

Scuba Confidential :: Safe Diving :: UW Photo—Lighting :: Tina Christiansen Portfolio



GLOBAL EDITION
May 2015
Number 66

British Columbia
Freshwater Interior

India
Andaman Islands

Micronesia
Yap

Los Islotes
Sea Lions

Bimini
Shark Lab

ISTANBUL, TURKEY
Bosphorus Strait

Papua New Guinea
Kavieng Wrecks

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COVER PHOTO: Spinner Dolphins, Red Sea, Egypt
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Always ask: What if...?

Earlier this spring a story made headlines in the UK press. Tragically a young British woman died of decompression sickness whilst she was on a Maldivian live-aboard.

We are not in receipt of the full facts. It is therefore our understanding that there was a significant delay of nine hours in getting the stricken diver to a medical facility, due to a lack of appropriate transport. And once she finally made it to the hospital, the staff failed to treat her decompression sickness.

As a parent of a young certified diver I deeply empathise with her parents. I can also relate to their grief and understand why, according to press reports, they have "slammed the sheer incompetence of the authorities in the Maldives" and questioned the role and responsibility of the tour operator.

Diving is about enriching experiences and adventures that can enhance our lives. To that end it is one of our missions to promote and encourage safe diving practices.

At the inquest, Coroner Paul McCandless warned others planning adventure holidays in remote destinations to make sure they know what emergency facilities are available before booking.

We would add to this how often do you ask, "What if...?" and act defensively.

Each time we board an aircraft we are asked to familiarise ourselves with the emergency procedures, despite the risk of an accident being ever so remote.

This same principle should be applied to any kind of diving.

X-RAY MAG columnist Simon Pridmore highlighted the fact that he makes a habit of locating the oxygen and asking what the local procedures are every time he gets on a boat. His article, *Where is the O2?* was published in issue #58 and you can also find it on the X-RAY MAG website at: xray-mag.com/where-is-the-o2

When diving in remote locations, we must both accept and adapt to the fact that the medical assistance and support we get in our home country may not be readily available.

Being far out at sea may also render our fancy phones useless, because they are out of range. Escaping from modern life and civilisation means just that. So what do you do?

Technical divers and scientific expeditions often conduct exploratory dives in remote locations. These tend to be quite costly and complex set-ups. This is partly due to the team making sure that medical emergencies are covered—the expedition will bring along their own physicians, and in some instances transportable chambers, which is hardly an option for most of us. Cedric

Verdier touched on this subject in his article, *Rescue in Remote Locations*, in issue #22. And this too is reposted on our website at: xray-mag.com/rescue-remote-locations

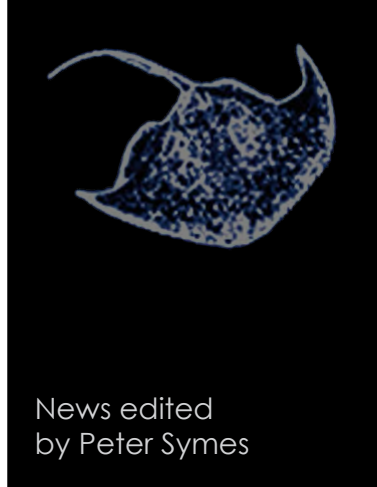
Operators do have a duty of care to make sure that gas fills are not contaminated, equipment including the boat is properly maintained, the staff are correctly trained, and the food served won't make you sick. In the event that an operator is found to be criminally negligent and in breach of accepted and mandatory standards, the book should indeed be thrown at them.

That said, ultimately the responsibility rests with ourselves. We need to step firmly away from a blame culture that is about to fester. No one should be blame-stormed for our own actions, choices and the resulting consequences.

Diving data shows that DCI may occur, albeit very rarely, even when we dive well within the limits.

When you are diving remote areas, you should not just assume that you can be airlifted to a medical facility, or even given medical treatment. Indeed, it is in remote areas where it is crucial to dive conservatively, defensively and with forethought.

— Peter Symes,
Publisher & Editor-in-Chief



News edited
by Peter Symes

NEWS

from the deep

WWF: Oceans worth \$24 trillion

The oceans make up the world's seventh largest economy, but pollution, overfishing and climate change are quickly eroding the seas' resources, according to a new report by the World Wildlife Fund (WWF).

The report authors, which include the Boston Consulting Group, list fishing, tourism and shipping as the main economic drivers of the vast economic power house of the oceans, which has an asset value at \$24tn and annual goods and services such as food valued at \$2.5tn. The report entitled, *Reviving the Ocean Economy*, states that this is an underestimate, since wind energy, and

offshore gas and oil are not included, as well as other "intangibles" such as the oceans' role in climate regulation.

But the oceans need more countries to take significant steps to protect its fragile marine ecosystems, which are experiencing an unprecedented strain, with almost two-thirds of the

world's fisheries reported to be "fully exploited" and a majority of the rest overexploited. In addition, the report

warns that as oceans soak up the carbon dioxide that human activity releases into the atmosphere, water temperature is rising and acidification is increasing in our seas, damaging fragile coral reefs—the nurseries of marine life.

The report's lead author, Professor Ove Hoegh-Guldberg,

who is the Director of the Global Change Institute at the University of Queensland in Australia said, "The ocean is at greater risk now than at any other time in recorded history. We are pulling out too many fish, dumping in too many pollutants, and warming and acidifying the ocean to a point that essential natural systems will simply stop functioning."

The findings of the research in the report show that the rate of warming today will cause coral reefs to disappear completely by

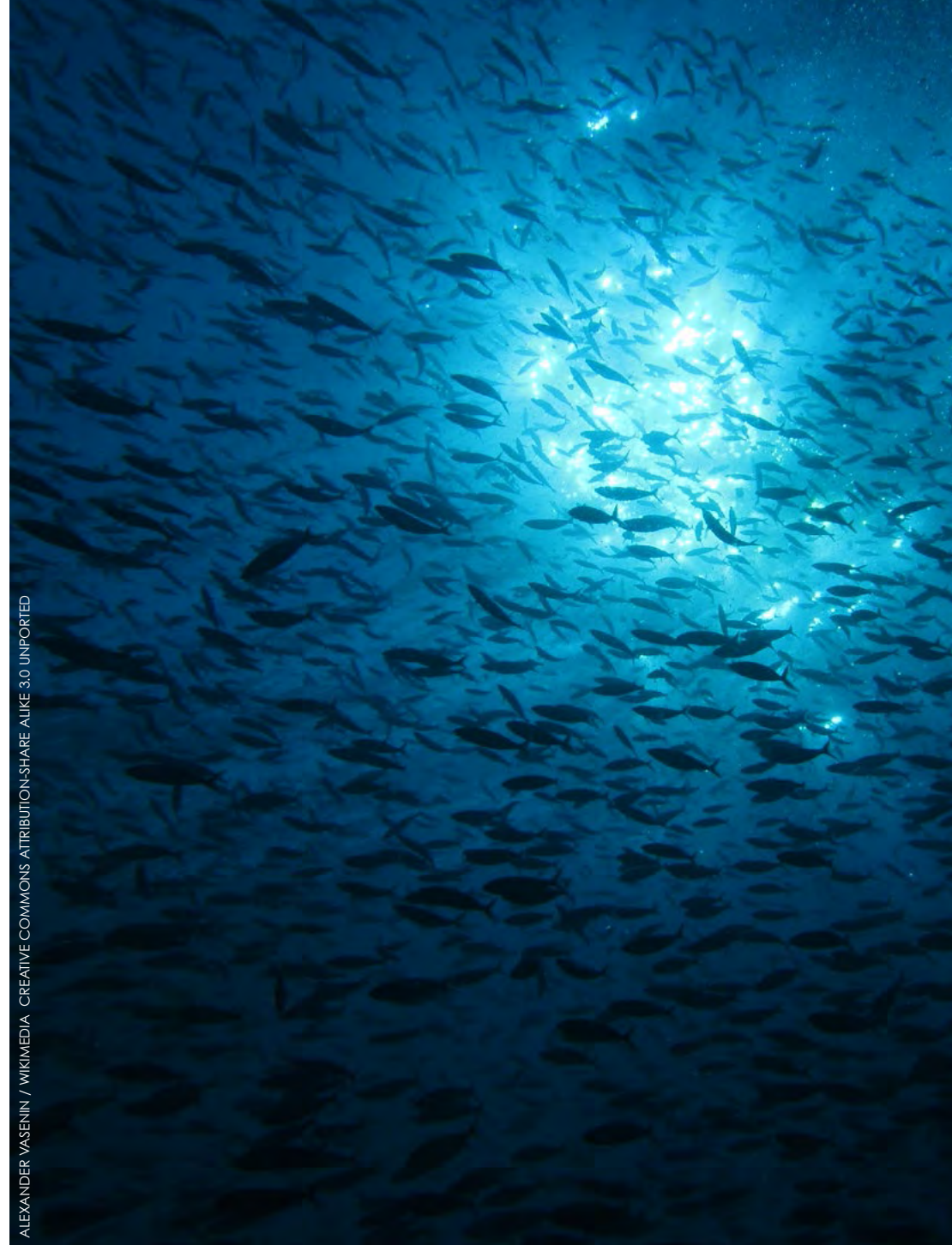
2050, taking with them food, jobs and protection from storms for several hundred million people. An eight-point action plan to help restore ocean resources was put forth by the report including setting aside 30 percent of marine and coastal areas as marine protected zones by 2030.

To read the full report, go to: http://d2ouvy59p0dg6k.cloudfront.net/downloads/reviving_ocean_economy_report_hi_res.pdf ■

SOURCES: WWF, THE GUARDIAN, THE TELEGRAPH

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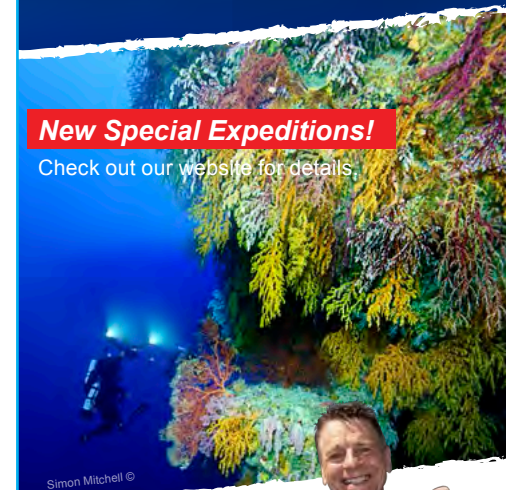
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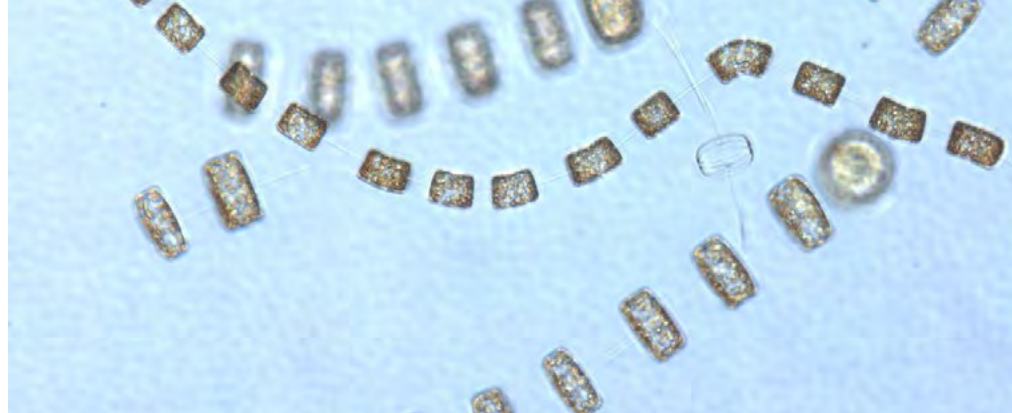
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The chain-forming diatom *Thalassiosira* is a common bloom phytoplankton.

Plankton blooms get sucked into the abyss by eddies

Each spring massive blooms of microscopic plants, or phytoplankton, unfolds in the North Atlantic Ocean from Bermuda to the Arctic. But what eventually happens to these tiny plants produced in the sea?

Scientists used a float to follow a patch of seawater off Iceland. They observed the progression of the bloom by taking measurements from multiple platforms.

Autonomous gliders outfitted with sensors were used to gather data such as temperature, salinity and information about the chemistry and biology of the bloom—oxygen, nitrate, chlorophyll and the

optical signatures of the particulate matter.

At the onset of the bloom and over the next month, four tear-drop-shaped seagliders gathered 774 profiles to depths of up to 1,000 meters (3,281 feet).

Oceanic whirlpools

"What we were seeing was surface water, rich with phytoplankton carbon, being transported downward by currents on the edges of eddies," said Amala Mahadevan of the Woods Hole Oceanographic Institution. "Eddies hadn't been thought of as a major way organic matter is moved into the deeper ocean. But this type of eddy-driven 'subduction' could account for a significant downward movement of phytoplankton from the bloom."

Global models of the ocean's carbon cycle

The scientists also hope to quantify the transport of organic matter from the ocean's surface to its depths in regions beyond the North Atlantic and at other times of year and relate that to phytoplankton productivity. Learning more about eddies and their link with plankton blooms will allow for more accurate global models of the ocean's carbon cycle, the researchers say, and improve the models' predictive capabilities. ■

SOURCE: NATIONAL SCIENCE FOUNDATION



Eddies--whirlpools within currents--transport plankton downward from the ocean surface. Satellite image shows the

Add more fish to save coral reefs

Fishing is a primary driver in the degradation of reef function, which in turn has generated growing interest in finding fisheries management solutions to support reef resilience.

Fishing is the primary source of diminished reef function globally, leading to widespread calls for additional marine reserves to recover fish biomass and restore key ecosystem functions.

Removing too many herbivorous and predatory fish species deprives coral reefs of critical ecosystem functions and the capacity to respond effectively to other disturbances. Knowing the right amount to leave behind can help local fisheries set clear limits on how many fish can be taken without threatening the ecosystem they rely on.

Crucial ecosystem functions can be maintained through a range of fishery restrictions, al-

lowing coral reef managers to develop recovery plans that meet conservation and livelihood objectives in areas where marine reserves are not socially or politically feasible solutions.

Recovery potential

Scientists studying the recovery potential of more than 800 coral reefs along an exploitation gradient have found that resident reef fish biomass in the absence of fishing averages ~1,000kg per hectare, and that the vast majority (83%) of fished reefs are missing more than half their expected biomass, with severe consequences for key ecosystem functions such as predation.

Given protection from fishing, reef fish biomass has the potential to recover within 35 years on average, and less than 60 years when heavily depleted. Notably, alternative fisheries restrictions are largely successful (64%) at maintaining biomass above 50% of B0, sustaining key functions such as herbivory. ■ SOURCE: NATURE



Fish are the key ingredients in a new recipe to diagnose and restore degraded coral reef ecosystems

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North Sea cod is back

Atlantic cod stocks in the North Sea are quickly improving and may become sustainable in five years, according to a new study.

Once considered one of the most devastated fish in the sea due to overfishing, cod is getting closer to being considered as sustainable as gurnard, a species of fish consumers have been told to eat instead of cod.

The research was commissioned by the Marine Stewardship Council (MSC), which certifies the sustainability of fish and shellfish, as well as the UK government funded organization Seafish, which represents the seafood industry.

While Atlantic cod stocks may be rebounding, the majority of England's inshore fisheries were found not to be operating sustainably. Of the 450 inshore fisheries analyzed, 400 were found to be overfished

or have serious problems in management or data. The true status of fish populations remains elusive due to a severe lack of scientific data on the size of stocks as well as the number of fish caught by fishers every year.

Grounds for optimism

Despite these issues, Seafish technical director, Dr Tom Pickerell, found grounds for optimism in the findings. "The biggest surprise was North Sea cod," said Dr Pickerell. "It is one of those that could potentially be a few years from entering MSC certification. It's on a trajectory that if it continues then it can come into a level that's long-term sustainable."

Pickerell added, "I would like to think within a decade we will have MSC-certified North Sea cod. I would like to put it closer—

where within five years it could look at entering the system."

Historically, the overfishing of cod in the North Sea that took place during the '80s and '90s led to tough regulations on the fishing industry. Since 2006, however, fish stocks have shown gradual recovery. Despite these positive gains, MCS still advises consumers to avoid North Sea cod, because the fish still remains at historically low levels. ■ SOURCE: THEGUARDIAN.COM



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New study deciphers octopus locomotion

Utilizing high-speed cameras, scientists have discovered how octopi coordinate their arms to crawl.

Researchers from Jerusalem's Hebrew University have filmed crawling octopi to learn how the animals utilized their flexible arms when they move.

Until now, scientists have struggled to understand how their elaborate crawling movements are coordinated. The answer proved remarkably simple: they just choose which arm to use to push themselves along without a trace of rhythm.

Inspiration for soft robots

The study, published in the journal *Current Biology*, is the first detailed investigation of how octopi move without a rigid skeleton. Octopus locomotion is of particular interest to engineers, whose objective is the design of biologically inspired robots.

"People want to build soft robots for medical purposes and rescue operations," said Dr Guy Levy, a researcher involved in the project.

Such soft-bodied, octopus-inspired arms would not be limited by fixed joints, which could be useful to access narrow, difficult-to-reach spaces.

Octopi on tape

To determine the octopus's remarkably efficient movement, Levy and his colleague, Professor Benny Hochner, video-taped the animals crawling from below, analyzing the motion frame by frame. By shortening and lengthening, each arm pushed the body in only one direction. The scientists' next step is to analyze the octopus nervous system to discover how this coordinated crawling is controlled. ■



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China expands in the disputed Spratley Islands, tension mounts in region

The Spratly Islands are located in what is widely known by the scientific world and the scuba diving community as the Coral Triangle—the global center of marine biodiversity. Recent satellite imagery has revealed that China has been doing a startling amount of land reclamation and construction in the Spratly Islands, whose sovereignty is in dispute by several countries including Vietnam, the Philippines, Taiwan and China.

Granted, disputes over the islands have been going on for hundreds of years, but the recent activities of China in the area have brought tensions to a boiling point. Two of the most vocal complainants, Vietnam and the Philippines, equate the Chinese land-reclamation activities to the establishment of military outposts. The growing concern over Chinese activities



in the region has also prompted US officials to warn China not to “elbow aside” other countries involved in the dispute. But Chinese officials say their activities in region are in line with protecting China's sovereignty.

Reef damage

However, there is no doubt that the reclamation activities are causing irreparable damage to the coral reefs in the area. A recent study by National Scientist Dr Edgardo Gomez at the University of the Philippines Marine Science Institute states that China, through reclamation activities on the Burgos Reef (Gaven Reef) and Kagitingan Reef (Fiery Cross Reef), has destroyed 311 hectares of reef ecosystems in the Spratlys and the Kalayaan Group of Islands—an estimated loss of around US\$110 million in marine resources.

Gomez said, “Some undiscovered species may be buried and be lost to mankind forever without

us even being able to discover and describe them.”

It is uncertain now what effect China's activities in the region are going to have on diving in the Coral Triangle in the long term, but tensions are definitely rising between China and the various countries vying for control over the Spratly Islands. While the parties involved will most likely continue to use diplomatic and legal means to find a solution, officials in the Philippines continue to press China to stop reclamation activities.

“We urge China to respect its international commitments and be mindful of millions of people not only in the Philippines, but in neighboring Asian countries, who depend on these very important marine resources,” said Asis Perez, Director of the Bureau of Fisheries and Aquatic Resources and concurrent DA OIC Undersecretary for Fisheries in the Philippines. ■

SOURCES: AMERICA.ALJAZEERA.COM, BBC, CNN, SUNSTAR.COM.PH



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wreck rap

Diver at
Deep Pete
wreck site
(right);
Historical
photo
of Pete
Seaplane
(below)

Text and photos by Don Silcock

The 21st of January in 1942 was a really bad day to be a resident of Kavieng, in New Ireland, Papua New Guinea. On that fateful day, the full might of the Imperial Japanese Navy was unleashed on this small town on the remote eastern edge of the Bismarck Archipelago, as it prepared to seize the main prize of Rabaul in nearby New Britain.

Rabaul's Simpson Harbour was the Australian Army's key base in the archipelago and had to be taken by the Japanese as they rolled out their plan to seize the main island of Papua New Guinea and isolate Australia to the south. As such, Kavieng also had to be taken, so that the Japanese could protect their rear as they prepared to head west towards Milne Bay.



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Ghosts of the Machines Kavieng's WWII Wrecks

On that day, Kavieng was subjected to massive aerial bombardment. Overnight, the majority of the Australians in the area were evacuated, along with the wives of many of the European settlers in New Ireland. The next day, the Japanese took

Rabaul. A day later, they seized control of Kavieng, and with it, the whole of New Ireland. The new rulers were brutal to the settlers and civil servants who stayed; by the end of 1943, all had been killed.

What goes around, comes around
Kavieng is located on the northern tip of

the long thin island of New Ireland. To the north is the vast expanse of the Pacific Ocean and the islands of Japan. This meant it was very strategic to the Japanese military machine, and so they established a major naval base there, which served as a staging post for supplies arriving from the main Imperial Navy base at

Truk Lagoon.

Kavieng was also used to re-supply the Japanese forward bases in Wewak, Hansa Bay and Alexishafen on the north-east coast of Papua New Guinea. In 1944, when the tide of war in the Pacific changed, it became a prime target for the Allied Forces.



New Hanover villagers (above); Diver at the Catalina wreck (left)

records from the time show that the *Sanko Maru*, a 5,461-ton tanker, was anchored in shallow waters with the partially submerged submarine next to it, while the Subchaser #39 cruised nearby guarding the two vessels.

B-25 Mitchell bombers targeted the *Sanko Maru* with numerous 500lb shells and the ship was quickly destroyed and sank; while the Subchaser #39 was pursued and ultimately ran aground on a nearby reef, where it became target practice for the bomber crews.

A tremendous photograph taken by the rear camera of Rita's Wagon, one of the attacking B-25s, captured

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Douglas MacArthur, the mercurial commander of the Allied Forces, decided against invading New Ireland as he implemented his "island hopping" strategy to regain control of the Philippines. Therefore, his commanders decided that Kavieng would have to be neutralized through air raids, led by squadrons of B-24 Liberator heavy

bombers. Those raids began on 11 February 1944 and continued over the next few days, effectively destroying the Japanese base and its fleet of seaplanes.

The air raids on Kavieng were followed on February 16 by six squadrons of bombers and strafers taking off in search of a 14-ship Japanese convoy reported to be heading for the area.

Three of those vessels—the *Sanko Maru*, an unidentified submarine and Subchaser #39, which was guarding them—were found near Three Island Harbor at New Hanover, the large island to the west of Kavieng. War



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Historical photos showing Kaveing under attack in WWII (above) and its seaplane base (left)

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Historical photo of the bombing of Subchaser #39 during WWII

Coral growth now covers *Sanko Maru* wreck (above); Midget-submarine wreck (right)

another Mitchell Bomber dropping a 500lb bomb on the Subchaser #39 while the *Sanko Maru* burned in the background.

As for the submarine, it was later identified as a Type C midget version, when bombers from the 500th squadron returned to the area the following day and dropped two 500lb bombs on it.

The bombs missed their target, but the submarine was lifted out of the water by the impact and flames were reported, so a sinking claimed. Later evidence indicated that the submarine was actually scuttled by the crew to prevent it from being captured.

The aerial attacks continued through to February 21. Several other Japanese ships suffered similar fates.

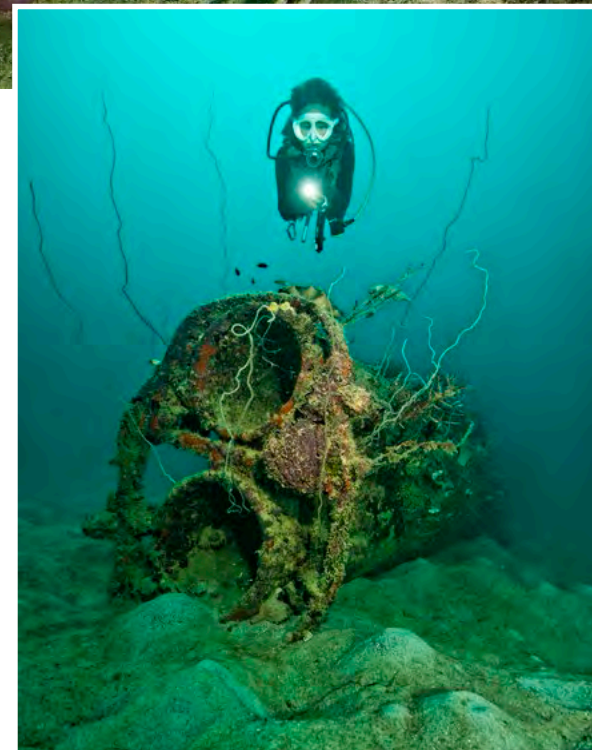
Ghosts of the machines

Nearly 70 years have passed since those February days of destruction. A visit to Kavieng today will reveal few visible signs of the Japanese occupation.

The town has long since returned to its persona as the typical "Somerset Maugham South Sea island port"—as it is so often described—which can probably be loosely translated as friendly, laid-back and quiet!

But beneath the waters are the ghosts of WWII that draw scuba divers from all over the world to experience and photograph the remains that litter the area—particularly the many aircraft wrecks for which Kavieng is famous for.

Those wrecks range from the superb Deep Pete Japanese biplane laying upside down in the blue Pacific



ic waters off Nusa Lik Island to several other WWII aircraft laying at the bottom of the harbor—victims of surprise air raids, which caught them at their moorings.



As it is on the Pacific Ocean side of Kavieng, diving it on an incoming tide means that the visibility is often exceptional and usually in excess of 30m.

Although its tail is broken, its biplane shape is remarkably still intact, given the relatively lightweight and

fragile nature of the aircraft. What makes the Deep Pete so photogenic is the resident school of yellow sweetlips that stream in and around the wings, and the batfish and barracuda that patrol in the clear blue waters above the wreck.

At just 31ft long and with a wing-span of 36ft, Deep Pete is not a big wreck. However, given its depth of

Then, throw in the shipwrecks at New Hanover and a unique opportunity to dive on the Type C mini-submarine, which sits upright and completely intact on the sand near Tunnung Island, and it's easy to understand why New Ireland is a "must have" in so many divers' logbooks.

Deep Pete

Deep Pete wreck site is the most photogenic of the WWII aircraft wrecks in the Kavieng area and by far my personal favorite.

The plane itself is a Mitsubishi F1M float-plane, which was designed and built to be launched by catapult from battleships, cruisers and aircraft tenders, and to be used for reconnaissance missions. It also saw service as an impromptu fighter, dive bomber and patrol aircraft.

This specific model was a biplane with a single large central float and stabilizing floats at each end of the lower wing. Apparently, early versions suffered from poor directional stability in flight, and were prone to 'porpoise' when on the water, which may explain why the wreck is actually there.

The name "Pete" is derived from the way the Allied Forces identified Japanese aircraft during WWII, as the actual naming convention was often both difficult to understand and pronounce. The Japanese gave two names to each aircraft, with one being the manufacturer's alphanumeric project code and the other the official military designation.

So, the Allies used code names instead, with men's names given

to fighter aircraft, women's names to bombers and transport planes, bird names to gliders, and tree names to trainer aircraft.

The wreck lies on its back, with the remains of its main float sticking up, on flat white sand in 40m-deep water—hence, the name "Deep Pete".

It is located on the western side of Nusa Lik (small Nusa) Island, which, along with Big Nusa Island, provides the shelter for Kavieng's harbor.



THIS PAGE. Scenes from the Deep Pete wreck site



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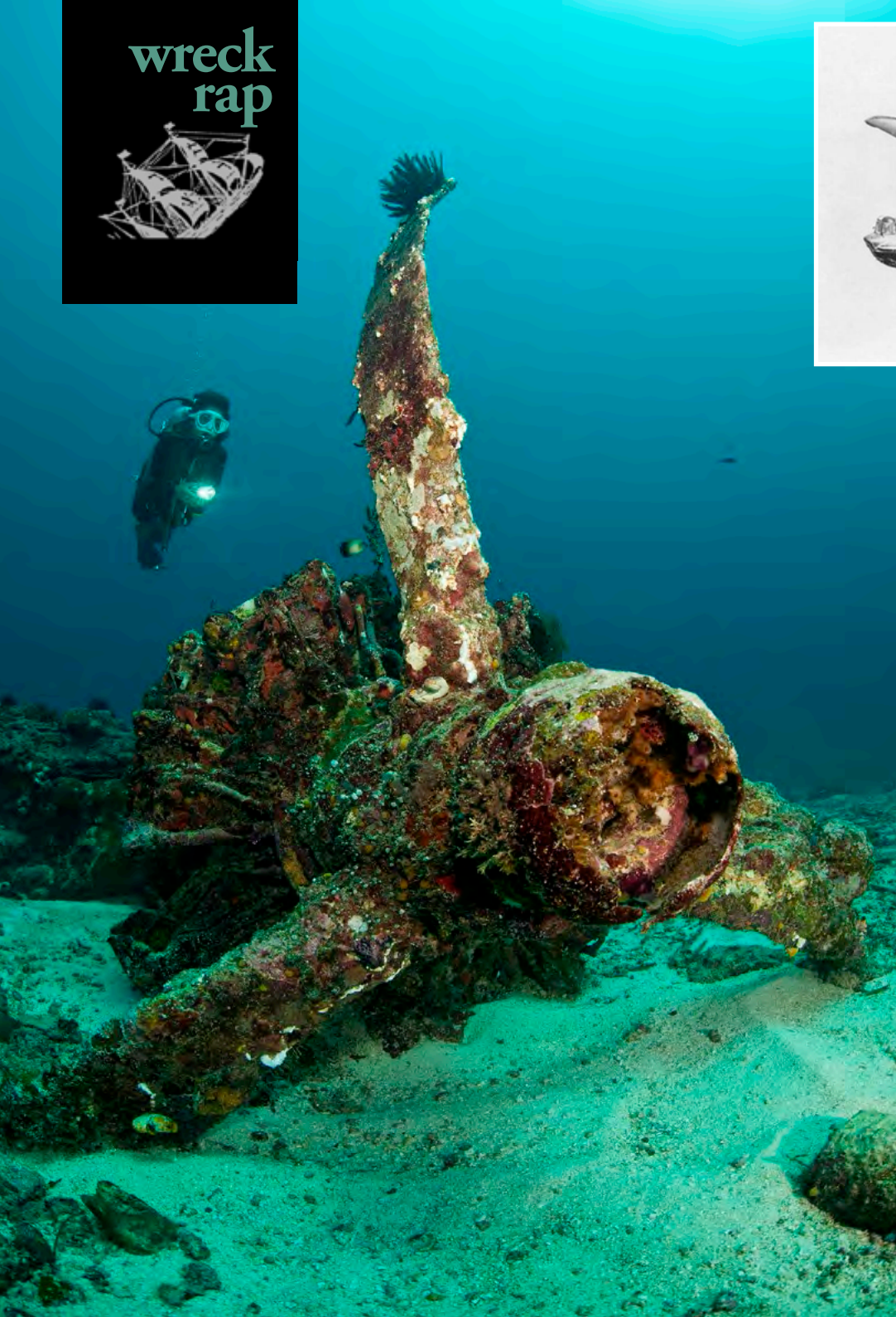


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40m and the square profile of the dive, there is rarely enough time to fully explore it, so at least two dives are required to fully appreciate and photograph it.

The Catalina

The wreck of the Royal Australian Air Force (RAAF) PBY Catalina A24-11 rests at 20m depth near the entrance to Kavieng's har-

bor. The Catalina flying boat was developed by the U.S. Navy in the 1930s as a long-range patrol bomber. Although slow and somewhat ungainly, Catalinas served with distinction during WWII—both in the role they were designed for, and as a very effective way of rescuing downed airmen.

Their ability to land on water meant that they could be used

to quickly and effectively rescue crews that had gone down in the Pacific and, in fact, have been credited with saving the lives of thousands of aircrew.

This particular PBY A24-11 was on a mission to attack Japanese forces in Truk Lagoon on 15 January 1942 and had taken off from Rabaul with six other RAAF Catalinas. They had landed at Kavieng, which was still under Australian control, to take on fuel before heading north into the Pacific.

After refueling at Nusa Island, the Catalinas took off again but one of A24-11's wing bombs accidentally exploded when it hit a swell during take-off, killing the crew and causing the plane to sink rapidly.

The wreck of the A24-11 was discovered in 2000 by the legendary Rod Pierce, skipper of the MV *Barbarian*, who also discovered the B17F Black Jack and S' Jacob wrecks.

What Pierce found were the engines and parts of the aircraft such as the wing and landing gear in one main location; being the heaviest parts, they sank to the bottom in the same location. Part of the rest of the plane have scattered across the seabed as a result of the destructive force unleashed on the plane at such close quarters when the wing bomb exploded.

Located as it is near the entrance to Kavieng's harbor, the



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Historical photo of the Catalina flying boat of the U.S. Navy



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Catalina is best dived on an incoming tide.

The Sanko Maru

Located just off the fringing reef of Tunnung Island, to the tip of New Hanover, are the wrecks of the *Sanko Maru* and the Type C midget submarine sunk during

the Allied aerial bombardment of northern New Ireland in February 1944.

The *Sanko Maru* was an armed freighter and apparently one of the "Hell Ships" used by the Japanese to transport prisoners of war in the Philippines under the most appalling conditions.

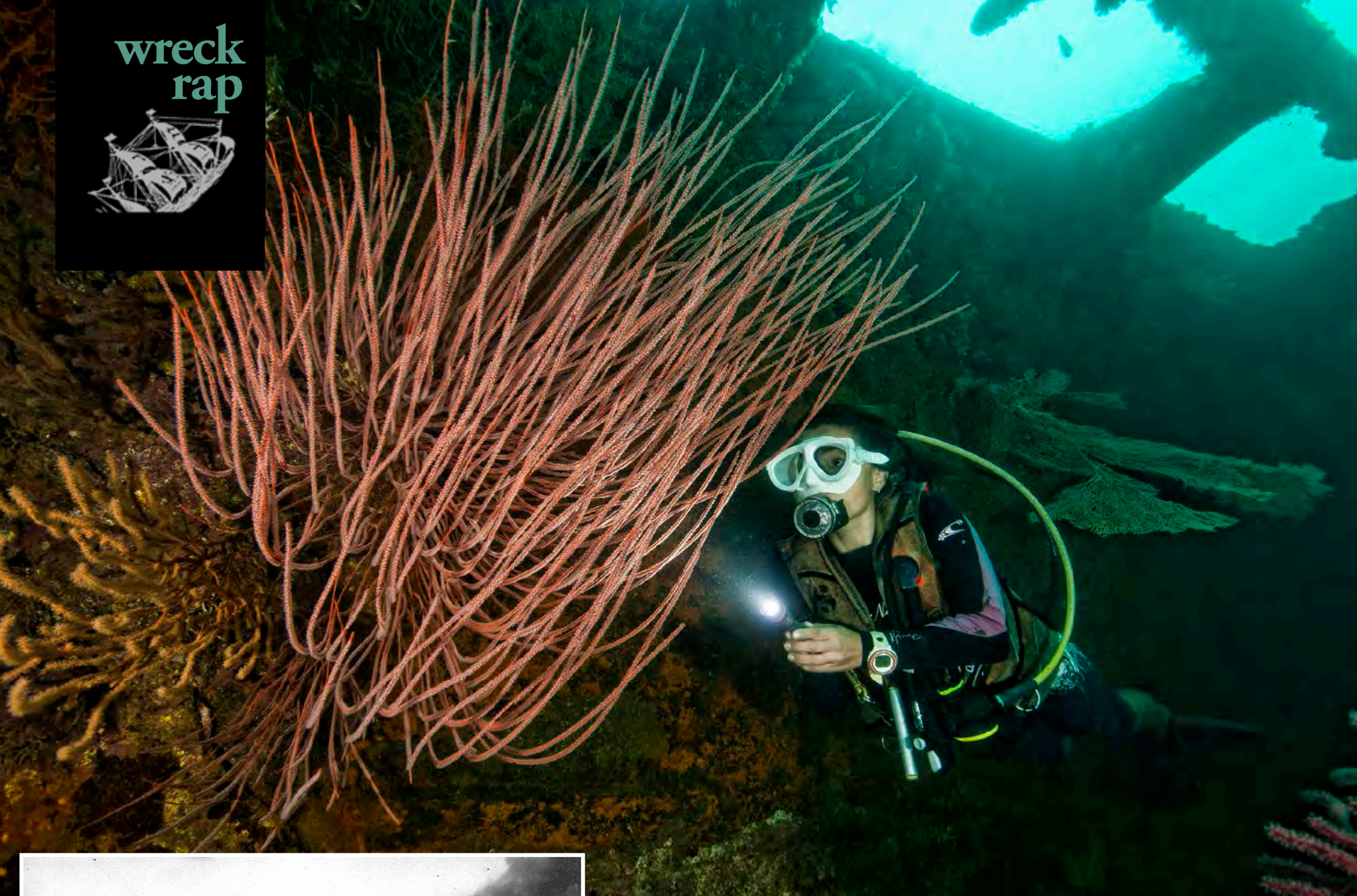
At just under 400 feet long, it is quite a large wreck and lies on its starboard side in 22 meters of water.

Located on the island's southern side, the *Sanko Maru* is swept by the rich currents of the Pacific Ocean that run down the north-west coast of New Hanover, and



THIS PAGE: Scenes from the wreck of the Catalina





Diver explores the interior of *Sanko Maru* wreck (above); Historical photo showing the WWII battle involving *Sanko Maru* and midget submarine

from the nearby islands.

The damage from those 500lb bombs is clearly evident, and the wreck has been stripped of its propellers and boilers by salvage divers many years ago. The wreck is easy to dive, with the upward-facing side of the ship in just six meters of water, making safety stops very easy.

Sanko Maru warrants a lot of exploration, but often does not get the attention it deserves because the star of the show is the nearby Type C midget submarine.

The midget submarine

As the story goes, the midget subma-

rine lay undisturbed just 50m away from *Sanko Maru*—until 1987, when it was discovered by accident by Papua New Guinea diving legends Kevin Baldwin and Bob Halstead.

Halstead was diving *Sanko Maru* from his liveaboard, *MV Telita*. Baldwin, who was on board for the trip, decided to swim out from the wreck to see if any debris had fallen on the sand, and must have thought he had won the lottery when he swam straight into a Japanese midget submarine!

Baldwin found the submarine in excellent condition, complete with its periscope and twin counter rotating propellers, but missing its torpedoes. Significantly, the main hatch on the conning tower was open, reinforcing



Diver on the wreck of *Sanko Maru*

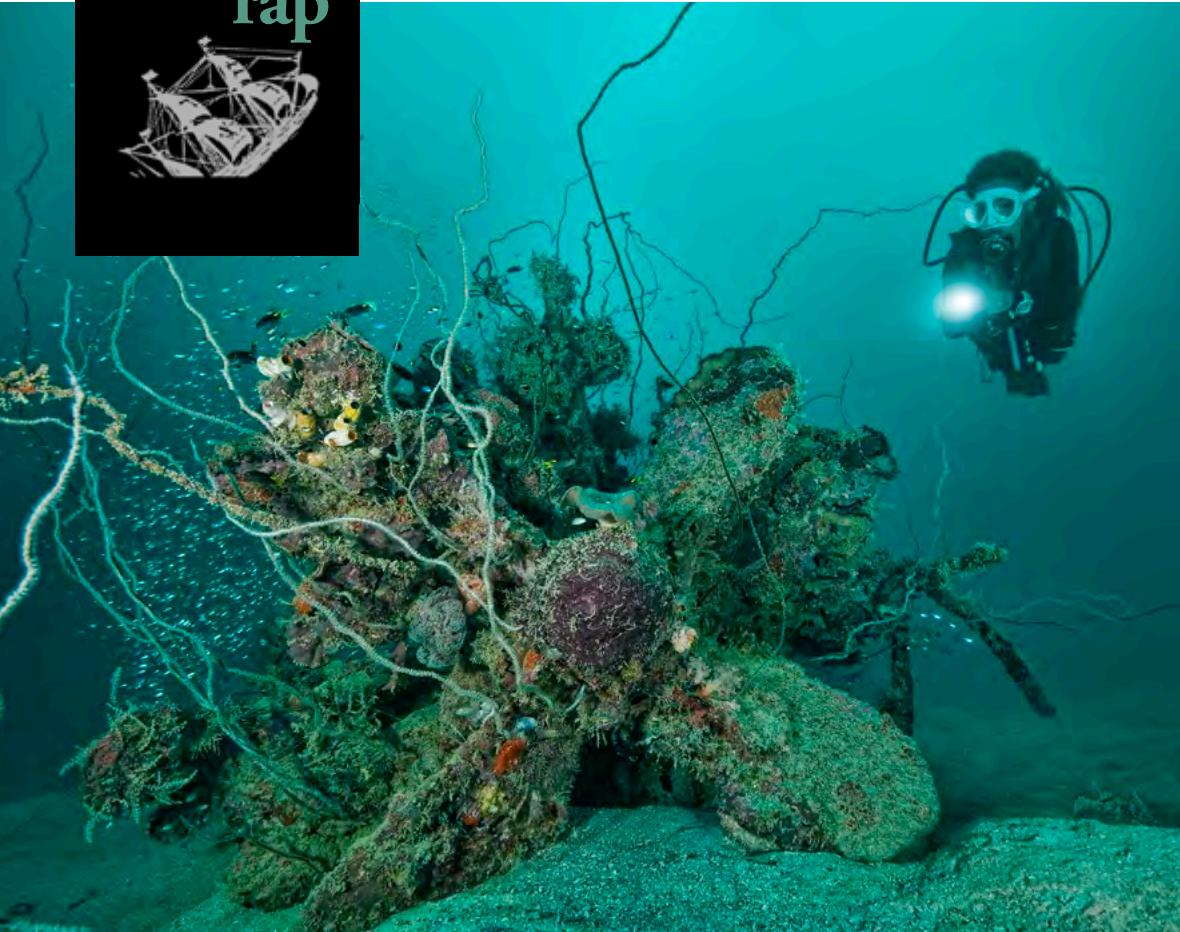


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thus, is covered in rich soft corals and gorgonian sea fans.

The sheer density of the marine growth on *Sanko Maru* is simply stunning and it would rate as a 9 to 10 on my personal “wreck scale” were it not for the visibility, which rarely exceeds 10 meters—probably because of the runoff





the theory that the crew had scuttled the submarine back in 1944 when it came under attack by the B-25s.

Ironically, the limited visibility in the general area meant that the salvage divers who had plundered *Sanko Maru* had missed what is probably the only diveable midget submarine in Papua New Guinea—and possibly anywhere else!

The Imperial Japanese Navy built a total of 76 midget submarines for combat use be-

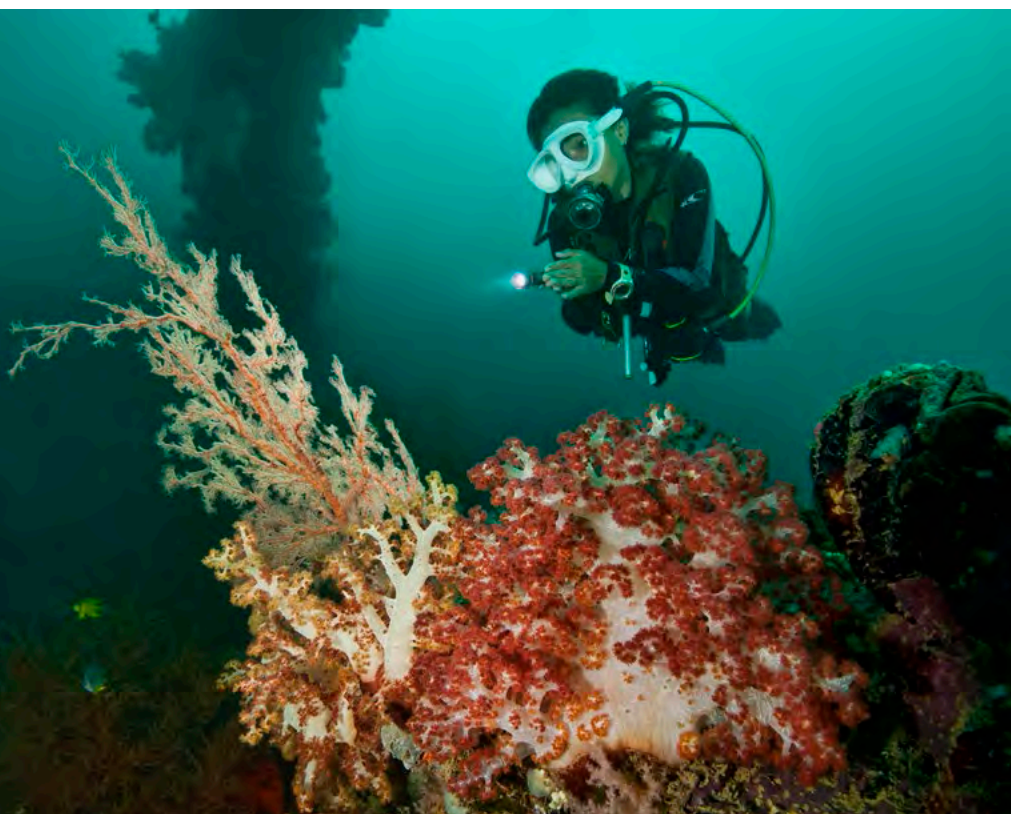
tween 1934 and 1944. Originally, they were designed to be carried by larger Japanese ships and deployed in the path of an enemy fleet, where they would disrupt its operations with torpedo attacks. However, during WWII, the submarines were deployed for special operations against ships in enemy harbors, including the infamous 1941 surprise attack on Pearl Harbor and the 1942 raids on Sydney, Australia.

There were three versions with the original

Type A, displacing 46 tons and 78ft in length and armed with two torpedoes. Driven by battery-powered electric motors, the Type A was capable of high speeds of up to about 20 knots, but had a very limited range.

The prototype Type B and production Type C submarines were fitted with a diesel engine to recharge their batteries.

Although no Japanese records on the Type C's survived the war, it seems clear that *Sanko Maru* was probably the “mother-



Rich coral growth on *Sanko Maru* wreck (above and top left); Wreck of Jake seaplane (top right); Historical photo of Jake seaplane (right)

ship" for the New Hanover submarine.

Diving the submarine is very easy as there is a thick rope laid out between it and the mast area of *Sanko Maru*. It sits bolt upright on the sandy seabed. The conning tower and the twin propellers have become home to a variety of marine life and sea whips, making the submarine very photogenic.

Diving the ghosts of the machines

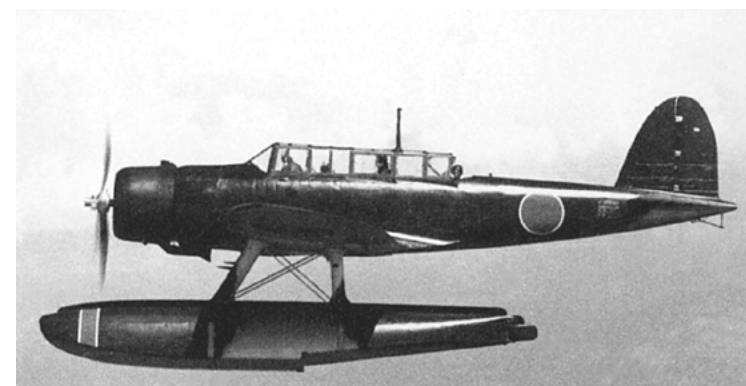
There are a few options available if you want to dive the ghosts of the machines detailed in this article (and the many others in the area). Both Lissenung Island Dive Resort and Scuba Ventures dive the aircraft wrecks around Kavieng on a regular basis.

If you want to dive the wrecks of New Hanover, your best bet is to

either sign up for Lissenung's annual exploratory trip to the area, which usually includes dives to *Sanko Maru* and the midget submarine as part of the itinerary.

Alternatively, check out the itineraries of Alan Raabe's *MV Febrina* and Craig de Wit's *Golden Dawn* liveaboards—both do the Kavieng and New Hanover area on a regular basis.

I personally based myself at Lissenung Island Dive Resort to cover both the aircraft wrecks and to participate in the exploratory trip, which was really great. However you do it, make sure you do—these are unique dives! ■



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Don Silcock is based in Sydney, Australia, and is the Asia Correspondent for X-RAY MAG. He travels widely in Asia and his website (www.indopacificimages.com) has extensive information and image galleries on the diving in Papua New Guinea and other great dive locations across the Indo-Pacific region.



Wreck of Jake seaplane





Annapolis finally sunk

Text and photo by Barb Roy

Vancouver gets its first major artificial reef as the former HMCS Annapolis is scuttled in Halkett Bay Provincial Marine Park on Gambier Island, British Columbia.

The ship was purchased from the federal government of Canada through Crown Assets Distribution in 2008 with the intent of making this the

first artificial reef in the Greater Vancouver area.

Leading up to the sinking, the *Annapolis* has been meticulously cleaned of hazardous and pollutant materials in compliance with federal regulations and an estimated 250 tons of materials (almost everything but the steel hull and aluminum super structure) has been recycled.

Annapolis has been the most complicated and most controversial project ever undertaken

by the Reef Society. Starting with the stock market correction in 2008 and the rapid fall of recycled metal values, the project also encountered changing federal government regulations. Then the impacts arising from emerging environmental concerns and legal challenges all forced the project timelines and costs to be extended. To date, the project has consumed over 17,000 person-hours on the part of over 1,000 volunteers who came out to complete the preparatory work on the ship. ■

The story of the Annapolis Project is a complicated one on many levels and the Reef Society has kept working diligently to make this project a success for Vancouver.

— Howie Robins, President, Artificial Reef Society of British Columbia

Vast treasure recovered from wreck of SS *City of Cairo*



Treasure found on the shipwreck The SS *City of Cairo* found by Deep Ocean Search

The SS *City of Cairo* was sunk by a German submarine 480 miles south of St. Helena on 4 November 1942 en route from Bombay to England via Cape Town and Recife, Brazil, unescorted, in late 1942. She carried 296 souls, of which 136 were passengers, and a mixed cargo that included 100 tons of silver coins housed in 2,000 rectangular black boxes belonging to the U.K. treasury.

Deep Ocean Search said in a news release that during the 2011 search, it located an unnatural object on radar. A sub found the *City of Cairo* split into two parts, buried by silt.

Under wraps for years

BBC writes that the ship and its cargo were presumed lost until 2011, when a team led by British salvage expert John Kingsford located an unnatural object among the ridges and canyons of their South Atlantic search area. Under a contract with the U.K. government, underwater salvagers Deep Ocean Search (DOS)

worked for several weeks searching a "jumbled up sea floor" twice the size of London, Kingsford told the BBC.

"We weren't convinced at first," he said. "But you have to give your team their head if they say they've found something, so we looked." The object was indeed the *City of Cairo*, and the team recovered a "large percentage" of its GB£34 million treasure chest. "There was a lot a relief all round," Kingsford said. ■

SOURCES: BBC, DEEP OCEAN SEARCH

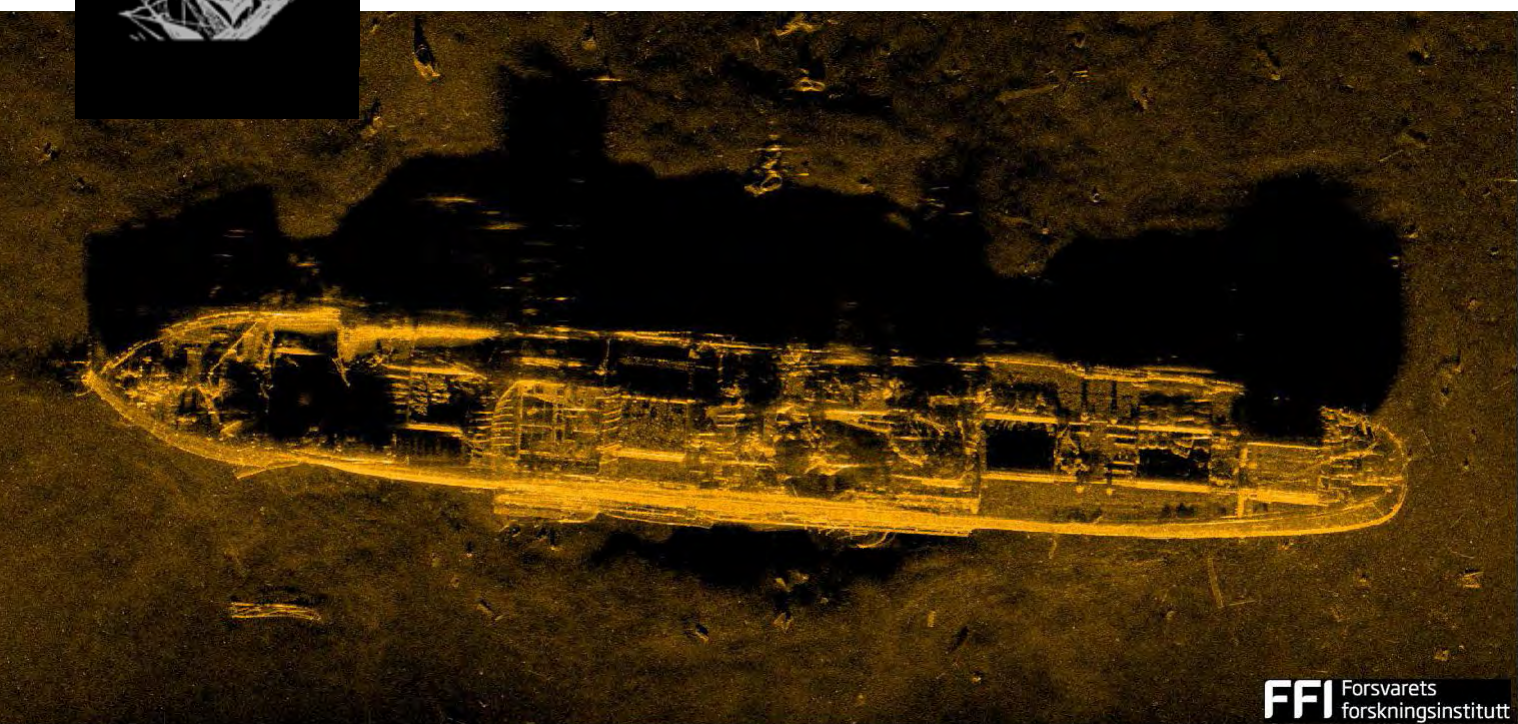


Historical photo of SS *City of Cairo*

DEEP OCEAN SEARCH / PHOTO: F. BASSEMAYOUSSE



Shipwreck at 600m in Skagerrak

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Norwegian Coastal Administration locates 15 more WWII wrecks in Skagerrak

After World War II many decommissioned vessels loaded with chemical warfare agents and munitions was scuttled in a 600m deep trench off Arendal, a port on Norway's Southern coast.

During a survey in 2009 the Norwegian Coastal Administration (NCA) located some 20 wrecks in the area. A recent search revealed an additional 15 wrecks, taking the total to at least 35.

Most of the wrecks stems from the post-WWII scuttling, but there are also some that cannot be associated with this campaign, said chief scientist

of Norway's Defence Research Institute, Petter Lågstad.

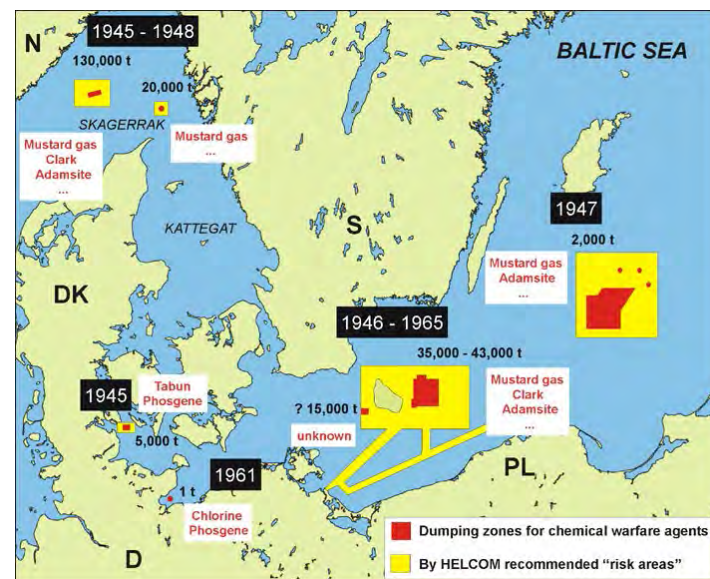
Some of the wrecks are obviously unrelated to the scuttling because of their size and age.

Lågstad stated that some of the wrecks are broken up and destroyed so that parts of the load with chemical weapons are scattered across the seabed. Some wrecks, however, appear whole and undamaged. "We assume in these cases

that the cargo is enclosed in wrecks," said Lågstad.

The final survey of the area is to be completed next year.

■ SOURCE: NORWEGIAN COASTAL ADMINISTRATION



Dumping zones for chemical warfare agents after WWII

Champagne from 1840s shipwreck tastes 'cheesy, metallic and sweet'

Bottles of champagne salvaged from a 170-year-old shipwreck have been tested in the lab by scientists seeking clues about historic winemaking methods. Analysis show very high levels of sugar—higher than most modern dessert wines—and traces of arsenic.

The new study, published in the journal *PNAS*, reports "chemical and sensory analysis" of the historic liquid. It was led by Professor Philippe Jeandet, from the University of Reims in Champagne-Ardenne, France.

When Jeandet sampled what is probably the oldest champagne

ever tasted, he was allowed just one droplet squirted from a microsyringe. Divers retrieved 168 bottles of the 170-year-old champagne from the bottom of the Baltic Sea in an unprecedented haul in 2010, but only two millilitres of the drink reached Jeandet's laboratory for analysis.

Tobacco and leather taste

"It was impossible to smell," Jeandet said, because of the tiny quantity. "But it was fabulous—just tasting 100 microlitres."

Engravings on the underside of the corks helped to identify the bottles. Jeandet remembers flavours of tobacco and leather, he said. "The taste remained for two or three hours."

The small sample shows that

the seabed preserved the champagne surprisingly well, and offers clues about 19th century winemaking practices, said Jeandet.

The bottles were discovered in a shipwreck off the Finnish Åland archipelago, and identified as early 19th century by engravings on their corks. In 2011, two were auctioned off, and one was sold for €30,000 (then US\$44,000), a record for champagne. The money went to fund scholarships in marine archaeology projects, said Björn Häggblom, a spokesman for the government of Åland. Eleven more bottles were sold in 2012; the others are stored in Åland and may be auctioned later. Five beer bottles were also found in the wreck, and an analysis of the beer was published earlier this year. ■



Bottles of champagne salvaged in 2010 from a 170-year-old shipwreck have been tested in the lab by scientists seeking clues about historic winemaking methods.

Dr Margaret Rule, 1928 - 2015

Dr Margaret Rule CBE, the British archaeologist who supervised the largest maritime archaeological excavation in history and the subsequent raising of King Henry VIII's warship from the Solent seabed, has died aged 86.

The warship *Mary Rose* was launched in 1511 and served for 34 years as the flagship of Henry VIII's navy. She sunk, without warning, a mere two miles outside Portsmouth Harbour on 19 July 1545 with the approximate loss of 500 men and boys. The *Mary Rose* had been leading an attack on a French invasion fleet. Her 'death' was watched from the shore by Henry VIII, who was stood by Southsea Castle.

Dr Margaret Rule's involvement with the *Mary Rose* began in 1965. Alexander McKee, an amateur diver and historian with a passion to find the wreck, approached Rule for archaeological help. She agreed to be involved even

though it was outside her experience. At the time she did not scuba dive—she was a land archaeologist. Rule had previously supervised the excavation of a Roman Palace at Fishbourne, near Chichester in West Sussex. When the Sussex Archaeological Society built a museum there in 1968, Rule became its first curator. One of the VIP visitors to the museum was the Prince of Wales. This contact would later prove to be vital to the *Mary Rose* Trust.

Discovery

In 1966 McKee had a useful break. He came across a chart made by the Deane brothers in 1836. It gave the posi-

tion of the wreck. Many years of seabed searching followed. To begin with Rule spent a fair amount of time sitting in a boat, waiting for the divers to report what they had seen underwater. Pretty soon she realised that the only way she could do her job was to learn to dive.

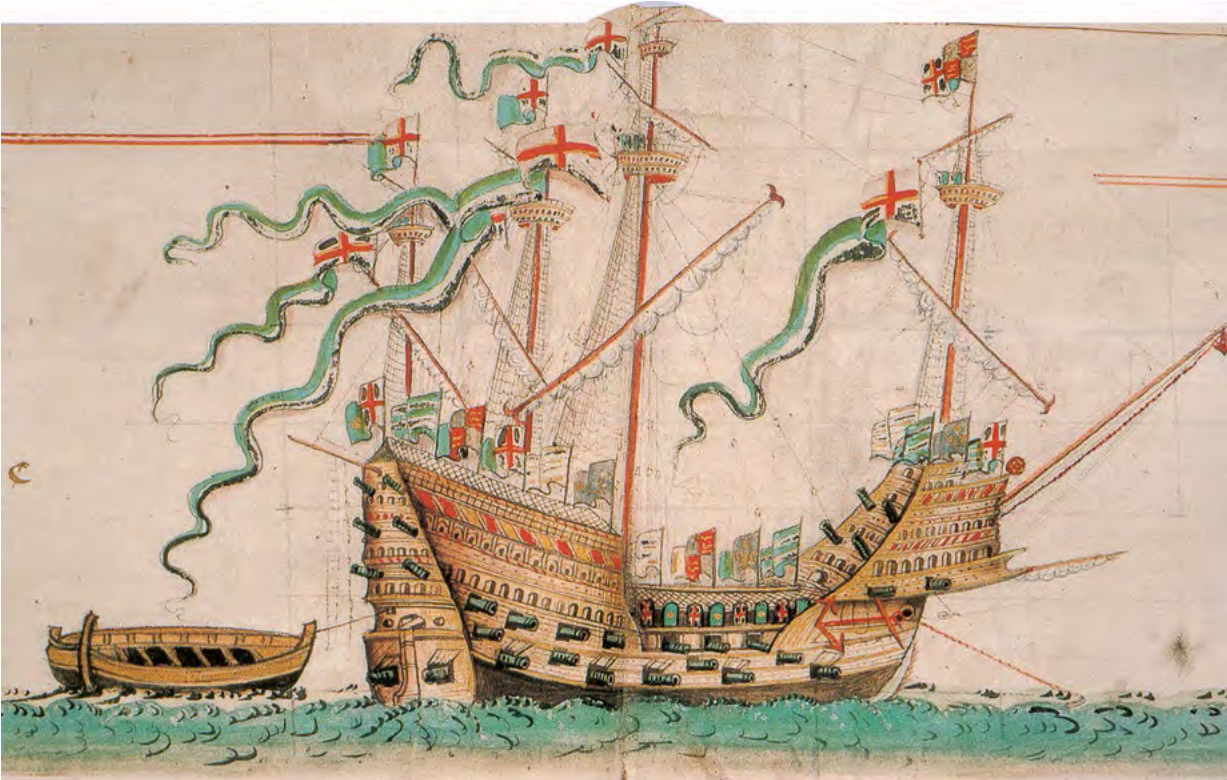
The ship was located in 1971. Alex Hildred, curator of the *Mary Rose*, confirmed that this was the first time that remote sensing technology sub-bottom profiling and side scan sonar had been used in England.

"We were very fortunate that on the first dive of the year (5 May 1971), we slightly missed our target—the area that we had been searching. We were about 150 metres to the south. Percy Ackland, who I always called our underwater gun dog, came up and whispered to me, 'The timbers are down there Margaret.'" Ackland had found three of the port frames of the *Mary Rose*.

By some miracle half of the hull had been well preserved by Solent mud. It was as though someone had chain-sawed through the wreck from bow to stern and the entire starboard side of the *Mary Rose* survived.

Maintaining dig standards

To begin with Rule was concerned whether land archaeology standards could be maintained under water. Rule told the *Telegraph*: "But I learnt you work under water with the same care and ingenuity as you do for a land dig. There you put your site to bed, you put a tarpaulin over your work... You do the same



Historical illustration of *Mary Rose* as depicted in the Anthony Rolle record of English Tudor ships



Dr Margaret Rule CBE



The Battle of the Solent is depicted in this Cowdray engraving by James Basire, with the recently sunken *Mary Rose* in the center

BELOW: Historical engraving by Frans Huys, c. 1561, shows carracks, similar to the *Mary Rose* being attacked by galleys, which were highly manoeuvrable

underwater. You don't leave your site open to be disturbed by currents."

Rule made hundreds of dives on the site and would often dive in the trickiest of areas and in low

visibility conditions. If the team was having a problem deciding something, she would dive the area and make a decision. She would spend her nights, when everyone else had gone to bed, reviewing video runs of the site.

"There is a difference between land archaeology and underwater archaeology because we, the archaeology supervisors and Margaret as director, cannot look over your shoulder into a trench and see what is happening everywhere; you have to rely on feedback from individuals," stated Alex Hildred.

Excavation

The consequences of finding the ship were enormous. It was decided that the wreck should be excavated in its entirety. The surviving 19,000-odd arte-

facts were in the main, in extraordinary condition. On land, organic matter is not always so well preserved and it can be difficult to date.

Here the team had a definite time line: 19 July 1545. The archaeologists knew exactly when the objects went into the silt. And the artefacts covered many facets of Tudor life. From thimbles, to quills, leather shoes, combs, coiled rope, a pocket sundial, and a manicure set to name but some.

This logistically difficult and challenging operation had other issues. There was a minefield of bureaucracy combined with legal constraints. At the time historical shipwrecks were not recognised. Rule fought the bureaucrats with tenacity,

which was very much in her character. She persuaded the government and the Receiver of Wreck to entrust the extraordinary collection into the hands of the *Mary Rose* Trust.

Protecting the wreck site

The other worry was the security and

safety of the wreck.

"Initially there was no way legally of protecting the *Mary Rose* when we first saw her in 1971. We had to protect her from looters. And so we never left marker buoys on site and we alerted

all our fishermen friends to keep a watching eye on it. We formed a *Mary Rose* Committee and we applied for a lease from the Crown Estate Commissioners, which cost a pound a year. And having got that lease, we



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SIMON MILLS

Dr Margaret Rule with Rear Admiral John Lippiett CB CBE, chief executive of the Mary Rose Trust

Remnants of the Tudor period carrack *Mary Rose* undergoing conservation at the Historic Dockyard in Portsmouth, United Kingdom

tion work had uncovered an intact ship structure. However, if a full excavation were to go ahead, it was likely the remaining timbers would be destroyed. The decision was taken to raise the ship.

Rule knew that HRH The Prince of Wales' interest in the *Mary Rose* had been crucial in attracting the funds to raise the ship. The British Sub Aqua Club's then President, Prince Charles—who was also the President of the Mary Rose Trust—had dived the wreck site twice in 1979.

Rule told the BBC: “We couldn't have done it without him . . . When he goes down [and] says ‘I've seen it, I've seen it with my own eyes and it can be brought up’, then everyone is supporting us and British industry comes behind us.”

could then defend our patch of mud.” Subsequently on behalf of the Mary Rose Trust, Rule successfully secured the right to retain the exclusive rights of the *Mary Rose* site.

Rule joined the Council for Nautical Archaeology (later the Nautical Archaeology Society). This small group of archaeologists were determined to get a new law in place to help curb the desecration and looting of submerged sites. Rule was a key figure in the campaign to get the 1973 Protection of Wrecks Act passed. Shortly after the act was passed, the *Mary Rose* was one of the first sites to be designated. Later Rule would become a member of the government's advisory committee on historic wrecks.

Gaining royal support

What started as an amateur project with virtually no money in the mid 1960s became a multimillion-pound project, thanks in part to Rule's passion, determination and vision. By 1978 the initial excava-

Prince Charles told UK media about diving the *Mary Rose* in 1979. “I remember my days of diving on the ship out in the Solent in the most impossible conditions, it was like swimming in a kind of lentil soup, you couldn't see anything, or so I thought, until it was under your nose. What I could never get over was the sheer expertise of the archaeologists operating under water.”

The remaining hull was very fragile and the technology had not been tried before. The plan was to pass hundreds of bolts through the timbers and attach them to a steel frame. This would then be raised onto a cushioned cradle and brought back to Portsmouth Dockyard.

Raising *Mary Rose*

The raising of the *Mary Rose*, after its 437 years at the bottom of the Solent, happened on 11

MARY ROSE TRUST / WIKIMEDIA COMMONS / CC BY-SA 3.0



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Salvage on 11 October 1982 of the 16th century carrack *Mary Rose*

October 1982. The raising of the hull inspired a number of Brits to learn to dive and many of us remember this momentous day. An estimated 60 million television viewers from around the world watched as the *Mary Rose* emerged from the Solent. Today the *Mary Rose*, and the 19,000-odd artefacts recovered from the wreck, are housed in a purpose-built museum, located in the historic Portsmouth dockyard. They are so well preserved, one could never tell they are at least 468 years old.

Prince Charles recently described to the UK press the atmosphere and technical problems on the day the hull was lifted. He explained that the crane used was on loan for only one day, and how he had encouraged the crew to get on with the job, despite technical difficulties including poor weather: “I will never forget the almighty crash as the chains came down and I thought it was all my fault. I think it was worth taking the risk as we have this truly remarkable example of a Tudor warship, which is unique.”

Over 5,000 dives were conducted by hundreds of volunteers as part of the *Mary Rose* project. Rule observed that it equated to “nine man years on the seabed”.

Tribute

Chairman of the Mary Rose Trust, Rear Admiral John Lippiett CB CBE DL paid tribute to Rule: “She made an extraordinary contribution to our nation's heritage. She was an extraordinary woman. Full of resolve and tenacity. Her determination was to achieve against the odds when so many people said this is not possible. She would never take no as the answer.”

It seems only fitting to leave the last word to Rule: “If I had left her there, I would have had much less worried 20 years. But I would not have had the exciting life I have had meeting such tremendous people as a result of the *Mary Rose*.” ■

SOURCES: BBC, FT, GUARDIAN, TELEGRAPH, BSAC AND MARY ROSE TRUST





Edited by
Scott Bennett

Touching corals punishable by law in the Philippines

Scuba divers were warned recently by the provincial chief of the Department of Environment and Natural Resources in Negros Oriental that touching corals is punishable by law.

At least two photos posted on Facebook by an environmentalist, who frequents Apo Island, showing a scuba diver/photographer using a poker and touching corals has prompted Penro chief, Charlie Fabre, to issue a warning to visiting divers.

Fabre said he will ask the Protected Area Superintendent, Efren Rombawa, who is also the chief of the Community



(Filephoto) Philippine reef landscape. Look but do not touch!

Environment and Natural Resources Office on Apo Island to look into the matter.

Fabre admitted that guides from the dive shops may also be held responsible for this particular violation, and that under the law, they are not supposed to act

as guides for scuba divers. He said this is not the first time his office has received a report of divers touching the corals in Apo Island. ■ SOURCE: VISAYAN DAILY STAR

Fake malaria drugs less common than previously reported

A rigorous analysis of antimalarial drug quality conducted in Cambodia and Tanzania found no evidence of fake medicines. Previous reports had suggested that up to one third of antimalarials could be fake.

Researchers from the London School of Hygiene & Tropical Medicine analysed 2,028 antimalarials from Tanzania and Cambodia. Samples were selected in a rigorous and representative way making this one of the most recent comprehensive data sets on antimalarial quality.

Drugs were analysed in three inde-

pendent laboratories in the UK and USA and classed as acceptable quality, falsified (fake drugs which do not contain the stated active pharmaceutical ingredient or API) or sub-standard (genuine medicines produced by authorised manufacturers which do not have the correct amount of API).[2]



JIM GATHANY / PUBLIC HEALTH LIBRARY / PUBLIC DOMAIN

No falsified drugs were found in either country. However, substandard drugs were found in 31% of samples in Cambodia and in 12% of samples in Tanzania.

But researchers warn that routine surveillance is crucial as poor quality medicines exist, leaving malaria patients at risk of dying and increasing the risk of drug resistance. ■ SOURCE: AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE

Lost luggage? Not likely.

Osaka's Kansai International Airport has not lost a bag since opening in 1994.

While visitors to Japan may experience plenty of lost-in-translation moments, their luggage is unlikely to go astray. Kansai International Airport has been voted the world's best for reuniting passengers with their luggage. Incredibly, not one incident of lost baggage has occurred since the airport opened in 1994.

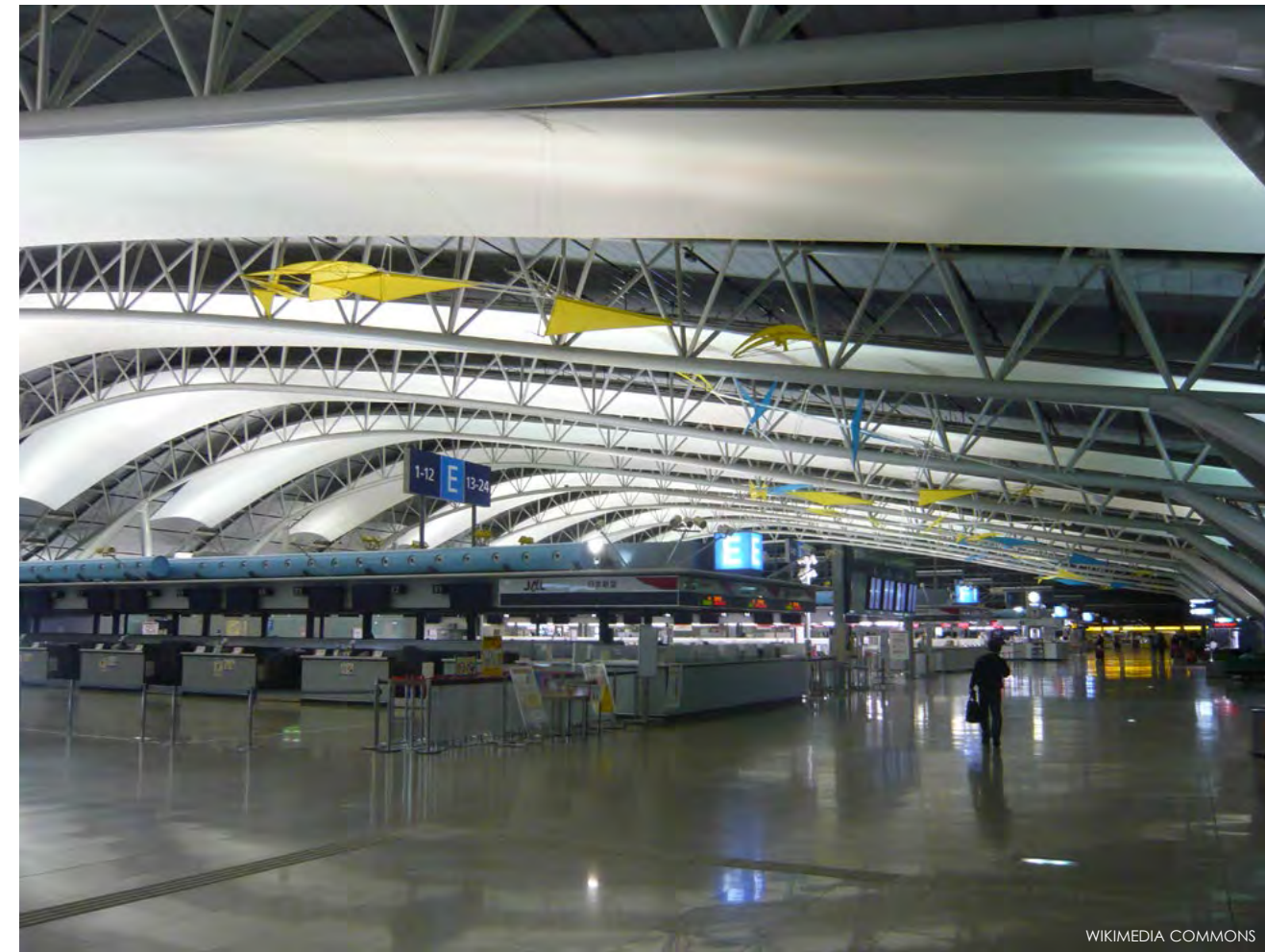
For its recent World Airport Awards 2015, a ranking of the world's top 10 airports for baggage handling was compiled by Skytrax, the UK-based airline and airport consultancy.

The study encompassed 550 airports in 112 nations worldwide, utilizing reviews

from 13 million users to decide rankings in 20 categories. Japanese airports fared extremely well, with Tokyo's Haneda International in sixth place and Narita International rounding out the top 10.

"The baggage delivery award is based around various criteria, the core emphasis integrating speed and efficiency of baggage delivery, staff support services, baggage hall information and so on," said Peter Miller, director of marketing for Skytrax. "Specific reasons for Japanese airport performance is somewhat intangible, but in most respects [is a result of] the more fastidious nature of staff and their disciplined approach towards ensuring maximum service efficiency," he added.

Asian airports took the top six spots for baggage handling, with Copenhagen in seventh, followed by Munich and Zurich. ■



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Kansai International Airport

Edited by
Peter Symes

Airlines in Thailand face global ban

New flights from Thailand may be banned after the country failed an aviation safety audit by the U.N. International Civil Aviation Organization (ICAO). In an alert issued in March of this year, the agency branded the Southeast Asian tourist hub a "significant safety concern", after failing 89 out of 100 points in the audit, according to analysts.

As a result of the country's failure to meet minimum standards of the Universal Safety Oversight Audit Program, South Korea and Japan stopped allowing new scheduled and charter flights from Thailand. However, the Thai government planned to sign an emergency deal with Japan to minimize the impact on travellers over the busy Easter holidays and Thai New Year celebrations. The Bangkok Post reported that the bilateral agreement would require that all planes from Thailand flying to Japan in April and May undergo safety checks upon landing.

Agencies in other countries are also requiring inspections including the Civil Aviation Safety Authority of Australia. It is very likely that the US Federal Aviation Authority will follow suit with its own audit, leading to American and EU bans of Thai flights, according to Credit Suisse analyst Timothy Ross. As it became clear what damaging ramifications the negative audit report has had on Thailand, mistakes were acknowledged by Thai Prime Minister Prayuth Chan-ocha, who told media: "We have to concede that we violated the rules and we must find ways to address the problems." He has promised to take immediate steps to rectify the failures plaguing the nation's aviation industry, so crucial to its tourism sector, which makes up 10 percent of Thailand's economy. ■ SOURCE: NIKKEI ASIAN REVIEW

Airline customer satisfaction in US ranked

Out of ten American airlines surveyed, JetBlue Airways took the top spot for customer satisfaction, with Southwest Airlines coming in second and Alaska Airlines in third. Who came in last? Spirit Airlines ranked lowest in the recent travel report from the American Customer Satisfaction Index (ACSI).

The rankings were based on responses from 7,768 airline, hotel and internet travel customers from January 19 to February 9. Survey questions covered such topics as seat comfort (which received the lowest scores) to on-time arrival, flight schedules, and boarding and baggage experience.

The low-cost airline replaced United Airlines, which moved up two places from last year. Spirit Airlines spokesperson Paul Berry said that while the carrier's bare fares are 40 percent lower than other airlines, first time customers might not be familiar with the airline's pricing structure—which adds fees for carry-on bags, water and printing of boarding passes at the airport—and may relate the low-cost with a lack of customer service. Berry said, "Once they fly us once and they get it, they love us; they know how to navigate the Spirit way of flying."

Overall, customer satisfaction with the airline industry rose almost three percent from last year. Even though passenger satisfaction hit its highest level since 1994, the airline industry only beat out three other industries including subscription television, health and insurance, and net service providers. ■ SOURCE: CNN

JetBlue ranks first in customer satisfaction in US

Airbnb adds Cuba

Americans can now choose from over 1,000 properties to book in Cuba through the San Francisco-based website. Airbnb said that the Caribbean island nation may very well develop into their largest market in

Latin American. "We are actually plugging into an existing culture of micro-enterprise in Cuba," said Kay Kuehne, Airbnb's regional director. "The hosts in Cuba have been [renting out rooms to travellers] for decades."

However, users of the site may find some disadvantages, such as the high margins taken by Airbnb on each transaction and delayed response from prospective hosts due to slow internet service in Cuba, according to travel media reports. In addition, visitors outside the United States are not able to book Cuban listings due to current licensing restrictions. On the up side, the Obama administration continues to urge Congress to move forward with measures to make travel to Cuba easier for US citizens. ■ SOURCE: BBC

FILE PHOTOS: OLGA TORREY



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Istanbul

— *Life Beneath the Bosphorus*

Text and photos by Ates Evirgen





Entrance of Golden Horn (Karakoy side) featuring Galata Tower built by the Genoese during the Byzantine period



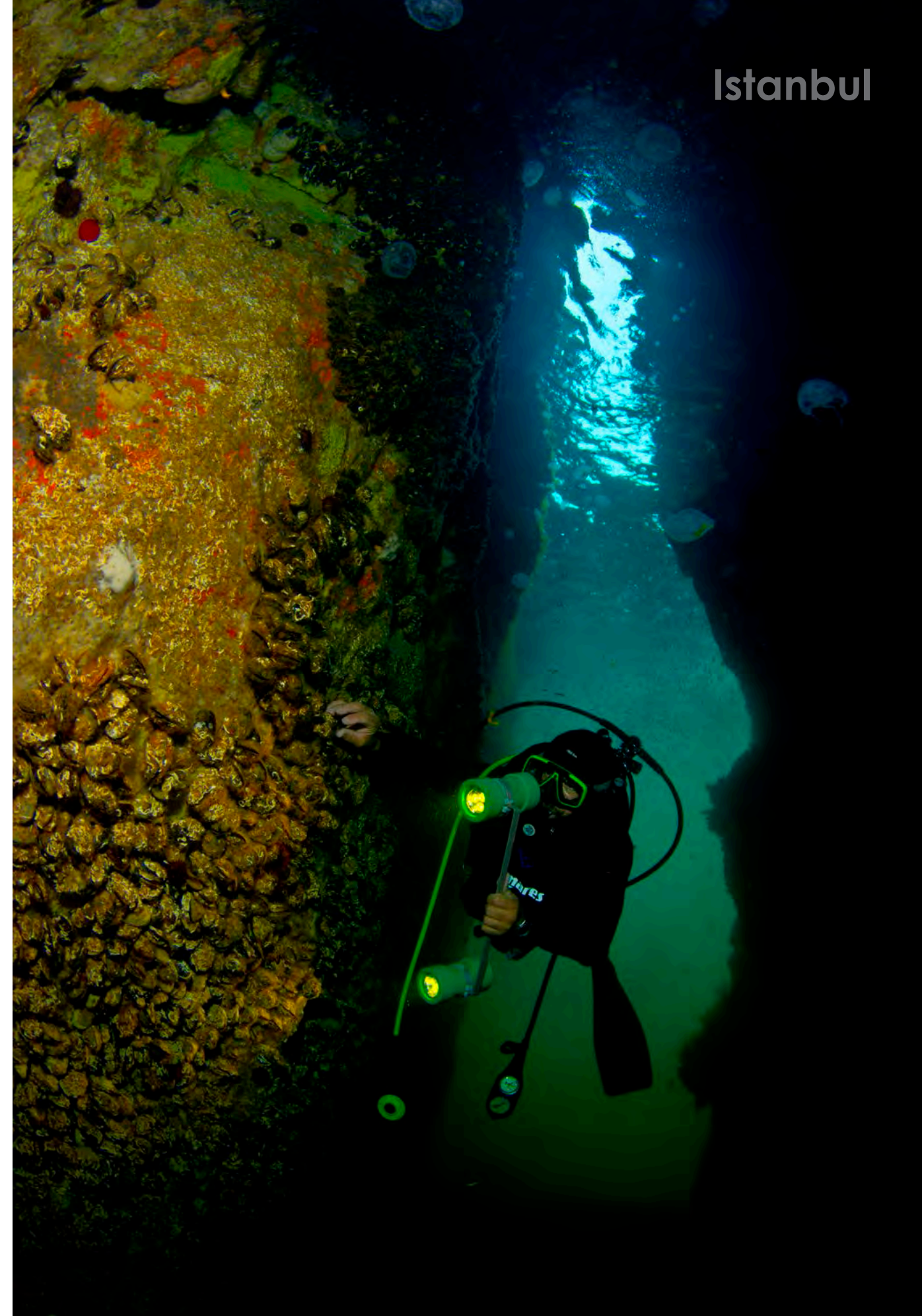
A seagull on the coast of Buyukada

Istanbul—a metropolis of over 15 million inhabitants—is one of the world's most populous cities, and thus, naturally, Turkey's largest and most important city, both economically and culturally. Indeed, Istanbul remains one of the oldest cities in the world. It was the capital of the Roman Empire between 330–395 AD, the Eastern Roman Empire between 395–1204 AD and between 1261–1453 AD, the Latin Empire between 1204–1261 AD, and finally the Ottoman Empire between 1453–1922 AD.

The city ceased to be the Turk's 'capital' with the foundation of the Republic of Turkey in 1923 by Kemal Ataturk. Yet, thanks to its rich heritage and ever-expanding population, it maintains and increases its importance with each passing day.

Istanbul has been given various names throughout the ages—names associated with different stages of the city's history. In historical order, these are: Byzantium, Augusta Antonina, Nova Roma, Constantinople, Konstantiniyye, Islambol and Istanbul. Intriguingly, this giant metropolis is also home to a significant natural habitat.

With many of its dwellers unaware of it, spectacular natural phenomena have been continuing for millions of years around this city. Millions living here do not realize that it is located on Europe's largest raptor migration route; thousands of



An underwater cavern beneath Buyukada. PREVIOUS PAGE: Diver on reef at Tavsan Island in Istanbul



IUCN red-listed
angular roughshark
(*Oxynatus centrina*)
Buyukada, Istanbul
(right)

birds pass through Istanbul's skyline twice a year. With this feature, Istanbul is located on the most important bird migration route in the world. Knowledge of this by the citizens of Istanbul might indeed be the last hope for Istanbul's gradually disappearing nature.



Bosphorus Strait

But the real migration is the one of "fishes" that has been occurring periodically for thousands of years through the Bosphorus Strait, connecting the Black Sea with the Sea of Marmara. In essence what gives Istanbul its true character is the strait of Bosphorus, which allows the city to rest on two continents. Indeed, this strait forms a boundary separat-

ing Asia from Europe and divides the city by name as Asian and European. It is a narrow and curved waterway approximately 30 kilometers in length; and a waterway that provides a passage for life in water.

In addition to being an ecosystem securing a delicate balance, the strait acts as an ecological tunnel regulating

the two-way passing of marine organisms between the Mediterranean and the Black Sea. However, few people recognize this aspect of the Bosphorus.

Indeed, fishes coming from the Mediterranean and the Aegean are forced to pass through this strait in order to be thoroughly lubricated in the waters of the Black Sea, rich with nutrients, to

Entrance of Bosphorus from Marmara side (left)

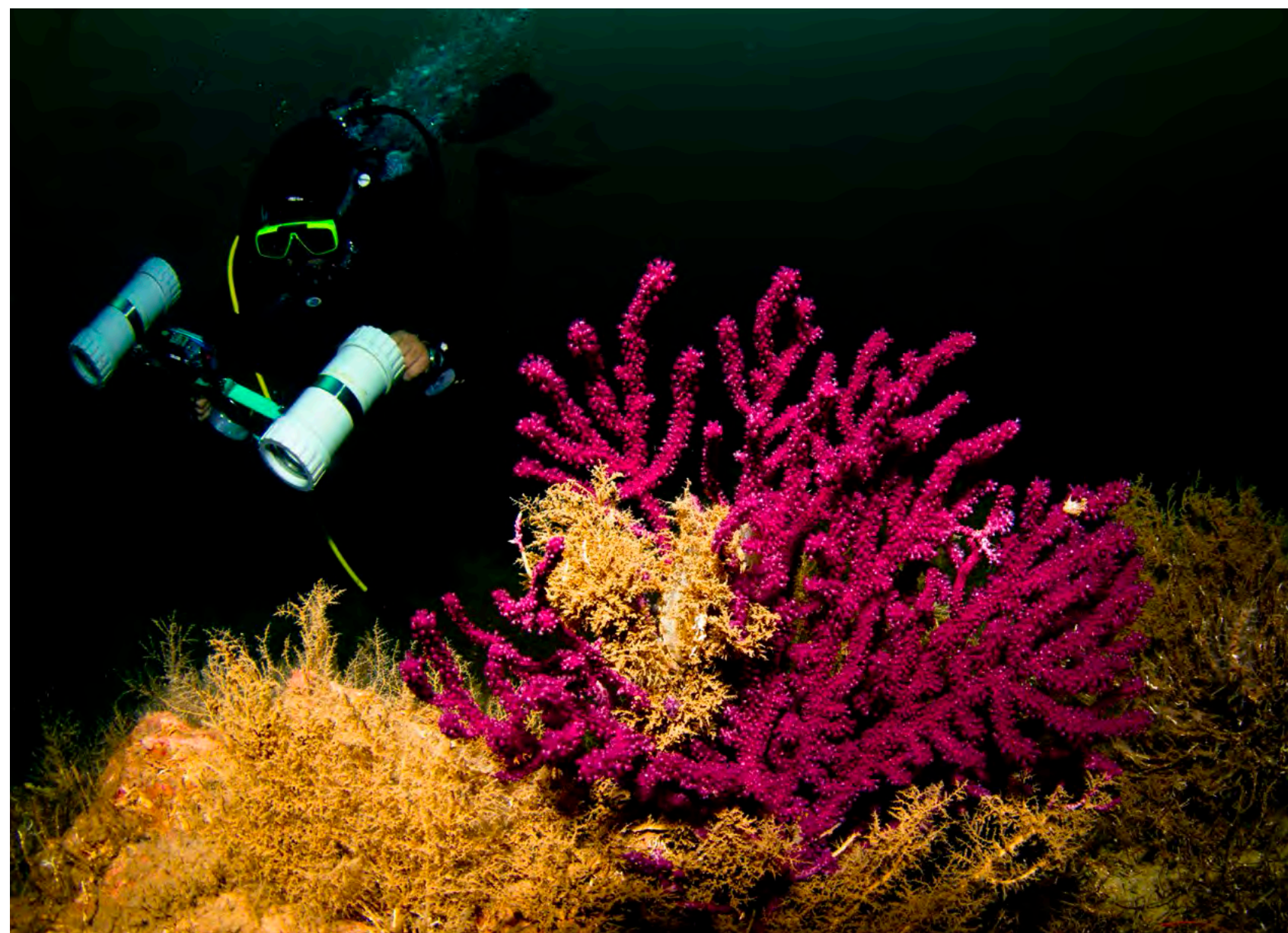


Common
lobster

later ovulate. This journey makes the Istanbul Straits one of the most dynamic regions of the world for fishing. Those migrating fishes, who first lay their eggs and then thoroughly become fed when the water cools down, begin to migrate back and pass through the straits in order to return to their homes.

Most famous of these fishes are the northern blue-

fin tuna (*Thunnus thynnus*), Atlantic bonito (*Sarda sarda*), blue fish (*Pomatomus saltator*), Atlantic mackerel (*Scomber scombrus*), chub mackerel (*Scomber japonicus*), and horse mackerel (*Trachurus trachurus*). Hence during this journey, starting from small to big, these fishes also become bait for others. During rich times of this migration in the past, it was also common



Diver with vioscent sea-whip (*Paramuricea clavata*) on reef

Istanbul



Polybius depurator crabs (above) and jellyfish (left), Yassiada, Prince's Islands

Back then, those great white sharks that got caught in fishing nets and lines were sold for money. But today, those old shoals don't pass through these straits anymore. Overfishing and pollution have reduced the fishes in these seas, whilst premature fishing has further prevented the arrival of larger fishes who eat them. In turn, this has caused the disappearance of large tuna which live off these fishes, and subsequently of the great white sharks who track them.

Scuba divers and underwater photographers cannot be expected to remain indifferent to this, a sea life that used to host such a habitat until recently. Having said that, due to strong currents and busy sea traffic, strait coasts are not only unsuitable for scuba diving but they are moreover dangerous.

for great white sharks (*Carcharodon carcharias*), the most dreadful and famous hunters of the seas, to enter the Sea of Marmara and progress to the Bosphorus Strait, in search of shoals they pursued.

Diving

Even so, the coasts of Istanbul at the exit of the strait are busy diving locations for scuba divers. One top location is "The Princes' Islands", close to the Anatolian side of Istanbul. These islands, also dubbed the "Istanbul Islands", consist of nine large and small islands and two rocks near their shore. Five of them—Büyükdada, Heybeliada, Burgazada, Kınalıada and Sedefadası—constitute a district of Istanbul and are still inhabited.

There is no continuous and regular settlement on the smaller islands of Sivriada, Yassiada, Kaşık Adası (Spoon Island) and Tavşan Adası (Rabbit Island). These small islands are the main dive spots for divers in Istanbul—especially Sivriada, Yassiada and Tavşan Adası, in terms of diversity, would easily compete with top dive locations in

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Diver with soft coral (*Alcyonium palmatum*) at Tavsan Island, Istanbul



Common starfish (*Asterias rubens*), Balıkcıadası, Prince's Islands (above). An exotic species first noted in 1995, transported to Istanbul shores by way of ships' ballast waters from the North Atlantic; Sea anemone, or *Sagartia elegans* (right)

the Mediterranean.

One cannot expect not to find remains of ancient civilizations in the seas of a city that served as capital for the Byzantine and Ottoman Empires. Indeed, it is very common to come across ruins during dives. A Byzantine shipwreck of archaeological value was discovered 60 to 70 feet deep underneath the southern side of Sedef Adası (Mother of Pearl Island). Therefore, Sedef Adası remains the only island closed for recreational diving out of them all.

Marine life

A large part of Turkish coasts (including the Aegean) reveals a Mediterranean character. Therefore, organisms which could be seen in a dive off southern European shores are quite similar to organisms found

in Turkey's southern coasts, in terms of water temperature, visibility and other characteristics. Yet the Sea of Marmara and the Black Sea show many differences from the Mediterranean Sea by way of structure, living organisms and other factors.

As an extension of the Mediterranean Sea, the Sea of Marmara shows significantly more similarities with the North Atlantic Seas. Due to the development of international sea transport and maritime traffic, most species that do not belong to these seas, carried by ships' ballast waters, show exotic diversity of life in the Marmara. Thus there is a palpable excitement of the many divers taking photos of various sea creatures at those Istanbul coasts.

Wild life on Istanbul shores displays a great variety. However, as a result



of population growth and human activity in those areas, adverse environmental conditions brought about by urban lifestyles and indus-



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Istanbul

Janolus cristatus nudibranch (above); Squid eggs laid on a branch (right) of a long gorgonia-type coral (*Spiniuricea klavereni*)

trial waste have been the primary causes in the decrease of fish species in those seas.

The Sea of Marmara, transferring water between its two connecting seas through the Bosphorus, has a two-layer water system. This is vital for species living in the sea. In these circumstances, while some sensitive species disappear due to pollution, some pollution-tolerant species even manage to increase with each passing day. These species are called "gastropoda" when formed from sea slugs and sea snails, and "bivalvia" when formed by mussels, clams and alike.

It is hard to come by fish species of high commercial value off Istanbul shores. There is not much of these species to be seen, bar a few benthic, or bottom-dwelling, species. Nevertheless, these shores

can be true "muck diving" zones. A wide variety of soft and solid coral species, crustaceans from different species, sea snails, sea slugs and jelly fish can be seen everywhere. In fact, the soft coral species living in benthic style, sea urchins, anemones, crustaceans and many more demersal fishes present a golden opportunity for underwater photographers eager to take closeup and macro pictures.

Conditions and visibility

Being a city of such a large population, the number of divers in Istanbul is naturally high as well. It is crucial for these divers to be able to make daily dives and take high quality photos from their backwaters, without being separated from their homes for long.

One of the challenges facing



divers exploring Istanbul's waters is the fluctuation in seawater temperature between summer and winter. Especially in winter, water





CLOCKWISE FROM LEFT: Historic "Maiden's Tower" near entrance of Bosphorus, from Marmara side; An albino specimen of a very common sea urchin (*Paracentrotus lividus*)—this is the only known photo of this albino member; Soft coral at 30m, Tavsan Island; Red gorgonia (*Paramuricea clavata*) at 33m, Sivri Island; Colony of Mediterranean feather star gathered on top of rock (*Antedon mediterranea*)



Istanbul

temperature falls to 6°C in parallel with the Black Sea and rises to 25°C in summer. However, the temperature at the bottom water layer remains constant at 14°C throughout the summer and winter. At the junction of these different layers of water temperatures, a thermocline layer is formed. The boundary of this layer can be anywhere between 10 to 25 meters, depending on the temperature and the water.

This fluctuation in seasonal water temperatures at the Sea of Marmara affects very much the visibility as well. Alongside the cooling pace of the water, visibility in water increases even more and this enables divers to make wide-angle photographs in Istanbul's seas. This situation continues for the whole winter. However,



with the arrival of the spring months when seawaters begin to warm, visibility from up to 10-15 meters from the surface falls to 2-3 meters due to rising plankton levels. During this period, only close-up and macro shootings are feasible. At the same time, within recreational dive limits, due to the warming of the upper layer, the variety of species and populations of organisms increase.

In short, at the shores just outside of the Bosphorus, which witness one of the largest seasonal fish migrations known on earth, the nature of diving can vary significantly throughout the year. In winter, it can be very difficult to dive without a dry suit. In summer, one can easily dive with standard equipment to take underwater photos. The proximity of dive sites to the city also provides a great opportunity for urban divers

and underwater photographers who want to escape the challenges of urban life and reach dive sites less than two hours after leaving their homes. This in turn renders the health of Istanbul's seas and underwater ecosystems all the more important to scuba divers. ■



Based in Istanbul, Turkey, Ates Evirgen is a widely published and exhibited underwater photographer, instructor and author of the underwater photography books, *Fotograflarla Türkiye Deniz Balıkları* and *Shooting Photos Underwater*. For more information, visit the author on Facebook at: [Facebook.com/atesevirgenphotography](https://www.facebook.com/atesevirgenphotography)



Finger-shaped sea pen (*Veretillum cynomorium*)—a very common soft coral in Istanbul waters at 20m depth



The Sea Lions *of Los Islotes*

Text and photos by Gregory Lecoer



Young sea lion, driven by its own exuberant curiosity, observes the divers before joining the game; Malleable and graceful sea lion (left and previous page)

Underwater photographer Gregory Lecoer journeys to Los Islotes off the coast of Baha, Mexico, in the Sea of Cortez, which is home to a colony of California sea lions.

In between the Pacific Ocean and the Sea of Cortez [ed.—also known as the Gulf of California], the Mexican peninsula of Baja California takes shape. Located at the mouth of the Sea of Cortez, its capital, the quiet town of La Paz, offers a vast biodiversity and exceptional landscapes. Nicknamed by Jacques

Yves Cousteau as “the world’s biggest aquarium”, the Sea of Cortez is conducive to many exceptional encounters depending on the season: hammerhead sharks, whale sharks, giant manta rays, mobula rays, sea turtles, dolphins, California sea lions, as well as many marine mammals such as blue fin whales, hump-back whales, gray whales and even killer whales.

Ranked by UNESCO as a Biosphere and World Heritage Site for its biodiversity and unique natural landscapes, Espiritu Santo’s Island is just a few nautical miles from La Paz. It is well known for its colony of California sea lions living at a neighboring island further north called



Young sea lions are always playing with divers or socializing with other pinnipeds





Sea Lions



On the way to Los Islotes, keep your eyes peeled, as the trip is full of marine life and behavior to watch, such as the flying mobula rays pictured breaching above and left

rants, blue-footed boobies and pelicans chasing the boat. Still, the most exciting part remained, as we watched mobula rays flying above the surface, greeting us with a few leaps!

Approaching

Los Islotes.

To get there, it is a 45-minute trip on a “panga” [ed.—a small fishing boat with an upswept bow and outboard motor commonly used by the locals]. The journey was surprisingly short as there were so many things to see: an escort of dolphins, breaching whales, turtles taking a breath at the surface, frigate birds, cormo-

Los Islotes, we on the boat were amazed at the skill of navigation required, when a strong odor and noise attracted our attention. No doubt, we had arrived! A colony of no less than 300 pinnipeds could not be but unnoticed. Many basked in the sun, while others socialized. As for the males, they barked in order to assert their territory and protect their harem.

Accustomed to seeing tourists disembark, adult sea lions paid no attention to our boat, unlike the little ones, full of curiosity. They circled around the small panga, tied at the mooring. It was time to attend the pre-dive briefing and safety rules before putting on our equipment and submerging into the blue.

Diving with sea lions

Once in the turquoise water, a quick round of observation was required to get oriented. Very curious and mischievous, the young sea lions were like puppies. They started swimming around us. Then they quickly became friendly to us divers and showed a keen interest in our equipment. Once confident, they nibbled our palms, tried to grab the straps of our masks,



When they are not underwater, sea lions sun themselves to dry, thermoregulating their bodies; Coral reef of Los Islotes (top)



Sea Lions



LEFT TO RIGHT: Very friendly sea lion, maybe too friendly; Freediving is a good way to interact with sea lions; Fins are one of the favourite chew toys of the sea lions; Young sea lion playing with a porcupinefish like a toy

played with the elasticity of our neoprene suits or softly chewed the tips of our fingers.

Although they might appear clumsy on land, sea lions are great swimmers and amazing acrobats. Extremely sharp and agile, it is not rare to have the privilege of attending a graceful ballet between several youngsters playing in shoals of thousands of



anchovies, or see them having fun with everything that arouses their curiosity—like the poor porcupinefish (pictured

above) which had a hard time escaping. Although the sea lion delicately and carefully handled this fish with poisonous spines, it became the object of a game like a dog would play

with a ball.

All around the tiny island, diving was captivating. Guided by the sea lions,

we moved along the coral reefs and drop-offs overflowing with life. It was not uncommon to see a few cormorants diving into the sea, chasing anchovies several meters deep.

Precautions

Although pleasantly surprised by this natural bond between the sea lions and divers, we must not forget that they are wild animals in a wild environment. Keep in mind that a bite can inflict enormous damage on humans,



Agility, speed and somersaults—sea lions move like acrobats underwater (left); Rocks of Los Islotes (top left); Sea lions and sea birds at sunset over the Sea of Cortez.

and the risk is even more critical during periods of reproduction, when adult males are very territorial and aggressive.

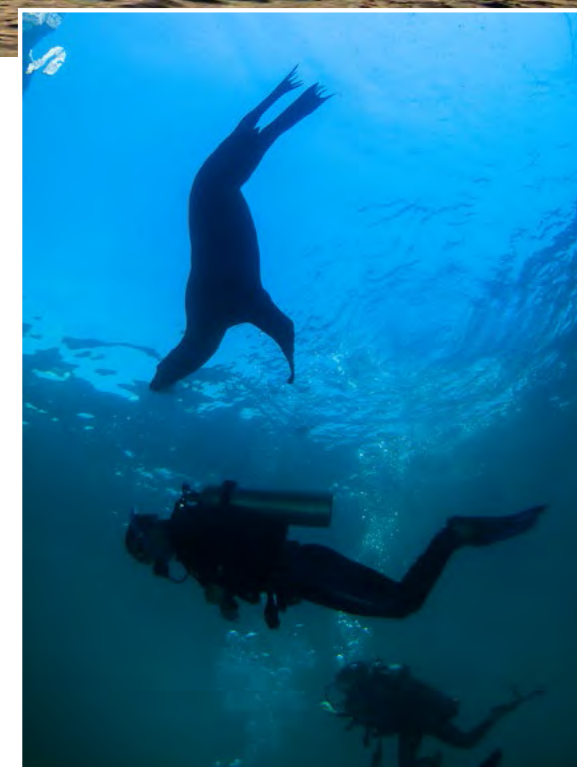
Therefore, it is essential to follow the safety rules and codes of conduct in order to have the correct behavior. For this, it is essential to have an expert guide, able to properly supervise the divers. In addition to the safety instructions for diving and snorkeling, here are some important rules to respect while interacting with sea lions:

- Do not climb on the rocks. You will cause stress to the animals who might show aggressive behavior in return, and you will be seen as an intruder, especially during the breeding season (which occurs in the month of May). During this time, there is an inherent risk of being attacked by a “macho” male sea lion, filled with adrenaline.

- Stay away from the rocks and try to arouse the curiosity of females and young sea lions as they swim around you, leaving territorial macho male sea lions at a good distance.

- Sea lions are wild animals, so it is not permitted to touch them, feed them or behave disrespectfully. (Imagine you are walking down the street and a group of strangers start to tamper with you!)

The dive site is ideally suited for beginners and experienced divers but also for non-divers. It is strongly recommended that videographers and photographers recharge their camera and strobe batteries completely before heading out, as there are so many things to do and see throughout the day. This is also a great site to practice apnea, or freediving, with the marine life. ■



Curious sea lion observes divers underwater

Gregory Lecoeur is a widely published, award-winning underwater photographer and dive writer based in France. For more information, visit: www.greglecoeur.com.



Scuba Confidential

Running Out Fast!

Text by Simon Pridmore
Photos by Pierre Constant

Ben is a scuba diving instructor: this is his story.

It was the first dive of the day. I rolled backwards into the ocean from our little tender boat, descended to 24m, swam over to Cannibal Rock and began a gentle exploration from the bottom up. Even at this hour of the morning, the colours were glorious; there were battalions of fish and the huge rock was visible in all its splendour in clear 27°C water.

Fifteen minutes into the dive, at around 18m, I simultaneously felt and heard a massive explosion, then the pressure wave battered me from above. My first (illogical) thought was that I had been fish-bombed. After all, we were in remote Southeast Asia and it had happened to me before, but we were in the Komodo National Marine Park where such activities are thankfully now very rare. It was only when the thunderous noise did not stop that it occurred to me that this was no bomb. I concluded (correctly this time) that a catastrophic air supply failure must have just taken place somewhere

behind my head.

The next few thoughts, actions and decisions came fast, much faster than I can write them down now (maybe even faster than you are reading them!). I looked at my pressure gauge, which was down to 100 bar and falling fast. I could actually see the needle moving.

My first thought was to head up as I was not in deco, still had some air left and was not too far away from the surface. There was little risk if I kept calm, but I knew there were safer options. I considered slipping my BCD off and bringing it round to the front so I could find out what had actually happened and see if I could deal with it myself. But this would consume valuable seconds and the problem might turn out to be something like a blown cylinder valve O-ring that I could not do anything about.

I decided that an air-sharing ascent would be the most relaxed and safest option, and so I started looking for help. The other divers in my group were not too far away. So I swam towards them. The first person I came across was Martin, but he was burdened by a monster video system, and I remembered that his octopus was an inflator

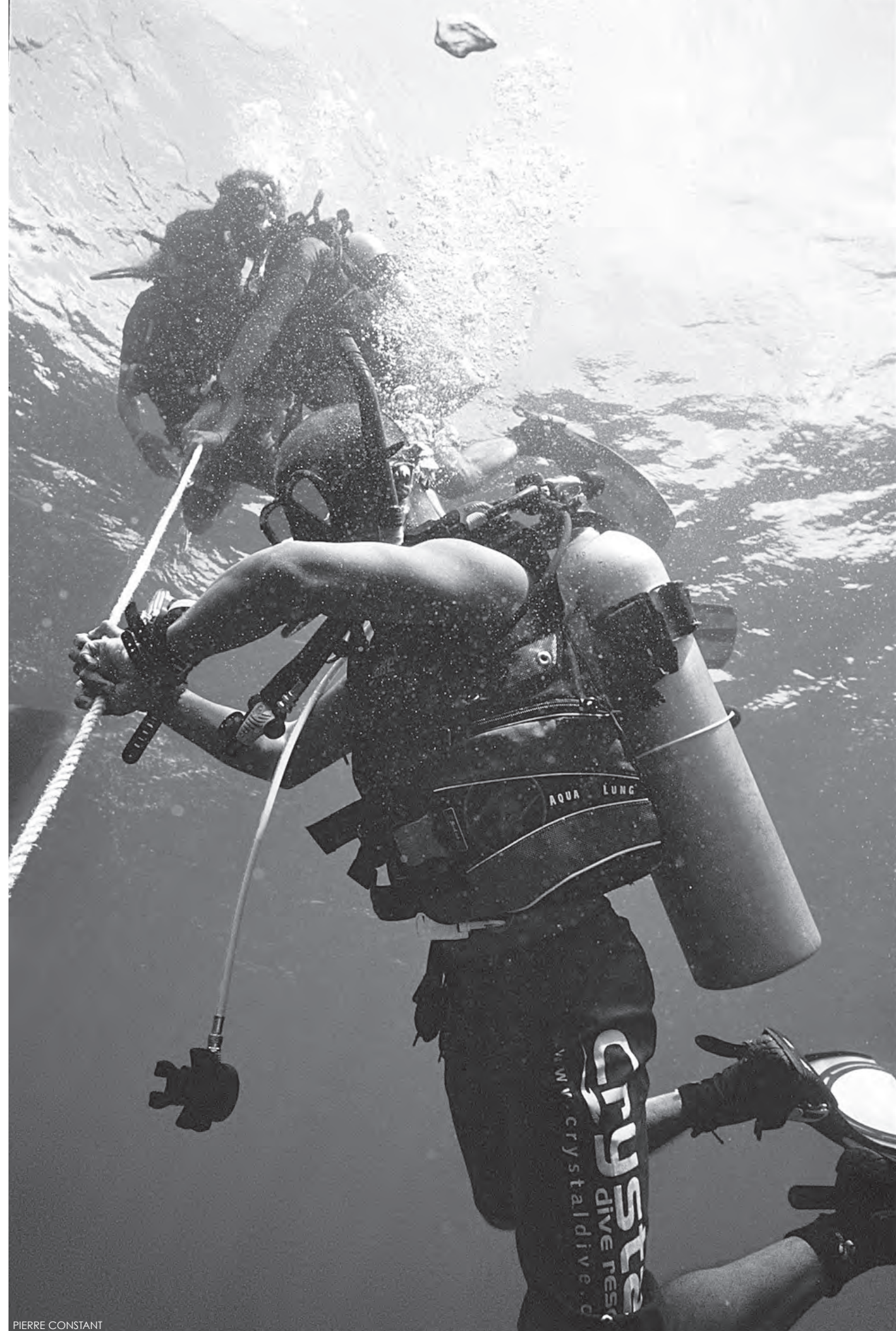
hose regulator—no use going to him. Behind Martin was Kate, but she was also carrying a big camera and was head-down, legs in the air, no doubt photographing something tiny camouflaged in something spiny as usual. So, not her either.

Then I saw my girlfriend, Amy, an experienced diver armed with an octopus regulator on a 1.5m hose; and best of all, she was someone whom I was pretty sure liked me—the perfect choice. So I politely asked if I might share air with her. She generously acquiesced, so we ascended comfortably together, and I survived to tell the tale.

What had gone wrong?

When Ben surfaced, all he could find was a small cut in the valve face O-ring. It had probably been showing signs of damage for a while, allowing a little high-pressure air to bubble pass it gently, but neither he nor anyone else had thought to change it. And then it just gave way and burst.

This does not happen frequently, but for a diver to experience it once is already one time too many. If it happens when you are deep, when you are carrying a single cylinder with a



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single valve and when you are far away from other divers, your only option is to ascend directly to the surface, as slowly as you can before the air runs out completely.

How long have you got?

As Ben's experience suggests, a catastrophic air supply failure can empty your cylinder in a very short time. Part of this time will be spent figuring out what has happened, weighing up the possibilities and deciding what course of action to take. At depth, these processes will be delayed by narcosis.

In 2012, the folk at Advanced Diver magazine in the USA ran a few scenarios using a standard set of equipment on a full 12-litre cylinder placed at a depth of 30m. They found that a burst high-pressure hose caused the cylinder to empty in 22 minutes. No problem there—plenty of time to surface safely.

However, they also found that a burst low-pressure hose or a blown burst disc on the cylinder valve emptied the cylinder in under 90 seconds! An uncontrolled free-flowing regulator did not take much longer, causing

the cylinder pressure to plummet from 200 bar to zero in just 154 seconds.

Even at 18m, Ben probably would not have had time to reach the surface at a safe ascent rate before his air ran out.

What can you do?

1. Replace all O-rings as soon as you notice bubbles, and replace hoses as soon as you notice significant wear. This is something that technical divers, and particularly rebreather divers, are trained to do but the mainstream sport diving community is notoriously lax. It is not uncommon to see a group of divers patrolling the reef with bubbles spewing out from everywhere: tank valves, high pressure hoses, octopus second stages, even BCD dump valves.

2. For deep dives, even if no decompression stops are planned, consider genuine alternate air source options, such as a pony cylinder, a dual outlet valve, double cylinders or even a Spare Air.

3. Practise rescue scenarios with your regular dive partner(s)

and make sure you and they, like Ben's girlfriend, are properly equipped with a long regulator hose to allow a comfortable, safe ascent.

4. If you regularly dive alone on a single cylinder, practise self-rescue scenarios. One course of action Ben could have taken during the incident was to slip off his BCD, bring it around in front of him and turn off the cylinder valve. Then, as he ascended holding his equipment, he could open the valve slightly to take each breath, then turn it off to conserve air while he exhaled. However, this is a difficult skill. It needs to be practised several times with a dive buddy close at hand—be sure to completely master this before you even think about doing this in an emergency. ■

Simon Pridmore has been part of the scuba diving scene in Asia, Europe and the United States (well, Guam) for the past 20 years or so. His latest book, Scuba Confidential, is available in paperback, audiobook and e-book on Amazon.

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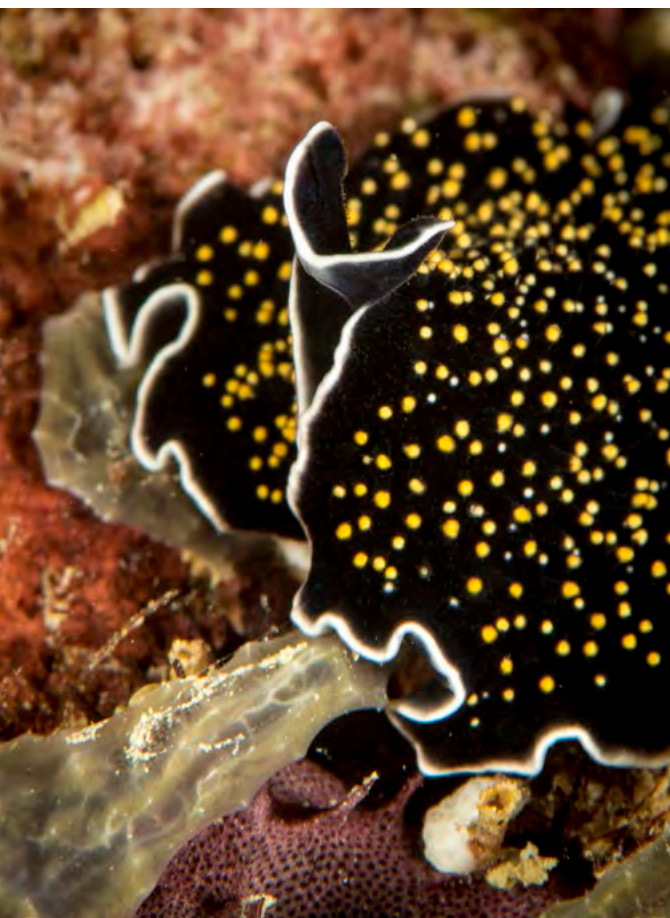
Yap

Micronesia's Best Kept Secret

Text and photos by
Brandi Mueller



Micronesia has so many great islands to dive that it's hard to pick just one. Often, some of the lesser known islands, such as Yap, get passed over for their more popular neighbors such as Truk (Chuuk) or Palau. I had always heard great things about Yap's diving though stories of mantas and sharks, so I headed there to find out if it was indeed one of Micronesia's best kept secrets.



I discovered some truth in that as soon as I arrived. It's not often you show up at a dive resort and find you are the only person there. My flight had arrived from Guam in the middle of the night and I had only diving on my mind, with the intent of a few hours of sleep and then get up for diving. But immediately, I was introduced to Yap's own prescription

of island time. "Sleep in," they told me. "We'll go diving whenever you wake up."

I found out pretty quickly that it was quite nice to have one's own resort.

After sleeping in for as long as my dive-giddy body would let me, I wandered down to the restaurant for breakfast. While eating French toast and looking out over Yap's lagoon, my dive guide

came down and asked when I'd like to dive. We decided that we'd go out to see the famed Yap Manta Dive after lunch, followed by a twilight mandarin-fish dive in hopes of seeing them mate. The idea sounded perfect to me and we didn't even have to ask anyone else. After leisurely getting my gear together, I wandered down to the dive shop and

then had a short stroll around Colonia, the main town of Yap. After lunch, we headed out to the manta dive via Tagreng Channel (formerly German Channel), a man-made channel created when Yap was a German colony to get from Colonia to the ocean faster. Yap has a large barrier reef [ed. – a reef that is separated from an island by

THIS PAGE: A manta at the manta cleaning station

Yap



drift over the top of a shallow coral head, allowing wrasses and other fish to eat the parasites off their bodies.

There was to be no touching of the mantas and divers were not allowed on the top of the coral head, but just around the sides of it (The top was only for the mantas). It was best not to swim on top of the coral head anyway, as it would scare the mantas away.

I promised to be still and not swim over the top of the coral head, and so we backrolled into the water for



a surrounding deep channel of water¹]. All the water inside Yap's barrier reef is called the lagoon.

The Tagreng Channel was beautiful, sometimes very narrow and shallow through the mangrove forest that was slowly being overgrown by the trees. The channel was best transversed during high tide, otherwise some pushing of the boat would be required. Luckily, it was high tide, so my captain zipped through it like an amusement park ride through a narrow tunnel of green mangroves.

Diving with mantas

Arriving at the dive site, I was briefed on the rules of the manta dive. The mantas had been coming to this site to be cleaned for many years. They would slowly

my first dive in Yap. Visibility was a little milky but we hadn't even gotten to the coral head when a manta swam right past us. I think it was racing to get there before us.



Manta identification chart

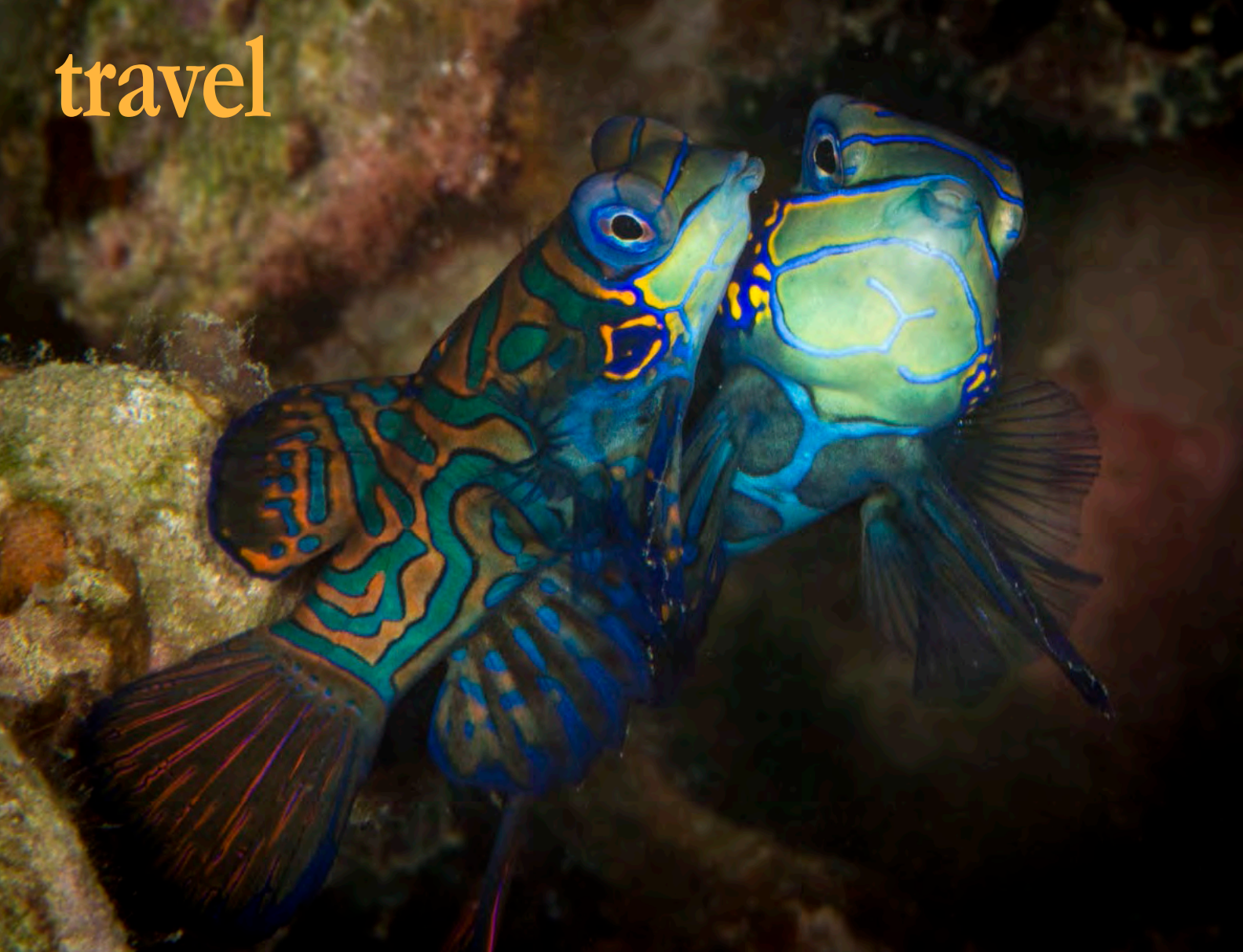
After a short swim, we were at the coral head and my dive guide pointed out a spot for me to stay, with a rocky outcrop to hold onto if needed, in about five meters of water. I wedged myself into place among the rocks (where there was no coral) and waited.

As soon as I was settled in, a manta, as if on command, drifted over

the top of the coral head. It paused for the fish to swim up to it; soon, the wrasses began swimming in and out of its mouth, on its underside and around its tail. The manta seemed to relax, as if it was getting a massage, and kept slowly drifting towards me, closer... closer... till suddenly, the manta and all its spa fishes were directly over me.

I ducked, so it wouldn't hit me, but it seemed to ignore me completely and passed by. Once on the outside of the coral head, the manta appeared to awake from its trance and circled the

¹ Wikipedia.org



Mating mandarin fish (left); A female mandarin fish (lower right and lower left); Mandarinfish do not have scales like most fish, but rather sport slimy skin with a pungent smell which is thought to ward off predators

Mandarinfish at Rainbow Reef

I was in manta heaven and grinning from ear to ear as we headed back through Tagreng Channel to a dive site called Rainbow Reef. Just outside of town, this was the mandarinfish dive. Close to a small island, the dive site was shallow, about 18 meters at the bottom, and it had lots of antler coral where the mandarinfish lived in. We stayed above six meters and my dive guide called me over and pointed into the coral. At first, I didn't see anything, and then a flash of blue, red and yellow flitted past. Staring harder into the coral, I saw another flash of color. Then, the tiny mandarinfish, about two inches long, slowed down and looked out at me from behind a coral branch.

The mandarinfish was named after the colorful robes ancient Chinese Mandarins would wear. Their tiny bodies are blue and green, with yellow and red wavy patterns. Mandarinfish are also unique because they do not have scales like most fish, but instead have slimy skin with a pungent smell thought to prevent predators from eating them. Their bright coloring was also a warning sign for predators that they did not taste very good.

As the light started to fade, the real show began. My dive guide pointed out a pair of mandarins. A large male was chasing a smaller female. As the light had almost disappeared, I turned on my red focus light to keep them in sight,

Calling all underwater photographers! Join contributor Brandi Mueller—festival headliner—for the first ever underwater photo festival in Roatán. Click the ad and register now!



as the two fish went cheek-to-cheek and swam up out of the coral head.

This was the mating ritual of the mandarins. Each night, they paired up and, for a brief second, rose up out of the coral next to one another to mate, releasing

eggs and sperm, which fertilize and fall back onto the reef.

It was dark when we climbed back onto the boat and headed in for dinner. I couldn't have been

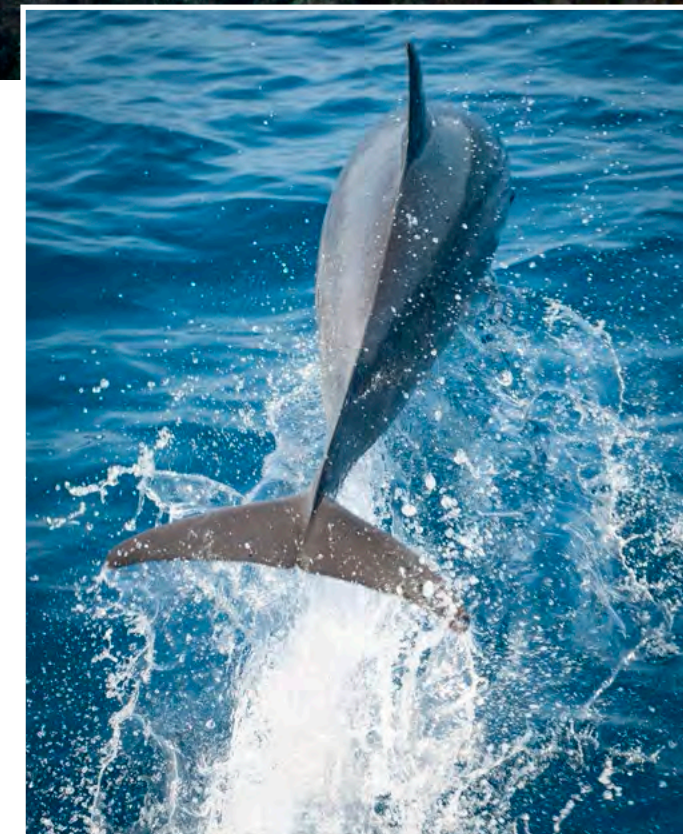


outside of the coral head, returning to its original location to do it all over again.

This continued until my air was low. Two other mantas had also come to visit the spa several times, but the first one I saw was still there even when I left. My dive guide told me that winter was the best time to visit because the mantas were also mating. Sometimes more than ten mantas showed up at one time, chasing one another and trying to mate as well as being cleaned. This was October and he told me the mantas showed up most days, but usually not for entire dives like this one, so I was lucky to see them for so long, so close.



CLOCKWISE FROM LEFT: Two pipefish on a reef; A diver explores the swim-through at Canyons, a dive site on the southern tip of Yap; A spinner dolphin plays at the bow of our boat; A green sea turtle with a small bite in its shell sits in the rocks at Vertigo, a popular shark feeding site



until the seas calmed. On my second day, we went back to the manta cleaning station for another great dive and then to a sunken fishing boat with plenty of macro action, which included nudibranchs, flatworms and pipefish.

On the first day, the weather allowed us

happier, having had such an amazing manta encounter AND seen mating mandarin fish, and it was only my first day of diving!

Diverse marine life

Due to rough sea conditions caused by a typhoon that had recently passed nearby, it was too rough to leave the lagoon

to go out of the lagoon, so we went to the most southern point of the island to a popular dive called Yap Canyons. There was still a bit of a swell and some current but the water was crystal clear and there were fish everywhere. Colorful coral and sponge-encrusted canyon walls granted us entrance into swim-throughs, and there was a massive wall that dropped

off into the deep blue abyss.

Turtles and sharks swam past us with ease as we fought to make our way in the current. As we swam along the rocky canyon walls, they seemed almost to sparkle with hundreds of pink and purple anthias moving about.

During the surface interval, we continued around the southern part of the island and the crew fished out a floating coconut. I wasn't really sure what they were going to do with it. The captain took out a large knife and, holding the coconut in his palm, proceeded to whack it with the back of the knife while moving it through his fingers. The knife made enough of a crack in a perfect circle around the coconut so he was able to stick the knife into the crack and open it, providing us with fresh coconut water to drink. He then cut out strips of the meat to eat from the inside.

It was still quite rough outside of the lagoon, so we headed back to the manta dive site (I just couldn't get

enough of it). The location was also a research site for Manta Trust, a research organization studying mantas worldwide. Each individual manta has a unique pattern on its underside of white and black spots. Divers can send in photos to help ID individuals, and Manta Trust collects the data to do population studies on when and how often each manta shows up at the cleaning station.

The next day, we went back outside the lagoon to Vertigo, a shark feeding site. Conditioned to the sound of the boat, sharks were all around us before we even jumped in. Visibility at Vertigo was perfect. Grey reef sharks, black tips and white tips all crowded around us and the bucket of fish chum.

After watching the sharks for a while,

My dive guide had his eye on another pair and motioned me over. I watched the male follow the female and how she would let him chase her, but slowly, and she seemed to keep looking back to make sure he was keeping up. It was like a mandarin fish soap opera down there!

Just as the light started to completely disappear, the two were getting closer and closer to each other and suddenly they both ascended above the coral head, cheek-to-cheek. I snapped away, hoping to get something. But as soon as it started, they both disappeared back into the coral head.

Topside attractions

On my last day, I toured the island's cultural points with my dive guide. Yap is known for its use of stone money. Made of limestone, large and small disks with holes in them were used as currency. What makes them even more special is that limestone is not found in



Two male mandarin fish showing off for a female

I decided to leave the feeding area and head down the steep wall. Healthy coral and anemones dotted the wall and I found a lone turtle sitting in the coral. On closer inspection, the poor thing had a small bite (from the sharks?) on his shell.

On my last dive, we went back to Rainbow Reef to try and get a few more photos of mandarin fish mating. Learning from my previous dives, I felt the best way to see the mating was to find a female and follow her, no matter what. So, just after descending, I found one and watched her dart around in one coral head for quite a while, eating small crustaceans. A male showed up and chased her into another coral head.

Another male also showed up and the two males had a bit of a face-off, with both competing for which one looked prettier. In turn, each male would puff up his body and stick his long, pointed dorsal fin straight up. While the males fought, the female fled back to her original coral head and then, lost in the distraction of the males, I lost her (as did her suitors).



A manta at the manta cleaning station



Yap. The Yapese would sail 450km (280 miles) to Palau to quarry limestone and make the stone disks.

Once arriving in Yap, the stone money usually wasn't moved. Ownership may change, but large "banks" were created where the stones would be put on display (and some still are on display). The largest is almost four meters wide and smaller stones can be just a few centimeters.

The worth of the stone is also interesting as it is not solely based on size. It includes how it was carved and the difficulty of how it got to Yap. If a father sailed to Palau and lost his life on the journey in a quest for the stone, the stone was then also worth the father's life. If the son sailed after his father for the same stone and died, his life too becomes part of the stone's worth.

My guide also took me around to several WWII airplane wrecks on land, several of which required

some short hikes into the jungle. My favorite was one with some sort of Japanese radio wreckage where one could still see the kanji characters on the knobs.

After my tour, I relaxed with a local brew called Manta Gold from the Stone Money Brewery and got ready for my flight home. Contemplating my trip, I was really glad I hadn't passed over Yap. With mantas, sharks, culture, and so much more, the island of Yap is truly beautiful and I look forward to returning. ■

Brandi Mueller is a PADI IDC Staff Instructor and U.S. Coast Guard Captain living in the Marshall Islands. When she's not teach-



ing scuba or driving boats, she's most happy traveling and being underwater with a camera. For more information, visit: Brandiunderwater.com.



Yap

CLOCKWISE FROM FAR LEFT: Rush hour in German Channel; Wreck of a fishing boat near Colonia; On the pathway of a stone money bank, several pieces of stone money line the walkway; School kids learn how to sail a traditional canoe





fact file

Yap, Micronesia



SOURCES: U.S. CIA WORLD FACTBOOK, XE.COM, VISIT-FSM.ORG, EN.WIKIPEDIA.ORG/WIKI/YAP

History Yap has an interesting history as the main islands of Yap are thought to be settled by the ancient Malay but some of the outer islands were settled by Polynesians. Yap was colonized by the Spanish from the 17th century until then sold to Germany in 1899. The Japanese occupied Yap in 1914 which continued through the end of WWII when the USA assumed occupation. The Federated States of Micronesia (FSM) was formed in

1979 including Pohnpei, Kosrae, Yap, and Chuuk (Truk). Currently the FSM is independent under a Compact of Free Association with the United States. Government: Constitutional government in free association with the United States. Capital: Palikir

Geography The Yap islands are part of the Caroline Islands in the northwestern Pacific. The main islands of Yap consist of four major islands, three of which are connected and there are fourteen outer islands. Total coastline of Micronesia: 6,112km

Climate Equatorial tropics with average temperatures of 75-86°F (23-30°C) year round. Heavy rainfall year round with summer and fall being the wettest. Little typhoon risk. Water temperatures are warm with 82-84°F (27-28°C).

Environment Overfishing, climate change and pollution pose challenges.

Economy The economy of the FSM

relies heavily on fishing and subsistence farming. High-grade phosphate is the only mineral deposit worth exploiting. The



tourist industry has potential but is hampered by the remote location and a lack of sufficient facilities, as well as limited air connections. Between 1986 and 2001 the United States provided \$1.3 billion in grant aid under the original terms of the Compact of Free Association. The amount of aid has since been reduced, but the Amended Compact of Free Association with the United States guarantees significant annual aid through 2023, wherein a Trust Fund has been established with annual contributions by the

United States and the FSM to in effect provide payouts in perpetuity to the FSM after 2023. Despite this move, the medium-term economic outlook looks fragile due to current slow growth of the private sector.

Population Yap 11,000; Micronesia 105,681 (July 2014 est.) The FSM has several ethnic groups: Chuukese/Mortlockese 49.3%, Pohnpeian 29.8%, Kosraean 6.3%, Yapese 5.7%, Yap outer islanders 5.1%, Polynesian 1.6%, Asian 1.4%, other ethnic groups

Language Yapese, English

Health In the FSM, there is no risk for rabies or malaria, but occasional risk for dengue. FSM is very close to the equator, so be aware of heat and sunburn. Local hospitals are on each island but have very few resources. Yap State Hospital in Yap's capital, Colonia, can take care of normal needs, although it is suggested visitors bring required prescription medication with them. Major illnesses should be flown to Guam (~3 hours) or Honolulu (~7 hours).

Security Yap's capital, Colonia, is mostly safe, but keep an eye out after dark.

Decompression chamber Yap State Hospital has a recompression chamber.

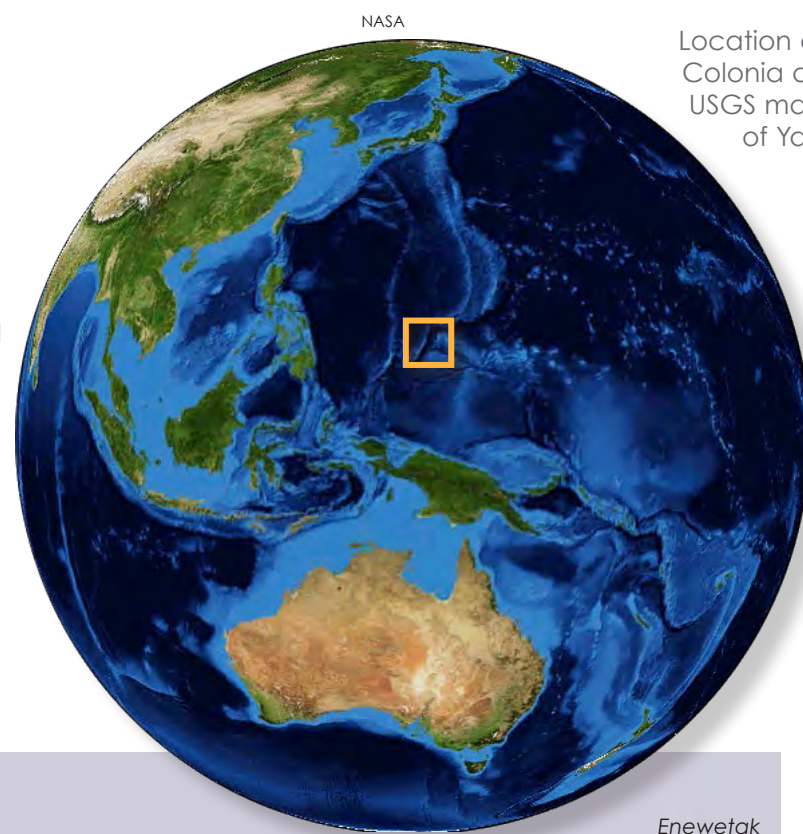
Dive season Year round. Manta mating season is December through April when the mantas are most common and in large groups.

Getting there United Airlines services Yap with routing through Guam and Palau.

Entry/Exit \$20 U.S. cash departure tax collected at airport prior to departure.

Web sites Tourism Micronesia www.visit-fsm.org

RIGHT: Global map with location of Yap
BELOW: Location of Yap on map of Micronesia



Location of Colonia on USGS map of Yap



Sharks at Vertigo



British Columbia

Diving Canada's Freshwater Interior

Text by Barb Roy. Photos by Barb Roy,
Ron Akeson and Travis Van Mol



BARB ROY

Although British Columbia's (BC) coastal area offers numerous shipwrecks, colorful walls and reefs full of life, there are also a considerable amount of freshwater lakes and rivers to explore within what is known as BC's Interior Region of Canada. Actually, you might be surprised at what you will find to do and see above and below the water.

On many occasions I have joined friends and dive groups to check out some of the more popular Interior destinations, but I was amazed to find many more sites were also available. Most of the

locations are listed on dozens of different websites, including a few informative YouTube videos. Some I knew nothing about. I have listed below several to wet your travel-hungry curiosity as well as included some advice from some active divers residing in the areas of mention.

If you are driving from Vancouver, our dive getaways usually started by meeting up in the city of Kamloops, located about 310km (193 miles) northeast of Vancouver. Dale Anderson, owner of Ocean Pacific dive store in Kamloops and an SSI Master Instructor shared some of his general knowledge for those wanting to visit the area:

"Ocean Pacific has been here since about 1970, but I have been here since 1993. We dive year round because the lakes, like the ocean, cools down and

the visibility gets much better. Water temperature during the summer is around 70°F at the surface and 45°F at 100 feet. Winter temperatures are 40°F at the surface and 32°F at 100 feet!"

As with most temperate water destinations I have found wearing proper thermal protection is a must. This is achieved by wearing a dry suit or a very thick 6.5 to 7mm wetsuit. I can tell you first-hand, when I was ice-diving the lakes in Alaska, a dry suit was the preferred choice when conducting multiple dives in one day.

Divers on surface of Pavilion Lake (left and below); Horses can be found grazing in the Cash Creek area (right)
PREVIOUS PAGE: Salmon at the mouth of Adams River

Pavilion Lake

On several occasions I have joined wreck-explorer and filmmaker Ron Akeson and local dive instructor Travis Van Mol to photograph and see the unusual mounds of microbialites found growing at the bottom of the lake. Peter Symes, editor-in-chief of X-RAY MAG, joined us on one of the excursions.

"These unusual structures resemble large termite mounds and vary in size and shape, depending on their depth," comments Ron. "However, it is imperative to utilize proper buoyancy control when diving here."

Because of the fragile nature of these structures, the World Heritage Site has granted Protection Status to the lake. It is believed that these single-celled



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Mounds of microbialites in Pavilion Lake (above); Diver Wayne Grant explores the microbialite mounds of Pavilion Lake (right)



RON AKESON

NASA astronaut Chris Hadfield talks with author Barb Roy during an interview

bacteria and algae microbialites are important in relation to the study of Earth's history, which is one of the reasons this lake attracted the attention of the U.S. National Aeronautics and Space Administration (NASA) and the Canadian Space Agency (CSA) several years back for further scientific studies (www.pavilionlake.com). YouTube also boasts some great videos about their research and discoveries during the Pavilion Lake Project.

When I interviewed Canadian astronaut, Chris Hadfield, who also participated in the project, he was excited about his experience and commented:

"I get asked a lot, what are we finding on the bottom of the lake. Well, first off we lift these one-man subs called Deep Workers with a crane into the water from a floating platform. We blow air out of it so it gently sinks into the water. Then we use cameras and robot arms to film and

pick up samples from the bottom of the lake. Some of the microbialites are as big as you are and some bigger than the subs. These huge structures are growing at the bottom of the lake.

"The things we call microbialites have existed around the world and in our oceans for billions of years and yet here they are being formed and we can actually see the process happening here in this lake. If we can understand the microbialites on this planet then we can start looking for them on other planets and see whether they have had life in their history. So what seems like a small innocent lake in British Columbia actually becomes a window in understanding history in the rest of the universe. And that's why this whole team wants to try and really understand what is going on in this lake so that we can apply it to everything else."

The lake sits within Marble Canyon Provincial Park at an elevation of 806m



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(2,643ft). Dive access is across from the small island with minimal parking. The surrounding topside terrain resembles the underwater scenery, including structures on the hills around the lake, hinting the water level might have once been much higher. Travis said the microbialites are also found in nearby Kelly Lake, which was the focus of study in 2011 by a similar group of scientist from CSA and NASA.

Paul Lake

This picturesque lake is located in Paul Lake Provincial Park, 20km north of Kamloops. When asked where and when are the best ice-diving lakes, Travis replied, "February is the best time for ice diving. Our signature Valentine dive takes place at Paul Lake or Pavilion Lake and is a great event! We carve a big heart in the ice to dive through."

Travis also mentioned he will get together with friends during the warmer

months for an after-work dive in Paul Lake, "You can see thousands of shiner fish," he adds.

When not diving, this is an excellent lake for fishing rainbow trout! Camping is also available, complete with swimming areas for the kids and boat launching sites.

Johnson Lake

Similar to Pavilion Lake, this equally clear lake rests on a limestone bed at an elevation of about 1,117m (3,666ft) with a dive depth of around 15m (50ft) or more. Fallen trees are one of the main features to see here, forming a maze to swim through. During the winter months this is another popular lake used for ice diving.

Dale adds, "There is a cool land-slide here and usually crystal clear water, but cold."

The water tends to take on a turquoise

blue coloration because of the limestone foundation and is bordered in some areas by long white sandy beaches (east end), giving it a tropical appearance. Paddling around the lake in kayaks is exceptional but the fly-fishing can be extra special, especially if you hook into one of the prized rainbow trout! Hiking and horseback riding are also popular around the lake during the summer months.

Adams Lake/River

This is where Travis, Ron and I always jump in to see the hordes of returning Sockeye Salmon as they bunch together to head up the River to spawn in early October. Although it is a bit of a hike to get to the lake from the parking lot, it is easy when two trips are made. We always brought along a large tarp to lay on the sand at the water's edge, for the dive gear.



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Andy Lamb, author of several dive-related books and co-owner of Cedar Beach Bed & Breakfast on Thetis Island (Vancouver Island), also took advantage of the brilliantly red spectacle this past season, commenting:

"We dove at the mouth of Adams River where it enters the lake. The diving was from the shore and easy to do. Visibility was good but not spectacular. Swimming into the current tight at the mouth was challenging but offered the



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THIS PAGE: Salmon run at Adams River; Diving with the salmon at Adams Lake (top right)



Underwater photographer Ron Akeson uses a GoPro camera attached to a pole to capture images of salmon in Little Shuswap Lake; Detail close-up of salmon (right inset)



best chance for photography. I was very pleased to see a surprising number of other fish species like a few Chinook salmon, bull trout, rainbow trout, many large-scale suckers, some Rocky Mountain whitefish, burbot (freshwater codfish) and small sculpins."

When diving here I used a regular scuba unit but my dive companions were diving rebreathers. Observing how the salmon reacted to all of us, I am not sure they were able to get any closer to the fish than I did while using open-circuit. Most of the fish were more interested in their journey up the river but a few were curious enough to swim around me and get within an arm's length from me.

Shuswap Lake (Big & Little)

Full of sandy beaches and great family fun, this is the lake Travis told us about where you can find a number of wrecks, including an old model "T". Ellison Park in Vernon even has a dive park with some old boats and truck cabs. While on the website for Copper Island Diving I counted 25 different shore and boat accessible locations for diving.

Other activities to do include paddling around in kayaks or canoes, hiking one of several trails, cycling on specific trails (helmets are mandatory in BC), bird watching or just photographing the lake's beautiful topside scenery. Windsurfing, waterskiing and swimming are even more things to add to a sunny day. Due to

the popularity of this lake, reservations are recommended for the campsites in the Shuswap Lake Provincial Park during the summer.

Lake Okanagan

This 780-foot deep lake near the town of Kelowna is 341m (1,000ft) above sea level. I counted ten dive sites on Tourism Kelowna's website which includes an old milk truck in 100ft at Wilson's Landing, small caves and rock formations at Rattlesnake Island and two small boat wrecks in 30ft at Paul's Tomb. On the website of Kelowna Divers, the Otter Bay Scuba Park, located in Ellison Provincial Park, is mentioned, where divers can find a rowboat,

Boston Whaler, an old truck and several other items.

Sheldon Boyd, owner of Serpent Aquatics, located in West Kelowna, is an avid diver in Lake Okanagan adding, "There is a lot of history around the lake and divers can find small boats, old piers, glass bottles and other artefacts around the lake. Divers have set boats into two provincial parks—Kickinee—north of Penticton and Ellison—west of Vernon and the largest wreck known and dove in the lake

some are in parks while most are beach access roads or regional parks. The lake can freeze along the shoreline in places but hasn't frozen over for many years.

"Okanagan Lake is approximately 80 miles long and temperatures are as low as 34°F from December through February. By May people are swimming in the lake, and by August the temperature can be 72°F on the surface and 55°F around 60ft. Visibility is best November through early December. Once the snow melts, visibility drops during the spring run-off and from there into summer ranges up to 30ft depending on the dive site. August through October is the best months to see a lot of fish in the lake as the Kokanee Salmon start their annual spawn. This brings along a host of other fish from fry to

large carp that can be up to 3ft in length. There have been reports of sturgeon in the lake and some have washed ashore."

The Okanagan Valley is also known for its wonderful orchards, vineyards and family-friendly campgrounds. I really enjoying visiting a farmer's market after my dives to indulge in one of the locally grown fresh apples!

Other lakes

"The Upper Arrow Lakes, Kootenay Lake, Slocan Lake, Kootenay River are all iconic for historic wrecks," suggests Travis. He wasn't kidding; I found information on three train boxcars in Slocan Lake, near Silverton in 30-90 feet of water. The steamer tug Ymir (1899) can be found at Nelson's waterfront park in Kootenay Lake. If diving shipwrecks is your passion, then perhaps the best place to start



Divers at truck preparing to dive with salmon at Adams Lake





PHOTO COURTESY OF STEPH / OCEAN PACIFIC DIVE SHOP KAMLOOPS

Ice diving in British Columbia (above); Paddling kayaks at sunset in Kamloops (right); Photographing pelicans in Kamloops (far right)

is with the book, *Historic Shipwrecks of the West Kootenay District*, published by the Underwater Archaeological Society of British Columbia, which features 13 wrecks and the 1897 City of Ainsworth wreck.

No matter which lake you choose to explore, be sure to adjust your dive planning to the altitude and always use a dive flag/float. While on my various adventures exploring BC's Interior, I found the book, *Diving British Columbia Lakes and Rivers*, written by William M. Hall, very helpful. Local dive stores and clubs

is another source of updated information to join up with local groups or hire a guide if needed.

One note worthy of mention is the possibility of seeing turtles in many of the lakes. The western painted turtle is the most common, identified by bright yellow stripes on its head, neck, tail and legs with red coloration on its underside shell. These native pond turtles spend winters hibernating in the muddy lakebeds,

surviving icy cold conditions with half a meter of ice covering the water!

A favorite site Travis likes is Chum Lake, in the Turtle Valley near the town of Chase, "The painted turtles are in no more than 20 feet of water, which you can do snorkeling. The turtles seem safe to dive with, but it can be hard to know where they are at times."

When we weren't diving, Ron and I rented kayaks in Kamloops to paddle out to see the white pelicans and enjoy the fall foliage. We also went on several hikes around Adams Lake so he could film the salmon in the river with his Go Pro camera mounted on a long pole. The North and South Thompson Rivers support the largest interior wintering tundra trumpeter swans, so that may mean a return trip in the near future! There was even a group offering a tour where you could paddle the path of the salmon in a canoe.

Overall I found the region offered plenty of diving or camping options and additional activities like horseback riding, paddle boarding, swimming, snorkeling, wildlife viewing and fishing. ■



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Edited by
Rosemary 'Roz' E. Lunn

POINT & CLICK
ON BOLD LINKS



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Equipment

Xenos

Liveaboard diving should never be endurance diving. You want something ridiculously easy to don when you are peeling your suit on and off several times a day. The innovative staff at Fourth Element believe they have achieved this nirvana with the new Xenos Wetsuit. (This was originally showcased at DEMA.2014). Fourth Element looked beyond the world of diving for inspiration, and analysed what other sports manufacturer do when rapid clothing transition is required. The resulting Xenos, according to this UK-based company, is a very comfy suit that should accommodate both fit and fuller form divers. Part of the secret is the Hydrolock wrist seals. Although these conical seals look tight, they are in fact very stretchy, and are finished in such a way that they help keep water out. This Xenos is available in 3mm, 5mm and as a shortie. Refreshingly, it does not come in just black and grey. The men have a choice of blue and black, whilst women have a choice of magenta and black.

FourthElement.com



Tech shorts

At last year's DEMA Show, Apeks launched a pair of diving shorts that broke the mold. Instead of securing them with a drawstring, Apeks designed an adjustable waistband and belt that make the shorts quick to don and provide great adjustability, with a snug fit. Attention has also been paid to the two large cargo pockets. Each pocket has an "expansion system" fitted to the outside of the pocket—basically velco tabs that allow you to velcro down or release the pocket, so that you can use the pocket just for wetnotes, or truly stuff it to full capacity. Inside each pocket is a stainless steel integrated D-ring, allowing divers to clip off and secure pocket contents. The pocket should be quick to drain, courtesy of four large grommets, and the pocket itself is secured and closed by a large velcro pocket flap, which keeps everything in place. The result is a sophisticated pair of unisex diving shorts that come in a choice of five sizes—small to extra large. And for drysuit divers who don't have cargo pockets, these shorts might well be an economical solution to your storage issues. **Apeks.co.uk**

ScubaCapsule

Another solution that allows you to take your smartphone diving—ScubaCapsule—was unveiled at Boot Dusseldorf 2015. The housing is CNC machined from a single block of high quality aluminium. A number of sensors, a panel and a porthole of scratch-resistant non-reflective Gorilla Glass are then fitted to the case. (The built-in electronics allow the user to select a number of functions on their smartphone, once they are submerged.) To take it diving simply inserted the smartphone into the ScubaCapsule, then secure the metal case with a stainless steel catch. ScubaCapsule states the housing is rated to 150m (492ft). ScubaCapsule has also launched an app to augment the diver experience. Features include an underwater camera with a heads-up display, a nitrox computer and a compass. It seems the idea behind the app is to reduce the need to carry multiple devices. Diving heaven? Smartphones are notoriously battery hungry. Personally I feel more secure carrying additional compass, a double gauge combo and a computer. Flat batteries are never fun, especially underwater. **Scuba-capsule.de**



Newton

Cressi launched the Newton, a recreational computer dive watch, at DEMA.2014. This computer can be dived with air (21%), nitrox (up to 99% with a 1.2 to 1.6 PPO2 range), or as a gauge/timer. Cressi collaborated with Bruce Wienke to create the dual-mixture Cressi RGBM algorithm. This Haldanian-based algorithm allows the diver to gas switch mid-dive between two different mixes. There is growing research data that indicates deep stops might not be the optimal way to decompress. It is therefore useful that the deep stop function can be turned on or off. The 150m (490ft) depth rated Newton is encased in stainless steel and ABS and has a mineral glass face. Other features include a display with oversized digits, alarm clock and stopwatch functions. **Cressi.com**



XT Lite

Dive Rite has launched a backplate with the strength of marine grade 316 stainless steel and the weight of aluminium, called the XT Lite. The excess weight has been lost, whilst ensuring strength is not compromised, by laser cutting a series of cut-outs from the body of the plate. The plate is then hand-finished to ensure that there are no rough or jagged edges. Dive Rite has considered



that divers have changing needs for their kit. The XT Lite backplate has two sets of 2-inch slots cut along the centre spine so that the plate can be dived with a single cylinder without the need of a single tank adapter. Plus a series of 3/8-inch holes and 1-inch slots have also been cut along the outer edge of the plate, thus giving the diver a plethora of choices when it comes to mounting lights, lift bags, pony bottles and other paraphernalia. **DiveRite.com**



Good Ideas Gone Bad

A Confession

From a Rebreather Diver

Text submitted by an anonymous contributor known to the magazine. Photos by Peter Symes and Barb Roy

I have always wanted to start using a rebreather. I wanted to become a true shark of the diving world. There's nothing more calming than listening to nothing except the undersea life, without the sound of bubbles puffing up to the surface.

After training on the unit, I was up and ready to go diving every weekend just to try out my new toy. Diving in Monterrey Bay [California, USA], became completely dif-

ferent as fishes would bump into me; octopi would look and study the strange human I was; and sharks no longer ran away. Indeed, I became a true shark.

However, mistakes occurred and bad ideas were used during my rebreather diving time. Some were down right stupid, like trying to position the D-ring, as well as other ideas generally frowned upon by the rebreather community.

What follows is the story of one stupid idea that could have been life-threatening, leading to a situation that was easily prevented; it is an experience I am willing to share and learn from.

One day early in the morning, I poured scrubber into a tupperware container so that I could transfer it into the

cartridge of my rebreather unit. Each dive day, I noticed a pattern and had a brilliant idea: I would take a marker and make a line on the tupperware container right at the spot where the scrubber will fill the cartridge for my unit.

On the day I made the mark, I filled the scrubber into the tupperware container just to the line, poured everything into the cartridge and set up the rebreather in my car. Simple enough, I didn't think about it, and it was the first time I was trying out a new rebreather system and thought, "What a wonderful idea!"

At pre-breathing time on the boat, the unit worked fine, as new cells had been installed four month ago and the batteries were brand new. During

the dive, whenever I turned around, I could hear rattling, like Mexican beans in a can. I thought, "What is going on?" But I decided to just ignore it. When I got to the surface after a 40-minute dive, I was so tired that I could not climb up the boat ladder. Two divers carried me up, and when I took the rebreather loop off my mouth, I was gasping and starving for air. I decided to call it a day and retired to the boat galley to rest while the charter went on.

After regaining my strength, I drove home thinking I should have eaten a well-balanced breakfast. Upon cleaning the rebreather, I opened up the scrubber chamber to dump the scrubber, and I noticed that the scrubber wasn't filled up and packed correctly. The scrubber material was about



PETER SYMES



opinion

one to two inches below the required fill. I swore I filled it up to the black line on the tupperware container, so it should have been enough.

This is what happened:

There were some air pockets in the scrubber cartridge, and I did not shake and pat the cartridge down.

Because the scrubber was loosely packed, all the scrubber shifted from one side to the other while I was underwater, enabling carbon dioxide to flow through and mix with 100% oxygen.

Toward the end of the dive, I was breathing a fair amount of carbon dioxide, which could have been lethal. Had I continued doing the second dive that day, it could have been my

last dive on Earth.

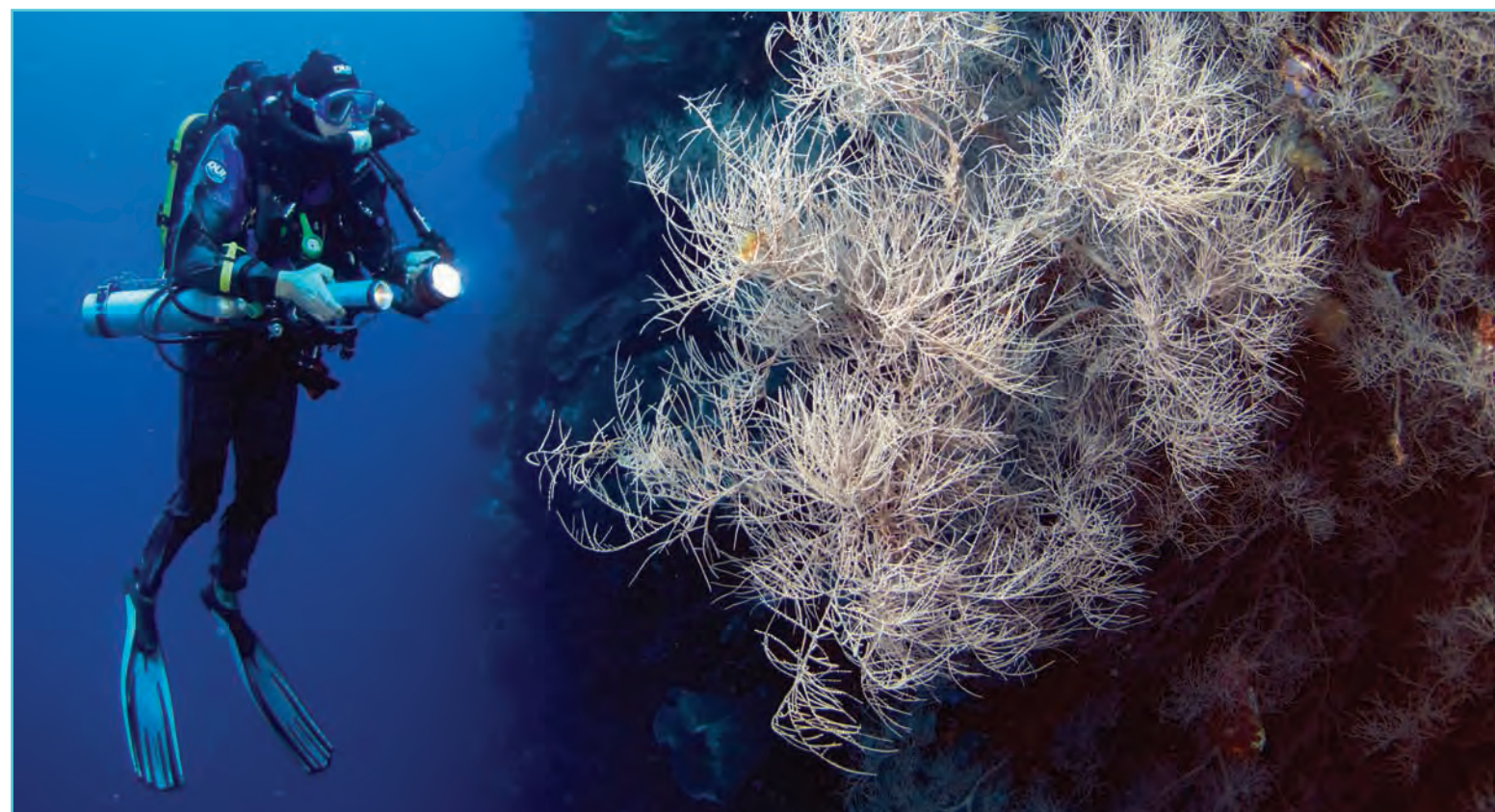
Lesson learned

Sometimes good ideas that work well on paper don't work well in real life. Throughout the night, I thought to myself that it was probably the dumbest thing I have ever done on a rebreather.

The next dive day, I ignored the black line on the tupperware container, and I filled the scrubber fully, patting the chamber down, and filled some more until the scrubber reached the proper fill line. After a full day of diving, I felt fine.

To this day, I still remember that day when I thought I could just do a fast fill on the scrubber and shave off 10 minutes of packing the scrubber. For just spending 10 minutes more of packing and patting down, I would have enjoyed that beautiful day, but instead was treated to a headache and drowsiness, which could have been fatal.

These days, I now take my time in packing the scrubber and making sure the cartridge chamber is packed properly. The rebreather, after all, is a life support machine, and being cheap and fast certainly isn't a good idea. ■



A CCR experience without equal

At Wakatobi, rebreather divers are not just accommodated, they are welcomed by a staff that understands the special requirements of the equipment, and in some cases, are CCR divers themselves. A supply of oxygen, diluent, and bail-out tanks are available on site, along with ample stocks of sorb with oxygen fills to 206 bar, with helium available by advanced request.

Rebreather groups may be provided with dedicated boats to accommodate their extended profiles. Equally attractive as the support system is Wakatobi's marine environment itself, which offers profiles that are ideally suited to rebreather diving, along with a wide range of marine subjects that become even more accessible to those who dive silently.

Bring your rebreather and experience Wakatobi today. Learn more at www.wakatobi.com or email office@wakatobi.com.

"Overall, it would be hard to imagine a more perfect environment. You don't have to dive a rebreather to experience all the wonderful attractions of Wakatobi, but having these systems can add yet another layer to your enjoyment of this magnificent ecosystem."

Craig Willemsen, owner, Silent World Diving



www.wakatobi.com



BARB ROY





India's
Andaman Islands

— *The Spell of Kalapani*

Text and photos by Pierre Constant

Mangrove
flats in
Mayabunder
(right); The
British ruins at
Ross Island
(below)

Extending 329 kilometers from north to south, the Andaman and Nicobar Islands have 1,912km of coastline, about a quarter that of India. The continental shelf has a surface area estimated at 16,000km². The coral reef biodiversity here amounts to 5,440 species, 138 of which are endemic.



Some call it *Kalapani* ("the black waters"), from the Hindi *Kala* ("black") and *pani* ("water"), but to scholars, the word has a much somber meaning. It comes from *kal* ("the time of death") and therefore Kalapani should trans-

late as "the waters of death". To those convicts who were doomed by the British Empire in the 18th century, it meant transportation to the penal settlement of Port Blair in the Andaman Islands.

The first British colony had been

established at Port Blair in 1789 by Captain Archibald Blair, but was closed in 1796. A penal settlement was later opened in 1858, to cast away prisoners after the first Indian war of independence in 1857.

Consequently, Kalapani be-

came a place for throwing freedom fighters into living hell. To the Indians, these islands were a sacred place, for it symbolized their struggle for independence. The initial batch of 200 prisoners (aged 18 to 40 years) was exiled

on 10 March 1858 and sentenced to hard labor. A number of them were Burmese from Tharawadda, who had revolted against British rule.

From the very beginning, aborigines attacked the working par-



Havelock beach with dive boats (above) and rickshaw driver (top right); Gate to Cellular Jail (top left) and five-armed star design of jail, Port Blair (left inset)

oil daily. For those who failed to do so, punishment was barbaric, with torture and flogging being the norm. Neck ring shackles, leg irons and chains were common adornments here. Particularly defiant prisoners

were handcuffed for a week or sentenced to six months of solitary confinement.

Self-proclaimed god, David Barry, was a dreaded jailor from 1905 to 1919. "We are here to tame lions...", he used to roar to the newcomers.

Geography

Located 1,000km east of India in the Bay of Bengal, 700km west of Thailand in the Andaman Sea and 100km south of Burma, the Andaman and Nicobar Islands are spread between latitude 6°45 to 13°41 N, and longitude 92°12 to 93°57 E. They represent a group of 572

islands—38 of which have been inhabited by human beings for a very long time.

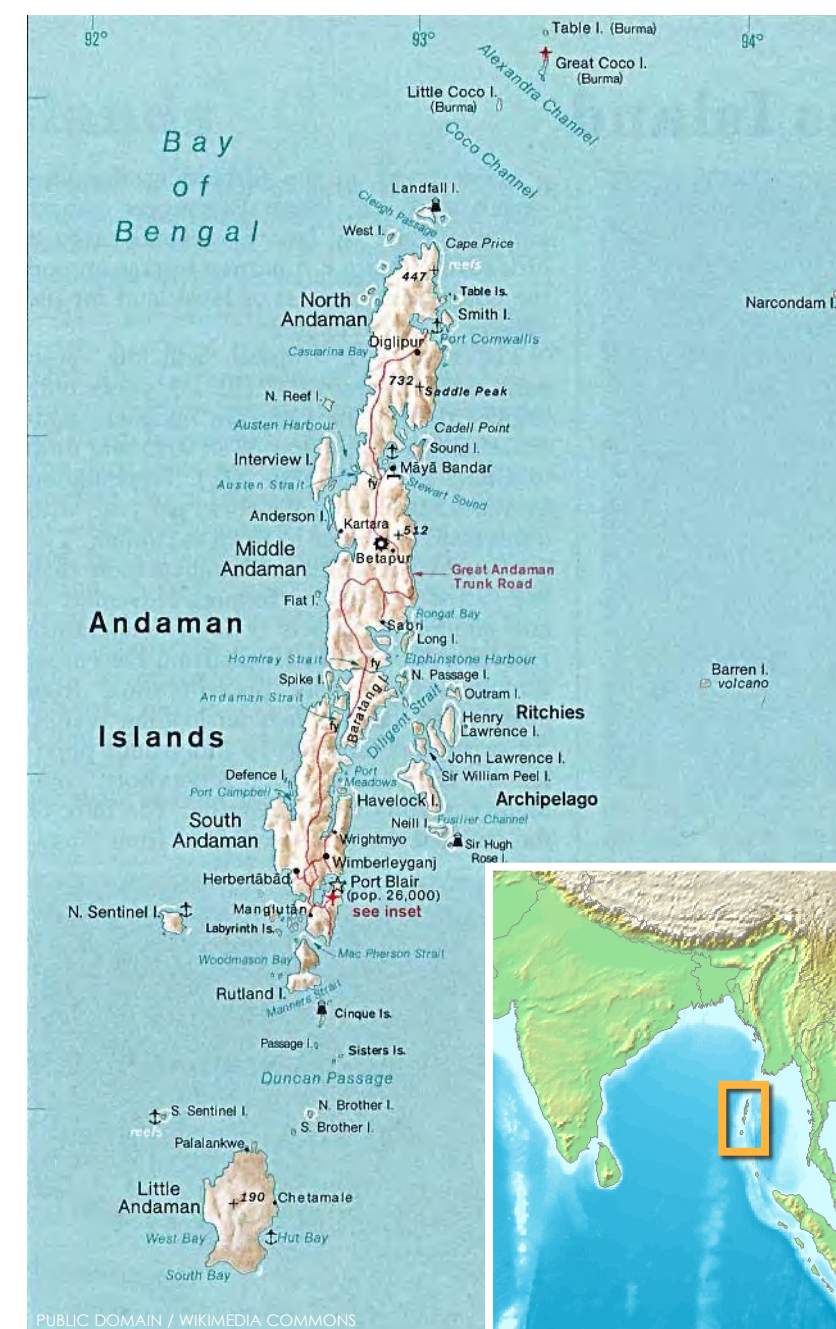
The 8,249km² land surface is shared between the Andaman Islands (6,408km²) and Nicobar Islands (1,841km²). Two deep channels cut through the island chain from east to west: the latitude 10°N channel between the Andaman Islands and Nicobar Islands, and the Sombrero Channel between Great Nicobar and the Nicobar group.

The 2004 Indian Ocean earthquake of December 26 [ed.—also known as the Sumatra–Andaman earthquake] induced major topological changes for the Andaman and Nicobar Islands. They are in the seismic Zone V outside the Himalayan belt and have experienced several earthquakes in the past, triggering tsunamis. The earthquakes of 1847 and 1941 created a tsunami that hit India's eastern coast. For aficionados

ties, resulting in a number of prisoners killed.

The infamous "Cellular Jail" in Port Blair was constructed in late September 1893. Instead of dormitories, there were individual cells measuring 13.5 by 7.5 feet, designed to keep political activists from communicating with each other. In total, 693 cells were completed by 1909 in the two-story monument, which looked like a starfish with five arms, controlled by a central watchtower.

Forced to perform nine hours of painstaking hard labor every day, political convicts had to produce 30 pounds of coconut oil and 10 pounds of mustard



Map of Andaman Islands, with regional locator map



Former prisoner, Cellular Jail



of plate tectonics, the so-called Sunda-Andaman Trench is related to the subduction of the Indo-Australian Plate below the Eurasian Plate. The northeast-moving plate converges obliquely at 54mm per year with respect to the Eurasian Plate.

The Andaman and Nicobar Islands are bounded by the Andaman Trench to the west and by the Sunda fault system to the east. Measuring 3,000m to 3,500m deep, the Andaman Trench marks the active subduction zone where the Northeast Indian Plate goes under the Eurasian Plate.

The island chain acts as a small tectonic plate, known as the Burma micro-plate. The Andaman Sea represents the back arc basin, characterized by the Andaman spreading centre.

The tectonic setting results in the development of several thrusts and strike slip faults. The West Andaman Fault (WAF) is the most

prominent right lateral slip fault that has continuity all along the islands. This fault extends from Sumatra in the southwest up to the Burma micro-plate in the north.

Consequently, the Andaman outer arc ridge, the right lateral WAF and the Barren volcano—120km northeast of Port Blair—are major tectonic features in the region. Extending from north to south in apparent parallel lines, the Andaman and Nicobar ridges are in fact scraped accretions of oceanic sediments uplifted during the Oligocene times.

The eastern part of the Andaman



man Islands is made of highly deformed rocks (ophiolites) from the ocean floor, comprised of Cretaceous and early Eocene ultrabasic volcanic pelagic sediments. The western part of the islands are a prism of Eocene/Oligocene (Primary era) conglomerates—flysch,



Andaman deer, Ross Island (left); The coastal forest at Beach #7 (far left)

sandstone and siltstone, with calcareous sediments of the Miocene/Pliocene times.

The Great Quake

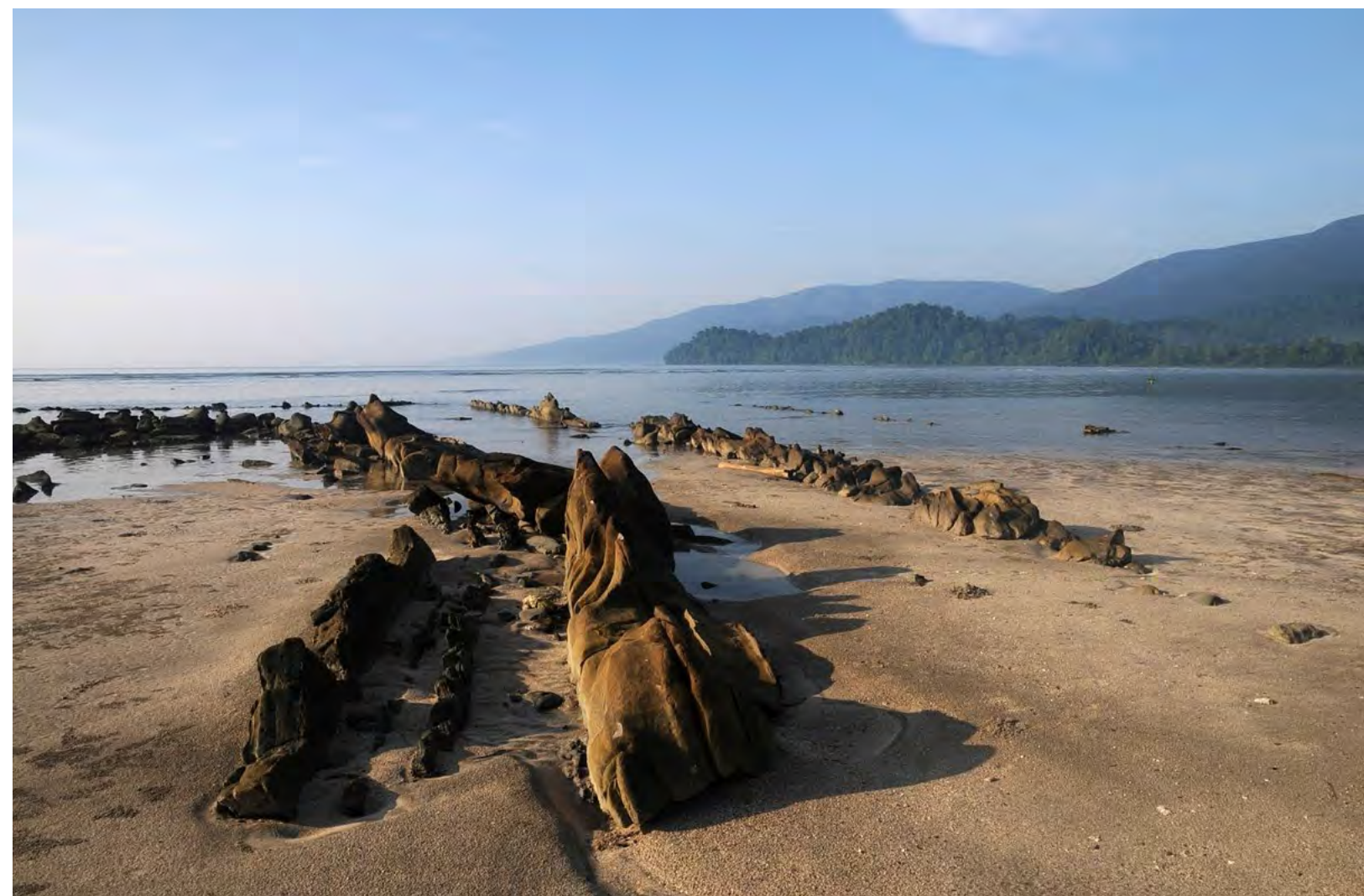
At 9.1–9.3 on the Richter scale, the December 2004 earthquake was the second largest in magnitude in the area in 200 years and the third-largest earthquake ever recorded, in the company of large earthquakes such as Kamchatka in 1952 (magnitude 9.0), Alaska in 1964 (magnitude 9.1) and Chile in 1960 (magnitude 9.5).

Andamans

The rupture was 1,200 kilometers long along the subduction plate boundary in the Sumatra and Andaman and Nicobar region, registering a slip of about 20m to 25m.

The seismic data showed two phases: 400km long and 30km deep along the coast of Banda Aceh in the epicenter, with a 600km rupture occurring along the Andaman Islands. The thrust motion had a gently dipping plane towards the northeast.

A sharp change of 1.2m in the mean sea level was recorded in Port Blair after the earthquake. A 10-meter-high tsunami wave hit the Little and Main Andaman Islands. The tectonic subsidence of



Beach and rock alignments in Diglipur (above); Locals from the farming community, south Havelock

the eastern coast was conspicuous, with submerged beach and forested areas along the eastern coast of South Andaman. Uplifts of land (maximum of three meters) were noted in Mayabunder and Diglipur in the North Andaman.

The eruption of a mud volcano created a surprise near Jarawa Creek, at Baratang Island (Middle Andaman), 105km north of Port Blair. On December 28, only two days after the devastating earthquake, the Barren Island volcano erupted east of the Middle Andaman Island. Lying within the Burma micro-plate, it has sustained its activity since then.

Born from an eruption in the late Pleistocene, Barren Island has a

diameter of 3km and a land surface of 10km², culminating at an elevation of 335 meters. Contrary to common belief, it is not barren; it is covered with a lush green jungle and is home to 13 species of birds, seven species of mammals, nine species of insects and 10 species of butterflies. A probable shipwreck in the area also brought goats, which have since colonized the island.

History

Known to the Chinese, Indians, Burmese and Thais, the Andaman Islands were visited by Marco Polo in the 16th century. Long before the British made their first claim, the islands were inhabited by aborigines, headhunters and

fierce cannibals. Despite their geographical isolation, it is rather peculiar to note that recent DNA matches indicate a direct link with the pygmies of southern Africa.



Sunset in Mayabunder (right); Local school girl on her way home on the bus (below)

Andamans



Rice farm in South Havelock (above); Farmer with his cow, south Havelock (right)



The five foraging communities here are dependent on aquatic and terrestrial resources. Classified as Negritos, the Jarawas (south Andaman), Greater Andamanese, Onge (Little Andaman) and Sentinelese are short in stature, characterized by broad heads, relatively broad straight

noses and dark skin. Two other distinct groups are classified as Mongoloids: the Nicobarese and the Shompen, who are characterized by yellow brown skin, straight hair, oblique eyes and prominent cheekbones.

The migration routes of the Negritos were most certainly from

Malaysia, Borneo and Sumatra. In the Andaman Islands, the tribes were hunter gatherers, whereas in Nicobar, they were mainly horticulturists and herders.

Bows and arrows, adzes, spears and harpoons are still commonly used for hunting and fishing. Turtles, fishes and dugong are on

the menu. Single outrigger canoes and rude crafts like dugout canoes are favorites for hunting on the sea. The Onge of Little Andaman collect honey by climbing trees.

The Jarawa tribe of South Andaman build round dwellings made of leaves, which act as community huts. Skulls of wild pigs, decorated with cane strips, are displayed inside huts as trophies.

For the Greater Andamanese, the scarification of the back in three vertical rows of horizontal cuts was in practice in the late 19th century—reminiscent of the scarification (initiation) rites of the Crocodile men of the Middle Sepik in Papua New Guinea.

After the colonization of the islands in the 18th and 19th centuries, the Great Andamanese, Onge and Jarawas stayed away from the white men and civilization altogether, until recently. The



Inter-islands ferry boat (above); Dive instructor Angshuman and a student in the dungy (top right); The dexterous Karen boatman manoeuvring the dungy with his toes (right inset)

Great Andamanese and Onge have now accepted outsiders. The Nicobarese have integrated them as well. The once-ferocious Jarawas are becoming friendly.

However, Shompen still avoid contact, but are not hostile. Numbering a mere 39-strong on Sentinel Island, the Sentinelese continue to refuse contact and are resolutely hostile to strangers who try to land.

The journey

The daily domestic flight from the Indian mainland connects Chennai to Port Blair in exactly two hours. There should be a time difference of one hour, but, against all odds, the Andaman Islands run on Indian time. One experiences a ridiculous sunset at 5PM and a disturbing sunrise at 5AM!

A light rain welcomed my landing at the South Andaman airport. I was whisked to the pier by a

nervous driver who did not want me to miss the ferry. The MV *North Passage* would leave at 2PM to Havelock Island. It would be a crossing to the northeast (lasting two hours and 15 minutes) on a calm sea. It was compulsory for foreigners to report their Andaman visitor's permit upon arrival.

For over 20 years, Havelock has been the hub of diving activities on the Andaman Islands. To my bewilderment, I found out that there are now 64 dive centers in operation. While the islands are spread out on a large scale, dive shops and attached resorts are all concentrated on a tiny stretch of land east of Havelock.

Vikas, the dive manager of Dive India is very professional. He introduced me to Angshuman, a bright convivial instructor. I also met Rahul, the inhouse marine biologist-cum-instructor. All smiles, Johnny, the Karen divemaster,

with 15 years of experience of the area, would be my guide. "You'll be in good hands!" I was told.

Accessible through a small strip of coconut trees, the nearby beach is a mix of sand and grey silt. At low tide, the reef flat extends quite far out to sea.

Awaiting the morning departure was a dungy, an elongated Burmese boat with an inflated bow, which served as the local dive craft with a lot of character. The mid-part, acting as the passenger cabin, comprises a rounded half-tubular bamboo frame, and is covered with a black plastic sheet for sun and rain protection.

The dungy is propelled by an old rusty 20hp inboard motor that



Andamans

goes "tuff-tuff" like a steam train. The snorkel-type exhaust pipe exhaled a cloud of black smoke as we cruised at a snail's pace.

An inconspicuous shadow at the stern was a slender Karen boatman who stood up like a sentinel on watch, steering the boat skillfully by clasp and maneuvering the handle of the boat's rudder between his toes. Amazed, I gazed at him as he stared at the horizon, oblivious and undisturbed.



Dungy loaded with tanks before departure



School of Bengal snappers under a rock arch, Johnny's Gorge

Diver with school of slate sweetlips (*Diagramma pictum*), Johnny's Gorge (above); Andaman sweetlips, butterflyfish and red gorgonian, Minerva ledge (right)

Numbering 3,000, the Karen had been introduced to North Andaman in the mid-19th century and are now concentrated in Mayabunder. Originally hill tribes from Burma, they have become sea Karen, being involved in fishing activities, while also farming rice paddies traditionally.

"Unfortunately, we experienced a very serious coral bleaching in April 2010, due to global warming," warned Vikas, giving me advance notice. "The water temperature rose up to an amazing 34°C, and every bit of coral was dead down to 10 meters. Fortunately, at depth, it is still all right."

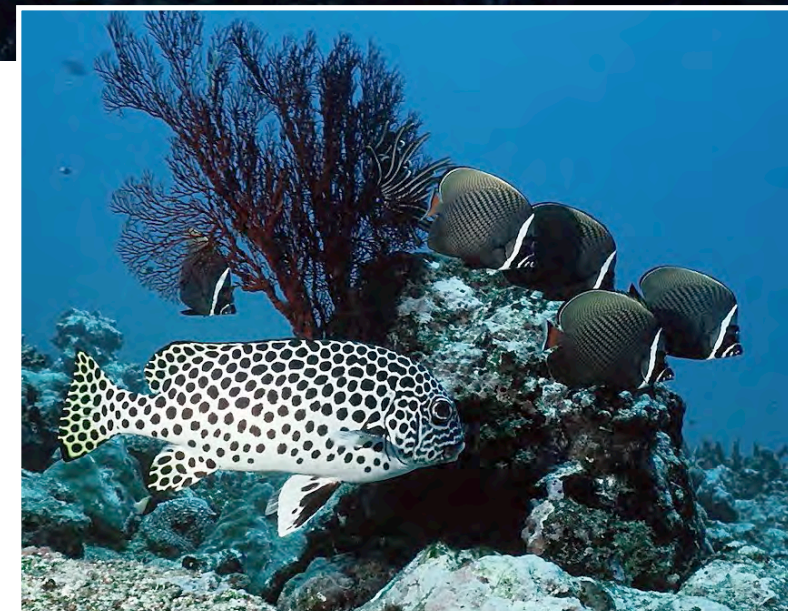
Dive sites

Johnny's Gorge. Named after the dive-master, Johnny, Johnny's Gorge was one of these fountains of life, sparkling and teeming with fish. At a depth of 25m, I met a school of striped blue and gold Bengal snappers, hovering over several

enormous barrel sponges. Various species of sweetlips mingled around cleaning stations. Marbled groupers of a fair size had made their home here.

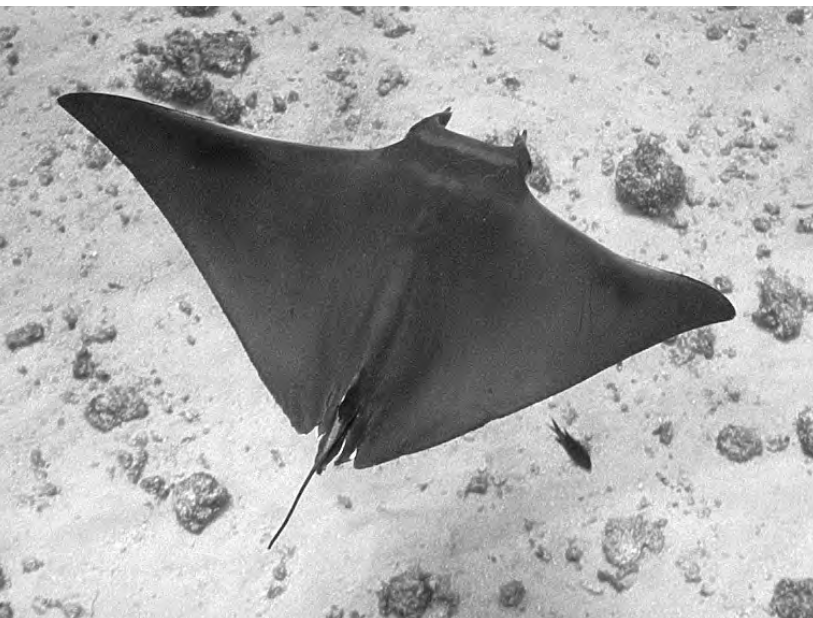
An inquisitive giant grouper (*Epinephelus lanceolatus*) 1.5m long, approached me for a closer look, with a flock of yellow black-striped pilot fish at its nose. The big fellow was rather shy though, and turned around swiftly to flee.

Some dogtooth tunas and spotted queenfish darted by on a hunting spree. A cool Napoleon wrasse drifted like a dark cloud in the distance. Gorgonians and soft corals dotted the seafloor, sulphur yellow hanging corals carpeted the rocks. It was pure enchantment, and a good indicator of a healthy reef in the deep. A whitetip reef shark rested in peace on the sandy bottom, but would not allow a close visitor. It took off with a



flick of the tail.

Minerva Ledge. The second dive at Minerva Ledge was a shallow one. Sadly, it was not really worth a mention, being scraped and bleached out. Nevertheless, I came across the endemic spotted Andaman sweetlips, whitish with big black spots. When we were at the safety stop, Johnny pointed out to what looked like a mobula ray, cruising along the bot-



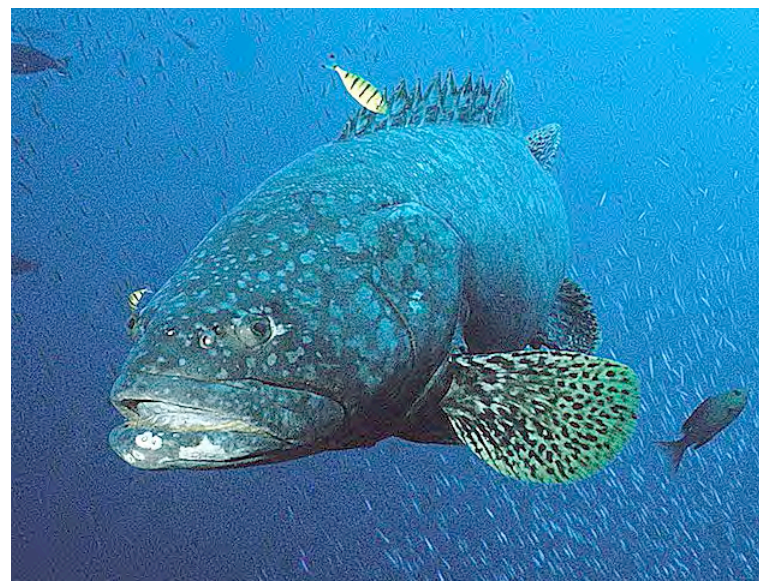
18m, the dive site had a surface current, fading at depth. Visibility was poor (due to its proximity to the mainland) with lots of particles in the water. The fish life was plentiful, with lots of snappers, sweetlips, groupers, blue ringed angel-fish, giant jacks and big eyed jacks swimming in schools. I attempted a few penetrations inside the wreck and towards the propeller, startling a giant grouper that disappeared into the darkness of the hull.

tom. I swam toward it and found that it had a very small tail. Perhaps it was a baby manta ray. Frightened, it zoomed up towards the surface in a spiral.

SS *Inchket*. The SS *Inchket* was the wreck of a cargo with a steam boiler engine, which sank in 1952 and completely broke apart. Starting from 7m down to

Dickson's Pinnacle. On a clear sunny day that made one think of paradise, I hopped aboard the dungi *Bullshark*. The sailing time to Dickson's Pinnacle on a flat sea was about an hour to the southeast of Havelock.

We dived on a large coral bommie that reminded me of "Magic Mountain" in southern Raja Ampat. It was covered in soft corals, barrel sponges, hanging corals in sulphur yellow colour, whip corals and feather stars. A large turtle hovered on top, with a mixed school of Bengal snappers and paddletail snappers hanging around at the sides. Bluefin jacks, giant jacks and dogtooth tunas cruised at speed. Another giant grouper came



Wreck of SS *Inchket* (above); Divers hanging on to anchor line, at safety stop (top left) and giant grouper coming in for a look (left), Dickson's pinnacle; Mobula ray, Minerva Ledge (far left)





out of the blue and zoomed up to me for a closer look. The visibility was excellent. A smaller pinnacle revealed itself nearby, covered with *Tubastrea micrantha*, or black sun coral with green tentacles, which look like Christmas trees surrounded by clouds of anthias. "To the southeast, there is a stream of bubbles coming out of the seafloor," explained Johnny. A clear

sign of volcanic activity, for sure.

Diving with an elephant. Beach #7, on the west coast of Havelock, is 15km away from the main bazaar. There, the stretch of white sand is mind-blowing—wide and long, breezy and fringed by an authentic jungle feel. Big trees with buttress roots, large ficus with hanging roots that dig



School of yellowtails, Jackson's Bar (above); Potato grouper, Broken Ledge (right) Barrel sponge, grouper and Bengal snappers, Dickson's pinnacle (left)

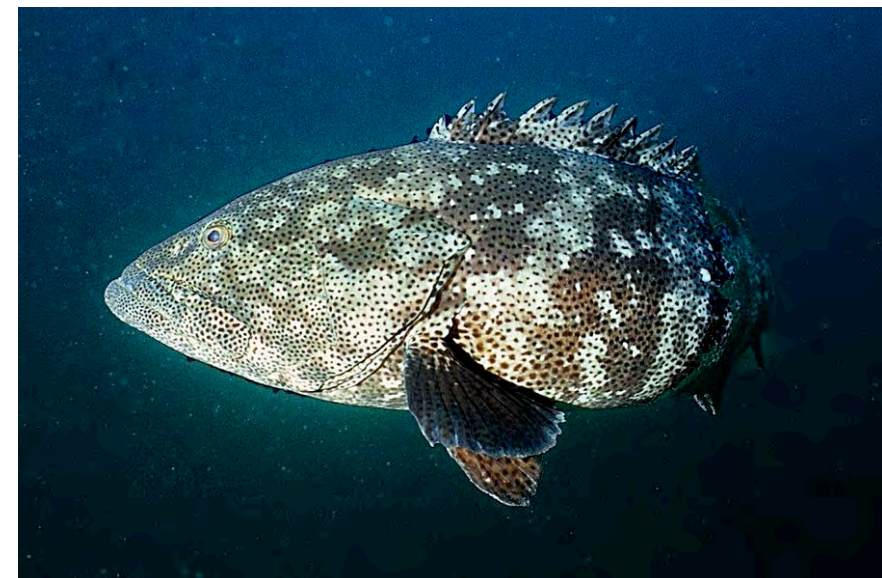
into the ground, leafy *Terminalia* trees [ed.—or Indian almond trees] that attract bats at night. A number of Indian tourists strolled along the seashore, taking family pictures, for this was indeed the ideal setting for a postcard at sunset. Today, however, the sun disappeared behind a cloud layer, before its dramatic plunge into the Bay of Bengal. A stone's throw away was the location of Barefoot Scuba Dive Centre, where people could, upon request, dive with Rajan, the swimming elephant.

Over 20 years ago, working elephants were the norm in the Andaman Islands, used in the logging trade. This activity has been officially banned since then, and the elephants are now retired. Well,

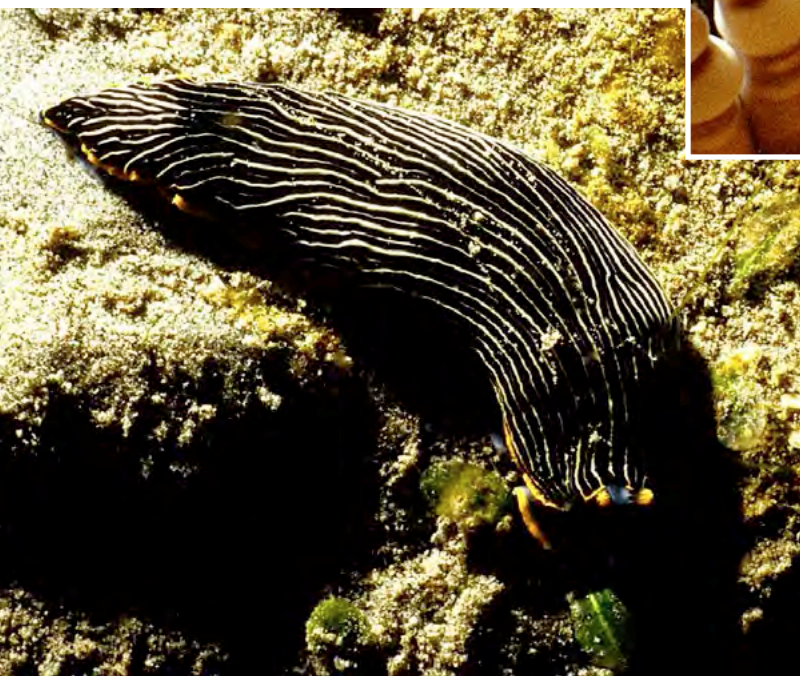
except for Rajan. Once in a while, it posed stoically and displayed in the water for the tourists and amateur photographers willing to pay the mere amount of US\$1,000 for an outing, shared with four other persons.

Can you believe that? I almost swallowed my tongue! You may agree that this is a shameful rip-off, but you'd be surprised—some people do pay the fee, including so-called professionals!

Jackson's Bar. Last but not least was



Jackson's Bar, named after the dive-master Johnny's third brother. Johnny's Gorge, Dickson's Pinnacle and Jackson's Bar are key dive sites in Havelock. Locat-



ed at a depth of 20m in clear water, this flat rocky reef makes a shelf that slopes down to 30m on sand. The rock is literally covered in barrel sponges, soft corals, with usual fish life.

A school of rainbow runners darted by, mid-water, while Bengal snappers and gold-spotted sweetlips gathered in clouds, hovering above the bottom. A cute barramundi, posed next to a white sponge, where a large Java moray eel peeked out from below an overhang.

Oblivious, a potato grouper dozed off on the seafloor. With the speed of lightning, a school of flashy silver yellow-tails swirled by in a showy display, out of



Cleaner shrimp and anemone (above), sea hare (top left), *Armina semperi* nudibranch (left) at V16 dive site

sheer curiosity. I finished up my film before the end of the dive, and missed out on a large banded sea krait sleeping in a crack!

Beyond diving

A visit to the Andaman Islands is not only about beaches and diving, but to a certain extent about history and culture. For a bit of sightseeing it is possible

to travel by road from Port Blair up to North Andaman, firstly along the Great Andaman Trunk Road—crossing the Jarawa tribal lands—to Rangat, Mayabunder and Diglipur (the end of the road).

Alternatively, one can catch a ferry from Havelock to Rangat, via Long Island, three times a week. Heading south from Havelock, a daily ferry sails to Neil Island, a traveler's hang out, away from the crowds. Dive India has opened a new resort and dive center on Neil in late October 2011, giving access to new dive sites in pristine locations.

The Wall. Past the small lighthouse west

of Havelock, an underwater ridge extends north towards Sir William Peel Island. Named The Wall, this dive site is actually the continuation of Havelock's dorsal spine, crested with jungle, which goes underwater. Rock formations are conspicuously tilted towards the east.

Dive instructor Angshuman, covered in tattoos—from Bob Dylan to a pirate ship, a Buddhist mandala, a flying dragon and Jim Morrison (among others)—gave his lively briefing on the dungi.

We waited for the 8:30AM ferry from Port Blair to sail by, before we jumped in. The visibility was far from flash, even murky, but white bushes of black coral were thriving everywhere, as well as gorgonians, cushion stars and different species of sea cucumbers: black, pink and the *Thelenota* sp. loafbread type—not to mention, a leopard sea cucumber (*Bohadschia argus*), which loves to regurgitate its stomach in white sticky filaments, if molested.

Johnny promised me he would find a harlequin ghost pipefish, but the rascal remained absolutely elusive. Instead, he discovered a cute *Phyllidia ocellata*

Andamans



Barrel sponges, whip coral and featherstars, Broken Ledge



Andamans



Spondylus clam (above) and *Halgerda batangas* nudibranch (left), The Wall

On the bigger scene, dogtooth tunas were ever present, plus an entertaining mixed school of golden striped jacks and goatfish were foraging in the sediment.

Finally, at a depth of six meters, I came upon the extremely rare sighting of a small colony of spine-cheek anemonefish with abnormal yellow bars (outlined with white) across the sides. One sees these clownfish usually with white bars, and for me, it was definitely a first. For a moment, I wondered if they could be endemic to the Andaman Islands, but ichthyologist Gerry Allen had already reported them in Sumatra.

Dreaming

The dream of the divemasters and dive instructors Vikas, Rahul, Angshuman, Johnny and others, would be

the emergence of a liveaboard in the Andaman Islands. "Imagine, we would be able to reach remote dive sites, like Barren Island, Narcondam Island, pristine reefs... and there are so many of them! If only the authorities would allow access..." they mused, as their eyes opened wide, alluring smiles on their faces. Then one can imagine from the dreamers' vision that the magical, yet unknown parts of the Andaman Islands are still out there to be discovered—alive, in the deep blue, waiting to be revealed. ■

Pierre Constant is an author, photographer, dive master, naturalist consultant and expedition organizer based in the Galapagos Islands. For more information, visit: Calaolife.com and Scubadragon-galapagos.com.

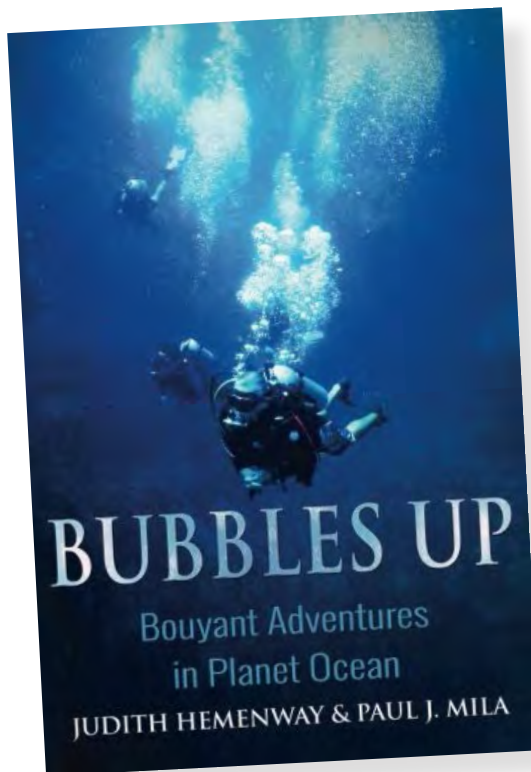
REFERENCES: WIKIPEDIA.ORG



Scorpionfish (above), *Phyllidia ocellata* nudibranch (top center), and lamellarid, *Coriocella* sp. (top right) at The Wall



Edited by
Catherine
GS Lim



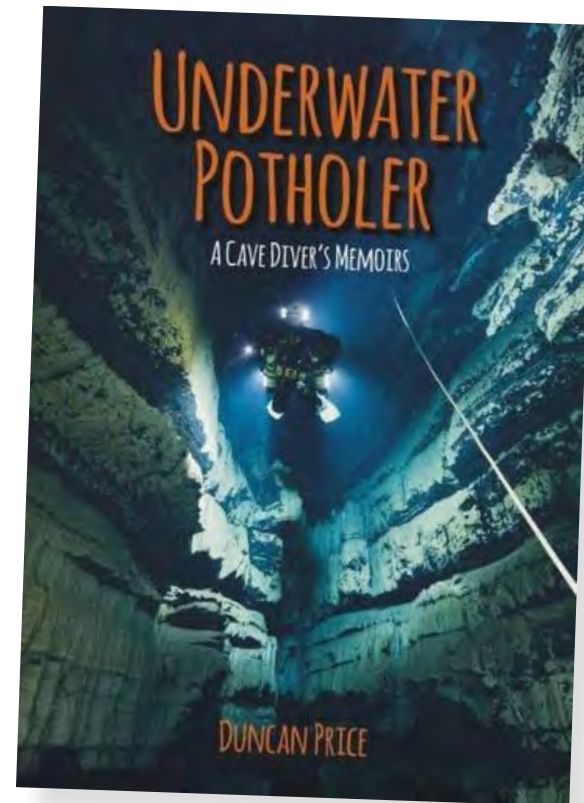
Dive Tales

*Bubbles Up:
Bouyant Adventures
in Planet Ocean,*
by Paul J. Mila and
Judith Hemenway

This is a book
about life. Sure,
the setting for the
27 chapters is
mostly underwater,
and amongst the

company of divers. Yet, looking beyond the stories, we find life lessons, shared experiences, firm friendships and endearing family bonds. Divers will chuckle and nod in agreement as they read the words of two kindred spirits; perhaps they may even run into an old friend or two. Non-divers will receive a glimpse into the majesty of the underwater universe, and understand that every creature within this realm is a sentient being that deserves our mutual respect. Available in both print and e-book.

Paperback: 262 pages
Publisher: MilaBooks.com
Date: 1 March 2015
ISBN-10: 069237826X
ISBN-13: 978-0692378267



Cave Diving

Underwater Potholer: A Cave Diver's Memoirs, by
Duncan M. Price

This book is the result of Duncan Price's 30-odd years of cave diving. His travels into the inner spaces within our oceans take him (and us!) into so many diverse places, including the caves beneath Welsh Valleys, Yorkshire Dales and the Blue Ridge Mountains. Along the way, we chance upon sharks, unexploded bombs, secret nuclear research facilities. Any technical jargon are explained simply and clearly, so that the narrative remains engaging and does not overpower the writer's characteristic candour and good humour.

Paperback: 208 pages
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ISBN-13: 978-1849951586

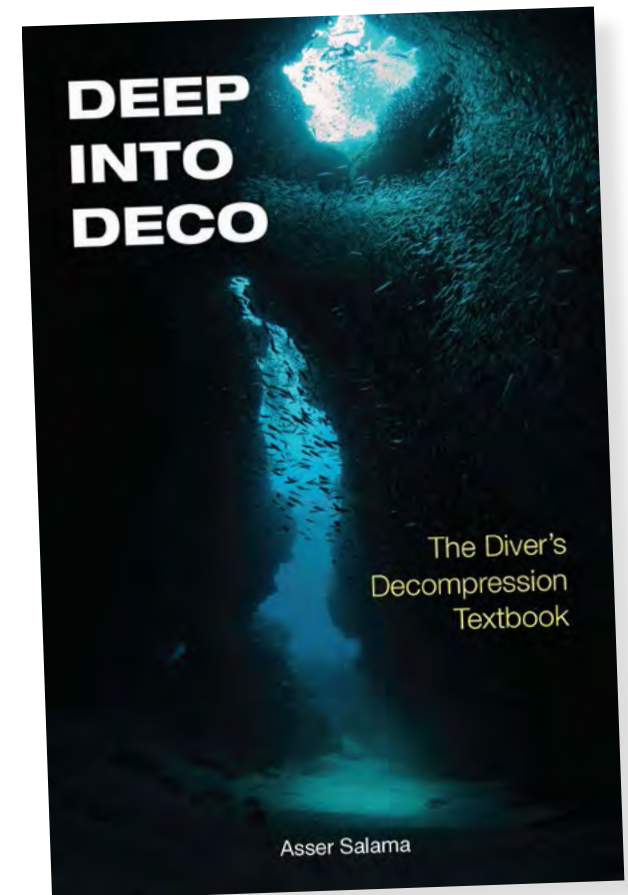


Underwater Babies

Underwater Babies, by Seth Casteel

From dogs to puppies, and now babies. Yes, Seth Casteel's stellar portfolio now has a new subject: babies swimming underwater. Behind the joyful photos of blissful tots in water is the hard work of photo-taking, that took Casteel to 18 swimming schools in 10 U.S. states. He had taken more than 750 photos to get the 67 shots that made the cut for publication. Although a celebration of babies, the book was conceptualised to highlight the importance of water safety for babies. Read more about the photographer in an X-RAY MAG interview here: www.xray-mag.com/content/seth-casteel-portfolio

Hardcover: 112 pages
Publisher: Little, Brown and Company
Date: 7 April 2015
ISBN-10: 0316256501
ISBN-13: 978-0316256506



Decompression

*Deep Into Deco: The Diver's
Decompression Textbook,* by Asser
Salama

Most divers perceive decompression stops are part and parcel of the dive experience. Such a casual attitude to this complex topic is understandable, though it belies the wealth of information and research that has transpired throughout the decades on this essential topic. That's where this book comes in, covering the early experimental technologies to the latest innovations and commercial softwares in today's decompression arena. This book is written free of technical jargon or mathematical equations, making it straightforward and easy to understand. Ideal for anyone seeking a deeper understanding into decompression theory.

Paperback: 120 Pages
Publisher: Best Publishing
Date: February 2015
ISBN: 9781930536791



MERRILL GOSHO, NOAA / PUBLIC DOMAIN

Gray Whale breaching (file photo)

Gray whale made a round trip of 22,500km

The critically endangered Western North Pacific gray whales, one of two distinct groups of gray whale may actually be extinct as scientists track individuals swimming to and from Mexico.

Until now, it was believed there were two distinct groups of gray whale: the Eastern gray whale (EGW), found along the west coast of North America, and the critically-endangered Western gray whale (WGW), found along the coast of eastern Asia. U.S. and Russian biologists say a population living only on the western side of the Pacific may now be extinct.

Scientists attached satellite-monitored tags to seven WGWs on their primary feeding ground off Sakhalin Island, Russia, three of which subsequently migrated to regions occupied by non-endangered EGWs.

Longest migration

A female with the longest-lasting tag visited all three major EGW

reproductive areas off Baja California, Mexico, before returning to Sakhalin Island the following spring. Her 22,511km round-trip is the longest documented mammal migration and strongly suggests that some presumed WGWs are actually EGWs foraging in areas historically attributed to WGWs.

One, not two populations

The finding that three of seven whales tagged off Russia crossed the North Pacific to breeding grounds off Mexico, suggests they may be part of the same population. They include the female, named Varvara by scientists, who made the long migration.

"These whales were almost certainly born in Mexico (the eastern North Pacific)," lead researcher Prof Bruce Mate of Oregon State University Marine Mammal Institute told the BBC. "If this small sample size is typical, it would suggest that [the two populations are one]."

Russia's oil exploration threatens gray whales

The gray whale is found mainly in shallow coastal waters of the

North Pacific Ocean. While the Eastern population has recovered to around 20,000 animals, numbers of the Western gray remain very low with only around 180 individuals left, according to the International Whaling Commission. Scientists at the IWC have raised concerns about the threat of oil exploration in eastern Russia to gray whales in the area.

Russia says it is aware of the problem, but the company's capacity to shift is limited for financial reasons. Western Pacific gray whales (also known as grey whales) come to Sakhalin each summer to feed, and seismic survey work—which involves producing high-intensity sound pulses and studying reflections from rock strata under the sea floor—can seriously disrupt their feeding. The small area where the whales congregate has shallow water, and scientists suspect this is where mothers teach their calves how to feed at the sea floor. ■

SOURCE: BIOLOGY LETTERS

Japan's plan to revive its outlawed whaling hits a snag

Japanese Prime Minister Shinzo Abe last year re-committed the country to pursuing Antarctic whaling after the International Court of Justice decision banned the previous program. A recent report released by an expert panel of the International Whaling Commission stated that Japan failed to provide enough information to determine whether killing more minke whales was necessary to meet the research objectives.

It's 2015. You don't need to be a scientific expert to know there's no need to slaughter whales in the Southern Ocean.

— Patrick Ramage, Global Whales Program Manager, IFAW

minke whales would be killed annually in a 12-year program, meaning a total kill of 3,996—on top of the nearly 10,000 already killed under its scientific permits.

The IWC expert panel acknowledged considerable work had been undertaken to develop NEWREP-A. "However... the present proposal contains insufficient information for the panel complete a full review," its report said. It proposed a new work program by the Japanese, which might take several years, to provide more scientific information before a full review of the program could be completed under IWC rules.

No different

Australia had argued in a submission to the IWC panel that NEWREP-A was no different from the previous Japanese hunt rejected by the international court.

"Japan has added several non-lethal elements to the program in an attempt to make it appear less focused on lethal methods. However in terms of allocating research effort, and likely expenditure, these appear to be subsidiary to the primary goal of lethal sampling," said Australian scientists led by Bill de la Mare of the Australian Antarctic Division.

■ SOURCE: IFAW



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opinion

Divers at bow of HMS *Stubborn* lying in 55m, Malta. Decompression is an additional risk.

Text and photos by Gareth Lock

Admittedly a rather contentious title, but it's supposed to be. Debates over whether diving, or even certain types of diving, are safe sometimes get emotive and heated, depending on the arguments being made. These include: Is closed circuit rebreather diving safe? How much safer is recreational rebreather diving than open circuit? Is cave diving safe? Is recreational diving to 18m on open circuit safe?

The simple answer is—it depends! This article will present a series of arguments so the reader (and diver) can make that decision, as ultimately, it is the diver who is choosing to get in the water and expose themselves to the risks therein. The article will cover some essential definitions and then outline where responsibility could or should lie when it comes to undertaking a “safe” or “unsafe” activity. Note: the article will use figures from the United Kingdom, as these were the easiest for the author to source.

What is the definition of “safe” or “safety”?

“Safety” has been defined as “the condition of being protected from or unlikely to

cause danger, risk, or injury” [Oxford Dictionary]. “Safety” means “the absence of unwanted outcomes such as incidents or accidents”, hence a reference to a condition of being “safe” [Safety I, Safety II: Hollnagel] or freedom from harm or danger [Websters Online]. These sound

like relatively simple concepts, so why is diving safety a problem to define?

The problem arises because of the terms “risk” and “danger”, and the lack of a clear definition of what an acceptable level of risk or danger is. “Danger being defined as the possibility that some-

one will be harmed or killed” [Cambridge Online]. Being underwater is an inherently unsafe environment because without technical or mechanical assistance, the majority of people would drown if they could not get to the surface within a minute or two.

In environments such as aviation, nuclear or medicine, the acceptable level of risk can be relatively well defined. The values are normally determined at a much higher level than the individual organizations involved, either through legislation and standards that need to be



Is Diving Really Safe?

—Weighing Risk & Responsibility





compiled with in order for devices/systems to be certified as safe for use. The assessment of whether an organization or system is safe is done by looking at the legislative or "standard" rate defined e.g. 1×10^{-7} per flying hour for a catastrophic failure and comparing it against the live rate of the organization or system.

In aviation, determining such technical failure rates is relatively easy because of the health and usage monitoring systems in place, plus the logging of flight hours for each aircraft. Whilst the target should be zero, it is accepted that this is not feasible because it would be impossible to predict every possible failure mode and to mitigate it. Furthermore, the inclusion of fallible humans into the control mechanisms to prevent the incident from occurring means that some things

slip through the gaps.

Due to this ability to define rates and the ability to model and cost mitigations, there is a term called As Low As Reasonably Practicable (ALARP), in which the cost of mitigating risk is balanced against the impact of the risk materializing. According to the U.K. Health and Safety Executive or HSE, ALARP is defined as "those standards for controlling risk that HSE has judged and recognised as satisfying the law, when applied to a particular relevant case, in an appropriate manner" [<http://www.hse.gov.uk/risk/theory/alarpglance.htm>].

Furthermore, to be ALARP, there needs to be a disproportionate cost of putting that control or mitigation in place compared to the cost of the failure; disproportionate is hard to define and more information is here (<http://www.hse.gov.uk/risk/theory/alarpcba.htm>) but has been suggested to be between 2 and 10 times the costs involved. So, over the life of a program, if there was expected to be one person killed, and the cost of human life being in the order of £300k per additional year of life to £6.0M per life [U.S. figures http://en.wikipedia.org/wiki/Value_of_life#Estimates_of_the_value_of_life], mitigations would need to cost more than £600K to £60M to implement (for the human life costs alone).

Now, consider sport diving, defined in this context as recreational or technical diving (Open Circuit, Closed Circuit or Semi-Closed Circuit) which is not military or commercial (e.g. civilian, offshore, air, surface-supplied, saturation, bell), but includes instructional and training dives. Fundamentally, there is no single overarching organization—which effectively

manages at a global-level—sport diver training, the standards which are delivered, or the acceptable injury or fatality rates during these activities. Furthermore, much of sport diving takes place outside of any directly managed or supervised structure. Therefore, there is no organization responsible for this sector of diving. Without an organization or legislature to define what is acceptable, some unsolvable questions arise:

Sometimes dives don't go to plan and a rescue has to be effected. Make sure that skills are current and well practiced, you don't know when they will be called upon.

What is the definition of "practicable" within ALARP if you don't know what the rate should be?

What should be done to get it down to that (undefined) rate if you don't know the most prevalent issues?

How much should be invested to make things "safe" if "disproportionate" is also not defined?

What is risk?

Risk is defined by the UK HSE as "the likelihood that a hazard will actually cause its adverse effects, together with a measure of the effect". The most basic and obvious "adverse effect" would be a fatality. Although this is the easiest to define, it is fortunately also one of the least likely to occur. As a re-

Safe Diving

sult, the numbers are small; In the United Kingdom between 1997 and 2014, diver fatalities has been between 10 and 24 per year.

Diver Alert Network (DAN) has reported the annual case intake (mean±standard deviation) for the 20-year period from 1989 to 2008 was 89 ± 12 , with a range of 67 to 114 cases. Other adverse events could include decompression illness (DCI), uncontrolled buoyant ascent, entrapment/entanglement, out of gas, oxygen toxicity or hypercapnia.

To understand the term "likelihood", we need to know the background rates: the divers per year, dives per year, hours under-



Stern of HMS *Stubborn* lying in 55m. Some divers have tried to enter this wreck!



Penetration dives incur additional risks but can be completed safely if risks are known and understood

water per year. Unfortunately, we don't really know the number of active divers in the United Kingdom. However, fatality per diver per year is not too useful either, as we need to understand "exposure" as that influences the likelihood of the risk materializing e.g. a 10-minute 12m dive has less exposure than a 100m 5-hour closed circuit rebreather (CCR) dive in

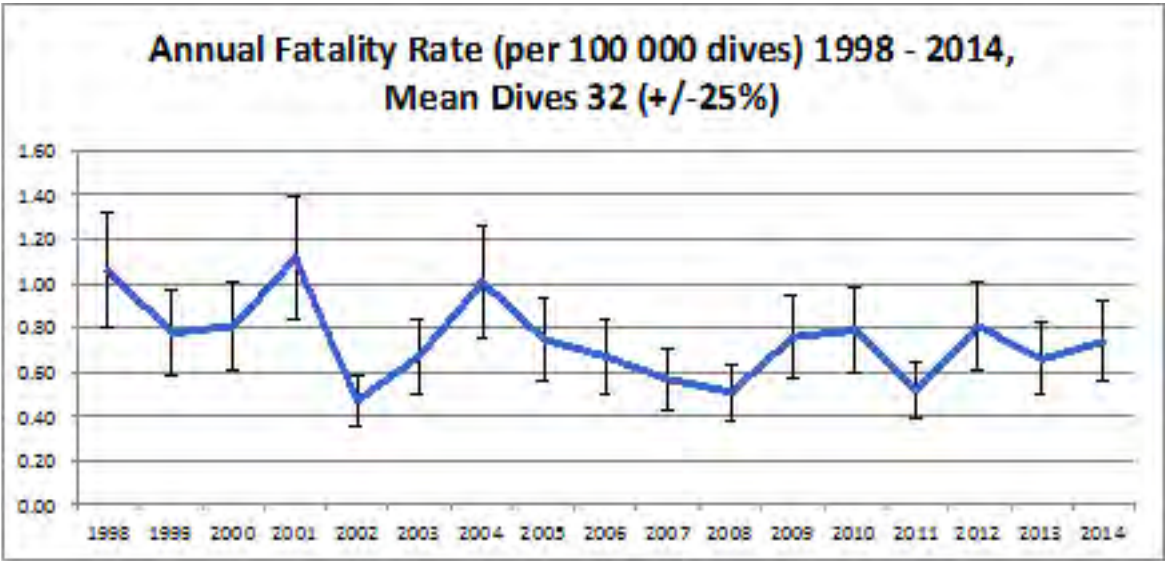
3°C water. So exposure could be dives per year, or hours underwater, but environmental factors influence likelihood, too.

Consequently, we don't really have an effective or accepted rate. Graphs 1 and 2 (below) show this in more detail, covering fatality and DCI rates respectively.

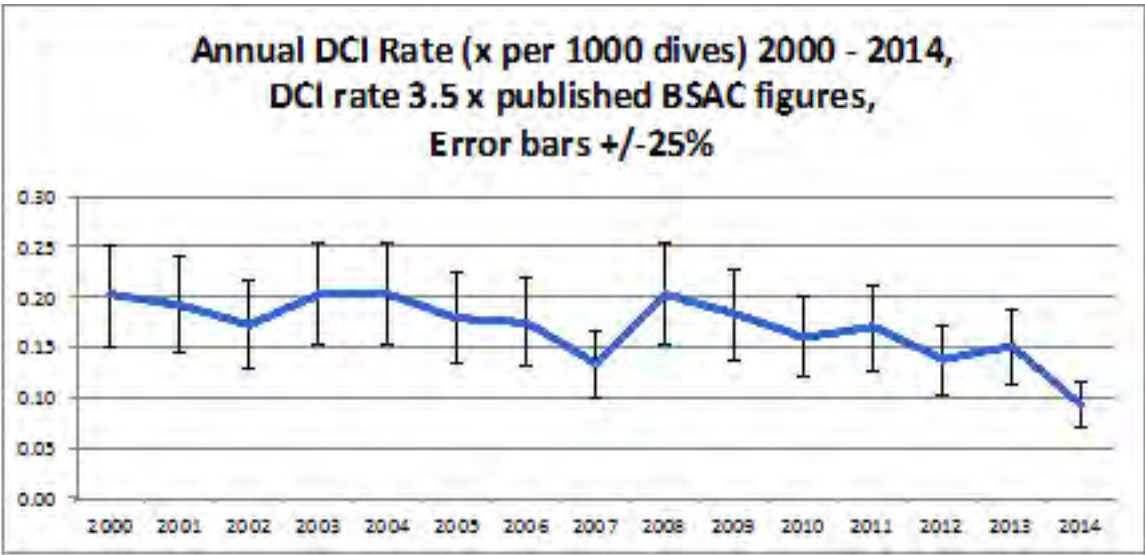
The annual fatality rate per year per

100,000 dives between 1998 and 2014 is shown with 25 percent error bars based on a mean of 32 dives per year (British Sub-Aqua Club, or BSAC, calculated 32 dives per year from an unpublished 2007 study). A U.K. diving population of 70,775 to 67,559 was extrapolated using BSAC membership and a sliding scale of 66 percent to 43 percent based on figures from Paras 1997 report and BSAC's DAN Fatalities Conference report from 2010.

The DCI rates are based on BSAC figures for each year (2000–2014) multiplied by a factor of 3.5. This 3.5x factor is based on DCI figures from BSAC in 2010 and divers treated by British hyperbaric chambers in 2010. These figures are comparable to Diving Diseases Research Centre (DDRC) figures [St Leger Dowse, M., Bryson, P., Gunby, A., & Fife, W. Comparative data from 2,250 male and female sports divers: Diving patterns and decompression sickness. *Aviation, Space, and Environmental Medicine*, 73(8), 743-9] from 2002 which gave a DCI risk of 0.293 (female) and 0.119 (male) per 1,000 dives. Surprisingly, when looking at using the population size from the BSAC reports, this equates to a mean DCI rate of 1:191.3 per diver per year (SD 46.5, range 153.5 to 338.6).



Graph 1



Graph 2

Dr Andrew Fock's research assessed CCR fatality rate to be between 4 to 10 times the recreational fatality rate. In his paper, he quantified this by stating that this was not an accurate figure because the quality of data was poor [<http://www.ncbi.nlm.nih.gov/pubmed/23813461>]. So, whilst there is an increase of 4 to 10 times of a CCR fatality compared to open circuit (OC) recreational and technical diving (impossible to split apart), we are still talking small numbers.

Assessing risks

Whilst there is a calculated fatality rate per 100,000 dives of 0.469 to 1.118 and a DCI rate of 0.092 to 0.204 per 1,000 dives, there is considerable evidence that humans are very poor at assessing risks and what it means to us. For instance, in Daniel Kahneman's *Thinking, Fast and Slow*, he shows that we regularly underestimate the risks involved in undertaking an activity. He gave the example of "clinicians who were 'completely certain' of the

diagnosis [but] were wrong 40% of the time". So, we either can't comprehend the values or we choose to ignore them because we don't think they apply to us.

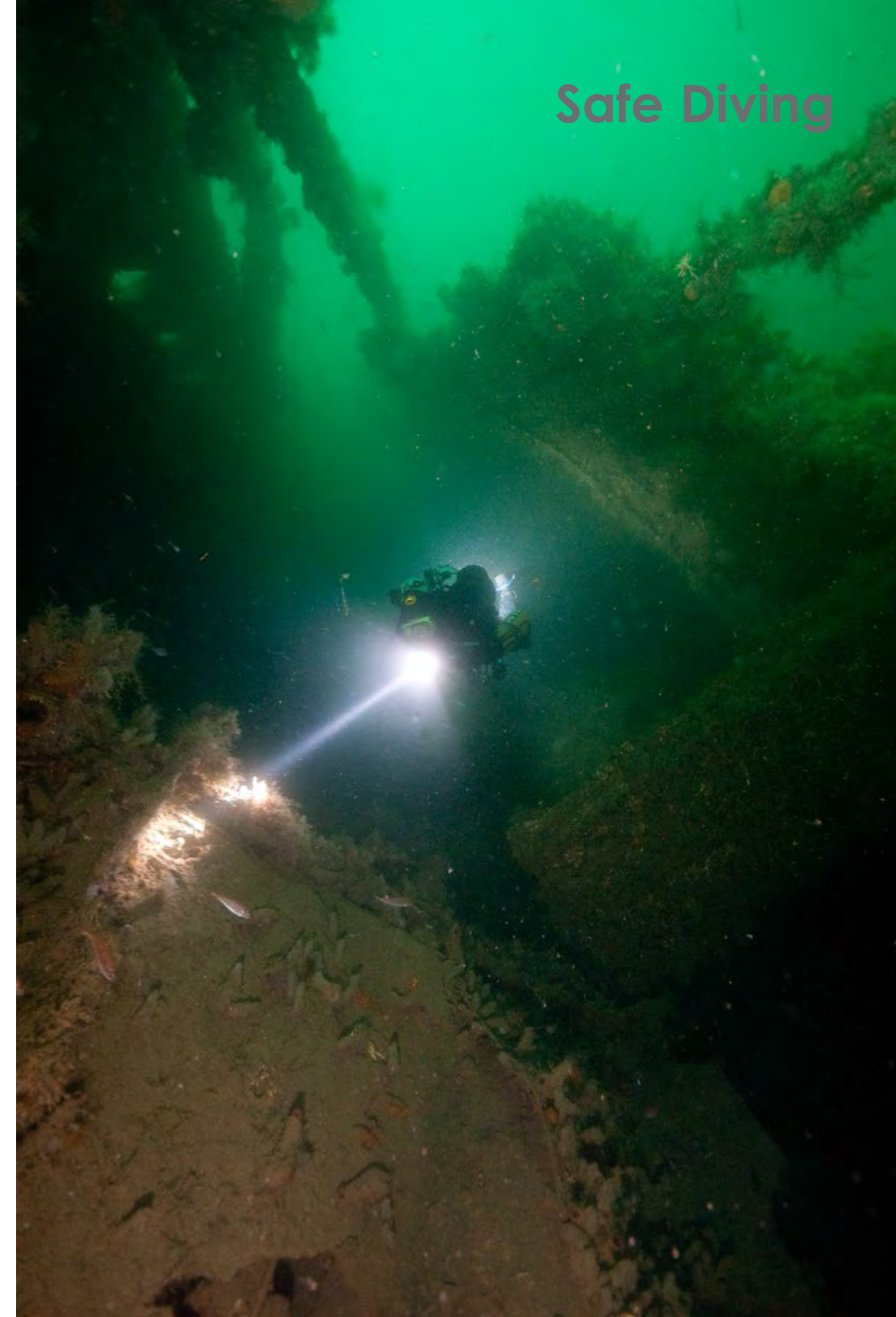
Unfortunately, due to the "noise in the system" (i.e. variability in fatalities per year), fatality rates are not a good measure of risk and trying to ascertain whether the risk is going up or down based on behaviors or interventions. So, why not look at another adverse outcome, such as DCI? As seen earlier, the possible variation in rates, physiological factors (fitness, body fat/muscle, body temperature, hydration), technical factors (gas choice, ascent rates, decompression algorithm, thermal protection) and environmental factors (temperature, workloads) all impact DCI likelihood, so assessing meaningful DCI risks is also very hard.

If the risks can't be quantified at an individual level, and organizations don't necessarily describe their risk appetite or aversion, how can we assess the risk of diving?



opinion

THIS PAGE: U.K. diving poses additional risks to blue water destinations—temperature, reduced visibility, harsh weather; Make sure that skills are current and well practiced (below)



Safe Diving

What is safe then?

If we have assessed safety to be dependent on the absence of or the effective management of risk, and the definition of an acceptable level of risk comes from an organisation or an individual, is diving safe or not? Corporate risk acceptance/aversion is predominantly defined by the level of reputational or commercial risk they are willing to undertake if a fatality or adverse outcome occurs. This is similar to how other organi-

sign to say that they know and accept the risks they will face. Doing so means they have no comeback on the organization should an accident occur. Thus, the risk is transferred from the organization to the diver. However, we have previously said that defining the likelihood of those risks is nigh or impossible in quantitative terms (or even qualitative terms, as one still needs figures to create relative comparisons).

Complicating matters further

zations play the numbers game in terms of investment required versus the likelihood of the risk materializing.

One way organizations try to manage risk is the use of liability waivers which divers

is the person's level of acceptable risk. This is influenced by a number of factors, not least, how risk-averse or risk-seeking they are, which in itself is influenced by their own and immediate peer's knowledge, skills and attitude. If a diver has been shown serene scenes with very few complicating factors like poor visibility and/or entanglement/entrapment hazards, their perception of risk would be very different to if they had been shown the outcome of a rapid ascent with severe DCI or a dead diver. Fortunately fatalities are rare, but that doesn't mean the risk is not present; DCI, out of gas, uncontrolled buoyancy ascents are certainly more common and all could lead to a fatality were it not for the resilience of the human body.

Another factor influencing risk perception and acceptance is risk homeostasis, whereby personal risk-seeking values remain unchanged despite additional safety-improving technologies being introduced. So, as technology such as CCRs allows risk to be managed more effectively for

deep or long dives, the duration that divers spend underwater now are massive compared to 15 to 20 years ago e.g. sub-100m diving or dives in excess of five hours are now not uncommon.

Whilst the likelihood of a risk materializing can be modeled and contributory factor scores applied, an absolute figure cannot be calculated, nor can "acceptable" be effectively defined. I have been asked if my PhD research could be used to develop an algorithm for the lay-diver to determine the likelihood of an adverse outcome if they entered certain values. The obvious answer is no!

What individual divers can do is to effectively manage their risk by following best practices for their peer group and to encourage their peers to do the same. Individuals are likely to "drift" from the norm if left to their own devices. However, if a group works together at maintaining alignment with best practices (e.g. stopping bad habits when they occur), then individuals are less likely to drift.

As a result, high-performing

teams/individuals can take on more risks because they communicate well, have good team situational awareness and trust each other to call off the dive if needed, etc.

So, is diving really safe?

The simple answer is yes. However, for it to be safe, as an individual,

you need to be proactive in both understanding the risks that are out there and actively managing them to reduce them to what you would consider to be an acceptable level. That means:

- Take personal responsibility. Don't just trust someone else to own the risk for you—you are the





Divers (above) recovering ghost nets from the *Maine*, United Kingdom. Care must be taken to ensure divers don't get entangled whilst undertaking this activity.

one getting in the water, and the one who needs to breathe and ascend to the surface if something goes wrong!

- Allocate a portion of your diving time to skills maintenance and/or development so that when something unexpected happens, you are better prepared. Skills development is not just about doing a course, it is about actively practicing what you learned afterwards.

- Conduct effective briefs that cover both the plan and some "what ifs", so you are better prepared for 'Murphy' if he shows up.

- Conduct effective debriefs focussing on what went well, why it went well, and what could be done to improve the situation the next time.

- If you have had an adverse event (see sidebar for possible definitions of adverse events), consider submitting a report to organizations like DISMS, DAN, BSAC, so others can learn from your experience. It's indeed better to learn from someone else's mistakes or accidents than to make them yourself.

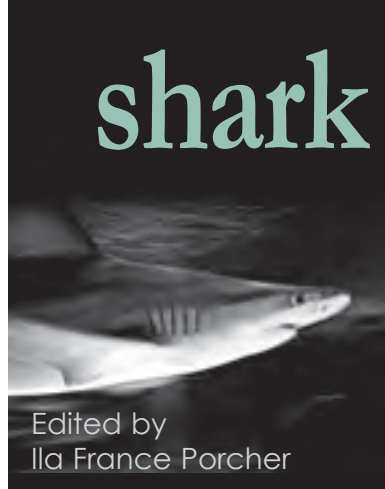
- Develop your "team" diving so you can help each other out. That isn't just about when things go wrong on the dive, but pre-dive, during the dive and post-dive, you are able to spot something happening and correct it. You will be amazed about what you did without realizing it because you are potentially focused on your own activities. External feedback is essential if you are to improve your performance and safety.

Finally, it is your personal responsibility to understand and manage the risks of diving; don't undertake "trust-me dives"—the person you are diving with is not necessarily the only one who is going to get hurt or killed if something goes wrong. Prevention is much better than reaction when it comes to safety! ■

*Gareth Lock is an accomplished technical diver based in the United Kingdom. Recently retired from the Royal Air Force, he is now teaching Human Factors in the Oil & Gas sector. Lock is also undertaking a part-time PhD examining the role of human factors in scuba diving incidents. For more information, visit the Cognitas Incident Research website at: **Cognitas.org**.*

INCIDENT DEFINITIONS

- Running out of air/gas on a dive
- Surfacing at the end of a dive with less than 50bar in your cylinder (or whatever your agency's minimum "end gas" is). Could also be large discrepancies in gas pressures when running independent twins or sidemount.
- Becoming entangled or entrapped during a dive; this could be due to fishing lines, nets, dSMB lines, inside a wreck or caves.
- Uncontrolled Buoyant Ascent
- Unplanned separation which ends in a solo ascent. (Planned solo dives and/or planned separation do not count).
- Hyperoxia. Defined as: the diver suffers an Oxygen toxicity (OxTox) event/seizure, or the CCR has a pO₂ above the planned maximum set point which was not demanded or anticipated by the diver. (During ascent/descents, high/low pO₂ may be encountered but this should be expected.)
- Hypoxia. Defined as: an OC diver breathes a gas with a pO₂ less than 0.18 underwater, or the CCR has a pO₂ less than .7 which was not demanded or anticipated by the diver. (During ascent/descents, high/low pO₂ might be encountered but it should be expected.)
- Hypercapnia. Difficult to technically define but any symptoms or signs of overexertion, excessive uncontrollable breathing rates or scrubber breakthrough
- Major equipment problem e.g. dSMB locking/jamming, BCD inflator failure, regulator uncontrolled freeflow, unable/forgot to ditch weight belt or a problem on CCR which forces a bail-out and end dive
- Mild to severe DCS. Defined as: having numbness and tingling, muscular weakness, pain, fatigue, dizziness, visual problems, vertigo, nausea, loss of consciousness or skin changes [Mitchell/Doolette/Vann/Wacholz, 2005]
- Major Narcosis (N₂ or CO₂): Defined as noticing significant reduction in motor skills, awareness and memory ■



Edited by
Ila France Porcher

Lemon
shark
in the
Bahamas

Text by Ila France Porcher.
Photos courtesy of Dr Samuel H.
Gruber, Andy Murch, Peter Symes,
Diego Garcia (Discovery Canada,
Daily Planet)

Samuel H. ‘doc’ Gruber began studying sharks in 1961, perhaps before any other scientist had done full-time research on a living shark. During his long career, he founded the Bimini Biological Field Station (Shark Lab), the Shark Specialist Group of the International Union for the Conservation of Nature (IUCN), a United Nations organization based in Switzerland, and the American Elasmobranch Society. He has published over 200 scientific papers, and his work is still ongoing today. This is part three, the final installment of the story of his work and life.

Since his riveting meeting with the hammerhead shark at the age of 20, Gruber had focused on trying to learn all he could about sharks. Yet his interest had not extended to conservation. But already when he wrote his doctoral dissertation in 1968 he knew that sharks were in trouble. By the time the ‘60s passed into the ‘70s, some scientists were unsure whether or not they could ever be

sustainably exploited.

By 1979 he had established a research site where he pursued his studies on the needs of young, growing lemon sharks. Using nets, each year he would catch between 100 and 120 baby lemon sharks in a shark nursery called Coupon Bight, in

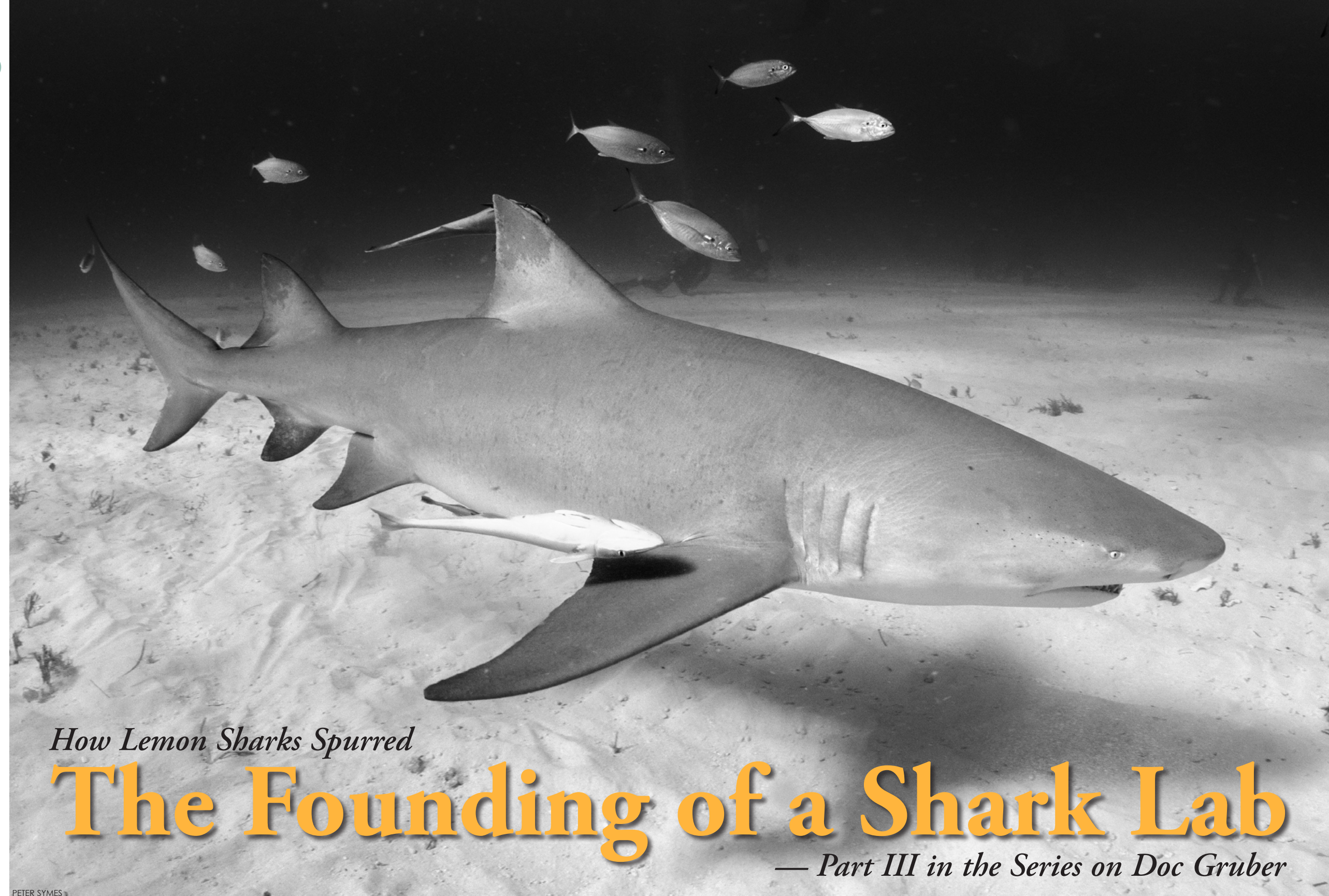
the Florida Keys. He would examine, tag, and release these baby sharks again. But after several years, in the early ‘80s, this number began to fall. In three years it fell from 100 sharks to zero. He could not find a single lemon shark pup in Coupon Bight.

That was when it became personal. He knew that lemon sharks were in deep trouble now, because he had personally observed and recorded their disappearance.

Gruber felt personally angered. Not only was his careful work during all of

those years wasted, but the loss of the entire local population of sharks by gill-net fishing seemed an inexcusable excess.

He found out that the pups had been lost to overfishing. Fishermen had been going there to get the little baby sharks



How Lemon Sharks Spurred

The Founding of a Shark Lab

— Part III in the Series on Doc Gruber

PETER SYMES





PETER SYMES



during a period of about twenty years, and had fished them all out. The mothers who should have returned to have more babies never got the chance to grow to maturity because they were killed in the place they were born.

Research at Bimini later revealed that the mature females return to their birth-place to bear pups, so after about 12 years if no lemon sharks are permitted to grow to maturity, there will be no new cohorts of lemon shark babies born. This is what happened in the Florida Keys, and why his study population fell to zero. The rapidity with which a local population could be destroyed was stunning to him.

Thus, he began to write about what he had seen, and the word got around, because he wrote some scathing articles about the overfishing of sharks.

Founding the American Elasmobranch Society

Gruber founded the American Elasmobranch Society in 1983. At the time, he remembers, there was great interest on the part of scientists to get funding to study sharks. But it was very difficult to get a grant to study, and his colleagues wondered how to go about it, particularly when Gruber received such grants regularly. Gruber didn't know

how he did it—perhaps it was just his luck. At the time, in the early eighties, he was no longer funded by the Navy, but had remained good friends with his scientific officer, Dr. Bernie Zahuranec at the Office of Naval Research.

In 1981, there was a meeting on great white sharks, hosted by the California Academy of Sciences. This was the first meeting of its kind, and everyone who was interested in white sharks attended.

During the sessions, Gruber was approached by a group of colleagues, who told him that they wanted to get together form a society to generate interest in getting shark research funded. There was a meeting at the poolside with Dr. Zahuranec, Dr. Don Nelson, and Dr. Leonard Compagno, and they all put forth their ideas, and hashed out what it would take to establish an academic society.

Afterwards, though he was still fighting his cancer with toxic chemotherapy, Gruber worked on the plan. He produced by-laws, contacted everyone by letter, telephone, or fax, (there was no e-mail or Internet back then) and eventually he gathered together the group and they commissioned him to go forward.

They all said, "Yes we want this, we will support your plan," but it mostly verbal as Gruber recalled. It was basically a one-man operation, but Dr. Zahuranec was very encouraging and helpful.

Finally, in 1983, with the help of his father, Sidney, who was a banker, and his brother, Herbert, Gruber founded and incorporated the American Elasmobranch Society in the State of Florida and later was granted non-profit status. He funded it with his own money. With the assistance of Dr. Zahuranec, Gruber even donated 11,000 dollars to the foundation—in the eighties that was

a lot of money—to set up a fund for students who submitted the best research papers at the annual Society meeting. It is still in place today, and is called the Gruber award.

Gruber ran The American Elasmobranch Society for five years, by which time it was well established, and he could hand it over to others who would keep it going. Now, 32 years later, with over 500 members from around the globe, it is the largest society dedicated to shark research in the world.

The Shark Specialist Group, of IUCN At the 1991 annual meeting of the AES in

New York city, a gentleman from Species Survival Commission, of the International Union for the Conservation of Nature, (IUCN) got up in front of the large audience and announced, "Will Dr Gruber please come up!"

His name was George Rabb and he was the chairman of the Species Survival Commission (SSC), a science-based network of volunteer experts from around the world. The SSC is the group which sets up the IUCN specialist groups. Its goal is the achievement of "A just world that values and conserves nature through positive action to reduce the loss of



PHOTO COURTESY OF DR SAMUEL H. GRUBER

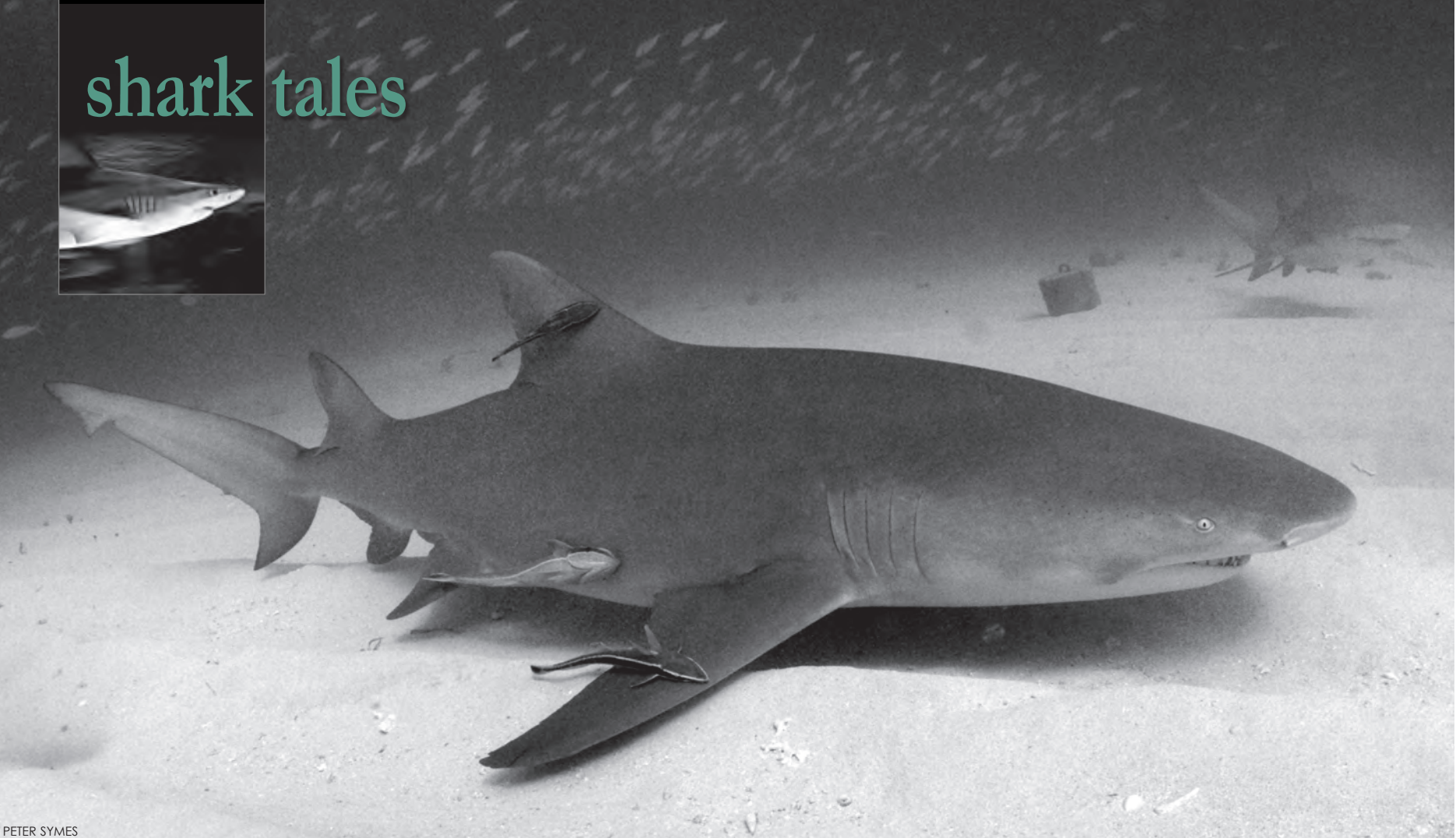
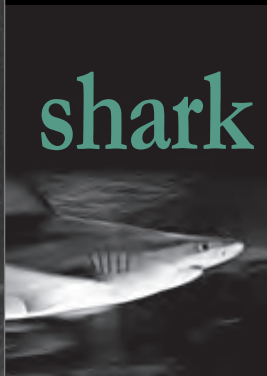
Doc Gruber loves lemon sharks



DIEGO GARCIA / DISCOVERY CANADA / DAILY PLANET

Gruber feeds hammerhead shark (above); Lemon sharks in the Bahamas (top)





PETER SYMES

Lemon
shark in the
Bahamas

Shark Lab

appears on Discovery and BBC Natural History shows, in his personal mission to help change public attitudes to these maligned and misunderstood animals.

During a recent filming for Discovery, he dove down to hand a fish to a large, circling hammerhead, and remembered again his dramatic meeting as a young man, with the majestic shark that had inspired his career.

At that time, like everyone else, he had never doubted that sharks were insatiable killers. There had been so many stories about them coming out of WWII, when sharks had devoured the crews

of sinking ships, and planes that had ended up in the ocean, that everyone believed that they were the horror of the ocean. In 1958, there was one over-arching theme in the public attitude to them—the only good shark is a dead shark.

But during his dramatic meeting with the hammerhead, in spite of his fear, he had felt a deep need to find out something more about them. After all, many animals are predators, and even a cow will kill in the right situation. During the intervening decades, he has found out about them, and what he has learned, is that it was all wrong. To think that sharks are the devil-fish from hell, was wrong from every

diversity of life on earth."

Rabb began a presentation on the need to protect sharks from further decimation through the establishment of a Shark Specialist Group, and declared that Gruber ought to be the one to take charge. An astonished Gruber asked if he had the right person in mind, since he knew nothing about conservation, but Rabb had looked at Gruber's work, and was convinced that he did. So Gruber agreed to give it a try.

With his usual intensity, he threw himself into the work. Systematically, he built it up, got the right people involved, and established networking groups around the world. He worked as

director of the new Shark Specialist Group (SSG) for five years, and got it up and running, until it was able to go on by itself.

Gruber saw his role as an instigator—he was the person who had an idea, and who went for it—who got things started, and then handed them over to those who were better at running them. It was characteristic of him to make a decision, and then drive ahead as if there was no turning back—he knew only one way to go, and that was forward. Always he had a strong spirit and an iron will, to go ahead and accomplish what he had in mind, no matter what it took.

It was the same when he went to military prep school.

Though he found it hard, very hard, he was determined to make it no matter what it took—there was no turning back. He went ahead and did exceptionally well. That was characteristic of him.

The great hammerhead shark revisited

Though long past retirement, Gruber continues to savour every moment of his life. He is still involved with research at Bimini, and on free afternoons, enjoys himself flying in vintage WWII aircraft over the blue seas of Florida and California.

He is often interviewed by the media on the subject of sharks, and appears regularly on National Geographic, where he holds the position of NGS Explorer. He also



ANDY MURCH

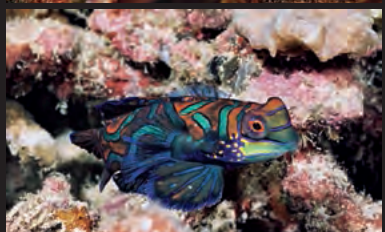
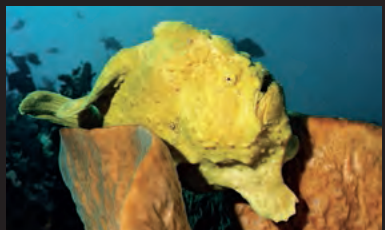
Hammerhead shark



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shark tales

Lemon
shark
in the
Bahamas

point of view.

"Sharks are not man-eaters or woman-eaters, he declares. "If you want to find a man-eater, you have to look at the Nile crocodile, which kills and eats upwards of a dozen victims year, or Bengal tigers, which stalk humans in the Sundarband (India) tiger reserve and kill an average of 23 people a year, year in and year out.

"Sharks kill a few people,

but compared to most everything else, they are not even on the radar.

"Originally, our understanding of the role of sharks was that they would eat you and so they should be killed. Not only the lay public, but many



PETER SYMES



DIEGO GARCIA / DISCOVERY CANADA / DAILY PLANET

Gruber feeds hammerhead shark

of the most important marine scientists believed that. Fifty years later, when we have come close to succeeding, we have found out that the role that sharks play in the ocean is so crucial, that we are turning the ocean into a sick ocean by killing them.

"In fact, the only good shark is the one that is swimming around outside the reef taking care of the environment for us, and keeping it cleaned up. There has been an 180 degree turnaround in thinking about the role of sharks. Gruber is grateful

to the various conservation societies, such as PEW, for protecting sharks. They are doing a wonderful job, and he hopes that this change in the public attitude towards saving sharks has come in time.

This time, when he dove down towards the great circling hammerhead, he felt no fear, because he knew that there is no real concern about such a shark attacking a person in the sea. There may still have been doubt about that even 12 to 14 years ago, but now, he is sure of it. As he handed the fish to the shark he was aware only of its streamlined beauty, and felt the deep familiar thrill, just to be there, with the shark.

"Sharks are very smart," he said. "They learn quickly, and they are only interested in the food you bring."

Sharks and the ocean

Sharks have been evolving for

half a billion years, separately from all other vertebrates, so they represent an ancient, and very different, evolutionary line of animals.

"Though they are commonly referred to as fish, in fact, they are as different from fish as a frog is different from an elephant," Gruber explains. "Their internal fertilization has produced a completely different life history strategy—sharks operate more like sea turtles and whales than they do like fishes in their strategy of birth and fecundity and their maternal investment in the babies."

"Because of their long and independent evolutionary history, sharks have developed very highly evolved organ systems. Their heart is more like a mammal's than a fish's, their kidneys are more like a mammal's than a fish's, and their brains are large, correlating with their learning capabilities. Their behavioural repertoire is

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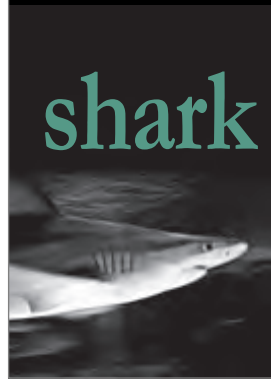
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shark tales

Shark science pioneer and founder of the Bimini Shark Lab, Samuel H. 'Doc' Gruber (right); Diver with lemon shark in the Bahamas (below)



PHOTO COURTESY OF DR SAMUEL H. GRUBER

very complicated with regards to such things as mating and courtship—things we know nothing about—much more complicated than what we see in other fish-like vertebrates."

During this long evolution, sharks survived many extinctions, and each time, they adapted to the niches left by the species that died out. Repeatedly they took advantage of the extinctions because niches opened for them to fill—this is called adaptive radiation.

This was how sharks evolved many forms, including the hammerhead, and display great diversity. The hammerhead shark has turned out to be a very modern species, having evolved in just the last thirty million years. It is an apex animal in every way—in terms of size, social behaviour, feeding, bio-chemistry, and biology.

Contrary to common belief, not all sharks are top predators—some

are bottom feeders, some eat fish. The largest sharks, such as the whale shark and the basking shark, are filter feeders, while others eat whales. They have adapted to a wide variety of niches, from the sunlit shallows, to the depths of the abyss, and their influence is felt from the top to the bottom of the ocean's food chain.

The ocean has developed sharks, and they have been shaping its ecology since life emerged from the oceans, back near the beginning of vertebrate history. They were the animals successful enough to survive extinctions, while other species died out. And yet, we have specifically targeted them, and are driving them right into extinction. Out of hate, or for their fins and other frivolous products, we are killing the very fabric of the ocean ecosystems.

So Gruber's final word is a warning. The killing must stop, or one

day we may find that by killing off the sharks, we have destroyed the ocean's vitality. Its ability to continue to play its role as part of the life-support system of our earth will certainly be impacted. ■

Ila France Porcher, author of The Shark Sessions, is an ethologist who focused on the study of reef sharks after she moved to Tahiti in 1995. Her observations, which are the first of their kind, have yielded valuable details about their lives, including their reproductive cycle, social biology, population structure, daily behaviour patterns, roaming tendencies and cognitive abilities. Her next book, On the Ethology of Reef Sharks, will soon be released.



PETER SYMES

Turks and Caicos ban shark exports

Text by Rosemary E Lunn

Amendments to territorial fishing regulations will ban the export of sharks from Turks and Caicos Islands beginning 1 July 2015.

Many shark species make their homes in waters around the Turks and Caicos Islands. These include silky and lemon sharks, which the International Union for Conservation of Nature considers Near Threatened with extinction, and thresher sharks, which are listed as Vulnerable.

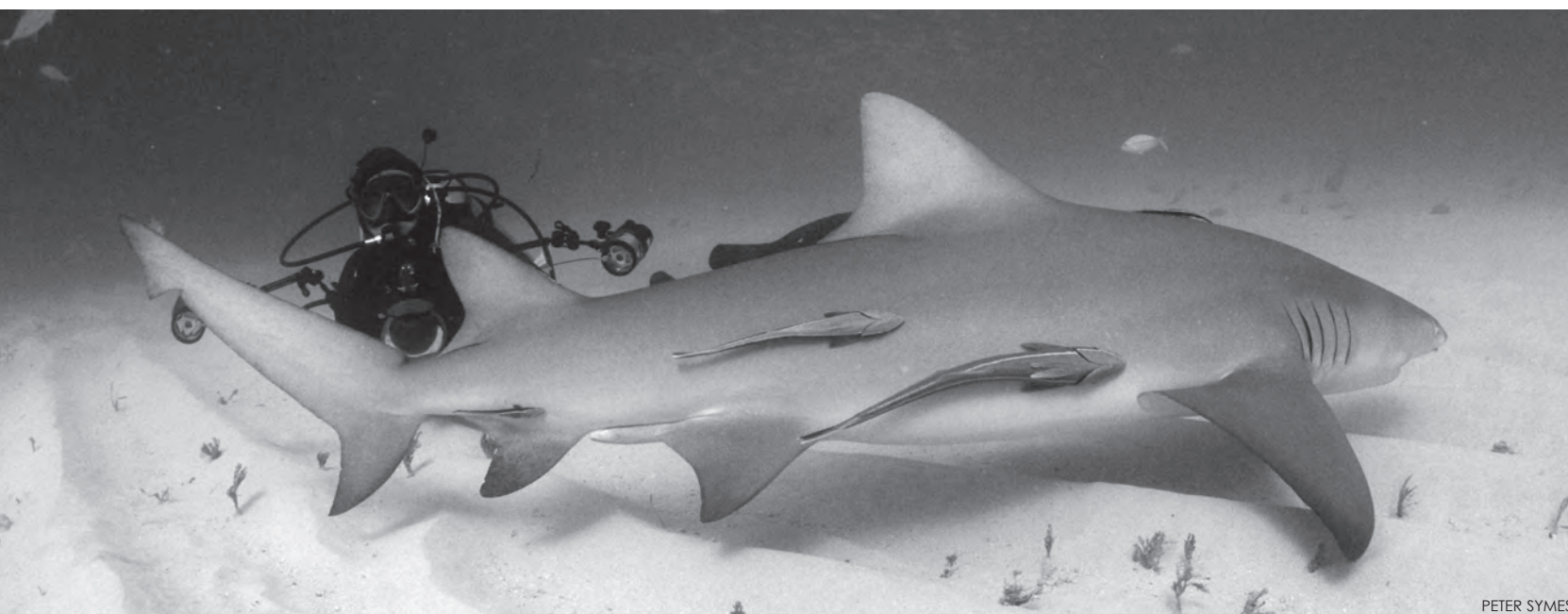
By regulating the variety and abundance of other marine species in the food web, these local sharks play vital roles in maintaining the health of critical coral reefs. Without them, these beautiful and diverse marine areas risk becoming degraded.

"This export ban is a great first step in restoring depleted shark populations to the waters of the Turks and Caicos Islands. But there is still work needed to fully safeguard sharks here and across the Caribbean," said Angelo Villagomez of The Pew Charitable Trusts. ■

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PETER SYMES





shark tales

Researchers measure a whale shark in the Maldives. Photo by Melody Sky Photography

Text by Ila France Porcher

In the Maldives, the whale shark—the world’s biggest shark—adds value to paradise. Three percent of global shark wildlife tourism money is spent just viewing whale sharks in the Maldives.

A study by scientists of the Maldives Whale Shark Research Programme (MWSRP) revealed that a small group of whale sharks in a single Maldivian Atoll accounts for nearly 3% of the global shark eco-tourism and nearly half that of the Maldives. But the impact of this majestic and charismatic animal on the economy of the island nation of the Maldives was largely unknown.

“The Republic of Maldives hosts one of few known year round aggregation sites for whale sharks,” said James Hancock, co-author and a director of MWSRP. “We have seen that they have become a major tourism draw to South Ari atoll, but we didn’t expect these big numbers.” The South Ari atoll Marine Protected Area (S.A.MPA) alone attracted 77,000 tourists in 2013. This equates to US\$9.4 million in direct income to operators who offer the chance to glimpse the magnificent creature.

This is the first value that has been attributed to what is a burgeoning industry in the Maldives. It is also the first time that a valuation for a

wildlife viewing experience has been calculated exclusively from observational studies.

“Instead of surveying tourists and extrapolating results, we actually went out and counted how many boats and people were in the water looking for sharks,” said Neal Collins, a joint researcher from IUCN and MWSRP, and one of the authors of the study. “By doing so we were able to estimate not only how many people were interacting with the sharks, but also where and how they do it,” added co-author Fernando Cagua.

“When we include the whale sharks from South Ari Atoll, we were able to adjust previous estimates of annual ‘shark related’ tourism expenditure in the Maldives from US\$12 million to nearly \$20 million,” said Fernando. “There are still many mysteries about these whale sharks—we don’t know why they come here or for how long they stay—but bringing the money issue to the table is an important step towards ensuring their conservation.”

Though the South Ari Atoll Marine Protected Area (S.A.MPA) is the most popular whale shark viewing region in the Maldives, this area is as yet unregulated. The study highlights how the implementation of a management plan which safeguards the aggregation site, would reduce the possible economic impact that would result from the sharks leaving the area due to stresses from the attention they receive.

The S.A.MPA was first designated in 2009, and at 42 square kilometers, it is the largest protected area in the Maldives. An accepted management plan was not reached at the original

time of designation, so the study has proven timely, as consultations with local communities and tourism industry representatives have again begun, with a more determined effort to create a world-class whale shark tourism destination.

“In a sense the whale sharks here are perfect for wildlife tourism. They are the largest shark in the world and the slow moving, shallow swimming behaviour they exhibit in S.A.MPA waters makes them accessible not just to scuba divers but also to snorkel excursions. This opens up an incredible wildlife experience to just about everyone, which of course

brings with it a degree of risk in terms of the welfare of both the sharks and the tourists,” said Richard Rees, director of MWSRP. “The encouraging thing is that everyone in the industry we talk to agrees these risks need to be managed and the local communities are receptive to participating in the management of the area,” he added. ■

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REES, R. PRESS RELEASE, MALDIVES WHALE SHARK RESEARCH PROGRAMME (MWSRP)



Whale sharks add value to Maldives





tech talk



JOEL SILVERSTEIN

With 23 years of hindsight...

Set Theory

— A Look at Rigging Options

—The following article is reprinted from the pioneering American journal for technical diving, aquaCORPS, V4, MIX, January-February 1992.

Edited by Michael Menduno
Photos courtesy of Lamar Hires,
Bob Janowski, Michael Menduno,
Tom Morris and Joel Silverstein

Though double (twinset) tanks and stage bottles are generally a requirement for most technical diving operations, diving sets vary significantly depending on the specific application and diving environment. Here's a look at some of the more common methods of set rigging as practiced today in the "doubles community."

Diving in little places

Modern equipment is designed to make diving in an overhead environment as safe as possible. Redundancy is the key to conducting these operations. The question becomes, "How do I rig this?"

A few years ago, the Hogarthian Concept—"dive as simple and clean as possible"—was introduced to the underground. Hogarthians had a number of specific ideas, which created a furor in the cave community,

but got people thinking. Though some of the ideas were rejected, the concept is valid and has been implemented in various ways by members of the community.

Equipment is never rigged externally on the sides of tanks, and nothing, in particular the long hose, lies above the manifold crossover bar. All split rings are removed so as not to create a line trap, and so is anything that can foul or break delicate cave formations; many are more than 13,000 years old and can never recover.

The Submersible Pressure Gauge (SPG) is secured to the inside of the wrist as are other instruments. Reels and back-up lights are rigged to D-rings at the shoulders and as close to the back plate as possible on the

waist straps using short tethers.

Pouches mounted on the waistband are used for carrying smaller items such as a line cutter, slates and tables, and line markers. The back up second stage regulator is secured by a piece of surgical tubing that is worn around the neck.

Rigging completed, there is no substitute for technique. In order to protect the cave, diving in small fragile places requires the finesse and the brainwork of a technical climber. Like their free hanging counter-parts, divers relay on a series of 'moves' rather than brute force. And the edge is never more than a breath and prayer away.

*— E.J. 'Lalo' Fiorelli
Soquel, California*



T. MORRIS

Captain Billy Deans—a wreck and technical diver and one of the early pioneers to use trimix for deep diving





T. MORRIS

Lamar Hires of Dive Rite pioneered sidemount diving in caves. Today, recreational divers have adopted this style of diving and sidemount in open water.

Squeezing by

Originally developed for the tight low visibility sump diving that is common in Europe, sidemounts allowed spelunkers to more easily transport single cylinders through a dry cave to the dive site.

In North Florida, the use of sidemount techniques has allowed exploration into small silty areas that were once thought impassable and has opened up entire new cave systems that were simply inaccessible with back mounted doubles.

Sidemounts reduce the strain of carrying heavy doubles up steep inclines, lowering cylinders down into a hole, and making those long walks through the woods to the dive site. Cave systems known to be silty can now be penetrated without heavy silting.

Sidemount configuration means wearing the cylinders on the hips instead of the back. The cylinders are fastened in the middle with a snap to a harness at the waist. The necks are clipped off at the

armpit using bungee material (a bicycle inner tube is preferred) so that the cylinders are forced to lay parallel to the diver's body. Adjustments are usually needed at first to insure a snug comfortable fit.

When diving with sidemounts, gas supplies must be balanced for adequate reserves throughout

the dive. The regulator and SPG hoses no longer lay across the back and instead are clipped across the chest area. The management of these is critical for proper monitoring of gas supplies and switching regulators during the dive.

Back-up and emergency equipment must be streamlined



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Divers used to bungee in their sidemount cylinders using bike inner tubes. Today, divers use metal clips to secure their sidemount cylinders because these are a more secure method of attachment.

and tucked away to achieve the desired profile—no thicker than two cylinders that lay along the diver's hips.

Clearly, sidemount diving is not for everyone because of the potential hazards that exist; low visibility, line traps and squeezes that seem to get smaller and smaller are only a few of the obstacles to be overcome.

A diver must be totally comfortable in all these conditions before considering sidemount as an alternative. Suitably equipped, divers who are, can usually find a way to squeeze by.

— Lamar Hires
Dive Rite, Lake City, Florida

China cult

Previously isolated from the underground and fellow wreckers to the south, the east coast wreck diving community evolved its own

style of set rigging suitable for the cold dark waters of the north and the available technology. Still seen on the boats that work the *Doria*, *Texas Tower*, the *Virginia* and the *San Diego*, a typical east coast wreck diving set consists of a pair of double 80s or 95s (10.5 or 11.5 liter) or secured to a large capacity BCD jacket with a manifold system, or commonly two independent regulators, which are rotated throughout the dive.

A 40cf (5.5 liter) pony mounted between the doubles serves as a bailout, along with a handmade upreel (hemp rope wrapped around a forearm-length aluminum spindle). For the most part, stage bottles, typically air, are something divers leave tied off to the anchor line at 10ft (3m), and oxygen for decompression is still used sparingly, if at all.

Now with the advent of larger tanks, harness and manifold systems, improved decompression

methods and mix technology, all that is changing. Today, a well-outfitted high tech wreck diver carries a pair of cold-filled Genesis 120s (14.5 liter) with DIN crossover manifold and valve protectors, shoulder mounted stage bottles, or 'wing tanks', containing decompression gas (EAN and or oxygen)—do you really want to bet your tissues on that cylinder clipped off to the anchor line? Harness, bag and back plate system, argon inflation system and of course an upreel.

The result? Wreck divers are staying down longer, getting more of that first class china, and most importantly are doing it safer. After all, when you come right down to it, the most valuable artifact that you'll ever bring home is yourself.

— Billy Deans
Key West Diver, Florida



COURTESY OF M. MENDUNO

Jim King (above) about to go in—quads (four cylinders) were often used in conjunction with diver-carried stage bottles where self-sufficiency was the key; Lamar Hires (right) ca 1990, Blue Springs, Tennessee.

Quads

For long deep exposures, particularly those associated with expedition-level pushes, carrying sufficient gas volumes to do the job becomes a major operational consideration. Fortunately, most of these dives are conducted in cavernous passageways or open water where restricted space is not the issue.

According quads (four cylinders) are often used in conjunction with diver-carried stage bottles in order to carry sufficient bottom gas, and that required for decompression, where self-sufficiency is the key. DPVs are generally a requirement to overcome hydrodynamic drag.

A typical quad set-up consists of doubles, often 104s (18 liter) with crossover manifold containing bottom mix, mounted to a pair of side tanks containing

decompression gas; an enriched air nitrox and a bottle of oxygen, each with an independent regulator.

In addition, divers typically carry an 80cf (10.5 liter) bail-out bottle of bottom mix, and a second cylinder of deep nitrox mix (some-



BOB JANOWSKI

Set Theory



tech talk

Does this face look familiar? It's a young Richard Pyle wearing a Cis-Lunar MK2. This unit is the ancestor to Poseidon's current MKVI and SE7EN. Pyle was part of the development team on both these rebreathers.

times air) for decompression—six cylinders in all—making the diver relatively self-sufficient. High performance regulators, such as the Poseidon, are the standard, as well as double buoyancy compensator bags. Gas and quad equipment management are critical, and takes practice to get down.

How much gas? An explorer with a good quad set and stage bottles can carry just over 600cf (16,900 liters) of gas. An awful lot until you consider that gas consumption in the 300-500ft (90-150m) range being broached by leading explorers, will drain an 80cf (10.5 liter) cylinder in a little over five minutes, and the gas requirements for decompression—

often in excess of four to six hours—are stiff.

Of course, once closed circuit (C2) technology hits the street, quads and six plus tank dives will become a relic of the past. With a virtually unlimited gas supply in a 50 lbs. (22.7kg) pack, gas won't be the issue. But then that's technology for you.

— Michael Menduno

Futures market

If Dr Bill Stone has his way, we may all be taking another breath. Rated to 300m (meters!!), Cis-Lunar's MK-2R fully-redundant



M. MENDUNO

closed circuit rebreather will change the way we think about diving, blazing a trail for others to follow. Offering a 13- to 18-hour heliox gas supply, near optimal decompression, and a fail-safe systems architecture that would send any self-respecting tekkie into orbit—literally, the MK-2R, now in beta test, is scheduled to make its début sometime in 1992

The tougher issue is whether Cis-Lunar's initial production run of six units will saturate the market. Considering that IBM first estimated the worldwide market for computers to be only four systems, Stone and his colleagues may not have to worry for long. All they have to do is hang in there. But then that's exactly what Stone has in mind. Microbells anyone? ■

A youthful Kevin Gurr acts as dive valet to Bill Stone—ten years later Gurr designed the Ouroboros "Boris" rebreather, and more recently the Hollis Explorer rebreather.



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photo & video

Edited by
Don Silcock

Hello small world, by Beth Watson. Example of cross lighting. Photo of blenny taken in Bonaire, f32, 1/200, ISO 100

Text and photos by Beth Watson

Of course there is no substitute for adequate working knowledge of the camera system, and a good eye for composition is a bonus, but the key factor in creating dynamic, creative and impactful underwater images is understanding the light. Learning and understanding how light falls on the subject and having the ability to control and shape the light is crucial! The lighting is what creates the mood and atmosphere of any image.

The harshness and softness of light play a key role in the shape, appearance, dimension and texture of an image. It is important to know when to add light and when to subtract it. Direct light will cast harsh shadows while diffused light will create a much softer look. Shadows will be cast on the opposite side of the light source. A small light source produces hard, directional light with a narrow beam, while a large light source will produce a softer light with a wider beam.

The direction and angle of light will

dictate its quality. Light coming from an angle will produce texture and drama, and create character. Direct light coming from a standard flash camera position will usually be flat and unflattering, revealing minimal shape and texture. Angling the light sources will produce more interesting results.

The color temperature is a characteristic of visible light and refers to the warmth or coolness of an image, and affects its mood and feel. A warmer image will have more yellow and red tones while a cooler image leans towards the blue spectrum. Color temperature is measured using the Kelvin

scale (Fig. 1, next page): a higher number reflects a cooler temperature and a lower number reflects a warmer tone. The white balance setting on the camera, photo-editing software and filters will give the photographer control over the color temperature.

Water is denser than air, resulting in

the loss of visible colors very quickly. Red is the first color to be absorbed and is no longer seen at five meters (15 feet); orange, yellow, green and blue are the next colors to be absorbed. Due to the absorption of light, artificial lighting is needed. Otherwise, images will lack color and contrast.

Lights, Camera, Action

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photo & video

Example of top lighting. Photo of coconut octopus taken in Lembeh, Indonesia, f13, 1/100, ISO 160

One-strobe lighting techniques

Front-top lighting

Front lighting is typically done by placing a strobe directly above the lens port. Aiming the strobe downwards at a 45-degree angle will give the image depth and texture, and the colors will pop. Positioning the strobe directly on the subject will result in a flat and lifeless image. Another alternative is to place the strobe directly over the top of the subject, so that directing the light downward will create interesting shadows.



Example of front lighting. Photo of French angelfish taken in Bonaire, f32, 1/125, ISO 100



Side lighting

This technique can be very effective in producing high-quality images, especially when using a single strobe. Positioning the strobe at the left or

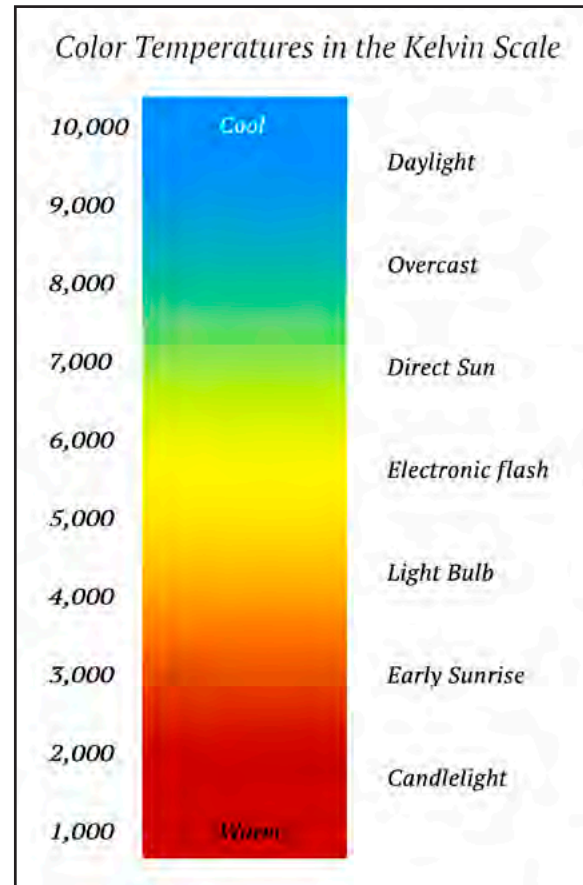
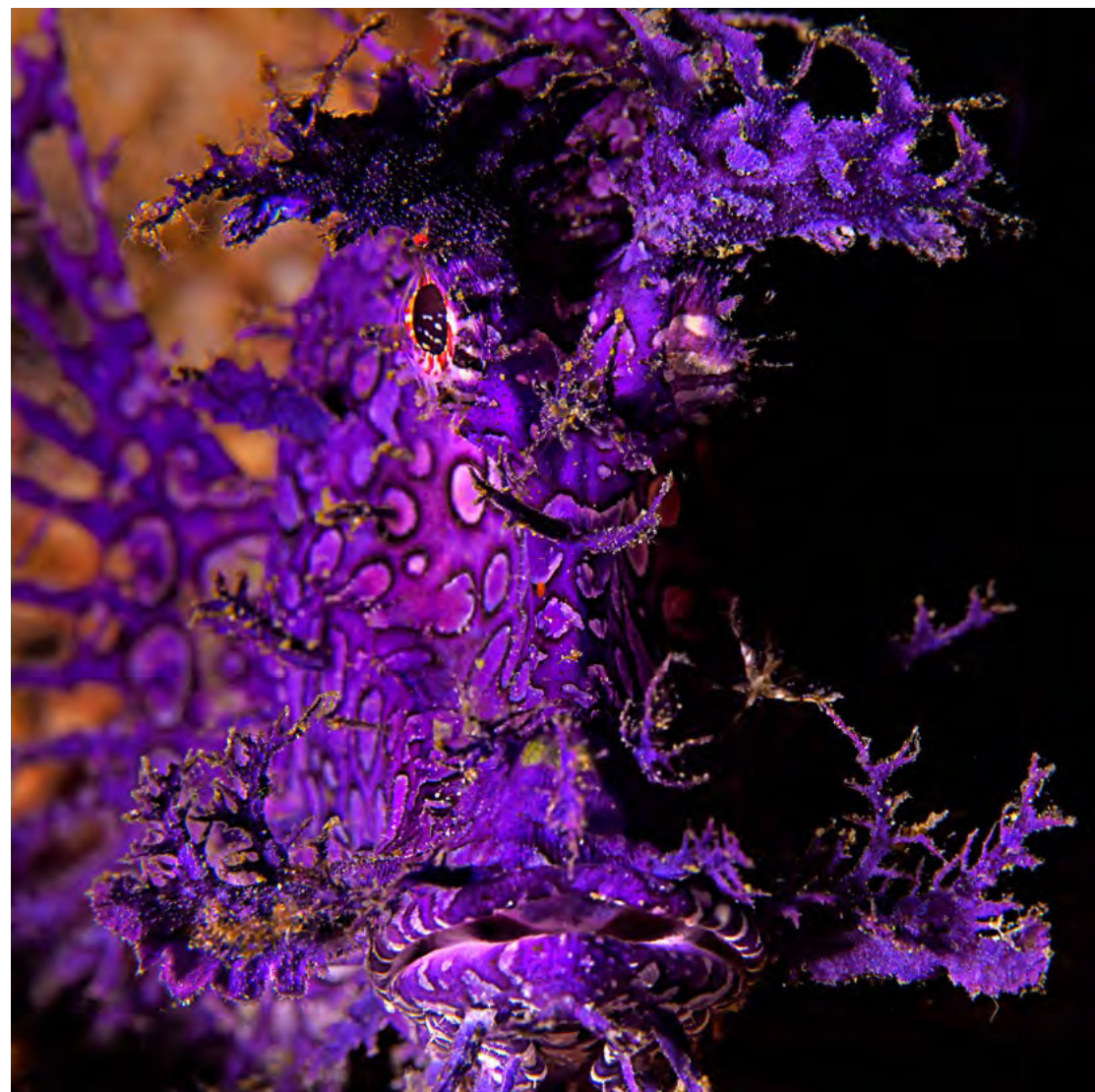
right of the camera creates shadows, giving the image depth, and accentuate textures.



FRONT LIGHTING

Example of side lighting. Rhinopias scorpionfish, Komodo, Indonesia, f14, 1/60, ISO 160 (right)

Figure 1. Color temperatures in the Kelvin scale b (top right)



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Goliath Grouper Photo Competition 2015

In an effort to increase awareness on the plight of [Atlantic Goliath Grouper](#) (*Epinephelus itajara*) and to further their Federally protected status, the [South Florida Underwater Photography Society](#) (SFUPS) is holding the first international photo competition in support of the species.

Atlantic Goliath Groupers were on a fast track to extinction but thanks to conservation efforts they thrive in South Florida waters. Every year from August through October hundreds return to local waters off West Palm Beach County for a mating ritual of collective spawning. Start planning your underwater photographic expedition to swim with one of the friendliest fish in South Florida.

THE PHOTO CONTEST:

- Categories:** 4 Photo and 1 Video
- Dates:** August 1 - October 31, 2015
- Location:** Palm Beach County, Florida
- Prizes:** Dive Travel Packages, Scuba Equipment, UW Photo Gear, and More
- Sponsors:** Reef Photo & Video, Palm Beach County Diving Association, Ocean Arts Media, Nova Southeastern University, Florida Dept. of Environmental Protection and many more

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SIDE LIGHTING





photo & video

Example of macro lighting. Mantis shrimp, Puerto Galera, Philippines, f25/1/160, ISO 160 (right)



BACKLIGHTING



Example super macro lighting. Arrow crab, Bonaire, f32, 1/160, ISO 100 (right)



BASIC MACRO LIGHTING



Backlighting

Place the light source behind the main subject, and observe how the light falls upon it. What is the desired outcome? The use of a constant light source often works well in this situation and can provide instant feedback. Double-check the exposure of each image, as overexposure presents a problem when too much light spills out from around the subject. Camera angle, distance and height of the subject in relation to the camera, and distance from the subject to the light source are other variables that need to be taken into consideration.

from the center of the camera. This helps to minimize backscatter. Extending the strobe arms to their maximum length will

in closer to the camera. Use diffusers when shooting wide-angle scenes, they will allow for increased coverage and soften the shadows. Keep in mind that diffusers will decrease the amount of light and contrast in an image; adjust the camera settings accordingly. Position the strobes slightly behind the housing to avoid unwanted light spilling into the image.



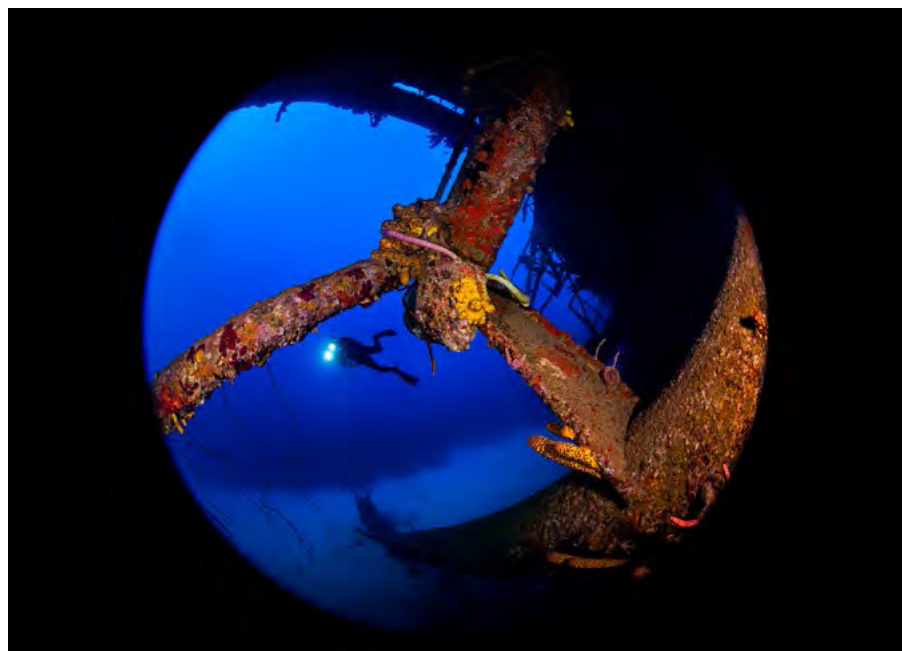
WIDE-ANGLE LIGHTING

Two-strobe lighting techniques

Wide-angle lighting

The basic setup for wide-angle underwater photography is to extend both strobe arms bilaterally. Angle each strobe slightly outwards, away

most likely be required for a reef or wreck scene, but a smaller subject will require the strobes to be drawn



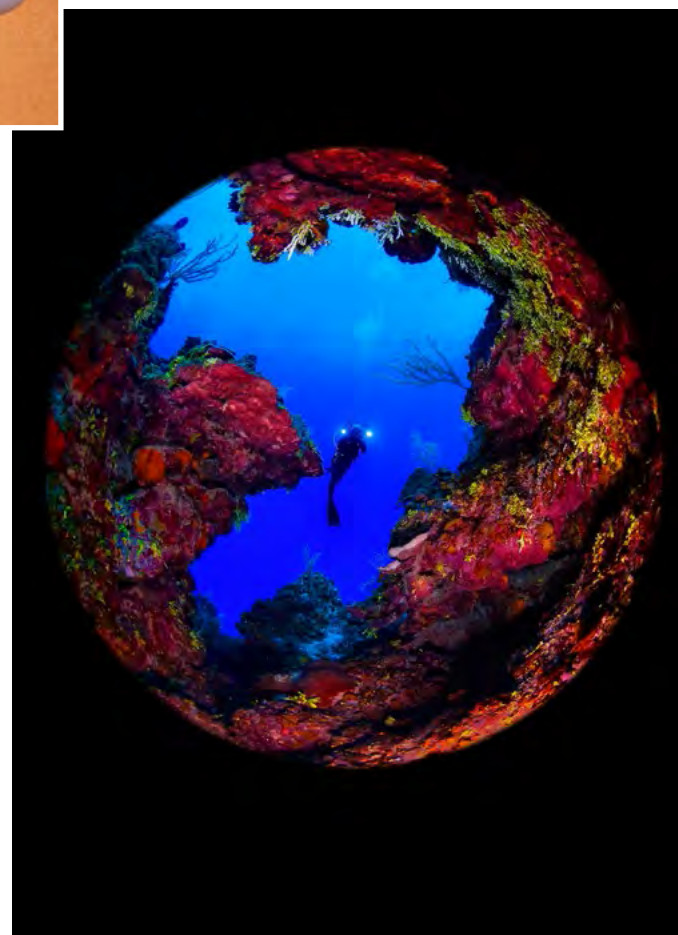
Example of wide-angle lighting (right). Diver on the Hilma Hooker, Bonaire, f8, 1/125, ISO 320



BASIC SUPER MACRO LIGHTING

Macro lighting

Aiming the light source directly at a subject while underwater can be a problem. The light hits particles in the water and is reflected back on to the camera sensor, creating unwanted backscatter. However, this does necessarily apply when shooting macro subjects because of the close proximity of the camera to the subject. Reducing the amount of water between the camera lens and subject significantly reduces the chance of recording backscatter. A basic strobe position for a macro lighting is to draw



Example of wide-angle lighting (left). Photo taken at Little Cayman Island, f8, 1/200, ISO 100

Example of backlighting. Ornate ghost pipefish, Lembeh, Indonesia, f/8, 1/250, ISO 160



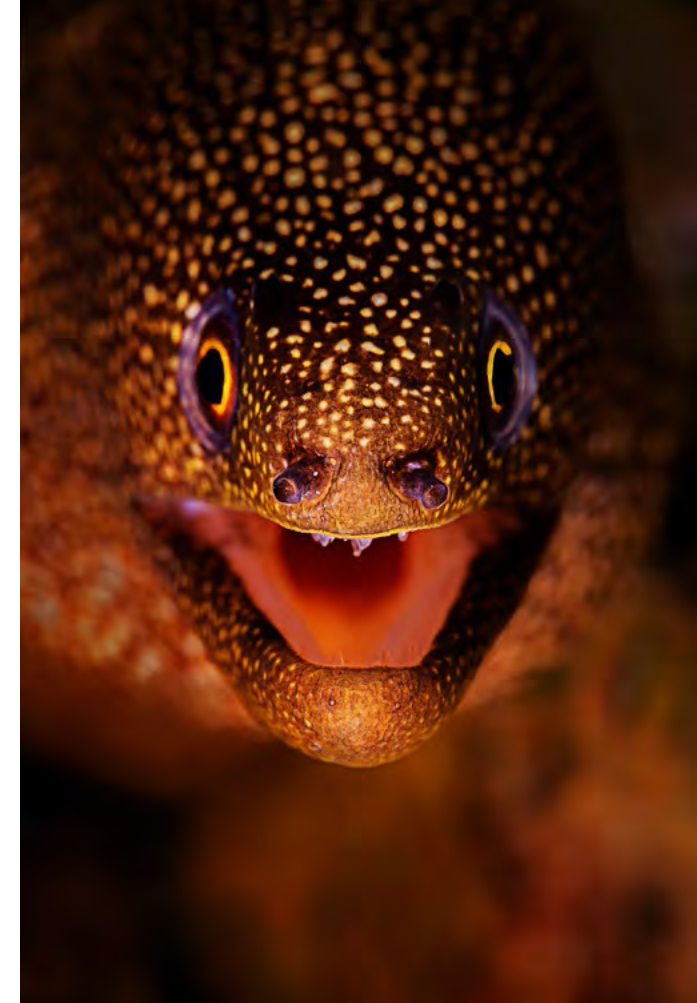


photo & video

Example of front and side lighting. Cleaner shrimp on anemone, Puerto Galera, Philippines, f16, 1/160, ISO 160



Example of front and side lighting. Golden tail moray eel, Bonaire, Netherlands, f29, 1/125, ISO 160



the strobes in very close to the camera and direct the light towards the subject.

Super-macro

Super-macro photography involves adding a device that adds magnification such as a diopter, teleconverter or extension tube. In theory, most strobe positions and lighting techniques can be modified in some form and applied to super-macro subjects. To be effective, the strobes



camera, depending on the desired effect. Position the strobes so the edge of the cone of light gently hits the subject. This technique gives the image a three-dimensional look.

Diagonal lighting

Diagonal lighting will illuminate the subject, nicely providing texture, color and



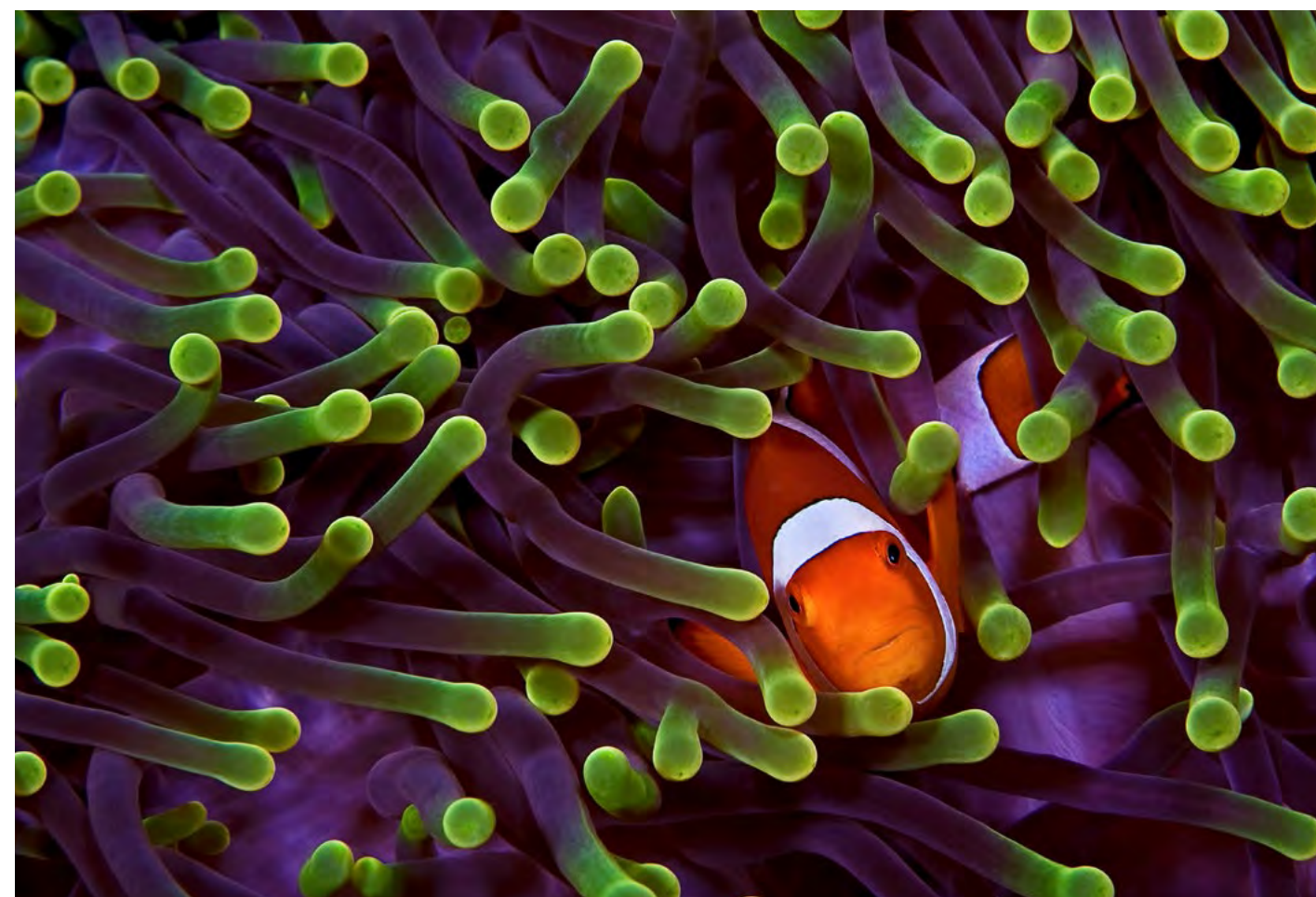
should be drawn in close to the camera. Due to the higher magnification, the power output of the light source will need to be reduced to avoid overexposing the image.

Cross lighting

A method by which both strobes are pointed inward towards the subject. This lighting technique creates a lovely quality of light and gives the image a nice balance. Increasing the shutter speed will create a black background, produce vivid colors and provide depth.

Front and side lighting

Position one strobe over the lens port at a 45-degree angle facing the subject. Place the other strobe to the left or right of the



dimension. To achieve this effect, place one strobe at the top right, and the other at the back left; or vice versa. The height and angle of the light depends on the subject and desired effect. Experiment with various strobe power ratios, set the strobes manually and take control of the lighting situation.

Inward lighting

If the subject is hidden in a crack or crevice, pull the strobes in very tightly and aim them towards the camera lens. This helps to eliminate unwanted shadows. This technique is most effective when shooting super-macro subjects because of the increased magnification and short working distance from the lens to the subject.

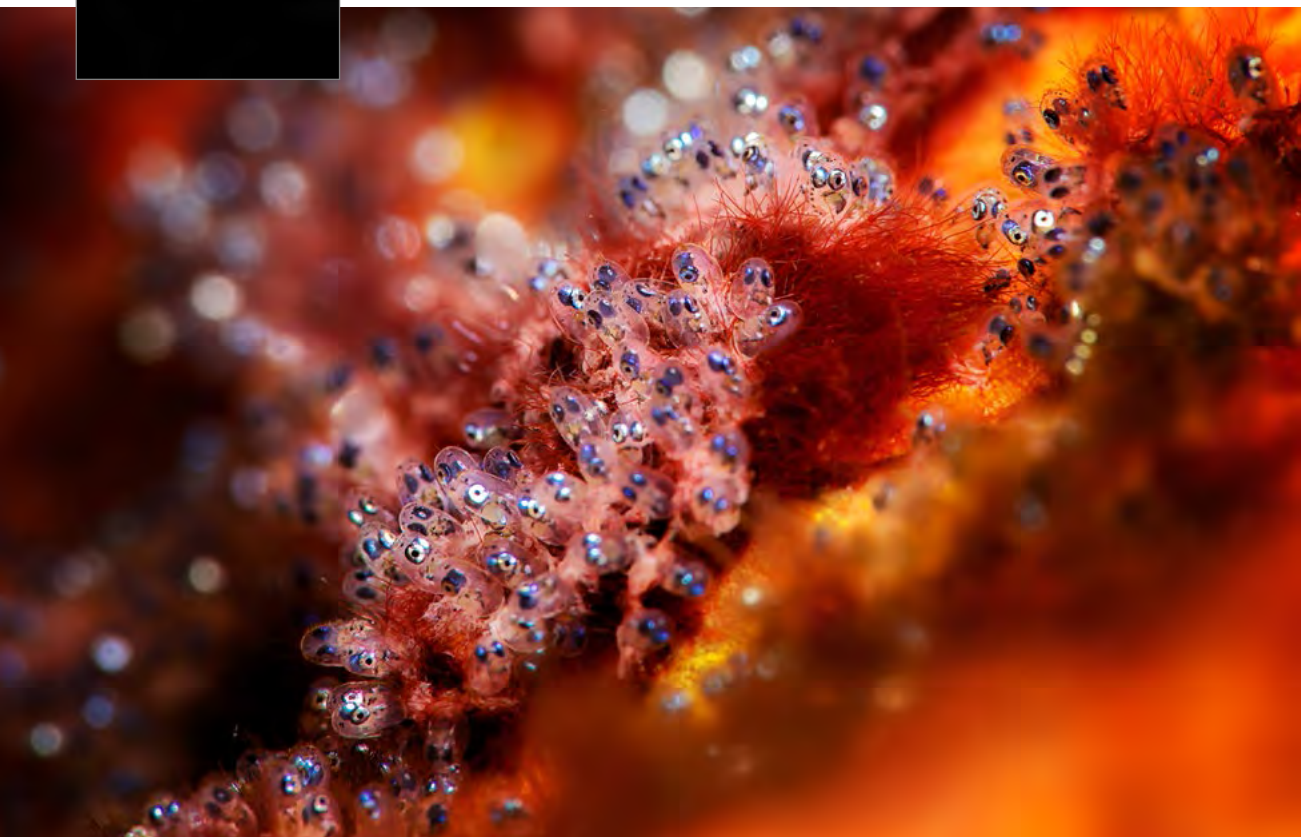
Example of cross lighting. Polyps, flower cup coral, Puerto Galera, Philippines, f32, 1/50, ISO 100

Example of diagonal lighting. Clownfish with anemone, Wakatobi, Indonesia, f22, 1/125, ISO 100





Example of inward lighting. Damselfish eggs, Turks and Caicos Islands, f25, 1/80, ISO 160 (below)



Snooting

Snoots have become very popular in recent years. A snoot is a device placed on a light source used to direct light onto a specific portion of a subject. This creates a spotlight effect, highlighting the subject and blocking out distracting backgrounds. Snoot lighting grabs the viewer's attention, produces vivid colors and creates a wow-factor. Learning to use a snoot requires patience and per-

severance. Trial and error is part of the process; but when success strikes, and that stunning image is captured, it is very rewarding.

Off-camera lighting

Using this technique requires thought and preparation. Whether the off-camera light source is placed on a wide-angle wreck or behind a translucent leaf fish, the images will be creative, dynamic and eye-popping. The strobe will be detached from the housing, and hand-held or placed on a tripod. Several triggering mechanisms can be used to trigger the off-camera strobe. Using an extended sync cord is a good way to begin experimenting with this technique. For more creativity and flexibility, investigate fiber optic triggering systems.

Example of snooting. Peacock flounder, Bonaire, f18, 1/80, ISO 160 (right)



Example of snooting. Wunderpus, Lembeh, Indonesia, f16, 1/160, ISO 160 (lower right)



Get creative with multiple light sources

It is the angle of light that ultimately determines the quality of light. Using more than one strobe opens the door for an endless array of lighting possibilities. Experiment with unfamiliar lighting techniques and apply changes to favorite tried-and-true methods. Visualize how the light will fall on the subject before pressing the shutter, attempt to "see" the image before it is captured.

In the words of Ansel Adams, "The concept of the photograph precedes the operation of the camera. The print itself is somewhat of an interpretation, a performance of the photographic idea." Be creative, explore and observe.

Tips and hints

- Proper buoyancy is perhaps the most important factor in becoming a good underwater photographer and diver. Practice buoyancy skills often.



Example of snooting. Blenny, Cozumel, Mexico, f29, 1/160, ISO 160

- Disturbing the environment, moving or harassing animals for the sake of capturing an image is unnecessary and unacceptable.

- Strobes are most effective when the subject is 1m (3ft) or less from the camera.

- Always perform a pre-dive check, making sure all strobes are firing correctly before the dive.

- Take control, shoot in RAW, use manual settings on the camera and strobes.

- Experiment, try new techniques

- Think outside the box! ■

Beth Watson is an award-winning, internationally published underwater photographer based in the U.S. state of Missouri. For more information, visit: www.bethwatsonimages.com.





photo & video

Edited by
Don Silcock

PRODUCT SHOTS
COURTESY OF THE
MANUFACTURERS

Nauticam NA-7II Housing

Nauticam has released its housing for the new full-frame Sony A7 Mark II mirrorless camera. The NA-A7II housing features lever controls for AF-ON, review and record plus a switch that allows the electronic viewfinder to be enabled or disabled. Nauticam has developed a new set of ports for the Sony A7 mirrorless cameras and selection offers support for the new Sony 16-35mm f4 rectilinear wide-angle zoom. The NA-7II is shipping now with a U.S. retail price of \$2,750.



Subal A7 Housing

Austrian premium housing manufacturer Subal has announced the imminent release of their new housing for the Sony A7 full-frame mirrorless camera. The housing provides full access to all camera controls and is designed to accept all three models—A7, A7R and A7S. Utilizing Subal's Type 2 ports, the housing ships with either electronic or fiber optic strobe triggering bulkheads. The Subal A7 housing is available from the end of April 2015 at a retail price of US\$2,850.

Sea&Sea Housing for Canon 7D MkII

Sea&Sea has released their new new housing for the Canon EOS 7D Mark II DSLR camera. The MDX-7DMKII is compatible with Sea&Sea's excellent internal YS TTL converter and its control levers have been designed for improved ergonomics over the earlier MkI version. The housing is shipped with two fiber-optic bulkhead fittings and there are options for both Nikonos and HDMI connections. The MDX-7DMKII is available now at a retail price of US\$3,600.



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Gates Alexa Mini Housing

California-based Gates Underwater Products has announced it will support the release of the ARRI ALEXA Mini camera and produce a housing for it. Few details are available now, but Gates stresses that the housing will be compact in size and have mechanical controls for accessing the camera functions. The Gates Alexa Mini housing will be available in Q3 of 2015 but no pricing is currently available.



Easydive Leo III Housing

Innovative Italian manufacturer Easydive has announced the release of a new version of their Leo housing. The Leo III housing utilizes electronic control over the majority of camera functions, which greatly reduces the number of external controls and allows it to be upgraded for use with different camera models. Easydive claims that the Leo III can host all major DSLRs from both Canon and Nikon and works with more than 50 different DSLRs in total. To switch between different camera models requires a change of the tray that mounts the camera in the housing and updating the housing's firmware by downloading the revision from the Easydive website. The Leo III with 2 Nikonos and fiber-optic connectors as standard can be fitted with port adaptors for other manufacturers ports if required. The Leo III is available now at a retail price of €2,790.





photo &
video

Edited by
Don Silcock

PRODUCT SHOTS
COURTESY OF THE
RICO BESSERDICH



Canon XC10 Camera

In a clear sign of convergence between video and stills imaging, Canon has announced the upcoming release of its new XC10 camera. Combining 4K video and a respectable 12 megapixel stills the XC10 camera has a fixed optical zoom lens with image stabilization and a 1" sensor. Capable of recording at up to 305Mbps to an internal CFast 2.0™ card and ISO up to 20,000 the XC10 is a very interesting development. The XC10 will be available in June at a retail price of US\$2,500.

ARRI Alex Camera

German motion picture equipment company ARRI has announced the upcoming release of its ALEXA Mini camera. The new camera supports both uncompressed ARRIRAW 2.8K and 4K UHD shooting and features

a built in lens motor controller for use with PL mount lenses. Alternatively, an interchangeable lens mount can be used that allows the use of B4 video and EF mount still lenses. The ALEXA Mini will be available from May 2015.

Nikon D7200 DSLR Camera



Nikon has announced the release of the DX format D7200 DSLR camera, the successor to the highly regarded D7100. The release follows Nikon's usual modus operandi of refreshing its models every two years and the D7200 features what appears to be a new 24.2 megapixel sensor from Sony, replacing the 24.1 megapixel one from Toshiba used in the

D7100. The new sensor has no low-pass filter and the D7200 uses Nikon's EXPEED 4 processor. The ISO range is 100 to 25,600, and the camera has a 51-point autofocus array, which is driven by a new Advanced Multi-CAM 3500II DX high-

density system; so overall, there are some significant improvements over the earlier model. Most importantly Nikon has fixed what was probably the biggest complaint made about the D7100—its buffer size—and the new camera now holds 18 RAW images or 100 JPEG's, compared to 6 and 50 previously. Video is available at 1080 at 30/25/24p or 1080 at 60/50p in 1.3x Crop Mode. Given Nikon's rather mysterious decision to not update the seminal but six-year-old D300s, the D7200 is now the company's top-of-the-range DX format DSLR. For underwater photographers it represents an excellent combination of functionality and value, plus it appears that it will fit into existing D7100 housings, as Nikon did not change the body or controls. The D7200 is available now at a retail price of US\$1200.



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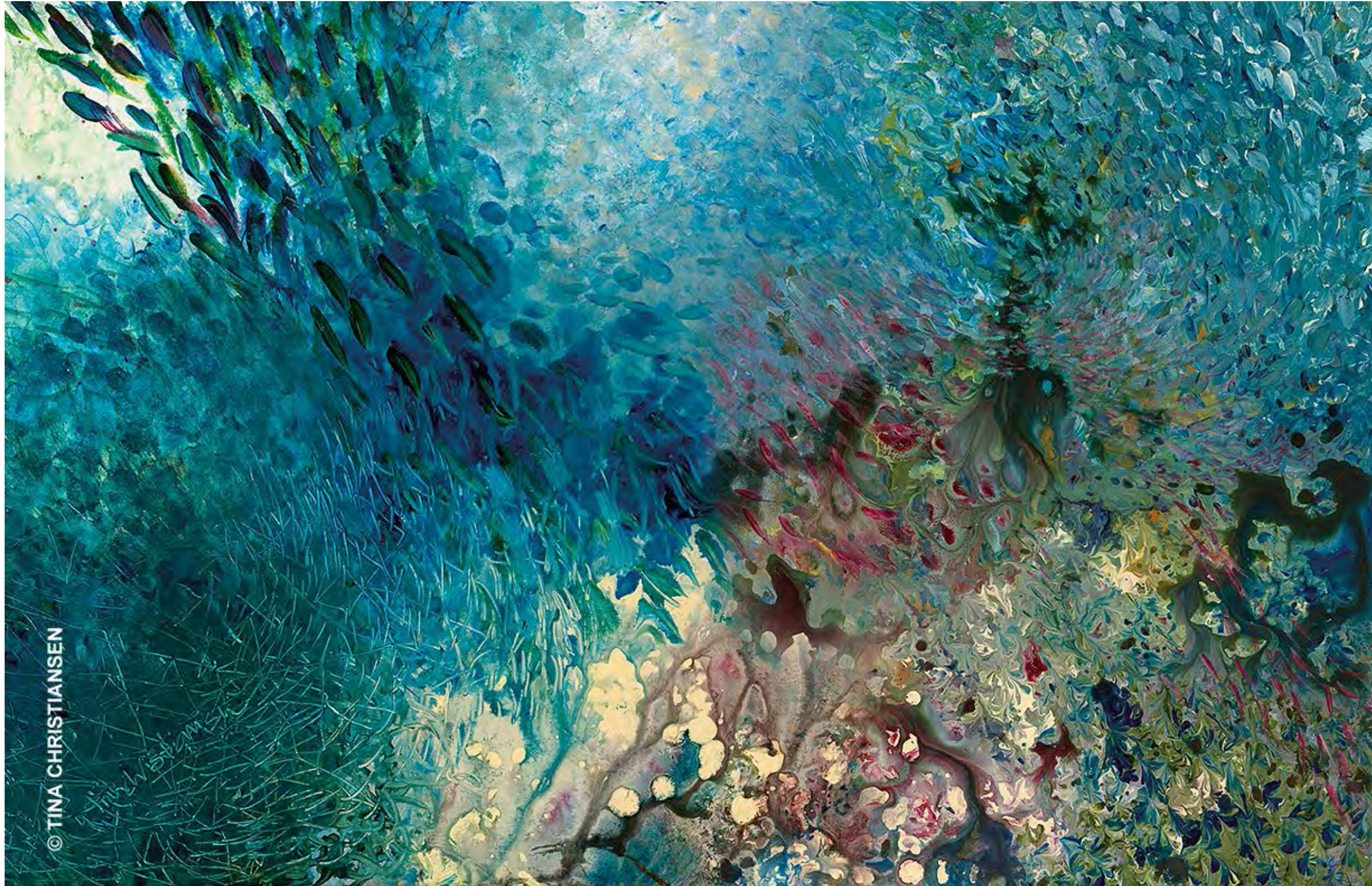
"Exceptional service in every aspect of my time spent at Wakatobi. After three visits of multiple weeks I only find myself wanting more. Go Go Go to Wakatobi as it truly is an amazing experience!"

Troy Cheek, October 2014



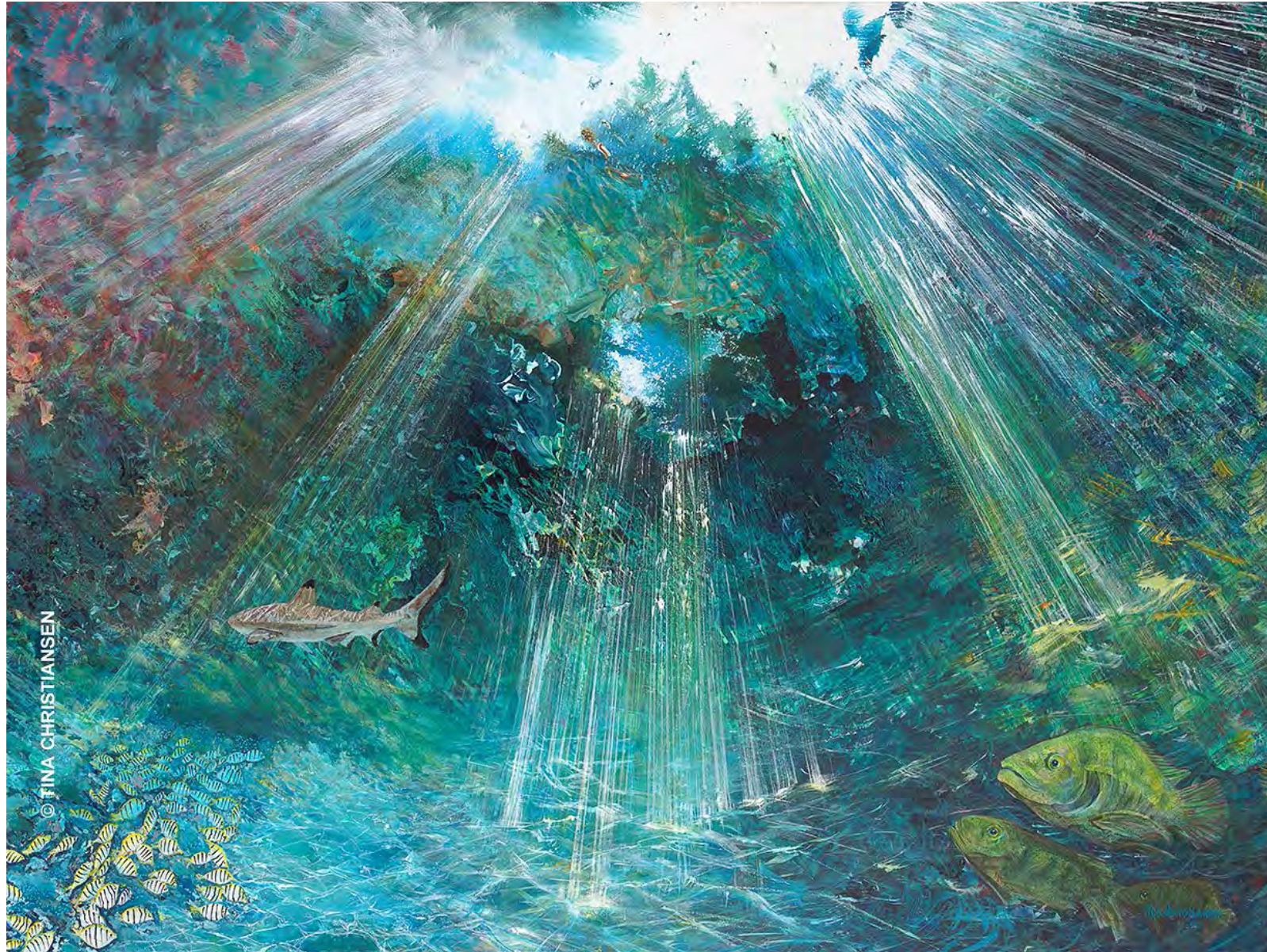
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Tina Christiansen



P O R T F O L I O





Tahitian Reef Shark,
by Tina Christiansen
Acrylic on canvas,
30 x 40 inches

PREVIOUS PAGE:
Swirling Fishes, by
Tina Christiansen
Digital composite of
two earlier acrylic
paintings 44 x 72
inches

Paradise Island,
by Tina Chris-
tiansen Acrylic
on canvas
24 x 18 inches



Text edited by Gunild Symes. All artwork and photos by Tina Christiansen

American artist Tina Christiansen creates swirling, color-rich paintings with themes inspired by the underwater realm. As a former architect, she comes to painting with an appreciation for structures found in nature. *X-RAY MAG* caught up with the artist to find out more about her art and what inspires her to create.

X-RAY MAG: Tell us about yourself, your background and how you became an artist.

TC: I have been painting for about 40 years. I started as a watercolorist and currently work in acrylic water media, which lends itself very well to images of the sea.

I am a licensed architect, now retired. I began my college study in fine art, and I switched my major to architecture. I studied natural forms and biological structures in nature. For example the dolphin is almost a perfect laminar form, it produces

very little drag as it moves through water. (Useful to know if you're designing ships or planes)

The bones of birds are formed by calcium deposits along the stress lines of the limb leaving the center hollow, very light and strong. Some of the tensile structures that architects and engineers design use the laws of physics and nature to span great lengths with very lightweight structures. The nautilus shell is a perfect mathematical progression, shared by many other natural forms.

Fractal forms are found through-

out nature, I can see these same structures in the paints I use, especially when I mix water with pigments that are mineral base, such

as cobalt blue, titanium white, copper oxide and so on.

I am fascinated by the sea, and I enjoy boating and snorkeling in the



Pargo, by Tina Christiansen. Acrylic on canvas, 20 x 60 inches

oceans surrounding North America and Hawaii. I recently was fortunate to travel to Tahiti and the Society Islands. What a place! I try to capture the spirit of the sea creatures I paint, the attitude of the turtle, the intensity of a shark, the electric swirl of fishes in the water as they sense and swarm so close together.

X-RAY MAG: Why do you paint underwater themes? How did you develop your style of painting and body of work over time?

TC: I've spent my life looking at the sea, above and below the surface of the water. I look at the play of light on its surface and crepuscular rays piercing the water. The refraction of light as it is bent

and moves over the sandy bottom is fascinating to me.

Coral reefs seem to me to be the treasure box of the ocean. I have only begun to explore the colors and textures there. In some of my paintings, I try to capture the space of the underwater rooms that I see below the surface of the ocean.

X-RAY MAG: What is your artistic method or creative process? How do you create your artworks?

TC: It's a very dynamic process, I splash water and paint all over in some of the images, sometimes I even finger paint. I layer many colors in washes to achieve the depth of field that I want. Sometimes I paint the environment of the "sea

room" first and see what sea creature comes up in my mind's eye (from snorkeling experience). I then paint the turtle or the shark in at the last moment. Sometimes I start with the fish or the leopard ray, for example, first.

Water color and acrylics painted in a water color style cannot be entirely controlled. The best paintings are often the result of happy accidents. I go with where the wash leads me as it dries and curls, like the water that washes sand and seaweed up on the shore. These images are in my main online gallery at TinaChristiansen.net. I also paint mermaids, those images are at Mermaidart.net.

X-RAY MAG: What is your relationship to the underwater world and coral reefs?

How has snorkeling underwater influenced your art? In your relationship with reefs and the sea, where have you had your favorite experiences?

TC: I have gone snorkeling at Tunnels Beach in Kauai and Sugar Beach in Maui; several islands in the Society Islands; the Gulf of Mexico in northern Florida; the kelp forest in La Jolla California; and Catalina Island, California!

It's hard to pick a favorite, but I think snorkeling with the blacktipped sharks of Tahiti was a life experience, and the turtles of Hawaii fascinate me, too. When I was painting *Flying Turtle* [next page], I didn't realize it was really flying around in the water like a bird until I finished the painting. And then when I looked at it,

I realized where birds evolved from. It was a real *aha* moment for me. So that is where the name of the painting came from.

X-RAY MAG: What are your thoughts on ocean conservation and coral reef management, and how does your artwork relate to these issues?

TC: I hope to share how delicate and beautiful they are with people who swim and people who don't. It's the most beautiful thing on earth. It's where we came from, and we'd better take care of it. Once you see it, you can tell how fragile and important it is. Nobody has to try to make you a believer once you've seen it.



Coral Reef Grouper, by Tina Christiansen. Acrylic on canvas, 20 x 30 inches

© TINA CHRISTIANSEN

X-RAY MAG: *What is the message or experience you want viewers of your artwork to have or understand?*

TC: I want them to stop and take a long look, and notice the intensity and depth of what it is that I am painting. I want them to get in the water and take a look for themselves... at how beautiful it is.

X-RAY MAG: *What are the challenges and/or benefits of being an artist in the world today?*

TC: For every hour I paint, I must spend 10 marketing and preparing my work for sale or show. I would prefer to just paint, but if you want people to see your work, you have to get out there and show it. Right now I am working on a series of silk scarves that have my coral reef paintings reproduced on them. They are quite beautiful. I have a line of silk sarongs I hope to market wholesale to the whole-sale, high-end catalogue fashion world.

Watch for my silk scarf website that should be operational in June 2015. It will be **Artbytina.net**.

X-RAY MAG: *How do people/children respond to your works? What feedback or insights have you gained from the process of showing your work to various audiences?*

TC: I do "live" painting demonstrations. I try to get people involved in the splashy part of the painting process. It is really fun to see people try their hand at painting and to see them get fascinated by what the paint is doing. I find that people who can just play with the paint a little bit are the best prospects for becoming avid artists.

X-RAY MAG: *What are your upcoming projects, art courses or events?*

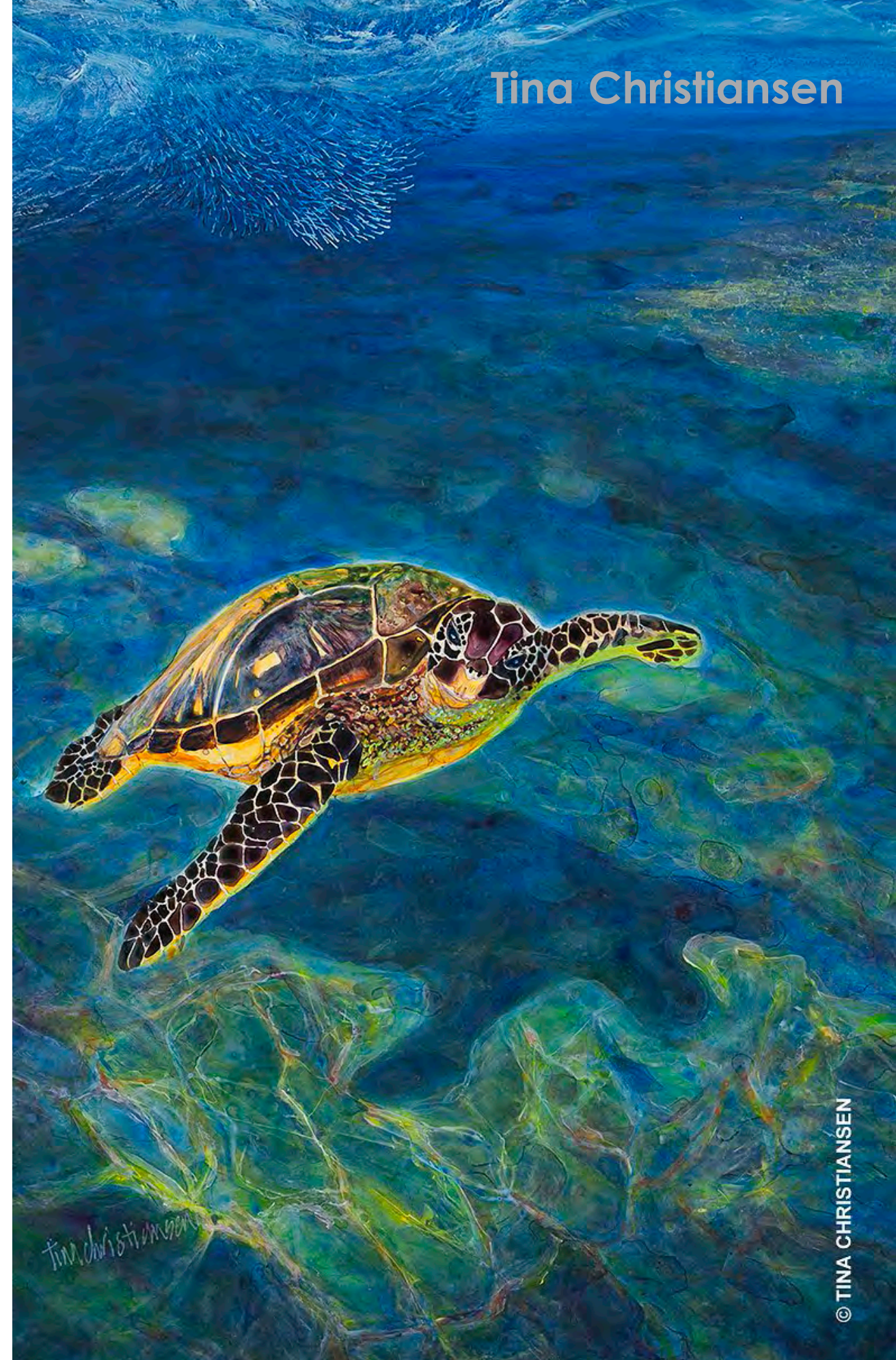
TC: I've just moved to Whidbey Island, so I hope to capture some of that north-

ern sea environment this summer, while boating in the San Juan Islands. It's a different light and color of water, and the sea creatures! Well they are pretty spectacular too.

Now that I've retired from architecture, I can focus on becoming a great painter. I had a Japanese watercolor instructor in art school who told me that I could begin to learn to paint within three years of practice. He said in about three years of practice I might be able to paint something well. He said that in 30 years I would know whether I was a good painter or not. Finally, he said after that it was up to me whether I would become a great one. I would like to see whether I can become a great painter. ■

*For more information or to order prints, visit the artist's websites at: **TinaChristiansen.net** and **Mermaidart.net**... soon to come is the artist's paintings on silk at: **Artbytina.net***

Tina Christiansen



© TINA CHRISTIANSEN

Flying Turtle, by Tina Christiansen Acrylic on clayboard, 18 x 16 inches