



GLOBAL EDITION
July 2018
Number 86



Australia
Christmas Island

Macro in
Mozambique

Aircraft Wrecks
Gran Canaria

US Virgin Islands
St Croix

Scotland
**Islands
of Forth**

Ecology
**Japanese Giant
Salamanders**

PHILIPPINES

Dumaguete

COVER PHOTO BY WALT STEARNS

DIRECTORY

X-RAY MAG is published by AquaScope Media ApS
Copenhagen, Denmark

www.xray-mag.com

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

IN MEMORIAM
Michael Symes, Ph.D., Senior Editor
Barb Roy, Associate Editor

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

SECTION EDITORS
Scott Bennett - *Travel, Sharks*
Andrey Bizyukin, Ph.D. - *Features*
Larry Cohen - *Photo & Video*
Kelly LaClaire - *Marine Mammals*
Catherine GS Lim - *News, Books*
Roz Lunn - *Equipment News*
Michael Menduno - *Tech*
Ila France Porcher - *Sharks*
Don Silcock - *Photo & Video*

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

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

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

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

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

CONTRIBUTORS THIS ISSUE
Ingo Arndt
Scott Bennett
Rico Besserdich
Linda Cash
Glen Cowans
Udo Van Dongen
Mark Fitz
Justin Gilligan
Rob Hughe
Jennifer Idol
Leila Jeffreys
Kate Jonker
Sabine Kerkau
Catherine GS Lim
Rosemary E. Lunn
Simon Mallender
Mathieu Meur
Max Orchard
Mark Powell
Simon Pridmore
Andrew Scott
Don Silcock
Walt Stearns
Chris Surman
Gunild Symes
Peter Symes
Inger Vandyke
Frank Walsh
Lawson Wood

SUBSCRIPTION

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

COVER PHOTO: *Flamboyant cuttlefish, Dumaguete, Philippines*
Photo by Walt Stearns

contents

Glossodoris nudibranch at Blacks dive site, Ponta do Ouro, Mozambique. Photo by Kate Jonker



8
DEEP AIRCRAFT WRECKS
OF GRAN CANARIA
BY SABINE KERKAU

42
MACRO IN
MOZAMBIQUE
BY KATE JONKER

columns...

62
PFO: NOT THE
"HOLE" STORY
BY SIMON PRIDMORE

14
ISLANDS OF FORTH
SCOTLAND
BY LAWSON WOOD

53
CHRISTMAS ISLAND
AUSTRALIA
BY SIMONE MALLENDER

81
UW PHOTO & VIDEO:
BLACK & WHITE
BY RICO BESSERDICH

22
DIVING DUMAGUETE
IN THE PHILIPPINES
BY WALT STEARNS

66
ECOLOGY: JAPANESE
GIANT SALAMANDERS
BY DON SILCOCK

89
PORTFOLIO:
FRANK WALSH
BY GUNILD SYMES

32
ST. CROIX
US VIRGIN ISLANDS
BY JENNIFER IDOL

76
TECH TALK: THE EVOLUTION
OF DIVE PLANNING
BY MARK POWELL

plus...	
EDITORIAL	3
NEWS	4
WRECK RAP	8
EQUIPMENT NEWS	61
BOOKS & MEDIA	65
MARINE MAMMALS	70
SHARK TALES	71
NAUI NEWS	74
DAN NEWS	75
PHOTO NEWS	83

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



— In loving and grateful memory of Michael Charles Symes (1935-2018)

A tribute to great fathers

& inspirational

I am endlessly grateful to my late father for great many things. Not just for his loving and stimulating parenting early on but also for being instrumental in my later achievements, career and accomplishments. This magazine, for example, has his influence all over it as it is very much built around some millennia-old core values and quests he instilled in me from a very tender age.

Let me explain and cast some light on why the magazine has its specific content, editorial profile and aesthetics. I.e. why we always have art.

I grew up in a home stuffed with books—my dad's very select and carefully curated library, which he built over a lifetime. This collection represented a timeline from antiquity to science fiction and comprised math, physics and biology; philosophy and epistemology; history; art and culture; poetry and lots of significant literature and classical works. Those bookshelves reflected humanity's evolution, great achievements and growing insights over time.

While he held degrees in natural sciences, he was also very apt at drawing and watercolours, design and woodwork, cooking and photography, just to name a few—whatever he put his mind to. Once he had grasped a matter and understood it well, he moved on to some other intriguing subject.

From watching him, I learned what amazing powers of comprehension humans are endowed with and how to immerse oneself in the acquisition of knowledge and skills, to arrive at some deeper understanding of the "inner nature" of whatever subject matter was studied.

So in due course, I too became a

scientist and communicator.

As much as his immersions into scholarly matters filled much of his spare time and science was a corner stone of his universe, it was all but a part of a much greater picture.

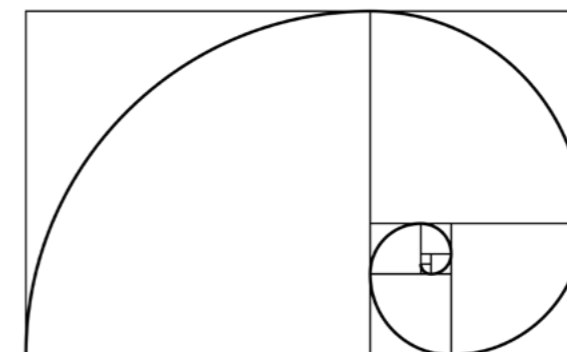
What he strived to understand on a deeper level was what it means to be human, and to be and feel alive. And he lived by that. So, in between his studies, he was also fond of good food, wine, music, travel and stimulating conversations, along with a good laugh. For him, life was to be enjoyed, and he sought and saw beauty in all its aspects and deeper connections everywhere—which we, at *X-Ray Mag*, now strive to communicate.

To name but a simple example of how math is connected to biology, photography and art—all regular elements in this magazine—consider the Fibonacci sequence of numbers. It is a series of numbers where a number is found by adding up the two numbers before it: 1, 1, 2, 3, 5, 8, 13, 21, 34 ... and so on.

A tiling with squares whose side lengths are successive Fibonacci numbers is shown above. By drawing arcs connecting the opposite corners of squares in the Fibonacci tiling we get the inscribed spiral—a curve we also find in the transected nautilus shell.

What's more, for every quarter turn, this spiral gets wider (or further from its origin) by a unique factor ϕ also known as the golden ratio (1.6180339887...)


This ratio, which the Ancient Greeks also called the "golden section" or "divine proportion", turns out to be a universal measure of beauty, and is widely used in composition in architec-



A B C
The squares making up the rectangle have side lengths 1, 1, 2, 3, 5, 8, 13, 21 and 34. How the length AB subdivides AC is the "golden section."

ture, paintings and sculptures as well as photography, including many images in this magazine. This ratio is even present in how this magazine is laid out.

I could go on and on about what my father called the beauty of mathematics—captivating examples are legion—

Watch a short (6:30) TED talk about the magic of Fibonacci numbers 

but some other time. In the grander scheme of things, my father saw the scientific method, rational thinking and level-headed objectivity as the only workable approach to solving present and future problems—just as it has already provided us with countless innovations and technological advances resulting in vast improvements in longevity and quality of life.

Research provides us with an informed basis upon which we can make clever decisions and find optimal solutions.

Moreover, he saw ongoing enlightenment as the (much needed) antidote to ignorance, incompetence and misinformation which seems on the rise.

As Neil deGrasse Tyson, the American astrophysicist, author, and science communicator points out: "A most important feature is the analysis of the information that comes your way. And that's what I don't see enough of in this world. There's a level of gullibility that leaves people susceptible to being taken advantage of. I see science literacy as kind of a vaccine against charlatans who would try to exploit your ignorance."

On the diminishing role of facts and analysis in public life, former US president Barack Obama just commented: "... a selective sorting of facts and evidence isn't just dishonest, but self-defeating to a society that has always worked best when reasoned debate and practical problem-solving thrive."

Getting facts right matters both for ourselves as individuals, for society and humanity—and the truth is out there and should always be embraced—if we are to build a better world, one that is democratic, enlightened, progressive, wise, just and compassionate.

As divers, travellers, photographers, foodies, etc., we seek out beauty, and experiences and adventures that enrich our lives. Knowing what lies below the surface (pun intended) not only enhances our appreciation but arms us with the necessary insights and awareness with which we can protect the environment for future generations.

Cheers, Dad, and thanks for everything. Enjoy your after-life Cheddar sandwich while I take my camera diving, hunting for patterns and shapes.

— Peter Symes
Publisher & Editor-in-Chief

Arenui
THE BOUTIQUE LIVEBOARD

PRISTINE CORAL REEFS ✓

PELAGICS FROM MANTAS TO MOLA ✓

MACRO FROM PYGMIES TO BLUE-RINGS ✓

RAJA AMPAT ✓

AMBON, MALUKU ✓

KOMODO & ALOR ✓

LUXURY CABINS ✓

MASSAGE & SPA ✓

5 STAR SERVICE ✓

WWW.THEARENUI.COM



News edited
by Peter Symes

from the deep
NEWS

Belize's Blue Hole no longer considered endangered

World heritage body, Unesco, has removed the Belize Barrier Reef from its list of endangered World Heritage Sites after nine years.

UNESCO's World Heritage committee has decided to remove Belize Barrier Reef from the list after the government of Belize enacted legislation to cease offshore oil exploration, praising the Central American country's "visionary plan to manage the coastline" and stating that "the level of conservation we hoped for has been achieved".

UNESCO's World Heritage committee

The Belize Barrier Reef Reserve System (BBRRS) is the second largest in the world after Australia's Great Barrier Reef. UNESCO added the reef to its

list of world heritage sites in 1996 but said it was in danger in 2009 following plans by the Belize government to allow oil exploration in nearby waters. Belize was urged to put safeguards in place to protect what Charles Darwin described as "the most remarkable reef in the West Indies". In 2017, the legislature imposed a moratorium on oil exploration

"The significant progress made by Belize is commendable, particularly the enactment of a moratorium on oil exploration and other petroleum operations within the entire maritime zone of Belize."

— UNESCO

tion in Belizean waters, which makes it one of only a handful of countries in the world with such legislation. The World Heritage site comprises seven protected areas: Bacalar Chico National Park and Marine Reserve, Half Moon Caye Natural Monument, South Water Caye Marine Reserve, Glover's Reef Marine Reserve, Laughing Bird Caye National Park and Sapodilla Cayes Marine Reserve. ■

SOURCE: UNESCO



USGS / PUBLIC DOMAIN

Belize's Blue Hole. UNESCO removes the Belize Barrier Reef Reserve System from the List of World Heritage in Danger

GULEN
Dive Resort

Pheriphylla

Nudibranch

Wrecks

All year around

www.gulendiveresort.com
post@gulendiveresort.com

Photo: Alex Dawson



Edited by Peter Symes

Diving is a kind of leisure activity we never really associate with Stone Age people



PXHERE / PUBLIC DOMAIN

Did Stone Age people swim and dive just for the fun of it?

One-third of the people living in an ancient village far from the sea developed a condition typically seen today in avid surfers and divers.

Surfer's ear is the common name for an *exostosis* or abnormal bone growth within the ear canal. Irritation from cold wind and water exposure causes the bone surrounding the ear canal to develop lumps of new bony growth, which constrict the ear canal. The condition is not limited to surfing and can occur in any activity with cold, wet, windy conditions such as windsurfing, kayaking, sailing, jet skiing, kitesurfing and diving.

So, how come nearly half the adult population in a Stone Age village in eastern Turkey, far from the ocean developed these bony growths indicative of frequent

exposure to cold water? Körtik Tepe is a site in eastern Turkey, which was first occupied between 12,400 and 11,250 years ago. This was a time of massive social change, when roaming hunter-gatherers first began living in permanent villages. Very little is known about the lives of those early villagers, other than that they continued to hunt and gather food—and ate entirely wild plants, animals and fish—rather than farming the land.

Near 50% had surfer's ear
Surfer's ear has been reported in ancient skeletons before but such a high prevalence is virtually unheard of, and it seems likely that the people at Körtik Tepe regularly dived in nearby cold rivers. Some scholars theorize that they did so perhaps because fish or other aquatic resources were an important part of their diet.

However, relatively few fish bones have been found at the site, and nitrogen levels in the human bones are not consistent with an aquatic diet.

Diving for leisure?

A team led by Yilmaz Erdal at Hacettepe University in Ankara speculates that the ancient people spent plenty of time in the chilly waters of nearby rivers to keep clean, or even simply for entertainment. Reuven Yeshurun at the University of Haifa, Israel, is also sceptical of the fishing idea as there is solid evidence for fishing as a dietary staple and does not see why the ancient villagers certainly could not have engaged in swimming and diving activities, which is a kind of leisure activity we never really associate with Stone Age people. ■

SOURCE: INTERNATIONAL JOURNAL OF OSTEOARCHAEOLOGY

The Philippine Department of Tourism presents



ANILAO UNDERWATER SHOOTOUT



Photo by Cem Gazivekili

Over **US\$50,000** in prizes!

Get ready to dive and shoot the underwater beauty of Anilao, Mabini, Batangas, Philippines
November 27 - December 1, 2018

Contact the Office of Product & Market Development-Dive at
info@anilaoshootout.ph
phdiveteam@gmail.com

www.anilaoshootout.ph



DIVE PHILIPPINES



DAUIN PHOTO COMPETITION

28th Oct - 2nd Nov, 2018 | Dauin, Philippines

Tropical Diving Package

Euro 950 (based on double occupancy)

Sono inclusi:

- 9 nights in AZURE dive resort with private balcony or terrace
- Roundtrip A/C airport transfers (Dumaguete Airport - Azure resort)
- Half board meals (breakfast, lunch or dinner)
- Daily complimentary bottled water in room
- Scheduled day dives with boat, tanks, weights, and dive master
- Marine sanctuary fees
- Hotel and government taxes
- Wi-Fi

Exclusions:

- Airport taxes, Gratuities, gear rental, drinks (juices, shakes, and spirits)

Optional Add-ons:

- Nitrox – Euro 4.50 per tank
- Additional dive – Euro 23
- Extended night – Euro 89 per person (1 night, half board meals, 2 dives, Marine park fees)
Based on double occupancy

Note: During the DAUIN photo shoot competition, no single occupancy due to limited rooms availability



IPAH VIOLET BETH



YUPING ISABELLA

PHOTO WORKSHOP

Learn tips and tricks from wide angle to macro photography by MTOL

PRESENTATIONS

Portfolios by MTOL from wide angle to macro

EQUIPMENT

Learn and share how MTOL puts equipment into action

COMPETITION CRITERIA

Understanding the judging criteria before hand



In March 2018, Diveheart Borneo was launched, with the support of Premier Marine Scuba Center. The Diveheart Adaptive Buddy Diver Training program (left) in Kuching, Malaysia, was the first of its kind in the Borneo region.



Diveheart Malaysia making waves and expanding

Diveheart Malaysia has been making waves since the organization started regular, monthly, in-pool scuba training programs for persons with disabilities (PWD) trained by Diveheart Ambassador and founder and director of Kids Scuba Malaysia, Syed Abd Rahman, who worked closely with the rehabilitation unit for spinal cord injury (SCI) patients of the University Malaya Medical Center (UMMC) in Kuala Lumpur.

After months of intensive underwater therapy training involving the sport of scuba diving, the first batch of four SCI patients from UMMC graduated as PADI scuba divers on Tioman Island in Pahang in October 2016, with the assistance of

Kids Scuba Diveheart volunteers and Jim Elliot, president and founder of Diveheart, who flew in from Chicago to conduct Diveheart training and oversee the PWD open water dives.

It all started in 2012, when Rahman met Elliot for the first time at the Diving Equipment and Marketing Association (DEMA) show in Orlando, Florida, to discuss an interest in scuba training for persons with disabilities in Malaysia. Four years later, in March 2016, Elliot was invited to Malaysia by Rahman and the late Charles Rowe. Rahman and Rowe hosted Elliot and Tinamarie Hernandez, Executive Director of Diveheart. The two conducted a Diveheart Scuba Experience in Kuala Lumpur with some individuals with disabilities in a swimming pool environment, assisted by Rowe and dive professionals from Kids Scuba.

Milestones

Since 2016, the Malaysia International

Dive Expo (MIDE) has extended its full support to Diveheart Malaysia, and the organization has been featured in the last three years at the annual show, which is held at the Putra World Trade Center in Kuala Lumpur (read more about MIDE 2018 on page 87). At this year's MIDE, Diveheart SCI PWD divers from UMMC were recognized and invited to come up onto the stage to share their scuba diving experiences as persons with disabilities, becoming role models for the local disabled community in expressing their Diveheart message: "Imagine the Possibilities!"

In August 2017, Diveheart Malaysia was invited to train a team of dive professionals from the University Malaysia Terengganu (UMT), a marine research university in the east coast region of the country, for the Diveheart Adaptive Diver Buddy Course. UMT then became the first university in Malaysia to have a qualified Diveheart Adaptive Diver Buddy (ADB)



Team.

When Rahman visited the Diveheart world headquarters in Chicago in November 2017, Kids Scuba was recognized as a Diveheart 5-Star Dive Center

Diveheart Ambassador and founder of Kids Scuba Malaysia, Syed Abd Rahman, with PWD PADI scuba diver Riza Faisal (top center); and with president and founder of Diveheart, Jim Elliot (left) at the DEMA Show in Orlando, Florida, USA in 2012

in acknowledgement of its generous support and dedication to the Diveheart mission in enhancing the lives of individuals with disabilities through the sport of scuba diving, and for its excellence in providing high quality adaptive diver training in Malaysia. This was truly an achievement for a dive center in Asia, supporting water therapy and underwater sports involving scuba diving.

In December 2017, Diveheart Malaysia and Kids Scuba Dive Team Malaysia, led by Rahman, went to world-reknown Sipadan Island in Sabah to conduct the Diveheart Open Water Diving Program. One of the organization's graduates, PWD PADI scuba diver Riza Faisal, enjoyed the beautiful dives of Mabul and Sipadan Islands, assisted by many Diveheart volunteers and dive professionals of Borneo Divers Mabul Resort. Faisal

Diveheart Malaysia and Kids Scuba Dive Team Malaysia, led by Rahman, went to world-renowned Sipadan Island, assisted by Diveheart volunteers and dive professionals from Borneo Divers Mabul Resort (right); Diveheart Malaysia was invited to train a team of dive professionals at the University of Malaysia Terengganu (below and lower left). UMT then became the first university in Malaysia to have a qualified Diveheart Adaptive Diver Buddy Team.



said it was “truly an amazing, awesome underwater zero-gravity experience”.

Another milestone saw Diveheart Borneo in Malaysia launched in March 2018, with the support of Premier Marine Scuba Center, a PADI dive center in Kuching, Sarawak, led by Ernest C Teo. During the Diveheart Adaptive Buddy Diver Training Program, six scuba divers who are medical professionals and rehabilitation physiotherapists from the Kuching General Hospital were trained by Rahman as Diveheart Adaptive Dive Buddies. The Diveheart Adaptive Buddy Diver Training program in Kuching was the first of its kind in the Borneo region.

through scuba diving, scuba therapy and affiliated activities. The program strives to instill the “can do” spirit in participants, to inspire them to take on challenges which



About Diveheart

Diveheart is an organization that was started in Chicago, USA, with the objective to help build confidence, self-esteem and independence in the lives of children, adults and veterans with disabilities



they might not have considered before. Using the zero gravity of the underwater environment as well as the adventure paradigm, the organization helps participants believe that if they can scuba dive, they can do anything.

Diveheart is a non-profit organization, whose slogan is “Imagine the Possibilities”, aims is to provide and support educational scuba diving programs that are open to any child, adult or veteran with a disability, in

the hope of providing both physical and psychological therapeutic value to that individual. The organization works with individuals who have diverse disabilities, including physical and developmental disabilities, vision and hearing impairments, amputations, post traumatic stress disorder, traumatic brain injuries, and more. With the program, participants have discovered “the forgiving, weightless wonder of the water column, which provides the perfect gravity-free environment for those who might otherwise struggle on land”.

Sponsors and support

Diveheart activities are driven by dive agencies and volunteers, facilitated by dedicated dive centers, and funded by sponsors and caring friends. The PADI Asia Pacific office in Sydney, Australia, extended PADI scholarships to the selected PWD Diveheart candidates from the UMMC to be certified as PADI scuba divers, trained under the direct supervision of Rahman of Kids Scuba.

For the specialized scuba training involving persons with disabilities, the Diveheart programs provide supplemental instructions, guidelines and protocol to handle people with disabilities such as visual-impaired, hearing-impaired, amputee, paraplegic and quadriplegic individuals. One of the ADB participants in Borneo, Ms. Caroline said, “The program made us realize how brave and challenging it can be to dive with these special abilities and that good team work is needed.”

For those who are interested in being trained as an Adaptive Diver Buddy or a Diveheart volunteer, please contact Kids Scuba PADI 5-Star Dive Center located at Tropicana Kajang Heights Recreational Hub, about 30 min-

utes from Kuala Lumpur, or telephone Syed Abd Rahman at +6019-3176705 or email at: syed.rahman@diveheart.org. Diveheart volunteers are not necessarily required to be scuba divers, as there are many areas both in and out of the water in which they can be of assistance. ■

Boat dive MANIA

Your Buddies love boat diving!

Go crazy during Boat Dive Mania! Especially for those who absolutely can't get enough of boat diving. Book one of our boat dive packages and get 6 boat dives free*!

More info on www.buddydive.com/boatdivemaniam

International Reservations: +599 717 5080
 Call Toll Free US/Canada 1-866-GO-BUDDY
WWW.BUDDYDIVE.COM/BOATDIVEMANIA
*ONLY VALID AT BUDDY DIVE RESORT BONAIRE. TRAVEL PERIOD 1 - 30 SEPTEMBER, 2018



Technical diver on one of the several deep aircraft wrecks resting on the sea floor around Gran Canaria in the Canary Islands

Text and photos by Sabine Kerkau

For over a year, I had been looking forward to a very special expedition that was planned for May 2014. But as you know, life does not always go the way you plan. The expedition was postponed, and once again, I had to find an alternative, at relatively short notice.

After getting some interesting offers in March 2014, I met a rebreather diver from Gran Canaria at the Dive and Travel Show in Madrid. He suggested that I come to Gran Canaria for wreck diving. At first, I was not particularly interested, because I really wanted to do some nice wreck dives, and the Canary Islands were not necessarily known for their wealth of wrecks. I had been to Lanzarote a few times, but I had never seen any interesting wrecks there. On the



Deep Aircraft Wrecks of Gran Canaria

contrary, I was told again and again that there were no wrecks anywhere on the Canary Islands.

When I mentioned this to my Canarian

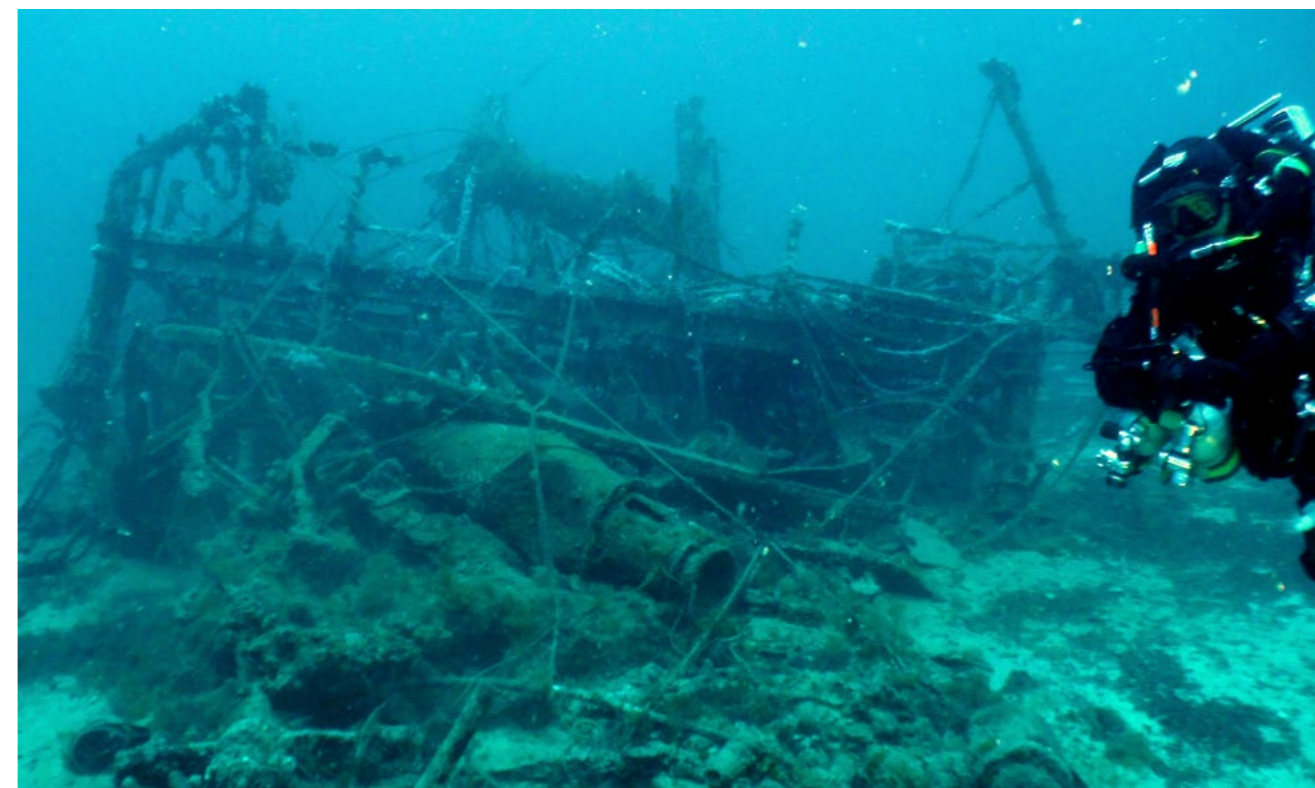
friend, he just laughed. "Come and see what we have! You will not regret it."

Over the next few weeks, he kept sending me links to videos of some offshore

wrecks, which his dive group had taken. Among them was a video of an airplane wreck, a Douglas C-47. The wreck looked really interesting, and supposedly, there

were even more aircraft wrecks. This was certainly not an everyday occurrence, and I decided to fly to Gran Canaria for a wreck dive.





Douglas C47 wreck (above) off the harbor of Puerto Escala, Gran Canaria; Lead Wreck (right)



Diving and tech support

The starting point for our dives was the beach of Puerto Rico. Puerto Rico is located south of Gran Canaria and is thus, most months of the year, quite sheltered from the wind. This, and the fact that the majority of the wrecks can be reached within 15 to 20 minutes by RIB, made it possible to dive a wreck almost every day.

The wrecks, which are approached from Puerto Rico, lie in depth ranges between 60 and 65m. For rebreather divers, 3-liter bottles were provided for diluent and oxygen and bailout bottles. As a diluent, there was usually a trimix 10/50. Bailout mixtures were trimix 18/38, nitrox

50 and 100% oxygen. Team bailout was not permitted.

Our basic times were between 25 and 35 minutes, with the total dive time mostly in the range of 90 minutes. We dived in buddy teams. There were no fixed lines at the wrecks. We used the anchor rope as our ascent and descent line. Under the boat hung four decompression lines to a depth of about 16m. When all the divers were on these lines, the anchor was hoisted, and we drifted with the current.

The support and help we received at the base and on the boat were unique. The loading and unloading of the boat was done by the base team. They even

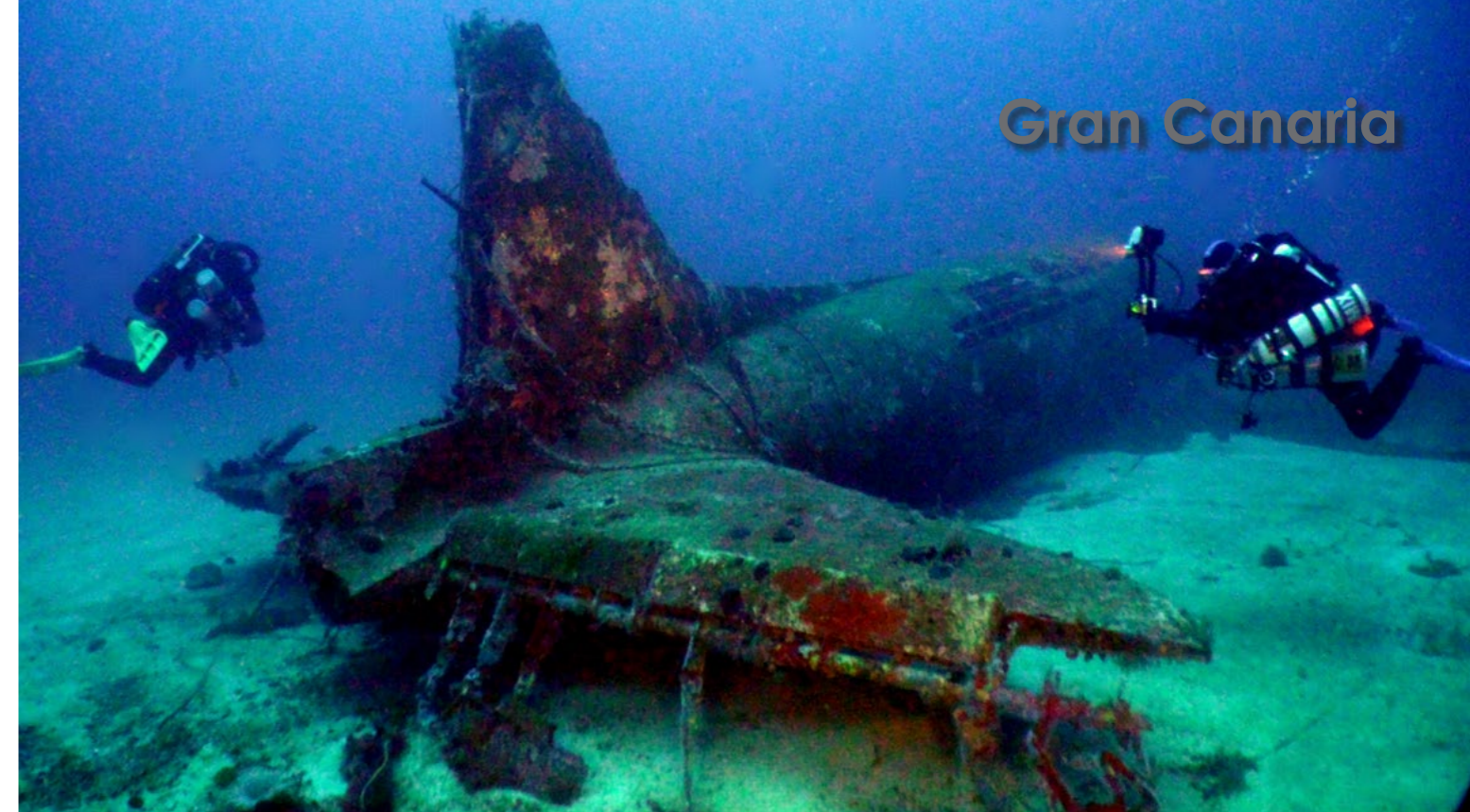
carried my rebreather to the boat and back. Over the week we spent diving, we felt like friends—not like customers on a base. And that is exactly what our host wanted.

Douglas C-47

Location. The Douglas is about five nautical miles off the harbor of Puerto Escala. By boat, the trip to the dive site takes about 15 minutes. The maximum depth is 65m.

History. On 2 October 1973, the Douglas

took off at 10:10 a.m. from the Las Palmas airport for a test flight. At an altitude of 4,500 feet, the engines were to be tested. The pilot switched off all engines one after the other and started them again. After a few attempts, the left engine could no longer be ignited. The pilot, Tomas Adin, decided to make an emergency landing on the water. The landing took place at 11:00 a.m. off the coast of Arguineguín. The crew of the Douglas—consisting of the pilot, co-pilot, mechanic and radio operator—survived the ditching. They were brought ashore-



Gran Canaria

THIS PAGE: Wreck of the Douglas C-47 airplane that rests off the harbor of Puerto Escala, Gran Canaria

re by fishermen. The plane stayed on the surface for about 10 minutes before it sank.

Diving. Depending on where the anchor was placed, we floated on the descent, directly over the old machine. The visibility was very good, so the wreck could be admired as a whole. First, I got the impression that the Douglas was just parked on the bottom of the sea. It seemed almost completely intact. Only when I looked closely could I see that the nose of the aircraft and the cockpit were dented. On the hull, some of the outer surface panels were missing. This made for interesting lighting conditions inside the machine. The hatches were open, and it was safe to enter the wreck.



The Douglas was not a big wreck. Nevertheless, there was much to discover. We made two dives there, in impressive light and visibility conditions.

Texan T-6

Location. The Texan wreck lies at 63m. It is rarely dived because it lies in the channel between Gran Canaria and Tenerife.

There are often very strong current and high waves. The journey takes about 45 minutes.

History. On 30 September 1974, Captain Antonio Conde Lorenzo undertook a training flight with Commander Martinez. They started at 9:15 a.m. from Gando



Airport, along with two other T-6s. There was radio contact between the pilot and flight control. After completing their exercises at 4,500 feet, the plane made

a right turn, lost altitude and crashed into the sea for unknown reasons. Captain Lorenzo died in the crash. Commander Martinez survived and swam to shore.





Diver (above) and moray eel (left) on Texan T-6 wreck (right); PIO 12 wreck (top right)

PIO 12

Location. The PIO 12 was probably a high sea trawler. The wreck lies at 65m depth. The dive site can be reached by inflatable boat within 10 minutes.

Diving. At first, we did not notice much about the wreck on our dive, because it was completely enclosed by a huge school of fish. The wreck itself was pretty much destroyed, but it was still worth the dive. There were countless moray eels living on this wreck.

Since the PIO 12 is not often dived, many details about it are yet to be discovered.

The Lead Wreck

Nobody knows the true name of this wreck, not even when and why it went down. It was given the name "Lead Wreck" because when it was discovered by our dive guide, Dirk, the wreck was overhung, layer upon layer, with nets. Dirk said he collected about 500 to 600kg of

lead weights that had hung on the nets, which he salvaged from the wreckage.

Location. This wreck is located about 15 minutes from the port at a depth of about 60m.

Diving. The hull was almost completely disintegrated. Nevertheless, there were many details to admire: big winches, masts with crow's nests and much more. The most impressive thing for me was a huge amphora, completely undamaged and unopened, lying between the remains of the wreckage. It was a very interesting dive with good light and visibility.

Afterthoughts

Gran Canaria has more submerged wrecks on other shores. Many of these wrecks can only be dived in favorable wind conditions. But it is not easy to find a dive operation that services these dive sites. Unfortunately, the owner of the base with whom we worked together has since passed on the management of the dive operation. ■



Sabine Kerkau is a German technical diver, dive writer and underwater photographer based in Switzerland. For more information, please visit: Sabine-Kerkau.com.

See a video about the wrecks we dived at: <https://vimeo.com/96911469>.



Fairey Swordfish seen in flight in 2012



TONY HISGETT / WIKIMEDIA COMMONS / CC BY 2.0

WWII torpedo bomber found off Malta

Tests of an autonomous underwater vehicle off Malta uncovers the wreck of a Fairey Swordfish—a legendary WWII medium-sized biplane torpedo bomber and reconnaissance aircraft.

Despite being already considered obsolescent at the outbreak of the conflict in 1939 the biplane was nonetheless in frontline service throughout the Second World War and achieved some spectacular successes such as sinking one battleship and damaging two others of the Regia Marina (the Italian Navy) during the Battle of Taranto in 1940, and its role in the sinking of the German battleship *Bismarck* in 1941.

The Swordfish also flew a high level of anti-shipping sorties in the Mediterranean, many aircraft being based at Malta. While there were never more than a total of 27 Swordfish aircraft stationed on the island at a time, the type succeeded in sinking an average of 50,000 tons of enemy shipping per month across a nine-month period. The recorded Swordfish losses were low, especially in relation to the high sortie rate of the aircraft and in light of the fact that many

aircraft lacked any blind-flying equipment, making night flying even more hazardous.

Robots with AI

The discovery of the wreck was part of a long-term project by Chris Clark and colleagues at Harvey Mudd College in California to bring robotics to archaeology. His team has developed computer systems that use artificial intelligence (AI) to help better analyse images of the sea floor, as well as algorithms to improve the search and navigation of a target area.

During the second world war, Malta was an important Allied base and was heavily bombed by Axis forces, resulting in many planes and ships sinking to the

bottom of the Mediterranean Sea. This makes it a hotspot for wrecks and the perfect testing ground for underwater autonomous vehicles. "It is dangerous and time-consuming to send divers to look for wrecks, so obviously, we need to get robots down there," said Clark.

The team found the bomber in 2017, but as there are plenty of people who are interested in finding sunken treasure, the discovery has been kept under wraps. The team is currently in discussions about making it a protected site and until then, they will not reveal its location for fear of treasure seekers stealing parts of the plane. "It is a piece of history," said Clark. ■ SOURCE: NEW SCIENTIST



US NAVY / WIKIMEDIA COMMONS / PUBLIC DOMAIN

Historical photo of Swordfish taking off from HMS Ark Royal

New artificial reefs under way in British Columbia

The Artificial Reef Society of British Columbia (ARSBC) is pleased to announce the sinking of the first of four surplus vessels as an artificial reef in Powell River, BC. The sinking of YOGN-82 took place on Saturday, 23 June, between 11:00 and 12:00 noon.

The ARSBC, which has sunk more ships and aircraft than any other non-profit group in the world to create marine habitat, has worked and consulted with Catalyst Paper for the sinking of the first vessel. In addition to the letters of endorsement from the Tla'amin Nation (Sliammon), the Regional District of Powell River and the City of Powell River, approvals were granted by the responsible federal government agencies.

The breakwater vessels are all American Second World War surplus, which were purchased over time by the mill. Constructed from cast reinforced concrete, they have survived afloat and have been part of Powell River's seascape acting as a breakwater system protecting the mill's log pond and foreshore. Ranging from 109 to 128m long, and weighing between 6,000 to 8,000 tons, these historic relics are the last of their kind afloat anywhere in the world. Consequently, this project has the potential to become a significant dive tourism attraction for the city of Powell River.



PHOTO COURTESY OF ARSBC

USS YOGN 82, which will be sunk by ARSBC, was a US Navy tanker barge.

Four vessels sunk

ARSBC President Howie Robins believes this exciting new project will build on the organization's successful record of accomplishment of converting ships into productive long-term reef habitat. "This will be the most unique and creative marine habitat project ever undertaken by our Society.

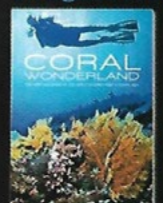


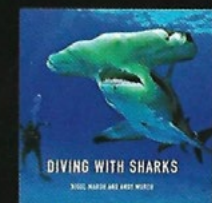
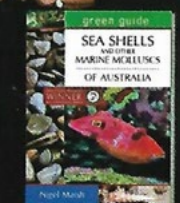
The challenge will be to place up to four of these large vessels in a group formation at variable depths ranging from 25-35 meters. Divers of all skill levels seek novelty, and this will be a dive back into maritime history for adventure divers worldwide" said Mr. Robins.

■ SOURCE: ARSBC

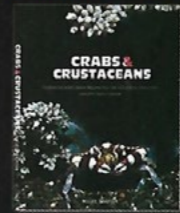
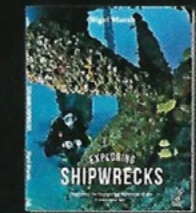

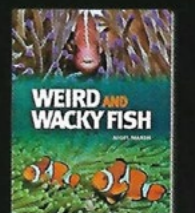
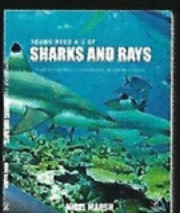
NIGEL MARSH PHOTOGRAPHY


Nigel Marsh is an Australian photojournalist, underwater photographer and author. Working with New Holland Publishers, Nigel has produced a number of guide books for divers and snorkellers, and also a series of children's books with marine related themes.

Dive guide books

Children's books



AVAILABLE IN BOOK SHOPS AND ON-LINE

www.nigelmarshphotography.com





The Wreck Preservation Ale has been described as "dark, malty, and stormy with hints of blackcurrant and spices"

Beer recreated from yeast found on 220-year-old shipwreck

Australian brewery recreates the world's oldest beer using 220-year-old yeast discovered in the depths of Sydney Cove—Australia's oldest merchant shipwreck.

In a groundbreaking partnership between the Queen Victoria Museum and Art Gallery, the Australian Wine Research Institute and James Squire Brewery, the world's oldest beer has been resurrected. The beer, appropriately named, The Wreck – Preservation Ale, will go on sale for a limited time only in June.

The Sydney Cove left Calcutta, India, in 1796 for a fledgling penal colony in Sydney, Australia—but before it could reach its final destination, the ship sank. It was not discovered until 200 years later when a team of amateur divers stumbled upon the long lost wreck. Ceramics, leather shoes, cannons and anchors were brought to the surface, but the greatest treasure was found inside sealed glass bottles.

Oldest bottled alcohol

Twenty-two of those vessels remained sealed, contents untouched, according to the Queen Victoria Museum and Art Gallery, which keeps the artifacts in its permanent collection. In 1993, experts from the Australian Wine Re-



JAMES SQUIRE BREWERY

search Institute took samples from some of the sealed bottles and determined they were grapes, port wine and beer, making it the world's oldest bottled alcohol on record. The secure corkage and cool ocean temperatures had preserved the contents, and this one-of-a-kind find was carefully stored at the Queen Victoria Museum and Art Gallery in Launceston.

Now, 20 years later, brewers are hoping to bring some of this old beer back to life using some of the yeast found on the ship.

"I thought we might be able to culture yeast and recreate a beer that hasn't been on the planet for 220 years," David Thurrowgood, museum conservator and chemist, said in a statement.

Rare strain

To resurrect this 18th-century beverage,

the team re-examined the contents of the bottles and isolated the yeast. Analysis of the genetic make-up revealed that it was a rare hybrid strain worlds away from the types used to make modern beer.

Taming this historic yeast wasn't easy, according to brewer Stu Korch. "Particular care has been taken to extract and grow this yeast into a brew that enhances its unique characteristics." But, through a process of trial and error, the impossible was achieved.

Dark and stormy

"After a lot of different recipes, we decided it was perfect for a porter style," said Haydon Morgan, the brewery's head brewer. The Wreck Preservation Ale has been described as "dark, malty, and stormy with hints of blackcurrant and spices". ■

SOURCE: JAMES SQUIRE BREWERY



MUSEUM SOUTHEAST DENMARK

500-year-old wreck uncovered in Denmark

An excavation for a new apartment complex and underground parking in the town of Køge, about 45km south of Copenhagen, uncovered a surprisingly well preserved 500-year-old shipwreck, which is one of the biggest clinker-built vessels from that era.

The team of archaeologists is excited because it is a rare find, and the ship has already provided several surprises in regards to unusual design features. The vessel is estimated to have been about 16m long and 7m wide.

The ship, which is one of the largest clinker-built ships of the time in Denmark, is built of massive oak planks, which are very well-preserved with remains of wood and iron rivets, caulking and ropes, museum inspector Annemette Kjærgaard, Museum Southeast Denmark, wrote in a press release.



MUSEUM SOUTHEAST DENMARK

It is very unusual to find timber which is so well preserved that it is even possible to see tooling marks, explained excavation coordinator Jeppe Færch-Jensen.

The bottom of the ship hasn't been uncovered yet, but it is here the archaeologists expect to find the reason as to why the ship foundered. ■



Islands of Forth

Text and photos
by Lawson Wood

— *Wreck Diving in the Scottish Estuary*





Diver on wreck in the Firth of Forth (above); Lighthouse on the Isle of May (right); Large dahlia anemone on rocky reef (far right). PREVIOUS PAGE: Lobster on dead men's fingers

The entrance to the Firth of Forth, an estuary in southeast Scotland, is guarded by a number of islands, the two largest and most popular for diving being the Isle of May or May Isle, 7km (4.5 miles) from Crail in Fife and the Bass Rock, or The Bass, located 2km (1.2 miles) offshore and 5km (3.1 miles) northeast of North Berwick in East Lothian. Both rocky islands are usually visited on a day dive trip in which divers can enjoy three dives amidst some of the most spectacular coastal scenery in the British Isles.

The other principal islands are Inchkeith, Inchmickery, Inchgarvie, Inchcolm, Alloa Inch and Tullibody Inch.

Although May Isle is only 57 hectares, it has been a National Nature Reserve since 1956 and is internationally important for its seabird and seal colonies. This small island has over 200,000 breeding seabirds, as well as over 90,000 puffins; the island is honeycombed with their burrows. Both islands are National Nature Reserves with the Bass Rock being world famous for its resident population of gannets (*Sula bassana*) named after this rocky stack.

This is the largest "single rock" colony of northern gannets in the world. Seals inhabit her small caves during the breeding season, but these are usually itinerant visitors from nearby May Isle. Large numbers of grey seals (*Halichoerus grypus*) make the Isle of May their home. During the summer months, most are found



lounging on the shallow coastal rocks just southwest of the island. They have their pups in October and November, and it is these youngsters that are the most curi-

ous and make for the best interactions during dives.

May Isle

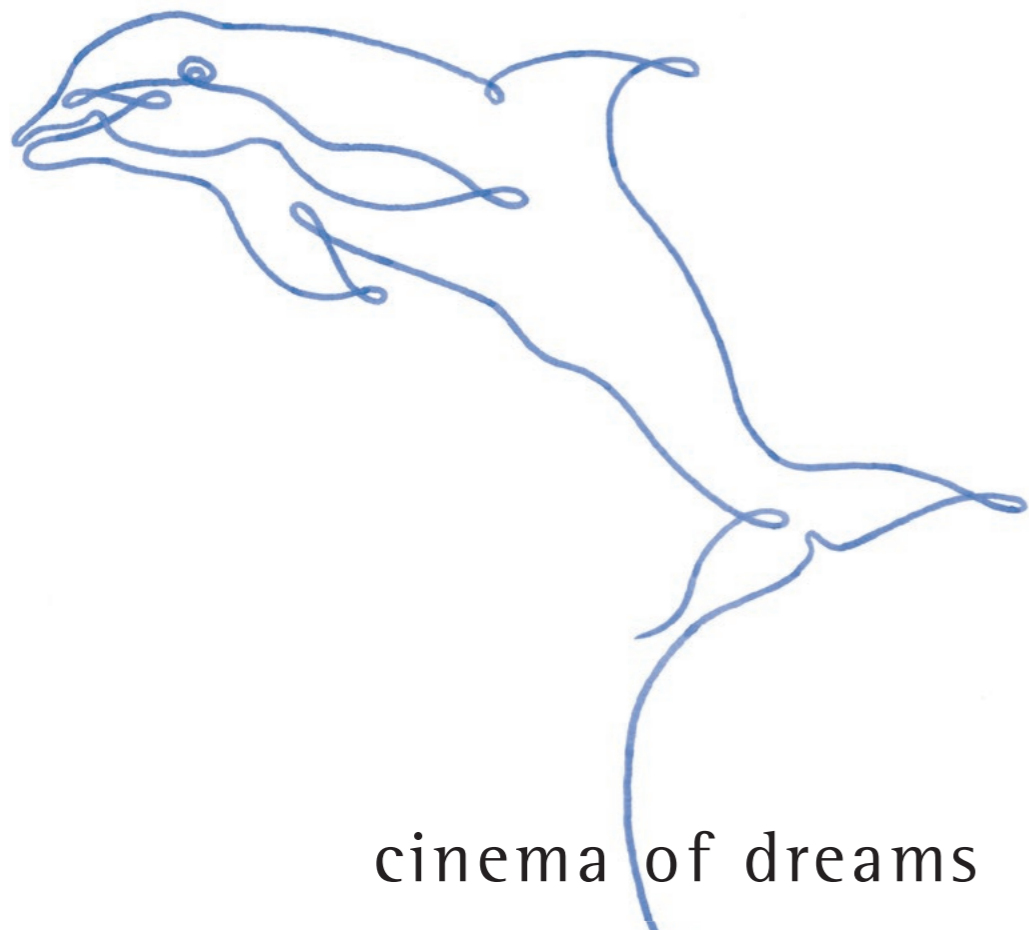
May Isle in the north has a number of shipwreck remains, with one of the most popular wrecks being the *Anlaby*, which

is found nearby the Altarstones (high water) landing on the western side of the island.

Anlaby wreck. This former British iron screw steamer weighed 717 tons and ran aground on 23 August 1873 in thick fog,

SEACAM

silver



cinema of dreams



www.seacam.com



Scotland

whilst carrying a cargo of coal from Leith to Danzig. Parts of her bows can still be found in 5m (17ft) and the rest of the wreckage stretches down to the bottom of a rocky scree slope, which tumbles down from a small vertical wall to around 18m (60ft) where the muddy sand slope stretches off into the depths.

The four-blade prop, shaft, rudder and much of the stern is still fairly intact, despite being actively salvaged in 1880 when her hull was blown up to get at the engines. These sections of the stern still reach over 3m above the rocky seabed, and the wreckage inevitably has lots of juvenile fish around the periphery.

Bollards, various ribs and steel plates are littered around the slope, but it is fairly small and your interest in the wreck is soon overtaken by the fact that there are always



Artifacts (bottom) and dead men's fingers (top) found on a wreck in the Firth of Forth





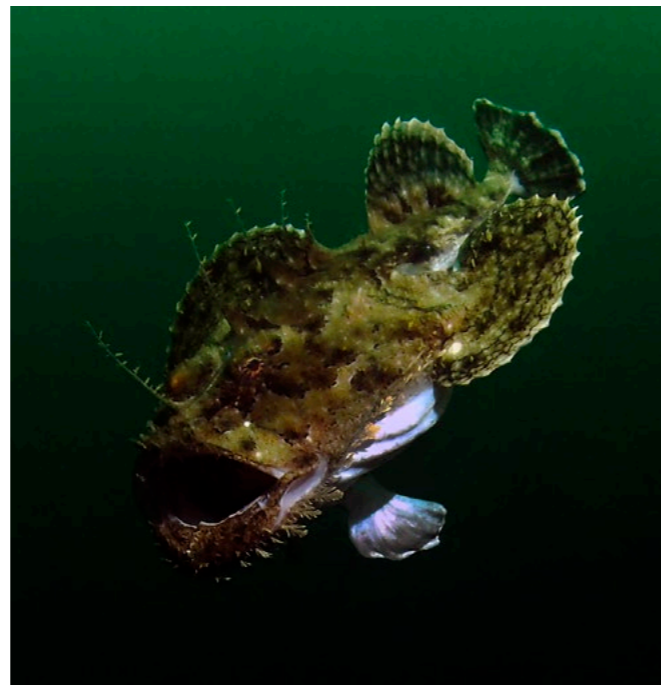
Grey seal (above) and the odd-looking *Lophius piscatorius* anglerfish with its wide mouth (left and below), can be found in the Firth of Forth.

fooled by their camouflage; when prey gets within range, they open their mouths rapidly and food gets sucked into in!

As your time and air run out, you can ascend to the mini wall, which has long-clawed squat lobsters, tunicates and various types of anemone. This is an easy dive with little or no current and in usually good visibility as the island is so far out to sea.

Seals. A second, shallow dive with the seals is always popular and during the summer months the young "yearlings" soon approach you, frolicking all around. You can approach them as they sunbathe on the rocks,

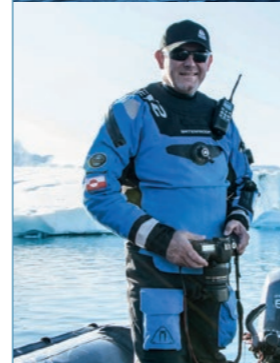
and the shallow waters to the south of the island have numerous gullies to allow you to have some amazing interactions. Many divers actually prefer to snorkel with the seals as without the associated



EX2

THE EXPEDITION DIVING SUIT

A COMPLETELY NEW INVENTION FOR UNDERWATER PHOTOGRAPHERS, DIVE GUIDES, EXPEDITION LEADERS OR ANYONE WHO NEEDS BREATHABILITY, MOVABILITY, LOW WEIGHT AND SEVERAL OTHER FEATURES.



THE EX2 BACKGROUND STORY

"I developed this suit for myself. It is a completely new kind of suit, designed with only one purpose in mind - to make me perform at my best as an underwater photographer. Its outstanding movability, breathability and flexibility creates a feeling of not wearing a dive suit at all. In fact, I put the suit on in the morning and take it off in the evening and the whole day I am ready to jump into the water to take the picture of my life. All the details on this suit derive from specific needs. Pockets for all my photo gadgets, a radio and microphone holder to keep in contact with wildlife spotters or guides and a pee zipper for speedy relief. The low weight and compact packing volume makes it easy to carry anywhere at any time"

- Goran Ehlme Underwater photographer and head of Waterproof R&D

www.waterproof.eu





aground in 1902 and then finally sunk around 300 metres east of the southern tip of the island in 30m (100ft). The wreck is well broken up, although her boiler, steam engine, mooring bollards and bows are still obvious, as is the stern, with her propeller rising vertically up from the seabed. This is very popular with divers as the wreckage is quite contained in a small area, allowing you to explore the site within your safe bottom time.

Bass Rock

Formed over 350 million years ago, the Bass Rock is 107m (351ft) at its highest point and is fairly circular in shape. This huge trachyte plug has sheer vertical walls on three sides and a massive tunnel that cuts the rock as it slopes more gently towards the south where a low promontory has the remains of a castle, which dates back to 1405. Still owned privately by Sir

noise and exhaust bubbles underwater, snorkelers are able to approach the seals much more closely. There are shipwreck parts scattered amidst the kelp in the shallows around the southeast corner, which

you cannot fail to be impressed with when you are hanging out with the inquisitive seals. **Primrose wreck.** Another popular wreck is the *Primrose*. This steam powered trawler ran



THIS PAGE: Divers and details on the wrecks found in the Firth of Forth in southeastern Scotland



Hew Hamilton-Dalrymple, whose family has been in possession of the island since 1706. This volcanic plug is all that remains of an ancient volcano, and you can dive around all of its sides. There is a scree slope to the edge of the western cavern, with a more muddy bottom to the east. With the huge numbers of seabirds found on the rock, the visibility can be variable due to the large amounts of guano dropping from the sky above. Whilst gannets are the predominant lodger, you can also find shags; kittiwakes; razorbills; seagulls, guillemots and even puffins, which have travelled down from their nesting burrows on the Isle of May. The Bass is visited each day by hundreds of tourists from May to September, but it is visited rarely by divers.

Most dives are done on an ebbing tide. You start your dive in the west, and keeping the wall

on your right-hand side, allow the gentle current to help propel you along to the northern side of the rock. Regarded as one of the top three cliff dives in the United Kingdom, and one of the top 12 wildlife wonders of the world, it is a simple dive plan. Drop to your desired depth and just follow the near vertical wall around until it is time to come up!

As you approach the other side of the Bass Rock, you will come to an area of slack water where the current diverges and then will start to push against you. It is usually at this point that you will finish your dive.

The rock strata are quite evident, and there are nearly horizontal clefts all around the cliff face. But take care as you turn the northern corner, as the ridges now start to drop down at a steeper angle, and if you follow the ridges, you can find yourself dropping below a safe diving limit



for your time underwater.

Diving this site regularly, I keep seeing the same critters, particularly one old lobster, which is dark blue and mottled with grey algae. It does have a nice hole on the wall to hide in, but it appears

NOMAD LS

35 LBS OF LIFT
ADJUSTABLE BUNGEE SYSTEM
SUPERFABRIC ARMORED OUTER PANEL
DELUXE STYLE ONE-SIZE-FITS-ALL HARNESS
REMOVABLE LOW PROFILE BUTTPLATE

DIVE RITE
EQUIPMENT FOR BEACHES & BOATS
www.DIVERITE.com

PHOTO COURTESY OF MICHAEL HIGBY



View of Bass Rock from dive boat (above); Lighthouse on Bass Rock (left); Aerial view of Bass Rock (top left)





to spend its time wandering around, amidst the dead men's fingers and plumose anemones. Curious volcanic outcroppings are covered in a dwarf species of the plumose anemones (*Metridium senile*) in both a white and orange form. Ballan wrasse (*Labrus bergylta*), velvet swimming crabs, small spider crabs, gobies and blennies are all over the place. What never ceases to amaze me is that these species of marine life, which are usually found on the sea floor, appear to be quite happy on a rugged vertical cliff. Adaptation to the environment is always a revelation.

Various species of nudibranch are found all over too—from the largest *Dendronotus*, which feed on dead men's fingers, to the smallest *Eubranchus*, which lives on delicate hydroids, the Bass is a wonderland for nudibranch spotters.

There are number of small islands in the same group as the Bass, including Craigleith, Lamb, Fidra and Eyebroughy.

They are much shallower and more in-shore. Visibility is generally not as good, but nonetheless excellent for spotting marine life.

Dive boats venture out from North Berwick, Anstruther, St. Abbs and Eyemouth. Independent clubs are able to launch

ribs at a number of sites, and navigation is pretty easy as both islands are so prominent on the skyline. The trips from Eyemouth have a travel time of around 1.5 hours, leaving around 8:00 a.m. and returning around 6:00 p.m. Daily expeditions are three-tank dive trips, including

Lobster (above); Bass Rock (top left); Plumrose anemone and dead men's fingers (right)



a couple of dives at the Isle of May and, with correct timing of the tides, a dive at the Bass on the way back. If you are lucky and have air left, a fourth dive at Fast Castle may be on the cards.

Gannets

The gannet (*Sula bassana*) is the United Kingdom's largest seabird, with a wingspan of just under 2m (6ft). Living in the largest gannetry in the world, they have been recorded to travel 540km (330 miles) in their search for food and are quite often found off the coast of Norway. With a skull as strong as a crash helmet, the gannet can hit the water at speeds of 90mph, which actually stuns the fish making it easier to feed. The 150,000 or so birds on the Bass Rock will consume over 200 tons of fish each day, hence their distant foraging expeditions, which can last over 30 hours, leaving their mates to guard the nest.

Leaving the Bass around October, gannets are known to over-winter in the Mediterranean, even as far south as the Gulf of Guinea on the Equator. Returning in the spring, they all lay their eggs during a short period of time in May. Fiercely independent,

the nests are packed tightly together, just at the edge of pecking distance and are in the region of three nests per metre. The young gain weight rapidly on their fishy diet and will voluntarily plunge off the cliffs into the sea in September before the worst of the winter storms kick in (hopefully learning to fly on the way down). Over 75 percent of the new chicks will die before they can gain their independence.

Final thoughts

If you are planning on diving along the southeast of Scotland, it is Eyemouth and St. Abbs that usually come at the top of the list, but put aside time for the local dive companies and take the day trip to the Isle of May and the Bass Rock for a greater appreciation of the great diversity of diving that is available in such a small area. ■

Lawson Wood is a widely published underwater photographer and author of many dive guides and books.



Location of the Firth of Forth in Scotland on map of United Kingdom (below)



For more information, please visit: lawsonwood.com.



Numbering around 150,000, gannets roost on Bass Rock (above and top left); Grey seal in Firth of Forth (top right)



Diving
Dumaguete
in the Philippines

Text and photos by Walt Stearns





Dumaguete sits down close to the southern tip of Negros Island in the middle of Visayas Island group in the Philippines, approximately 500km south of Manila. A coastal province, it is bounded on the east by the Bohol Sea and the Tañon Strait, which serve as a natural border to the neighboring provinces of Cebu, Bohol and Siquijor. The main city, which goes by the same name, is situated on the plains of the southeastern coast of Negros Island near the mouth of the Banica River. **Dumaguete, for the most part, is a university town, home to a number of institutions of higher learning.**

Dumaguete seems to follow only two seasonal changes: dry and wet. June through September is the Philippines' monsoon season, and as you might expect, conditions are warm and humid. April and May are actually the hottest time period, with average maximum temperatures that can reach 34.3°C. The better time to visit is the dry season, from November through May, when average air temperatures are between 25 and 30°C, with December to February down to an average of 22.9°C.

I traveled to Dumaguete from Puerto Galera. Because there is no direct site-to-site travel, the transfer required me to go back to Manila in reverse order of how I got to Puerto Galera: a 45-minute boat ride back to Batangas, followed



by a two- to three-hour drive to Manila's international airport in order to catch a one-hour flight to Dumaguete. Once there, I was met by representatives of Atlantis Dive Resort, loaded in their custom air-conditioned jeepney (a Philippine ostentatious-styled bus used for local transportation) and was whisked off to the resort.



Resort's larger banca (above) used for day trips to Apo Island; Anthias and damselfish (top left) hover above some of the hard corals at Apo Island; The rich tropical landscaping around the Atlantis Dumaguete Resort (top right) makes for an inviting scenic backdrop during your stay; Atlantis Dumaguete Resort's own private, air-conditioned jeepney used for shuttling guests to and from the airport as well as on their whale shark trips to Oslob on neighboring Cebu Island. PREVIOUS PAGE: Clown frogfish (*Antennarius maculatus*) or juvenile warty frogfish



Dumaguete

Puerto Galera property, I found that I was more enamored with the Dumaguete Resort. While the accommodations appeared to be just as roomy and similarly appointed, the ambiance here struck me as both more secluded and inviting. In addition to the ground's tropical landscaping being particularly lush and more thought out, there was the simple little fact this resort was not in the middle of a tightly-packed community like Sabang Beach.

During my four-night stay, I was placed in one of the Deluxe Rooms on the second floor with a veranda type balcony with an attractive view of the grounds. The one group of rooms with an even nicer view

The resort

The Atlantis Dive Resort in Dumaguete offers 40 guest rooms and suites, with one group spread out in a semi-circular fashion around a large freshwater pool, and the second group closer to the beach, which is also where the restaurant is located.

In the months before my arrival, the Dumaguete property had recently undergone some significant renovations. Upgrades included the addition of a spa facility similar to the one in their Puerto Galera Resort, but slightly larger with four private therapy rooms. The services are top notch, much like what you would see in a high-end spa in the United States, but at significantly lower prices. The facility offers a wide range of therapeutic and relaxing services, along with a sauna and rain shower area to complement your therapy.

Having just come from the



Restaurant (above) at Atlantis Dive Resort (top left)

ATLANTIS
Philippines
DIVE RESORTS & LIVEABOARDS

ATLANTIS AZORES

*Arrive as a guest,
leave as a friend...*

reservations@atlantishotel.com
WWW.ATLANTISHOTEL.COM





Dumaguete

area sits beneath a giant open-air thatch roof, but with one singular difference: the view. Instead of a freshwater pool to one side and pedestrian walkway on the other, the entire dining area and bar sits on the edge of the beach overlooking the ocean. The resort's kitchen uses fresh local fruits and meats to create a range of local and international dishes. Rather than follow a monotonous à la carte menu system, lunch and dinner dishes are changed daily and posted on a large blackboard.

Camera room

If you are very serious about underwater photography, a resort's camera room can be a really big deal. In Puerto Galera, I was quite satisfied with their camera room setup. Arriving in Dumaguete, I was able to see that the owners took it up a couple notches.

The room itself was the largest of any resort I have ever visited, with more than 827 sq ft of floor space. Most important to any photographer are the camera tables; here, they

GANGGA ISLAND RESORT & SPA

MANADO - NORTH SULAWESI

More Than a Diving Paradise

www.ganggaisland.com



are the Ocean Front Rooms, which overlook the ocean from both the room and front balcony.

The Deluxe Rooms have ample floor space, and normally come with one double bed that can be converted into two twin beds. My room was furnished with a flat-screen LCD TV with free movie and sports channels, DVD player (which I never bothered using), desk, fully stocked mini bar and coffee-maker, and wifi for Internet use (which I did use). All rooms come with private bath and shower, air-conditioning, and ceiling fans.

Like Puerto Galera, the Dumaguete Resort's restaurant dining



Deluxe Room at Atlantis Dive Resort (above and top left)

Large camera room at Atlantis Dive Resort





Since the Dumaguete resort has no pier or jetty of its own, when there is some wave action present, divers sometimes have to wade into the water in order to board the boat for local dives (above).

are built into three of the walls, adjoining each other in the corners to create a broad, continuous work surface area over 41ft long by 2.5ft deep. Underneath are 21 individual cubbyholes to store equipment with additional space below for bulkier items such as large camera cases and bags. In addition to providing a seri-

ous amount of workspace, the benches were fitted with 16 sets of power outlets in both 220 and 110 volts, able to accept both standard US and European plugs, along with a secondary shelf above the work surface for battery charger placement. The room is not only well lit, there are also eight additional fluorescent work lights

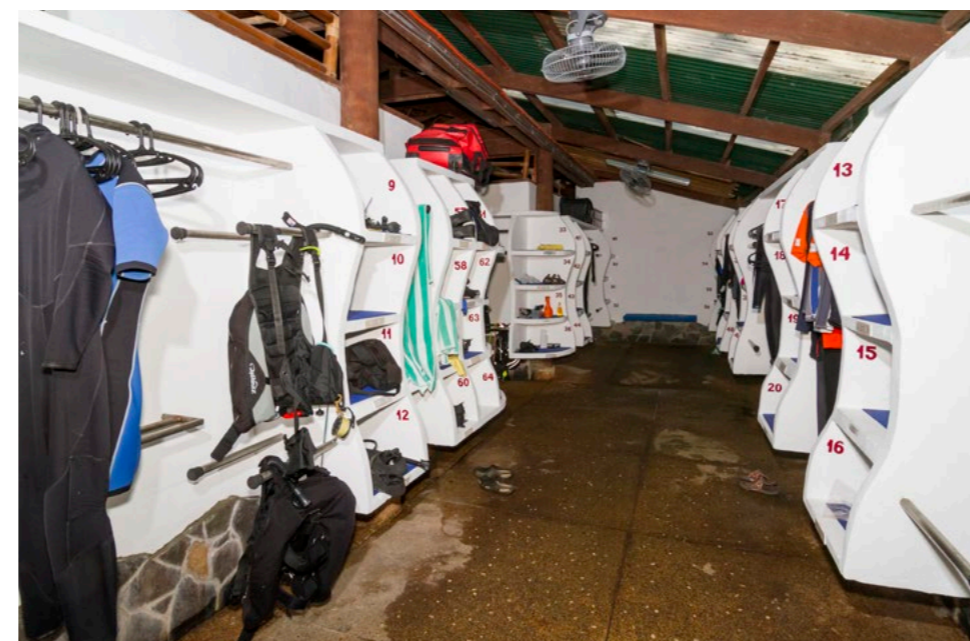
TV mounted on the wall with both HDMI and USB connections. The big screen is also available for guests to show off their photos or videos to friends whenever they like.

Dive center

The heart of any dive resort is the dive center. The facility at Dumaguete is quite large, very well organized and supervised, and features a split-floor plan. There is a well-appointed staging area where divers pick out their tanks and rinse their gear afterwards, and a separate equipment room, which has 60 individual shelves for stowing masks, fins, and other equipment, along with places to hang wetsuits and BCDs to dry overnight. Yes, it's the tropics, but I would still recommend a full wetsuit, as bottom times can be long and water temps in the Dumaguete area average 76-78°F (24°C) from January to March, then warm to around 79-80°F (25°C) during the rest of the year.

mounted to the underside of the secondary shelf for extra illumination, with five air-gun systems positioned around the room. The room is climate controlled so that the air is dehumidified and cool but not cold enough to cause problematic fogging in lenses and ports.

This same space can double as a classroom, as the center portion is left open for table and chairs, and there is a 42-inch HD flat-screen



The dive center provides both air and Nitrox 32 through a large cache of Al 80s (above); Guest equipment storage and drying room (right); Juvenile painted frogfish (top right)



Dumaguete

Atlantis' beachhead, and several are less than five minutes away.

In most cases, boats carry no more than eight divers, plus a dive guide, driver and deck hand. While the skiffs have tank holders, camera systems are placed where space is available, so it is important to pay attention to the handling and placement of camera setups when boarding and riding out to the dive site.

Dark water, dark bottom —it must be muck

The diving in the Philippines is both impressive and diverse. In the Dumaguete area, most of the diving is muck diving in its truest form, as the bottom fringing most of the shoreline of Dumaguete is devoid of colorful, pristine coral reefs. Three prime examples are Punta, Car Wreck and the

OASIS EXPLORERS
True exploration in the heart of Bunaken Marine Park

About Oasis Explorers
Oasis Explorers is a newly launched technical training facility located at Bunaken Oasis Dive Resort and Spa in North Sulawesi, Indonesia. The facility is the first in Bunaken Marine Park to offer multi-agency technical training, trimix and CCR compatibility, and a vastness of unexplored deep dive sites, all in the setting of an award-winning luxury dive resort. Expect a state-of-the-art filling station, specialised equipment, experienced surface support and expert advisors.

Oasis Explorers will also be working on opportunities in North Sulawesi for more detailed scientific surveys, environmental awareness for deep-water marine species and the first comprehensive mapping project beyond recreational depths.

Please send enquiries to tech@oasisexplorers.com

- Technical Diving
- Trimix and CCR
- Multi-agency training
- State-of-the-art facilities
- Virgin dive sites
- Specialised equipment
- Expert advisors
- Luxury dive boats

www.oasisexplorers.com
Based at Bunaken Oasis Dive Resort and Spa
www.bunakenoasis.com

Set in the world-famous Bunaken National Marine Park, Bunaken Oasis offers a truly luxurious diving experience.

Exceptional air-conditioned cottages with sea-view balconies. Chill-out bar, and gourmet panoramic restaurant. Custom-built spa with qualified therapists.

Panoramic free-form infinity pool is filled with fresh water.

From water-makers, with UV treatment, to black water treatment, Oasis was designed to minimise any impact on the environment.

5* PADI affiliated Oasis dive centre designed for photographers and dive boats that are second to none, with fresh water deck showers, toilets and, above all, space.

The center's cache of scuba tanks comprises primarily of aluminum 80s with air or 32 percent nitrox (available for a small upcharge), but there are also several 63 and 90 cu ft tanks available. Once your tank, BCD and regulator are assembled, the staff then carries them down to the beach and loads everything on the boats.

Like most resorts I have seen in the Philippines, there is no dock or pier, and boarding is done from the beach. In the case of Dumaguete, this will require wading out to chest-deep water before climbing up the boat's boarding ladder.

One difference between Atlantis and other area operations is that their boats are not of local design. Instead, they run a fleet of fast, 24-foot out-board-powered center console skiffs equipped with large canvas tops for sun protection.

The daily dive schedule can vary according to group size and itinerary. In some cases, this may dictate a series of



single dives set around 8 to 9 a.m., 11 a.m., 2 p.m., and 4 p.m., or a morning start for a two-tank itinerary. This flex-

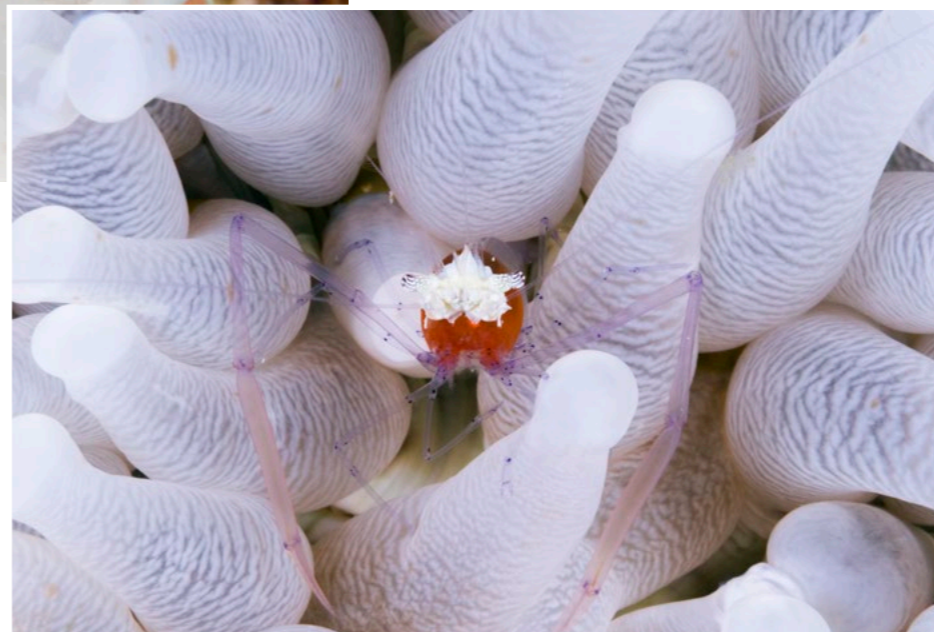
ibility is possible because the majority of the diving in the Dumaguete area is no more than a 30-minute boat ride from



Dumaguete is all about macro, from muck to reef. Examples include a crinoid crab (top left), ghost pipefish (left) and pigmy cuttlefish (above) hiding amongst the bottom debris and vegetation.



Emperor shrimp atop a large nembrotha nudibranch (above); Dragon shrimp on whip coral (top right); Popcorn shrimp on anemone (right); Anthias (left)



the untrained eye. But closer examination reveals that what at first seems like an aquatic desert is actually home to an ongoing parade of the strange, the bizarre and the beautiful.

Divers come here in search of painted, warty and hairy frogfish, ghost pipefish, flamboyant cuttlefish, wonderpus, nudibranchs and my nightmarish favorite, the Bobbit worm. And when somebody runs

The secret to an eventful muck dive experience boils down to control and patience.

The sea bottom at all the muck dive sites I visited was not all forgiving to sloppy dive skills. A large scissor kick will drag up the bottom and leave a huge dirty wake everywhere you go. In addition to disturbing the habitat, this will earn you the displeasure of your fellow divers.

It is important to maintain neutral buoyancy and limiting fin movement

through the use of techniques such as sculling and modified frog kicks. Equally important is streamlining your gear and making sure nothing is dragging in the dirt like computers, gauges or octopuses.

Developing the skills and techniques to do it right can be challenging, but very rewarding, as it opens the door even further to what you might see.

across the Holy Grail of macro critter photography, the Rhinopias scorpionfish, you would think they had discovered buried treasure.

resort's house reef, where you will find yourself hovering over the dark grey to chocolate colored, often silty, sandy bottom that at first will appear lifeless to




GORONTALO:

Hidden Paradise

- Operating since 2003
- Trip Advisor "CERTIFICATE OF EXCELLENCE"
- Over 12,000 LIKES on Facebook
- Custom-built speed boats & private dock
- Experienced dive guides
- Pioneer of 30+ dive sites
- Walls, caverns, pinnacles, muck & wrecks
- Daily flights & new airport terminal
- November to April dive season
- Custom & group packages
- Minimum: 1 diver

www.riguelsdiving.com








Apo Island

While muck diving is Dumaguete's largest attraction, it is not the only one. Atlantis Dive Resort also organizes three-tank dive excursions to neighboring Apo Island, which offers a very different underwater environment.

The itinerary for the excursion to Apo Island starts around 8 a.m., when gear and divers are loaded into a 60ft dive banca. From the resort, the crossing to Apo takes just over an hour to complete.

When a powerful typhoon struck the island in 2012, the windward side suffered severe damage to the coral reefs. Fortunately, the leeward side, where most diving is done, escaped the worst of the storm's fury. The underwater visibility at Apo typically ranges between 60 to 90ft, which is a significant change from the muck diving sites at Dumaguete, which average 20 to 30ft.

Apo offers the type of hard coral reef systems typical of the Philippines, with steep sloping profiles punctuated by ledges and mini walls dropping to depths of 70 to 90ft. Marine life includes large schools of fish, healthy hard corals, banded sea krates, and hawksbill and green sea turtles.

Following the second dive, the boat pulls up to the beach, while resort staff prepare a buffet lunch. After the third dive, the boat begins the run back home, getting everyone back at the resort by 4:00 to 4:30 p.m., leaving plenty



of time to prepare for a late afternoon or night shore dive.

Swim with the world's largest fish
Though most of the focus at Atlantis

Living up to its namesake, the pom pom crab (above) waves small white anemones attached to two pinchers as a form of defense against predators; Flatworm with tunicates (top left); Orangutan crabs on bubble coral (top right); Juvenile frogfish (right)




For cryptic critters, blending is the key to survival. You can see the anemone shrimp with the white tube anemone (above), and the popcorn shrimp among the tentacles of a mushroom coral (right), but do you see the decorator crab in the picture to the left?

everyone re-boards Atlantis Dive Resort's custom, air-conditioned jeepney for another 40-minute drive up the coast to the town of Oslob. Once there, following an orientation on the basic dos and don'ts of snorkeling with whale sharks, everyone is carried out from the beach on outrigger canoes to the waiting whale sharks.

Following a two-hour-plus snorkeling session, back at shore, the staff once again puts together a hearty lunch beachside, with the return trip back the resort on Dumaguete around 2 p.m.

Afterthoughts

My impressions of Dumaguete's muck diving and the side trip to Oslob for the

whale sharks were most favorable, but I was not as impressed with the diving around Apo Island, which was typical of many areas of the Indo-Pacific, and not particularly memorable.

The staff was friendly, helpful and accommodating. Rooms are spacious, well appointed and clean. The resort's dining fare was very good with made-to-order breakfasts, and the lunch and dinner menu varied enough to make it interesting. The soups and grilled pork were especially savory.

What I also like about the Atlantis' Dumaguete Resort, as compared to the one in Puerto Galera, was the overall ambiance of the property itself. While



the infrastructure and services at the two resorts are generally on par, the location, landscaping and ambiance of the Dumaguete Resort seemed to be a bit more relaxed and secluded, making the entire experience that much more attractive. ■

For more information regarding bookings, and what you need to bring, visit Atlantis

Dive Resorts at: **Atlantishotel.com**.

Walt Stearns is a widely published dive writer, underwater photographer, scuba instructor, certified cave and rebreather diver, and an SSI Platinum Pro5000 member based in the US state of Florida. He is the founder and publisher of the Underwater Journal. For more information, visit: **WaltStearns.com**.

fact file



Location



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

Text by Matthew Meier

History The Philippines have been inhabited for tens of thousands of years but it was not until 1543 that the country was named Las Islas Filipinas in honor of King Phillip II of Spain by the explorer Ruy Lopez de Villalobos. The islands were colonized and remained part of the Spanish empire for more than 300 years. Following the Spanish-American war in 1898, the Philippines were relinquished to the United States and in 1935 became a self-governing commonwealth. During World War II, the islands fell under Japanese control but on 4 July 1946, after the United States helped the Filipino people reclaim control, the Republic of the Philippines was granted its independence. Numerous presidents and varying degrees of political and economic stability have followed, but the country remains independent to this day. The Philippines are a founding member of the United Nations and the World Trade Organization, and their current President, Rodrigo Duterte, was elected in May 2016. Government: presidential republic. Capital: Manila

Geography The Philippines are located east of Vietnam in Southeast Asia, between the Philippine Sea and the South

China Sea. The country consists of an archipelago of 7,107 islands, spread out over nearly 300,000 square kilometers. The terrain consists of volcanic mountains and coastal lowlands, ranging from sea level to the highest peak, Mount Apo, at 2,954m. The Philippines are situated at the northern tip of the coral triangle, the epicenter for global marine biodiversity. Coastline: 36,289km. Terrain consists primarily of mountains with coastal lowlands varying from narrow to extensive. Natural hazards include typhoons, landslides, volcanoes, earthquakes and tsunamis.

Climate The climate in the Philippines is tropical, and the heat and humidity is greatly influenced by the Amihan ("dry" northeast monsoon that typically blows mid-November to April) and the Habagat ("wet" southwest monsoon in May to October). The monsoons roughly create three seasons: the hot, dry summer from March to May; the rainy season from June to November; and the cool dry season from December to February. The air temperature averages 80°F (27°C) and ranges between 70-90°F (21-32°C) depending on the season and location. Water temperatures fluctuate between 78-84°F (26-29°C).

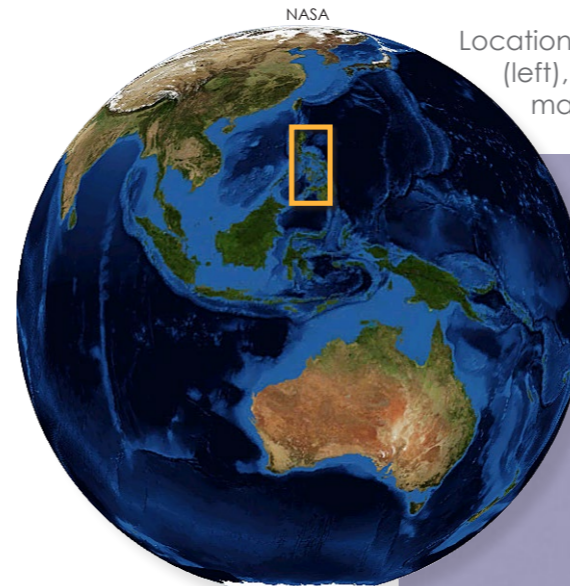
Environmental issues

Challenges include air and water pollution in major urban areas, deforestation in watershed areas, soil erosion, degradation of coral reefs, and pollution of coastal mangroves, which are important breeding grounds for fish.

Economy The Philippines boasts an emerging economy, as it transitions from agriculture to the service and manufacturing industries. Primary exports include semiconductors and electronic products, transport equipment, copper, petroleum, coconut oil, fruits and garments. Roughly 47% of the population is employed in the service industry, which accounts for 56% of the country's GDP.

Currency Philippine Peso (PHP) Currency may be exchanged at the Manila airport, local banks and resorts. Credit cards are widely accepted at tourist destinations. Exchange rates: 1USD=51.98PHP; 1EUR=64.39PHP; 1GBP=73.88PHP; 1AUD=40.38PHP; 1SGD=39.73PHP

Population The official population of the Philippines is 102,624,209 (July 2016 est.), with over 12 million living in the capital city of Manila. Ethnic groups: Tagalog 28.1%, Cebuano 13.1%, Ilocano 9%, Bisaya/Binisaya 7.6%, Hiligaynon



Location of the Philippines on global map (left), and location of Dumaguete on map of the Philippines (below)



Ilonggo 7.5%, Bikol 6%, Waray 3.4% (2000 census). Religions: Catholic 82.9%, Muslim 5%, Evangelical 2.8%, Iglesia ni Kristo 2.3%, other Christian 4.5% (2000 census). Internet users: 56,956,436, or 55.5% (July 2016 est.)

Language The official language is Filipino, with eight major dialects, but English is widely spoken at most resorts.

Voltage The voltage in the Philippines is 220/240 AC at 50 cycles and several socket types are utilized. An international multi-prong adaptor is recommended.

Cuisine Philippine cuisine has a mixture of influences from Hispanic, Chinese, American and other Asian cultures. The food tends to have full-bodied flavors but is not as spicy as that of neighboring countries. Rice, fish, coconut, mangoes and plantains are staple ingredients. Filipinos do not eat with chopsticks but prefer western cutlery or the traditional method of eating with a just-washed right hand.

Tipping Tipping is not part of the

Filipino culture and is not required, though it is becoming more common among the local population. Tipping is, however, expected on liveaboard dive boats and at most tourist resorts. Each establishment will have their own guidelines and recommendations.

Transportation International flights from numerous countries and airlines connect through Manila and Cebu. Regional airlines connect from these hubs to a multitude of locations throughout the archipelago. There is also an extensive ferry system for traveling between islands and an established network of roads once on

land, although only about 26% of the country's roads are paved.

Health & Security Mosquito-borne illnesses are a problem, and there are cases of malaria, dengue and Zika. Avoid mosquito bites by using mosquito repellent and covering up during times when mosquitoes are out. Water- and food-borne illnesses can also be a problem, so be sure to drink only bottled or filtered water, and only eat food that is cooked thoroughly. Check with your state department for current travel advisories before your trip.

Decompression chambers

Chambers can be found on various islands across the country, in cities such as Manila, Cebu, Batangas City, Cavite, Makati City, Quezon City and Subic.

Travel/Visa A return ticket and a passport are required for entry into the Philippines and the passport must be valid for at least six months. Travelers from the United States and Europe typically receive a free 30-day tourist visa upon arrival. An international terminal fee of roughly 550 PHP is charged at the airport when you depart the Philippines.

Websites

Philippines Tourism experiencephilippines.org



St. Croix

— *Changing Tides on the Caribbean Isle*

Text and photos by Jennifer Idol





Diver at reef wall, St. Croix (above); Reef shark (top right); Converted sugar plantation home (right); Emerging leatherback sea turtle hatchling at Sandy Point (left)

islands. The islands are uniquely situated next to the Puerto Rican Trench, the deepest part of the Atlantic Ocean, with depths exceeding 8,400m (27,559ft). This unique geography influences the nesting behavior of leatherback sea turtles on Puerto Rico and St. Croix.

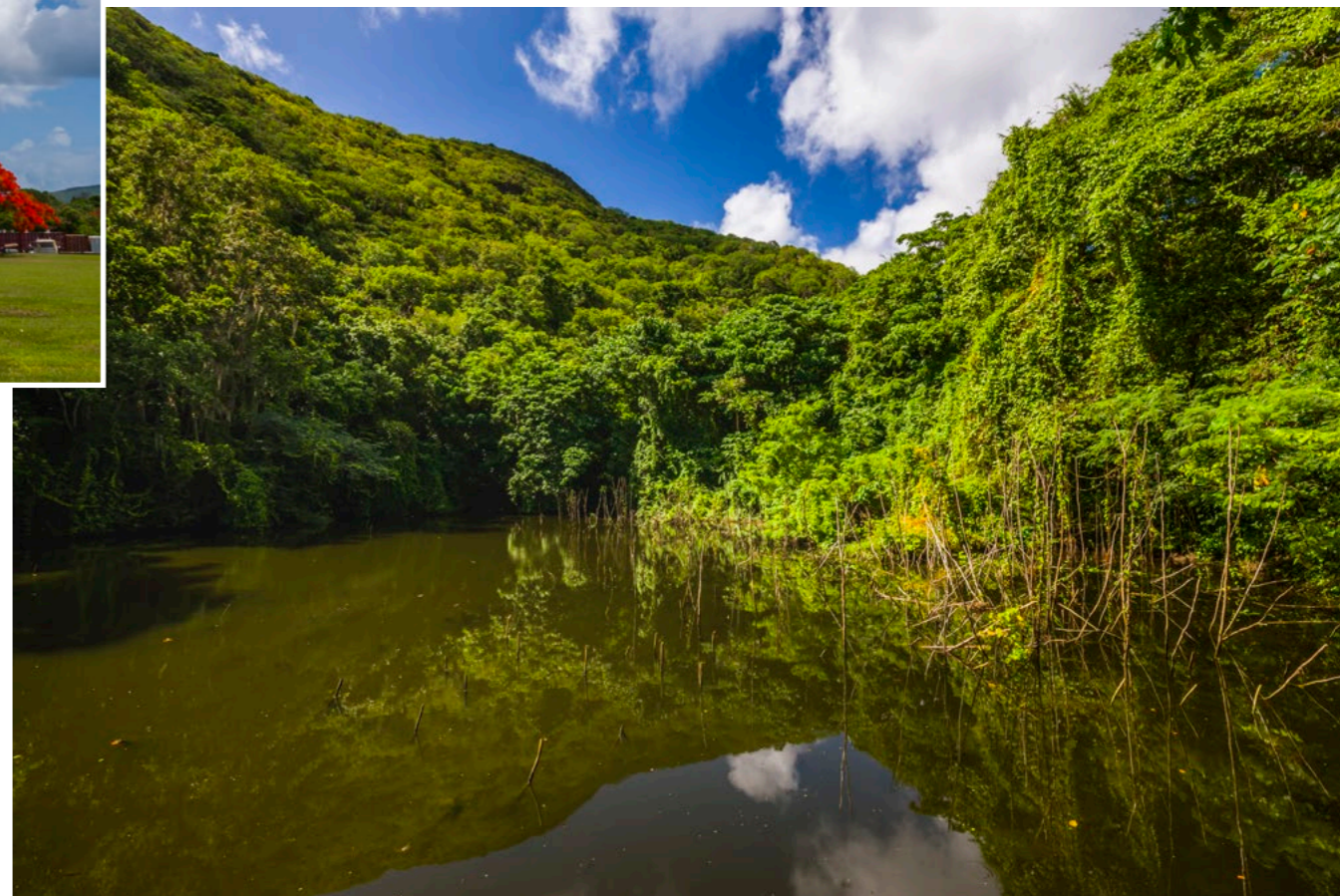
Visitors since the 1400s have left their impression on the islands, seen through historic buildings and the changed landscape, especially on the island of St. Croix. The Christiansted National Historic Site reflects the activities of St. Croix's colonial legacy as part of the Danish West Indies center for sugar production, trade, and Transatlantic Slave Trade.

Visiting peoples changed life on St. Croix, from clearcutting native tropical dry forest to prevent malaria and develop sugarcane plantations to the introduction of non-native species and export of



hardwoods. Canopy loss from the removal of trees on St. Croix reduced rainfall and diminished water resources. The remaining tropical dry forest can be seen in the northwestern corner of the island and is known locally as the rainforest.

Islands are isolated and vulnerable ecological centers. St. Croix resembles a desert but is home to significant life. From four nesting species of endangered and threatened sea turtles (hawksbill, leatherback, green and loggerhead) to highly endangered least terns, the island is an overlooked gem.



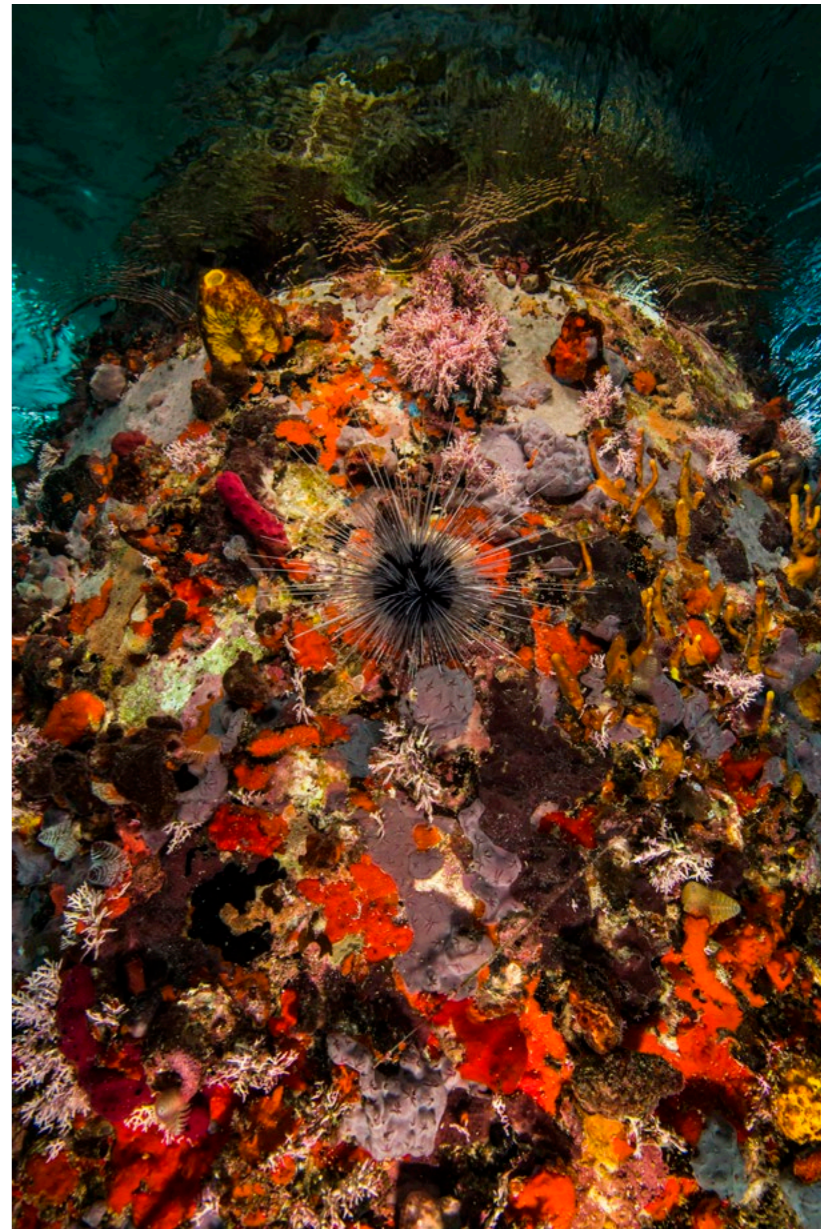
Tropical dry forest of St. Croix. PREVIOUS PAGE: Hawksbill sea turtle

St. Croix is known for nesting leatherback sea turtles but has recently become known as one of the islands through which Hurricane Maria passed. However, life on this US Virgin Island reaches beyond the tales of these two stories.

St. Thomas, St. John and St. Croix comprise the US Virgin Islands on the north-eastern side of the Caribbean Sea. St. Croix is isolated from the other two



Snorkeling at Frederiksted Pier (above); Point Udall (left); Cane Bay reef scene (far left); Diver and dive boat of Cane Bay Dive Shop (top right); Detail of Frederiksted Pier—life grows abundantly, even in small places (right)



Quiet oasis

Nearly all tourists visit from the United States or Puerto Rico. St. John and St. Thomas receive 90 percent of visitors to the US Virgin Islands, leaving St. Croix a quiet and uncrowded escape with opportunities to dive, snorkel or tour the island. Point Udall is the easternmost point of the United States and a gathering place to observe the sunrise. Almost three-fourths of tourists arrive by cruise boats, so the island is usually quiet.

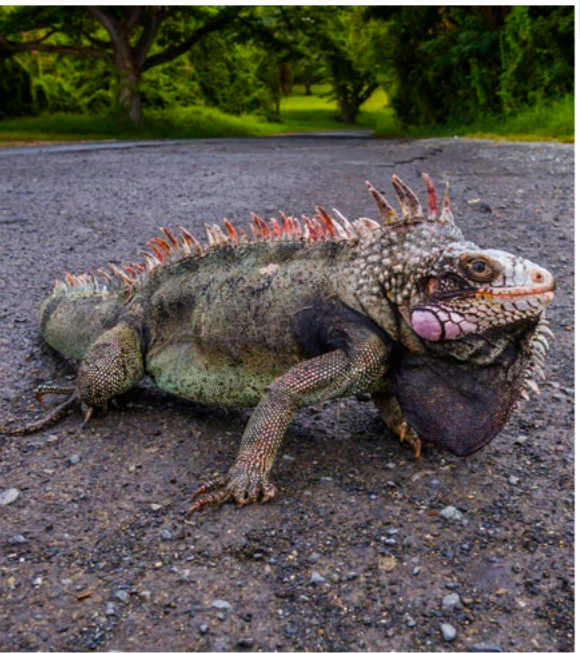
Since food is expensive, the Plaza Extra West Superstore can be a valuable resource. The café at Sand Castle on the Beach hotel and Blue Moon in

Frederiksted are restaurants for people looking for fresh food. Most tourists frequent the Christiansted Boardwalk area for pubs and food, but options are also available in the Cane Bay area.

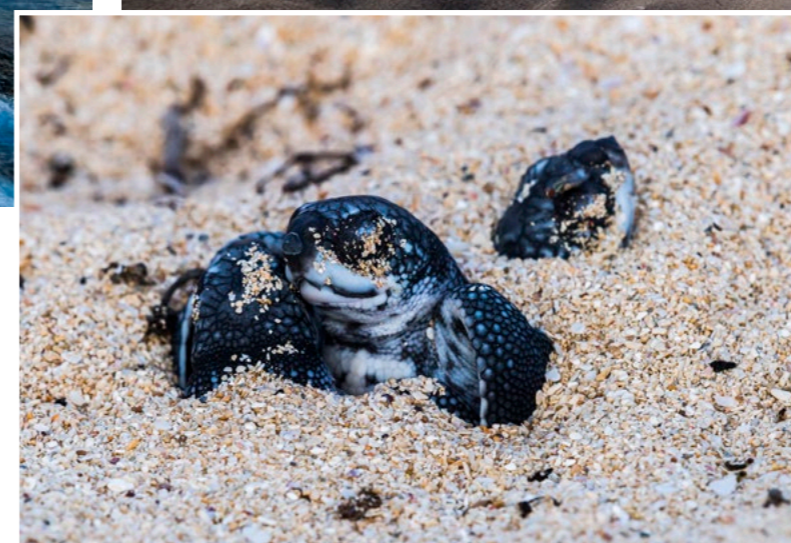
Most goods are imported; this includes water since the groundwater faces contamination, while well-drawn water exceeds recharge rates due to the lack of rainfall. If you must have bottled water in your accommodations, buy by the gallon at the grocery store to save both plastic and money.

St. Croix suffered little damage, though the infrastructure struggled to provide electricity for all buildings during the first months following the hurricane.

Tornadoes caused more damage than the hurricane, creating isolated damage. Divi Carina Bay, an all-inclusive beach resort and casino, was one of the damaged businesses. They opted to rebuild a modern facility that will open in 2019. The road at Sandy Point National Wildlife Refuge remains closed due to damage from the storms. Other-



Iguana in tropical dry forest on St. Croix



Cane Bay Beach (above); "Seasonally Closed" sign at Sandy Point National Wildlife Refuge (left); Leatherback sea turtle hatchlings emerge from their nest (right); Hatchling tracks in the sand at Sandy Point (top right)

Sandy Point National Wildlife Refuge

The southwestern tip of St. Croix was established as a national wildlife refuge when the US Fish and Wildlife Service purchased an initial 340 acres from the West Indies Investment Company in 1984. The refuge's administration headquarters are located in Puerto Rico.

Forming the refuge caused concern about diminished accessibility to the beach. Activities are limited because the refuge closes to the public between April and August every year to protect endangered leatherback sea turtles, the largest of the sea turtles. Educational programs help the public understand why the closure is a positive activity.

Closing beaches saves lives

For more than 38 years, a program has been in place for the study of these sea

turtles. Research revealed they rely on the beach at Sandy Point as a primary nesting site. Foot traffic across nests prevents successful hatching. Hatchlings emerge from their shells and wait a few centimeters (half-inch) below the sand before emerging. Stepping on a nest can easily kill 20 to 30 individuals.

Ten days before hatchlings break through the eggshell, they need more oxygen flow across the shell. Sand must not be packed down, or else nests suffocate due to the obstruction of the flow of oxygen to the eggs and hatchlings. Collapsed nests reduce gas exchange, producing higher mortality and lower success rates.

Leatherback sea turtles are extraordinarily adapted animals, even in how

they lay their eggs. They lay from 60 to 80, and sometimes as many as 100 to 115 eggs. The bigger the female, the more eggs they lay. The real wonder is in the kinds of eggs they lay.

They produce both yolkless and yolked eggs. Thirty to forty percent of the eggs laid are yolkless and will not hatch. They are smaller than normal-sized eggs and come out last to form a cap over the yolked eggs. This maintains air space to optimize gas exchange as embryos develop and keeps sand from filling in. This is why keeping the beaches free of activity at Sandy Point is important.

AnAmericanImmersion.com

Available on Amazon



Discover how an oil spill inspired a woman to undertake a quest to become the first woman to dive all 50 states and explore vivid underwater landscapes in this revealing book.

50 THE UNDERWATER DESIGNER PHOTOGRAPHY & DESIGN

BEST PUBLISHING COMPANY

**BEST BUILT
LIVEBOARD 2014**
By Liveboard Association
of Maldives



Maldives Blue Force One

The best Boat at the best price!!!

- 👑 Weekly liveaboard diving cruises. Guaranteed departure from Saturday to Saturday.
- 👑 5 Atolls Classic Route & South Hemisphere Route.
- 👑 Themed cruises: Manta Trust, Family Weeks, Photosub, Videosub, Freediving, Surfaris...
- 👑 We include: 18 dives (2 night dives) per week. NITROX, wifi. Shore excursions. Dinner on desert island... and many more.

Information on boats, routes, schedule, brochure, videos... look it up on www.maldivesblueforce.com



Blueforce
MALDIVES BLUE FORCE ONE



Maldives Blue Force

info@maldivesblueforce.com
www.maldivesblueforce.com

St. Croix



Leatherback sea turtle hatchlings emerge from the sand (right) at Sandy Point National Wildlife Refuge (above)



Refuge management

The refuge is one of nine national wildlife refuges in the Caribbean. Green Cay National Wildlife Refuge was established on the northern side of St. Croix to protect the last significant populations of the critically endangered St. Croix ground lizard.

Funding for Sandy Point National Wildlife Refuge has been limited since its creation. Two staff members oversee all duties of the refuge, from facilities management and safety patrol to the management of invasive species, habitat restoration and reforestation, and monitoring endangered and threatened species. Recent partnerships with the US National Oceanic and Atmospheric Administration (NOAA) have enabled programs to continue.

Since the refuge was established, they obtained an additional 47 acres, totaling 385 acres. Depend-

ing on beach erosion, the beach fluctuates by six to 10 acres. Scientists monitor the annual erosion cycle, which threatens nesting sites and an archeological site.

The Aklis archeological site at Sandy Point has uncovered pre-Columbian skeletal material from 200 to 400 A.D. and some others that could be older. Monitoring these sites helps volunteers and interns move nests and artifacts to safety. Nest relocation saves 20,000 to 30,000 hatchlings that would have been lost to erosion.

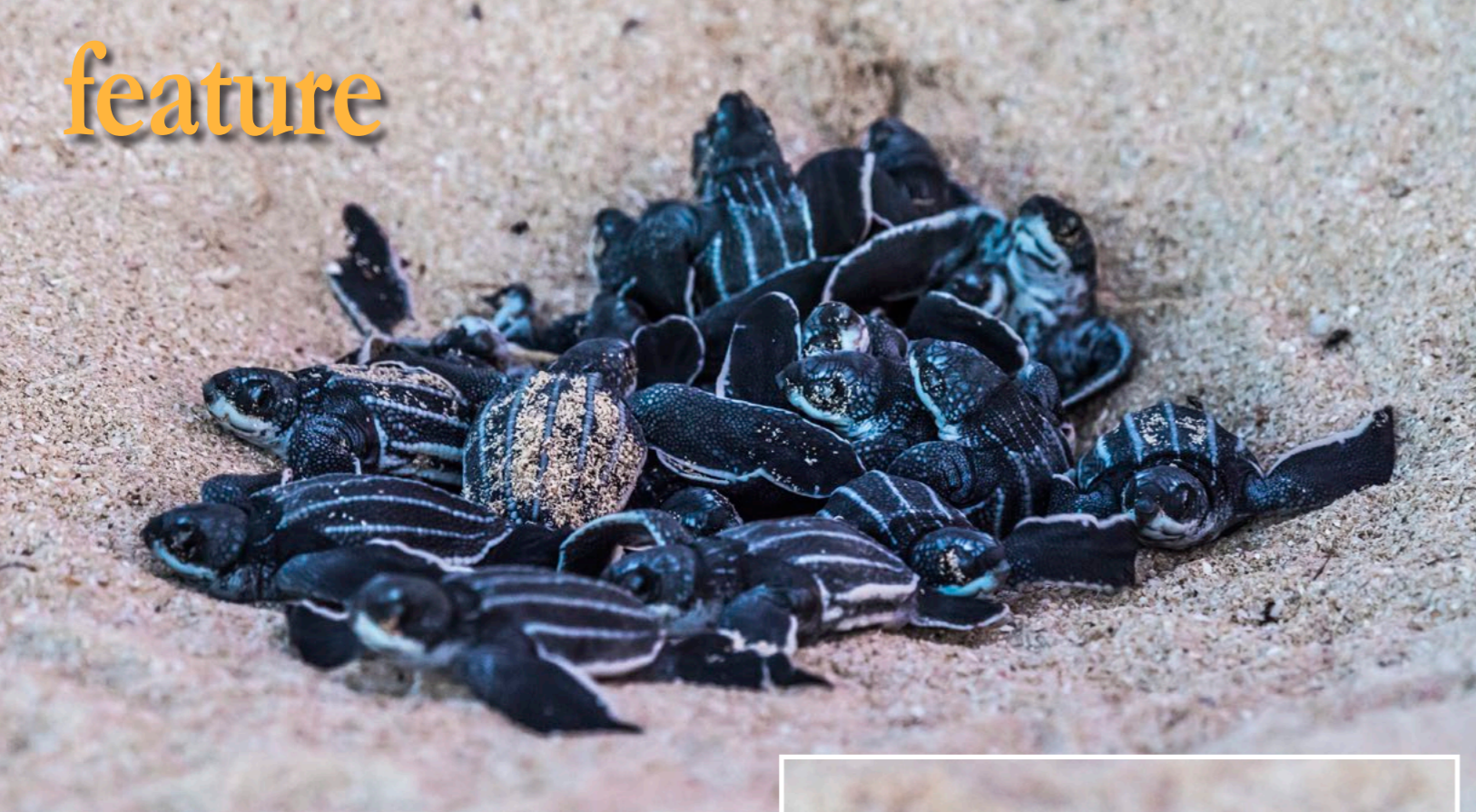
Nesting sea turtles

For more than 18 years, Claudia Lombard, wildlife biologist and federal wildlife officer for Sandy Point and Green Cay National Wildlife Refuges, has managed and studied

life at the refuge. She manages the nesting area and engages in endangered species management and population recovery.

The leatherback sea turtles she oversees are not just a keystone species, but also begin life as adorable palm-sized hatchlings. Four to six nests are usually built a day, but 2017 was an unusually quiet year for nesting activity.

Last year, Sandy Point saw the lowest number of nesting sea turtles in 25 years, with 26 individuals. Normally, 95 individuals nest at Sandy Point National Wildlife Refuge during nesting season. One-fourth of the population arrived. Studying sea



THIS PAGE: Leatherback hatchlings at Sandy Point. The beach here is ideal for leatherback sea turtles due to the sand consistency and the nearby trench, which provides protection for female leatherbacks.

turtles is a long and slow process due to their slow maturation and nesting behavior.

The beach at the refuge is ideal for nesting because of sand consistency and the nearby trench. Deep water close to shore provides protection for leatherback females to ascend and quickly reach the steep beach. Leatherbacks dive deeper than all other sea turtles to depths of 914m (3,000ft) and likely to more than 1,220m (4,000ft).

Nesting females seek to lay their eggs in sand on the steep slope just over the berm. They are looking for depth in the sand to build a nest. Placement of the nest just a short distance from the water's edge helps hatchlings escape predation and be able to reach the water.

They cannot do push-ups if they land upside down. They roll to right themselves. Their flippers

are as long as their bodies, so their movement is a dragging and pushing behavior. They move slowly across sand and emerge when temperatures are cooler in the evening and night. As the temperature cools, they become vertical under the sand and push up collectively. When the sand warms, they stop moving.

NOAA marine biologist Kelly Stewart leads project leaders in leatherback monitoring and conducts hatchling DNA research with the Marine Turtle Genetics Program. Male sea turtles never return to land, so back-calculating DNA paternal fingerprints supplies groundbreaking news for population information like genetic diversity.

Males mate with females offshore, who congregate in an

area as they come in to lay their eggs. A female will lay an average of 5.1 nests of eggs every 10 days. They average nesting every two years, with small numbers nesting at three- and four-year intervals. One possible reason for the interval between nesting seasons is that it takes that long to forage. Green and hawksbill sea turtles, which also nest at the refuge, lay more often than leatherback sea turtles.

If a female is disturbed when she approaches the shore, she will not lay her eggs. However, she needs to do so, or else the eggs will continue to develop additional shells, increasing mortality rates for the

DEFINE YOUR TRAINING



Join NAUI's global community of divers and share in a world of exploration and adventure. NAUI's extensive network of dive centers and instructors is ready to be your guide and help you discover the underwater world through a full suite of courses. **Learn new skills. Make new friends. Engage your curiosity. What will you discover with your NAUI training?**



nau.org/certifications





 @NAUIWorldwide
nauhq@nau.org | +1 813.628.6284



Desert vegetation at viewpoint of Buck Island from Udall Point (above); Living historic building made of coral (right) at Christiansted National Historic Site (far right), managed by Zandy Hillis-Starr

entire clutch. This is why it is essential never to disrupt an approaching female, and to allow her to complete her nesting behavior.

In addition to their large size, leatherbacks are highly specialized. They are an ancient remnant of early stem stock. Hard-shelled species stem from leatherback stocks. They have existed since before the dinosaurs became extinct.

Their physiology is unique. Mammals are homeotherms, meaning they maintain body temperature at consistent levels. Unlike other sea turtles, leatherbacks are facultative homeotherms that warm their blood by other methods. Heat exchangers in their circulatory system maintain core temperature. They avoid losing heat from their core to the append-

ages through the positioning of veins and arteries. This is believed to contribute to their deep diving ability.

They are highly specialized feeders that rely on giant deep-water jellyfish as a food source, which exists nowhere else. The diving behavior eliminates predators and competition for their food source. Most sharks live in shallow water. Their genetic evolution is steady and unchanged because they exist within an ecosystem with sectors that are relatively unchanged.

Buck Island Reef National Monument

Around Buck Island is an 8,000-year-old reef that has survived threats such as overfishing, hurricanes and white band

disease, which caused a sea urchin die-off. It now faces ocean acidification, which kills coral reef structures by preventing marine invertebrates from pulling calcium from the water.

Perhaps St. Croix's theme should be about the individuals making huge ecological impacts and serving many needs. Zandy Hillis-Starr is another of these individuals who dedicated her career to helping life on St. Croix, particularly the hawksbill




sea turtles. She is the Chief of Resource Management for the National Park Service's Christiansted National Historic Site, Buck Island Reef National Monument, and Salt River Bay National Historical Park and Ecological Preserve. In short, she manages three national park re-

sources with a plethora of duties. She is the first permanent biologist studying Buck Island, and her connections with the Buck Island research lab helped produce a continuous baseline of ecological history. She was the first to document loggerheads on Buck Island and, in 2002, wrote the first protocol for monitoring sea turtles in the National Park Service. Joel A. Tutein is superintendent of Buck Island Reef National Monument. Hillis-Starr's love for sea turtles was cemented when Tutein

showed her the first nesting sea turtle she had ever seen. Tutein feels it is an honor and privilege to work in the conservation field and strives to prevent species from becoming extinct. He knows how important people are to the survival of this ecosystem and works to connect to local youth through education. Too many important projects are ongoing in St. Croix to enumerate, but all the studies connect life with the island. For example, Alexandra Gulick, PhD



DIVE RITE XT FINs
 Classic design for maximum propulsion with minimum effort
 Lightweight monoprene construction
 Standard with stainless steel spring straps
 Available in sizes Small through XL in Black or Red

DIVE RITE
 EQUIPMENT FOR SERIOUS DIVERS
 www.DIVERITE.com



Trumpetfish at Cane Bay (above); Peacock flounder at Protestant Bay (right); Sea urchin skeletons in seagrass bed (left); Captured mongoose, which is an invasive species, Sandy Point (below); Great white egret catches lizard (far right); Baby Zenaida dove chick gets second chance after fall from palm tree (lower right inset)



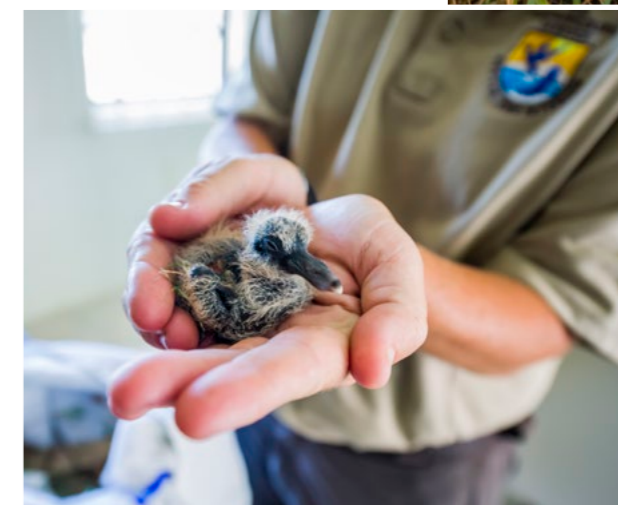
pollution from coastlines. Wildlife threats

Michael Evans, manager and federal wildlife officer of Sandy

Among his duties, he focuses on protecting visitors and teams from egg poachers and illegal activity. A number of threatening activities take place on the island, including drug and wildlife trafficking in items such as ivory and taxidermy, conducted for monetary profit.

To preserve the reef habitat, no collection of natural items is per-

mitted in St. Croix, including sand, coral, shells, urchins and sand dollars. Customs officials confiscate these items to preserve the island. While collecting a few bits of uninhabited shells seems innocuous, the collective action of individuals has great impact. More than one ton of sand was confiscated by customs agents in St Croix from visitors in two years.



tonwood. The St. Croix agave, or Eggers' century plant (*Agave eggersiana*), is endemic to St. Croix and found only in dry regions. Night blooming cereus is a cactus flower the size of a dinner plate that opens at dusk one night each year.

West End Salt Pond is home to least terns, an endangered sea-

candidate at the Archie Carr Center for Sea Turtle Research at the University of Florida, studies the relationship between seagrass ecosystem function and green sea turtle grazing dynamics and behavior. Seagrass is a necessary food source for green sea turtles, particularly in the Caribbean.

Seagrass are invaluable coastal ecosystems that not only support a diverse array of marine life, but also play an important role in carbon sequestration, protecting coastlines from storms, and buffering neighboring systems like coral reefs from nutrient runoff and

Point National Wildlife Refuge, has worked at the refuge for 24 years, with an additional 23 years in Puerto Rico.

He manages some of the invasive species at the refuge. Mongoose were introduced in the late 1700s to remove snakes and rats. However, they eat sea turtle eggs and are an ongoing threat. Part of his work is to oversee mongoose activity.

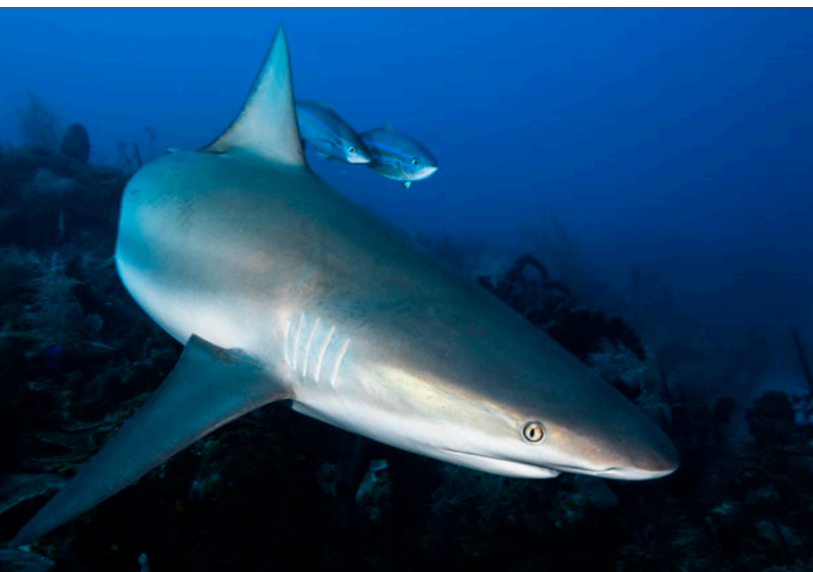


Island life

Endangered plant species depend on St. Croix. Rare trees and plants such Vahl's boxwood (*Buxus vahlii*) are

found only in Puerto Rico and St. Croix, and some are among the rarest trees in the world. Four species of mangrove inhabit the island: white, red, yellow and but-





Croix, though numbers there are unstudied. *Cardisoma guanhumi* are the species of land crabs found on St. Croix. Locals hunt them at night and keep them alive, feeding them for several days to clear pollution from their bodies before eating them.

bird in need of listing to better protect them. Other birds such as Zenaida doves occur on the island and are limited to the Caribbean region. Merlins and peregrines also hunt here.

Land crabs have declined in Puerto Rico and are present in St.

St. Croix has seen an increase in shark activity. In fact, reef sharks were plentiful at the bottom of walls on all dives. While the reef life was fascinating and hawksbill sea turtles were engaging, sharks steal the show on deeper dives.

Rebuilding the reef system

The Nature Conservancy developed a Coral Nurseries and Restoration project led by Dive Safety Officer Lisa Terry. She and her team of volunteers cultivate, harvest and plant staghorn and elkhorn corals around St. Croix.

According to the Nature Conservancy, critically endangered staghorn and elkhorn coral have declined by 90 to 95 percent. Populations of elkhorn coral in the US Virgin Islands alone has dropped from 85 percent to 5 percent.

Restoration efforts are rebuilding the reefs through in-water nurseries that are strategically planted in areas where natural and human threats are low.

How you can help

Visit St. Croix to support the economy and practice sustainable behavior at home and abroad by



Location of US Virgin Islands on global map (above); Satellite map of St. Croix (right)



THIS PAGE: Reef sharks steal the show, with increasing numbers in St. Croix



Divers planting staghorn coral (above); One of the ways in which you can help is to assist with trash removal, such as this can floating in Protestant Bay (right)



accessible and collaborating with the wildlife refuges and The Nature Conservancy.

Jennifer Idol is the first woman to dive 50 U.S. states and author of *An American Immersion*.

She's a PADI Ambassadiver, member of the Ocean Artists Society and has earned 29 certifications throughout her 22 years of diving. For more information, visit: theunderwaterdesigner.com

REFERENCES:
 BUREAU OF ECONOMIC RESEARCH, OFFICE OF THE GOVERNOR, CHARLOTTE AMALIE. *US VIRGIN ISLANDS ANNUAL TOURISM INDICATORS*. US VIRGIN ISLANDS. AUGUST 2017.
 US DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY [MAP]. VIRGIN ISLANDS OF THE UNITED

STATES, OFFICE OF THE GOVERNOR, FREDERIKSTED, VIRGIN ISLANDS. 1958.
 US FISH AND WILDLIFE SERVICE
 US VIRGIN ISLANDS CARIBBEAN ISLANDS NATIONAL WILDLIFE REFUGE COMPLEX. *COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL ASSESSMENT SANDY POINT, GREEN CAY, AND BUCK ISLAND NATIONAL WILDLIFE REFUGES [DRAFT]*. US DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE SOUTHEAST REGION ATLANTA, GEORGIA. AUGUST 2009.

Staghorn coral being harvested (above) and transported (right); Nurseries show that reefs are immediate shelter for fish (left)

avoiding single-use plastics such as straws and plastic bags. Leave natural life in place in this paradise by not purchasing or collecting shells, sand and coral. Place all trash in proper bins and recycle whenever possible. Share your love for this island oasis through your stories and photos.

While fish and wildlife service management needs volunteers and interns, the turtle team is limited to interns studying sea turtles with compelling sea turtle conservation goals. Participants in nest watching and monitoring require significant training and must be capable of walking in sand several miles each day or night. The turtle team is composed of six interns who work four months of the year.

The turtle watch program includes a public education opportunity on sched-

uled nights. These groups may observe hatching nests after participating in an educational seminar. The program is worth visiting as staff answer any questions about the sea turtles.

Life in St. Croix is a complex and changing ecosystem driven by the relationship between inhabitants, visitors, wildlife and plant life. ■

Special thanks go to the staff of Cane Bay Dive Shop (canebayscuba.com) for their support, making numerous dive sites



Shooting Macro in
Mozambique

Text and photos by Kate Jonker





The vast expanse of pristine beach at Ponta do Ouro (above right); Many sand roads lead to Ponta do Ouro (top left)—soon to be a thing of the past, as a new tar road between Maputo, Ponta do Ouro and the Kosi Bay border post is due to be completed in December 2018; Some of the many market stalls in Ponta do Ouro (above left); If you look closely, you will even find a barber shop in the market at Ponta do Ouro! (right); PREVIOUS PAGE: Golden blenny peeks out of his hole in the reef at Lionfish Alley.

There's a cartoon that pops up on social media every now and again of a diver photographing a tiny starfish on a rock as a beautiful shark glides above him. The diver continues to concentrate on the critter as his buddies try, without success, to catch his attention. Such is the life of a macro photographer, and such was my recent experience in Mozambique.

I have been diving in Ponta do Ouro, a small Mozambican coastal village 10km from the South African border, since 2002 and love its laid-back atmosphere, rustic village life, long sandy beaches and warm blue ocean, just waiting to be explored. Because of the clear water, schools of colourful fish, vibrant reefs and the chance of seeing "something bigger," I had always previously opted for wide-angle photography whilst diving here.

However, a year ago, photos of incredible macro life in Ponta do Ouro started to emerge on social

media, and amongst the winners of photographic competitions. I was intrigued—I had no idea that such macro life existed in Mozambique, and I was keen to go and find it for myself.

Getting there

I travelled to Ponta do Ouro with a group of 11 diving friends, flying from Cape Town to Durban and then taking a bus to the South African-Mozambican border post at Kosi Bay. Once our passports had been stamped, we were met by Isaak, a friendly Mozambican taxi driver who




A relaxed way of life in Ponta do'Ouro





Divers push a dive boat into the surf (above); Sunrise on the beach at Ponta do Ouro with dive boats waiting to be loaded for the first dive of the day (right); Mantis shrimp peers cheekily from a hole in the reef at Doodles (lower right)

Explore Gordon's Bay Cape Town - South Africa

**Dive Charters, Guided Dives, Gear Rental
Scuba & Photography Courses**

www.indigoscuba.com info@indigoscuba.com

took us across dunes and through coastal forests on a winding sand road to Ponta do Ouro.

We soon arrived at the house we had rented, unpacked and went in search of groceries and the delicious local "2M" beer at the nearby market. A relaxing evening was spent chatting and preparing our cameras for our dives the following day.

In Mozambique, the boats launch through the surf, directly from the beach. Typical of most dive boats in Southern Africa, they have hard hulls, inflatable pontoons and outboard motors. All dive gear is loaded onto the boat at the beach, and the divers help to push the boat around so that it is facing the waves, and a tractor then pushes the boat into the water.

As soon as the boat is floating, the skipper will jump aboard, shout "ladies up" and the ladies all heave themselves up over the pontoons and onto the boat. Not very lady-like, but a lot of fun nevertheless. Once the boat is slightly deeper in the water, the gents are called to clamber aboard. Safety rules require that everyone dons a life jacket until the boat is through

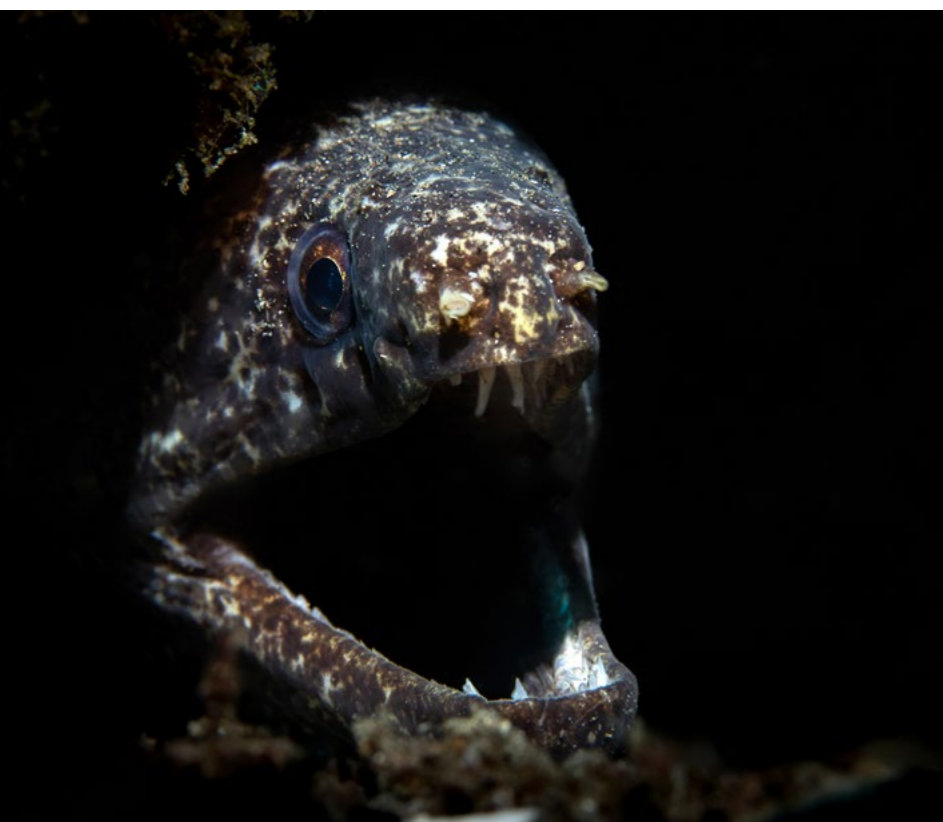
the surf break. It is also vital that passengers put their feet in the foot straps on the deck and hold on tightly to the ropes tied to the pontoons as it can often be a fast and bumpy ride to get through the surf.

Diving

Doodles. Our first dive was at a lovely site called Doodles. The reefs of Ponta do Ouro comprise low-profile fossilised sand dunes covered with hard and soft corals. Dive sites range from 10m to over 40m in depth, and there is something here for everyone.

To get acclimatised to the Mozambican way of diving, I opted to use a 17-70mm macro lens behind a compact macro port. Being a zoom lens, it enables one to photograph relatively wide-angle reef scenes as well as schools of fish, fish portraits and larger critters. I soon spied critters that were too small to photograph with my





setup—a Favorinus nudibranch on a rosette of Spanish dancer eggs, a tiny Spanish dancer nudibranch, a beautiful purple leaf fish and sea whip gobies. There were also larger subjects that I was able to shoot at closer range, and I was very excited to see a beautiful orange frogfish that tried to camouflage himself against a large orange sponge.

Tea Garden. Not wanting to change my lens in-between dives, I used the same setup on our next dive at Tea Garden where I spent most of my time photographing the vibrant reef fish as well as the many shrimps, porcelain crabs and anemone clownfish that shared their sprawling anemone homes. A huge red octopus sat superciliously atop the reef, looking very much like a character from the movie, *Pirates of the Caribbean*.



Lionfish Alley. The next day was definitely macro day. Armed with my 60mm macro lens, snoot and strobes and a +12.5 diopter to magnify the tinier critters, we went off to Lionfish Alley, a smallish reef 30 minutes up the coast from Ponta do Ouro. Critters were plentiful, and I spent a very happy 40 minutes photographing tiny blennies that played hide-and-seek with me as they darted in and out of their holes on the reef. Nudibranchs chomped their way through their food of choice, leaf fish swayed in the gentle surge, and octopuses hid in cracks on the reef.

Suddenly, all pandemonium broke out and we were enveloped in a huge school of about 300 yellow-spot-



Mozambique

Giant frogfish at Doodles (top left); At Lionfish Alley, a Spanish dancer (left), a sea dragon nudibranch (below), an undulated nudibranch (center), a marbled leopard moray eel (bottom left), and a common octopus, peering out of its lair (bottom right)





Diver uses a wide-angle macro technique to photograph a beautiful scorpionfish at Atlantis

ted kingfish. They circled us, swarmed around us, the black spots along their bodies flashing on and off. They were in hunting mode, and the fish on the reef quickly darted for cover. This carried on for a good 15 minutes until the tornado of fish disappeared as quickly as it had appeared. What an amazing experience—and, of course, it was a photographic opportunity missed as we all had macro lenses on our cameras!

The dive continued, and we found more beautiful nudibranchs, gobies and shrimps. The fun ensued on the safety stop as a lone remora swam from diver to diver, trying to find a new home. Fortunately, no one was to his liking!

Close. Our second dive of the day was at a site called Close, but as the surge was pretty strong, I struggled to take any reasonably good macro pho-

tos. There were quite a few tiny nudibranchs, which were impossible to capture using a diopter. Small sea whip gobies kept us entertained as they darted up and down their sea whip homes, and a beautiful pale pink and purple scorpionfish lazed on the reef, sadly too big for my macro setup. It was a really beautiful site, with a very busy cleaning station, but unfortunately not a very successful macro dive for me.

Atlantis. The following day was a day I had been waiting for with mixed emotions. It was to a dive site known as Atlantis, which would take us to the limits of recreational diving. The last time I dived here, I had experienced nitrogen narcosis, and I was not keen to experience that tunnel vision and ringing in my ears again. At the same time, I was incredibly excited, as I had heard that



Twinstripe blenny (above) and sea whip goby (top left) at Close dive site

Mozambique

Mike Ball Dive EXPEDITIONS

COD HOLE • CORAL SEA • GREAT BARRIER REEF • AUSTRALIA

Expeditions On the Wild Side

The Best Diving on the Coral Sea & Great Barrier Reef!

Dive with giant potato cod, explore deep walls, witness shark action at Osprey Reef.



Minke Whale Season! June-July

Unique Opportunity on the Great Barrier Reef. www.mikeball.com/minke

New Special Expeditions!

Check out our website for details.



Phone: +61 7 4053 0500

www.mikeball.com

Email: resv@mikeball.com Fax: +61 7 4031 5470
Visit: 3 Abbott Street, Cairns, Queensland 4870 Australia



5 ★★★★★ QUALITY RATING by our guests

Worldwide liveaboards
THE TREMENDOUS 10
Red Sea - Maldives - Indonesia

FREE NITROX

See them all at www.emperordivers.com

EMPEROR divers.com THE PACIFIC CHOICE RED SEA - MALDIVES - INDONESIA 25 LEADING THE WAY FOR OVER 25 YEARS Quality | Excellence | Service | Flexibility | Value



forests that adorned the top of the reef at 36m. We only had a short time to explore the reef, and before long, we spotted a huge orange Spanish dancer, the size of a dinner plate—then another and another. Suddenly, with just three minutes left of the dive, we found him—the purple weedy scorpionfish sitting proudly on a patch of the reef, well camouflaged between a clump of purple sea fans!

I took a few photos and swam on, giving the others the opportunity to photograph this “Holy Grail” of fish. I reviewed my photos and realized that, in my excitement, I had neglected to observe the “get close and then get closer” rule of underwater photography, and the fish was very small in the frame. Once the other divers had finished, I had one more minute to take some closer shots before our bottom time was up and we

there was a purple *Rhinopias frondosa*, or weedy scorpionfish, on this reef—a fish at the top of my bucket list that I had always wanted to see.

Conditions were perfect,

and descending to the reef, the water was midnight blue, clear and calm with no current. The beauty of the reef quickly opened up to us, and we could see the huge, black tree coral



Purple weedy scorpionfish, or *Rhinopias frondosa*, at Atlantis (above); Very small and well-camouflaged juvenile scorpion fish at Tea Garden (top center); Huge common octopus (top left) and spotted porcelain crab (left) at Tea Garden







DIVE DAMAI
Indonesia's Signature Service

info@dive-damai.com
www.dive-damai.com

12 guests - 18 crew: INDONESIA'S SIGNATURE SERVICE LIVEBOARDS!!



Horseshoe hawkfish (left) at Checkers; Black-margined nudibranch at Drop Zone (below)



Red-spotted coral crab at Checkers

had to make our slow ascent to the surface.

It had been an exhilarating dive and we all met on the surface, whooping with excitement. As we waited to climb onto the boat, we were joined by a solitary wahoo, who hung next to us, watching our antics. The excitement and adventure of exploring this incredible reef and discovering a fish that is so seldom seen in these waters was unforgettable.

Checkers. The excitement lasted long into our next dive of the day, which was at Checkers, one of my favourite sites as it has beautiful topography and is teeming with fish life. I spent the dive floating between the schools of snappers and battfish, taking wide-angle macro photos of the clown anemonefish and having a bit of a giggle at one of my buddies who



insisted that a piece of coral was in fact a nudibranch. He spent much of the dive taking photos of said nudibranch, only to find out later that it was, in fact, a coral! And such is macro diving, especially for

those who are in need of corrective lenses!

Stables. The following day, we dived on the moon—literally! We descended 30m to a completely



Seahorse wrapped around a sea pen at Stables dive site

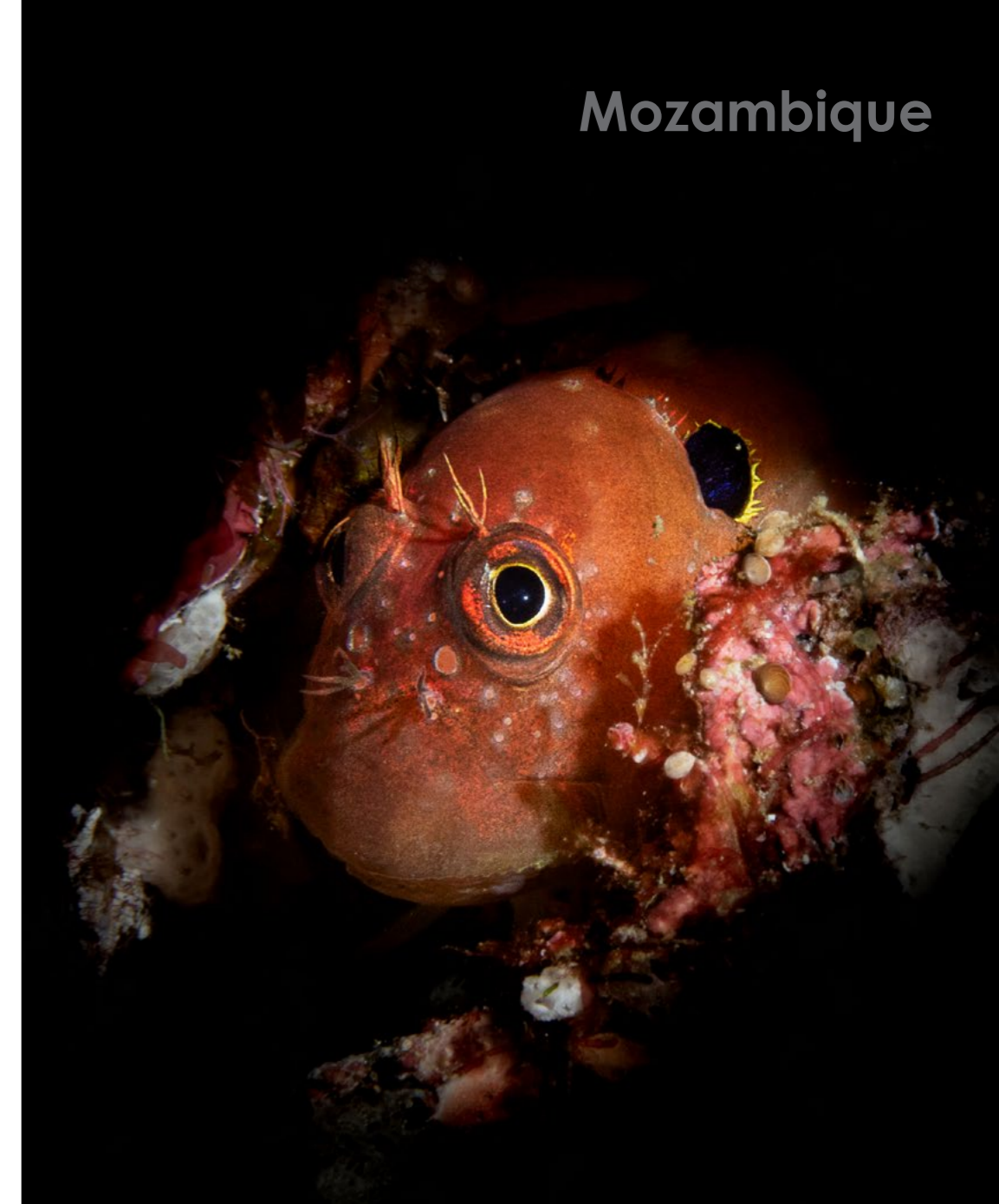


Tiger anemones provide a perfect camouflage for this little sea whip goby at Three Sisters (left)

name. There was quite a bit of surge and current running, so I spent most of the dive on the sheltered side of the reef photographing the nudibranchs, inquisitive geometric eels and comical blennies.

Blacks. The following day took us to one of Ponta do Ouro's most famous macro dive sites, Blacks. Here, we were treated to a multitude of macro subjects, from robust ghost pipefish, nudibranchs, juvenile fish, pipefish and the cutest, shy little yellow black-spotted boxfish that kept turning his back on me. Hinge-beak shrimps patrolled the lairs of the spiteful black-cheeked morays that waited to snap at the hands and arms of unwary divers. Although this is a relatively small reef, I could have spent hours exploring it, as there was so much to see.

All too soon, it was our last day and we opted to return to Blacks. Early into the dive, one



flat, sandy sea floor that was seemingly barren apart from hundreds of sea pens. This was Stables, the legendary "muck diving" site of Ponta do Ouro. Visibility was incredible, and we could see in all directions as far as the blue horizon would allow. As we started to swim, life started to emerge from amongst the sea pens. Curious hairy urchins known as sea mice, shy filefish, pipefish and seahorses were discovered hiding among the sea pens, and a strange-looking eel poked its nose out from a hole in the sand. It was a silent and eerie dive that, because of its depth, was sadly over far too soon.

Three Sisters. The second dive of the day was a little more normal. We visited Three Sisters, where blennies peeked out



of holes in the reef and garden eels swayed in the sand. Sea whips, covered with tiger anemones, provided a beautiful backdrop for the little gobies that had made them their homes. Nudibranchs grazed on the reef and a huge variety of reef fish of every shape, size and colour swirled around the three large rocks that give this site its



At Three Sisters dive site, a blackflap blenny (above) and an inquisitive nalolo blenny (bottom far left); Tiny juvenile boxy at Blacks (left); A vibrantly coloured *Siboga cuthona* nudibranch at Blacks (center)



Bornella anguilla, or snakey bornella nudibranch, at Blacks dive site (above); *Flabellina* nudibranch at Blacks (top center); Very small *Roboastra luteolineata*, approximately 1cm in length, glides across the sand at Tea Garden (top right)

of my buddies called me over and pointed at a bushy hydroid. As it swayed in the surge, its branches opened up to reveal a *Bornella anguilla*, a nudibranch I had been hoping to see for over 10 years! Photographing this beauty was a great challenge as I had to wait for the hydroid fronds to open up, focus on the nudibranch and press the shutter before they closed, hiding him from me again.

I concentrated and concentrated, desperate to get a good shot. Just then, my husband came over to me, frantically waving and showing me the sign for "shark." He wanted me to follow him, but I didn't want to leave my nudibranch behind until I was certain I had taken the best possible photo. I waved at him and let him swim off—this was far more important than seeing a shark

that I wouldn't be able to photograph with a macro lens.

When we surfaced, my husband asked if I had seen the shark. I replied that I had not, and he started laughing. He told me that I had had my nose so deep into the reef that I had yet again missed seeing a zebra shark, one of the very few sharks I have never seen and really wanted to, but always missed. We laughed all the way back to the beach.

Afterthoughts

Our trip to Ponta do Ouro certainly ended on a high note. It was very different to any of our previous trips, and we dived some incredible sites and explored fascinating new sites too. I feel that we have only scratched the tip of the iceberg as far as macro photography in Mozambique goes, and there is so much more to be



Tessellated halgerda nudibranchs at Blacks dive site; Purple-edged ceratosoma nudibranch at Drop Zone (left)



discovered.

There are definitely some sites that are more suited to macro photography—such as Tea Garden, Blacks, Lionfish Alley and Stables—and others that are better for wide-angle. The reefs in Ponta do Ouro are teeming with life and are of such great diversity, though, that whatever setup you choose to take beneath the waves with you, you will always find exciting and beautiful subjects to photograph. But don't be surprised if a whale shark or manta swims above you when you are photographing nudibranchs—as such is the life of a macro photographer. ■

Kate Jonker is an underwater photographer and writer based in South Africa. She teaches underwater photography, is an SSI Dive Control Specialist and dive boat skipper for Indigo Scuba in



Gordon's Bay and leads dive trips across the globe. For more information, please visit: Katejonker.com.

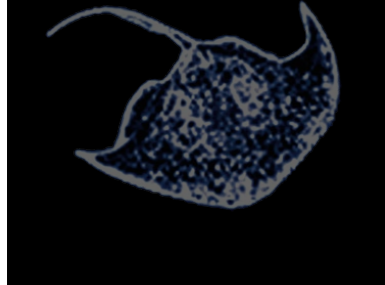


Camel hinge-beak shrimp (above) and neon and yellow bandtail cardinalfish (top right) at Blacks

At Blacks, robust ghost pipefish (above), red-scribbled pipefish (top left) and a tiny geometric eel (right)



fact file



Mozambique



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

History After nearly five centuries as a Portuguese colony, Mozambique gained independence in 1975. This was followed by large scale emigration, a severe drought and a prolonged civil war which thwarted the nation's development until the mid-1990s. In 1989, the ruling force, the Front for the Liberation of Mozambique (Frelimo) formally abandoned Marxism. The following year, a new constitution provided for multi-party elections and a free market economy. In 1992, a peace agreement negotiated by the UN between Frelimo and the Rebel Mozambique National Resistance (Renamo) force, ended the violence. After 18 years in office, Joaquim Chissano stepped down in December 2004 and his elected successor, Armando Emilio Guebuza served two terms until his executive power was passed to Filipe Nyusi in 2015. Government: presidential republic. Capital: Maputo

Geography Mozambique is located in south eastern Africa and borders the Mozambique channel between South Africa and Tanzania. Other neighbouring countries include Malawi, Zambia and Zimbabwe. Mozambique is the 36th largest country in the world with a coastline stretch-

ing 2,470km. The terrain is mostly coastal lowlands, uplands in the interior, high plateaus in the north west and mountains in the west. The lowest point is the Indian ocean is 0m and the highest point is Monte Binga at 2,436m. Natural hazards include severe droughts, cyclones and floods in the southern and central provinces.

Climate Mozambique's climate is tropical to subtropical.

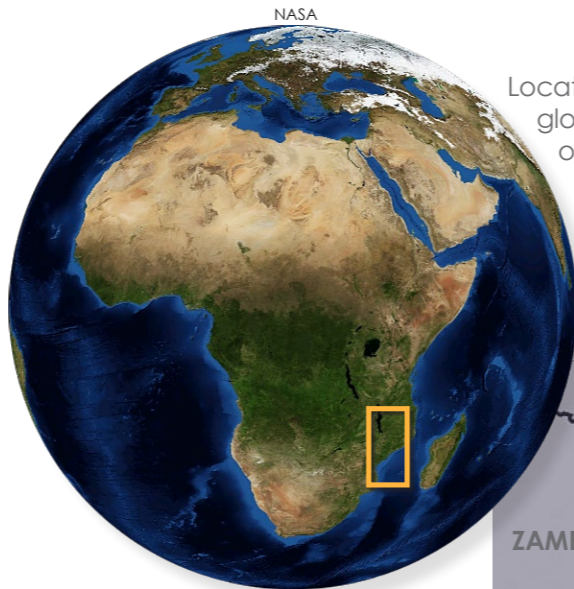
Environmental issues Increased migration of the population to urban and coastal areas has had an adverse impact on the environment. Other challenges include desertification, pollution of surface and coastal waters and elephant poaching for ivory.

Economy Mozambique was one of the world's poorest countries at the time of its independence in 1975. In 1987, in order to stabilize the economy, the government embarked on a series of macro-economic reforms. This, in addition to donor assistance and political stability after the multi-party elections of 1994, led to dramatic improvements in the nation's GDP. However, despite the introduction of VAT and reform of customs service, over 50 percent of the population still remains below the pover-

ty line and subsistence agriculture continues to employ the majority of the country's work force. The economy grew at an average of six to eight percent between 2005 and 2015, making Mozambique one of Africa's strongest performers; but the country's large external debt burden, donor withdrawal, elevated inflation and currency depreciation resulted in a slower growth from 2016 to 2017. American ExxonMobil and Anadarko are currently (2018) seeking approval to develop natural gas fields off the coast of Cabo Delgado province in the north of the country and the Mozambican government predicts that sales of liquefied natural gas from these projects could generate several billion dollars in revenues annually from 2022 onwards.

Currency Metical (MZN). Exchange rate: 1USD=59.21MZN; 1EUR=68.82MZN; 1GBP=78.8MZN; 1AUD=44.43MZN; 1SGD=44.15MZN

Population 26,573,706 (July 2017 est.). Mozambique is a poor, sparsely populated country with a rapidly growing youthful population—45% of the population is younger than 15, although population growth is affected by excess mortality due to AIDS and other diseases, which can result in lower life expectancy and higher infant mortality. The population is



Location of Mozambique on global map (left), and location of Ponto do Ouro on map of Mozambique (below); Juvenile twobar anemone clownfish in anemone (right) and male sea goldie (bottom right) at Three Sisters dive site.



Language Portuguese, which is the official language, is spoken by 10.7%. Other languages include Emakhuwa 25.3%, Xichangana 10.3%, Cisena 7.5%, Elomwe 7%, Echuwabo 5.1%, and other Mozambican languages 30.1% (2007 est.).

Health & Security For health and security updates, local laws and medical facilities, please check your national state department's current travel advisories before your trip. The following vaccines are recommended by the US CDC (Centres for disease control and prevention): Hepatitis A and Typhoid, as there is a risk of contracting these diseases through contaminated food or water in Mozambique, especially if you are staying with friends or relatives, visiting smaller cities or rural areas, or if you are an adventurous eater; Malaria—talk to your doctor before you leave in order to take the right malaria medication for your trip, especially as some medications are not suitable for divers. DAN (Divers Alert Network) can provide accurate advice in this regard; be aware that a prescription is required to get malaria medication.

Decompression chambers The closest hyperbaric chamber is in Richard's Bay, South Africa.

Travel/Visa A visa, passport and return ticket are required for entry. Get a visa in advance of your trip. Passports must be valid for at least 6 months and have 3 blank pages, and be carried on your person at all times during your trip. Please consult consular services for more details, especially if you are traveling with minors through South Africa to get there.

Web sites Mozambique Tourism mozambique tourism.co.za



KATE JONKER

Christmas Island

— *Australia's Own Galapagos*

Text by Simon Mallender

Photos by Ingo Arndt, Linda Cash, Glen Cowans,
Udo Van Dongen, Mark Fitz, Justin Gilligan, Rob
Hughe, Leila Jeffreys, Mathieu Meur, Max Orchard,
Andrew Scott, Chris Surman, Inger Vandyke





JUSTIN GILLIGAN

So here we are. Five divers and I, hanging at a depth of 18m, about 80m from the reef edge over an unfathomably deep drop off, looking at each other. Did that just happen? Did we just have a rather intimate close encounter with the largest fish in the world? Apparently so.

We were alerted to this gentle giant's approach by our dive guide Hama, who, hanging out in the blue, spotted the gentle giant approaching and alerted us with a crazy rattling of his tank-banger. Scott Portelli, the keenest photographer among us (and fastest swimmer), had swum out into the blue twice as fast as the rest of us to get that one great shot before she turned away.

But she did not turn away. She kept on coming, swam up to and around Scott,

passing right in front of us, pausing only for a moment to look Scott in the eye and smile. Well, it looked like a smile—she opened her mouth slightly, turned gracefully and 10 seconds later had dissolved into the deep blue from whence she came, leaving us gaping incredulously at each other. We are going to remember this day for the rest of our lives.

In fact, today has been a long day full of wonders that started at 3:00 a.m. as we witnessed the spawning of several million red crabs on the shoreline of Christmas Island. We had all been so desperately hoping to see a whale shark, had I not captured it on camera, I could well have just made the whole experience up in my head. It was that surreal.

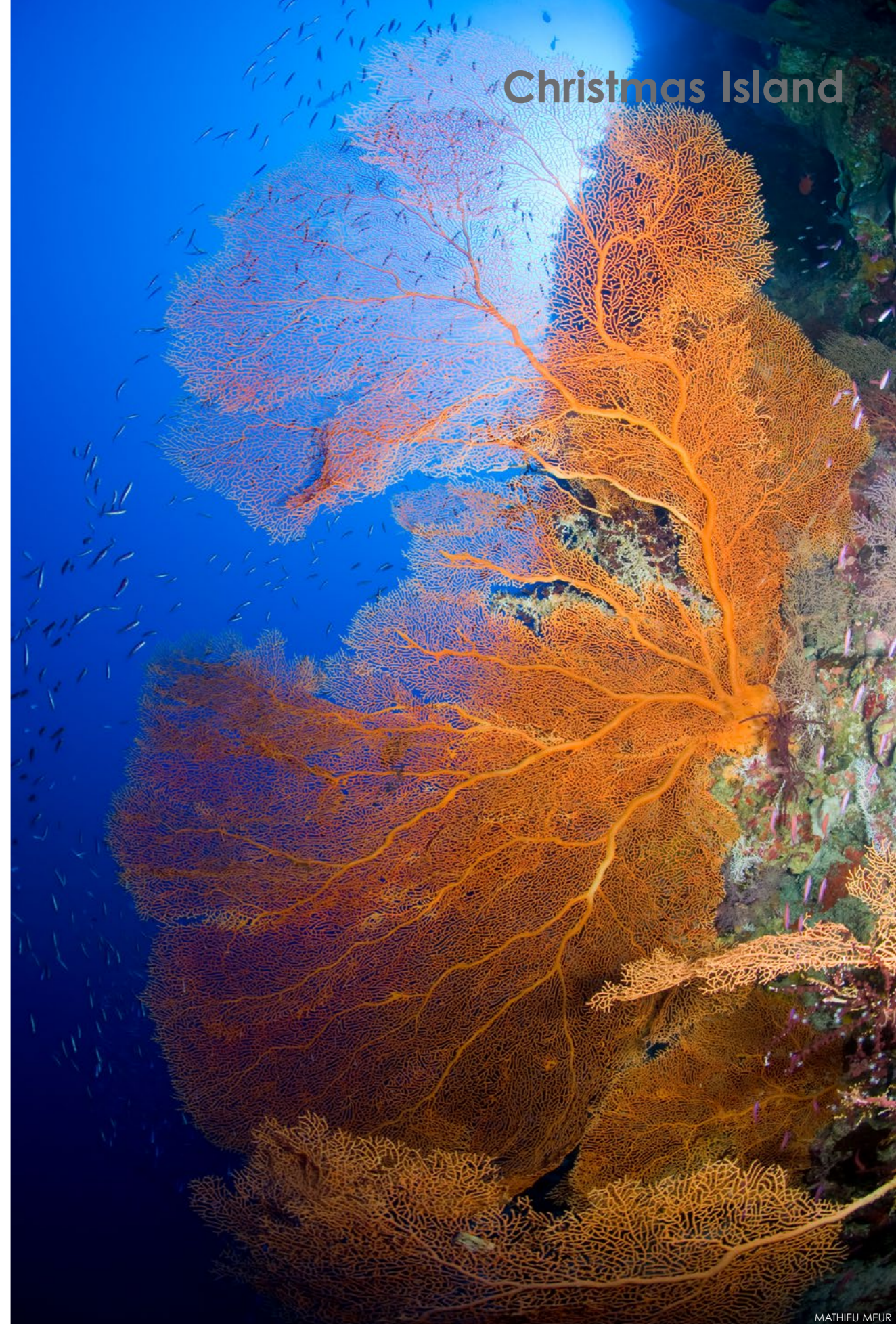
Whale sharks

The whale shark is the largest living fish



INGO ARNDT

on the planet and completely harmless (unless you are a plankton or red crab larvae—then you are lunch) and to be engaged by such a creature leaves an impression that will never wash off. As an ocean-going filter feeder, we know very little about their movements and behaviour. There are a few places where



MATHIEU MEUR

Large gargonian sea fan (above); Whale sharks (top left) can be seen during the annual red crab migration (previous page), when the red crabs (left) spawn, releasing their eggs into the ocean





CHRIS SURMAN



MAX ORCHARD



JUSTIN GILLIGAN



JUSTIN GILLIGAN

Baby red crabs

Red crabs at Blow Holes (above); Crab barriers along the road (top right); Baby red crab (right)

encounters with divers and snorkelers are almost guaranteed. At Christmas Island, encounters are not exactly common, but when they do occur, they are completely natural, and very special. The whale sharks are often sighted around the time of the annual red crab migration, when the red crabs release their eggs into the ocean to spawn, which in itself is one of the most amazing wonders of the natural world and why we had been up since 3:00 a.m. to observe it.

The red crab

The red crab (population 60 million), is Christmas Island's (population 1,200) endemic land crab. Every wet season, if the conditions are right, they all come

down to the beach to fulfil an annual reproduction ceremony. The males head off first and dig a cosy little burrow near the shoreline. The females arrive a few days later, having made the 5km trek at an average speed of 1km per day.

The whole exercise is dependent on there being enough rain to keep the crabs moist on their epic journey, and, on the phase of the moon. The crabs only release their eggs just after the turn of the high tide when the moon is in its final quarter and the waves are at their lowest.

This gives them the best chance of standing in the shallows on the shoreline without being washed away by waves and shimmying their precious payload of eggs into the outgoing waters where they

will be carried by the outgoing tide to spawn in the waters off Christmas Island. Turning from eggs to larvae to tiny red crabs (about the size of your pinkie fingernail), they return six weeks later to make the 5km journey back into the wet interior on their own.

So, after getting up before dawn to witness the amazing spectacle of several thousand red crabs shimmying their eggs into the sea, a spectacle duplicated at all the beaches and coves around Christmas Island, we grabbed some breakfast and headed out for a day's diving on Hama's dive boat which is called *Feral*.



Red crabs at dawn on Christmas Island





UDO VAN DONGEN



UDO VAN DONGEN

Christmas Island



Hawksbill sea turtle resting on reef (above); Crown jelly (left)

Geology and biodiversity

The unique location and geology of Christmas Island delivers corals that are twice the size and extent that you would expect. Because there is so little fishing in these waters, the marine life is as abundant as it is diverse—you will be hard-pressed to see such numbers and variety in any other one place.

nutrient-rich upwellings, the steep-sided walls are covered in pristine coral reefs down to 20 or 30m where great gorgonian sea fans take over. Conditions like this are perfect for all kinds of fish—from the smallest to the largest, and Christmas Island boasts about 650 identified species all up.

The coral reefs are home to great shoals of herbivores and parrotfish.

Surgeonfish and unicornfish can be seen working their way along the corals on every dive. On the near-vertical walls, the fusiliers stream up and down in search of plankton, and in the pocillopora coral heads, humbugs and hawkfish play hide-and-seek with divers as they pass.

There are dive sites all the way around the island and not all are steep walls. Some of the bays have shallow reefs sloping down to the drop-off. In the sheltered areas, feather stars congregate creating a small and colourful meadow, and it is here that turtles are often found resting. Giant morays hiding amongst the corals and rocks keep watch, as wrasse, rabbitfish and titan triggers cruise by.

The island also has its share of caverns and caves, and some of these weave through the volcanic rock coming out into the ocean below



MATHIEU MEUR

Crinoids on bommie (above); Diver and table corals on reef (top right)



ROB HUGHE



JUSTIN GILLIGAN

Feeding whale shark (above); School of batfish (left); Underwater photographer on wall dive (right)



UDO VAN DONGEN

the waterline. They are easily explored by divers who can surface inside the caverns to see great stalactites hanging above them.

There is no urban pollution from the island and being 300km from any neighbour means that the waters are exceptionally clear. It is often possible to see the reef sharks and eagle rays patrolling the reef wall 20m below.

Being steep-sided allows deep-water pelagics to come in close to the island's shoreline, so you can expect to be treated to some exceptional, though often brief, encounters with ocean going manta rays, scalloped hammerhead sharks and

other delights on your average dive day—perhaps a school of silky sharks cruising around 10m below you or a pod of spinner dolphins playing around you. And maybe, just maybe, if the rains are right and the moon is waning, and all your Christmases come at once, you will have an encounter with the largest, gentlest giant you could hope to meet—an encounter that will make you an ocean advocate for life.

Signature dive sites

Where your dive guide takes you will always depend on conditions on the day, but be assured, it's all good! Spend a few days on the island, however, and you

are bound to visit these signature dive sites.

Perpendicular Wall.

As the name implies, Perpendicular Wall is completely perpendicular to the ocean's surface. It falls away almost vertically a few metres from the surface, the corals leaning out as far as they can to catch the sunlight. Large gorgonians extend perpendicular to the wall to catch as much as they can from the passing currents. It is a riot of

colour and teeming with fusiliers that seem to take great pleasure in schooling up and down the vertical wall, whilst the other reef fish travel horizontally along it.

The dive starts under an overhang with fantastic sea fans and falls away pretty much vertically as you head left towards the northwest tip of the island. The





MATHIEU MEUR



GLEN COWANS

wall is literally teeming with life: great corals and shoals of fish, both small and big. Along the wall, sea fans, feather stars and hydrocorals add even more colour, and at the end of the dive,

there is a lovely 5m reef to explore while you do your safety stop.

Flying Fish Cove. This shore dive rates as one of the best shore dives in the world, and one you

can easily do on your own, having rented a tank from one of the local dive operators. It's more straight out until you hit the drop-off. Turn towards your left and work your way down the drop-off to about 18m, just following along the slope. After about 20 minutes, come back up the 9m on the slope, turn a sharp left towards the shore line, and then work your way back along the shallows at 9m, navigating back up the ramp via the two chains, which are laid out like airport landing lights to guide you back in.

It is a very easy dive. You really can't go wrong, and you will see more fish and coral types in that one dive than you would see in a week at other places, including several species of butterflyfish, hawkfish, squirrelfish, rock cod, blue tangs and the odd turtle. In season, it is also fairly common to encounter whale sharks at the drop-off.

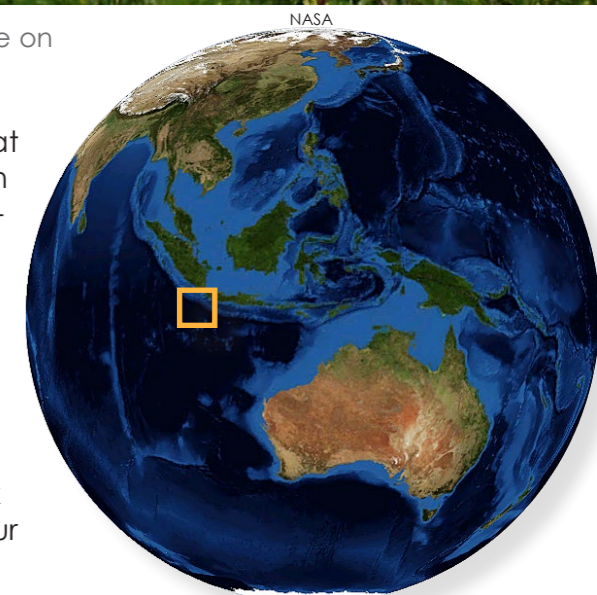
After the dive, there are toilets and showers in the carpark where you can wash down your gear, and gas barbecues to knock up some lunch.

Christmas Island

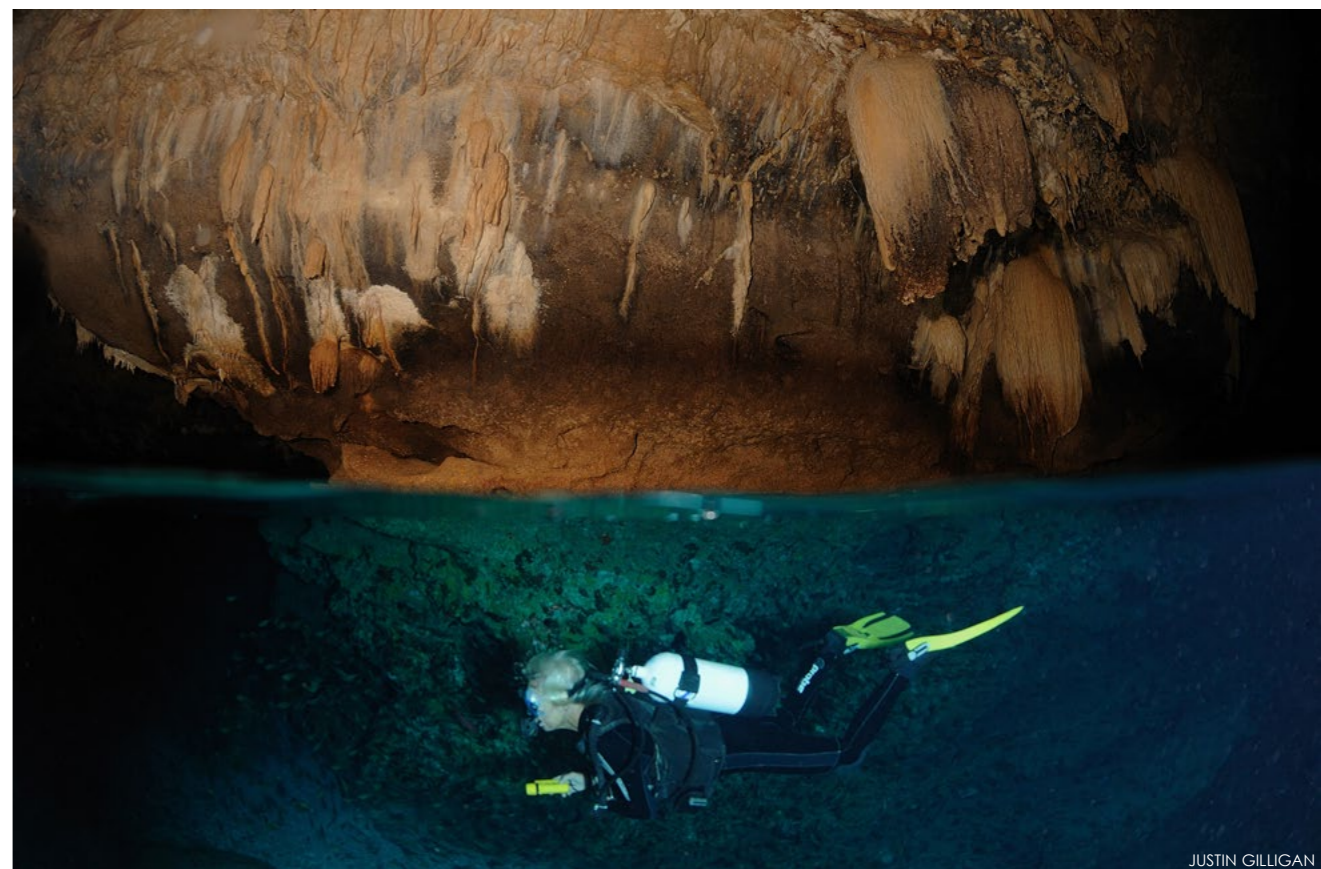


ANDREW SCOTT

One of the world's best shore dives is in Flying Fish Cove (above) where you can easily dive on your own; School of black triggerfish (top left); Diver with school of goatfish (left)



Location of Christmas Island on global map



Thundercliff Cave. There is, in fact, more than just one cave; it is a system of caves that you can actually follow deep inside the island. But most divers visit the first two: a big open chamber with very nice blue light at the entrance, and a second cave beyond and accessible via the first. The second cave has the more interesting stalactites and stalagmites—particularly one tall, thin column, which looks almost too thin as it is almost cylindrical rather than the typical conical shape of a stalagmite. There is also a formation referred to as a hanging shroud. Outside the cave, there is a flatter reef at about 12m, which has lots of the usual reef suspects: leatherjackets, several species of butterflyfish, surgeonfish and a host of goldspot seabream.

Shore excursions

There are plenty of wildlife encounters to be found on dry land between dives on Christmas Island. As the island is quite small, whichever you choose to explore—whether that’s hiking, bird-watching or scuba diving—all activities can be undertaken as a day trip from the main settlement, funnily enough called Settlement.

The Dales. Take one day to trek through the Dales along marked trails that wind through tropical rainforest and waterfalls, looking down amongst the winding roots of the giant figs for the island’s endemic land crabs. There are literally tens of millions of them throughout the forest, from the abundant red crab to the massive robber (sometimes called coconut) crabs.

Daniel Roux Cave. On another day, visit the Daniel Roux Cave; there are no lights, no handrails, no steps and no admission fees, so be sure to take a couple of touches to see the magnificent stalactites and stalagmites that rival the majesty of any cathedral. The cave is home to a large colony of small bats, which tend to go where they hang—it can get slippery underfoot, so be careful where you put your feet, and do not wear your Sunday Best.

The Grotto and Blow Holes. There are other little features of natural wonder scattered throughout the island: remote beaches where turtles nest, a little sunny grotto of saltwater (called The Grotto) and the Blow Holes on the south coast where the Indian Ocean is forced up

Diver in Thundercliff Cave (above and top left); Between dives, one can hike to the waterfalls at the Dales (top center) or visit the Daniel Roux Cave (top right) with its colony of small bats.



INGER VANDYKE

Christmas Island

Getting there

You can fly to Christmas Island from Perth (twice weekly) or Jakarta (weekly). Occasional charter services are also available from Kuala Lumpur.

Lodging and guided tours

Accommodation on Christmas Island ranges from boutique hotel rooms to self-contained and lodge-style properties—there is something to suit everyone. Many offer ocean views, and all provide the personal service that you would expect from smaller operations.

For a truly enriching wildlife experience, take a guided nature tour with Indian Ocean Experiences (indianoceanexperiences.com.au). ■

For more information and how to book lodging and tours, visit Christmas Island Tourism Association's website at: Christmas.net.au.



CITA

Extra Divers Australia is a full-service dive operation with a boat, which takes up to 16 divers, moored at the Wharf in Flying Fish Cove. It has been operating on Christmas Island for just over 12 months. They offer the full gamut of SSI courses, including TDI Tech Diving courses, though PADI courses are also available on demand. At the dive centre, you will find full sets of brand new dive gear—including dive computers—to hire and for sale. The custom-built dive boat (surveyed for 18) with a diver limit of 16, has been recently refurbished before its transfer to Christmas Island (search Australia at: extradivers-worldwide.com)

Rugged sea cliffs on the coast of Christmas Island (above); Baby boobie (left); Red-footed boobie (top right)

through volcanic shafts expelled in plumes of spray.

Bird watching.

Looking up, large frigate birds can be seen riding the ocean breeze, scanning

the waters below for dinner, and tropic birds loop the loop, dancing in the warm air currents. Looking down, you might find some brown boobies nesting on the ground, their eggs laid literally on what amounts to a huddle of sticks and stones. These birds have no fear of humans, so there is no need for an enor-

mous camera lens; you can get a close-up with your iPhone.

On the way back, a visit to the golf course offers great vistas over the ocean and the chance to see another rare specimen: the red-footed booby—a great colony of which will live in a single tree.

Multicultural Cuisine.

And all this can be found in a place where, at the end of a great day's exploring, a multicultural community offers the prospect of a great Malaysian-style curry, an authentic Chinese dish, or a good old-fashioned fish 'n' chips with a cold beer or a chilled chardonnay at the Golden Bosun Tavern—the best place on the island to catch the Indian Ocean's stunning sunsets.

Dive operators

There are two dive centres on Christmas

Island: **Extra Divers**, who can cater to large groups of up to 16 divers; and **Wet'n'Dry Adventures**, who offer an intimate experience.

Wet'n'Dry Adventures, a PADI dive centre, is a small and friendly family business that has been operating on Christmas Island since 1994. The operator is Hama, his second-in-command is Linney, and his boat, which takes up to five divers, is called Feral. Hama's philosophy is to fit two dives into a half day so that you are free to use the other half day to see more of Christmas Island. Linney bakes something fresh every morning: apple turnovers, date and walnut cake, or muffins. So, between dives, there is fresh bakery and hot drinks to look forward to. (Learn more at: divingchristmas.com).



GLEN COWANS

Spinner dolphins can be seen in the waters of Christmas Island in Australia



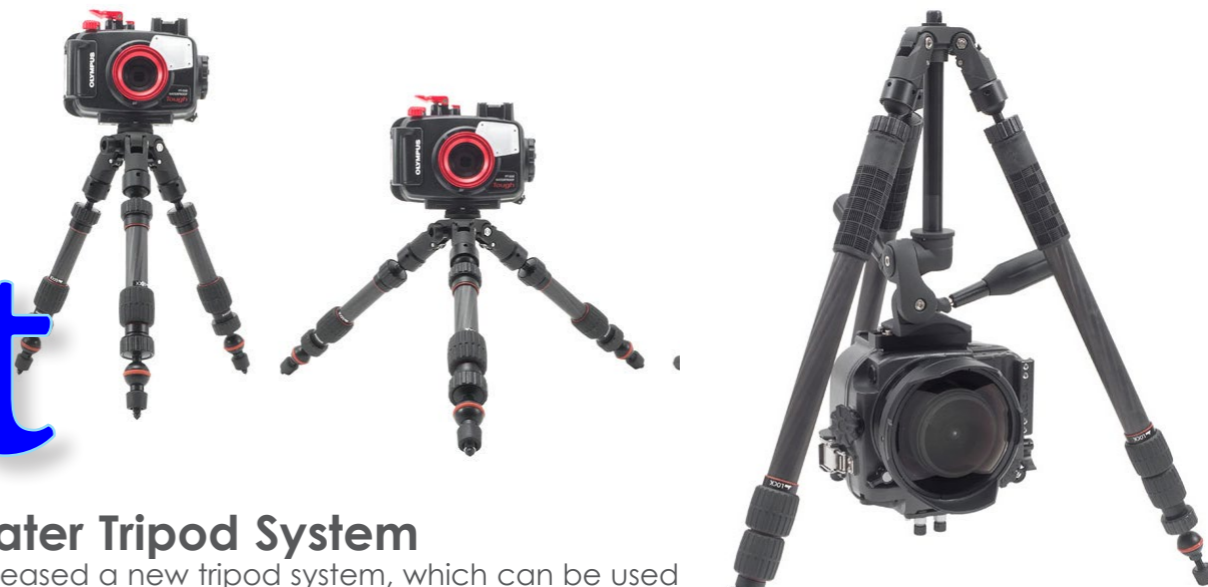
Edited by
Rosemary E. Lunn
and Peter Symes

POINT & CLICK
ON BOLD LINKS



THE FACTS AND VIEWPOINTS IN THIS SECTION ARE NOT NECESSARILY THE VIEWS OF X-RAY MAG. EQUIPMENT PRESENTED IN THIS SECTION HAVE NOT BEEN TESTED BY X-RAY MAG STAFF, NOR ARE THE ITEMS WARRANTED. INFORMATION PROVIDED IS CONDENSED FROM MANUFACTURERS' DESCRIPTIONS. TEXTS ARE USUALLY EDITED FOR LENGTH, CLARITY AND STYLE. LINKS ARE ACTIVE AT THE TIME OF PUBLICATION.

Equipment



Underwater Tripod System

Inon has released a new tripod system, which can be used in both fresh and salt water, thanks to a specially selected material, surface finishing and assembling method. The system comprises the UW Tripod Hub and the UW 3-Way Panhead, which in combination with various arms, legs and different parts, can be set up in a wide variety of configurations. The UW Tripod Hub is equipped with 1/4 tripod screw to add an UW Panhead or head part of variety of Shoe Base products. Usable as a simple tripod by attaching underwater housing directly. It is also possible to hang down a camera system by attaching the elevator upside-down for extremely low angle shooting or shooting a subject just underneath of the tripod. Inonnews.blogspot.com

Without a 'p'

Fourteen years after Shearwater Research was founded in a spare bedroom, the Canadian manufacturer has debuted their inaugural watch dive computer—the Teric. When news about the Teric came across my desk, I had to ask why this everyday time piece had seemingly broken the Shearwater tradition of wrist-worn computers with a name starting with "p." Teric is derived from the word Pteric, as in Pterodactyl or Pterosaur. Shearwater understandably removed the silent "p" to stop the mispronunciation of Pteric. Bruce Partridge, Shearwater's Chairman, said, "We've gone beyond our best traditions with the Teric. It is our most compact unit produced to date, and yet, it is also the most feature rich." The Teric has a rich, full-color AMOLED screen providing a highly visible, bright and vivid display. It also comes with an all new freediving mode that has programmable sampling rates, configurable haptic and audible alarms and improved ascent and descent rate indicators. As with the Perdix AI and the NERD 2, the Teric can connect with up to two wireless tank pressure transmitters. Shearwater.com



Trolley

I have moved a lot of scuba cylinders in my time, so anything to take the pain out of lugging tanks ought to be embraced. US inventor James Long has come up with the Tank Trolley. Two wheels, some webbing and a ridged axel "that can support the weight of a full size tank with dive gear attached". The manufacturer states that this can "roll through sand, grass, gravel, dirt and docs [sic]. It will even go down steps." The Tank Trolley weighs 2.2kg (5lbs), and when it is not in use, can be stored in your dive bag. I genuinely cannot decide whether this ridiculously simple solution is a gimmick to be avoided, or a seriously useful tool that you wish someone had invented years ago. I would be really curious to test something capable of transporting a twinset / set of doubles.

Tanktrolley.net

Plastic-free

Thanks to the Blue Planet II effect, I defy any diver to not to be aware of the plastic pollution crisis. One culprit is the one-time-use plastic water bottle. You would think that refilling what looks to be a reusable plastic water bottle would be perfectly ok, but it's not because the hard plastic contains the chemical Bisphenol A (BPA). This can leach into the beverage, and there is the potential that this chemical may interfere with our hormone system and cause fertility issues. However, you do not need to have water woes. A number of manufacturers, including Leakproof, are now creating BPA-free products. Leakproof produces a range of BPA-free, phthalate-free, versatile drink bottles, which are dishwasher safe and suitable for hot or cold drinks. You have a choice of five sizes, ten colours and three finishes. Leakproof.co.uk



C & R Testing

We care for compressed air



W32 CANOPY
High Pressure Compressor
Charging Rate: **180, 250 or 300 lt/min**
Working Pressure: **225/310 bar**
Dimensions (CM): **w70 L100 H130**
Weight: **280, 290 or 300 kg**



W31 MARINER
High Pressure Compressor
Charging Rate: **105 or 140 lt/min**
Working Pressure: **225/310 bar**
Dimensions (CM): **w44 L81 H52**
Weight: **65 kg**



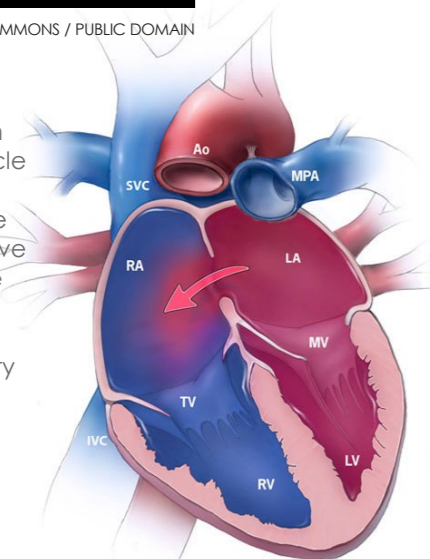
Alkin and Aykom
Compressor Distributors

C & R Testing Ltd
Unit 1, Owenshaw Mills, Old Cawsey,
Sowerby Bridge, Halifax HX6 2AF
Telephone: **+44 (0) 1422 410 466** | Email: info@candrtesting.co.uk
Website: www.candrtesting.co.uk
Opening Times: Monday to Friday 9.00 am - 17:00 pm
Saturday and Sunday - Closed



US CDC / WIKIMEDIA COMMONS / PUBLIC DOMAIN

RA: Right Atrium
RV: Right Ventricle
LA: Left Atrium
LV: Left Ventricle
TV: Tricuspid Valve
MV: Mitral Valve
Ao: Aorta
MPA: Main Pulmonary Artery
SVC: Superior Vena Cava
IVC: Inferior Vena Cava



Text by Simon Pridmore

The Scuba Confidential column in this issue is again adapted from my book, *Scuba Physiological: Think you know all about Scuba Medicine? Think Again!* The chapters in *Scuba Physiological* were originally written by scientists in the field of decompression research as part of a three-year project called PHYPODE (Physiology of Decompression). My (self-appointed) task was to rewrite their sometimes-complex research in a form accessible to all divers.

Researchers took a close look at PFO and arterial bubbles and reached some quite startling conclusions. Most divers know that many people have a PFO and that having a PFO makes you more susceptible to decompression sickness (DCS), but that is far from being the “hole” story, (forgive the pun).



Scuba Confidential:
PFO: Not the “Hole” Story
 — *Arterial Bubbles, PFO & Pulmonary Shunts*

What is PFO?

Let's start with a quick anatomy review. PFO stands for Patent Foramen Ovale. The foramen ovale is a remnant of the vascular system as it was before birth. A baby in its mother's womb cannot use its

own lungs to load oxygen into the blood. It uses the placenta instead, which brings the blood of the foetus into close contact with the mother's oxygen-carrying blood.

Oxygen-rich, placental blood enters the baby through the umbilical cord, and

flows through a large vein into the right atrium. So that the blood can be sent as quickly as possible to the brain and other organs, there is a “swing door” (the foramen ovale) between the right and left atrium, which lets through approximately

90 percent of the blood.

The remaining 10 percent follows the normal route from the right ventricle into the lungs, then to the left atrium, where it is pumped out by the left ventricle. After birth, of course, all of the blood goes

PIXABAY



PIXABAY

this way because the umbilical cord has been cut and the placenta is no longer connected. When a baby is born, it takes its first breath, inhales deeply, expands its lungs fully and opens up the alveoli and the pulmonary capillaries. No more blood passes through the foramen ovale and the door fuses closed in a couple of days or weeks.

In about half the population, however, the fusing process takes longer and the foramen ovale remains unfused (or "patent," to use the medical jargon). With advancing age, more shut completely but autopsy studies show that about 25 percent of people over 40 still have a PFO.

Bubbles in the brain

Bubbles that form during and after a scuba dive are swept into the lungs, where they become trapped in the pulmonary capillaries, slowly evaporate, and eventually disappear. However, sometimes bubbles can be observed in the arterial circulation, which means that, somehow, they have bypassed this pulmonary filter.

The brain receives most of the arterial blood and divers who get cerebral DCS, that is, symptoms relating to the brain, the

inner ear, the eye and the upper portion of the spinal cord, are found more frequently to have a PFO than divers who have no history of DCS or who get other types of DCS. The conclusion is therefore that bubbles are passing into the brain

via the PFO.

However, new high-resolution echocardiography units can now detect much smaller bubbles than was previously possible and they are now finding post-dive bubbles in the arterial system of divers

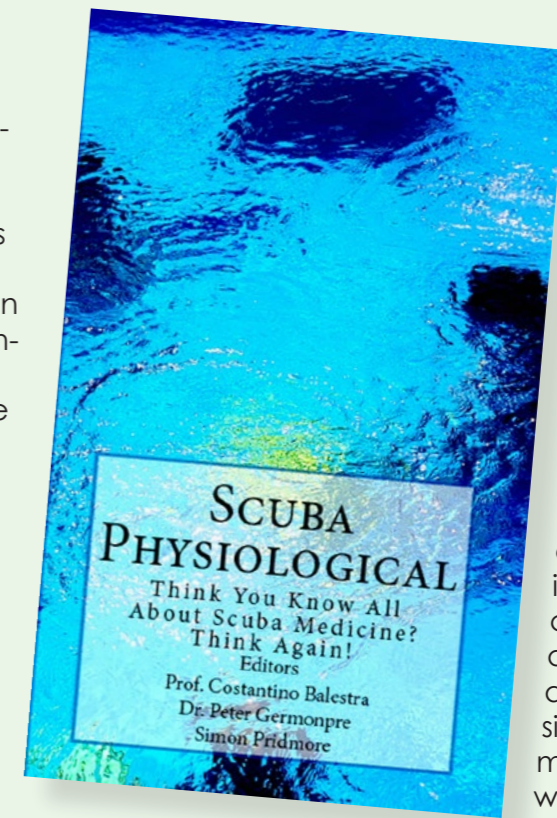


PIXABAY

A New Book for Scuba Divers!

If you are a diver, much of what you learnt about topics such as decompression sickness and narcosis in your scuba diving class is over-simplified and some of it is just plain wrong, as diver training agency texts have not kept pace with the science. Despite 170 years of research, the nature of decompression sickness and decompression stress remains unknown. Great advances have been made to make diving safer, but there are still glaring gaps in our knowledge. *Scuba Physiological* provides us with a good summary of what we know, a glimpse of where current science is taking us, and some good tips to make us all safer divers now.

The chapters in *Scuba Physiological* were originally written by scientists in



to the general population of divers. They thought it was a great idea and *Scuba Physiological* is the result.

Scuba Physiological: Think You Know All About Scuba Medicine? Think Again! by Simon Pridmore is available on: **Amazon.com.**

the field of decompression research as part of a three-year project called PHYPODE (Physiology of Decompression). Simon Pridmore is not an expert on diving medicine but, when he came across the material, he knew that many people in scuba diving beyond the scientific community would be interested in it. So, he contacted the original authors and proposed an abridged, edited, simplified and re-formatted e-book, which would make the information more accessible

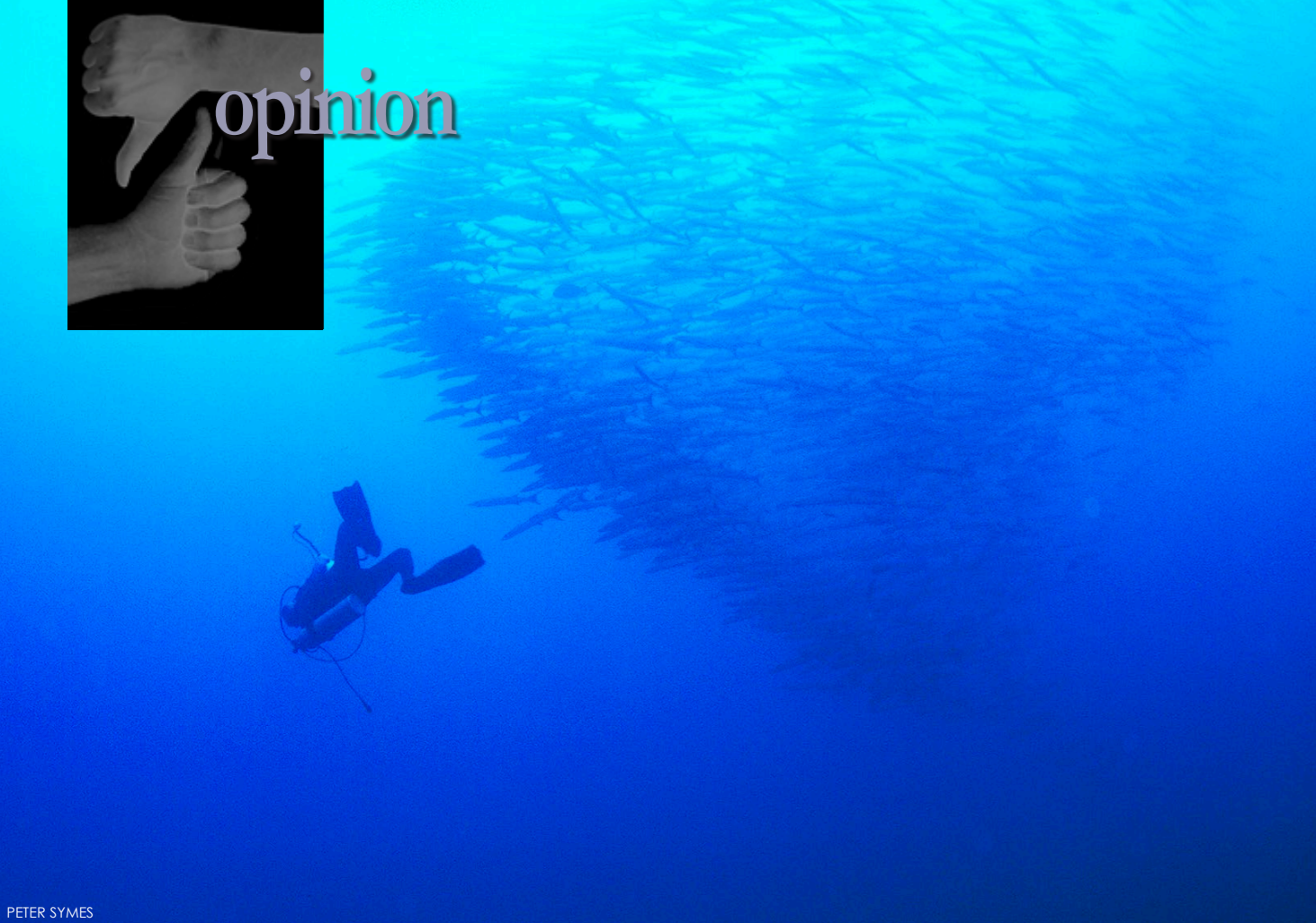
with no DCS symptoms much more often than in the past. The frequency is greater than one would expect if a PFO were the only factor responsible, so bubbles must be passing across the lungs in some way.

Again, using echocardiographs, researchers have observed significant post-dive passage of bubbles between the venous and arterial circulation via the lungs in approximately 10 percent of divers who do not have a PFO. The passage occurs via shunts called Intra Pulmonary Arterio-Venous Anastomoses (IPAVA). Like a PFO, the IPAVA allow blood and bubbles to bypass the small capillaries in the lungs that normally trap bubbles.

The shunts are usually closed but they open up when test subjects start performing physical exercise and the intensity

of exercise required to open the IPAVA varies greatly between individuals. Some people experience a shunt when they are at rest or just engaged in very mild exercise. Others need to be doing much higher levels of exercise before the shunt opens. Once the exercise stops, the IPAVA close again within a minute or two.

Bubbles may be present in a diver for a period of up to two hours after surfacing. The deeper and longer the dive, usually the more bubbles there will be. We know that one diver may be more prone to producing bubbles than another, although we do not know why. If a diver exercises after diving, the IPAVA may open and cause bubbles to pass into the arterial system. Even mild exercise, like surface swimming while wearing scuba



PETER SYMES

gear, may be enough. This might explain why divers who do not have a PFO nevertheless suffer cerebral DCS.

Arterial bubbles and DCS risk

DCS occurs on average only once per 2,500 to 20,000 recreational dives, depending on the type of diving. However, millions of divers perform tens of millions of dives a year. So, if 25 percent of divers have a PFO and bubbles are frequently found in divers, post-dive, there should be many more cases of cerebral DCS than there are. So why doesn't a PFO result in cerebral DCS more often?

A PFO is a door, not a window. As long as the pressure on the right side of the heart is lower than on the left, which is normally the case, the door stays closed, and no blood or

bubbles will pass through it to the arterial side. However, certain things can briefly increase the pressure in the right side of the heart. A Valsalva manoeuvre, the technique most divers use to equalize pressure in their ears, is one example.

Other diving-related actions that can produce the same effect include lifting heavy dive equipment or climbing up a boat ladder in full equipment after a dive. Holding your breath while exerting, pushing down to pass a stool, or simply coughing, can also do it.

All these activities momentarily stop venous blood from entering the heart. When the activity stops, the blood rushes into the heart like a tidal wave and briefly but significantly increases blood pressure on the right side of the heart.

This pressure may open a PFO, and blood and bub-

bles will start shunting to the arterial side. It is like a traffic jam creating a backwards-expanding line of stationary vehicles. Once the end of the queue reaches an alternative, normally unused, back road, vehicles will start using that road instead. Typically, DCS involving a PFO occurs about 20 to 30 minutes after surfacing, which corresponds roughly with the peak in the volume of bubbles in a diver. Remember, it is the bubbles that cause DCS, not the PFO.

So, the question remains: Whether bubbles enter the arterial system via a PFO or via IPAVA, why does cerebral DCS not occur more often?

Nitrogen bubbles that pass into and lodge in a tissue will shrink and disappear rapidly if the nitrogen pressure in the tissue is lower than the nitrogen pressure in the bubble.

After a dive, all body tissues desaturate, some faster than others. The brain is a very fast tissue with a half-time of approximately 12.5 minutes. This means that every 12.5 minutes, the nitrogen saturation of brain tissue halves. So, in most cases, 20 to 30 minutes after the dive, the brain will be desaturated to the extent that any bubbles passing into it will rapidly disappear and cause no harm.

Other tissues such as inner ear fluids have a slower tissue desaturation half-time and this may account for the fact that many instances of PFO-related DCS involve inner ear problems, such as dizziness and hearing loss.

A quick summary

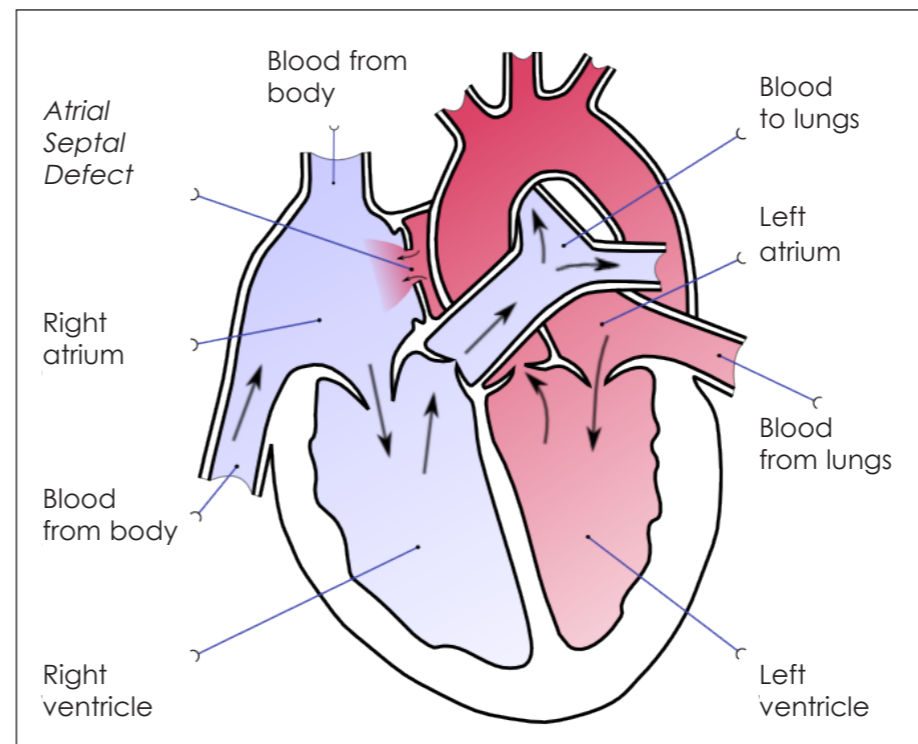
1. Post-dive bubbles are normally eliminated by the lungs but, in certain conditions, they may cross over to the arterial side.

2. Arterial bubbles occur more frequently than previously thought, but often without acute negative effects.

3. Diagnosis of a PFO presents additional risk for a diver, especially on demanding dives.

4. Exercise within two hours after surfacing, especially involving a momentary holding of breath, may increase DCS risk. All divers, not only those who have a PFO, should avoid it. ■

For a more detailed summary of the PHYPODE findings on PFOs and other issues, read Simon Pridmore's book, *Scuba Physiological: Think you Know All About Scuba Medicine? Think Again!* It is available as an e-book via Amazon stores worldwide. For more information, visit: SimonPridmore.com.

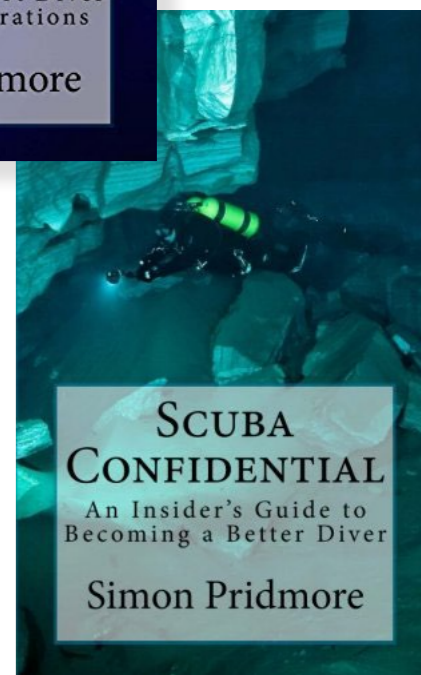
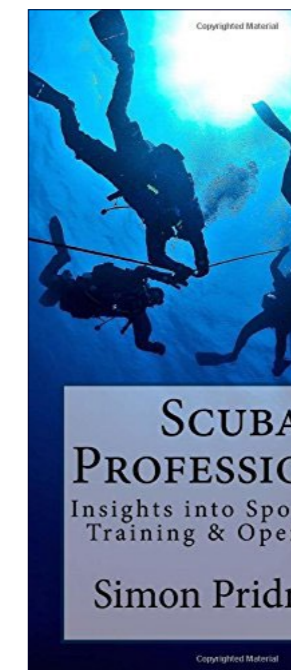
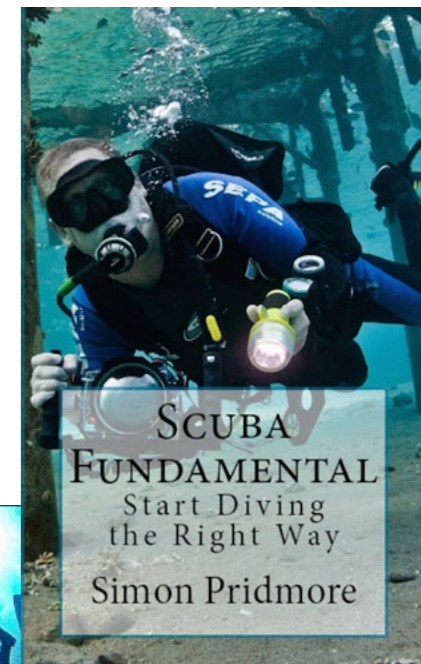


Atrial septal defect with left-to-right shunt. When this does not close after birth naturally, it is called a patent foramen ovale (PFO).

PFO

Get the trilogy!

Three books by Simon Pridmore no diver should be without



Available as paperback, ebook and audiobook at Amazon, Audible and iTunes

Click on the book cover to go to the order page, or go to the link below

simonpridmore.com

MANCO CAPAC / WIKIMEDIA COMMONS / CC BY-SA 3.0

Edited by Catherine GS Lim

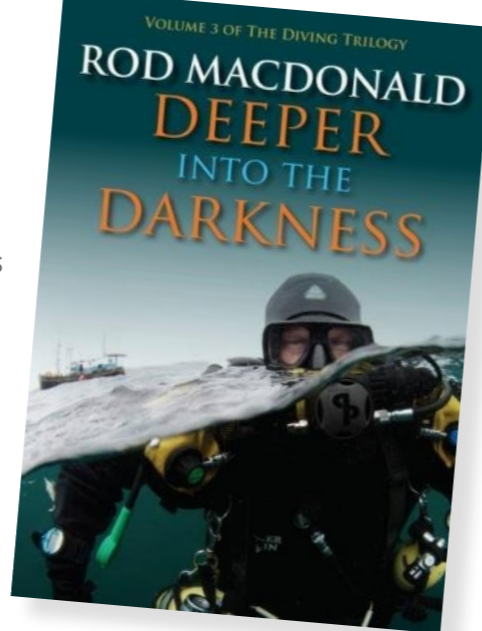


Wreck Diving

Deeper into the Darkness, by Rod Macdonald

Rod Macdonald explores famous shipwrecks and sunken K-class submarines around the UK, as well as American shipwrecks from the Battle of Guadalcanal and Japanese wrecks in Truk and Palau Lagoons. The latest developments in shipwreck exploration are recounted at Scapa Flow, as is the desecration of naval war graves at Jutland, South China Sea and Java Sea. This book brings the development of technical diving up to the present with the use of closed circuit re-breathers utilising mixed breathing gases, allowing Macdonald to dive even deeper into the ocean depths.

Paperback: 288 pages
 Publisher: Whittles Publishing
 Date: 31 May 2018
 ISBN-10: 1849953600
 ISBN-13: 978-1849953603

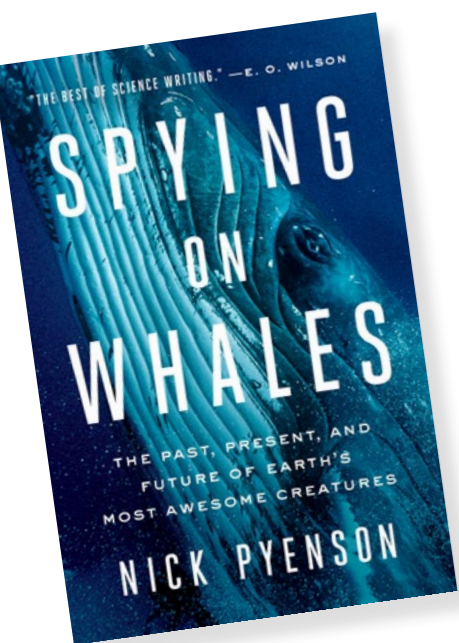


Whales

Spying on Whales: The Past, Present, and Future of Earth's Most Awesome Creatures, by Nick Pyenson

In this book, Nick Pyenson pieces together the story of the whale. Readers are taken on a global journey, from the Smithsonian's fossil collections to Antarctic waters, and even to the largest whale fossil site ever found (in a desert in Chile!). Questions like how their ancestors evolved from land-based animals to become the large, aquatic gentle giants of today, and how they consume enough to sustain their size are addressed here. The author also delves into what the future holds for them, alongside human-driven habitats and climate change.

Hardcover: 336 pages
 Publisher: Viking
 Date: 26 June 2018
 ISBN-10: 0735224560
 ISBN-13: 978-0735224568



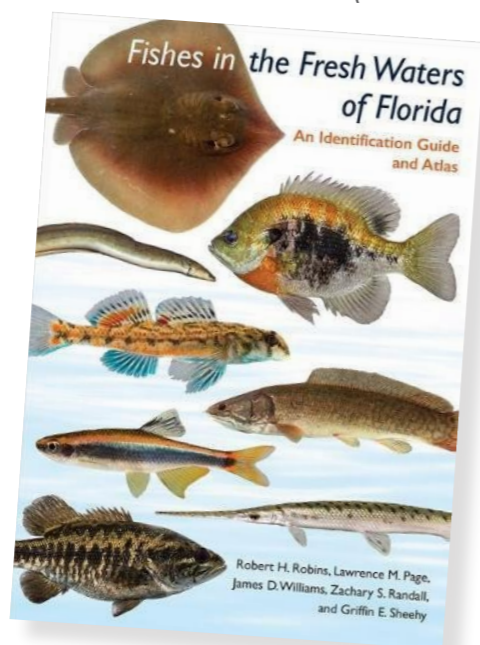
Florida Fish

Fishes in the Fresh Waters of Florida, by Robert H. Robins, Lawrence M. Page, James D. Williams, Zachary S. Randall, Griffin E. Sheehy

This identification guide to the 222 fish species in Florida's fresh waters is the result of the authors' research of the historical fish collections in ten natural history museums. Among the species covered are three species native only to Florida (seminole killifish, flagfish and Okaloosa darter), and North America's smallest freshwater fish (least killifish). Each species is presented

with colour photographs, key characteristics for identification, comparisons to similar species, habitat descriptions and dot distribution maps. The book also includes recent discoveries, changes in taxonomy, marine species that enter Florida's fresh waters, and invasive species.

Hardcover: 488 pages
 Publisher: University of Florida Press
 Date: 10 April 2018
 ISBN-10: 168340033X
 ISBN-13: 978-1683400332



FREE Download



Let's dive into the world of wonderful books?

www.DolphinsDivingDreams.com





Japanese giant salamander in mid-water

Text and photos by Don Silcock

The Japanese giant salamander is a quite unique, if rather mysterious, creature that lives in rivers across western and southwestern Japan.

As both its common and Latin names (*Andrias japonicus*) suggest, it is an endemic species of Japan that is both protected under federal legislation and formally nominated as a special natural monument because of its cultural and educational significance.

The Japanese giant salamander is indeed quite large, reaching up to 1.5m in length and 25kg in weight, which together with its large mouth and rather strange features gives it a quite formidable presence—at least when you first come face to face with one!

They possess a quite amazing ability to burrow down into the rocks of the river beds, something they do head-first, and given their overall size really does make you wonder how they turn around



Japanese Giant Salamanders

down there, because when they do re-emerge they are face-first.

Chinese vs Japanese

Despite its name, the Japanese

giant salamander is not the largest salamander in the world. That prize goes to the closely-related Chinese giant salamander, which can reach 1.8m in length and

up to 50kg in weight. Critically endangered in China, the Chinese salamander was introduced into Japan for commercial reasons in the early 1970s but now

poses a threat to the Japanese version, as the two species are known to mate, which has created a hybrid variant.

The Chinese version has a repu-

tation in Japan of being much more aggressive than its local cousin, which is distinctly sloth-like when observed during daylight hours.



A giant salamander starting to re-emerges from the river bed (left), resting on the river bed (below and bottom left), and rising from the river bed (bottom right)

The local river near Wara Village in Gifu Province (right)



being nocturnal creatures, they are quite timid during the daylight hours. They are also very well-camouflaged, and their brown and black mottled skin allows them to blend in extremely well against the river bottom. Plus, as

they spend a significant amount of time burrowed in to the river bed, you must actually know where to look for them in the first place, which means that a guide is essential.

Their small eyes, poor vision and



Japanese giant salamanders are nocturnal, and because they lose their gills when they are very young, they must interrupt their daytime slumbers to obtain air, something which they do by either rising to the surface to breath, or—in highly oxygenated, rapidly-flowing water—they can absorb it through their skin.

Being in the water with these creatures is an interesting experience but is one that involves quite long periods of inactivity, because while they slumber down in the river bed rocks, you must wait patiently on the surface. The salamander's breathing cycle is about 30 minutes and looking at rocks while you

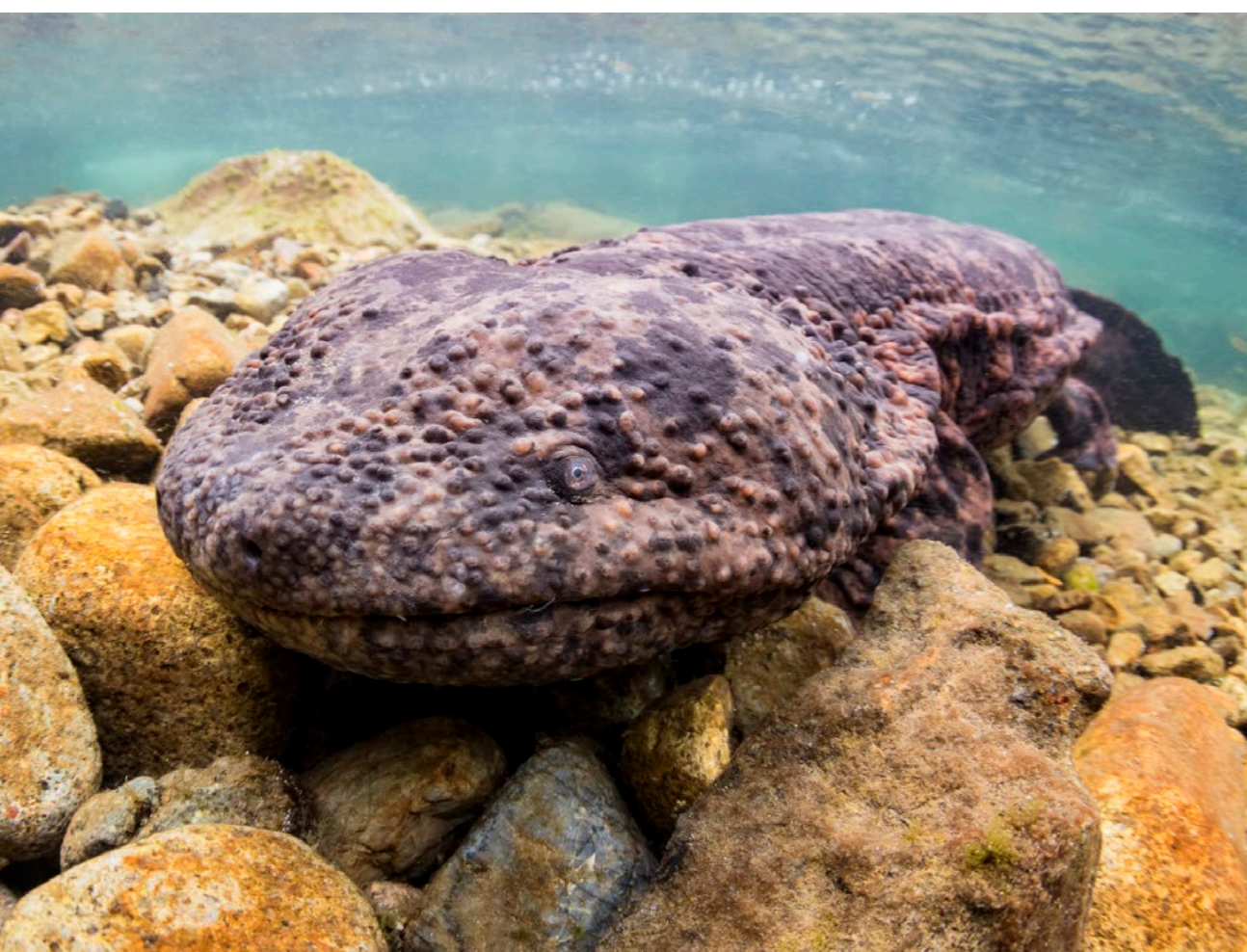
wait is not exactly exciting. Then, you suddenly notice a rock that was not there the last time you looked, but it is not a rock, it just looks like one. It is the salamander starting to re-emerge.

What follows then is a slow and cautious crawl up the rocks, followed by a quick dash to the surface and a scramble back down into the riverbed—kind of a drive-by salamandering.

Photography tips

Photographing the Japanese giant salamander can be a rather challenging because





Japanese giant salamander at the surface (top left) and on river bottom (above and left) Location of Japan on global map (right); Gifu is located in the Chubu region, which is highlighted on map of Japan (far right)



nocturnal nature means that they are very sensitive to light, so there is no way to use strobe lighting without harming them and so natural light is the only option. And, being quite large animals, a wide-angle lens is the way to go. I personally used the versatile Tokina 10-17mm lens with my Nikon D500 and Nauticam housing.

The salamanders emerge into the river at night when they feed on insects, frogs and fish. During the day, they are quite slow and sluggish, apart from when they rise to the surface to get air, which is when they move quite quickly—probably because they are most vulnerable at that point.

I think the mid-water shots of the salamanders are the most interesting, as they seem to bear more than a passing resemblance to ET at that moment—but you have to be quick, as they do not linger. As I mentioned before, they need to

take air about every 30 minutes. So, the cycle I got into during the two days I spent with the salamanders was roughly this: Around 25 minutes of rock-watching; followed by a few minutes of cautious movement as they first start to emerge from the river bed; and then about a minute of hurried activity when they rose to the surface, taking in air before returning from whence they came.

The salamanders do not like you to approach as they emerge from the riverbed. If you get too close, they will start to either retreat or shoot off in another direction. So, you really are better off backing away a little and being less intimidating.

If you are patient and have a touch of luck, you may encounter one of the salamanders out in the open. If you do, then all of your stalking skills will be required to approach them. Taking your

time can get you close enough for some nice close-ups of these most interesting creatures.

WIKIMEDIA COMMONS / PUBLIC DOMAIN



Where to see them

The first thing you will need is a guide, because without one, your chances of seeing a Japanese giant salamander are almost zero. Not only that, these animals live in rivers in rural Japan where almost nobody speaks English, or any other language come to that, and so you really do need a Japanese guide.

For my trip, I was very fortunate to be helped by my dive buddy, Martin, who lives in Tokyo and is fluent in Japanese, having grown up with an American father and a Japanese mother. Martin put me in touch with Yoshihiro Ito, who is the Japanese "salamander whisperer" and one of the nicest people you could hope to meet. Ito san turned a life-long obsession with the wildlife of Japan into his full-

time occupation a few years ago, giving up a good job as a sales manager in the process.

To see the giant salamanders, we had to go to the city of Gifu, the capital of Gifu Prefecture in the Chubu region of central Japan, which required a journey of just over two hours on the excellent Shinkansen bullet train from Shinagawa station in downtown Tokyo.

Ito san met us at Gifu station and drove us up into the mountains and the small village of Wara, where he knows all the spots in which the Japanese giant salamanders burrow down amongst the

rocks in the riverbed of the local river.

Once kitted up in drysuits (the water is cold), Ito san guided us to the best spots, and we began our routines of rock-watching, followed by a few minutes of intense activity as the salamanders came up for air. We spent two days around Wara. Then, on the third day, Ito san took us to another river where he knew how to find the regular "baby-sized" salamanders.

For me the opportunity to stay in a



In the image above, Martin (right) is doing his best "Mr Bean" impression (photographing baby salamanders) as Ito san (left) looks on; The Japanese Ryokan-style country inn where we stayed (top left); Dinner time at the inn (left); The excellent high-speed Shinkansen bullet train (far left)

local Ryokan style country inn was nearly as good as the experience with the salamanders. It has been on my "to do" list for many years, but as my Japanese is limited to asking for a beer and saying thank you, it was just too hard to do. Traveling with Martin and Ito san, however, made it all happen! We ate Japanese style in the inn's dining room with other travellers who were passing through the area, and it was just great.

When to go

The very best time to see the Japanese giant salamanders is during their mating season in late August when the sexually mature adults migrate up stream into the mountains to spawn and lay their eggs in "dens." The larger males guard those dens and are known as "denmasters." They will mate with numerous females during the season, while smaller males will often to sneak into the dens and fertilize the eggs.

How to do it

You have two options and both involve Ito san. You can go directly to him, but do not expect perfect communication, as his English is not fluent. However, you can absolutely rely on him to do everything possible to make sure you have a good trip. Ito san's email is: yoseadiv@hyper.ocn.ne.jp

Alternatively, you can go with Andy Murch of Big Fish Expeditions who organizes trips to snorkel with the salamanders through Ito san. The logistics of these trips are basically the same, but Andy will be there to guide you through the intricacies of Tokyo and the Shinkansen. ■

Asia correspondent Don Silcock is based in Bali, Indonesia. For more information and insight on the Japanese giant salamanders, plus extensive location guides, articles and images on some of the world's best diving locations, check out his website at: Indopacificimages.com.

marine mammals



Edited by Scott Bennett

Orcas, also known as killer whales, are fierce predators in the wild, whose calls can instill panic and flight in their prey.



PIXABAY / PUBLIC DOMAIN

Sounds of orca send whales fleeing

Some types of orca calls—having similar characteristics to the screams of humans—spur dolphins and whales to run for cover, while other types of orca calls are less threatening and do not cause cetaceans to flee.

Regarded as one of the ocean's most formidable predators, killer whales are pack hunters, with some orcas hunting other marine mammals, while others prefer to eat only fish. In a new study published in *Journal of Experimental Biology*, Matthew Bowers from Duke University and colleagues speculated whether aquatic mammals that are potential killer whale prey could distinguish calls of the predatory killers from those of other marine mammals.

Strong reactions

Monitoring pods of pilot whales off North Carolina and Risso's dolphins off California's Catalina Island, Bowers and his colleagues played

recordings of killer whales and social calls from pilot whales, Risso's dolphins and humpback whales to the animals while observing their reactions. One individual from each group was tagged with a data-logger that recorded the sounds heard by the animals, in addition to their depth and movements.

When most of the sounds, including many of the killer whale calls, were played, the pilot whales and dolphins remained calm. When four specific killer whale calls were broadcast, their reaction was entirely different. "It was crazy to see a group of animals respond so strongly to something you're doing," said Bowers, describing the response of the Risso's dolphins as a stampede. "The strong and differential responses to this subset of killer whale calls was eye opening," he added.

Back in the lab, Bowers and Nicola Quick reconstructed the dolphin and pilot whales' movements and noticed the two species' reactions were completely different. While the pilot whales came together in

a tight group that dived down toward the alarming sound, the dolphins flocked together and dashed off in the opposite direction at high speed for more than 10 km.

Unique features

Correlating the animals' movements with the sounds they heard, the team discovered unique features in the distressing killer whale recordings that did not occur in calls by members of their own species, the humpback whale calls or the killer whale calls that had not incited panic. The distressing calls featured many sound structures that are prevalent in mammalian distress cries, including the wails of humans.

"The signal starts to jump around in an unpredictable fashion," said Bowers. He explained that the features are disconcerting because our brains cannot weed out the erratic sounds and ignore them. "We suggest that these calls convey information about the predators' behaviour or intent," he said. The calls could warn potential victims of "the killer in their midst". ■

SOURCE: PHYS.ORG

New sanctuary for captive whales and dolphins

The world's first retirement home for captive raised dolphins and whales could end up being in Nova Scotia or Washington State, which are both on the shortlist of possible locations.

The effort to establish the retirement community for cetaceans started two years ago when the Whale Sanctuary Project, based in the United States, announced it was looking at sites in North America where it could set-up a large seaside enclosure. There are ongoing talks with government officials, local residents, fishermen and indigenous groups, but the organization has yet to submit a formal proposal to US and Canadian officials.

Survival skills lacking

Unfortunately, dolphins and whales, which are raised in captivity, cannot be returned to the wild since they lack the skills needed to survive. Critics argue the sanctuary plan is flawed because it will be difficult to keep the orcas, which can weigh up to 5,400kg (5 to 6 tons), contained. Pathogens are also an

issue for marine mammals raised in captivity, and these could infect wild populations. To meet this challenge, there are plans to erect two nets to keep the whales in. There are also plans to have veterinarians monitor the cetaceans, to reduce the risk of illness.

A decision about location is expected to be made before the end of the year, with the aim of having the 28-hectare sanctuary operating by 2020. Nearly \$20 million has been raised for the \$20-million project, with a fundraising drive expected to start soon. The Change For Animals Foundation reports that at least 2,300 cetaceans are still held in captivity around the world, including about 53 killer whales, 200 beluga whales, and 2,000 dolphins. ■ SOURCE: CTV NEWS ATLANTIC



GÜNTER ROHE / CREATIVE COMMONS / CC0

Captive dolphins, Canary islands

THALASSA
5* PADI DIVE RESORTS INDONESIA

SUMMER SPECIAL
(JUNE-JULY-AUG)

BOOK 18 DIVES GET 20

BOOK 9 NIGHTS GET 10

A\$ 1950,00

Visit Thalassa Dive Resorts Indonesia in Lembeh and / or Manado on both sides of North Sulawesi, and dive in some of the most diverse underwater environments in the world.

...where guests leave as friends!

www.thalassamanado.com



shark tales



Lemon sharks doing ... erh... something. A cobia is seen joining the merry-go-round.

What do sharks do all day?

What do sharks do when we are not looking?

To answer this question, Murdoch University fish biologist Luran Brewster attached accelerometers to the fins

of 24 lemon sharks in the Bimini Islands, Bahamas to find out.

Similar to our wearable Fitbits, the accelerometer collects data about the sharks' movements, which are then

analysed using a statistical approach called machine learning. "Very basically, machine learning is a model that learns patterns in data and can be used to identify similar patterns in new data and make predictions from it," said Brewster.

Of the 24 lemon sharks tagged, 20 were recaptured and the data from their accelerometers analysed.

Five behaviours

"The model identified five different behaviours for lemon sharks, like swimming and resting. Also, successful prey capture (represented by the shark shaking its head from side to side), burst swimming and chafing behaviours, where the shark performs

a barrel roll movement to scratch its back," she added.

The results showed that the sharks did not spend much time at rest; during the warmer months, they spent one percent of their day resting, while during the colder months, the amount of time rose to just 10 percent.

In addition, they preferred to catch prey in the early evenings, and preferred not to eat during high tide. They also tended to eat more when the water is warm.

Such information will increase our understanding about the species and how human activity is affecting their behaviour. Brewster now intends to study the sharks' behaviour in areas affected by human development.


"We have been able to determine the fine-scale activity budget of a wild shark species here in pristine conditions. We can compare it with the activity of other lemon sharks inhabiting waters degraded by human development as a means to assess the risks associated with coastal development and establish how to manage the impact development has on coastal species," she said. ■ SOURCE: MARINE BIOLOGY

S O C O R R O  V O R T E X



THE FASTEST AND MOST EXCLUSIVE LIVEBOARD TO DATE FOR THE SOCORRO AND GUADALUPE MARKET.


For more info & reservations please contact: april@pelagicfleet.com | www.vortexliveboard.com



S O C O R R O V O R T E X

LUXURY + ADVENTURE



We are currently redesigning her to be the ultimate liveboard experience for the discerning diver.



140 FEET. 14 GUESTS

COMPLIMENTARY WIFI, BAR & NITROX.

AL FRESCO DINING & LOUNGE, JACUZZI, 4 LUXURY STATEROOMS, 2 JR SUITES AND A MASTER SUITE WITH A CALIFORNIA KING SIZE BED

PELAGIC FLEET

VORTEX SOLMAR V PELAGICSAFARI

For more info & reservations please contact: april@pelagicfleet.com | www.vortexliveboard.com

shark tales



Juvenile spiny dogfish (*Squalus acanthias*) from Alaska, Prince William Sound



DAVID CSEPP, NMFS, AKFSC, ABL / NOAA / PUBLIC DOMAIN

Catching sharks can induce labour

A study about capture-induced birth by pregnant sharks and rays when they are caught shows that the phenomenon is more prevalent than previously thought.

Once in a while, a video surfaces on social media showing dying sharks or rays experiencing capture-induced births, giving birth to their squirming babies on the deck of fishing boats.

Sometimes, the cubs perish unceremoniously on cam; in other cases, they are released into the ocean, after which they swim away, presumably to a long and happy life.

Really?

Instead of "giving birth," read "abortions" or "premature births."

Kye Adams and his team have been studying the phenomena of capture-induced parturition in elasmobranch species like sharks and rays, looking into why it happens, which species are susceptible and

its impact on the population as a whole. The findings of his research have been published in the journal *Biological Conservation*.

"It's quite prevalent across a lot of species and also seems to be not well known by both researchers and recreational fishers. [...] They don't realise these events are abortions, they think they are witnessing a natural birth," said Adams, a doctoral candidate at University of Wollongong in Australia.

Their research, which involved scouring through scientific records and social media, uncovered several unsettling facts. Eighty-eight species have been observed in capture-induced parturition. The rate varies according to the species; for instance, two percent of spinner sharks delivered when they were caught, while for blue stingrays, the proportion was at 85 percent.

Why does it happen?

Reasons for the occurrence could not be positively confirmed. Adams has some theories: The dying mother may prematurely give birth to allow her offspring to escape; she

may do so to distract her captors and enable herself to flee; the birth may be the result of the stress of being captured.

Whatever the reason, it is likely that most of these premature pups would not survive, and this has an impact on the future of the species. "Juveniles still have a high probability of dying before they will give a return in the form of offspring," said marine biologist Nicholas Dulvy, from Simon Fraser University in Burnaby, British Columbia.

According to Adams, for critical endangered species like the angel shark and sawfish, "even the loss of a few pups could be pretty concerning."

It is not just fishermen who are responsible for this. Even the scientists who capture sharks to tag them also run the risk of inducing premature births. "Like fishermen, scientists who are catching sharks for research need to know that [capture-induced parturition] happens, and implement strategies to reduce their impact," Adams said.

■ SOURCE: SCIENCEDIRECT



2 - 6 AUGUST 2018

Level 1, Hall 3
International Convention Centre • Sydney • Australia



We are back with more updates....

DIVE GEAR MAINTENANCE

Guide to Maintaining Your Gear

MARINE EDUCATIONAL PROGRAM

Diving curriculum activities for school students (marine studies) from 16 to 18yo

PHOTO/VIDEO COMPETITION

A chance for School Students (marine studies) from 16-18 year olds to show off their love for the water through their lenses

EXHIBITORS' REGISTRATION

Keen on being part of the expo? Please contact us at info@australiadiveexpo.com

Stay tuned for more updates...

JOIN US TO EXPLORE THE
BUSINESS OF DIVING
www.australiadiveexpo.com





New Hammerhead Shark Sanctuary in Costa Rica

In May 2018, Costa Rican President Luis Guillermo Solís announced the designation of more than 10,000 acres of critical nursery habitat for the endangered scalloped hammerhead shark.

The first of its kind in Costa Rica, the Scalloped Hammerhead Shark Sanctuary of Golfo Dulce is the result of a collaboration between Rainforest Trust and Misión Tiburón. It establishes a new level of protection and is part of the 172,974-acre Marine Management Area and Shark Sanctuary planned for the Golfo Dulce ecosystem, which is one of only four tropical fjords in the world.

Rainforest Trust CEO, Dr Paul Salaman, described the move as a critical step in protecting the nursery. Researcher Andrés López, co-founder of Misión Tiburón, said, "When we started in 2010 to study the population of scalloped hammerhead shark in Golfo Dulce, we never thought it would become the first marine sanctuary for Costa Rica."

No-take zones

The new designation will lead to the establishment of no-take zones in the wetlands of Coto River, an important nursery habitat for the sharks. The catch, capture, transport and retention of hammerhead sharks will be banned, as well as the exploitation of marine resources until a proper management plan is put in place to regulate wildlife harvesting from the protect-

ed area. Patrols will also be conducted.

"Now, this new governance model gives us hope for the future, as we believe this is the first step to develop conservation initiatives which will benefit not only endangered species but also the local communities," said López.

Rich diversity

Besides the hammerheads, other shark species found in Golfo Dulce include tiger sharks, bull sharks, blacktip sharks and whitetip reef sharks. It is also home to 276 fish species, 296 mollusc species, 71 macro-crustacean species, as well as whales, dolphins, rays, and sea turtles like the hawksbill turtle, green turtle and olive ridley. In addition, it sees seasonal aggregations of whale sharks. ■

SOURCE: RAINFOREST TRUST

Do shark repellants actually work?

Australian researchers have put five of the most popular shark deterring products to the test. Only one seemed to work.

Prevention and responses to shark bites have varied temporally and regionally, and have included shark hunts, organised shark culling, beach meshing and drumlines, beach closures, shark fences, land and aerial based shark spotting, and acoustic telemetry. While these measures aim to reduce the probability of sharks and humans encountering each other, other measures aim to repel sharks directly from approaching people in the water.

These deterrents have been developed to elicit a response by impacting one or more of the shark senses, including

vision, smell, and electro-reception.

Do they work?

Charlie Huveneers at Flinders University in Australia and his colleagues decided to put five of the most popular shark deterring products to the test. These included two devices that create electric fields, two that create magnetic fields, and a smelly surfboard wax: Shark Shield Pty Ltd [Ocean Guardian] Freedom+ Surf, Rpela, SharkBanz bracelet, SharkBanz surf leash [Modom], and Chillax Wax.

Trials were conducted at the Neptune Islands Group

Marine Park off the coast of South Australia. Each deterrent was attached to a surfboard and a piece of tuna bait was dangled below the board to mimic a surfer's foot, and an underwater camera recorded any shark interactions. A total of 50 trials were conducted per product.

The researchers compared the percentage of baits taken, time to take the bait, number of passes, distance to the bait, and whether a shark reaction could be observed. A total of 297 successful trials were done at the Neptune Islands Group Marine Park. During these

trials, 44 different white sharks (*Carcharodon carcharias*) interacted with the bait, making a total of 1413 passes.

Only one worked

Of the five products, only the electric device made by Australian company Ocean Guardian had any significant effect. It halved the number of shark attacks on the bait. The device attaches to the tail of the board and is designed to create a strong electric field. The aim is to overwhelm the sensory receptors that sharks use to detect weak electric signals of their prey, says Huveneers.

■ SOURCE: FLINDERS UNIVERSITY



Which shark repellants actually work and which are just hype? (unrelated file photo)

LAWSON WOOD

August 31 — September 2, 2018

LEADERSHIP RESCUE WORKSHOP CEBU, PHILIPPINES



“Everything you see is telling you a story. Are you listening?”

NAUI Course Director Butch Hendrick

CALLING ALL DIVE INDUSTRY LEADERS!

Learn the most effective, state-of-the-art rescue diving techniques in a rigorous 3-day program that challenges participants with dynamic, live-action, real-world scenarios.

Visit naui.org/events to find out more and register.



PREVIEW what's in store for you!

“This was by far the best training I have received in over 20 years.”
-Cheryl Thacker, Course Director

“The workshop delivered a shocking reality that we need to consider commonly accepted equipment configurations, first-response techniques, and our own abilities and limitations to manage rescue situations.” -Andy Olday, Course Director

Direct questions to training@naui.org or +1 813-628-6284.

Leadership Rescue Training

An industry wide call to action

By NAUI Worldwide



Take a moment to **watch** NAUI's video explaining more about the workshop:

www.youtube.com/watch?v=eBVx-KdF-28



“ The point is, how can we make the entire world of scuba leadership take diving to the next level so we can collectively take better care of our students? ”

Alarmed by what they perceive as the deteriorating quality of leadership-level rescue skills across the industry, combined with a rising number of students who sustain an injury during a scuba rescue, Course Directors Butch Hendrick and Andrea Zaferes of Team Lifeguard Systems approached NAUI Worldwide with the concept of a comprehensive, real-world rescue skills workshop for diving professionals.

“Step one,” says Hendrick, “is to avoid a problem altogether. The way you do this is by perfecting the art of observation. What does a victim really look like? Dive professionals need to see where problems might occur by observing a diver’s change of breathing rate, the attitude of their body, hand motions, etc. Some instructors might pick this up on their own over the years, but why not provide them with this knowledge up front? **It could save someone’s life.**”

It’s for the entire industry – to help fix problems at the instructor level. You take this class, you pass it and walk away with a NAUI instructor level certification.”

With that, the Leadership Rescue Workshop was born. The workshop is a three-day event open to diving professionals from any agency and is designed to hone a professional’s rescue and supervisory skills. The workshop practices realistic emergency scenarios in and around the water at real-life speed, retraining the dive professional from the ground up on rescue scenarios.

As you might expect, the workshop tackles dozens of other real-world scenarios to help prepare dive professionals for actual rescues, but one interesting aspect of the workshop is that it’s open to any dive professional from any training agency. “When I suggested that we open this up to other agencies, NAUI immediately agreed,” says Hendrick. “The workshop isn’t just a NAUI thing.

NAUI’s Training Director, Terrence Tysall, agrees. “We hope that the workshop will get a good conversation going that will improve the quality of dive training overall. We need to get over being divided as different agencies. We need to get back to the little things, like sharing information, gear and techniques. We need to find that again, and the Leadership Rescue Workshop is the perfect forum to do so.”

**Next Leadership Rescue Workshop
Cebu, Philippines
Aug. 31 – Sept. 2**

www.naui.org/events/leadership-rescue-workshop-philippines



Rising to the Occasion

— Ascent Rates for Experienced Divers

Sponsored content by DAN

There are almost as many approaches to ascending from a dive as there are divers to try them. Most divers follow contemporary guidelines and approximate a 30 feet-per-minute ascent rate, while others may opt for double that rate. Some divers will follow whatever their computer dictates, and still others will ascend just a touch slower than their own bubbles. The result is widespread confusion about where the data for these various approaches comes from, and what constitutes a safe ascent rate. Is there a magic formula that divers can use to ascend at the end of dives to minimize their risk of decompression illness (DCI), and what are the costs of ascending too quickly?

Almost all experts in dive medicine agree that divers should ascend slowly following dives, whether they're recreational, working or technical. The reality is that very little direct evidence exists about what ascent rate is safest. Most of the recommendations come from observational studies of bubble grade found using Doppler ultrasound or are based on anecdotal or theoretical concerns. In the early days of diving, John Haldane and Leonard Hill experimented with a variety of linear ascent rates, some as slow as

3 to 5 feet per minute, but the rate itself was not sufficient to prevent decompression sickness (DCS) when exposures were sufficiently great. Haldane realized there must be an optimal ascent rate that would reduce unnecessary exposure to depth and provide a sufficient decrease in pressure to allow off-gassing but be slow enough to protect divers from DCS. This ascent rate is thought to vary depending on the depth, tissue saturation and breathing gas. In saturation diving, the decompression rate is on the order of several feet per hour, while in short, deep diving it is on the order of feet per minute—faster at depth and slower close to the surface. In recreational diving, where the depth and exposure are limited, a maximum ascent rate may be specified without regard to depth.

US Navy frogmen generally wanted to ascend from their dives and exit the water quickly, but such quick ascents were impractical for hardhat divers. Thus, a compromise of 60 feet per minute was reached. This ascent rate remained in place for many years even as dive tables continued to be refined. It was not until about 20 years ago that the US Navy changed their recommended ascent rate to 30 feet per minute.

In 2009 a study published in the journal *Aviation, Space and Environmental Medicine* looked at 47 recreational divers using ascent rates of 30 feet per minute and 60 feet per minute. At various intervals following the dives the divers were checked with Doppler ultrasound devices, and the group that had a faster ascent rate was shown to have higher bubble grades. This gives credence

to the theory that slower ascents help reduce decompression stress on the body after diving.

Perils of quick ascents

Decompression stress is defined as the amount of inert gas dissolved in various tissues throughout the body. During ascent, bubbles increase in size and are released by tissues into the veins. These venous bubbles then travel to the lungs, where they are off-gassed through normal breathing. Faster ascent rates are thought to have an impact on decompression stress by not allowing sufficient gas bubbles to be off-gassed through breathing.

DCI is one of the greatest concerns associated with fast ascents. When bubbles arise or become trapped in tissues or vessels they begin to cause traumatic injury to the body, which is known as decompression sickness. Air can enter the arterial circulation and result in an arterial gas embolism (AGE), which can cause a rapid onset of stroke like symptoms. AGE may occur subsequent to lung injuries but may also happen in the absence of any apparent injury to the lungs. On the other hand, rapid ascents can occur with no ill effects at all.

Besides not allowing for sufficient off-gassing during decompression, rapid ascents can have other implications. Expanding gas in air spaces such as middle ears and sinuses may cause local injuries known as reverse blocks or reverse squeezes. These pressure injuries (barotraumas) occur when gas expands in these spaces faster than the body can equalize them. Congestion is often a fac-



tor in reverse blocks. The lungs also need time to release expanding gas. During slow ascents this is achieved through normal breathing as the lungs are constantly equalizing to ambient pressure. If the ascent is too fast and the lungs cannot accommodate the expanding gas, pulmonary barotrauma can result.

Keeping it under control

So how can divers control their ascent rates so as not to exceed the limit on which they have decided? One way is by practicing buoyancy control skills. BCDs and drysuits rely on air inside them while at depth to control buoyancy. During ascent, this air expands, causing the diver to ascend more and more rapidly if it is not vented, which can lead to an out-of-control ascent. Improperly maintained inflator or deflator mechanisms on BCDs and drysuits can cause more air to enter the system than intended and may not allow the diver to vent air quickly enough to stay in control. Proper weighting before the dive is also essential in helping to eventually control ascent rate since the diver will not need to add as much air to the BCD while at depth. Keep in mind that equipment changes such as switching from aluminum to steel tanks have an impact on proper weighting and buoyancy control

during the dive and the ascent. The most common method of controlling speed during ascent is to simply vent excess air from the BCD or drysuit during ascent. Body positioning can also help by increasing drag in the water. Monitor your computer, and know what ascent rate it has been set to. If the rate is faster than you prefer, many computers allow you to change it. Use of a bottom slope, wall, ascent line or other visual or tactile reference is helpful. When practicing ascents in open water without a slope or ascent line, closely monitor the time and depth during your trip to the surface. Safety stops are a great way to slow and pause your ascent in the shallow depths where the greatest changes in pressure occur.

Despite the lack of definitive consensus on what ascent rate divers should use, "slow" is a good way to go. The US Navy and the National Oceanic and Atmospheric Administration (NOAA) use a rate of 30 feet per minute, and recreational dive-training-agency recommendations range from 30 to 60 feet per minute. Regardless of the ascent rate you choose, it is most important that your ascents be well under control.

For more information, go to: DAN.org.





Text by Mark Powell

“Plan the dive and dive the plan” has long been the mantra employed in all areas of diving. Technical divers in particular spend more time planning their dives than many recreational divers. This is due to a number of factors, including increased risks, greater depths, high gas usage at depth, increased decompression obligations, increased oxygen toxicity loading and a host of other reasons. For many recreational divers, dive planning has become a lost art, but technical divers still place a large emphasis on the value of dive planning. Despite this, the methods of dive planning have changed to take advantage of changes in technology and equipment. In this article, we will look at how dive planning for technical divers has evolved and how we can best make use of modern technology while still maintaining safety.



The Evolution of **Dive Planning**

ANDREY BIZYUKIN

In the early days of technical diving, there were no PC planning tools or dive computers suitable for technical dive planning. The only option for planning

a dive was to look up a decompression schedule using pre-generated tables. Initially, not even the pre-generated tables were publicly available, and the

very earliest technical divers had to use commercial diving tables or work directly with decompression researchers if they wanted to obtain a set of trimix tables.

The decompression schedule would be copied out on a dive slate with fixed decompression stops and run times. Central nervous system (CNS) and oxy-





Pre-printed decompression tables (below)

US Navy Air Decompression Tables

The table is organized into columns for different repetitive groups (50 FSW, 55 FSW, 60 FSW, 70 FSW, 80 FSW, 90 FSW, 100 FSW, 110 FSW, 120 FSW, 130 FSW, 140 FSW, 150 FSW, 160 FSW, 170 FSW, 180 FSW, 190 FSW). Each column contains a grid of depth (in feet) and time (in minutes) for various repetitive groups. The tables are color-coded and include a barcode and contact information for International Training at the bottom.

PHOTO COURTESY OF MARK POWELL



PHOTO COURTESY OF MARK POWELL

Using a PC planning tool to generate a dive plan (left)

However, as computers become more common, reliable and affordable, this gradually changed. Divers would still use a planning tool to generate a decompression schedule to write on their slate just as before. The change was that this schedule was now used as a backup to the computer, which became the primary method of running the dive. Despite this, the plan would still primarily be pre-determined in terms of a fixed bottom time, in order to still be able to fall back on the written plan. However, the actual ascent time would now be determined by the deco schedule on the computer.

Now computers are much more avail-

gen toxicity units (OTU) loading would be calculated by hand. Gas usage would be calculated for each phase of the dive and the rule of thirds was used to add in a safety reserve. The dive would then be executed by following the dive plan run times written on the slate, with depth and time being monitored using a bottom timer.

ally taken to mean the next depth increment, which on many tables was 3m or 10ft deeper. "Slightly longer" would be taken to mean anything from three to five minutes longer. Finally, a backup plan would also be prepared showing the decompression schedule if the divers lose their decompression gas and have to complete their decompression using back gas.

Backup plans would also be prepared just in case the diver goes slightly deeper, stays slightly longer or, in the worst case, goes both deeper and stays longer. With pre-prepared decompression tables, "slightly deeper"

Personal computers

With the increased availability of personal computers, it became feasible to generate custom tables using a PC planning tool. This allowed divers to use a number of different gasses, decompression models and conservatism settings. The overall process of planning a dive remained the same, just using a planning tool instead of tables. The planning tool would generate the decompression schedule, CNS and OTU loadings as well as gas requirements. The only difference would be that the PC planning tool would do the laborious arithmetic required to calculate gas requirement, CNS loading, etc. rather than the diver doing it by hand. When used correctly, these PC planning tools removed the risk of the diver making a silly arithmetical error. The computer-generated schedule would then be transferred to a slate just as when the plan is generated by hand. In the water, the dive would be executed in exactly the same way, with divers using their bottom timers to monitor the run times written on the slate.

In time, personal dive computers became available that could handle decompression diving, trimix or rebreathers, but they were still expensive and often unreliable. As a result, it was common to use a written plan on a slate with a computer as backup, in case of going off the plan or in case of an emergency.

This was not an ideal situation as divers would have to spend a significant amount of money on a dive computer without being able to make full use of it. This led to the difficult situation in which divers would have to forego the flexibility offered by the dive computer and stick to a fixed depth and time in order to be able to fall back on their written backup plans in the case of a computer failure. This difficult decision made many divers and agencies question the suitability of dive computers for technical diving.





PHOTO COURTESY OF MARK POWELL



ANDREY BIZYUKIN

Using slates and wetnotes for dive plans (above); Technical diver with a rebreather (top right)

able and reliable. In addition, the costs have reduced so much that many people have backup computers. The flexibility offered by the computer is in contrast to the rigid nature of tables. Unfortunately, when your backup is based on written tables you cannot make full use of this flexibility. However, when you have a backup computer, suddenly this flexibility comes into its own, and this is where significant changes to planning styles started to be adopted.

Significant changes

When you have a fixed decompression schedule, working out the gas usage for that schedule is very straightforward. The disadvantage of having flexibility in the decompression schedule is it now becomes impossible to calculate exactly how much will be required in advance.

This is where a shift in the approach is required. Let's consider the point of gas planning: It is to ensure we do not run out of gas, even in an emergency situation. Specifically, we want enough gas to get ourselves and our buddy to the surface, or to the next breathable gas source, even in a stressful situation. This is known as minimum gas.

We can calculate our minimum gas in advance for our maximum planned depth. This is based on combining the breathing rates of our buddy and ourselves and then doubling this figure to take into account the stress of an out-of-air emergency. This is then multiplied by the time it will take to start the ascent and ascend to the first gas switch stop.

We can then multiply this by a figure to account for the increased pressure at depth to give us the total volume of gas

required in litres. Finally, we can then convert this into a bar pressure by dividing by the size of your cylinders.

Let's say that after performing this calculation, we know that our minimum gas is 70 bar. This means that at any point in the dive, as long as I have at least 70 bar, I know I have enough gas to get to the next source of breathable gas, even if my buddy has a catastrophic gas loss. Once one of us reaches 70 bar, we must then start the ascent. Using minimum gas rather than fixed usage gives us the flexibility in back gas planning to match the flexibility in decompression schedules provided by the dive computer.

Decompression stops

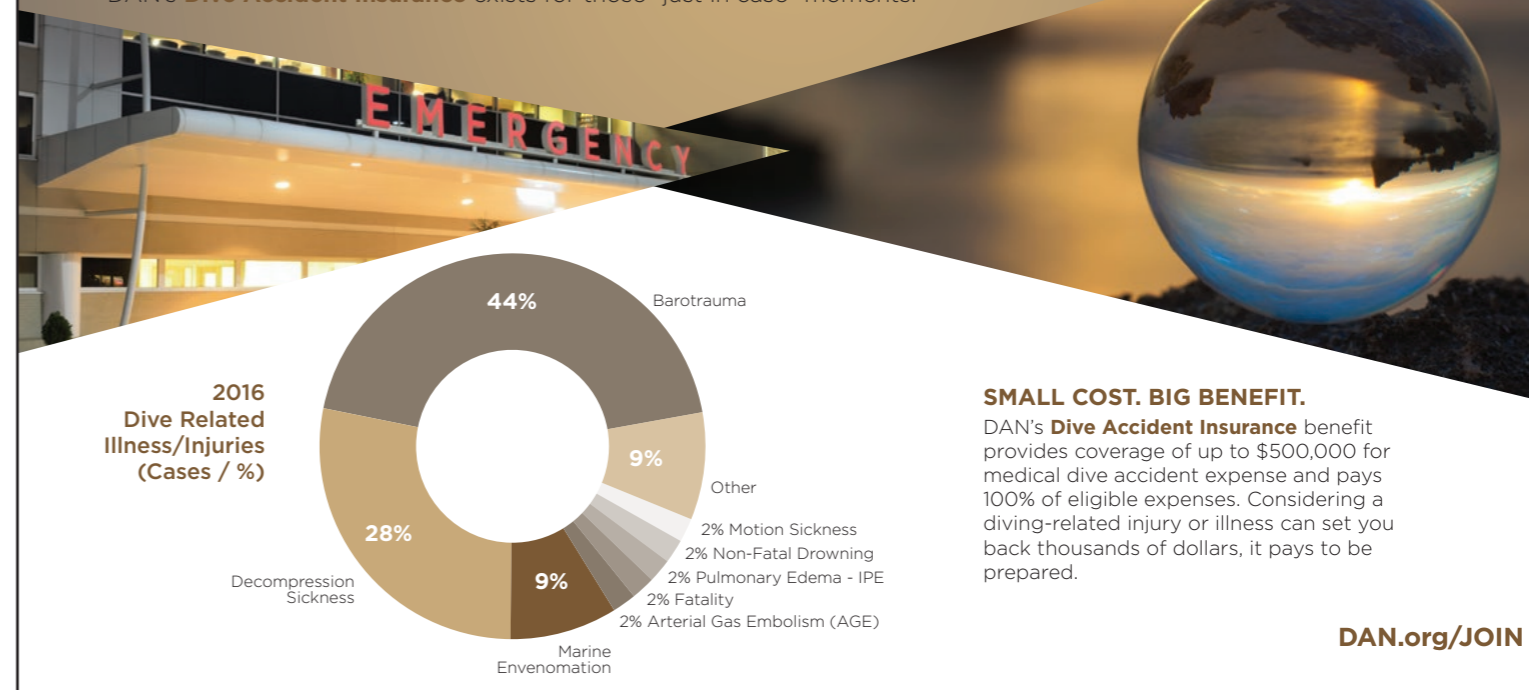
Minimum gas calculations will cover the gas required to get to the first gas switch, but what about the gas required for the

DIVE PREPARED.

BECAUSE NO ONE KNOWS THE FUTURE.



No matter how much you train or how well you plan, accidents can still happen. And there is no crystal ball to predict when you may find yourself facing an emergency. The smart solution is to make sure you and your family are protected against the unforeseen. DAN's **Dive Accident Insurance** exists for those "just in case" moments.



SMALL COST. BIG BENEFIT.

DAN's **Dive Accident Insurance** benefit provides coverage of up to \$500,000 for medical dive accident expense and pays 100% of eligible expenses. Considering a diving-related injury or illness can set you back thousands of dollars, it pays to be prepared.

DAN.org/JOIN



ANDREY BIZYUKIN

For decompression stops, the traditional approach has been to work out exactly what is required and see how much is available, and ensure that the amount required, plus a contingency, is less than the amount available. The alternative is to use a planning tool to find the maximum amount of decompression that can be done on the gas available, without exceeding the safety reserve.

Dive Planning

you only need to calculate these numbers once for any given dive depth. With a PC planning tool, it is very easy to calculate these two numbers for a range of dive depths. This can be turned into a table in your wet notes that then contains all the required information you need for dive planning.

For most dives, it will be gas usage, either backgas, deco gas or, in the case of CCR, bailout gas, that will determine the limits of the time. Other factors such as CNS should also be considered, but when the dive plan is generated using the PC planning tool, the CNS can be reviewed and, provided it is well within safe limits,

can be considered as a secondary consideration to the real limiting factor.

Rebreathers

The discussion above has mainly been concerned with open circuit diving, but CCR diving has progressed along a similar path. Modern rebreathers almost always have a built-in decompression computer integrated into the handset, and most divers have a backup computer.

However, gas planning is very different on a rebreather, compared to open circuit. A CCR has almost unlimited gas and, if nothing goes wrong with the CCR, it

is likely to be scrubber duration or CNS limits that will determine the maximum length of the dive. The only time that gas usage becomes an issue is in the case of a bailout where gas availability becomes critical.

In reality, it is the bailout scenario that will normally be the limiting factor for most CCR dives. This means that bailout planning will determine the limits for TTS. This is done by using a planning tool to calculate the maximum CCR bottom time that can be done without then exceeding the available bailout gas, when the diver bails out at the end of the planned CCR bottom time. The CCR TTS at this point

decompression stops? The traditional approach has been to work out exactly what is required and see how much is available, and ensure that the amount required, plus a contingency, is less than the amount available.

The alternative is to use a planning tool to find the maximum amount of decompression that can be done on the gas available, without exceeding the safety reserve. You now know that you can do this amount of decompression, and this can be converted to a total time to surface. Again, you know that this time to

surface can be done within the gas available. This means that as long as the total time to surface is less than this maximum amount, you know you have enough gas available.

Putting these two concepts together, the procedure is to first calculate the longest dive that can be done at the target depth within the decompression gas limits. This can be used to find the maximum time to surface (TTS). We then calculate the minimum gas required to get divers and their buddies up to their first gas switch. Provided the dive

is around the target depth, the divers just need to monitor their available gas and their time to surface. The actual bottom time becomes less important. The dive is terminated when either of these limits is reached: either the available gas reaches the minimum gas limits, or the total TTS reaches the maximum amount.

If one dives with a regular buddy and always use the same size cylinders and the same gas mixtures, then this means that the minimum gas and time to surface will always be the same for each dive at that depth. As a result,



ANDREY BIZYUKIN

Technical diver with a rebreather

Depth (m)	Minimum Gas	Time to Surface (TTS)
45	70	62 minutes
50	75	64 minutes
55	80	67 minutes
60	85	72 minutes

Sample dive planning table showing minimum gas and TTS for a range of depths. Note these are not real numbers and should not be used for dive planning.



tech talk

Author and technical diving instructor Mark Powell ready for a dive.



PHOTO COURTESY OF MARK POWELL

becomes the end point of this dive, as we know that as long as we stay within this CCR TTS, the corresponding bailout ascent is achievable with the bailout available.

Overhead environments

Overhead environment diving also introduces a number of other factors. For cave and wreck penetration, the minimum gas and time to surface calculations will have to include the time required to exit the overhead environment as well as the time to ascend, and so the planning becomes more complicated.

For more advanced dives, when the depths are greater than 80m, more planning factors come into play. Team logistics become the more important factor and, although time to surface and minimum gas calculations can still be used, there are a whole range of additional factors, such as the use of support divers, surface support emergency planning.

Technical training tends to follow the evolution above with new divers starting with written plans, generated from pre-printed tables or PC planning tools. This ensures that the diver understands the principles behind decompression schedules and gas planning. It also ensures that the diver can manage ascent rates and display the discipline required to follow the dive plan on the computer accurately. The diver then moves on to using dive computers with tables on a slate as a backup before eventually planning by using the

TTS and minimum gas approach.

Using TTS or minimum gas does not remove the need for planning. You still need to do the planning in order to know your minimum gas or TTS, but the details of the decompression profile can be calculated "on the fly" by the dive computer. By understanding the minimum gas and time to surface concepts, the combination of dive planning using a PC planning computer and the use of a dive computer to intelligently manage the execution of the dive provides the best of both worlds. The dive is still planned to ensure more than adequate safety. Divers still have to understand the details of their dive plans and should not "blindly" follow their dive computers. But at the same time, they can make use

of the flexibility offered by modern dive computers. ■

Mark Powell is one of the leading technical diving instructors in the field. He has been diving since 1987 and instructing since 1994, and is a full-time technical diving instructor trainer and a member of TDI's Global Training Advisor Panel. He teaches all levels up to and including Advanced Trimix Instructor. In addition, he has led a number of expeditions to various parts of the world, including the Middle East, Costa Rica, Malta and the Red Sea, but is usually found diving the wrecks around the coast of the United Kingdom. For more information on any aspect of technical diving, visit: Dive-tech.co.uk.

DEMA SHOW 2018
 NOVEMBER 14-17, 2018 | Las Vegas Convention Center | Las Vegas, NV

IMMERSED

IN OPPORTUNITY

JOIN US AT THE WORLD'S PREMIER INTERNATIONAL TRADE-ONLY EVENT FOR DIVING, ACTION WATERSPORTS AND TRAVEL PROFESSIONALS.
 Connect with thousands of industry professionals who direct, influence and recommend purchases for their organizations. Discover fresh technologies and products, explore new possibilities, build a worldwide professional network and surround yourself with opportunity.

REGISTER AT DEMASHOW.COM
 ENTER VIP CODE: XRPA18

In partnership with **godivenow**



photo & video

Coral,
Honduras.
Image
specs:
Canon 7D,
Canon EF-S
10-22mm,
f/14, 1/125s

Text and photos by Rico Besserdich

People like color. Is any photographer not familiar with the delighted exclamation of the viewer: “Oh, this is so colorful”? This point also applies to underwater photography; the task of creating colorful underwater pictures is the goal (and passion, in some cases) of many. But then there is also good ol’ black and white photography. Yes, even underwater!

Some readers may surely be shaking their heads now, wondering what is the point of depicting a colorful underwater scene, or a sea creature, in black and white? While others might be quietly and stealthily whispering things about “fine art,” (since black and white photography is, after all, the only true “master’s” skill, isn’t it?). The absence of “nice colors” in an image must be art, automatically, right? Well... no, not really, but a general potential does exist. It all depends on the photographer.

If Hannibal Goodwin—the American who invented roll film on a celluloid base, patented in 1889—had had the opportunity at the time to produce color film for still photography, he certainly would have done it with joy, and dismissed black and



Black & White *Underwater Photography*

white photography as “colorless and boring.” But for the time being, the art form stayed with gray tones, even in the early days of underwater photography.

By definition, black and white photog-

raphy is a “special” category of photography; the phrase “black and white photography” arose only after the invention of color photography. Previously, we spoke simply of “photography,” which

depicted the nuances of color brightness found in reality, in achromatic grayscale gradations, including the extreme values of black and white. Such photographs were originally called grayscale photos.

Gray. Achromatic. Colorless. That does not sound so exciting on first impression, does it? Gray weather, gray future, gray hair... the list of gray things as expressions of something negative is long. Or





photo & video

Lionfish (right), Na'Ama Bay, Red Sea, Egypt. Image specs: Canon 40D, Tokina 10-17mm, f/10, 1/125s

Freediver (far right), Bodrum, Turkey. Image specs: Canon 40D, Canon EF-S 10-22mm, f/13, 1/200s. Model: Didem Kara

to quote Goethe's Mephisto: "All theory, dear friend, is gray but the golden tree of life springs ever green."

So we better leave the gray zone now and walk towards the light! Because as photogra-



phers, we do first and foremost one thing: We paint with light. This is photography.

Shades of gray

Gray as a mouse? Well, there is also anthracite, ash-gray, slate gray, smoky gray, field gray, concrete gray, Payne's gray, dove gray and silver gray—all well-known gray tone expressions. And then, of course, there is black and white.

Various shades of gray are defined by their brightness. So, now we are talking about light. Awesome! Our main tool of photographic creativity enters the scene! Let's work with it!

Moray eel, Hurghada, Red Sea, Egypt. Image specs: Canon 7D, Canon EF-S 10-22mm, f/16, 1/250s.

To create an underwater photo in black and white, there are several possible methods:

1. You can shoot with an analog camera and still rely on the excellent quality of genuine black and white films such as those made by Kodak, Agfa and Fuji.
2. You can shoot with an analog camera, but use color film and convert your color images using software into black and white (after scanning).
3. You can shoot with a digital camera and select the "Black & White" option under "Picture Style" in the menu ("Picture Style" may be listed as "Creative Style" in some camera models).
4. You can shoot with a digital camera in color and convert the captured color image via software (like Adobe Lightroom or Photoshop) into a black and white picture.

Digital vs "pure" analog

Nowadays, the majority of underwater photographers shoot their images with digital cameras. It must be noted, however, that "pure" black and white photography does not exist with digital cameras underwater in this form. Image sensors in digital cameras save all the measured values and visual information when capturing an image, thus also all color values as well.

In the default settings of the "Black & White" option in the camera menu, the camera's own software converts the recorded (color) image into a black and white version. It may sound strange to talk about image manipulation occurring here, but in a way, that is exactly what is happening, inside your camera.

If we use a DSLR camera and shoot our photos, preferably in RAW or DNG format (we should!), and if our camera was set to the Black & White picture style, we



Black & White

may find ourselves surprised when viewing and further processing the shots in our RAW converter (e.g. Adobe Camera RAW). The supposedly black and white pictures suddenly appear in color. That is because the camera's sensor stored all the values, including all colors.

It is natural, and basically just fine, to convert a color photograph later, using software, to black and white. In fact, this is the normal procedure most commonly used today. But one still can-

not quite call it "pure" black and white photography. Pure black and white photography comes from "pure" black and white analog film. Everything else is more or less already "manipulated"—yet, not to be judged, of course.

Pricey exceptions

But there are (as always) exceptions! Let's check out the LEICA M Monochrome camera, which comes with a pure black and white image sensor. For a piece of cake costing around US\$7,500





photo & video

Near the shore, Bodrum, Turkey (right). Image specs: Canon 7D, Sigma 10-20mm, f/11, 1/125s

Borderlands, Kas, Turkey (below). Image specs: Canon 40D, Sigma 10-20mm, f/5.6, 1/60s



(without lens, just the body), it could be ours. Unfortunately, based on the author's knowledge, no underwater housing for this camera exists at this time.

With their Achromatic digital back, PHASE ONE offers "pure" black and white photography for various medium-format digital cameras. Ready for some more gray hairs? Well, the Achromatic is US\$41,000... and that is just for the digital back only. A Hasselblad medium format camera with that black and white digital back from PHASE ONE, plus an underwater housing and a proper lens, would turn the future of our bank accounts gray. Dark gray. It would be somewhere around US\$75,000.

Yes, pure digital black and white underwater photography is costly.

Back to basics

But let's stick with "normal" underwater photographers (in terms of black and white photography), leave the gray zone, and walk along the middle path.

For black and white underwater photography, we will need to look at things with different eyes. "Reading the light" is the key here and, in doing so, brings us back to the



core of photography itself. Light, shadows and textures are excellent design elements of black and white photography. During a dive with the camera AND with black and white photography in mind, it might be a good idea to look out for the following:

1. How is the light in general (i.e. time of day, position of the sun, are there clouds or no clouds, light rays, or reflections)?
2. Are there any interesting shapes and structures?

Interesting shapes such as fishes (preferably those that are not too small), wrecks of all kinds as well as branches, tree trunks or divers swimming around. And, of course, there is much more to discover! Be on the lookout for interesting shapes or forms. Even the simplest thing underwater could become a great subject for a beautiful black and white underwater photograph. It is just up to your photographic eye to see it.

Once you have spotted an interesting subject, take a closer look. What about the structure? Wrecks often come (after a long rest on the seabed) with fine structures, due to the corrosion of the metal, which can boost the quality, depth and contrast of a black and white photograph quite a bit. Even the bark of a tree in a local lake or just a rippled sandy patch in

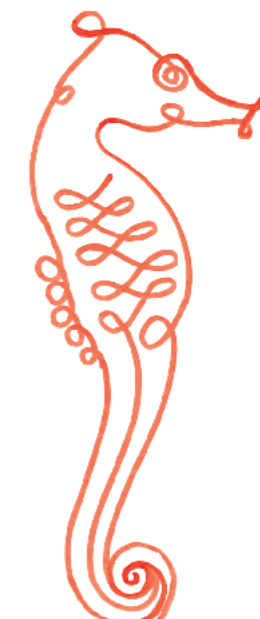
shallow water near the beach can act as a nice picture element too. Structure is very important. Always look close, twice, and take your time. It's worth it.

3. Shadows. Where there is light, there are shadows too, and they are also important for a successful black and white picture. How do the shadows fall? What is the overall impression of the underwater scene, in terms of the interplay of light and shadow? Are the shadows deep black, without any details in them (not so ideal); or do the darks, even in the shadow itself, have details still visible (which is even better)?

The photographic eye

The "photographic eye" is not available for sale in a shop, but it is something one can learn and

SEACAM
silver



cinema of dreams



www.seacam.com





The Dakota, Kas, Turkey. Image specs: Canon 40D, Sigma 10-20mm, f/8, 1/160s, ISO 800

something that can be taught. The point here is to take the necessary time to look at the environment (and not just underwater), concentrate, and have the picture already in your mind before pressing the shutter button.

For a closer look, and to imagine how the envisaged scenario would probably look as a black and white image, it is necessary to develop a certain sensitivity. Colors, as a stylistic device, fall away and our artistic sense should be focused on light, shadows, contrasts, shapes and textures. Black and white photography underwater is like the “calm sound of music.” If the necessary sensitivity for light is used, a powerful tool to represent underwater scenes and animals in a new way is placed in your hands. And with luck (and the goodwill of your audience), it may even become “art.”

As I said before: Most underwater photographers who are interested in black and white photography take their images first in color, then later convert them to black and white, using image editing software.

It must be said that a weak color image (incorrectly exposed, low contrast, blurred, inadequately or not well composed, or simply senseless) certainly will not get better when converted to black and white. To then declare such an image as “art” just because it is black and white is really not a good idea.

Art comes from ability and, if we understand photography as an art form, black and white photography is the basis of everything and the archetype of this art form. It is not the Holy Grail, but it deserves our respect as photographers.

Tips and tricks

Here are some tips for underwater photography in black and white:

1. Since there is no need to restore colors by using an underwater strobe or other light sources, it often works pretty well to take the photos with ambient light. When the sun is high, clear and bright in the sky, even at 20 (or more) meters of depth, creating beautiful black and white photos is possible. Depending on depth and light conditions, a higher ISO setting and, in some cases, even a tripod might come in handy.

2. Basically, there is nothing to be said against underwater macro photography in black and white, if the light is beautiful and your chosen “model” has interesting shapes and/or structures. But its true

Girl in the pool. Image specs: Canon 40D, Sigma 10-20mm, f/8, 1/160s



Lionfish, Ras Mohammed, Red Sea, Egypt. Image specs: Canon 7D, Canon EF-S 60mm, f/2.8, 1/320s



photo & video

Dunraven,
Egypt. Image
specs: Canon
7D, Sigma
10-20mm, f/9,
1/125s, ISO 400

strengths can be seen in the wide-angle photography. Wrecks of all kinds are always great subjects, but any underwater landscape is likely to produce a nice black and white light mood, photographically. Even relatively "boring" dive waters can be helped, taken in with a new and appealing photographic presence, when shot in black and white.

3. It simply has to be said again: light, shadow, shapes and structures. Try to direct your attention to these factors. You will be sur-



Black & White



prised how many new photographic options will come to you. Just try to think in black and white.

4. Make sure that the shadows still show some details in them. Seen photographically, 100% black is not quite ideal. The same goes for white: Burned out lights (sun) in 100% white should be avoided, if possible. Of course, there are exceptions and some brave ex-

Below the surface,
Bodrum, Turkey. Image
specs: Canon 40D, Canon
EF-S 10-22mm, f/8, 1/125s.
Model: Chris Mo

perimentation has often brought very interesting results. Have fun! Nothing should stop you!

5. Also, always check the histogram when shooting. If necessary, adjust your exposure. Balanced contrasts are important here. An ideal histogram represents an evenly ascending and descending "hill" shape that is neither on the left side (complete black with no sign) nor "triggers" on the right side (burned out lights, full white) of the histogram. Unless, of course, you have something very special in mind (as in the so-called High Key or Low Key effects). The histogram does not speak ultimate law. It only provides help in setting or adjusting your image's exposure.

6. For ambient light photography,

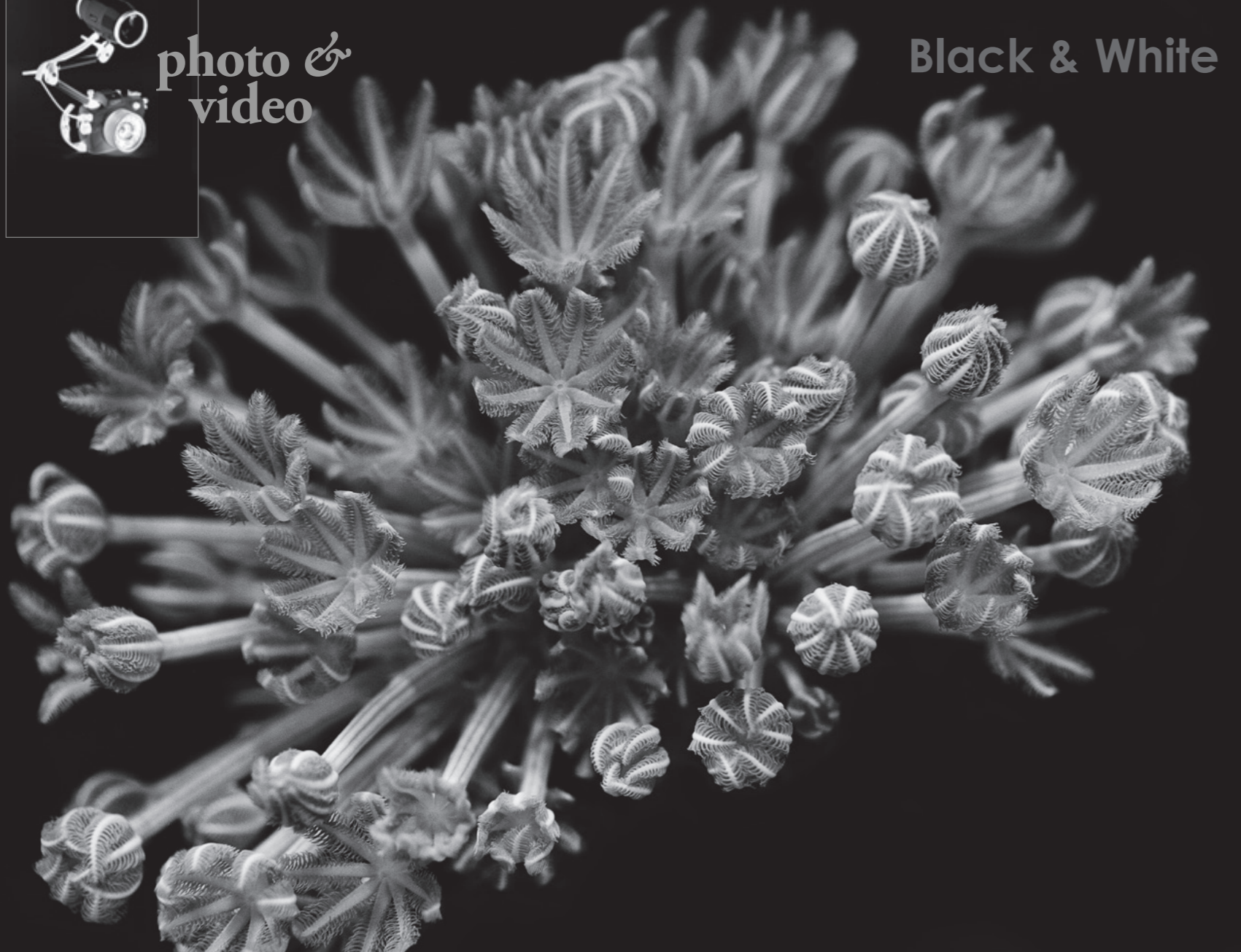
the hours from 9 a.m. to 2 p.m. are a good time to shoot. In this time window, there is also a chance to capture sun rays beautifully. The light itself is rather "hard" during these hours, though. A softer light then requires a lower position of the sun in the sky, i.e. early in the morning or late in the afternoon. Either way, it is good advice to check the light conditions (at the dive site) beforehand. Having the sun in the most ideal position is of no use when the sun is obscured by tall trees, buildings, dive boats, etc. Ideal times are also often dependent on the characteristics of the dive site and, of course, on what lighting effect you want to achieve.

7. Too much shade (dark black) can be brightened with a strobe. Try to see your strobe as a "shad-

ow brightener" and not as an ultimate lighting master. It is your duty (and not your strobe's) to read the (ambient) light and use its natural beauty to create an awesome photo.

8. Underwater landscapes and wrecks work great in black and white photographs when shooting panorama images.

9. It would be naive to think that black and white photography is more "forgiving" than color photography. In fact, the opposite is the case. A colorful fish or coral, as in a color image, can often "hide" disadvantages present in the image; people may say: "Oh, what nice colors!" and quickly forget that the picture is a little blurry or not composed well. In a black



Soft coral, Sharm El Sheikh, Red Sea, Egypt. Image specs: Canon 7D, Canon EF-S 60mm, f/2.8, 1/200s

and white image, this escape route does not exist.

10. Training your photographic eye does not require you to go diving. Even while sitting on your couch or walking the dog, you can look around and see how the light plays with subjects or landscapes. Try to open your senses. The key lies not in your equipment, but in yourself. Shoot as many photos as you can. When shooting in black and white, remember: Your camera (DSLR) stores the color version anyway. This is ideal for comparison later on. If you switch

between color and black and white, and if you like the black and white version more, ask yourself the "why." Why does the black and white version look better to you? Take your time and think well. Soon, you will find out that it is all about light, shadows, shapes and structures.

Final thoughts

Light and shadow. "Reading" the light... and painting with light. Photography. In black and white, photography is reduced to its original form and original expression—a beautiful instrument of creative

underwater photography! While shooting underwater images in black and white is fun, it is also fun and very inspirational to check out the beautiful black and white works of other photographers—Ernie Brooks, Christian Vizl and Amanda Cotton, just to name a few. By the way, some black and white photographers have never switched to digital. ■

Rico Besserlich is a widely published German photographer, journalist and artist based in Turkey. For more information, visit: Maviphoto.com. See his latest book at: Songofsilence.com.



The AIDE Australasia Underwater Photographer

of the Year Competition 2018

This is your chance to compete in Australasia's most prestigious underwater photography competition to win the coveted title of the Australasia Underwater Photographer of the Year.

- Categories:**
- Australian Water
 - Portrait
 - Seascapes
 - Small Exotic Animals
 - Compact Cameras

Participate Now

Register at www.australiadiveexpo.com / www.ogpicoty.com

Closing Date: 7 July 2018

Organised by:



MIDE reports success and LBO photo contest winners span the globe

Photos courtesy of MIDE

The Malaysia International Dive Expo welcomed over 10,500 visitors from 54 countries during the three-day event, which took place 4-6 May at the Putra World Trade Centre in Kuala Lumpur.

A crowd of 1,034 exhibitors from 16 countries participated, with approximately RM7.45mil (US\$1.84mil) in overall sales generated. During the show, the Malaysia Tourism Promotion Board (MTPB) organised the Malaysia Dive Tourism Mart, a B2B session, with a total of 11 buyers from ASEAN and South Pacific countries. In addition, nearly 900 non-divers attended the show, with 16 brave souls participating in the "Be A Diver" try-dive program in the on-site pool, which resulted in 368 visitors signing up for diving courses.

The opening ceremony, which was officiated by YBhg Dato' Yean Yoke Heng, Deputy Secretary General (Management) of the Ministry of Tourism and Culture of Malaysia, saw Malaysia Scuba Diving Association (MSDA) launch their new web-

site, which offers helpful information on all things diving in the country.

Lens Beyond Ocean

Underwater photographers from 17 countries participated in this year's contest, with 18 prizes worth US\$20,000 awarded to the winners below:

First place, *Macro*: Bausani Paolo, Italy; Second place, *Macro*: Damir Zurub, Croatia; First place, *Wide-Angle*: Cedric Peneau, Reunion Island, France; Second place, *Wide-Angle*: Marchione Giacomo, Italy; First place, *Portfolio*: Adriano Morettin, Italy; Second place, *Portfolio*: Tracey Jennings, Malaysia; First place, *Compact*: Pietro Cremone, Italy; Second place, *Compact*: Jie Zou, China; First place, *Creative*:

Best of Show: Norhayati Ahmad, Malaysia (right); First Place, *Creative*: Ipah Uid, Malaysia (below); First Place, *Freediving*: Cao Yang, China (lower right)



First Place, *Macro*: Paolo Bausani, Italy



First Place, *Wide-Angle*: Cedric Peneau, Reunion Island, France



First Place, *Compact*: Pietro Cremone, Italy

China; Second place, *Freediving*: Davide Lopresti, Italy; First place, *Video*: Fan Ping, China; Second place, *Video*: Tom Vierus, Germany; *Young Talent*: Sharifah Najwa Amni, Malaysia; *Best of Show*: Norhayati Ahmad, Malaysia.

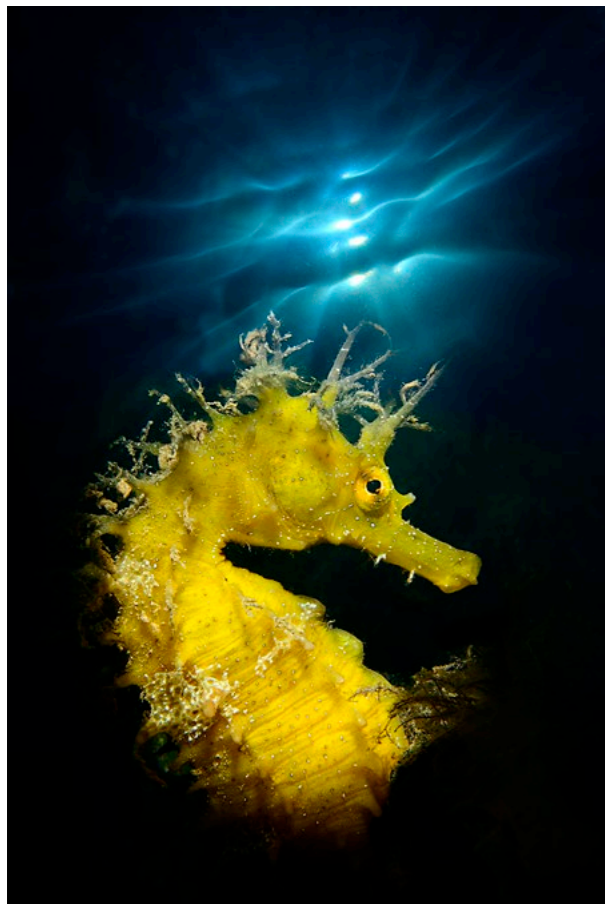
Judges included marine biologist and European Wildlife Photographer of the Year Dr Alexander Mustard from



photo & video

Overview of Malaysia International Dive Expo in Kuala Lumpur in May 2018 (right); Lens Beyond Ocean Photography Competition Gallery (lower right)

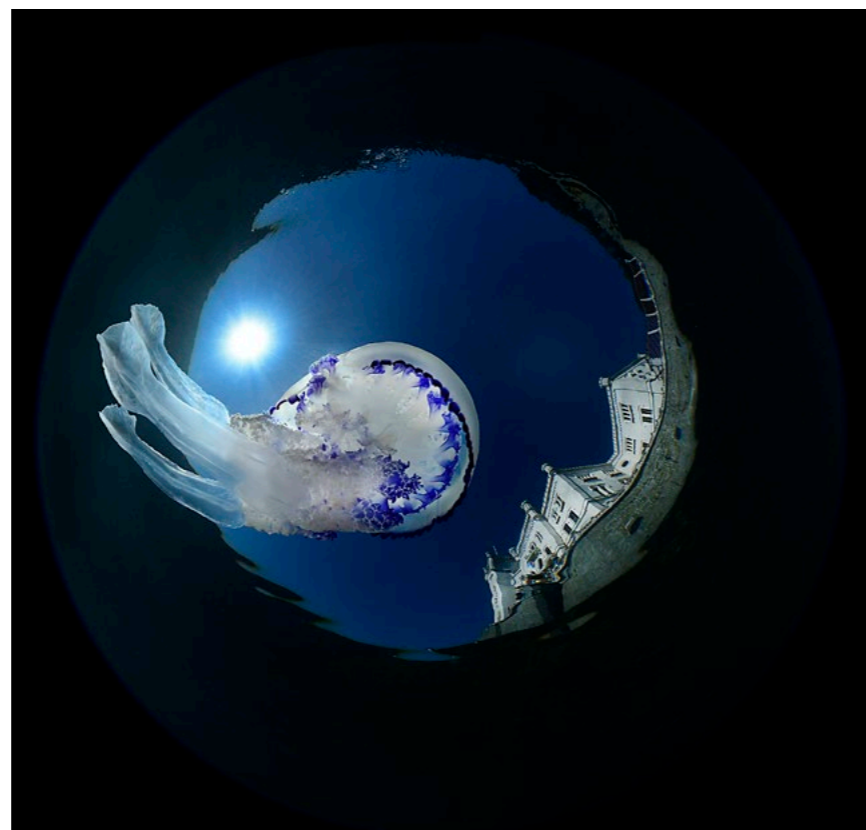
UW PHOTOS THIS PAGE: First Place, Portfolio: Adriano Morettin, Italy



United Kingdom; underwater photographer Amanda Cotton of the United States, who is an inductee of the Women Diver's Hall of Fame and member of the Explorers Club and the Ocean Artists Society; and PADI instructor and underwater photographer Nurul Yazid from Malaysia.

Speakers, forums and clubs

Sustainable practices were the topic of MIDE's much anticipated Ocean Rescue Forum entitled "Plastic Pollution," featuring expert speakers Dave Mccann from United Kingdom; Terry Cummins and Neil Davidson from Australia; and Muhammad Nur Al Haziq, Dato Hj Fazli M. Mohktar and Monica Chin from Malaysia. In addition, a freediving forum was



held with expert speakers such as Dr Azhar Hussin and national freediving record holders Azua Shafii, Jonathan Chong, Azam Hamid and Paul Sack. Other speakers at the show presented a range of topics, including dive travel, dive training, technical diving, freediving,

which welcomed 24 new members during the show, featured presentations for women divers by underwater welder Nur Izzati Athirah and underwater videographer Irwan Ismail. There were also presentations by disabled divers who shared their experience



marine conservation, underwater photography and more.

DiveDivas Fanclub, which encouraged other persons with disabilities to explore the many health benefits and leisure opportunities of the sport, as well as the ways people can learn to assist persons with disabilities to dive (read more on Diveheart Malaysia on page 6).

Liz Ward-Sing and Brendon Sing of Shark Guardian gave visitors a chance to learn about sharks and shark conservation in their marine education presentation.



Endorsement and support

MIDE 2018 was endorsed and supported by Ministry of Tourism and Culture Malaysia, Malaysia Tourism Promotion Board (MTPB), MATRADE, Malaysia Scuba Diving Association (MSDA) and Diving Agency PADI, NAUI, TDI/SDI, SSI, RAID, ITDA, IANTD, DAN, DDI together with local and international media partners. ■

For more information, please email: info@mide.com.my or call 603-7980 9902. For MIDE 2019 updates, please visit: mide.com.my and follow MIDE on Facebook @ Malaysia International Dive Expo, and Twitter @ Malaysia International Dive Expo.

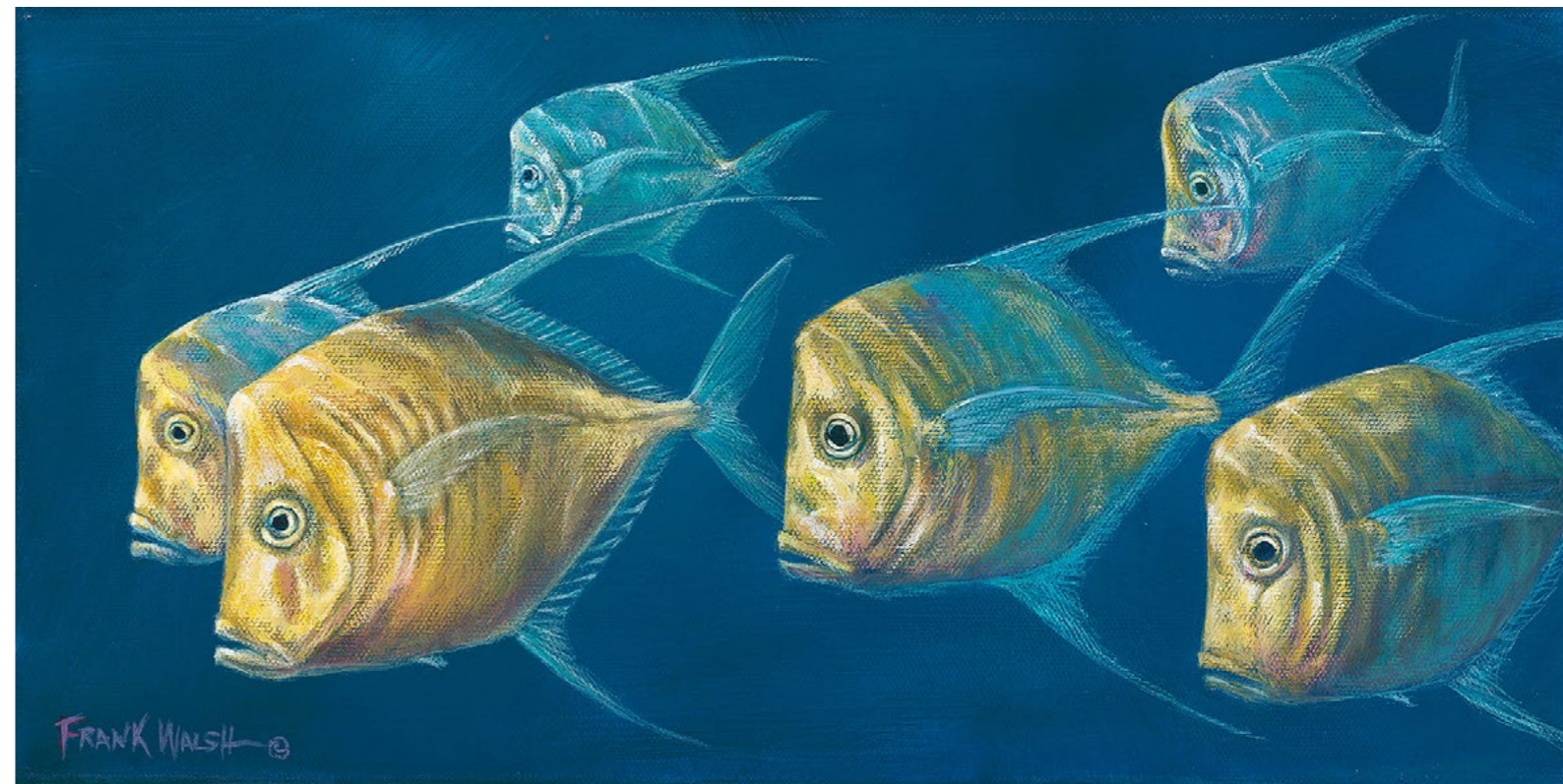
Frank Walsh



P O R T F O L I O



Distant Thunder, by Frank Walsh. Acrylic on canvas, 20 x 30 inches



Lookdowns, 8 x 16 inches, and *Formal Affair* (previous page), 30 x 48 inches, acrylic on canvas, by Frank Walsh

An avid scuba and free diver, American self-taught artist Frank Walsh has captured his intense fascination of the sea and its creatures in brilliant, dynamic marine life paintings and sculptures for over 30 years. *X-Ray Mag* interviewed the artist to gain insight into his art and creative process, and how the underwater world inspires his creations.

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

FW: I'm a self-taught artist born and raised in San Francisco. Like most kids, I always loved to draw and paint, but for me, that passion continued a lifetime. I was that kid in school that always colored inside the lines; maybe that's why I'm a realist and love painting detail. I never considered art as a career. It was just a fun release for my imagination. Instead, I wanted to be a firefighter.

When I was 23, I got my wish and started a 28-year career in the fire service. I was married at the time and had a son. With that came the bills, so I started doing detailed pen-and-ink drawings of classic fire engines and selling them as prints. This eventually gravitated to my other interest,

which was hunting and fishing. I started painting and selling sporting art in oils. It was a nice sideline, and I was still having fun.

Wildlife art was a hot ticket in the '70s and '80s as well as the limited-edition print business. It seemed like everyone was jumping on the band wagon, painting fur and feathers. I hate crowds, so I wanted to try something else.

X-RAY MAG: Why marine life? How did you come to this theme and how did you develop your style of painting?

FW: In the early '80s, I tried my hand at marine life. I also switched to acrylics since I'm impatient and was tired of waiting for my oils to dry. It was a major learning curve for both, but I like challenges. Back then, there was not much reference to work with, other than pho-

tos in books or reruns of Jacques Cousteau TV series.

I strive for accuracy and want to know all there is about the subject I paint. The best way to do that is to dive into that world. So, I got my scuba certification in 1986, diving in the chilly marine life rich waters of Monterey Bay.

It was like nirvana for me. There are a number of world-class dive locations in the bay. One in particular I loved to dive was Blue Fish Cove at Pt. Lobos State Park. We would usually do two dives at around 90ft, so we could see the hydrocorals and strawberry anemone-covered walls. We would hit it with a light and the colors would explode. I've tried to replicate that scene many times without success. I've come to the realization you need to have God's pallet.

Even though I was logging

Morning Dew Orcas, by Frank Walsh. Acrylic on canvas, 12 x 36 inches



hours underwater, I never saw any marine mammals other than sea lions and harbor seals. My only encounter with whales was on the surface and those were gray whales. Then Humphrey the humpback whale visited San Francisco Bay and kept on going 70 miles up the Sacramento River until he reached Rio Vista. He spent a number of weeks on the river until he was finally coaxed into following humpback whale song recordings back out of the Golden Gate.

I, like millions of others, followed his epic journey on the nightly news. I did an above and below painting of Humphrey with the Golden Gate Bridge. That painting sold almost as quickly as I got it off the easel. I now knew what I wanted to paint.

In the early '90s, I finally got my chance to dive with humpback whales when I met Mark and Debbie Ferrari, of the Center for Whale Studies in Lahaina, Maui, Hawaii. I had done some graphic work for them and in return, I

was able to go out with them as an associate whale researcher. My first encounter was with a female humpback they called Pineapple who was with a newborn calf.

To this day, I will never forget the feeling I had when they passed within a few feet of me. I will always remember Pineapple's eye following me as she passed. It was the start of a beautiful friendship with humpback whales. I had recorded every encounter on my Sony camcorder in a 25lb Ikelite housing. Looking back, it seems pretty rough compared to what you can get with a tiny GoPro today, but that vision will never fade from my brain.

During the '80s and '90s, there were only a few artists who were doing marine life art. There were a few of them that I admired. A couple of big names at the time were Robert Lynn Nelson in Hawaii, who coined the words "above and below" for his two world paintings; and George Sumner, who was an impressionist from San Francisco. Over the

years, many artists have copied Nelson's style, some to the extreme. On occasion, I too have painted the two worlds, but my painting style is quite different.

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

FW: I don't think there is anything unique with my painting method. I first start with many small thumbnail sketches, most being nothing more than doodles. This helps me with composition and values. Depending on how involved the painting is going to be, will determine whether I

do a detailed drawing that I will transfer to canvas.

One thing I don't do is copy

straight from a photo. I have a large collection of photos and videos I use for reference but never to copy. I know many artists are now using projectors to trace photos to their canvases, but I'm old school and still enjoy the drawing process. It could be frustrating at times when things are not working out but very satisfying when it does come together.

I prime my canvas or board with tinted gesso and then paint in my background color a few shades lighter than what it will be when finished. I do this since I usually use numerous color washes that will change the value and hue as I progress, giving a feeling of depth. I either draw directly on the substrate using a white charcoal pencil or caulk, or if it's a finished drawing, trace it using transfer paper. The image is blocked in

and values developed.

Over the years, I developed a system that I use for replicating refractive light below the surface. It is a slow process requiring numerous color washes. I use a hair dryer to speed the drying time between washes. I can't count how many hair dryers I've burned up. I then finish off with my highlights and sign.

X-RAY MAG: What is your relationship to the underwater world and coral reefs? How have your experiences underwater influenced your art?

FW: As I grow older, I spend more time snorkeling than diving. Most of what I want to see is all within 20ft of the surface. I like the freedom of having nothing more than a good set of fins, mask and



Monarchs of the Deep, by Frank Walsh. Acrylic on canvas, 24 x 48 inches

portfolio

snorkel. Over the years, most of my diving has been in cold 52°F water wearing a 1/4 wetsuit, hood, gloves and booties. At my

age, I'd rather not have to deal with that anymore.

For me, it really doesn't matter whether I'm at 100ft or 10ft, there is

always something I can take from my experience and use it in my art. I always carry a camcorder in a housing and now my GoPro. You never know what you will come across, for which it would be great to have a video reference.

That reminds me of a story. My dive partner, years ago, was the most avid diver I ever knew. He had been diving for years before I started and would be in the water at least two times a month. No camera, no spear gun—just him and the fish. He would laugh at me when I would take my camera when the visibility was like pea soup. He would always ask why I was bringing it. My reply would be that I wanted to be sure I had it in case we had a great white encounter. I said I could make a lot of money having video of him being eaten.

Well, he did have his great white shark encounter, but I wasn't with him. That day, while he was diving at 100+ft, a 15ft great white circled him and then swam off into the abyss. He said his decompression stop seemed like an hour, with no

video for the memories. It took him a couple of months before diving again.

X-RAY MAG: In your relationship with reefs and the sea, where have you had your favorite experiences?

FW: I've had many memorable encounters with various sea creatures while diving or snorkeling, but by far, the most incredible have been with humpback whales in the '90s. Many times, dolphins would be accompanying them as well. One particular encounter was with a new born calf. The mother who was known as Spreckles, was a very friendly and approachable whale. Spreckles and her male escort took off leaving us to babysit. This little whale circled us for

20 minutes trying to get close. Each time she passed, she would reach out with her pectoral fin as if she wanted to touch us. This had to be the first time she ever saw a human and wanted to learn more about us. We had to continually back away. After about 20 minutes, mom and her boy-friend showed up and pulled the baby away. They used us as baby sitters while they partied somewhere. I have all this on video.

Second only to humpbacks was a very recent dive last May. I did a night dive in Kona, Hawaii, with manta rays. I've been wanting to do this for years and finally got my chance. We had up to eight manta rays cruising within inches of us for 40 minutes. Watching them feed on plankton was a mesmerizing sight. I highly recommend this dive and plan to return and do it again.

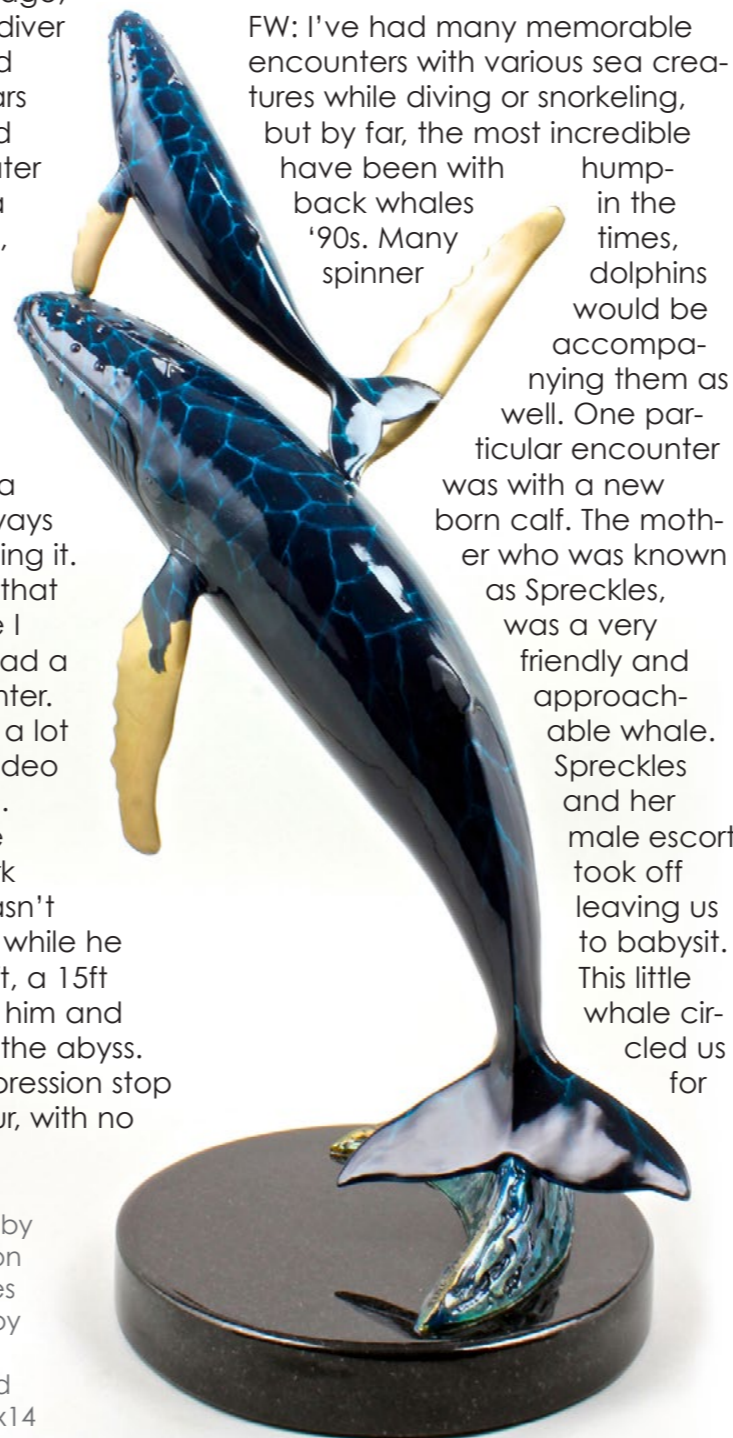
I'm currently putting the finishing touches on a painting of manta rays that I started after I returned. I've also been working on design layouts for a bronze sculpture of mantas that I hope to start shortly.

X-RAY MAG: What are your thoughts on ocean and freshwater conservation and how does your artwork relate to these issues?

FW: I've been a conservationist for as long as I can remember. I have been a member and contributor to many organizations that I felt were doing the most for areas I have the most concern. Just to name a few: the American Cetacean Society, the Billfish Foundation, the Center for Whales Studies, the Center for Marine Conservation, and the Guy Harvey Ocean Foundation. I have donated both prints and originals for fundraisers, and a percentage of my sales, to designated conservation



Pt. Lobos Entourage, by Frank Walsh. Acrylic on canvas, 30 x 20 inches (left); *Ohana Rising*, by Frank Walsh. Limited edition, hand-painted bronze sculpture, 24 x 14 inches (right)

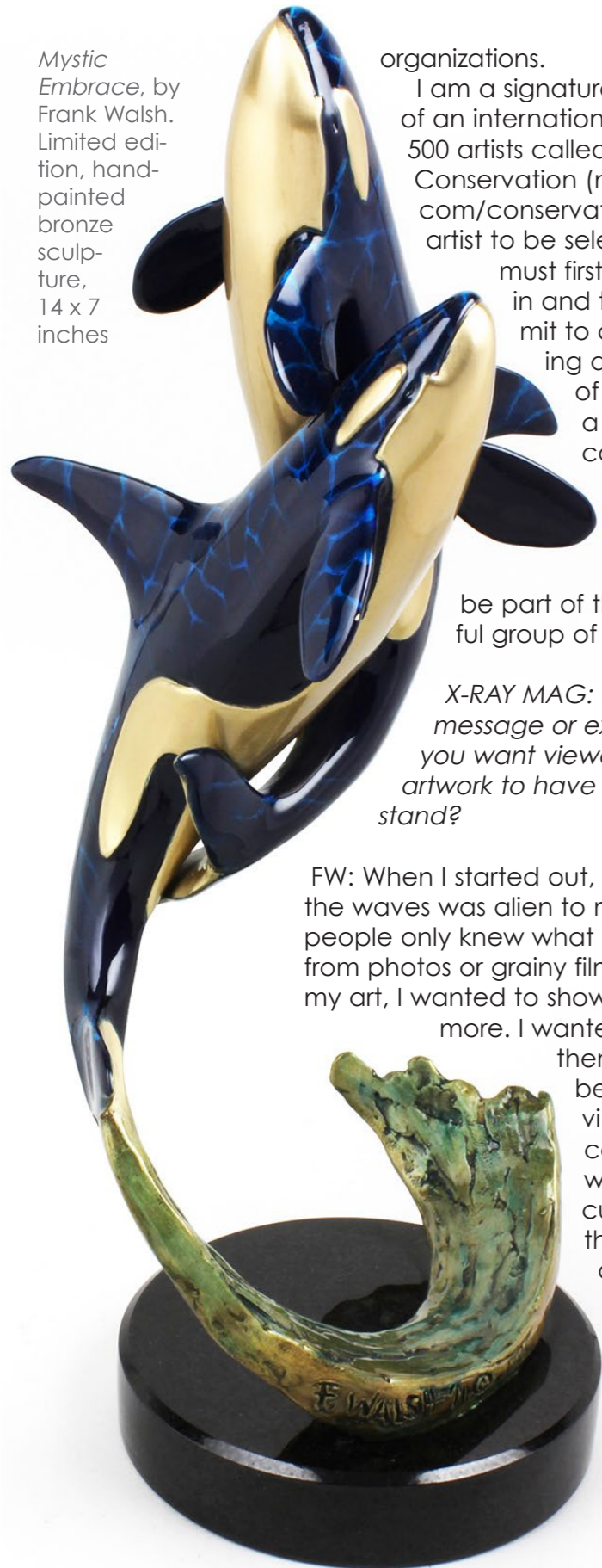


Sanctuary, by Frank Walsh. Acrylic on canvas, 28 x 18 inches



portfolio

Mystic Embrace, by Frank Walsh. Limited edition, hand-painted bronze sculpture, 14 x 7 inches



organizations.

I am a signature member of an international group of 500 artists called Artists for Conservation (natureartists.com/conservation). For an artist to be selected, you must first be juried in and then commit to contributing at least 10% of all sales to a selected conservation organization. I'm quite proud to be part of this wonderful group of artists.

X-RAY MAG: What is the message or experience you want viewers of your artwork to have or understand?

FW: When I started out, life below the waves was alien to many. Most people only knew what they saw from photos or grainy film. Through my art, I wanted to show them more. I wanted to show them how beautiful and vibrant the colors are when you cut through the depths and shine a beam of light on a hydrocoral and strawberry anemone-encrusted wall 100ft below

the surface. I wanted to show the beauty of a kelp forest undulate in the ocean surge as sunlight flashed through the forest. The only way I was able to experience this was by getting wet and deep. I was fortunate to be able to dive and wanted to share this with those who are not able. Hopefully with the knowledge we share, we can save this precious resource.

X-RAY MAG: What are the challenges and/or benefits of being an artist in the world today?

FW: I think being a professional artist is one of the most risky career decisions anyone can make. If you approach it with the intent of becoming rich and famous, you're sure to be disappointed. There are so many talented artists out there who are struggling to make ends meet.

Getting gallery representation is always a challenge and even more difficult now since there seem to be fewer galleries... at least in my area. Overhead expenses have caused many well-known galleries to close. Wall space is expensive, and gallery owners want art they know is going to move.

Fortunately, if you are Internet and social media-literate, you can get your work seen by thousands of people. I've found people more willing than ever to purchase art online. With social media, more collectors are forming relationships and trust with artists and making purchases. Most young artists are very adept at navigating through all the social networks, but for some of us older folks, that can present a problem. I've spent many hours educating myself in this new world of self-marketing and have seen some success. It is time-consuming because it changes quickly, and you need to be up to

speed, otherwise you will be left behind.

X-RAY MAG: How do viewers respond to your works?

FW: I always receive positive reactions, especially from children. They have been exposed through movies to so many of the critters I paint. The movie, *Finding Nemo*, was good for us marine life artists. Kids got entertained, and somewhat educated, and fell in love with the characters (fish). Someday, they will be young adults with money. Hopefully, they will still remember their childhood and want to hang some art that reminds them of that wonderful time.

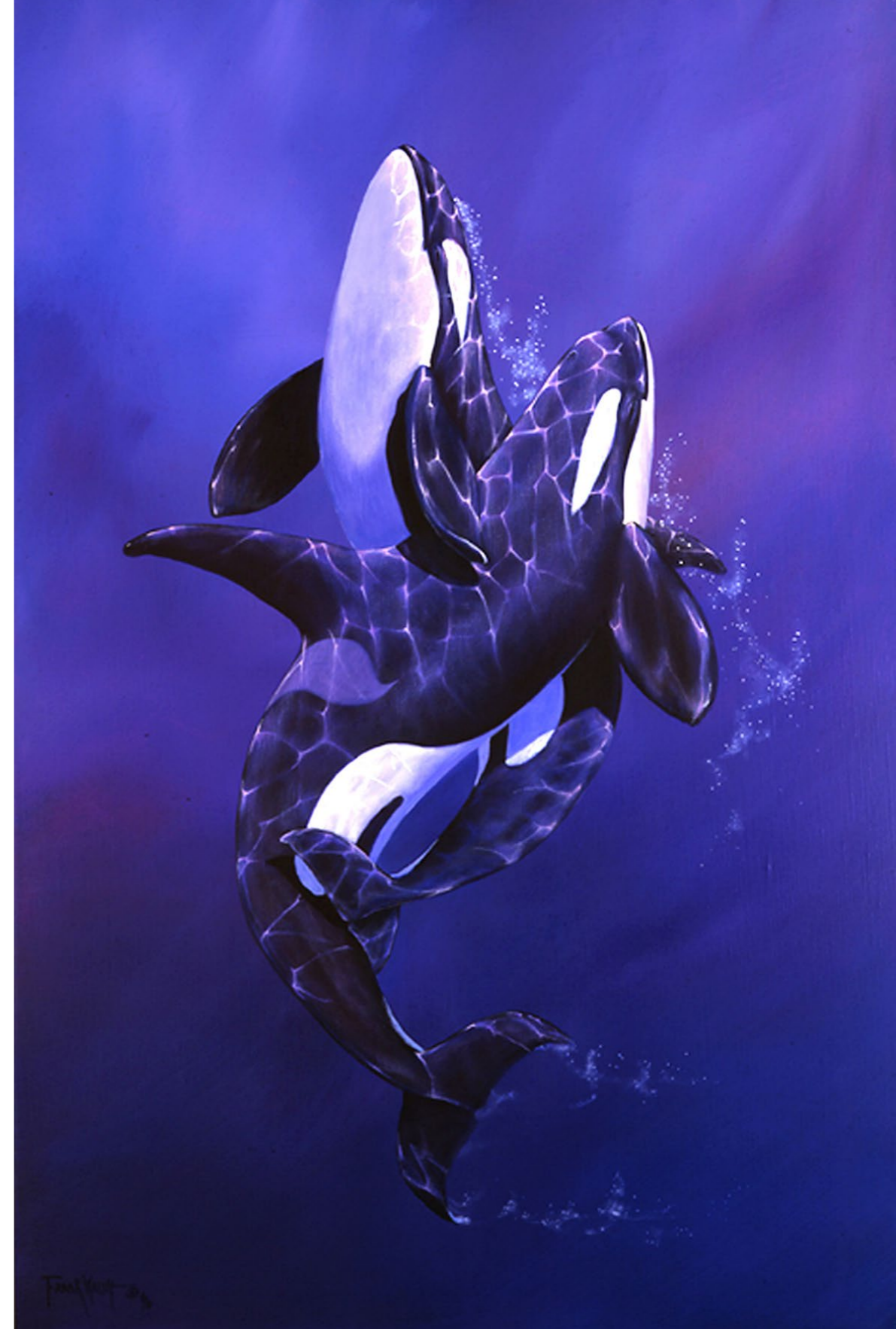
X-RAY MAG: What are your upcoming projects, art courses or events?

FW: I'm glad you asked that... I've never been one to be content doing one thing. I'm always looking for ways to expand my horizons. A few years ago, I started sculpting. Again, I am self-taught, making many mistakes along the way. I will be starting to sculpt the clay for my manta ray bronze in a couple of weeks. I'm really excited about getting started on this after my recent dive.

After 30 years, I'm starting to work with oils again. I've been wanting to try my hand at plein air painting (painting in the open air, on location) and just recently started getting out and doing a few. I was surprised how quickly I became comfortable with the medium. What I did find difficult was loosening up. I am so conditioned to paint slow and tight that painting fast and loose is a real challenge. I need to work on the that—more reason to get out of the studio.

I still have a pretty lengthy bucket list of places I want to go and dives I want to make. After 35 years of

Mystic Embrace, by Frank Walsh. Acrylic on canvas, 30 x 20 inches



painting marine life, things can become redundant, so these trips are needed to instill new enthusiasm. If anyone wants to follow and keep up with what I'm doing, please visit my website. While there, please be

sure to sign up for my newsletter and go to my FaceBook link for Walsh Studios of Art and Design.

For more information, please visit: Frankwalshoriginals.com.