.m. and headed out to our dive

site for the day.

The drive went smoothly, and once we arrived, we were pleasantly received by the owner. We got a briefing about the dive operation there, which had a compressor, so it was possible to refill tanks between dives. Air, nitrox, trimix and O₂ for rebreathers was available. Once the briefing was over, we went back to the car and got on the road to the entrance of the mine, where there was a parking area with room enough for seven cars.

The entrance to the mine could easily be found, thanks to the yellow container that marked it. Here, we got our second briefing, which covered what we had to pay attention to and where we had to sign in and out. Once this briefing was done, we kitted up, with anticipation.

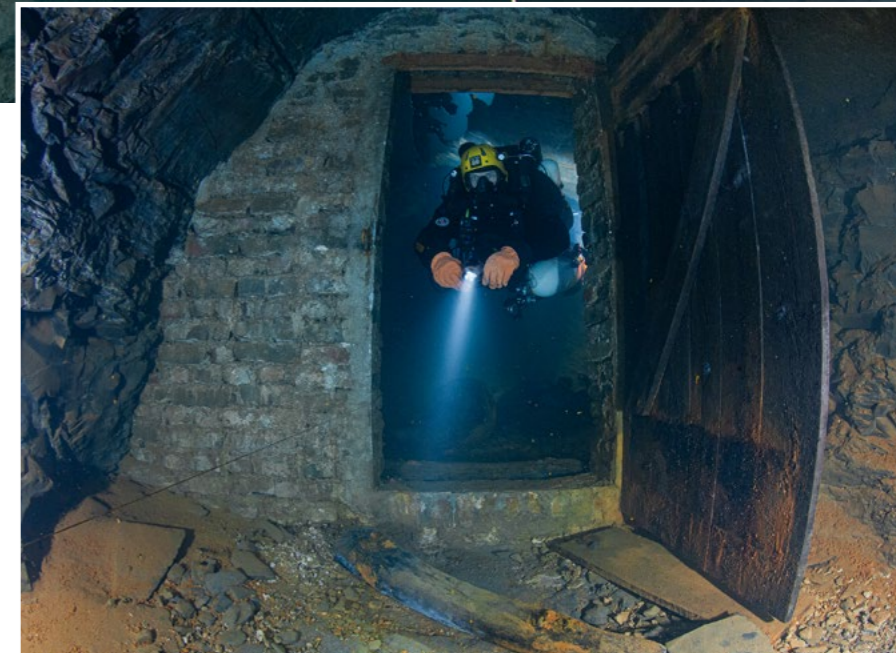
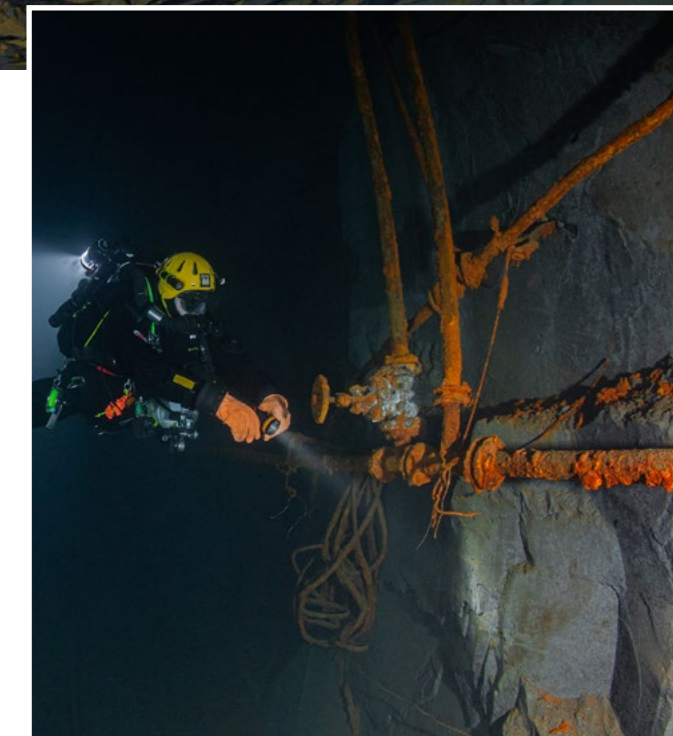
Pipes and rails run through the mine (top left); Diver swims through gin-clear water in a cavernous chamber (above).



Location of Nuttlar on map of Europe

IMAGERY ©2023 TERRAMETRICS, MAP DATA ©2023 GOOGLE





Diver follows pipes and cables through a passageway (top left). The mine is an enormous labyrinth of corridors and chambers; Diver and ladder in corridor of great height (top right); Diver at door built into a tunnel (right)

Diving

Willem and I placed our bail-out tanks at the water's edge, where we got our first glimpse of the water in the mine. "Wow! How clear it is," was my first thought, as we continued to get ready for the dive.

Willem and I would both be diving on rebreathers. We spent some time getting the rebreathers ready for diving and doing pre-dive checks. Today, I was diving with the Divesoft Liberty SM.

Once we entered the water and completed our S-drills, we descended

below the surface to begin our dive. The agreement was that we would do a dive of about 2.5 hours. After a few minutes, we arrived at a junction where several mine carts were strewn about, not knowing that they would never again move from their spots. It was a spacious corridor, but one had to be smart and not touch any of the carts in order to avoid a silt-out.

We followed the guide line, upon which we had to place a "cookie" between junctions. The water was cold at 8°C, so I had to turn on my heating apparatus. The water's vis-

ibility was extremely clear. There were pipes and cables everywhere, which once fed electricity to light bulbs throughout the mine.

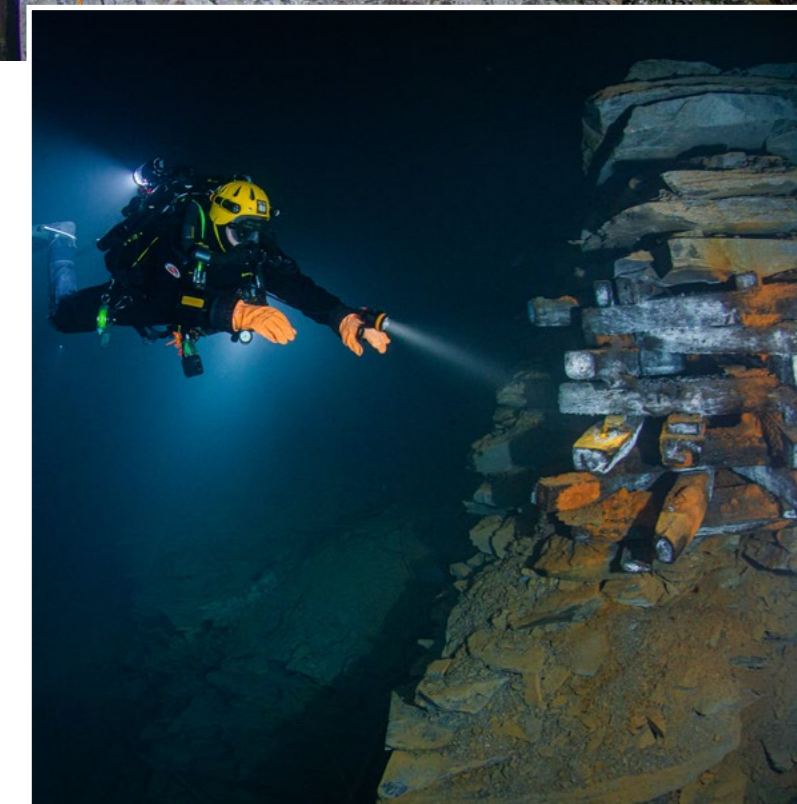
The main line was clearly visible throughout the mine, amongst all the stuff we came across. At each scene, Willem paused to take a photo. We had only just begun the dive and were already as giddy as

happy children.

I then followed Willem through a small passage, and we ended up in

Diver at gauge on pipe system





The walls of the mine appeared to be made by sawing rather than explosives (top left); Following the tracks through a passageway with crystal clear water (above)

a beautiful chamber as big as a house. The walls of this chamber were beautiful, which led me to suspect that they had been made by sawing and not with explosives.

It was an enormous maze of corridors and chambers, in which one could spend hours. The splendour of the past was shown to its best advantage here: the carriages, the rails... It gave one even more appreciation for the people who once worked here.

When we got back to the surface, after 2.5 hours of exploring, we had only seen the first part of the mine, but we were satisfied. Immediately afterwards, we were

already making plans to explore the deeper part of the mine.

How to dive the mine

The slate mine (Schieferbau Nuttlar) is open on weekends from April to mid-November. In winter, the mine is closed due to the hibernation of the bats. Reservation is compulsory. A maximum of 12 cave divers can enter per day, and a day ticket costs €69.

No cave diving certificate?

Would you like to go farther down into the mine but do not have a cave diving certification? Or do you doubt that cave diving is some-

thing for you? Here, you can still have a fantastic experience, under direct supervision.

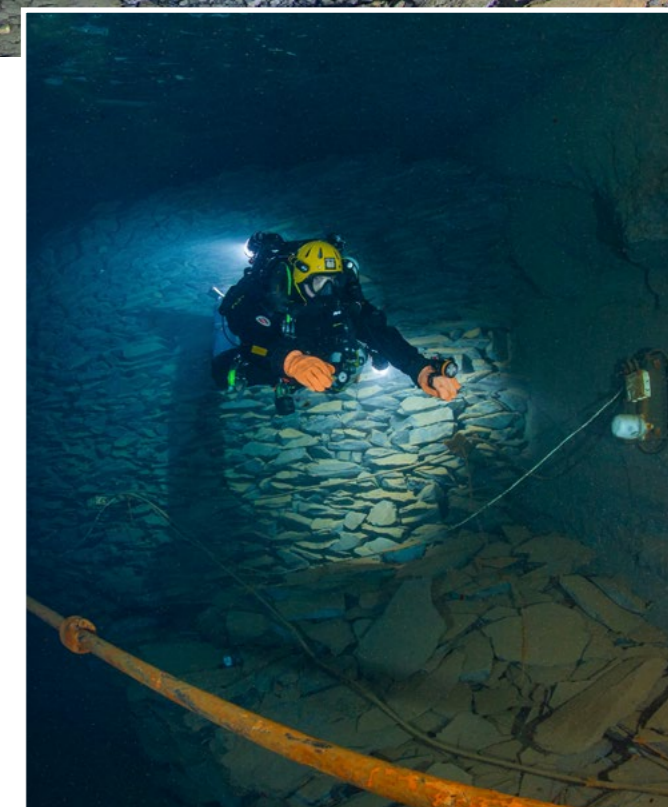
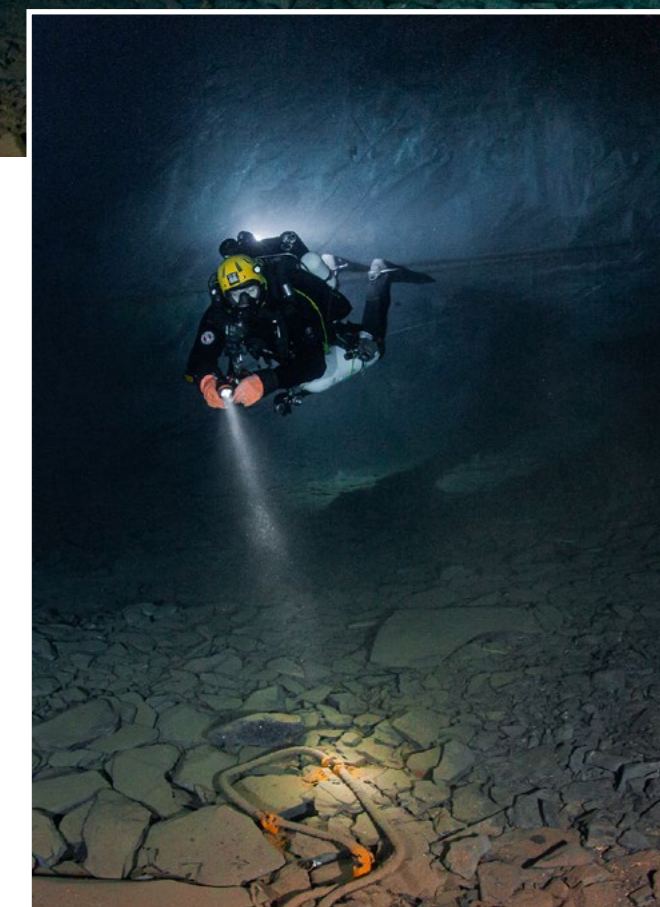
In a small group under strict guidance, you will be able to go farther—to places where there is no ascent possible. Floating above the rails, you can dive along passages with tubes, cables and old artefacts. The gas planning is conservative, but the experience is great!

There is a prerequisite for participation. You must have a basic technical diving foundation. This means that you must be able to dive with a double set, long hose and lights, but also that you have mastered all safety procedures,

such as gas sharing and valve turning. So, this dive is not for everyone, but it is an absolute must if you have the appropriate level of training and experience. You do not have to go to France or Mexico for your first unforgettable cave diving adventure! You can have one here.

Recreational divers without a cave diving certification can also enjoy this underwater world under supervision. You will be accompanied by an experienced cave diver from the dive school at Nuttlar. It is compulsory to dive with equipment that is suitable for cold water, i.e. separate breathing systems, a

Diver with stack slate slabs on top of lumber



ON THIS PAGE: Views inside the maze of tunnels in the mine. Divers without cave certification may explore the mine with a guide.

suitable suit, and some diving experience. There is no possibility of renting equipment on site. The cost is €69 per dive. Do not forget to bring your valid medical certificate, your dive certification card and valid dive insurance, which will be checked before you dive.

If you already have your cave diving certification, but you want to dive with a guide, this can be done with an extra fee of €50 per person, on top of the normal entrance fee. With this fee, you will get a guide who will conduct a dive with a maximum of three participants per group.

Non-diving tours

Don't want to dive but still want to visit the mine? This is possible in the form of a dry tour in the non-flooded part of the slate mine. A two-hour tour costs €23, a four-hour tour costs €33, and a seven-hour special tour for photographers costs €65. These prices include a small snack and a drink.

Accommodations

There are many options for overnight stays. One of the recommended hotels nearby is the Gasthof Sauerwald, which is only 3km away.

The address of the Nuttlar slate mine is Briloner Str. 48a, D-59909

Bestwig, Germany. From Brussels, it is a 3.5-hour drive. For more information, please visit: schieferbau-nuttlar.de. ■

A member of the Belgian military, Kurt Storms is an underwater photographer, cave explorer, and active technical cave and rebreather diving instructor for IANTD. He began diving in Egypt while on vacation and the passion never ended. He is also the founder and CEO of Descent Technical Diving, as well as one of the push-divers that documented the Laplet slate mine in Belgium for national television. For more information, visit: kurtstorms.com.

Image 2 (right):
Image 1 modified
with GAI, gener-
ating a realistic
extension of the
background

Text and images by Michael Rothschild

Artificial intelligence has been in the news lately, especially generative AI. It seems like every industry is trying to put this technology into their products, including image-processing apps. Michael Rothschild takes a closer look and gives examples in underwater photography.



Image 1 (above): Lake fish. Gear: Canon EOS 7D Mark II camera, Tamron 60 mm macro lens, Nauticam housing, dual Inon Z-330 strobes. Settings: ISO 200, f/11, 1/60s



Generative Fill

Artificial Intelligence in Underwater Photography

The idea of generative AI (GAI) is that a system can produce text, images or other media in response to original content and/or prompts (user-supplied instructions to modify the process). Public versions such as **ChatGPT** or **DALL-E** are available for online use by anyone. By working with a massive database, parsing the meaning of the prompts, and using a predictive model to figure out what word or other data ele-

ment is most likely to follow the last one, GAI systems produce impressive results.

There are serious legal and ethical concerns about this. While text GAI can generate flawless output from a purely linguistic point of view, the underlying meaning can be completely wrong or outdated. Furthermore, these systems typically work by harvesting online content, often without the consent of the original crea-

tors. These issues are beyond the scope of this article, and fortunately less applicable to the processes described below.

Postproduction

I am an underwater photographer. And while my work is dependent on my diving skills and ability to produce well-lit and composed images in the camera, a huge part of the process has always been post-

Image 3 (right): Topside beach photo taken with iPhone 12 Pro; Image 4 (below): Image 1 modified with GAI



production. More than most topside photographers, I spend hours dealing with the image degradation that comes from shooting through a dense medium that absorbs light far more than air, differentially for various points on the visible light spectrum, and with reflective particulate matter suspended in it. I consider that to be part of the art.

So, when Adobe released their beta version of Photoshop that contained a “generative fill” command, I figured I would see what this could do with underwater images. I was very impressed.



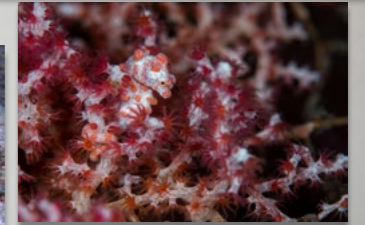
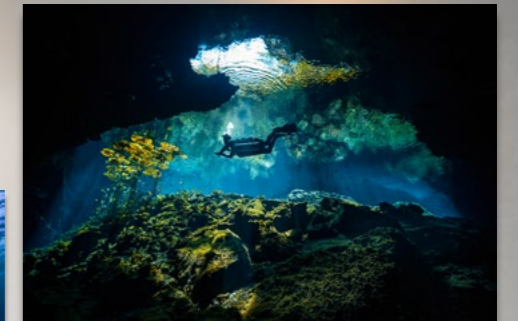
MALAYSIA'S ANNUAL UNDERWATER PHOTOGRAPHY COMPETITION



Malaysia International Dive Expo
7-9 JUNE 2024
Malaysia International Trade & Exhibition Centre (MITEC)

AMAZING PRIZES ARE UP FOR GRABS!

The **Hottest** and **Coolest** dive expo in Malaysia is bringing you prizes from the best dive destinations in Asia, the latest dive equipment, nifty photography gear and many more useful items you're gonna love.



PARTICIPATE NOW!

Register at www.lensbeyondocean.com

CLOSING DATE: 7TH MAY 2024

Backgrounds

One task that I had often done manually was the adding of extra background. This was necessary if you rotated a photo a small amount for the sake of composition, but you did not want to crop it further because that would make the subject too constrained or cut off. This was easy for small areas with bland backgrounds. If there was a lot of detail in the background, just using something like the clone tool made the image look obviously “faked,” so I worked out other approaches for this. But this only worked for very small areas around the margins. What if we wanted to dramatically increase the negative space? This seemed like a job for GAI, where the computer will actually produce high-resolution image detail based on the original image alone or alongside user-supplied prompts.

Topside. I first tried this without prompts on some topside photos. What you do here is take an image, enlarge the canvas, then select this empty space and a small amount of the origi-

nal image and apply the generative fill tool. A quicker way of doing this is to use the generative expand tool, which is now part of the crop tool dialogue box—you are essentially doing a reverse crop. You will get three versions to choose from each time you click. The image now fills the entire new canvas, based on what the computer finds at the margins of the selected space.

Image 3 is a topside photo that I loved, but it felt cramped, especially with the hand on the left side of the shot extending right to the border. I had tried expanding the background manually, but it took a lot of work and still did not look great. This was a perfect job for generative fill (Image 4).

Underwater. For underwater photos, I was able to do a similar manipulation, and I found an additional benefit. If your subject has a little negative space around it, and you only select background pixels of the original image, then you will get the effect of significantly increased water clarity (visibility). The reason for this is that you now have a

Image 5 (lower right): Diver on the wreck of the *Stolt Dagali*, New Jersey, USA. Gear: iPhone 14 Pro, Kraken Sports smartphone housing, dual Fix Neo 4030 DXII video lights; Image 6 (right): Image 5 modified with GAI

Generative Fill

Image 7 (right): The author snorkeling in a lake. Gear: Canon EOS 7D Mark II camera, Tamron 60mm macro lens, Nauticam housing, ambient light. Settings: ISO 200, f/11, 1/40s; Image 8 (below): Image 7 modified with GAI



high resolution image with more background and a relatively smaller subject. BUT, the original subject retains its resolution, detail and contrast.

If you had just backed up from the subject during the dive to produce an image with the same ratio of subject size to canvas size, you would be adding a lot more water between the subject and the lens. And unless you were in crystal-clear water with even ambient lighting (something that virtually never happens), the subject would be dimmer, less contrasty and with less detail due to the water column between the lens and the subject. With GAI, since you have retained the contrast and clarity of the subject, your brain interprets the image as being in much clearer water (Images 1 and 2 on the first page, and Images 5 and 6 on this page).

Horizons

The photos mentioned above show what you get if your subject does not extend to the edges of the original image. If it does, and it is cut at the border, then the system has to try to recreate something more complex than just background. Sometimes this is very accurate, as in this photo of me snorkeling (Images 7 and 8). See how the system has generated the bottom half of my body



underwater. For this one, I did a much larger fill, and the new image included a generated horizon. I did not “ask” for a horizon with a prompt, the system just figured out that a horizon would look right there based on probability and the underlying massive image database.

I am no longer snorkeling in a lake, a few feet off the dock, but apparently in the middle of the ocean! And, since the system is creating new, generated pixels, the resulting image is huge with a lot of zoomable detail



Image 9 (right): The author snorkeling in a lake. Video frame grab. Gear: Canon EOS 7D Mark II camera, Tokina 10-17mm fisheye lens (at 10mm), Nauticam housing, dual Fix Neo 4030 DXII video lights; Image 10 (above): Image 9 modified with GAI

and a sharp subject. This image was downsized for online use, but the large files are great for big prints.

Getting creative

Another approach is when there is enough detail in the margins for the system to “get creative,” and instead of just filling in drab negative space to give the impression of distance, it comes up with interesting possible environments. Image 9 is a selfie that I took while snorkeling under a dock in a lake with a lot of bottom grass. Image 10 is what GAI came up with.

Sometimes the system gets this right, and sometimes it makes guesses that are not what we would call accurate. For example, Image 11 (next page) is the original tight crop of the face of a



fish. My original attempt (with no prompts) resulted in the system guessing “wrong.” Even though a human recognizes this as a fish, the system has no real knowledge—it just makes assumptions based on a massive image database. For this photo, the closest match (used to generate the neck) looked more amphibian (Image 12, next page).

So, I decided to try giving the system a prompt for this photo, and suggested that it create a neck that looked like a snake. I also gave it more



NAUI REGIONAL MANAGER FOR CARIBBEAN TERRITORY

Andy’s appointment aims to strengthen NAUI’s mission of safe diving through education, expanding the association’s reach in the Caribbean, and building strong relationships with diving centers and business owners in the region.

Andy currently serves as the Regional Manager for the Florida Territory and will take on the added territory effective immediately.

[Full announcement](#)



Andy Olday
NAUI# 58352

NAUI REGIONAL MANAGER FOR CENTRAL & NORTHERN SOUTH AMERICA

Catalina Rodriguez has officially assumed the role of Regional Manager for Central and Northern South America, following in the footsteps of her father, Jorge Rodriguez (NAUI# 11062L).

Catalina is also a part of the Diversity Committee and aspires to reconnect the NAUI Latin American Community with the global NAUI Network.

[Full announcement](#)



Catalina Rodriguez
NAUI# 61085

NAUI REGIONAL MANAGER FOR SOUTHERN SOUTH AMERICA

We are pleased to announce the appointment of Dani Millikovsky as the Regional Manager for Southern South America, which includes the countries of Argentina, Bolivia, Chile, Paraguay, and Uruguay. This strategic appointment is part of our ongoing commitment to expand our global footprint and deliver exceptional dive safety through education programs!

[Full announcement](#)



Dani Millikovsky
NAUI# 30750



Image 11 (right): Lake fish. Gear: Canon EOS 7D Mark II camera, Tamron 60 mm macro lens, Nauticam housing, dual Inon Z-330 strobes. Settings: ISO 160, f/9, 1/50s; Image 12 (far right): The first modification with GAI to extend the neck of the fish produced an amphibian appearance; Image 13 (lower right): A second modification with "snake" in the prompt took it even further.



Image 14 (bottom left): Original "meh" photo of a fish; Image 15 (left): Image 14 modified with GAI, with "snake" in the prompt, creating a fantasy creature.



space on the right side of the frame, and it came up with an amazing but disturbing image (Image 13).

I am having a lot of fun with this, and these images were the result of just a few days of playing around with generative fill. I am continuing to work on this and figure out various ways of tweaking the output to get better results. These features are now out of beta testing, so if you have the current version of Adobe Photoshop, they are available for use, along with some helpful tutorials.

Is it cheating?

One final thing. I want to address a common question that I get when I lecture about post-production work on images. Is this "cheating"? Some photographers feel that any

sort of image manipulation is inappropriate, and that the photo is what comes out of the camera. I personally disagree.

We spend huge amounts of money on better and better technology to improve the quality of our images—high-end sensors, fast lenses, powerful strobes, etc. Why is technology used AFTER the shutter is pressed any different on principle? I am just trying to make the best images that I can, so how is cleaning up a shot by masking out a bit of backscatter off limits, while angling my strobes out to do the same thing is fair play?

The one exception I make is if the post-processing is done to deceive. For example, if someone is trying to sell a dive trip and they put a whale shark in the background of a reef shot—that is not right. Other than that,

my work is not done until I publish the photo.

Give this a try, you will be surprised how you can salvage many of your "meh" images with generative fill! ■

Michael Rothschild is a pediatric otolaryngologist (kidsent.com) in New York City and a technical rebreather diver. He has served as president and dive chair of the Big Apple Divers (bigappledivers.com), formerly the New York City Sea Gypsies, and as a medical moderator on Scubaboard. He is the co-director of the New York Underwater Photographic Society (bigappledivers.com/imaging), and he lectures on both underwater photography and ENT issues in diving at the Beneath the Sea expo.



WF095 Weefine Smart Focus torch, snoot & filter kit

This lightweight combination snoot kit with sleek design includes snoot lens, color filters and dive light. Designed specifically for underwater photographers, the Smart Focus 1200 torch, which has a brightness of 1200 lumens, 60-degree wide light beam and 21700 Li-ion battery, can be connected to the camera with a fiber optic cable, for use as an additional strobe/fill light or just as a focus light. With a runtime of 150 minutes and LED life of over 50,000 hours, it supports continuous shots, with a response time of up to 1/10,000 seconds. Weighing just 115g in water (including battery) and similar in size to a mobile phone, it is easy to carry and suitable for travel. Made of aircraft-grade aluminum with hard anodic oxidation coating and depth-rated to 100m (330ft), it has three strobe modes, stainless steel press-button control, battery level indicator, auto shut-off, and Weefine's new, patented strobe function. The housing for the WFA61 Snoot Lens and WFA62 Multicolor Filter & Snoot Unit is made of a stylish black aluminum alloy with hard oxidation treatment. An optional narrow snoot is sold separately. weefine.com



Inon D-200 strobe

Incorporating the latest features of the Z-330 strobe Type2, the D-200 Type2 is an optically triggered standard underwater strobe delivering Guide Number 20. Its newly designed high-performance fly-eye dome enables optimal even light distribution in its 110-degree beam angle underwater, without giving up strobe power. The D-200 offers high performance, multifunction and user-friendly handling, with minimal underwater weight. The unit includes Strobe Dome Filter SOFT, Strobe Light Shade and Reflective Sticker D/Z. inonuk.com

AOI UWL-03 wet lens

Providing a magnification of 0.73x and wider 140-degree view underwater, this wide-angle conversion lens is compatible with GoPro and most action cameras, as well as smartphones. With a body and lens hood made of black hard-anodized aluminum alloy, the internal lens elements comprise four glass elements and four groups with multiple layers of anti-reflective coating. Comes with a QR2 quick-release bayonet mount system, lens secure line, rear cap cover, neoprene dome cover and larger neoprene pouch for transport to protect its polycarbonate front dome element with hard coating. Depth-rated to 60m (200ft), it measures 99mm in diameter and 40.3mm in height, with a weight of 331g on land and 170g underwater. Optional easy-to-use, quick-release mount base for GoPro housings, or M55, M52, M46 thread adapters, sold separately. AOI-UW.com



Ikelite manual fiber optic transmitter

For dependable fiber optic triggering of a compatible fiber optic underwater strobe, use this compact, independently sealed device instead of the flash bulkhead. Supports high frame rate burst shooting when used with an Ikelite DS160, DS161, or DS230 Strobe and High Sensitivity Optical Converter #4405. Powered by two CR2032 lithium single-use or rechargeable batteries (not included), the transmitter has a built-in power save mode, lengthening battery life for at least a week of diving with average use. A spare set of batteries is recommended on trips. Compatible flash hot-



DJI Osmo Pocket 3 gimbal camera

For travelers, this compact and flexible gimbal camera will come in handy. It has a powerful 1-inch CMOS sensor with image quality optimization for reliable low-light performance, 2-inch full-color OLED rotatable touchscreen, full-pixel fast focusing, 4K/120fps, three-axis mechanical stabilization, intelligent features and fine-tuning for different skin tones. Its 10-bit D-Log M color mode records up to one billion colors, with ultra-high dynamic range for rich detail and full-spectrum visual experience, offering more flexibility in postproduction. It supports 10-bit HLG video recording, allowing for a higher dynamic range directly on HDR-enabled equipment. Other features include a new Product Showcase mode for quick focus on foreground/subject; multiple rotational speeds from ultra-responsive Default to Fast, to deal with more intense shaking; ActiveTrack 6.0, including new Face Auto-Detect and Dynamic Framing to shoot smooth, cinematic footage with one hand; built-in golden ratio composition; timecode function; and three-mic array, reducing wind noise and recording omnidirectional stereo sound. The camera supports USB Audio protocol and is DJI Mic 2 compatible for dual-person recording, with built-in Wi-Fi and Bluetooth mode. It is fast charging, with up to two hours of shooting, recording up to 116 minutes of 4K/60fps footage or up to 166 minutes of 1080p/24fps footage, supporting SpinShot, Motionlapse, digital zoom, and Panorama. dji.com

shoe is required for connection. Comes in handy for use with entry-level strobes with no electrical bulkhead. It can also be used with fiber optic cords to remove extra waterproof connections, or for disconnecting strobe cords underwater. Want to shoot split shots using natural light, without the weight of strobes, once you surface from a dive? Just disconnect your strobe arms, using the unique quick release mount, and hand the assembly to your dive boat's crew. ikelite.com



Alan Williams



P O R T F O L I O



Flying Fish, 120cm wide, by Alan Williams. Made from retired tools, car clutches, mechanical salvage, forged steel and copper sheet. The eye is made from a Victorian railway lamp. PREVIOUS PAGE: *Polypus*, 130cm wide, by Alan Williams. Made from 90% motorbike parts, 10% threaded bar and found objects.

Interview by G. Symes
All artwork by Alan Williams

Alan Williams, a British artist based in Brighton, creates astounding and intricate sculptures of marine life from found and upcycled metal objects. X-Ray Mag interviewed the artist to learn more about his creative process and perspectives.

X-RAY MAG: Tell us about yourself, your background and how you became an artist. Who or what has inspired you and your artwork and why?

AW: I have always had a fascination with the natural world, from the graceful beauty of birds and the spectacle of insects to the alien forms of nautical creatures.

As I grew up through the 1980s, my love for science-fiction and fantasy

art in film and books inspired my imagination. I loved the darkness of the work of H.R. Giger, and the illustrative cartoon fantasy art of Rodney Matthews, to name but a few.

Another big inspiration was the Art Nouveau movement of the early 20th century. I loved the stylised shapes and movement in the depictions of nature, which was later to heavily influence my work.



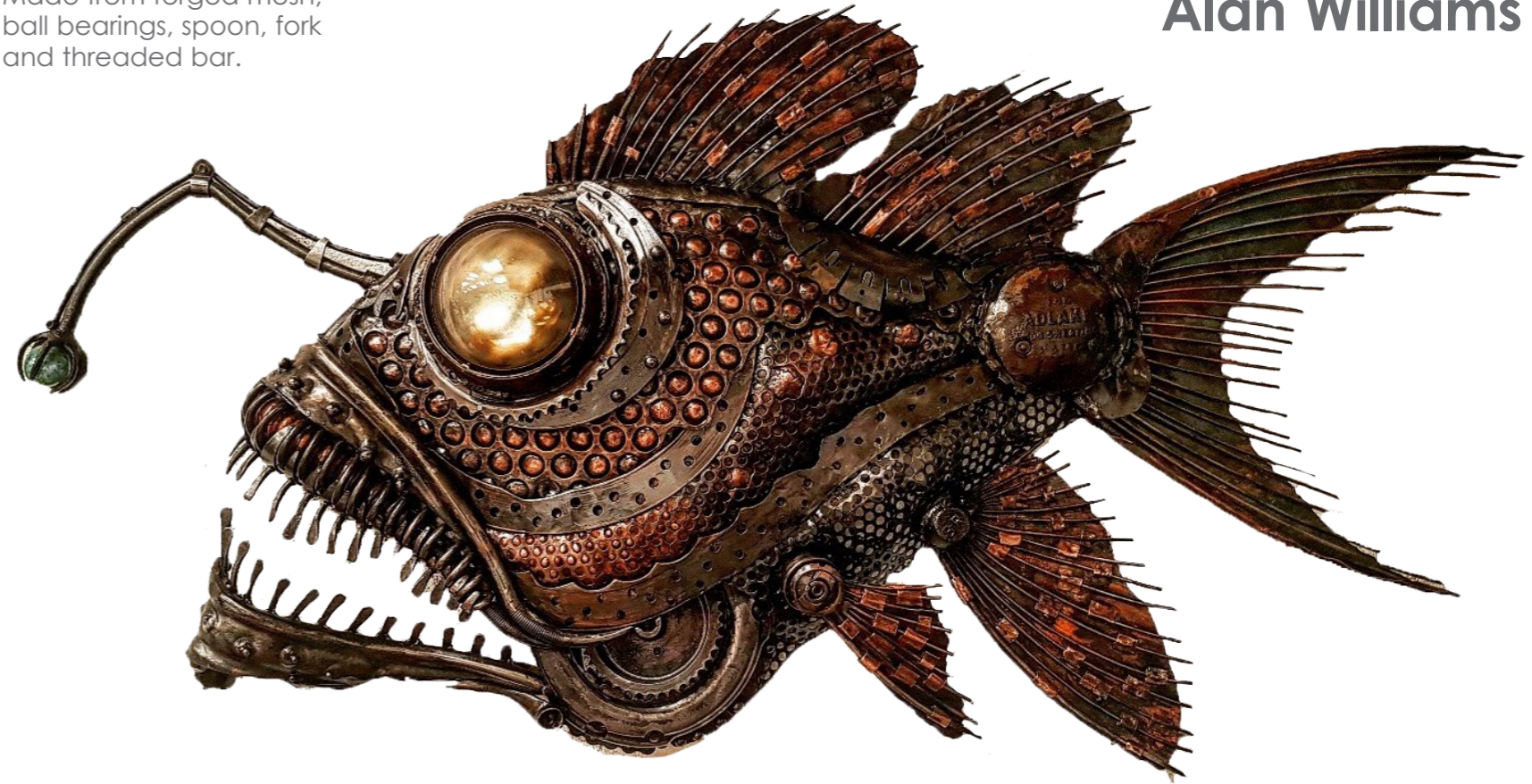
Squid, by Alan Williams. Made from found metal objects, steel mesh and copper sheet.





Hippocampus, 89cm high, by Alan Williams. Made from car clutches, retired tools, mechanical salvage, forged threaded bar, typewriter parts, bicycle and motorbike chain and gears.

Angler Fish (right), 137cm wide, by Alan Williams. Made from forged mesh, ball bearings, spoon, fork and threaded bar.

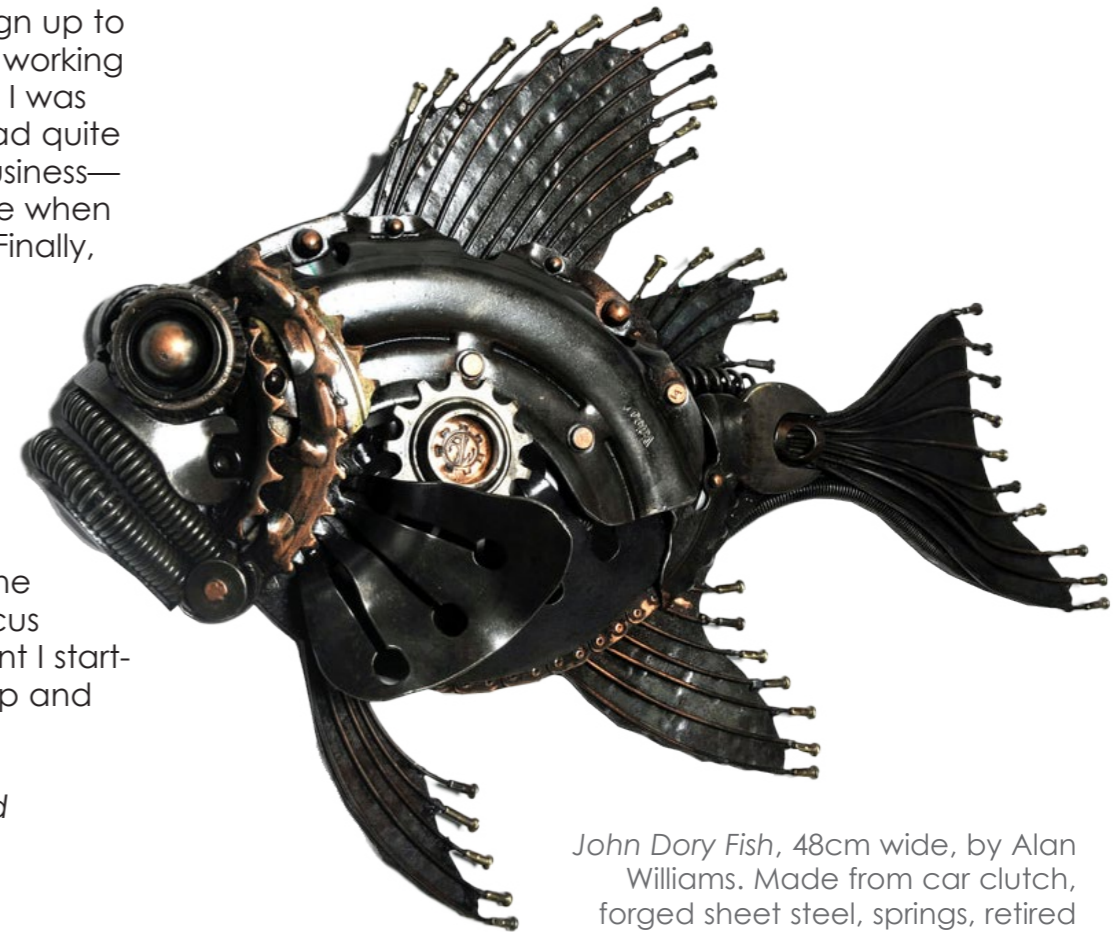


Alan Williams

I studied three-dimensional art and design up to degree level in college, with a focus on working with wood and metal. After graduating, I was desperate to get my own workshop. I had quite a few failed attempts at setting up in business—a learning experience I always reference when giving talks at colleges and universities. Finally, I began working with a blacksmith, and spent several years learning this ancient craft before getting certified by the Worshipful Company of Blacksmiths in London.

Alongside the more mundane metalwork jobs I had, I always kept my art going on the side. After seven years in the ironwork industry, I made the leap to focus on my artwork full-time. It was at this point I started to really refine my style, craftsmanship and the quality of the work I was producing.

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



John Dory Fish, 48cm wide, by Alan Williams. Made from car clutch, forged sheet steel, springs, retired tools, bicycle gears and spokes.

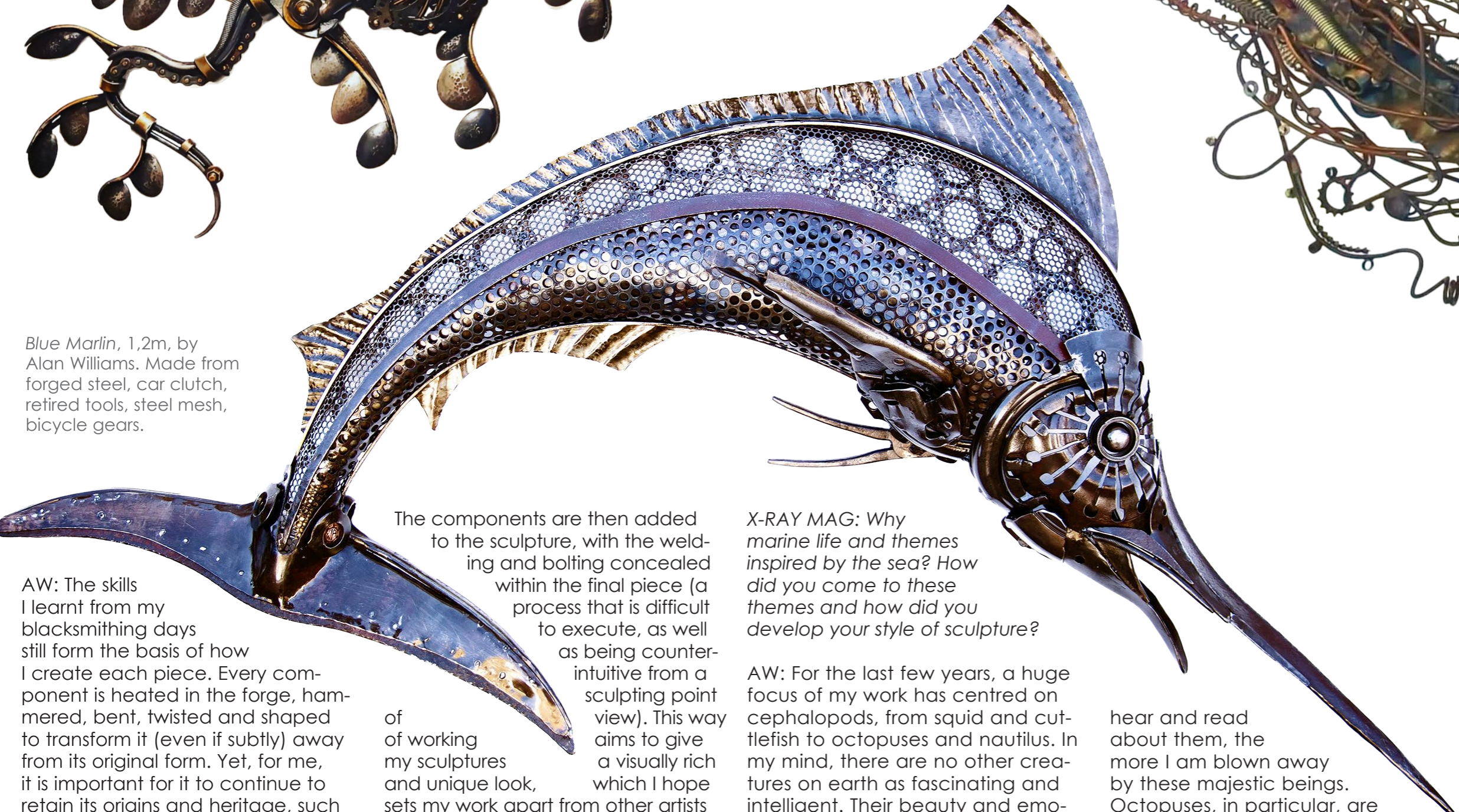


portfolio

Leafy Seadragon, by Alan Williams. Made from spoons, bicycle chain and found metal objects.



Blue Marlin, 1,2m, by Alan Williams. Made from forged steel, car clutch, retired tools, steel mesh, bicycle gears.



AW: The skills I learnt from my blacksmithing days still form the basis of how I create each piece. Every component is heated in the forge, hammered, bent, twisted and shaped to transform it (even if subtly) away from its original form. Yet, for me, it is important for it to continue to retain its origins and heritage, such as keeping the maker's marks, logos and branding visible.

The components are then added to the sculpture, with the welding and bolting concealed within the final piece (a process that is difficult to execute, as well as being counter-intuitive from a sculpting point view). This way aims to give a visually rich and unique look, which I hope sets my work apart from other artists working in this medium.

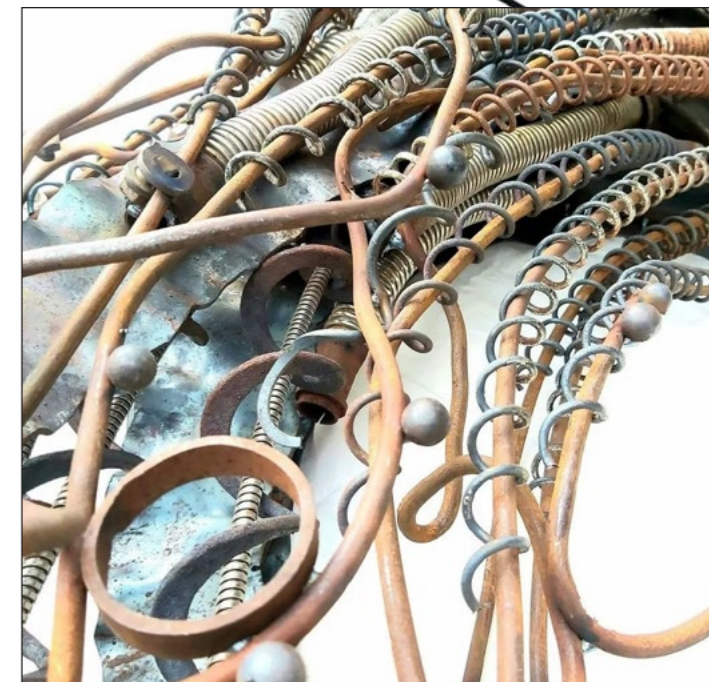
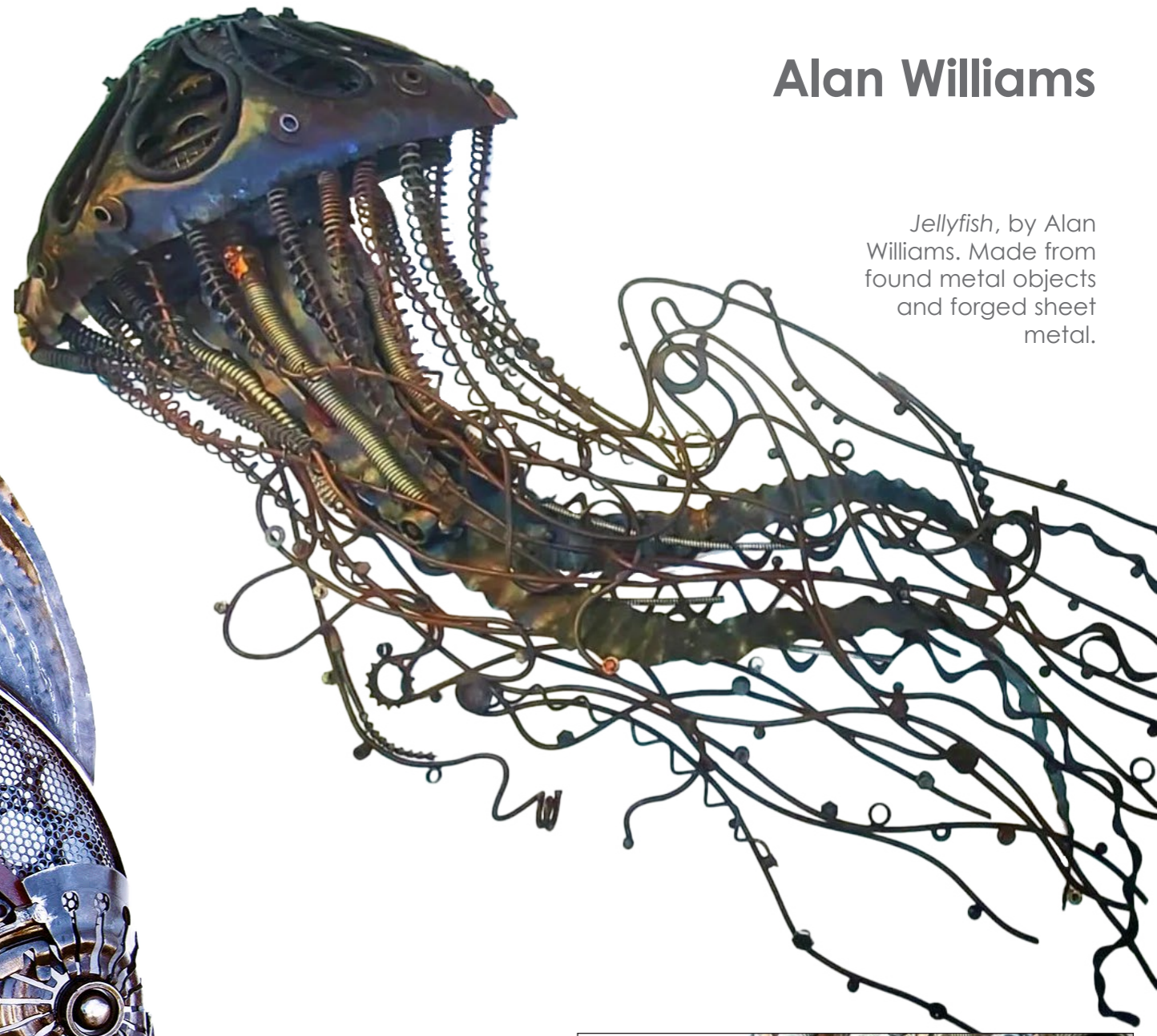
X-RAY MAG: Why marine life and themes inspired by the sea? How did you come to these themes and how did you develop your style of sculpture?

AW: For the last few years, a huge focus of my work has centred on cephalopods, from squid and cuttlefish to octopuses and nautilus. In my mind, there are no other creatures on earth as fascinating and intelligent. Their beauty and emotions are both hidden and visible at the same time. The more I see,

hear and read about them, the more I am blown away by these majestic beings. Octopuses, in particular, are a great source of inspiration. I would happily spend the rest of

Alan Williams

Jellyfish, by Alan Williams. Made from found metal objects and forged sheet metal.



Close-up detail of *Jellyfish*, by Alan Williams



Nautilus, 40cm wide, by Alan Williams. Made from car clutch, forged threaded bar, copper ribbed pipe and tube, motorbike and bicycle parts, plus a few nuts and bolts.



my days paying homage to them through my art.

X-RAY MAG: *In your relationship with reefs and the sea, where have you had your favourite experiences?*

AW: I have had several opportunities to explore the coral reefs, including those in Egypt and Thailand. Tragically, on one visit to the Surin Islands in 2014, the coral reef had been bleached by a rise in temperature. It was quite a devastating sight to behold. The reef looked like an underwater ghost town.

It was reported in 2019, however, that the coral was start-

ing to return. I hope that the vast numbers of schooling fish, turtles, sharks, rays and other aquatic visitors do too. I look forward to going back to see them again.

X-RAY MAG: *What are your thoughts on ocean conservation and coral reef management and how does your art-work relate to these issues?*

AW: I create my pieces from used, discarded and scrap metal. Reusing, recycling and issues around environmental sustainability are at the heart of my work. I feel that creating animal sculptures with these materials helps to deliver and



Seahorse, 70cm high, by Alan Williams. Made from car clutches, retired tools, mechanical salvage, forged threaded bar, typewriter parts, bicycle and motorbike chain and gears.



Close-up detail of *Seahorse*, by Alan Williams

Octopus, by Alan Williams. 80cm wide. Made from car clutches, retired tools, mechanical salvage, forged threaded bar, bicycle and motorbike sprockets, chain and gears.

emphasise the narrative about the preservation of the natural world. The elimination of pollution from our oceans and rivers is of the highest priority for us, as humans, in our attempts to reverse some of the damage we have imposed on our planet.

I find these materials inspiring for how they influence the design and aesthetic of a sculpture—from the repetitive, rhythmic shapes of cogs and

gears, which emulate the sinuous arms and suckers of an octopus, to the use of spoons and forks to create the different feather plumages on birds. Other materials I use in my creations range from bicycle chains, car clutches, mechanical salvage, retired tools—and anything else I can get my hands on and weld together. ■

To see a one-minute video of the artist at work on his sculpture, *The Making of an Octopus*, go to: [youtube.com/watch?v=iPNfyKcDsJE](https://www.youtube.com/watch?v=iPNfyKcDsJE).

For more information or to purchase artwork, please visit the artist's website at: alanwilliamsmetalartist.com. Or follow on **Facebook**, **Instagram** and **YouTube** @AlanWilliamsMetalArtist.



Leafy Seadragon, by Alan Williams. Made from retired tools, sheet metal and found metal objects.



Angler Fish, by Alan Williams. Made from forged mesh, ball bearings, spoon, fork and threaded bar.