



GLOBAL EDITION  
November 2014  
Number 63

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Island**

Canary Islands  
**Tenerife**

Dive Safety  
**Reporting  
Culture**

Sharks  
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Tech  
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Portfolio  
**Becker-Echivard**

THE MEDITERRANEAN SEA

# Côte d'Azur

# DIRECTORY

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COVER PHOTO: Diver in school of jacks, Indonesia  
Photo by Don Silcock

Orange cup coral, Côte d'Azur, Mediterranean Sea. Photo by Kurt Amsler



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## Don't miss the show

'Tis the Dive Show season once more. Just where is this year going? As I write this, EUROTEK and DIVE have just wrapped up, and before we know it, DEMA will be upon us. Whilst these shows may not be considered 'must attend' events by some, one should not underestimate the need and value for a regular gathering of the clans.

I remember writing previously in *X-RAY MAG* that events like EUROTEK, OZTek and DEMA serve a vital role, drawing people in from all over the globe, briefly bringing together a good part of the diving village. This simple act reinforces the strong sense of community we share.

Diving is such a social sport, and it is little wonder. You really do need to be a friendly soul if you are going to be stuck on a small boat bobbing around in the ocean for several hours. The world is now a smaller place because of social media.

I have certainly enjoyed seeing what is happening on a dive off Fort Jefferson; hearing about the latest discoveries on the *Antikythera* shipwreck; following the adventures of the first lady of sharks, Cristina

Zenato; hearing what the OWUSS Rolex Scholars are up to; or just simply salivating over photos of awesome viz, wrecks and caves. But at the end of it, nothing beats or can replace face-to-face human interface.

Technology has attempted to do this in the past. In the late '90s, long before the internet was the norm, the introduction of low cost, high capacity broadband coupled with powerful computer processors and video compression techniques, meant that video conferencing became a much more attractive proposition. Certainly video and conference calls have made inroads, and today they are considered a useful tool. However, they have not replaced physical interaction.

If you are looking to carve out a career in scuba diving, you are your own best ambassador. Events and shows provide you with the opportunity to learn and network. (Never underestimate the power of networking). You get the chance to meet people from outside your usual sphere of contacts. The synergy that face-to-face interaction brings ignites discussions and innovative thinking, and before you know it, your diving may take a different path.

Personal relationships enable you to stand out, rise above the noise and remain in people's minds. You will get invited to join a dive trip, hear about an expedition being planned or get introduced to other like-minded people.

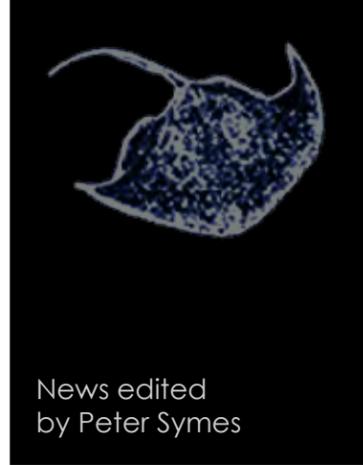
The community grows, because we are better able to socialize and interact with each other.

Diving has the capability of building such strong bonds of friendship, as though we were bound together by hoops of steel, no matter where in the world we really live.

We meet to discuss information, tell stories, share ideas, celebrate success, learn and laugh from our collective mistakes and mingle with the top explorers, pioneers and exhibitors in our field. Bonds get built that set the foundation for trust, and ultimately, lasting business and personal relationships.

So the next time you think, "Nah, can't be asked to attend that event," are you really making the best decision for your diving?

— Rosemary 'Roz' E. Lunn



News edited  
by Peter Symes

# from the deep NEWS

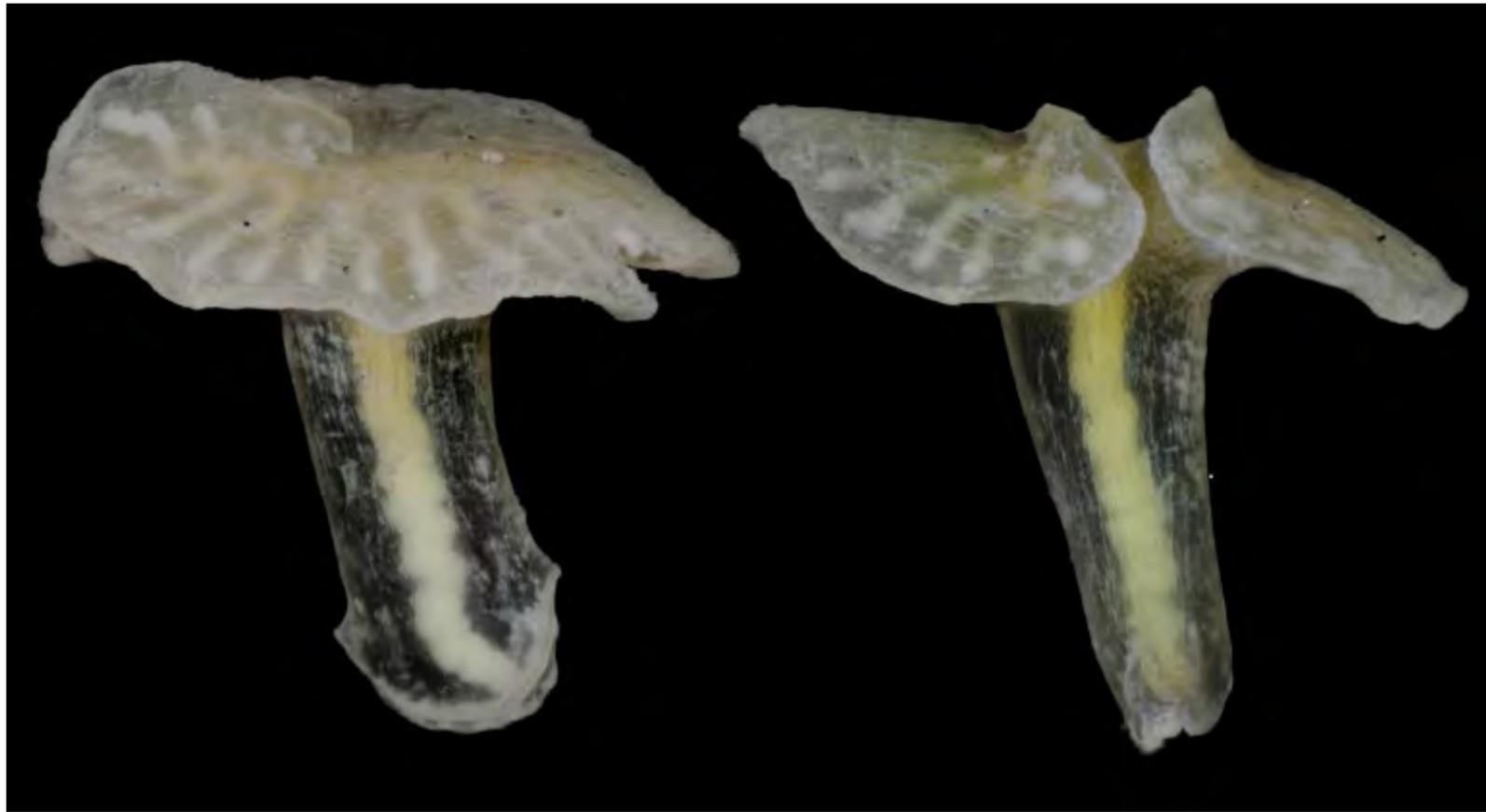


PHOTO ONE

A mushroom-shaped sea creature has defied classification in the tree of life.

## New life form found in the ocean?

**Organism does not fit into any of the known subdivisions of the animal kingdom.**

Two new species of 'multicellular, non-bilaterian, mesogleal animals'

were collected at 400 and 1,000 metres on the Australian continental slope off eastern Bass Strait and Tasmania during a cruise in 1986. The specimens in question were at first not recognised in the field, but were extracted from bulk samples in the laboratory during sorting.

The animals are composed of a body divided into a stalk with a mouth opening terminally and a flattened disc with a dense layer of gelatinous material between the outer skin cell and inner stomach cell layers. The mouth is set in a specialised, lobed epidermis field, leading into a gas-

*Finding something like this is extremely rare; it's maybe only happened about four times in the last 100 years. We think it belongs in the animal kingdom somewhere, the question is where.*

Jørgen Olesen  
University of Copenhagen

trodermis-lined gastrovascular canal (pharynx) in the stalk. While the animals are certainly multicellular, the precise structural identity of the epithelia lining the gastrovascular canal and the external remain to be studied and compared to that of other metazoans.

The authors of the article note several similarities with the bizarre and enigmatic soft-bodied life forms that lived between 635 and 540 million years ago—the span of Earth history known as the Ediacaran Period.

### What are they!?

These organisms, too, have proven difficult to categorise and some researchers have even suggested they were failed experiments in multicellular life.

The researchers did find some similarities to other animal groupings, such as the Cnidaria—the phylum that comprises corals and jellyfish—and the Ctenophora, which includes the marine organisms known as comb jellies. But the new organisms did not fulfil all the criteria required for inclusion in either of those categories.

Dr Olesen from the university of Copenhagen stated the new animals could either be a very early branch on the tree of life, or be intermediate between two different animal phyla. □

SOURCE: PLOS ONE

• Raja Ampat • Komodo •  
• Forgotten Islands • ...and more •

**D**

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A densely packed school of sardines. Will this be a more common sight in our oceans?

## Smaller fish are taking over the oceans

As overfishing removes all their predators, smaller fish are flourishing and taking over the oceans. Despite the increase in populations of smaller fish, scientists are concerned.

During nearly a century of industrialized fishing, the total biomass of predatory fish species has fallen by more than two-thirds, according to a study from the University of British Columbia. Top-level species that people like to eat, such as tuna, swordfish, grouper, and shark, have been hit the hardest. Changes in the ocean's fish population are not only having an impact on individual species but are upsetting the balance of nature by disrupting the entire functioning of its ecosystem.

The change also raises the risk of algae blooms, which can choke the oceans. This is because the species such as sardines and herring feed on the animal plankton that normally eats the plant plankton, which then grows so much it gets out of control. Examples

of the "green soup", which these vast blooms of algae create, can be found around the world—for example, in the Black Sea.

As oceans warm, many species of fish may also migrate from the tropical areas and towards the poles. According to another new study from the University of British Columbia, the worst-case scenario—in which ocean temperatures rise by as much as 3°C by 2100—showed fish could move as far as 16 miles per decade away from the Equator.

That would have a catastrophic impact on the food supply in tropical regions according to William Cheung, associate professor at the UBC Fisheries Centre and coauthor of the study. "This area has a high dependence on fish for food, diet, and nutrition," said Cheung. "We'll see a loss of fish populations that are important to the fisheries and communities in these regions." □

## What happened to all remaining oil from Deepwater Horizon?

Scientists trace missing oil to its resting place on the Gulf of Mexico seabed.

By analyzing data from more than 3,000 samples collected at 534 locations over 12 expeditions, the researchers identified a 1,250-square-mile patch of the sea floor on which four to 31 percent of the oil trapped in the deep ocean was deposited. That's the equivalent of 2 to 16 percent of the total oil discharged during the accident. The fallout of oil created thin deposits that are most extensive to the southwest of the Macondo Well. The oil is concentrated in the top half-inch of the sea floor and is patchily distributed.

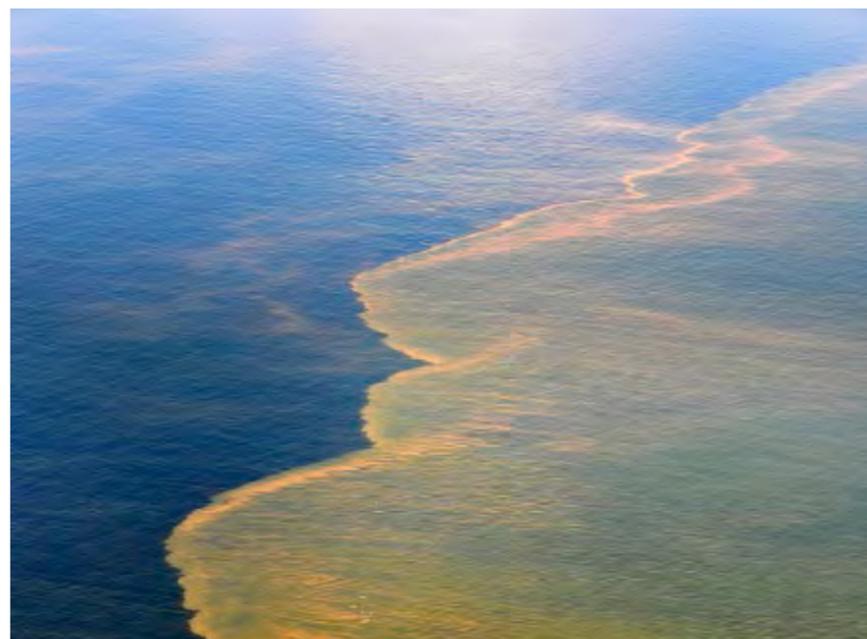
### Deep corals damaged

Scientist David Valentine of the University of California, Santa Barbara and colleagues were able to identify hotspots of oil fallout in close proximity

to damaged deep-sea corals. According to the researchers, the data support the previously disputed finding that these corals were damaged by the Deepwater Horizon spill. "The evidence is becoming clear that oily particles were raining down around these deep sea corals, which provides a compelling explanation for the injury they suffered," said Valentine.

*"This analysis provides us with, for the first time, some closure on the question, 'Where did the oil go and how did it get there?'"*

Don Rice,  
National Science Foundation



The U.S. government estimates the Macondo Well's total discharge—from April until the well was capped in July—at 5 million barrels

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The moment when *M/S Aërø Sund* started taking on water in earnest—only a few minutes later, she was gone below the waves



The Baltic seabed is dominated by large and otherwise barren expanses of sand, and the many shipwrecks now strewn all over it has created habitats benefiting wildlife and helping species, which would otherwise probably not be able to establish themselves in the area, to take foothold. Many wrecks constitute a physical substrate on an otherwise big expanse of barren sand turning them not only into habitats but also stepping stones along which species can move or migrate. As such, the wreck will also be monitored by a team of scientists who are interested in learning more about colonization and succession of species on new wrecks.

### A spectacle

Hundreds of spectators made their way down to the shoreline, and cars were tightly packed along the roads for several kilometres inland. At around 2pm, water was being let into the vessel, but for the better part of an hour, there was very little to notice from our observation point on the beach. Then, suddenly a little before 3pm, the ship started to list and water poured in through the big holes made in its side. Within a brief moment, she went completely under, with what appeared to be a dying gasp as air was squeezed out of her sinking hull. All too sudden it was all over, and nearly all the many leisure vessels with spectators took off at once, like a massive fleet getting underway. Only another 8-10 minutes later, boats had scattered and the once packed patch of water was left with only a couple of buoys marking the new dive site. What a spectacular day that was. The weather was great, another dive site was born and a new underwater habitat was created. □

### Preparation

Before the sinking, the ship underwent a process during which it was thoroughly cleaned and stripped of any environmentally hazardous materials such as fuel, oil, solvents, as well wires and lead-based paint and antifouling agents, which must be stripped.

# Denmark gets its first artificial reef

**On October 5 the former ferry, *M/S Aërø Sund*, was scuttled just 600 meters off the southern coast of the island of Fyn (Funen) in the western Baltic. After a rather long wait with seemingly little action, a little before three in the afternoon, the ferry finally started to list to port, and within only a minute or two, it sank and came to rest upright on the bottom at 19m.**

Text by Millis Keegan and Peter Symes.  
Images by Lars Kirkegaard/Fotografit.eu

With its proximity to the coast and a sheltered position out of harm's way—no way near busy shipping lanes—will surely make this new wreck a popular site with

both local and visiting divers. Dive clubs and dive schools are welcoming the opportunity to train for wreck diving and wreck penetration in a safe setting.

### Diving Denmark

The sinking is part of a bigger project, "Diving Denmark", which aims to develop the region around Little Belt, Denmark, into an attractive dive area. It is the result of a partnership between private and public groups including four municipalities and the organization, Naturturisme I/S, which was set up for this purpose. Each year substantial funds have been invested in supporting local businesses and development along the coast. In 2013-14 alone close to the equivalent of US\$6.7 million was invested. One of the stated aims is to attract tourists,

in and out of the high season, to the area. Offering diving on the sunken vessel is a good way to do just that. In this context it was essential that the chosen vessel had a strong tie to the area. Consequently the vessel which was chosen was the *M/F Aërø Sund II*, which served as a ferry on the Aërøskøbing-Svendborg route in the archipelago south of Fyn between 1960 and 1999. It is somewhat fitting as its regular route passed by just a bit further out from its final resting place.

### Creating habitat

It is not just the divers who benefit.





Historical photo of the U-boat 576 and her crew during WWII



# NOAA finds German Sub

ED CARAM / NOAA

A research team led by the National Oceanic and Atmospheric Administration's (NOAA) Office of National Marine Sanctuaries have found the German U-boat 576 as well as the freighter *Bluefields* just 240 yards apart off the coast of the U.S. state of North Carolina. Lost for over 70 years, it is a significant find and a rare glimpse into WWII history.

"This is not just the discovery of a single shipwreck," said NOAA sanctuary scientist Joe Hoyt, chief scientist for the expedition. "We have discovered an important battle site that is part of the Battle of the Atlantic. These two ships rest only a few hundred yards apart and together help us interpret and share their forgotten stories."

Lost just 30 miles offshore in the area known as the Graveyard of the Atlantic, the two vessels played significant roles in the Battle of the Atlantic during WWII.

"Most people associate the Battle of the Atlantic with the cold, icy waters of

the North Atlantic," said David Alberg, who is superintendent of NOAA's Monitor National Marine Sanctuary. "But few people realize how close the war actually came to America's shores. As we learn more about the underwater battlefield, *Bluefields* and U-576 will provide additional insight into a relatively little-known chapter in American history."

## History

On 15 July 1942, the U.S. Navy was escorting 19 merchant ships from Norfolk, Virginia, en route to Key West, Florida, carrying cargo in aid of the war effort. The convoy was attacked off Cape Hatteras and the U-576

sank the freighter *Bluefields* as well as seriously damaging two other vessels. The convoy's air cover, the U.S. Navy Kingfisher aircraft, responded by bombing the U-576. At the same time, the merchant ship *Unicoi* attacked the sub with its deck gun. Within minutes, the sub and the freighter *Bluefields* were lost, sinking to the seabed where they rest less than 240 yards from each other.

While there were no casualties on the freighter *Bluefields*, the wreck site is still protected as a war grave for the crew of the U-576 who lost their lives in the battle.

"In legal succession to the former German Reich, the Federal Republic of Germany, as a rule, sees itself as the owner of formally Reich-owned military assets, such as ship or aircraft wreckage," the German Foreign Office said in a statement. "The Federal Republic of Germany is not interested in a recovery of the remnants of the U-576 and will not participate in any such project. It is international custom to view the wreckage of land, sea, and air vehicles assumed or presumed to hold the remains of fallen soldiers as war graves. As such, they are under special protection and should, if possible, remain at their site and location to allow the dead to rest in peace." □

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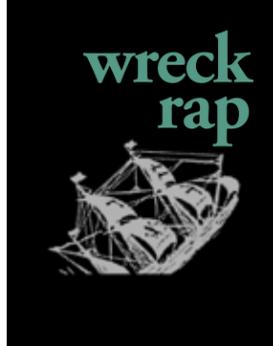


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## Franklin shipwreck found in the Arctic

Canadian Prime Minister Stephen Harper confirms the wrecked Franklin expedition ship found last month in the Arctic has been identified as *HMS Erebus*. The Victorian-era vessel became part of nautical folklore after it vanished in the mid-19th century. Its captain, Sir John Franklin, had been searching for the fabled Northwest Passage.

Two ships, *HMS Erebus* and *HMS Terror*, were part of Sir John Franklin's doomed expedition in 1845 to find the Northwest Passage from the Atlantic Ocean to Asia.

The ships disappeared after they became locked in ice in 1846 and were missing for more than a century and a half until last month's discovery by a group of public-private searchers led by Parks Canada. It was not known until now which of the two ships had been found.

In a release, the Prime Minister's Office said the confirmation of the ship's identity was made September 30 by those Parks Canada scientists, following a "meticulous review of data and artifacts" from the seabed and using high-resolution photo and video along with sonar measurements.

Ryan Harris, a senior underwater



Archaeologist Filippo Ronca of Parks Canada, at stern, measures muzzle bore diameter of one of two cannons found, which identifies this gun as a brass 6-pounder

archeologist with Parks Canada and the lead on the project, was the first to venture down to the wreck along with his colleague Jonathan Moore.

### Archaeological evidence

The find of one of Franklin's vessels in the shallow waters of the Canadian Arctic is not the end to the story but just the beginning, according to marine archaeologist Rob Rondeau.

Indeed, British archaeologist William Battersby, a colleague of Rondeau and an expert in the Franklin history, hailed the find as, "A frozen King Tut's tomb!"

Battersby and Rondeau have collaborated on the research of Franklin's ships since 2008. According to the researchers, it took ten years for Victorian England to find out that all 129 crewmen of the Franklin Expeditions had lost their lives, Franklin included.

Battersby and Rondeau said archaeological evidence confirms that all of Franklin's men died around 90km from Victory Point, the place they came ashore. This was not their intention, of course, as they had set out on foot after abandoning their ships on April 22 to head

south while pulling equipment and provisions on heavy wooden sleds. Their aim was to get to Back River on the mainland and paddle down the river to Hudson's Bay. This did not happen.

At Victory Point, a handwritten note penned by the captain of the *Erebus*, Commander James Fitzjames, as well as Lieutenant Graham Gore, the captain's second, was found in an empty food tin under a pile of rocks, a stone cairn put in place by the crew. The note was found ten years later by the Fox Expedition who were funded to search for the missing crewmen by Lady Jane Franklin, Sir John's widow.

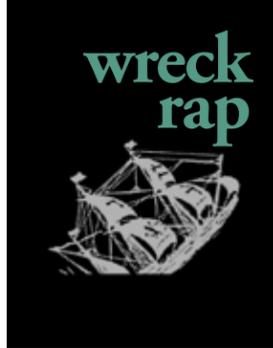
Following a path of debris left by Franklin's men, Fox's second in command, Lt. William R. Hobson, and his team found a sled with a ship's boat lashed to it as well as the remains of several of Franklin's men resting inside and around the boat. A gruesome discovery, the searchers were puzzled by the fact that the sled and boat faced north rather than south, which begged the question of whether or not the crewmen attempted to go back to the *Erebus* and *Terror*.

### Clues from Inuit oral tradition

Inuit indigenous people of the Arctic have incorporated the Franklin disaster into their oral history. A surveyor of the Hudson's Bay Company, Dr John Rae, met one of the Inuit hunters wearing bits of a Royal Navy



*HMS Erebus and Terror*, historical woodcut by Francis Watt



HMS Erebus in the Ice, by Francois Etienne Musin, 1846

officer's cap at a point near Pelly Bay, which is east of King William Island on the mainland. He gathered from the hunter's tale that a large group of "Ka-bloo-nans" (White Men) had starved to death many winters ago at a location much further west.

Then Rae ran into more Inuit people in Repulse Bay, southeast of Pelly Bay,

who knew about the fate of the Franklin Expedition. Upon trading with the Inuit there, Rae acquired artifacts and instruments from the Franklin vessels including one of Franklin's own medals.

Through the years the stories involving encounters with the crew and vessels of the Franklin Expedition varied as the Inuit passed them down from generation to generation, giving different locations for the finds. Many questions remained, as the expedition had state-of-the-art technology at the time including new inventions such as a daguerreotype camera with glass-plate negatives, which could have been used by the expedition's four doctors, possibly leaving behind photographs of Franklin and his crew.

"The recently discovered shipwreck will tell us a lot," said Rondeau. "Its location has already shed light on the mystery. It is, in fact, where Inuit reported seeing one of Franklin's ships. Its contents will tell us even more." □

SOURCE: PROCOM MARINE SURVEY & ARCHAEOLOGY



Marine archaeologist Andreas Bloch surveys what turned out to be the remains of an approximately 6,500 year old 'trunk vessel' in the shallow waters of Smålandfarvandet (an archipelago in southern Denmark)

## Survey uncovers Stone Age canoe

During the laying of a new electric cable, a dig in Denmark turned up a find twice the age of the Egyptian Pyramids. At a depth of about two meters and along what during the Stone Age was the coastline, the remains of a 'trunk boat' was discovered. After an estimated 6,500 years on the seabed, the material was "soft as butter" and very delicate, explained Jørgen Dencker, a marine archaeologist and curator at the Viking Ship Museum in Roskilde.

### Repairs

Most intriguingly the boat seems to have been repaired. It ap-

pears that a hole has been mended with some sort of putty and covered with a piece of bark with holes along the edges which was then affixed or sown in place with a string of some kind. The string is only about 2mm thick and appears to be made out of plant fibers. Exactly what it is made out of the archaeologists do not yet know, but in other instances, fibers from nettles or bark from linden trees have been used.

There is nothing primitive about it, Jørgen Dencker stated to the Danish daily *Politiken*. They used the same knots as we use today

and the vessel, which is made out of a hollowed out tree trunk (hence the name), was both light and elegant. What remains today are two planks about 2m long.

The boats were used for fishing and transport. At the time people lived in small settlements or camps along the coast and lived off the rich natural resources. Fish were plentiful and the forests were full of game. It is believed that people in the area during the Stone Age only needed to spend two hours each day to procure their food. □

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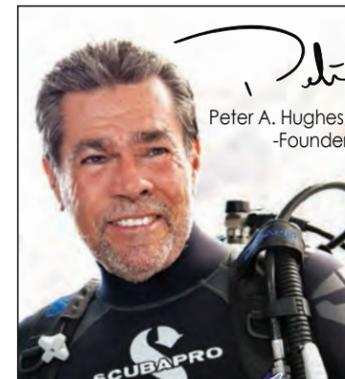
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Diamond Shoal Lightship No. 71, was the only American lightship to be sunk by enemy action during World War I



NOAA/MONITOR NATIONAL MARINE SANCTUARY

## Wreck of Historic World War I lightship to be preserved

The National Oceanic and Atmospheric Administration (NOAA) and U.S. Coast Guard, has agreed to jointly manage and protect the historic wreck. Although the LV-71 is located in 180 feet (55m) of water, it is within reach of technical divers. To help recreational divers better interpret the wreck site, NOAA will create illustrated dive slates and an online exhibit about the wreck and its crew is also planned.

Built in Bath, Maine, in 1897, the lightship, also known as LV-71, was constructed with a wooden hull with a steel keel and braces. She was propelled by a single surface condensing engine and a scotch fired boiler, with a four bladed propeller eight inches in diameter. She also had a cluster of three 100 cp electric lens lanterns mounted in a gallery at each masthead, a

12-inch steam chime whistle and a hand operated fog bell weighing 1,000 pounds.

She served as a floating light-house, sound signal station and navigational beacon and for 21 years, the lightship marked the treacherous waters of Diamond Shoals off of North Carolina to ensure other vessels could navigate safely.

### Submarine attack

Then, on 6 August 1918, the German submarine U-140 attacked the vessel while it was anchored off Cape Hatteras. Before it was attacked, LV-71 had reported by radio the presence of a submarine that had torpedoed the unarmed American steamer *Merak*. The U-140 intercepted the warning, and after giving the crew the opportunity to abandon ship in lifeboats, sank it by surface

gunfire. The lightship's crew of 12 reached shore without injury. According to *A History of U.S. Lightships* by Willard Flint, more than 25 friendly vessels were warned away from the area by the lightship.

### 100th anniversary

As a government vessel, the LV-71 is still owned by the United States. Under the agreement, NOAA, through the nearby Monitor National Marine Sanctuary, will conduct work required under the National Historic Preservation Act to document the wreck's physical remains, nominate the site to the National Register of Historic Places, and partner with the local community and Coast Guard to share LV-71's story for the 100th anniversary of its sinking and beyond. □

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Text by Betty and Dan Orr

For most of us, in order to see some of the best dive locations in the world we have to leave home and travel great distances by car, airplane or boat. Even with the prospect of incredible diving opportunities, right now—with scary diseases that may or may not be readily transmittable, civil and political unrest, economic instability, bad weather systems and much more that I only think about when I have to stay awake all night—travel might not be at the top of your must-do list.

In all honesty, there is always something happening somewhere in the world that may give us pause in our travel planning and the fear, real or imagined, of bumping into it should not drive us into a locked room in our basement. The best way to address these fears is to fully research the travel destination, looking at all the available travel advisories found on the relevant government and travel websites and make an informed decision about the risks associated with travel to that location or region of the world. Once educated and decisions made to

travel or not to travel, as we discussed previously, fully prepare to enjoy your adventure and look forward to coming home to brag about the things you have done and the wonders you have seen.

### Financial risk

Once you've made the decision to travel and have fully researched the site, it is important to consider the option of reducing your financial risk if something were to go terribly wrong. Trip or travel insurance is a great way to protect your travel investment and many of these

programs provide an array of additional benefits that may be very important to the traveling diver.

Entry-level and generally low cost coverage will usually only reimburse you if you can't travel due to weather issues (hurricanes, typhoons, tornadoes, tropical storms, floods, tsunamis, etc.). But if you want broader and more comprehensive coverage that would take care of you canceling a trip for any reason, expect to pay as much as 20 percent of the value of your trip.

Do your homework and as part of your

complete preparation for the trip, read the fine print of the proposed travel insurance policy. Do your research into travel insurance so you understand what is covered and what is not before you put your deposit down on your trip.

For the best coverage that your insurance dollars will purchase, buy it at the same time you put your trip deposit down. That is because many pre-existing medical conditions may be covered if you purchase your coverage at the time your deposit is made. Also, named storms, such as hurricanes, will only be

covered if the travel insurance is purchased prior to storm being named by the weather service. In other words, you can't buy car insurance after the car is wrecked (although it would be very convenient and many people have tried).

### Health risk

Next, consider reducing your health risk. Check to see if any immunizations are recommended or required for your destination and make arrangements with your health care provider to get the shots you need. Flu shots may not be on the list, but



# To Travel or Not To Travel...

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you should make sure that is current as well.

Once you have all your required or recommended immunizations, it is a good idea to put together a personalized first aid kit that includes anti-emetics and anti-diarrheal medicines. As careful as you may be, eating foods or drinking liquids in a foreign country could seriously disagree with your digestive tract. Ask your physician if they can recommend any additions to that kit. Nothing beats a professional's opinion.

If you do carry any prescription medications out of the country, make sure

you have them in the original bottle with the pharmacy and physician information clearly labeled on the bottle. Any unknown or suspect medications could be confiscated by customs agents as contraband.

### Wash your hands

An often-overlooked illness preventative mechanism is simply washing your hands often and thoroughly. Carry hand sanitizer to use in addition to soap and water.

While your hands may be clean, surfaces you come in contact with during travel may not. Considering all

the people using public and commercial transportation, you never know what someone did who sat in your seat previously. Plus, planes and other forms of public transportation are turned around so rapidly these days that they are given only the most cursory cleanings between trips. Disinfecting wipes are essential to clean arm rests, tray tables and other often touched surfaces before using them.

### Medical evacuation

Now, let's consider what you would do if you were injured or taken ill during a trip and you required emergency medical evacuation. Without considering the logistics involved if you were in a very remote dive or travel location, it is important to make sure that you have some

sort of financial coverage for medical evacuations. For instance, Divers Alert Network (DAN) provides medical evacuation coverage for its members, and even though they may constitute a very active diving population, the vast majority of medical evacuations are non-diving related.

Medical evacuations from even the most popular dive or travel location can be financially catastrophic if you do not have proper coverage. In many exotic locations, there may be no operational recompression chambers or even a rudimentary clinic, so divers and travelers may have to rely on medical evacuation services to get comprehensive medical care.

If the injury is diving-related, the injured person may require evacuation in a specialized aircraft capable of maintaining cabin pressures approximating 1 atmosphere as well as a specialized medical team. Emergency medical evacuation to the nearest appropriate medical facility can cost tens of thousands of dollars.

Most diving accident insurance and even some of the major credit cards may include some form of medical evacuation coverage in their benefit package. Just be sure that the one you have will evacuate you for any illness or injury, not just scuba diving. Make sure you know what coverage

you have before traveling and understand any and all exclusions.

Some evacuation coverage may be restricted to specified distances away from home or may exclude certain regions or countries. It is up to the consumer to know the limits of their benefits or coverage.

Many do offer broad coverage that you may not be aware of because they are in the fine print (sorry). The old adage, "large print giveth and small (fine) print taketh away" is certainly true with travel insurance/assistance benefits.

Know what coverage you've got and know how to use it. Hopefully, you'll never need it but it is better to have it and not need it than the alternative. This is all part of being fully prepared to fully enjoy what the wide world of diving has to offer. It's hard to put a value on peace but when you are far from home, it's just about priceless! □

*Dan and Betty Orr are consultants with over 80 years of combined diving industry experience. They provide diving safety and emergency management consultation, product review and evaluation, product and services marketing and educational expertise. For more information, visit: [www.dan-orrconsulting.com](http://www.dan-orrconsulting.com) □*



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Edited by  
Scott Bennett

## Going about getting some airport shuteye

You may be asking yourself one (or all) of the following questions: Can I really sleep in an airport? How do I do it? What should I bring with me?

### Get paid for cancelled flights

It's happened to us all: travel plans disrupted by delayed or canceled flights with seemingly nothing to be done. AirHelp, however, believes travellers are entitled to compensation. With five full-time lawyers on its 35-person staff, AirHelp helps travelers determine what they're entitled to when travel plans are disrupted. According to the company, 26.5 million travelers are entitled to monetary compensation each year, although less than two percent actually file claims.

"The problem is trying to figure out what your rights are," said co-founder Nicolas Michaelsen. Unless additional legal action is required, most claims are resolved within a period of six to eight weeks. "We'll follow through and take the airline to court," said Michaelsen.

"We've done that a lot of times," he added. To date, results have been mostly successful. Some 90 percent of their 50,000 users have been reimbursed, with an average payout of US\$600 before AirHelp takes its 25 percent share. □



If you are staying at a busy airport overnight, get there early to get a good spot, especially during peak travel periods. Airport officials may ask why you are there and not in a hotel and ask for proof that you really are departing the next day. Be prepared to answer all questions and present your outbound airline ticket. Dress in layers, with clothing that will make you comfortable if it is unbearably hot or bitterly cold in the airport. Pack a hat, gloves and blanket in your carry-on.

#### Be safe

Find out where the airport security office is and look for video cameras in the spot you decide to stay the night. They've probably seen many airport sleepers before and will direct you to a safe spot. If you are travelling alone, sleep near other travellers. A major concern is getting robbed while

you sleep! If you can't keep your bags in the left luggage office overnight you'll need to find a way to ensure undesirables can't access your bags. How you do this depends on where and how you sleep. Try sleeping with zippers facing either yourself, the ground or the wall.

#### Lounges

Flying first class is no longer necessary to receive first class service and comfort. There are now some wonderful pay-in lounges accessible to economy travellers for a relatively small fee. This includes buffet style meals, drinks (including alcohol), wifi, showers and comfortable chairs.

While one airport sleeping's objectives is to save money on hotels, you may want to bite the bullet and pay for a room. Before you go, it is good to know where the nearest airport hotels are located. Booking online can save some money. If you have a laptop or "smart" phone, start shopping for the best rate while in the terminal or while en route to the hotel. □

SOURCE: WWW.SLEEPINGINAIRPORTS.NET



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*"We spent the first week on Pelagian and the 2nd week on the island. The Pelagian was spacious and comfortable, like being in a 5 star hotel! Wakatobi resort was just as amazing - staff, accommodation, food, diving - all out of this world. Dive instructors ensured your experience was personal and you got the best out of your trip."*

Nicola Willis, August 2014



[www.wakatobi.com](http://www.wakatobi.com)

An underwater photograph of a vibrant coral reef. The scene is dominated by large, branching red coral structures that appear to be sea fans or similar soft coral. The water is a clear, deep blue, and numerous small, silvery fish are scattered throughout the frame, some swimming near the coral and others in the open water. The lighting is bright, highlighting the intricate textures of the coral and the shimmering scales of the fish.

*The Mediterranean's*

# Côte d'Azur

— *Where It All Began*

Text and photos by Kurt Amsler

Translation by Peter Symes

Edited by Catherine GS Lim

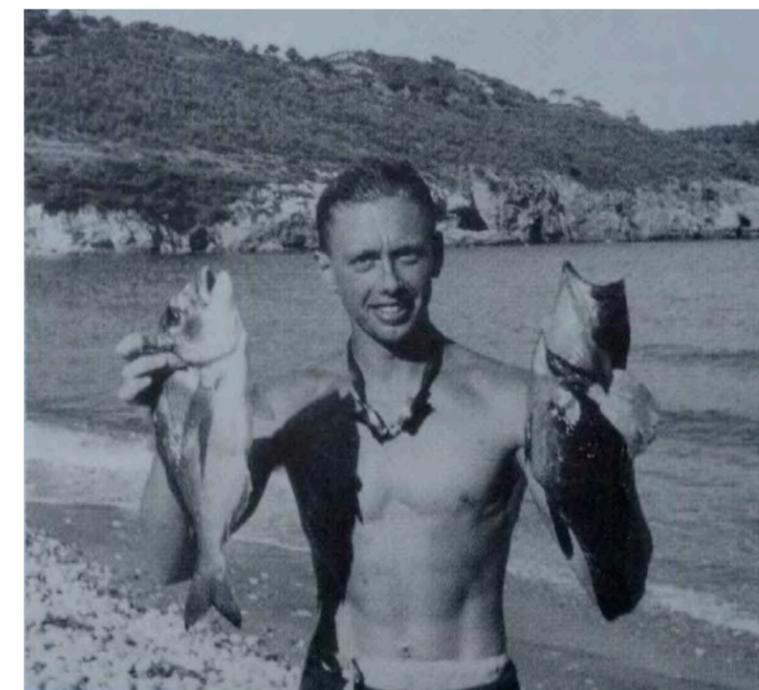


Coming full circle. It all started in the Med. It was here in the 1930's and 40's that the likes of Hans Hass, Jacques-Yves Cousteau, Frederic Dumas and Phillip Tailliez pioneered scuba diving as we came to know it. Erstwhile the obvious choice for dive travelers once the Red Sea and even more exotic destinations became accessible to a wider audience, it fell somewhat out of favor. But now, it's back on the map, the fish are back and so are the divers. Kurt Amsler gives us the lowdown on diving in what is now his backyard.

Wind the clock back to 1937, and we will find a young man from Austria by the name of Hans Hass spending his holiday after graduating from high school in the little town of Juan-les-Pins on the French Riviera. It was here he observed an

Englishman hunting for fish under-

water which seeded the inspiration that would later make him one of the greatest diving pioneers. It was also in this region that three Frenchmen from Marseilles—Jacques Cousteau, Frederic Dumas and Phillip Tailliez—who later came to be known as the “The Three Mus-



Historical photo of Hans Hass at Juan-Les-Pins, France

Diver at Cape Dramont, Esterel, Côte d'Azur (above); The scenic seaside at Bandol along the Côte d'Azur (top right). PREVIOUS PAGE: Red starfish on reef



Estérel, Côte d'Azur (left); Historical photo of Émile Gagnan with the first Aqua-Lung, 1943 (above); French village along the Côte d'Azur (right)

children opening a Christmas package who were quite as excited as we were when we unwrapped this first 'Aqua Lung'. If this piece of kit was working as intended it would mean a revolution in the diving community.

"We procured a set of three medium-sized cylinders with compressed air, which were connected to a regulator the



Jacques-Yves Cousteau with the first Aqua-Lung, 1943

keteers", first started underwater hunting before experimenting with various equipment that allowed them to breathe underwater. This was how the regulator came about.

It was here, in June 1943, that what was to become arguably the most important invention in diving was first developed and tested. Jacques Cousteau describes this event as an uplifting moment in his book, *The Silent World*:

"On the morning of said day, I went to the station in the little town of Bandol on the French Riviera and picked up a little parcel that had been sent to me express from Paris. It contained a new promising device, the result of years of struggles and dreams: It was the automatic aqualung that Emile Gagnan and I had built together. I went back to the villa Barry where my dive-buddies Philippe Tailliez and Frederic Dumas were eagerly awaiting my return. I don't think there have ever been any



Jacques-Yves Cousteau (left) with the first Aqua-Lung, in Bandol, France, 1943

size of an alarm clock. The regulator was fitted with two hoses that were attached to a mouthpiece. Kitted up with this equipment strapped on the back, a waterproof mask of glass over the eyes and nose and rubber flippers, we wanted to undertake free and independent daring forays into the depths of the sea.

"We hurried to a sheltered bay where we could be safe from the prying eyes of bathers and the Italian soldiers from the occupational force. I checked the air pressure. The tanks contained compressed air with a pressure of 150 atmospheres. I could hardly contain my excitement and was eager to discuss the plan for the first test dive."

The rest, as they say, is history. Of course, many other well-known names and places along the



Diver on wall of red gorgonian sea fans; Goby, Port Cros (right)

Côte d'Azur, closely tied to the evolution of diving and technology, which we now take for granted today, were in many cases conceived and first tested along these coastlines.

Henry Broussard and Dimitri Rebikoff developed some of the first underwater cameras and flash units in Cannes. In Marseille, Claude Wesly and Albert Falco (who later captained the research vessel Calypso) were among the first people to spend several days in an underwater habitat on the seabed. And, of course, there is the freediving legend, Jacques Mayol, who lived in Sanary.

Places like Grand Congloué, Le Dramont and Antheor are famous

for their ancient shipwrecks, while names like Port-Cros, Cavalaire, La Tour de Fondue, or Planier Island make the connoisseur divers' mouths water.

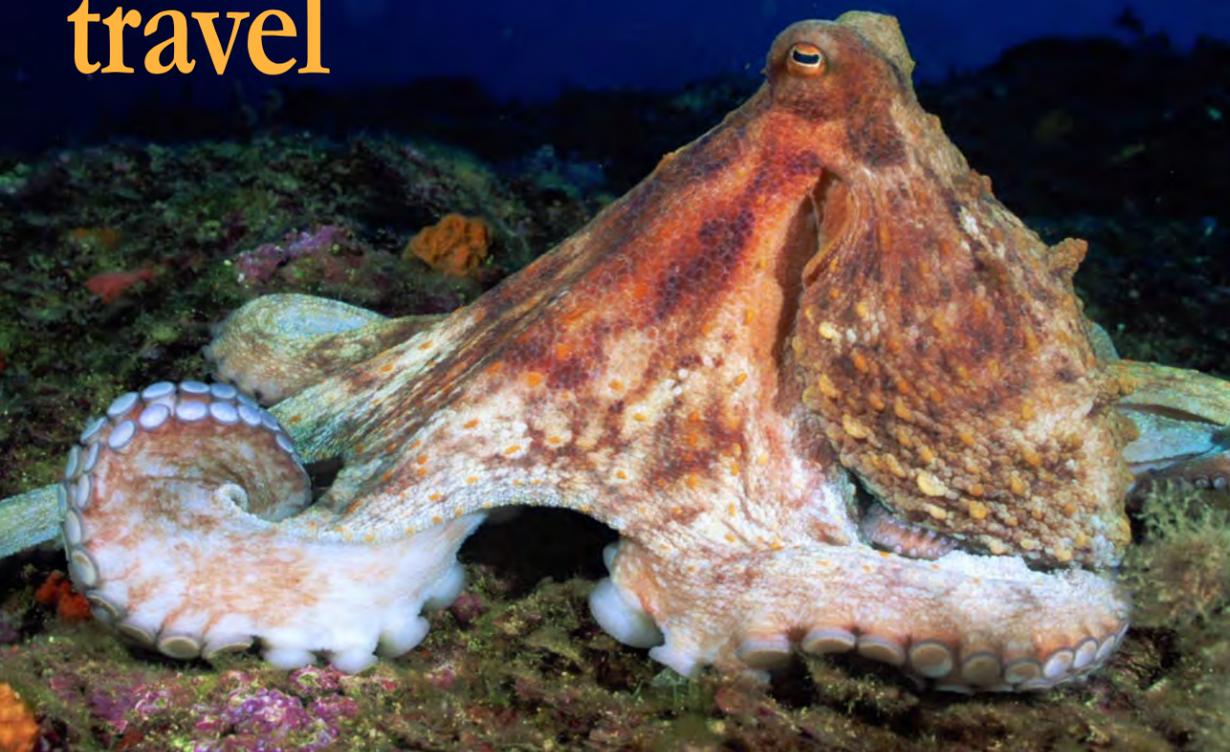
The French Riviera is also the seat of many leading brands of dive equipment: Scubapro in Antibes, AquaLung in Nice, Beuchat and Oceanic in Marseille. On the Italian side of the border, we find equally significant makes such as Mares and Cressi-Sub. The region is also a



center for skindiving, with commercial diving schools such as COMEX being based here.

For many years, the world festival of underwater images was based

Conger eels (above); Hermit crab (top left)



Common octopus (above); *Flabellina* sp nudibranch (right inset)

in Antibes/Juan les Pins before moving to nearby Marseilles. Beginning as a local event over three decades ago, this annual photographic celebration is now the world's biggest and most significant event of its kind.

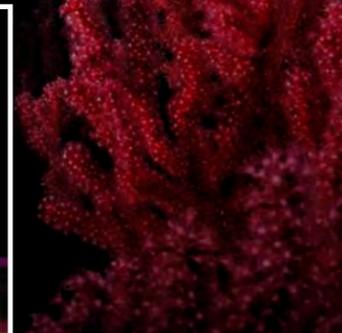
The highlights of the Côte d'Azur are, of course, the wrecks. Currently, many hundreds are known and about half of these are within reach of regular recreational divers. But there

are so many other highlights for a diving vacation on the Côte d'Azur.

### Profitez de la vie! —Enjoy life!

Surely the underwater world off the coast of southern France now looks quite different from the time the aforementioned pioneers went on their first exploratory forays into the blue realm. But for those who say that the Mediterranean has nothing more to offer, think again. Granted, you have to know the good places to experience diving adventures that do not get any better in tropical seas. Fortunately, there is now a very good infrastructure for divers in place with well-equipped dive centers from Marseille to Nice.

As far as the conditions go, the wind and weather can sometimes get a bit rough and the water is a few degrees colder than in a tropical lagoon. But it is precisely these factors that make diving at



the "Côte" a special experience.

### Technical diving

Diving in the Mediterranean differs from diving in the tropics in several ways. In the Mediterranean, the most beautiful regions are found at depths of between 20 and 40 meters. This depth already raises the bar with regards to the requirements of equipment and training.

In addition, a 10-liter tank (The ubiquitous Alu80 used as a standard tank size at many resorts worldwide contains 11 liters) can only take you so far. It is not really big enough. A 15-liter tank is more appropriate. Since the temperature of the Mediterranean decreases markedly with depth, a good 6mm to 7mm wetsuit is required in summer; while a dry suit comes in handy during the winter.

Many of the most spectacular sites and

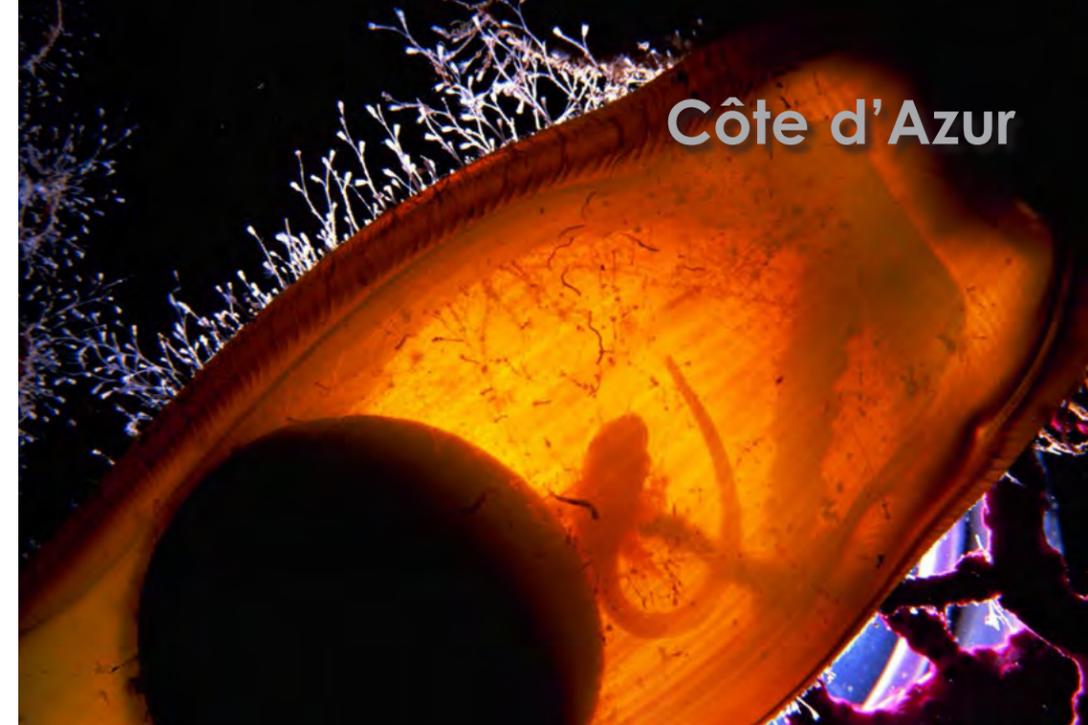
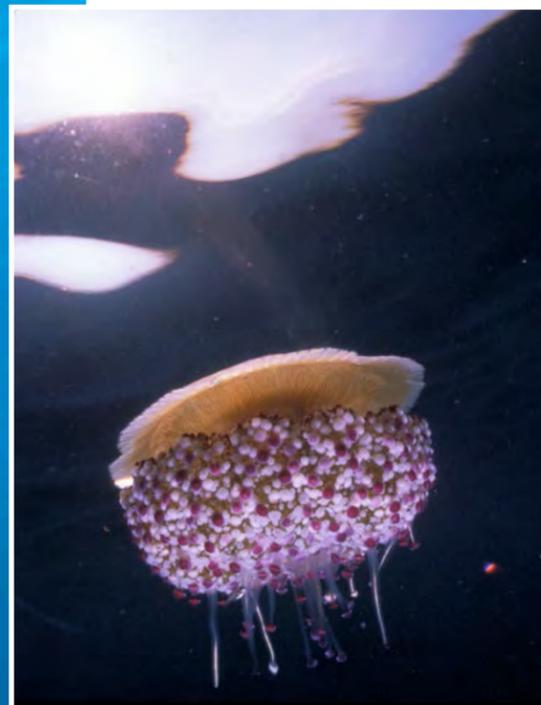


John Dory fish, or *Zeus faber*



Mola mola (above); Diver with grouper on reef of red gorgonians (top right)





Rhizostome jellyfish

wrecks are found in open water where ascending along a down-line is required, so a higher level of diving experience and training is recommended. The dive centers in locations covered in this article provide excellent service and training. Descending through the blue from a buoy in open waters is nicknamed "parachuting" and can be quite fun, even if it only takes a short time to get down.

**Flora and fauna**

The jewels of the Mediterranean are its biodiversity and colors, but

not as you know them in tropical reefs. Thanks to many protection measures and national parks in France, the abundance of fish is enormous. The colors of the underwater world are magnificent, and rocks and the wrecks are overgrown with large red and yellow gorgonians.

At this point, I would advise you to always bring a lamp of at least 20 watts, even during the day. Only with illumination is it possible to appreciate the beautiful colors on the walls of canyons, grottos and caves. In these habitats,



more sedentary creatures—such as moray eels, conger eels, scorpionfish, octopus and grouper (called Merou here in France)—can be seen.

On the island of Port Cros, for example, there are places with more than 30 of these groupers. Around the red gorgonians are

filefish, which show the same light colors as their tropical relatives. In open water, you can observe large flocks of small dark-coloured swallowtails chasing mackerel and the other predatory fish.

For several years, large schools of barracuda can be found in various locations. Practically hun-

typs of red precious coral and the various tubeworms never fail to make photographers' hearts beat a little faster.

**The wrecks**

Without a doubt, this coastline is a paradise for wreck divers. Just off Marseille, there are more than

CLOCKWISE FROM TOP LEFT: Grouper over seagrass; Fried egg jellyfish; Catshark embryo in egg case; Mediterranean moray eel

dreds of schools of fish can be found at La Gabiniere, in the National Park Port Cros.

For macro fans, the Mediterranean is a never-ending, and always exhilarating hunting area. Provided you have good eyes, you can spot various kinds of nudibranchs in all colors and shapes. The yellow anemones, the white pol-





ten large vessels, including the *Liban* and airplanes from the Second World War such as the German JU-88 and a Messerschmitt 109. More can be found at the height of Toulon and around the islands of Hyerschen.

Here too lie the famous *Donor*, the *Grec* and the *Congerwreck* of Port-Cros. Interesting stories are attributed to the *Rubis* submarine wreck in St Tropez, and the *Togo*. The majority of the wrecks were sunk by sea mines during the Second World War. Virtually all the wrecks on the Côte sit on sandy ground and have become artificial reefs, completely covered with fish and giant red gorgonians. The diving centers in these areas are specialized and well-equipped for wreck diving, so it is worthwhile to make use of their

experience and services.

**Donator wreck.** The *Donator*, or *Prosper Schiaffino* as it was originally called, was built in Norway. She was 78.28m long and 11.94m wide with a draft of 5.54m. The ship was underway from Algeria to Nice with a cargo of wine, which was stored in countless barrels in the cargo hold and in large tanks on deck.

By November 1945, the clearance of mines in the Mediterranean after the war ended was far from complete. Hence, the captain ordered increased vigilance and careful navigation. The freighter

#### DONATOR FACTS:

**Type of ship:** Freighter

**Year:** 1931

**Weight:** 1,698 GT

**Nationality:** France

**Sunk:** 10 Nov 1945

**Cause:** Sea mine

**Location:** Southeast of the island of Porquerolles

**Minimum depth:** Mast 25m; structure 35m

**Maximum depth:** 51m; rear bow 48m

**Difficulty:** Advanced

**Summary:** Good

reached the Spanish coast without incident and carried on towards Toulon. Since the passage between the peninsula Giens and Porquerolles was blocked, the *Donator* had to pass on the south side of the island.

On 10 November 1945, the fully-loaded freighter was working against a strong wind known as the Mistral. At exactly one o'clock in the afternoon, disaster struck. A huge explosion rocked the ship and tore the

THIS PAGE: Scenes from the *Donator* wreck

THIS PAGE: Scenes from the wreck of the *Donator*

apparent how huge the ship really was.

The fore deck can be found a little deeper. The deck planks have long since rotted away, exposing the cargo hold below. Some scattered metal wine barrels among a scrambled mass of metal debris still remain there to this day. Diagonally across the aft deck lies a huge mast which, until a few years ago, stood up vertically to a depth of 25m. It ultimately collapsed due to corrosion and the strain of mooring ships pulling on it.

What is left of the superstructure is now more of a skeleton



bow apart. The ship had hit a sea mine, which was either set adrift or had gone unnoticed by the minesweepers.

It took only a few seconds after the explosion for the hull to take in so much water that the stern of the *Donator* rose into the air. Although the ship fought to stay afloat—trembling and shaking but not capsizing—it ultimately succumbed and went under, with the bow going down first.

**Diving:** The wreck of the *Donator* now rests on a shallow sand bottom, with the blasted bow at 48m and the stern at 51m depth. The deck is at a depth of 40m, with the superstructures about 35m below the surface. The wreck is

very large and swimming around it is only possible if the current is weak.

A dive to the *Donator* is an unforgettable experience. More than 60 years on the seabed have transformed the ship into a thriving reef. Shoals of damselfish swim all over. In crevices and shelters, hundreds of orange red tilefish can be found.

The stern is clearly the most interesting part of wreck, with huge and lush gorgonians overgrowing the propeller and rudder. Here, a large steering wheel can be found. And a little towards the bow, a replacement propeller is lashed. Swimming next to the four huge prop blades makes it immediately



with perforated metal walls attached. And yes, it is possible to swim through from one side of the wreck to the other. On both sides, there are empty davits from where the lifeboats were once suspended. The midship has largely collapsed, but

the sides of the former bridge still stand up steeply in front of the fore deck where large pieces of metal debris lay scattered. From the extent of destruction, it is evident where the explosion struck. The remains of the bow, which now rests on its tip on the sand, is surrounded by more debris.



**Le Liban wreck.** The sinking of the passenger steamer *Liban* outside the port of Marseille, with the loss of almost 200 lives, was the greatest maritime disaster ever off Southern France. The disaster which struck on 7 June 1903 was inexplicable. It was neither bad weather and poor visibility nor technical failure that caused the fully-loaded passenger liner en route to Corsica to collide with the incoming steamer *L'Insulaire*. Captain Lacotte, who commanded the *Liban*, executed some maneuvers to free his vessel from the bow of the *L'Insulaire* and was eventually successful in doing so. But not before serious damage was inflicted on his ship.

Being aware of the consequences of the collision, he decided to head to the Ile Mairé to possibly run the ship aground

to keep her from sinking. The towering cliffs surrounding the island made beaching the vessel difficult but the captain opted to steer the stricken steamer at full steam between two protruding rocks at Les Farillons in front of a beach. The manoeuvre might just have succeeded, if not for what happened next. Only 20m shy of the shoal, the stern of the *Liban* slowly began to lift out of the water. With the propeller out of the water, the ship lost momentum and, under strong vibrations, the vessel came to a stop. The *Liban* began at first



LE LIBAN FACTS:

**Type of ship:** Passenger steamer  
**Nationality:** France  
**Weight:** 2,308 tons  
**Year of construction:** 1882  
**Sunk:** 1903  
**Cause:** Collision with another boat  
**Location:** Island of Maire, "Les Farillons," Marseille  
**Minimum depth:** 30m  
**Maximum depth:** 36m

the *Liban* broke midship. Once the curtain of water had fallen down and the bubbles dispersed, the once-proud ship had vanished.

**Diving:** The location at the Les

Farillons where the wreck rests slowly and then, with surprising speed, to sink bow first. Everything happened so fast that the crew had no time to deploy the lifeboats. A massive explosion followed as a boiler ruptured, tearing apart the steam engine. With a deafening crash and in a fountain of spray,

is protected from the northerly winds, but is exposed to the waves coming in from the south or east.

The *Liban* is about 50m long and lies with her bow at 30m and stern at 36m. As is usually the case with vessels with a keel, the *Liban* rests at an angle of 45 degrees on the seabed. Sliding over the railing and down to the rudder, a huge bronze propeller sticks out of the sand.

THIS PAGE: Scenes from *Le Liban* wreck





MESSERSCHMITT FACTS:

**Aircraft Type:** Interceptor  
**Nationality:** Germany  
**Weight:** 33,860 pounds  
**Year:** Unknown  
**Sunk:** 7 March 1944  
**Cause:** Engine failure  
**Location:** North of the island of Planier, Marseille  
**Depth:** 44m

the 30mm cannon firing through the propeller shaft ablaze.

His salvos kept missing their targets due to the

strong turbulence that threw his plane. After a second attack and pulling his plane back up, the engine suddenly stalled. Thanks to having gained high altitude and aided by a strong wind, the pilot managed to glide for many miles. The two American Lightning fighters left him alone, apparently having written off the Messerschmitt—the plane already had smoke coming out of the engine and steadily lost altitude.

However, thanks to his strong flying skills, Captain Fahrenberger managed

to fly the stricken plane to Le Planier, a small island with a lighthouse. Despite the windy conditions and wave action, he performed a controlled landing about 100 yards from the island and then made it ashore. There, he was later spotted and rescued by a German patrol vessel.

**Diving:** The wreck of the Messerschmitt lies almost exactly 100m from Le Planier at a depth of 45m. The plane is only 8.74m long, so it can easily be missed. It is possible to anchor directly over the wreck or to reach it by diving from the shore. This is always an eventful dive and the whole northern side of the island is covered by gorgonians. In slack currents, it is easy to get to the point on the rock wall just under the lighthouse, which is exactly south of the wreck. From here the plane is easily found by following a compass bearing of 0 degrees or due north.

Under the listing side of the hull, there is a dense cover of gorgonians with their intense red color lighting up if illuminated by a torch. This is a good spot to start exploring the wreck.

From the bow, which is still in a good state of preservation, swim over to the pile of rubble and iron parts to see the huge ruptured boiler that once formed part of the steam engine. This was the spot where the explosion that caused the vessel's demise occurred, so the level of destruction is most extensive here. Whenever there is current, divers can shelter behind the superstructure.

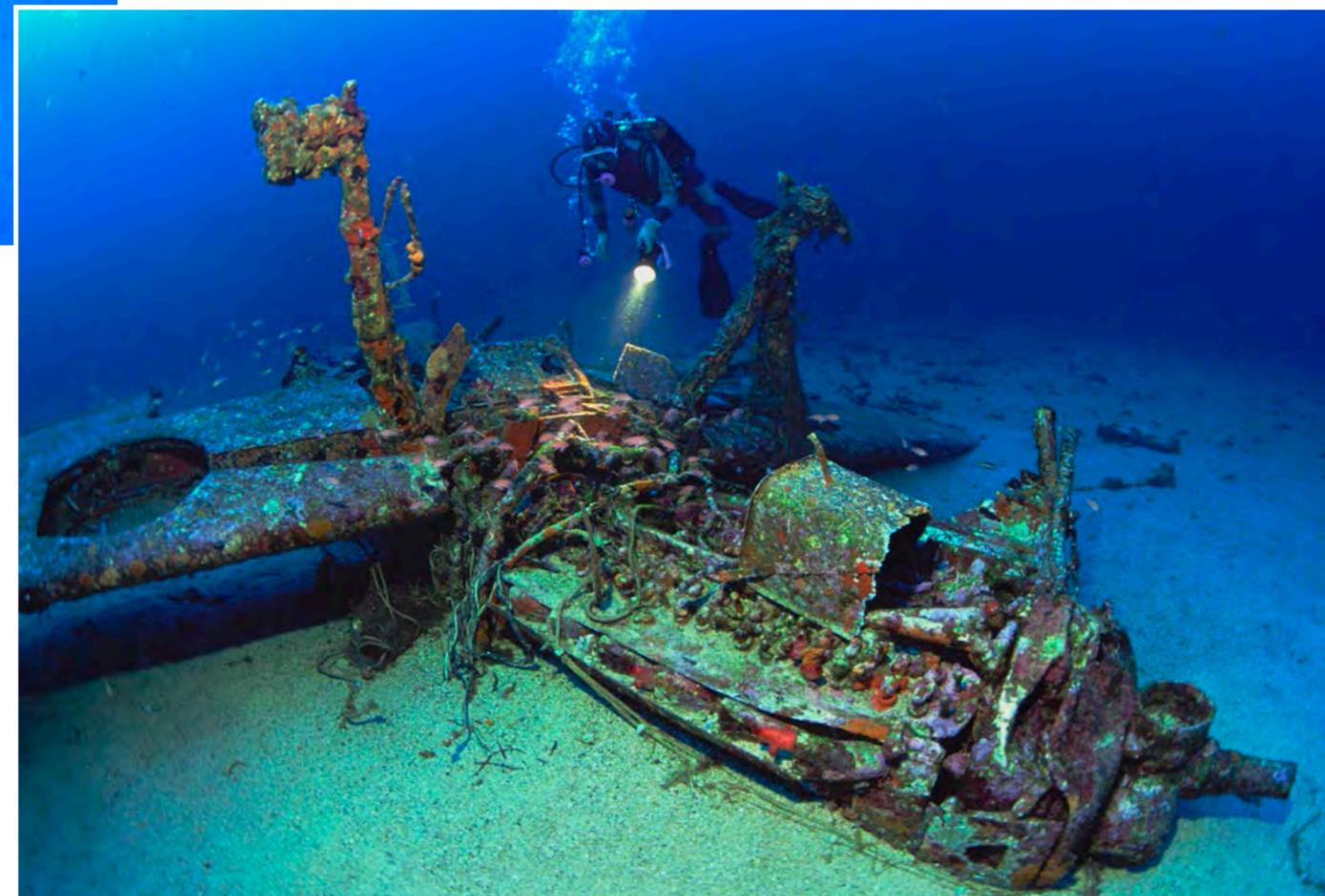
Thousands of damselfish usually scoot around on the former salon deck. Above the planks, schools of sea bream often congregate. Between the badly twisted iron parts, large conger eels hide with

their big googly eyes reflecting divers' lamplights. The abundance of fish and the growth on this wreck never fails to thrill me, over and over again.

In the deeper regions of the wreck, lush red gorgonians thrive. The deck is decorated with yellow horn corals strutting out from iron parts and in passages. The deck is flattened and there is a large anchor winch, which now rests beside the bow. From this point, there is a nice overview of the port side rail of davits, the erect bow and one of the masts, which lies on the sand of the starboard side of the wreck, among a lot of other debris. It is highly recommended to bring a dive lamp to illuminate the colorful gorgonians and spot the animals hiding amongst the iron parts.

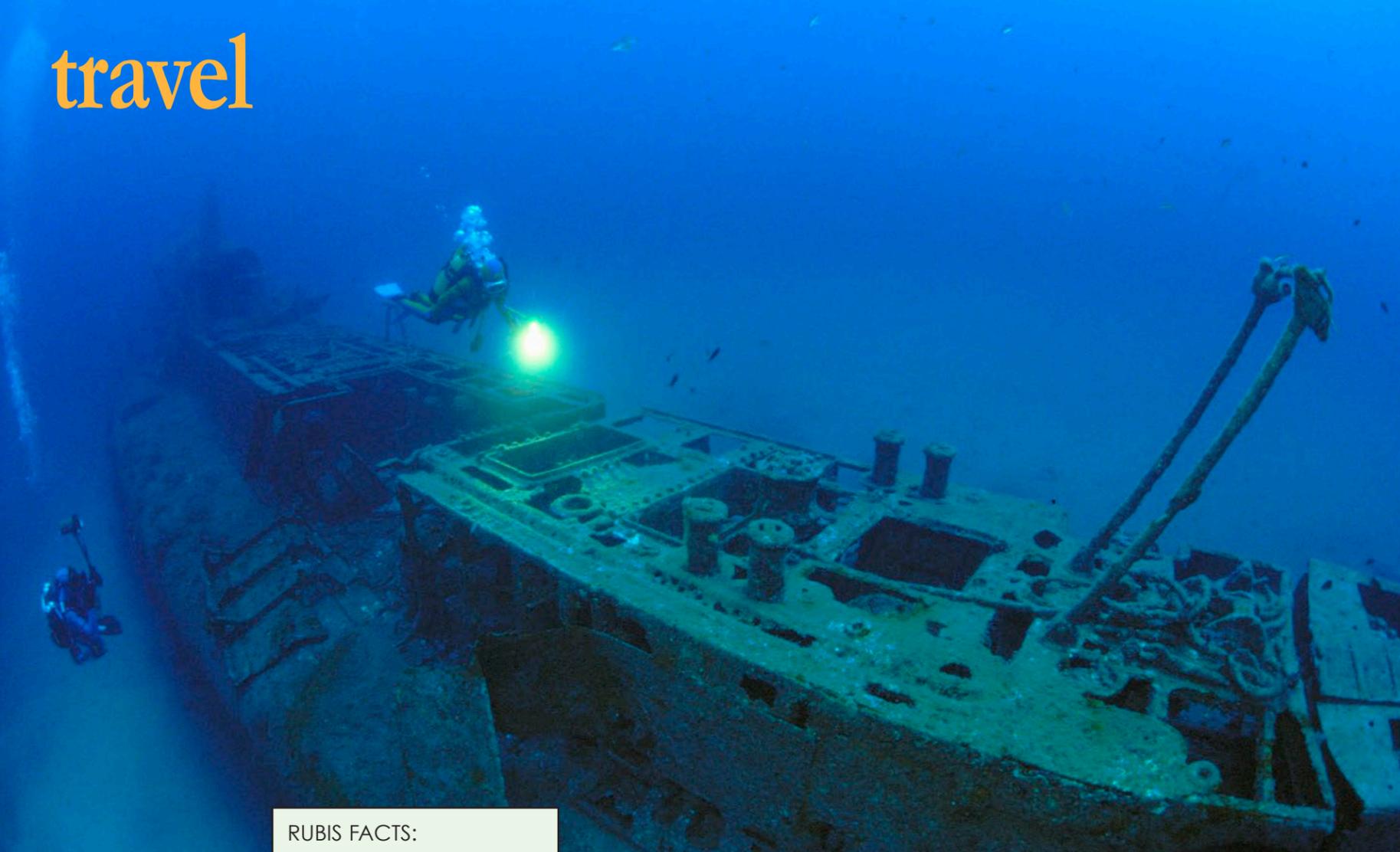
**Messerschmitt wreck.** On 7 March 1944, the alarm went off at the German air force base, Istre, near Avignon. Two American B-17 bombers, escorted by two Lightning fighter-interceptors, had been detected approaching Marseille. Two Messerschmitt ME 109 fighters were swiftly scrambled to intercept the enemy planes.

One of these was piloted by Captain Hans Fahrenberger, and the sortie that ensued would almost cost him his life. Once the enemy bombers were identified, the two Messerschmitt attacked without hesitation. Captain Fahrenberger dove towards the targets, with



THIS PAGE: Scenes from the wreck of the Messerschmitt





to captivate visiting divers. The wreck remains in an excellent state of preservation, even the conning tower, the gun platform and the mine covers, which, however, have begun to corrode.

Meanwhile, gorgonians and sponges have settled on both sides of the hull tubes, in tubes, on pipes, and in the many nooks and crannies. Thanks to the many big conger eels, moray eels and scorpionfish that now call the wreck home, the *Rubis* will continue to be a fascinating dive. There is rich growth

### RUBIS FACTS:

**Type of ship:** Minelayer submarine  
**Nationality:** France  
**Weight:** 762 tons  
**Launched:** 1931  
**Sunk:** 1958  
**Cause:** Sunk as a memorial monument  
**Location:** Cap Camarat, St Tropez  
**Minimum depth:** 34m  
**Maximum depth:** 41m

Following this course, the plane can be spotted from afar. It looks like a huge insect lying spread out, belly up. A blade of the propeller (which, driven by a 2000 HP engine, enabled the Me-109 to go as fast as 727 kph) still

sits, poking out of the sand. The others are gone. The tail, with the fin still attached, is slightly bent as the result of unsuccessful attempts by some commercial divers to lift the wreck to get to the cockpit.

As the aircraft sits on an open sandy area of the bottom, it has become an oasis for the marine life that have taken up residence

there. From within the barrel of the cannon, conger eels peek out onto the world, large tubeworms adorn the wings and the undercarriage, while the metal surfaces are encrusted with mussels.

Since the wreck is so small, it is paramount to avoid disturbing the seabed as kicking up sand immediately reduces the visibility.

**The submarine *Rubis*.** The French submarine *Rubis* was launched in 1930 and commissioned in 1932. The U-boat was designed to deploy mines in enemy territory without surfacing but she was also

able to fire torpedoes. All her 32 mines were carried on the outside of the pressure hull under a streamlined cover.

Other types of submarines at that time deployed mines through airlocks. The issue with this procedure was the weight loss that caused the deployment of the mine, which required the trim of the vessel to immediately be corrected. It was a tricky matter. The *Rubis* could dive to 50m and deploy her periscope from a depth of 15m.

On the deck, the dual 75mm Oerlikon cannons mounted there carried five torpedoes, which could be fired from the rear. During 28 missions, the *Rubis* deployed 683 mines, which sunk 23 ships. After the war, *Rubis* was moved to Toulon. The crew was

awarded the highest French and English medals. To spare the famous submarine from being ignominiously scrapped, it was scuttled with full honours in 1958 off Cap Camarat, between Cavalaire and Saint Tropez.

**Diving:** The *Rubis* sits upright in 40m of water. When the water is clear, her outline can be seen from the surface. There is something ominous about submarines that always seem



THIS PAGE: Scenes from the *Rubis* wreck



on the wreck and an abundance of fish. The conning tower, mine shafts, torpedo tubes, hydroplanes and the net cutter on the bow all look as if they have been taken right out of a movie set. But, mind you, this submarine is the real deal.

The *Rubis* is 66m long, so it is possible to swim around the whole wreck in a single dive. A foray through the narrow hatch of the submarine into the interior isn't recommended. Firstly, it is too tight of a squeeze to get through wearing a 15-liter tank or a twinset on your

back. Secondly, the sediment inside the wreck can reduce visibility to complete nothingness in an instant.

**Togo wreck.** The *Togo* was built by Robert Thompson & Sons in Newcastle and launched in 1882 under the name *Ville de Valence*. Owned by the Compagnie Havraise Peninsulaire, it imported citrus fruit from Spain. The ship's layout was ground-breaking, and it was the first in a new generation of ships. It was built entirely from stainless steel, had five watertight bulkheads, a dou-

ble-hull and was propelled by a powerful engine.

The ship was 76m long, 10.35m wide and weighed 1,640 tons. Sailing the large freighter required a 28-man crew. The *Togo* managed to get through the First World War unscathed, despite facing all sorts of dangers. While it was ultimately a German U-boat—the *UC-35*—which caused her demise, this was not until a good while after the war.

On 12 May 1918, some six months after the war ended, the *Togo* perished in the bay of Cavalaire where it

TOGO FACTS:

- Ship type:** Freighter
- Nationality:** France, later Italy
- Weight:** 1,640 tons
- Year of construction:** 1882
- Sank:** 12 May 1944
- Cause:** Sunk by Seemiene
- Location:** Approximately 800m east of "Pointe Dubreuil" Bay of La Cavalaire
- Minimum depth:** 45m
- Maximum depth:** 55m at the bow; 60m at the rear

was rediscovered only relatively recently. Although the fishermen in the sheltered bay made mostly profitable catches despite having their



THIS PAGE: Scenes from the *Togo* wreck



nets often snared, no one connected the dots—this was because, besides the nearby *Ramon Membru* wreck, nobody was even aware there was another shipwreck below the surface.

When the *Togo* was discovered by local divers, nobody knew its identity. The artifacts that were gradually recovered from the wreck then provided clues that ultimately led to the wreck's identification as that of the *Togo*.

**Diving:** The *Togo* is one of the biggest and most beautiful wrecks of the Côte. It is about 60m long but not entirely intact. Parts of the stern, including the a ten-meter-long part with propeller, are lying torn off and separate from the rest of the ship at a depth of over 60m. The freighter sits upright on the sandy bottom. The deck is 47m at the bow with the sandy bottom at 55m.

The first impression of the wreck as it starts to appear out of the din is that it is huge, overgrown with red gorgonians, and swarming with fish schooling around the boiler

structures.

It is recommended that one stays at the deck level, as the sides of the hull and the sandy bottom below are not very interesting. Besides, going any

deeper on an already deep dive would have a marked impact on dive time and decompression.

On each side of the bow and almost in a symmetrical position, there are two anchor winches at least two meters high still attached to their anchors with chains draped across the railing. The bow is pointed and the sides of the hull stand vertically, eight meters above the seabed.

Close to the bow, a few skylights can still be seen. On the front deck, there are big loading hatches. It is not worth the while to go inside the holds—aside from a little coal, there is nothing there.

After 20m down the front deck is the midship section. From here, divers can either continue along the ladders on either side of the ship or swim about a big gaping,



THIS PAGE: Scenes from the *Togo* wreck



round hole where the tall smoke stack once stood. On both sides of the vessel, davits protrude, now covered with lush red gorgonians.

Inside the superstructure, bathtubs and toilets can be seen. One of the masts now lies across the starboard side. Venturing a little further aft completes the tour. At this point, the deck is at 51m. Beyond, the stern just seems to drop off vertically into the dark abyss below.

Diving the *Togo* requires proper planning from the onset. Among other things, given the sheer size of the wreck, it is important to ensure you can find your way back to the ascent line. To allow for a decent tour, remain at the deck level, otherwise dive time will be too short. Carry a plentiful supply of gas and use proper equipment suitable for this type of dive.

### Best time to travel

The Mediterranean can be dived all year round. During winter, the water temperature drops to 12°C (54°F); by May, it climbs back above 12°C (60°F). Consequently, at least a semi-dry, or sometimes a drysuit is a prerequisite for staying comfortable during the dive.

Many dive operators now use better suits, permitting them to operate all year round. During the mild winters, diving is a real treat in the Mediterranean: after some days with no wind, the water is crystal clear and there appears to be more fish to see than in summer.

Overall, however, the best period is from June to October. The months of June and October I can recommend in particular because, while the weather is warm and stable and the water is clear, there are few tourists and prices at hotels and restaurants are lower.



THIS PAGE: Scenes from the French Riviera were visitors will find picturesque villages and enjoy local culture, wines and cuisine; Port-Cros, France (top left)

**Dive certification & gear**  
As is the case anywhere in the world, proof of dive certification

must be presented in France and preferably also a personal log-book. The days when only French

certificates were recognized are long gone and c-cards from all major training agencies are



Scenes from Saint-Tropez, France (top left, above, and right); *Flabellina sp* nudibranch (below); Diver and sea urchin on reef (left)

picturesque villages of Provence makes for a pleasant and relaxed atmosphere. Then, there are the culinary delights. I am not referring to piz-



zas on walking streets, but to all those small "restaurants" and "brasseries" that are partly hidden in side streets that put the genuine *Cuisine Francaise* on the table.

And from a personal perspective: When it comes to wine, there is simply

no place in the world where Cotes de Provence or a red or rouge Bandol tastes better. □

For more information, visit Kurt Amsler's website at [www.photosub.com](http://www.photosub.com).



widely accepted. Most dive centers utilize combination tank valves that can be used both with a DIN fitting and A-clamp.

One great feature about the Côte is that it is a great place for a drive-and-dive holiday, complete with carrying along your own dive gear in the trunk. But if you prefer to travel light, modern equip-

ment from leading manufacturers can be hired in many locations.

**Profitez de la vie!**

On a concluding note, a diving holiday on the Côte d'Azur isn't just about enjoying what is under the surface. The landscapes, the scent of pine and the



*Canary Islands'*

# Tenerife

Text and photos  
by Charles Stirling

*Diving Macronesia*



**Most of us in Europe know of Tenerife, but many in North America won't have heard of it. It's one of those sunshine locations that isn't too long a European flight for warmth, sun and reliable weather—easy to reach with economy airlines from many United Kingdom and European airports. It's the largest of the Canary Islands, part of Spain, but off the coast of Africa on the same longitude as Western Sahara and Morocco. From the Americas, it may be less expensive flying to mainland Europe, then on. It's become the main vacation hub in the Canary Islands, with five million visitors last year. It has, or at least has had, the reputation of being a party location, with cheap, slightly substandard accommodations in package holidays. Does its old reputation still hold, and more importantly, how is the diving?**

I first dived in Tenerife in January 1998 and have been back diving a few times. It has over 300 days a year of sunshine, with a summer that's not too hot and a warmish winter, which brings in the tourists—while the diving plus point is all-year-round diving, with very few days blown out. It's reliable, it's affordable.

I'm not one for package holidays, though at times, they do seem good deals. In Britain and throughout most of Europe, packages offering very cost effective visits are available, which can then have independently booked diving

linked in.

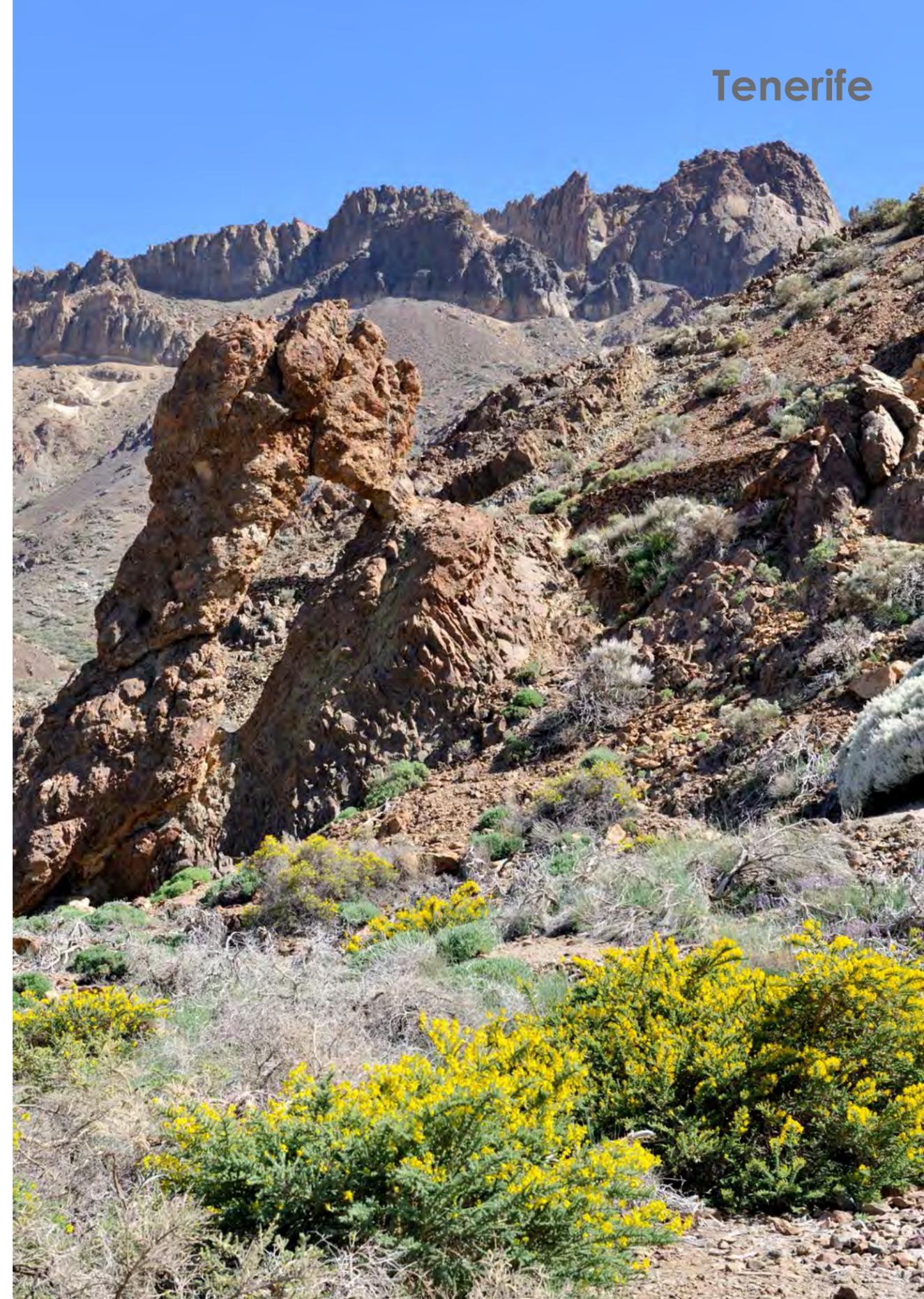
Here, I booked independently. I flew with EasyJet from my local airport, as EasyJet doesn't have a weight limit for carry-on bags (only size) so I could safely take my underwater camera housing. I wanted the reliable diving weather, but also a location in which my partner and dive buddy, Jenny, could do interesting non-diving activities if her recurrent ear-clearing problem—a damaged Eustachian tube—flared up.

**Tenerife's nature**

Tenerife is a temperate water location



White sandy beach, Las Americas/Los Cristianos



Rock formation, Zapatilla de la Reina, with caldera rim in the distance, Mount Teide National Park; Observatorio del Teide, with Mount Teide in the background, is a solar research centre (top left)





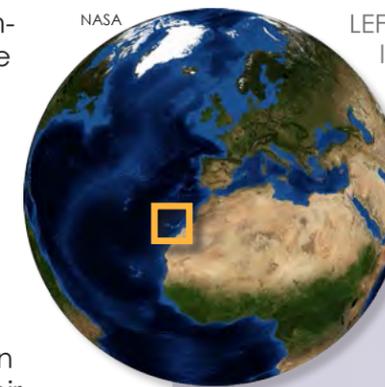
situated in the central Atlantic Ocean. It is a volcanic island; there are no coral reefs, no large diversity of tropical fish, not many wrecks, but interesting topography and marine life. The water is too cool in winter to support coral. During my trip, in early May, the water temperature was 19°C, just up from its lowest—territory for a good wetsuit.

The comments one might hear will be about the lack of marine life, these comments seem to me partly due to the contrast between tropical and temperate locations. It may also reflect that “reliable diving” aspect, as operators are used to being called upon for teaching—students can book and know they can do training—so dive centres haven’t worked to develop the marine life appreciation. It might be that Tenerife’s sheer reliability is almost the downfall for great diving. There isn’t the thinking and work done yet to develop its own special aspects, as was the case for “muck diving” in Southeast Asia. There seems to be scope to develop specialist diving in addition to the now-happening technical and rebreather areas.

Tenerife is very environmentally aware and protective on land and also of its resident and visiting cetaceans. They’re just not quite fully with it on all of the

marine life. For example, some fish like the grouper—which evidently is very tasty—seem less common than they were. Grouper eat sea urchins and would help to control the over-abundant sea urchin population—in so doing, reduce their overgrazing, allowing larger fish populations, which eat seaweeds, to thrive.

If one believes advertising, fishermen have found the island’s marine life appealing, as it is said to offer “some of the best angling on the planet”. Yes there is a lot of fishing in Tenerife with fish counters and dinner plates showing what we might have seen underwater. Grouper maybe too often end up on the dinner table. More protected marine zones would be a real move forward, and if handled properly, would probably be helping the fishing as well as the diving, but that’s a discussion for another time.



NASA



LEFT: Global map with location of Canary Islands  
BELOW: Location of Tenerife on regional map

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## Lodging

Considering my buddy’s potential ear problem, we booked diving with Aqua-Marina right in the middle of the tourist hot spot of Las Americas/Los Cristianos, so if Jenny couldn’t dive, she wouldn’t be isolated. I was a bit apprehensive

La Caleta Reef (above); The built up coast in the tourist area of South Tenerife (top right)



The summit of Teide (above). The national park hosts a variety of plant and animal species, many of them endemic; El Medano or Windy beach (right). Parts of Tenerife are constantly windy while farther down the coast it can be nearly dead calm, the effects of the lee side of Mount Teide

about being in the middle of a tourist area, but it proved fine—not all just candy floss. Yes, it was touristy—much like Sharm El Sheikh—yet offering a vast range of activities, the legacy of the package holiday era updated with what's new.

Our accommodation was a good-sized, reasonably priced, self-catering apartment organized by and near the dive centre. Quality was okay, but the lodgings needed a bit of minor repair. Tenerife has a very wide range of accommodation options from self-catering apartments to one-star and luxury five-star hotels, all

inclusive deals, camping, villas and more.

Besides activities the tourism tradition provides a wide range of accommodations, food and drink. This is particularly true in the Las Americas/Los Cristianos region in the south of Tenerife but has moved along the seafront in both directions. Going just slightly outside this resort area, the touristy side wanes somewhat and local customs, history and geography do come in.

**Topside activities**

Take your pick of activities of both water sports and land:

diving (of course), parasailing, flyboarding, windsurfing, whale and dolphin watching, sailing, fishing, golf, horse riding, quad bikes, push bikes (even a pedalling free 22-mile ride), mountain bikes, walking and hiking trails, wine sampling, paragliding, Segway tours, plus night clubs, casinos, bars and rather a lot more including theme parks and kids adventures.

So there are lots of choices when not diving. Hiring a car does make it quicker and easier to do non-diving activities. The roads are good and well signposted.

A drive up through Teide National Park is one very worthwhile excursion either by hire car or organized tour; it can even be done on a quad bike tour. The road reaches an altitude over 2,500m so it is not one to do immediately after diving. The volcanic landscape and views are stunning. Car hire here does have its sharks, but I booked through AutoReisen, which had good online reviews and proved problem-free.

**Alternative underwater activities**

As divers we see the underwater world in an up-close sort of way, non-divers can snorkel, but two activities here offer a different experience—BOB dives and a trip in a yellow submarine.

The BOB dives are effectively an underwater scooter with a "Breathing Observation Bubble". The driver's head goes in the air-filled acrylic bubble, with the air continu-

In a roadside cutting, layers of ash are evidence of many millennia of volcanic eruptions on Tenerife



Yellow submarine (left and above) in harbour of Marina San Miguel with dive tender boat in background; Thierry Garrigues (top right) showing marine life to visitors behind the porthole; BOB "The Breathing Observation Bubble" scooter diver (right)



rine, so I joined Thierry Garrigues of Buceo Aventura Tenerife who does the fish feeding by the submarine portholes. The sub leaves the harbour and starts descending almost immediately, going to a gully at 30m depth, in which it settles. Here Thierry, who has gone out separately on a tender, uses a fish as food to attract in more fish and maybe also shows other marine life of interest while he swims past the portholes.

He and his partner, Mari Mar Varela, a PADI Instructor, run a dive business and boat from next to the submarine base; they can organize dives with either the sub or most other locations around the south of Tenerife. So the chance exists to dive with a submarine that isn't a wreck.

### Diving Tenerife

The earlier comment, "good wet-

suit", is said with feeling. I started with my trusty old 5mm and 2mm shorty on top but felt slightly cool on a first shore dive. The dive shop offered a thicker shorty to go on top, which I accepted, but my weighting was then all wrong and I missed a night dive without time to correct it. After this, I stuck to my original, which was reasonably okay thermally for dives up to an hour in the 19°C water.

So, why are there only a few wrecks? After all, Tenerife has been on major trade routes for centuries and has lots of sharp rock pinnacles. The island's vol-



canic origin and Mount Teide gives the game away—the land plummets steeply both above

and below sea level. Three miles offshore, depths can be 2,500m while the 100m depth contour

ally replaced from a scuba cylinder. The scooter is attached to a float so that one can't go deeper than 4m, so it is safe. I've also seen these at Stuarts Cove in the Bahamas. The BOBs went out from Puerto Colon to a cove along the coast.

Then there's the yellow submarine—yes, a proper submarine, not just a glorified glass-bottom

boat floating on the surface, as seen in amusement parks or some resorts. This submarine goes out of the new Marina San Miguel and is one of 15 commercial subs worldwide. With viewing ports along its sides and ample room inside, it should be comfortable, but I was outside.

I've always thought it would be cool to dive with a yellow subma-





Sand sculpture on beach at Las Americas/Los Cristianos (above); Simple sheltered beach entry for the RIB (right); Aqua-Marina is a well equipped dive shop with good condition hire equipment, space for leaving your own and a pool for testing (lower right and below)

runs about half to a mile offshore, with a few places where it can be reached by a giant shore-based stride entry. Sinking ships seldom end up at sports dive depths, though more are at technical depths.

The narrow coastal shallows tends to mean dives were not too far off shore, and boat rides were generally short, just going up or down the coast. The local dive sites weren't crowded. There were a lot of dive centres, but I can't remember seeing another centre's dive boat on any dive.

**Dive operator**

My main diving centre was Aqua-Marina, which has incorporated two other dive businesses—Wannadive and Tenerife Dive. The three family-owned businesses decided to combine in order to provide the most comprehensive offering possible, since before, each had slightly different directions of focus.

Training is a large part of their offering from very beginning PADI Scuba Diver through technical and instructor levels. Again, the reliable conditions has helped

make them the largest instructor trainers in Spain, and now they can teach in any of nine languages (English, Russian, Spanish, French, German, Polish, Dutch, Catalan and Ukrainian).

On the technical side, they have cylinders of 5, 10, 12 and 15 litres and can pump nitrox with a membrane compressor up to 36%, with fills blended up to 100% O<sub>2</sub>. On the trimix side, they have helium in stock and can blend. They have Draeger Dolphin semi-closed rebreathers either for hire or training, but can organize training on most rebreathers with notice. They stock soda lime for divers bringing their own rebreathers.

**Dive sites**

Our first dive was from the shore along the local breakwater as a buddy pair to check out Jenny's ear, which proved fine on this 12m dive and continued to

be alright later on 30m dives. The dive we missed due to changing wetsuits was a night dive in the same shore location where the others saw stingrays, octopus, an angel shark, lobster and more fish—a very sad dive to have missed.

Having abandoned the extra thermal protection, weighting was fine and thermal comfort, okay. The remaining dives were, with a beach pickup, from one of the two RIBs in operation. Aqua-Marina were hosting a dive club from the United Kingdom who arrived a few days before us and also other independent divers

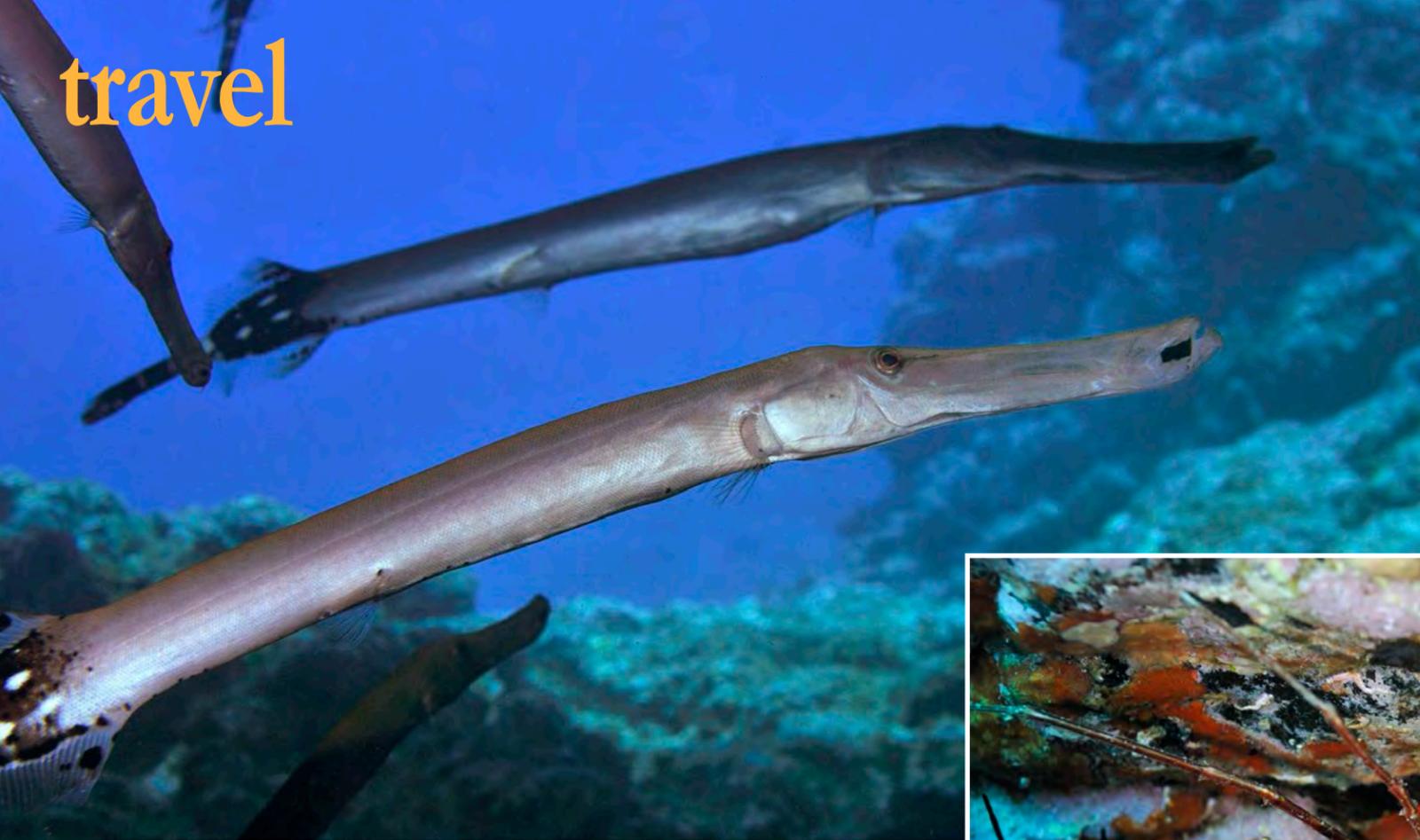
from a variety of countries, with varying experience levels.

Both boats were full and stayed together going to the same dive sites. This meant we missed a few preferred locations, since they had already



been done by the club divers, so we didn't have the chance to do sites out of Las Galletas or some others. The large number of divers also curtailed a lot of independence for the photographers.

*El Meridian* was our one wreck dive, a WWII mine sweeper later used as a cetacean watching boat before being scuttled for divers. Going down the shot line, the complete outline was visible from about 10m depth. It is reasonably intact at 29m depth, lying nearly upright on a sandy seabed with propeller and masts in place, its deck partly open. It's not a big wreck but photographically a good subject, particularly if the other divers



Trumpetfish (left); Arrow crab on rock with red encrusting sponge (below); Diver on reef at Las Americas (right)

reef top, but swimming to the edge at 25m, it dropped nearly vertically into the deep. This was used by some of the club divers to gain depth progression; carrying stage cylinders, they were going through a tunnel at 42m, exiting deeper. The rest stayed shallower, having a slow drift dive, going over rock reefs with sand-bottomed gorges in between, before ending on a shal-



didn't kick up loads of sand cutting visibility from 20m to 5m.

There are other wrecks including among them the 20m depth *El Condesito*, the *Cita Del Mar* at 40 to 50m, and in the north, the *Tabai-ba* wreck as well as a DC3 plane.

The scenic dives ranged from volcanic reefs to drop-off's, deep gullies and sandy patches between reefs. The volcanic nature of the area meant that the underwater landscape was varied but had some similar attributes between sites. Cracks and fissures—homes to small creatures—were at most locations.

Marine life included a typical good variety of temperate water critters: rays, trumpetfish, cuttlefish, grouper, garden eels, turtles, barracuda, wrasse, bream, triggerfish,

jacks, a number of species of moray and conger eels, damselfish, lizardfish, scorpionfish, shoals of grunt (roncadores), flounder, angelsharks, long-spined sea-urchins and more. Then, more likely seen when on the surface than diving, there might be a variety of whales and dolphins (21 species can be found visiting).



Long spined black sea urchins, an invasive species here

We did have pilot whales on the way to one dive, and the club divers had dolphins on another.

The lava flows which make up the seabed have produced varied features, with short (or even very long) caves and tunnels, rock columns, ridges with erosion adding to the interest. On Barranco del Agua, we dropped in on a shallow flat slightly sloping

low plateau.

In the briefing before Palm Mar Cave, a cave, which has never been fully explored, the advice was not to even try entering as the entrance has badly silted up with sand, but we saw the cross commemorating lost divers and the Virgin del Carmen statue, which was placed by fishermen for the protection of both divers and fishermen. The Neptune Cave, actually a short tunnel with sandy bottom, had a magnificent opening along one side filled with trumpetfish. Often stingrays are seen on the sandy bottom, but that's another dive.



Brown lizardfish



Tenerife

visibility and warmish waters are all aspects that can satisfy desires from very beginner to advanced technical diver. For these reasons the island is used by many agencies for training for which it seems excellent. As a holiday dive destination, it

works both as a dive location with holiday or a holiday location with diving. □

*Charles Stirling is an underwater photographer and dive writer based in the United Kingdom.*

The crevices, nooks and crannies on most of the scenic dives had various species of moray eels often with cleaner shrimp, sometimes with arrow crabs, octopus, and on night dives, the greater locust lobster or spiny lobster. On the sand patches, one can find flounder, various rays, weever and lizard fish, garden eels and angelsharks. While up in the water column near rocky reefs and around the wrecks and pinnacles, puffer, file and triggerfish, wrasse, roncadores

(which we know as a bastard grunt), various bream, barracuda and damselfish can be spotted, and if very lucky, a grouper might be seen.

### Dive safety & etiquette

Having joined this very mixed group of divers, the attention to safety was very evident. A guide would usefully lead the way, frequently hanging in the water checking back that everyone was following, and the tail would be brought up by a following guide who hurried

us (usually me) along so the group would stay somewhat together. For photographers this reduced chances to stop, look and compose.

Taking photos often takes time; one wants to wait for the right positioning of a fish, check out various angles, watch behaviour. The Aqua-Marina centre is aware of this. Normally, they let experienced buddy pairs have some freedom, but because of the numbers and mixed experiences of the divers, it was awkward to do

that on this visit. It was hard to complain, as everyone was so friendly and helpful.

Divers with cameras are not uniformly loved. We tend to be too slow for many, but here, it could be useful going slow. Some sites could warrant the full dive in a 20m square area.

So, the strong points about diving in Tenerife are the temperate waters, sheer reliability of getting dives in, plus all the accoutrements of a major holiday destination. The easy and wide range of depths, good



THIS PAGE: Scenes from *El Meridian* wreck; Diver at propellor and rudder (top right)

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POINT & CLICK ON BOLD LINKS



# Equipment



Edited by Rosemary 'Roz' E. Lunn

## Suunto EON

Unfortunately when you reach a certain age, you suddenly find your arm is not quite long enough to easily read your computer as your eyesight changes. Large colourful OLED displays certainly help, but it seemed only the technical diving computers offered this feature until now. Suunto has just launched the fully customisable Suunto EON. This stainless steel faced computer provides the diver eight different gas options (Oxygen 5 – 99%, Helium 0 – 95%) running on their Fused RGBM algorithm. The computer is depth rated to 150 metres / 492 feet and comes with four modes—air, nitrox, trimix and gauge—and we gather there are plans for a CCR mode in the next few months.

[Suunto.com](http://Suunto.com)



## Apeks

In celebration of its 40th anniversary, Apeks has just released the Black Sapphire regulator. According to the UK-based manufacturer, the stunning-looking metal cover, which is machined from aircraft grade anodised metal, improves performance in cold water. First stage performance in cold water has also been improved with a heat-exchanger that comes fitted as a standard. Five ports allow for flexible hose routing, and a unique carbon-coloured hose with both a second and first stage swivel makes it more comfortable in use. Black Sapphire will only be available in a limited quantity and follows Black Pearl, the company's 30th anniversary regulator, which has gone on to become a much sought after collector's item.

[Apeks.co.uk](http://Apeks.co.uk)



## Tablet housing

Ever fancied bringing your tablet with you down under? Finnish manufacturer Alleco has come up with a fully functional underwater tablet and cracked the issue of getting a touch screen to work underwater both with naked fingers and thick gloves or with a touchscreen pen. The tablet inside, in this case an Asus Google Nexus, is permanently embedded in the housing and is both connected and charged wirelessly. The Alltab housing can be customized to other tablets as well. The standard housing is depth rated at 15m and the pro version at 125m. The unit also comes with wrist straps for attaching it to the forearm.

[Alleco.fi](http://Alleco.fi)



[Scubapro.com](http://Scubapro.com)

## Scubapro Nova

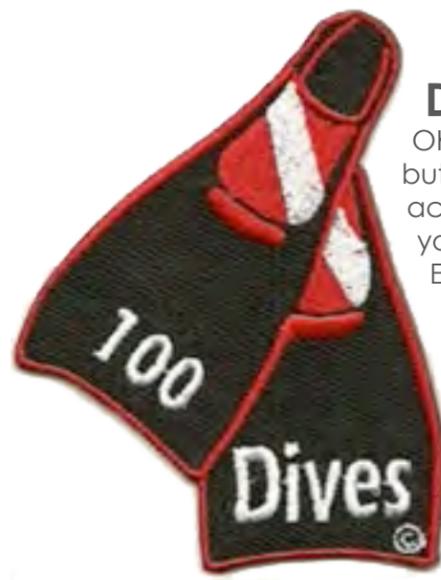
It would seem that GUE (Global Underwater Explorers) is quietly having an impact on torch design. Scubapro's latest offerings: the sleek looking NOVA 700 and 700R (R = rechargeable) can be secured to a harness by simply tying a clip to the end of the light body. Both torches are machined from heavy-duty aluminum, use the same light head and have a simple twist-on/ twist-off actuation. Scubapro states the strategically placed knurling (raised diamond-shaped indentations in the body) improves grip and makes the twist activation that much easier. The Nova 700 is the larger of the two at 22.2 cm / 8.7 inches long and it has a 10-hour burn time, compared to the 700R at 14 cm / 5.5 inches with a burn time of 2.5 hours.

## Fourth Element

Christmas: the traditional time to receive new underwear. It is fortuitous therefore that Fourth Element has launched their latest offering in thermal protection: the Arctic Expedition. This bio-mapped ceramic printed garment comes in two choices: a one piece (similar in style to the HALO 3D) or the traditional two piece option. Fourth Element has advised that the Arctic Expedition should be a relatively low bulk garment. The fabric has been resin impregnated for wear resistance, with key panels in the upper body augmented to make them wind and waterproof. Other features include warm hand pockets and a new thumb loop design.

[FourthElement.com](http://FourthElement.com)





## Dive patches

OK it may not be a new item but sometimes you just stumble across some little new fun thing you haven't seen before.

Embroidered dive patches that can be placed on caps, jackets, dive bag or log books comes in numerous shapes, motifs and sizes and only costs a few dollars each. Comes with a sticky back for easy application.

[Divepatches.com](http://Divepatches.com)



## Fusion 52X

Mares has launched what it hopes will become the new benchmark for cold water regulators—the Fusion 52X.

Traditionally Mares regulators have a bypass tube, and this is also the case with the Fusion.

The thinking behind it is that a significant amount of gas is delivered into the second stage, improving the quality of the breath, whilst reducing the chance of freeflow. Mares staff states that when they designed the Fusion they increased the bore and changed the angle of the bypass tube, thus the gas flows smoother when compared with previous models. The 52X comes with 2 HP and 4LP ports and has a new seat design, hence 'X'. As this X seat has great longevity, Mares has increased the recommended service period to 24 months on this high performance, balanced diaphragm regulator. [Mares.com](http://Mares.com)



## HUS

AP Diving launched the HUS—Heads Up Screen—at EUROTEK.2014. This CE-approved in line-of-sight HUS promises to be a boon for anyone needing 'hands free diving', i.e. photographers and film-makers who do not want their vision of the diving environment compromised. The secondary display is hardwired directly into the electronic head. Its display is then easily attached to the rebreather mouthpiece using an adjustable 140° articulated arm, thus giving the diver optimal positioning of the HUS.

The intuitive vivid OLED display delivers real-time dive information in coloured text: green = good, yellow = alert / information, and red = warning. AP Diving states that the diver benefits from excellent readability, even in very poor viz. The company has also confirmed that any APD breather with Vision electronics can be upgraded, and it will be an optional extra on new units. [APDiving.com](http://APDiving.com)



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# Thermal Stress

— *Thermal Physiology & Protection for Diving*

Thermal issues affect the comfort, performance and decompression stress experienced by divers. The impact varies with the timing, direction and magnitude of the thermal stress. Thermal protection can be provided by a variety of passive and active systems. Active systems should be used with particular care since they can markedly alter inert gas exchange and decompression risk. Increased decompression stress will be experienced by divers remaining warm during descent and bottom phases and cool or cold during ascent and stop phases. Decreased decompression stress will be experienced by divers remaining cool or cold during descent and bottom phases and warm during ascent and stop phases. Dive computers measure water temperature, not thermal status, leaving it to the diver to consciously manage thermal status and risk.

Text by Neal W. Pollock, Ph.D.  
Photos by Andrey Bizyukin





## Thermal Stress

Diving is conducted in thermal environments ranging from tropical through polar. While physical comfort and concentration and performance issues are often perceived as the top priorities, thermal status can also play a critical role in decompression risk. Thermal effects can either increase or decrease the net decompression stress, depending on the timing, direction and magnitude of the effect.

### U.S. Navy test

The best demonstration of the fundamental relationships was provided by a study of 73 male U.S. Navy divers (37±6 years of age; 27.6±3.1 kg·m<sup>-2</sup> body mass index) completing a total of 484 person-dives in an ocean simulation facility.<sup>1</sup>

*Thermal status can also play a critical role in decompression risk.*

Divers were fully immersed and exercising at the substantial rate of approximately seven times resting effort (seven metabolic equivalents [MET]) in a wet chamber during simulated dives to a depth of 37 msw (120 fsw). The bottom phase was followed by a long decompression (87 minutes) to accommodate increased bottom time in the event that the rate of decompression sickness (DCS) stayed low during the study. The water temperature was held constant (clamped) for two phases—descent/bottom and ascent/stop.

### Decompression risk

Clamp temperatures were 36°C (97°F), described as 'Warm', and 27°C (80°F), described as 'Cold'. Ultimately, the greatest decompression risk was experienced when the clamped conditions were warm for descent/bottom (promoting inert gas uptake) and cold for ascent/stop (impairing inert gas elimination). The lowest decompression risk

was experienced when the clamped conditions were cold for descent/bottom (impairing uptake) and warm for ascent/stop (promoting elimination).

### Big effect

The surprising result of the U.S. Navy study<sup>1</sup> was the magnitude of the effect. The 'Warm-Cold' combination had a 30 minute bottom time and yielded 22% DCS while the 'Cold-Warm' combination achieved an extended bottom time of 70 minutes that yielded only 0.1% DCS. While the decompression phase of the study dives was long in comparison with typical operational dive profiles, the study clearly shows that thermal status can have truly dramatic effects. Given this, it is important for divers to have a reasonable understanding of thermal physiology.

### Major avenues of heat exchange

There are four primary avenues of heat exchange important in the diving environment—radiation, conduction, evaporation and convection.

*Radiation* represents the electromagnetic energy radiating from any object to any cooler object separated by space (air or vacuum). *Conduction* represents the heat flow between objects in physical contact. Insulation represents the inverse of conduction, that is, the resistance to heat flow. *Evaporation* represents the heat energy expended to convert liquid water to gaseous state. Evaporative heat loss results from humidifying inspired gases and the evaporation of sweat on the skin. *Convection* represents the heat flow through circulating currents in liquid or gas environment.

The typical concern in most diving environments is the minimization of heat loss. Even tropical waters can produce substantial cold stress over long exposures. Radiative heat loss is

a relatively minor concern in diving. Radiative barriers have been added to the inside of some wetsuits and drysuits, but probably with limited benefit.

### Heat loss in water

Conduction is the primary avenue for heat loss in water. The heat capacity of water (density x specific heat) is >3500 times greater than air, yielding conductive loss rates 20-27 times greater than air. While 'cold' may be a bit extreme a descriptor for 28°C water,<sup>1</sup> it will produce substantial thermal stress for an unprotected diver since mean skin temperature is usually around 32°C. Protection against conductive losses is gained through improved insulation. A uniform distribution of an excellent insulator such as a vacuum space would be best, but persistent loft is a challenge in drysuits since hydrostatic pressure shifts gas to the highest point of a suit during immersion, effectively reducing the insulation layer elsewhere.

Evaporative heat loss from the skin is not a concern in high relative humidity environments. A fully saturated environment exists during unprotected immersion or in a wetsuit. A fully saturated environment develops very quickly in a sealed drysuit.

Convective heat loss can vary substantially, depending on the stability of the near skin microclimate. Drysuits provide a stable environment, wetsuits provide a reasonably stable environment if the design and fit effectively minimize water circulation. Convective losses can be substantial in a poorly fitting wetsuit.

There are four primary avenues of heat exchange important in the diving environment:

- Radiation
- Conduction
- Evaporation
- Convection

*Even tropical waters can produce substantial cold stress over long exposures.*



A rapid chilling of superficial skeletal muscles (conductive cooling) creates a crippling weakening.

## Thermal Stress

*Severe discomfort and impairment can result from prolonged cold stress even without marked core temperature drop.*

modest thermal protection suits can delay the development of hypothermia for long periods of exposure. Most divers who surface from a dive feeling cold, even if presenting with episodic or sustained shivering, are unlikely

to have achieved sufficient core cooling to meet the definition of hypothermia. Regardless, severe discomfort and impairment can result from prolonged cold stress even without marked core temperature drop.



### Unprotected cold water immersion

Even the modest protection of a poorly fitting wetsuit or drysuit moderates thermal stress for most divers. It is, however, possible that unprotected immersions or extreme expeditionary dives can produce significant stress. For that reason, extreme impacts should be understood.

Cold water immersion of an unprotected person can be described as a continuum of four phases.

### Cold shock

The first is characterized by the initial immersion response or 'cold shock' that develops in the first two minutes. In this phase heart rate, respiratory rate and blood pressure rapidly increase and cerebral blood flow velocity decreases as hyperventilation reduces the carbon dioxide level in the blood. The impact of cold shock increases for unprotected immersion as water temperature falls below 15°C (59°F).

Wetsuits and drysuits will normally largely eliminate this phase from the normal diver experience.

### Swimming failure

The second phase of unprotected immersion is characterized as short term immersion or 'swimming failure.' A rapid chilling of superficial skeletal muscles (conductive cooling) creates a crippling weakening. It is this phase that is most likely to kill unprotected swimmers that do not have sufficient buoyancy to keep mouth and nose clear of the water. Dive suits would have to be markedly inadequate for the conditions to see this with divers.

### Onset of hypothermia

The third phase is described as long term immersion, when hypothermia might develop. The evolution of hypothermia will vary dramatically with thermal protection worn, total mass, surface-to-volume ratio, the amount of subcutaneous fat to serve as passive insulation, the amount of skeletal muscle able to generate heat through shivering, and water temperature. Core temperature is normally maintained at 37±1°C (98.6±2°F). Mild hypothermia is defined as a core temperature of 35-32°C (95-90°F). Even



# Thermal Stress

The evolution of hypothermia will vary dramatically with thermal protection worn, total mass, surface-to-volume ratio, the amount of subcutaneous fat to serve as passive insulation, the amount of skeletal muscle able to generate heat through shivering, and water temperature.

*Passive insulation can be provided by wetsuits or drysuits. Active insulation can be provided by electrically heating garments or hot water suits.*

Standard foam neoprene is compressed by pressure, reducing the insulation and altering the fit.

The thermal protection of drysuit systems is generally provided by a three layer strategy. The base layer is hydrophobic to wick water away from the skin. In air environments the physical distance between the moisture and the skin limits

evaporation and, by extension, evaporative heat loss. This is not the case in the high relative humidity environment of the closed drysuit. Instead, the water is wicked away from the skin to reduce conductive heat loss to the liquid. The mid-layer of the drysuit provides insulation, further reducing conductive heat loss. The outermost shell layer provides a



## Critical phase

The fourth phase describes the critical period when a victim is rescued from significant cold immersion. A combination of handling stress, loss of hydrostatic pressure secondary to removal from the water, and increased circulatory demands to accommodate postural changes can all act to produce 'circum-rescue collapse'.<sup>2</sup> The impaired cardiac function associated with high moderate (32-28°C [90-82°F]) or severe (<28°C [82°F]) hypothermia are more likely to be associated with collapse. It is critical that patient vitals are closely monitored through the removal and post-removal period since physiological collapse is possible. This would likely only be a consideration for divers in the direst conditions.

A post-exposure decrease in core temperature ('afterdrop') may follow the end of cold dive.<sup>6</sup> While afterdrop is typically not a problem, it is important to be aware that a person close to serious core temperature depression could be taken over the edge with afterdrop. This is extremely unlikely to be an issue in a typical diving scenario.

## Thermal protection for cold water diving

Passive insulation can be provided by wetsuits or drysuits. Active insulation can be provided by electrically heating garments or hot water suits.

The fourth phase describes the critical period when a victim is rescued from significant cold immersion.





*Disciplined use of active heating systems could reduce the hazard, for example, by only turning it on at the end of the bottom phase.*

## Thermal Stress

barrier to reduce convective heat loss.

Drysuits may be made from a variety of thin membrane materials, standard neoprene, or crushed neoprene formed under greater pressure than standard neoprene. The insulation provided by shell suits is typically stable but modest thermal protection. As with wetsuits, the insulation of standard neoprene drysuits is compromised by pressure increase. 'Crushed' neoprene generally provides greater and more stable insulation throughout the typical diving range.

### Trapped gas

The undergarments and trapped gas can provide the majority of the insulation in a drysuit system. Some garments with extremely high loft have been marketed.

Problematically, if these materials are easily compressed, they will perform better on the surface than when compressed by hydrostatic pressure during immersion. Thinsulate has been the closest to a standard in diving undergarment insulation for decades, but it has only partially satisfied thermal protection needs. Recent efforts have been directed at integrating rigid forms into garments to limit loft loss during hydrostatic compression to stabilize insulation layers.

Ongoing efforts are directed at impregnating aerogel into undergarments. Aerogel is a low density, highly porous silica matrix with extremely low thermal conductivity. The goal is to encapsulate the aerogel into a bat matrix of other materials to overcome the relative fragility and inflexibility of aerogel.

### Argon is questionable

Argon has been promoted as a drysuit inflation gas to improve thermal protection. Theoretically, the 30% lower thermal conductivity could produce a 48% increase in suit insulation in comparison to air (1.92 vs. 1.30 clo, respectively).<sup>5</sup>

However, a double-blind field study found no benefit of argon vs. air. The argon fill did not improve skin temperature, core temperature or perceived thermal comfort.<sup>8</sup>

A similar lack of impact on core temperature or perceived thermal comfort was seen in a more recent study.<sup>10</sup> It is likely that hydrostatic pressure forcing the gas bubble to the highest point of the suit obviated the possibility of the gas forming a stable boundary layer over the skin and contributed to the lack of impact.

Another practical issue in using argon is that substantial volumes are required to fully flush air out of a suit. This can be a problem for the budget-conscious diver.

### Limited usefulness

Combining argon with an undergarment that preserves gas channels may offer some improvement, but a significant benefit of argon use may be limited to long, expeditionary dives when small improvements in thermal protection may be meaningful. For

most dives, a much greater thermal benefit is likely to be gained from improved insulating designs and materials.

### Heating

In-suit electric heating is now available for both wetsuits and drysuits. Battery-powered systems can provide multiple power settings and multiple zones. While these systems may substan-

tially improve personal comfort, they also have the potential to increase decompression stress by promoting the uptake of inert gas when used during the descent/bottom phase of a dive.

A reduction in heat output, or worse, a complete heating system failure later in the dive would produce the 'Warm-Cold' situation shown to dramatically increase decompression stress in the U.S. Navy study.<sup>1</sup> Disciplined use of active heating systems could reduce the hazard, for example, by only turning it on at the end of the bottom phase.

### Concerns

There are legitimate concerns with this approach. Reduced concentration and physical performance could result from inadequate thermal protection. The question as to

whether the system will activate appropriately when required may be stressful. Finally, it could be that late activation will not be sufficient to provide adequate comfort and improve decompression outcome.

A compromise for systems that provide multiple heating levels

*The argon fill did not improve skin temperature, core temperature or perceived thermal comfort*

*For most dives, a much greater thermal benefit is likely to be gained from improved insulating designs and materials.*



would be to keep it on the lowest setting during the descent/bottom phase and then adjust it to a higher setting just before ascent. It remains to be seen if concerns over decompression risk will outweigh personal comfort and keep these devices compatible with decompression safety.

### Little research

While few research data are available on the decompression hazard associated with electrically heated garments, there is a reasonable body of literature addressing similar concerns with hot water suits.

Primarily used in commercial operations, hot water is pumped into a wetsuit that distributes the

water around the diver's body before it escapes to the environment. As an added benefit in deep dives, the heated water may pass through a heat exchanger to warm the inspired gas. Hot water suits have been clearly associated with an increased risk of DCS in comparison with passive insulation.<sup>4,9</sup> A secondary concern is that actively warming the skin will effectively incapacitate the cold receptors that are predominant in the skin. This has been suggested to inhibit physiological response to respiratory cooling.<sup>3</sup> It is possible that a diver would not be aware of core temperature declines with skin temperature preserved at normal levels.

### Monitoring thermal status and decompression stress

Thermal stress is determined by the thermal protection worn, diver habitus and physical activity. It is not reflected by water tempera-

*It remains to be seen if concerns over decompression risk will outweigh personal comfort and keep these devices compatible with decompression safety.*

ture, which is the only thermal measure captured by existing dive computers. Current decompression algorithms do not assess thermal status, even though it can substantially influence decompression safety.

While real-time monitoring might one day allow for dynamic decompression algorithm adjustment, the best protection for current divers is a thorough appreciation of the hazards and thoughtful decision-making that favors safety, even if at the expense of comfort.

Efforts to avoid being warm during periods of inert gas uptake and cold during periods of inert gas elimination should be a minimum target. Remaining cool during the descent/bottom phase and somewhat warmer during the ascent/stop phase is optimal, as long as the warming is not achieved by physical effort that may also promote bubble formation. Increasing decompression safety buffers for thermal conditions that are less than optimal is good practice.

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## Thermal Stress



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Edited by Ila France Porcher

With 58 receptors located on their faces and heads, fish, including sharks, feel pain and suffer, a recent study has shown

Text by Ila France Porcher  
Photos courtesy of Andy Murch, Ila France Porcher and Dr Lynne Sneddon

**It was Dr Lynne Sneddon, at the University of Liverpool, who proved scientifically that fish feel pain and suffer. Her team found 58 receptors located on the faces and heads of trout that responded to harmful stimuli. They resembled those found in other vertebrates, including humans. A detailed map was created of pain receptors in fishes' mouths and all over their bodies.**

The experiment involved the injection of acetic acid, bee venom, or saline solution as a control, into the lips of trout, and those injected with the noxious substances responded with symptoms of pain, while the behaviour of the control group was unchanged. A morphine injection reduced these symptoms.

The relief of the fishes' symptoms by the pain reliever showed the interconnection between the nociceptors, which sense the tissue damage, and the central nervous system, which recorded the damage as pain. Here was proof that fish are

aware of tissue damage as pain.

"Given the evidence that the fish neurobiology, physiology and behavioural responses are comparable with pain in other animals (mammals) and painkillers reduce negative responses to tissue damage," Sneddon wrote, "it would seem that fish do experience pain and that this is an important state for a fish to be in. Scientific data has shown fish do not show anti-predator responses when

subject to pain and will avoid the area where this event happened."

While a few countries responded by passing laws to protect fish from cruel treatment—Germany made recreational fishing illegal—elsewhere, the fishing industry worked hard to discredit the proof that the old fisherman's tale that fish don't feel pain is untrue.

As a result, more than a decade later, fish and sharks alone are condemned

to being considered lower and simpler and less feeling than all the others. The dangerous idea that these animals can't suffer, no matter how they are brutalized, continues to stand directly in the way of their survival, perpetuated by those who kill them.

Yet, incredibly, never has evidence been presented that an animal could survive without the ability to feel pain.

## The reality of shark finning

I first became aware of the prevalence of the belief that fish don't feel pain while lobbying for the protection of the sharks I was studying, who were being massacred for the shark fin racket. Their community had been dramatically disrupted when the fishing began, and they had fled the area. I searched for them in vain.

Night was falling when a young shark emerged from the gloom. She was swim-

# Pain in Fish & Sharks

ILA FRANCE PORCHER



# shark tales



ming with a lethargy I had seen only in dying sharks—a large hook was embedded through the angle of her mouth, with a long tear beside it. She circled once, in slow motion and glided listlessly away, became a shadow, a movement in the coral, and vanished.

She was only the first. A nightmare began in which I alternated between searching for the sharks I knew, and beseeching people to write to the government to ask that they be protected.

*Scientific data has shown fish do not show anti-predator responses when subject to pain and will avoid the area where this event happened.*

— Dr Lynne Sneddon

The graceful adolescent shark eventually lost the hook, but her jaw had been damaged and she could no longer close her mouth. She lost weight over the following weeks, and within two months, she died.

I wondered sadly if people who fished for fun would still do so, if they could see the unimaginable suffering that they caused.

## Fishermen's arguments

But while I protested over the Internet that shark finning had hurled the sharks into a black hole of suffering, and that all sharks, all over the world, were in danger of being sucked into it, fishermen wrote to dismiss my concerns, and assure me that fish don't feel pain.

With the response of the community of sharks that were being massacred fresh in my mind, I couldn't believe what I was reading. I replied that the sharks who had escaped, as well

Fish have personalities: Bold rainbow trout investigate strange objects whereas shy fish stay away from them

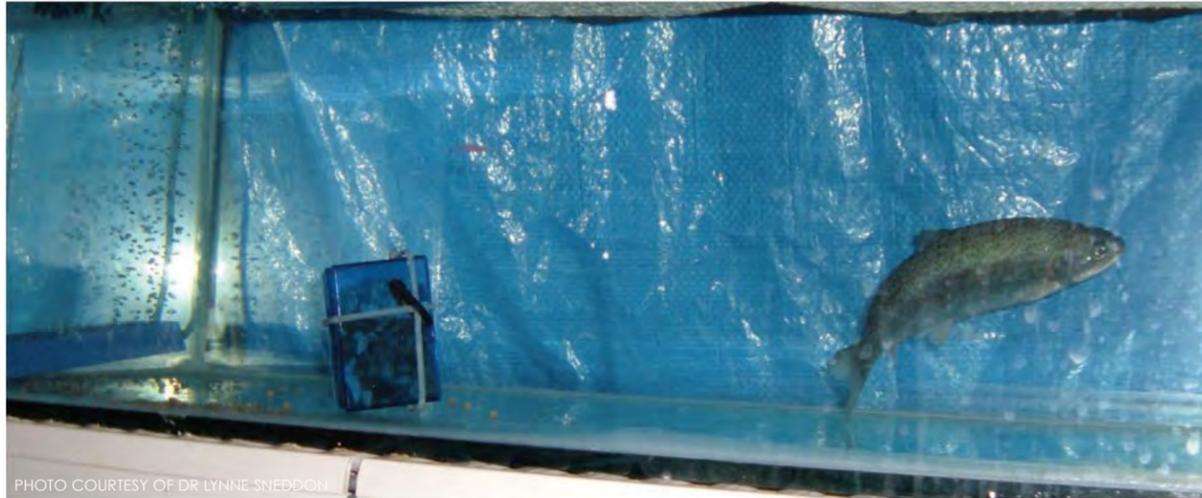


PHOTO COURTESY OF DR LYNNE SNEDDON



PHOTO COURTESY OF DR LYNNE SNEDDON

as female sharks with extensive mating wounds, showed similar signs of pain and suffering as the mammals and birds I treated for painful injuries, as a wildlife rehabilitator. They were less alert, less responsive, and swam unusually slowly.

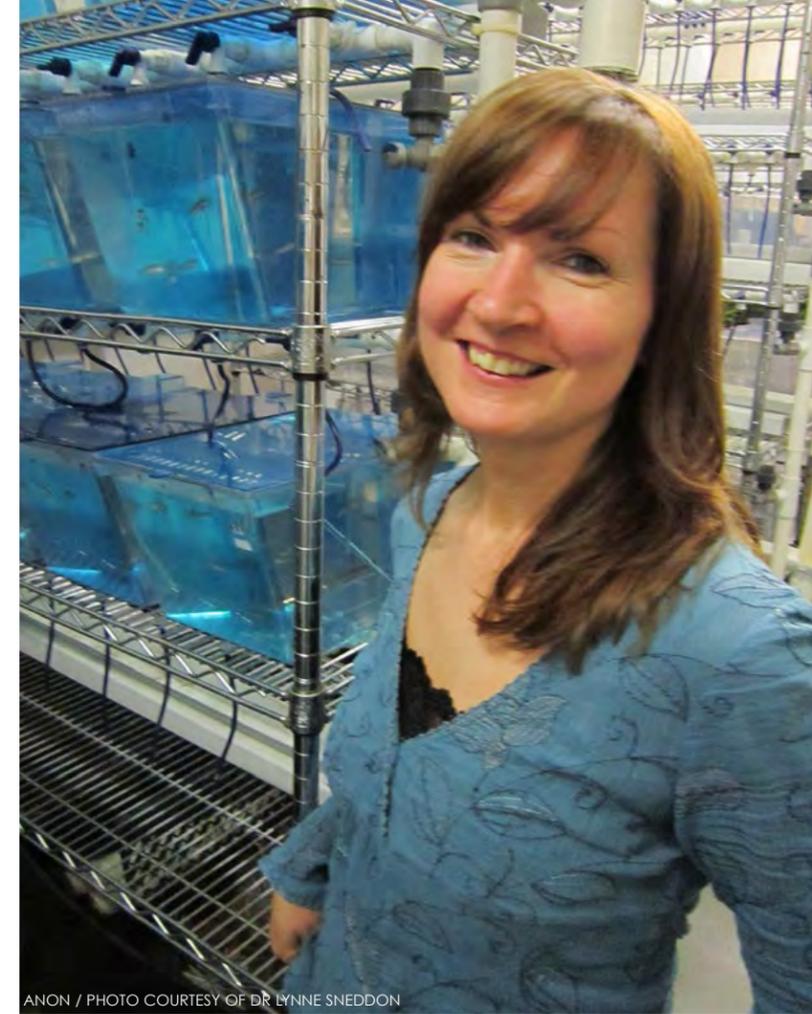
Pain is a warning sensation that is important for survival, and only a small percentage of fish who come into the world actually make it to adulthood—any weakness dooms them. An inability to feel pain would result in inappro-

priate behaviour, and the fish would go straight into evolution's garbage can.

If they did not feel pain, that should be supported by observable behaviour, yet fish and sharks are shy and cautious. When you see a shark slam the side of her body against a sand bank to dislodge her remora, the question just pops out of a slot: If she couldn't feel pain, would she be so irritated by the soft touch of a remora?

Fishermen argued that they

Dr Lynne Sneddon, pioneer in fish pain research at the University of Liverpool



ANON / PHOTO COURTESY OF DR LYNNE SNEDDON

had seen sharks continuing to function in spite of terrible wounds. But this is common—even injured humans will continue to fight for their lives as long as they can when in mortal danger. The effect has an obvious benefit for survival.

Others argued that fish could not feel pain because sometimes a fish will bite a baited hook a second time, after being unhooked and thrown back into the sea. But, while it may be obvious to the fisherman what he is doing, how could it be obvious to the fish?

These men assumed that the fish understood much more than it possibly could about its situation.

It could have no basis among its experiences for understanding the fisherman's practice of deception. It can see no dangerous predator underwater, so how could it imagine that above the surface a man is waiting, hoping to trick and kill it? Even a human walking by the sea, would never suspect that there was a creature waiting for him beneath the surface, with a plan to trap and kill him. A fish that had already bitten a bit of food with a hook in it, has no reason to assume that the next piece of food it finds will also hide a hook.

It was daunting, how many people were proud of their efforts to outwit fish. They didn't see any irony or contradiction in their claims that fish were too simple minded to feel pain, when they were so very proud that they were intelligent enough to outwit them.

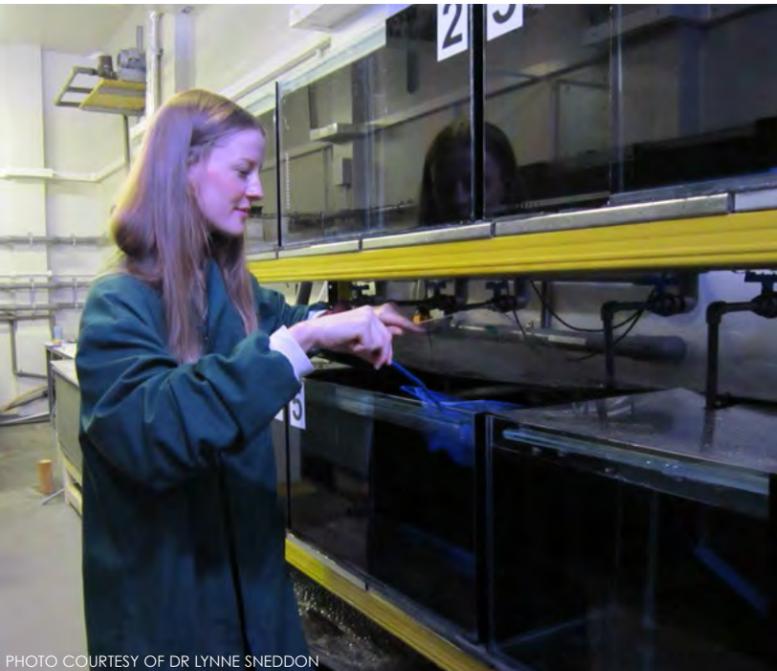


PHOTO COURTESY OF DR LYNNE SNEDDON

A research student, Jennifer Mitchell, at work in the Sneddon Laboratory investigating humane methods of anaesthetising fish





If fish did not feel pain, would spines protect sea urchins? NEXT PAGE: Sailfish hunting for bait balls in Mexico

### A fisheries article

Further investigations revealed that in 2002, fisherman James D. Rose had published an article in a fisheries journal, asserting that fish cannot feel pain. He alleged that though they may seem to feel pain when

hooked and yanked out of the water, they lack the brains to be aware of it. Fish lack the neocortex, the folded, outer layer of the brain that is so highly developed in humans, so cannot feel pain, he claimed.

According to him, the

neocortex is the seat of all higher mental functions, so the required neurological machinery to feel pain is missing in fish, and indeed, is present only in humans and apes. But he did not give a reason to claim that awareness of pain depends on



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Blacktip reef shark

the neocortex, and he had done no study to back up this idea.

In focusing on a comparison of the human brain with the fish brain alone, and omitting mention of the evolution of the vertebrate brain, Rose's article seemed biased and anthropocentric. From fish to man, the brain has the same structures, arranged in the same way. The only exception is the neocortex, which developed in mammals. Neurological studies have shown that the newly evolved neocortex of mammals took over certain higher functions which were already present in fish, amphibians, reptiles, and birds.

A study of the differences between vertebrates as they grow increasingly complex

reveals the thread of evolutionary continuity, and shows that no new ability or organ can suddenly appear in an animal without that feature having evolved in its ancestors. The implication is that the sensation of pain evolved along with all the other sensory systems.

Fish have elaborate forebrains, and expansion of the forebrain has occurred many times in different species—the degree of development has been correlated with cognitive abilities. Fish continue to develop neurons throughout their lives, and do so at a faster rate when confront-

ed with a stimulating environment, indicating a link between experience and neural development.

*An inability to feel pain would result in inappropriate behaviour, and the fish would go straight into evolution's garbage can.*

It is well established that birds feel pain, and have advanced cognitive abilities. Some species have better long term memories than humans, and others far exceed us in visual recognition. Yet their little pea-brains lack a neocortex.

Tests with birds have shown that higher mental capabilities can be found in a brain that is wired differently than ours. Dolphins, too, show high cognitive capabilities, yet their brains

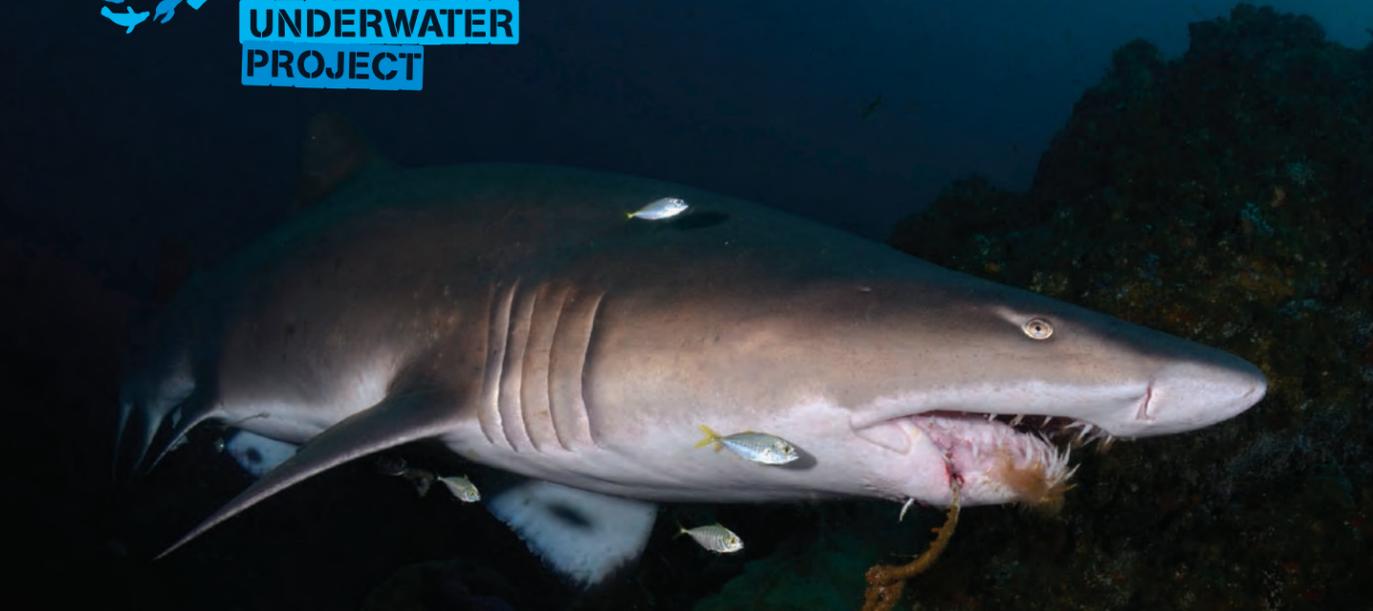
have a different form than primate brains, though both are mammals. There are people in which the expanded neocortex failed to develop, but who have normal psychology and IQs. So even in humans, it seems that the neocortex is not necessary for consciousness.

Other researchers found that the interconnections within the core of the brain was the essential neurological basis of conscious awareness, and concluded that the neural system involved in the sensation of pain, likely evolved as an "interactive dynamic system" with the cognitive processes, in the evolving central nervous system. These findings and others suggested that it is the way the various regions of the brain





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are integrated, and the continuous interplay of neural messaging within it, that generates consciousness.

Donald R. Griffin, the pioneer of cognitive ethology, theorized that the expanded human brain was more likely to have permitted the complex subconscious mind, and that consciousness had developed with the centralization of the nervous system, which was favoured by evolution due to its survival value.

### Cognition in Fish

Cognition, or the ability to think, seemed to be a relevant aspect in the establishment of whether fish could feel pain. In the same year as Rose's article was published, Redouan Bshary, Wolfgang Wickler and Hans Fricke published a review of the findings of the cognitive capabilities of fish entitled *Fish cognition: A primate's eye view*. The review covered a surprising range of evidence of fish

cognition, and concluded that the main cognitive difference between primates and fish was the ability to imitate. From nest building, to complex social behaviour, the abilities of fish were impressive, suggesting that they could not possibly be as simple minded as Rose had claimed.

Like sharks, fish have been shown to possess traits that distinguish one individual from another. They exhibit clear preferences, use tools, can learn complex tasks, and have long term memory, showing that they have the ability to make decisions and to remember negative events.

Rose ascribed only Pavlovian learning to fish, but in reviewing the relationship between learning in fish, memories, and conscious cognition, those who were actually doing research on the subject concluded that some fish behaviour is better explained within a theoretical framework that includes primary conscious-

ness. A state of basic consciousness is now thought to be present in animals whose nervous systems have evolved sufficient complexity, and it is believed that cognitive studies may be used to assess consciousness and sentience.

Yet, all of this easily available evidence that contradicted Rose's conclusions was omitted in his article. He seemed to rely on the beliefs of fishermen, that the fish brain was so simple that it was well understood.

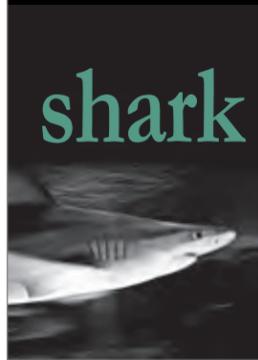
But no brain is simple, as anyone who has observed the activities of a spider will appreciate.

### Veterinarians speak out

With their training in healing, and experience with distressed animals, I felt that veterinarians were in a better position than fishermen to judge whether or not an animal was in pain, and queried those who advised me on my rehab cases.



# shark tales



Eastern Blue Groper, Shelly Beach, Manly, New South Wales, Australia



RICHARD LING / WIKIMEDIA COMMONS

An avian specialist in Australia, Dr Pat Macwhirter, wrote that she had assisted in surgery on a fish when a fish vet had come to work at her bird hospital, and that the fish had been more sensitive than a bird to electro-surgery. As a result of its high sensitivity to pain, the anaesthesia had been deepened. There was no doubt, she told me, that the fish had been in pain.

Another bird specialist, Dr Ross Perry, also in Australia, wrote me the following story:

"I have befriended a wild eastern blue groper, *Achoerodus*

*viridis*, that has a passion for sea urchins, the big ones with long sharp dark purplish red spines. She is very selective in how she approaches the sea urchin before striking it repeatedly to crack it open and suck out the contents. Groper have big fleshy lips and tiny teeth. She prefers me to uncover the underside of the urchin and to hold as many spines back out of the way as practical before striking. Even so a large spine broke off in her lip that fortunately left enough sticking out for me to cuddle her on her return so I could

grasp the spine with finger and thumb and pull it out. This has transformed my thinking about fish as sentient beings."

Indeed, how could spines have evolved as protection for sea urchins, if fish did not feel pain? The ocean is full of creatures that depend on stingers or spines for protection, and the fish that eat them, such as groper and trigger-

fish in the case of sea urchins, show complicated cognitive behaviour in their efforts to do so while avoiding the spines.

The best way to relieve pain in fish during surgery has been meticulously researched, and pain relief is systematically used by veterinarians who perform surgery on fish. For them, the pain system in fish is virtually the same as in birds and mammals. Given that they are conscious, and may suffer on an emotional level, fish welfare emerges as an important issue.

### Findings on pain in fish

Since animals cannot tell us how they feel, scientists have searched indirectly for evidence about their subjective experiences, in the studies of neuroanatomy, neurophysiology, and in their behaviour. They have developed strict criteria, all of which need to

be met, before one can conclude that an animal can feel pain.

First, there must be nociceptors, sensory neurons which respond to tissue damage by sending nerve signals to the spinal cord and brain. There must be neural pathways from the nociceptors to higher brain regions, and the signal from the nociceptor must be processed in the higher brain, not in the reflex centres in the hind brain or spinal cord.

There must be opioid receptors within the nervous system, and opioid substances produced internally. Pain killing drugs should relieve the symptoms of pain that the animal displays, and it should be able to learn to avoid a painful stimulus. This should be so important to the animal, that it avoids the threat of pain right away. The painful event should strongly interfere with normal behaviour; this should not be an instantaneous withdrawal response, but long term distress.

Fish conform to all of these criteria. Their nociceptors are nearly

identical to those found in mammals and humans. These are connected to the brain through neurons. There are also connections between the different structures of the brain, including those which are considered crucial to the experience of pain, and the whole brain of the fish is active during painful events.

As well as neural activity, certain genes that are crucial to the experience of pain in humans are also found in fish, and they are active throughout the fish's brain during painful events. This activity of the brain at the molecular, as well as the physiological level, indicates that these are not reflex reactions, as Rose claims. If they were, such activity would not be seen in the higher brain.

Fish have displayed a variety of adverse changes in their behaviour after the infliction of pain. An extreme increase in their ventilation (respiratory) rate, may be followed by rubbing the damaged parts on the substrate, rock-



DAVID MONNIAUX / WIKIMEDIA COMMONS

Purple sea urchin

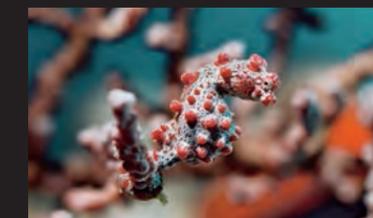


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# shark tales

Edited by Ila France Porcher

ing on their pectoral fins, trying to stay upright, and no longer feeding.

These, and other symptoms of distress, are relieved by the administration of morphine, which completes the circle, identifying pain as the cause of the change in behaviour. Like other animals tested, fish have been shown to self-administer painkillers if they can, even if that means going into a location that they do not like, to bathe in water that medicates them. This is another clue that the fish was suffering, and found relief in the undesirable location.

Fish swiftly learn to avoid painful events, which researchers think indicates that they are conscious—they experience the pain so severely that they are strongly motivated to avoid feeling it again, even after just one exposure.



ANDY MURCH

Though humans can over-ride pain at times in certain heightened mental states, and particularly when they are in danger, it seems that fish cannot do so. Studies have shown that after being hurt, fish become far less alert to danger, as if their pain is too overwhelming for them to ignore it, even to escape a predator. It is thought that due to their simpler neural design and mental states, they lack the ability to think about their pain, and put it in perspective as humans can. Pain

for them seems always to be an intense experience, which suggests that they may actually feel pain more intensely than humans!

When researcher Rebecca Dunlop discovered that fish learn to avoid painful experiences, she wrote, "Pain avoidance in fish doesn't seem to be a reflex response, but rather one that is learned, remembered and is changed according to different circumstances. Therefore, if fish can perceive pain, then angling [fishing] cannot continue to be considered a non-cruel sport."

Research has been done to find ways to minimize the pain fish suffer during fishing. The physiological state resulting from being hooked and reeled in, and the types of damage caused by being fished and handled by fishermen, have been closely studied. As a result, guidelines have been developed for fishermen to follow to minimize the suffering of the fish they catch.

The length of time the fish is kept out of the water is of vital importance, along with the damage caused by the hook. Nets, especially knotted ones, cause abrasions; this can be avoided by using a soft net. The roughness with which the fish is handled, and the use of "stringers," which are especially harmful, are also crucial to the degree of suffering, and the threat to the animal's survival.

But these developments failed to become common knowledge, and in

Pacific sharp-nose shark found with longline hook stuck in mouth (left and lower left)

Hooks used in longline fishing



ILA FRANCE PORCHER

2012, Rose published yet another paper that declared that fish could not feel pain, in an argument that again condensed to the idea that fish pain was not human pain, so could be ignored. He misrepresented Dr Sneddon's findings, so she wrote a rebuttal to the journal, but it was not published. Rose is a member of recreational fishing groups in the United States, which suggested that his review was written for political reasons.

Fish and humans share approximately 50 percent of our genes, and the lionfish shares about 80 percent. They and puffer fish are considered by researchers to be so similar to humans genetically that they are being used as model organisms for



ANDY MURCH

Dead tiger sharks on beach

some research.

The idea that there is a huge gulf between humans and animals is a religious one, which initially gained stature scientifically through the work of René Descartes back in the 17th century. Its use to justify inflicting pain and suffering on other life forms, particularly for pleasure, should be fought wherever it rears its ugly head, in the interests of continuing to establish a moral society.

### Shark fishing as fun

Just to put this political affair in perspective, according to the NOAA, the fishing industry generated one \$199 billion dollars in sales in the United States in 2011. And it is in the United States, home of Shark Week, that monster tournaments became popular after the movie *Jaws*, and fighting sharks for fun and excitement became popular.



ANDY MURCH



# shark tales

Edited by Ila France Porcher

Though the wholesale slaughter is giving way to catch and release, the question of whether such a practice can be morally justified must be asked.

One of the most famous American shark fishing captains, Frank Mundus, has been quoted in the book, *In the Slick of the Cricket*, as saying :

“Feeling good about tagging and releasing sharks was folly. The cheaper hooks bought by the weekend warriors were more often than not swallowed by the sharks which then fought their final battle gut-hooked. After being released, most sank to the bottom, dead. Maybe

two out of 12 are hooked in the mouth. Add it up along the coast.”

Sharks are not trout. They are large animals who have to swim forward continuously to keep oxygen flowing over their gills, and their horizontal undulation is like a heart beat—they can't stop, no matter how much pain they may feel as they are inexorably pulled by the big hook in their guts or faces to the surface, no matter how powerfully they try to escape. Given that fish suffer as other

they appear. As any wildlife rehabilitator learns, serious injuries to wild animals are usually fatal without the benefit of treatment and supportive care.

Recreational fishing is a blood sport that has not received the cultural bias against it that hunting has, and fish have not been protected from needless suffering by law as reptiles, birds

THIS PAGE: The blacktip shark is great to dive with (right). The shark is very vulnerable to catch and release, yet is the most commonly caught shark in Florida



ANDY MURCH



ANDY MURCH

it had been. Those who had escaped appeared swimming unsteadily, and more weakly than sharks I had seen close to death from illnesses. They displayed the same symptoms of pain shown by the birds, reptiles and mammals I was familiar with as a wildlife rehabilitator. They were less alert, less responsive, and they swam slowly, erratically, sometimes looking off-balance. The recovery of their normal swimming pattern when they lived, took up to two weeks.

Large hooks remained twisted into their mouths and often into the jaw itself, where they interfered with the sharks' ability to eat. Some lost weight and died in the next months. The hooks took weeks, and in some cases months, to rust out. The fishing line they trailed became covered with algae to a thickness of several centimetres. Some continually jerked their heads away from the drag as if the heavy weight pulling on the hook was a steady source of discomfort. Juveniles appeared exhausted by it and disappeared before losing the hooks. The answer to my question, “Would fishermen still kill sharks for fun, if they

could see the unimaginable suffering that they caused?” was clear to see. They would, and they do.

There appears to be a mindless acceptance of a tradition resulting from a discovery in the Stone Age, and, incredibly, still bragged about in the computer age. Fishermen have managed to take and keep control of the way fish and sharks are thought about and treated, and their communal agreement that these intelligent and sensitive animals deserve no better treatment than logs, continues to dominate. □

*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.*

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animals, there is no doubt that the suffering of sharks at the hands of “sports” fishermen is extreme.

Though they are thought of as being tough, sharks evolved with their weight supported at all times by the water in which they live, and lack a bony skeleton, so they are more fragile than

and mammals have. While deliberate cruelty to other animals is prosecuted, the motives of people who think that it's “exciting and fun” to brutalize a shark, are not questioned.

### The view underwater

When the massacre of the sharks I was studying began, the entire community of sharks fled, and it never reformed as





## Caught on camera: Whitetip sharks flirting

Text by Ila France Porcher  
Photos by Lynne and Rob Marshall

When divers Rob and Lynne Marshall were free diving in New Caledonia in October, Rob saw two whitetipped reef sharks flirting in an animated encounter, and was able to photograph them.

Rob described how the female had just passed by him, when the smaller male swept in, grabbed her pectoral fin in his mouth and vigorously dragged her down into the coral.

"The whole performance was very energetic!" he said. "Both sharks were struggling and thrashing about, smashing off bits of coral and stirring up the sand.

"Observing it, I really believed it was a fight to the death—it appeared that the male was trying to kill her! To my surprise, when he finally did let go, and they emerged from the coral, I could



see no sign of blood nor any torn or damaged skin on the female.

"There were at least two other sharks cruising around, and one of them

found a flat spot near to the action and lay there for a while observing the pair."

It is very rare to see mating be-



THIS PAGE: Divers Lynne and Rob Marshall captured these rare images of whitetip sharks mating in New Caledonia in the southwest Pacific Ocean

haviour in reef sharks. The male stabilizes the pair during copulation by holding the female with his mouth, and observers have described such mating sharks as undulating as if they were one animal. Whitetipped reef sharks are viviparous, and give birth to live young after a long gestation period. □





Text and photos by Gareth Lock

“...The real reasons people don't provide a higher level of detail are two fold: privacy and legal culpability” was the response recently when I posted a blog (<http://cognitasresearch.wordpress.com/2014/08/26/the-devil-is-in-the-detail/>) about the need to collect more detail when looking at diving incidents so that the community, the agencies and academia can understand WHY incidents happen. Just knowing what happens is not enough to come up with strategies (personal or corporate) to prevent incidents from occurring in the future.

We need to be able to raise the awareness and knowledge of those involved in the sport so that they can truly take responsibility for their own actions. Sticking a note in the manual saying that diving is dangerous or on the back of a CCR which says, “This unit can kill you if improperly used”, are not enough. That's like saying “Drive safely to work” to your

partner as they set off in the morning. People don't get out of bed in the morning and decide, “This seems like a good day to make a monumental, obvious mistake whilst 70m below the surface!”

Causality is complex and only by detailed reporting can we better under-

stand how to improve diving safety. But for detailed reporting to happen, it must be seen as the norm, and not the exception. Reporting because you have to is likely to produce a report which is less useful to the user than one which is written because you want to.

Notwithstanding this need to capture more data, I fully understand the legal implications for discussing fatalities, especially given the litigious nature of society at the moment, and the need to look for someone to blame or claim from. As a consequence, I have been trying to

promote the reporting of non-fatal incidents, starting off with ‘I Learned About Diving from That...’ sub-forums and then through the Diving Incident and Safety Management System (DISMS – [www.divingincidents.org](http://www.divingincidents.org)). The reasons for this promotion are multiple:



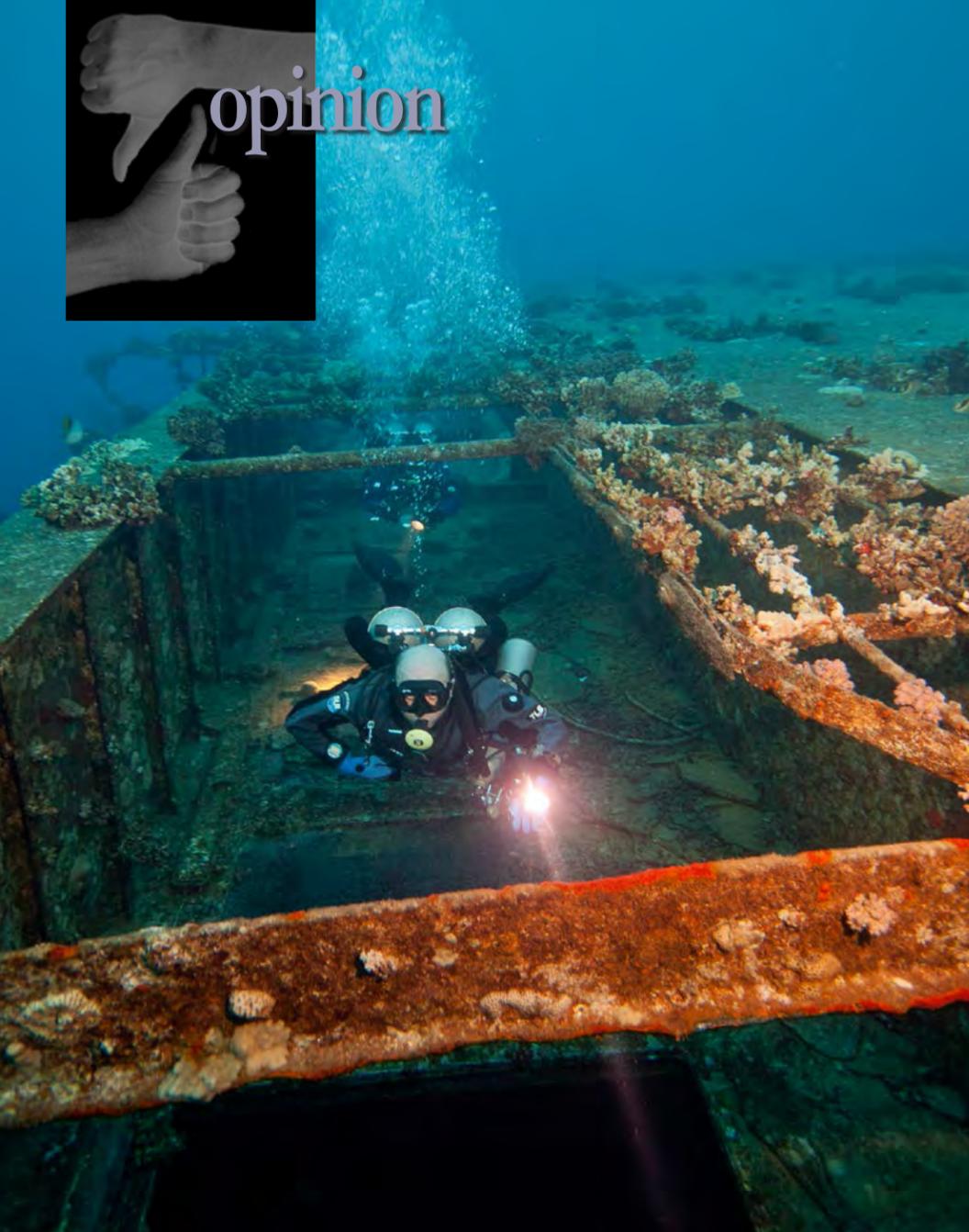
# Reporting Culture

— *Improving Diving Safety*





# opinion



the diver had previously not followed correct protocols for using the equipment the previous day. However, this was a time-consuming and lengthy investigation which is not the norm.

To give an example of why detailed reporting is important, take the following incidents.

### Incident Scenario 1:

A diver with around 600 dives over eight years and qualifications to dive to 75m with trimix was undertaking a dive with colleagues onto a wreck in 48m using 18/45 and 50% deco gas; the plan was for 30 minutes bottom time, which would lead to approximately 30 minutes of decompression. This was the diver's first trimix dive in approximately six months.

The diver filled his suit inflation bottle from a set of 32% and connected up the first stage and suit feed; this was approximately 90 minutes before entering the water whilst alongside. Nothing unusual was noticed at this stage.

After an uneventful transit to the dive site, the wreck was spotted and the divers entered the water. The diver in question completed

- In the majority of occasions, the only thing at risk is personal pride.
- Non-fatals are less emotive.
- The only people who really know WHY a fatal accident happened is the deceased. (This refers to decision making rather than technical analysis).

Some would argue that we can reconstruct incidents from 'black box' data such as the fatality which occurred at the Aquarius Project where it was possible to determine why the AP Inspiration shut down and identified that



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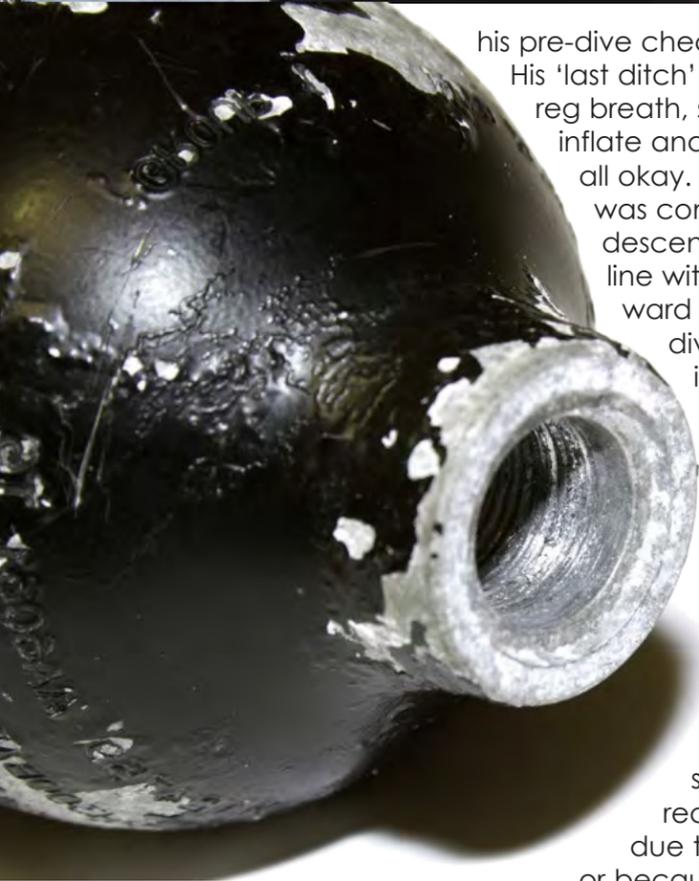


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his pre-dive checks with buddy. His 'last ditch' checks (primary reg breath, suit inflate, wing inflate and dump) were all okay. Bubble check was completed at 6m, descending the shot line with nothing untoward noticed. As the diver was passing 25-30m, he noticed that the inflate didn't appear to be working, although the suit wasn't that tight. This was a new suit and new inflate valve, so he wasn't sure whether the reduced flow was due to the new valve or because the bottle

wasn't empty. The diver reached around to make sure the valve on the suit inflate was open, and it was. The diver continued the descent to the sea bed with the suit tightening all the time. The sea bed was very silty with vis around 2m at best. At this point the diver decided that despite having his mobility restricted, he wouldn't say anything to his buddy or thumb the dive. The reasons being:

- To resolve the issue by getting additional gas in the suit would likely disturb the bottom, reducing vis further, as a buddy would have been required to either donate suit bottle gas, or help disconnecting the wing inflate hose and plugging it into the suit inflate valve.
- The vis was so poor, and combined with not having a wreck to dive on, they were likely to thumb

the dive very shortly and then ascend.

- If there was an issue, the diver could use his buddy to help resolve it as there was limited mobility.

As it was, the dive ended four minutes after being on the bottom, as there was no wreck and expensive trimix was being used up for the sake of diving HMS Seabed.

As the diver ascended, the gas started to expand in the suit and mobility returned. At the 21m stop for the switch to 50%, the buddy of the diver had an issue with deploying his stage reg; the buddy was supposed to send up the dSMB. As the buddy sorted out his stage reg, the subject diver went to send up the dSMB but had no suit gas to do this, so orally inflated the bag from 21m and sent it up. The rest of the ascent was uneventful.

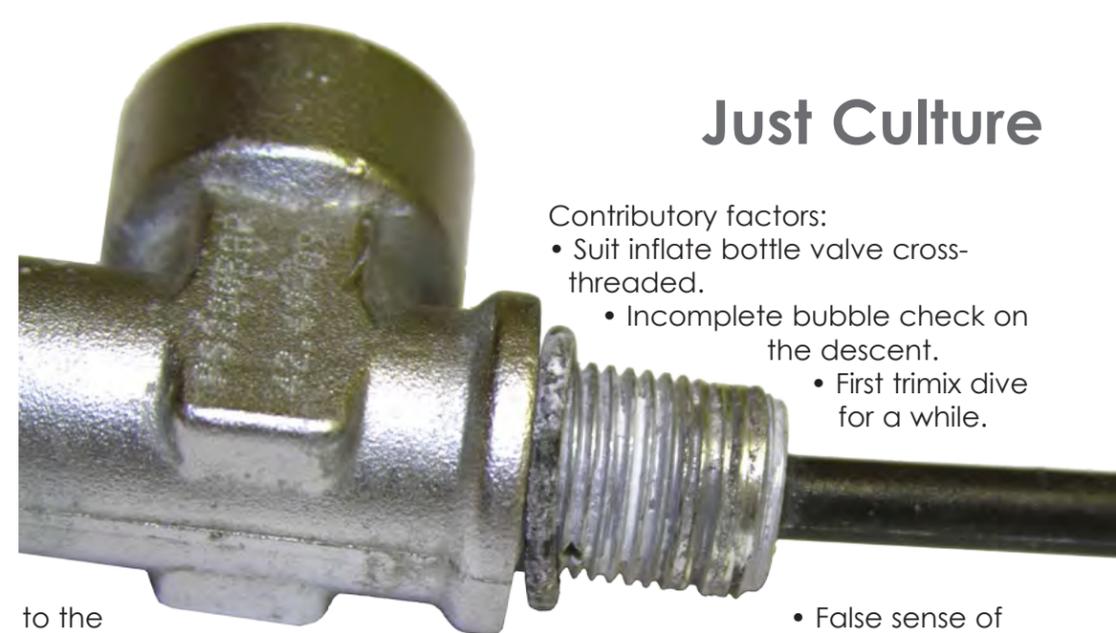
Back on shore, when the diver de-kitted, he noticed that he had quite a few suit squeeze marks around the shoulder area.

The diver's cylinders (3 x twinsets and 3 x stages plus suit inflate bottle) were all due a service within a month, so the week after the dive, the diver dropped his cylinders off with a dive centre to be serviced. The suit inflate bottle failed because of a valve problem; the valve had been cross-threaded at some point in the recent past, which may have been down

## Just Culture

Contributory factors:

- Suit inflate bottle valve cross-threaded.
- Incomplete bubble check on the descent.
- First trimix dive for a while.



to the diver taking the valve off to service it, which he had done on a number of occasions in the past.

Fortunately, a second incident, which would require mobility and flexibility, didn't happen. A gas donate would have been easily undertaken but a shut-down would have been impossible, as the diver had tried to reach his valves on the bottom and couldn't. This is what likely caused the compression marks on the shoulders and upper arms.

- False sense of security with having buddy present as buddy could help resolve any shut-down problem.
- Poor vis. Silty seabed. No wreck at the bottom, so bottom time was likely to be limited.
- Poor communication of the issue throughout the dive and its potential implications meant that the buddy did not have situational awareness.

### Incident Scenario 2:

A diver and his buddy undertook a dive to 48m. After spending five





minutes on the bottom, due to poor visibility, being very dark and not being on the wreck, they thumbed the dive and ascended. As the diver got undressed, he noticed that he had suffered from suit squeeze bruising.

As you can tell, both reports describe the same incident. However, one report provides significantly more information which allows more effective lessons to be learned. Writing incident reports takes time and it also needs the reporter to understand what is important in terms of causality—what are the links in the chain which could be broken if the lessons are to be carried forward.

Detailed reports also take time to read. In the current age of immediacy, everything appears to be reduced to 'sound-bites' and yet

we cannot extract the amount of information we need from brief reports.

"An emergency is most often a chain of events. The ability to recognise that a chain of events is materialising is an important step in breaking the chain and avoiding the emergency." This quote was copied from a Facebook post in which the user was discussing an incident and is the normal view of accidents—they are linear in time, and if you can break the chain, then you will stop what else is going on.

Unfortunately, the real world is far more complex. In the incident above, there are a number of

almost unconnected situations, each on their own not a problem. Indeed, the suit inflation bottle failing isn't a serious incident in and

of itself; it requires another independent problem to occur (e.g. free-flow/o-ring failure) which introduces a situation whereby the diver needs to shutdown but cannot.

Many people cannot spot the parallel or networked nature

of an incident developing until after the event because they have not seen such a situation develop before. Reporting helps that.

A great example of how reporting can be done, even when fatalities are involved, is to look at the follow-

*Many people cannot spot the parallel or networked nature of an incident developing until after the event because they have not seen such a situation develop before. Reporting helps that.*

WHERE TO REPORT IT:

DISMS - [www.divingincidents.org](http://www.divingincidents.org)

BSAC - [www.bsac.com/incident-reporting/](http://www.bsac.com/incident-reporting/)

DAN America Non-Fatal Incident Reporting - <https://www.diversalernetnetwork.org/research/incidentReport/>

DAN AP Non-Fatal Incident Reporting - [www.danasiapacific.org/main/accident/nfdir.php](http://www.danasiapacific.org/main/accident/nfdir.php)

ing link: <http://www.helsinki.fi/lifestyle/11212-deep.html>. It covers the double fatality in 2013 in the Plura cave system, Norway.

**Upon reflection**

Finally, I will close with this remark, "What use is 20:20 hindsight if it doesn't change your future behaviours?"—a statement I use in a number of my presentations on Human Factors and Safety in diving.

After reading about an incident, we often ask ourselves, "Why didn't they stop doing what they were doing? It was obvious what was going to happen." And yet, if we really looked at our own behaviours, do they change after we have read about incidents which happen in the types of diving we undertake? If they do not change, is it because we don't think it will happen to us, or do they not change because there isn't enough detail to understand what happened and therefore we don't know what to change?

Improved reporting can help counter both of these thought processes; as more incidents are report-

**Safety Culture**

ed, then the scale of the problem becomes more apparent (quantitative analysis becomes more credible) and, as more detail is added, divers can better understand what happened and why (qualitative analysis is improved).

We are never going to get absolute answers, but if one diver is making a mistake, you can be sure someone else in the world is too! Had something not go to plan? Report it. □

*Gareth Lock is an accomplished technical diver based in the United Kingdom. Currently serving in the Royal Air Force, Lock is undertaking a part-time PhD examining the role of human factors in scuba diving incidents. For more information, visit the Cognitas Incident Research & Management website at: [Cognitasresearch.wordpress.com](http://Cognitasresearch.wordpress.com)*



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## Dolphins can sense magnetic fields

A study published in *Naturwissenschaften* (Natural Sciences) has shown that dolphins respond to magnetic fields. According to the researchers, this magnetic sense may help dolphins navigate the world's oceans by using the Earth's magnetic field.

The experiment conducted at a dolphinarium in France presented bottlenose dolphins with a range of objects, some of which were magnetic. The dolphins were quick to swim to the magnetized objects to

investigate them.

"Dolphins are able to discriminate between objects based on their magnetic properties, which is a prerequisite for magnetoreception-based navigation," said co-author of the study Dorothee Kremers of the University of Rennes.

Kremers said that the magnetic sense, or magnetoreception, has been found in several animals such as pigeons, bats, insects and turtles, which use the sense most likely for orientation and navigation.

## Cetaceans squeal in delight

According to a study published in the *Journal of Experimental Biology*, dolphins and whales feel pleasure. Researcher Sam Ridgway who has dedicated much of his life to the study of whales and dolphins stumbled upon the revelation when he noticed that the animals he worked with squealed each time he rewarded them with tasty fish treats. But it was his wife, Jeanette, who hit upon the similarity between the animals' squeals and those of delighted children, leading Sam to look into whether these were truly expressions of pleasure.

Indeed, Ridgway found that the lapse of time between the marine mammals getting a reward and their subsequent squeals equalled the delay between a pleasant moment

and dopamine release. The finding suggested that whales and dolphins feel pleasure.

Ridgway also observed a transference of the phenomenon when trainers used a whistle or buzzer rather than food treats to reward the animals. He found that even though there was no food reward, the dolphins and whales still let out a "victory squeal" in response to the trainers' whistles.

Digging a little deeper, Ridgway searched through recordings done in past decades with fellow researchers Patrick Moore, Don Carder and Tracy Romano for experiments that tested the abilities of beluga whales and dolphins. Measuring the delay between the trainer's whistle and the victory squeals, Ridgway found that

"Inside the ocean, the magnetic field would be a very good cue to navigate," said Kremers. "It seems quite plausible for dolphins to have a magnetic sense."

Indeed scientists say there is evidence that dolphins' and whales' migratory paths may be connected with the Earth's magnetic field, however, the exact mechanism by which the animals can sense magnetic fields is not yet understood. □

SOURCE: TECHTIMES.COM

the delay was longer than the dopamine release, which is 100 ms. This suggested that the animals could have been expressing delight.

"The dolphins take an average of 151 ms extra time for this release, and with the belugas... it's about 250 ms delay," said Ridgway. "We think we have demonstrated that it [the victory squeal] has emotional content." □

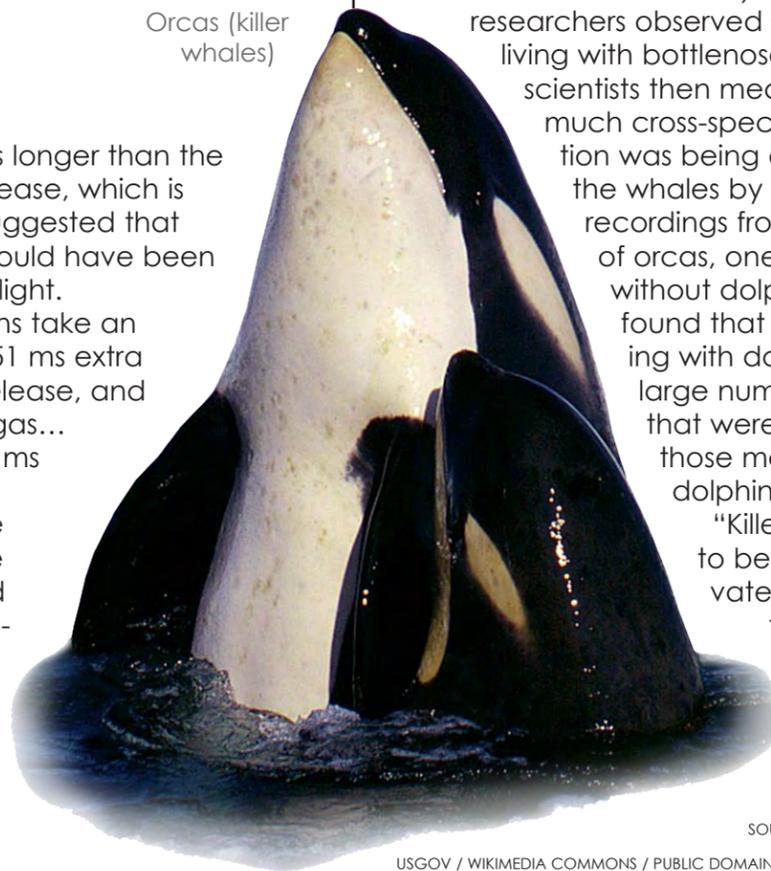
SOURCE: EUREKALERT.

Bottlenose dolphin



NASA / PUBLIC DOMAIN

Orcas (killer whales)



SOURCE: TECHTIMES.COM

## Orcas can speak dolphin

When socializing with bottlenose dolphins, killer whales learn how to communicate with their cetacean friends, according to a new study. It is a rare talent for one species to emulate another and researchers have been keen to prove the whales' ability.

"There's been an idea for a long time that killer whales learn their dialect, but it isn't enough to say they all have different dialects so therefore they learn. There needs to be some experimental proof so you can say how well they learn and what context promotes learning," said Ann Bowles, senior research scientist at Hubbs-SeaWorld Research Institute.

### Cross-species vocalizations

In the scientific community, it is thought that killer whales mimic dolphins in order to assist with social interaction. The large marine mammals are able to make a broad range of sounds such as clicks, whistles and pulses, and when they live together in packs develop a dialect of unique variations, according to cetacean biologists.

In the study published in the *Journal of the Acoustical Society of America*, researchers observed several orcas living with bottlenose dolphins. The scientists then measured how much cross-species vocalization was being adopted by the whales by analysing recordings from two groups of orcas, one with and one without dolphins. They found that the orcas living with dolphins used a large number of sounds that were similar to those made by the dolphins.

"Killer whales seem to be really motivated to match the features of their social partners," said Bowles. □

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training in  
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Text by Sergey Baykov  
Photos by Sergey Baykov  
and Anna Loznevaya

**On August 14 in Dahab this year, our team of three divers dived a distance of 10km in eight hours using rebreathers. The purpose of this experiment was a practical test of human capabilities and the performance of rebreathers on a long dive, while under the influence of physical activity.**

It was in autumn 2010 that my colleague, Sergey Gorpinyuk, proposed the original idea to me: to dive a distance of 7km. As to a location for the experiment, we chose the colorful Mexican cenotes (caves) because they have long passages, calm current and stable direction. In addition, they have markup distances and many exits. We needed only to mark the way in the caves with guidelines. The rebreather was chosen as a technical means for the realization of the project.

I was already certified as a Full Cave Diver, but at that time, I had just begun to dive on closed-circuit devices. Gorpinyuk, at that time, had already acquired some good experience diving with a rebreather. The task was clear, so two months later, I bought my rebreather—an Inspiration Vision,

a good kit with which to embrace the dream.

After testing the new rebreather in January and February, we traveled to the White Sea in north-western Russia to practice diving

with the apparatus in cold water and in overhead environments.

Two days we spent under the ice, with the air temperature at -37°C and one day we spent in flooded tunnels—it was good training!

#### **To Mexico cenotes**

Two weeks later we flew to Mexico. It was the beginning of March and the jungle was blooming. After the trip to the White Sea, saying that conditions in

Mexico were comfortable was putting it mildly. The air temperature was 25°C, the water was 25°C, and the visibility was amazing. Plus the beauty of the cenotes was astounding.

But, as fate intervened, a long dive didn't happen. Firstly, it appeared, that diving in the local caves required CCR Cave Diving certification, even if the diver has Full Cave and CCR certificates.



SERGEY BAYKOV

# 10k on a Rebreather

— *Making the Long Dive*





SERGEY BAYKOV

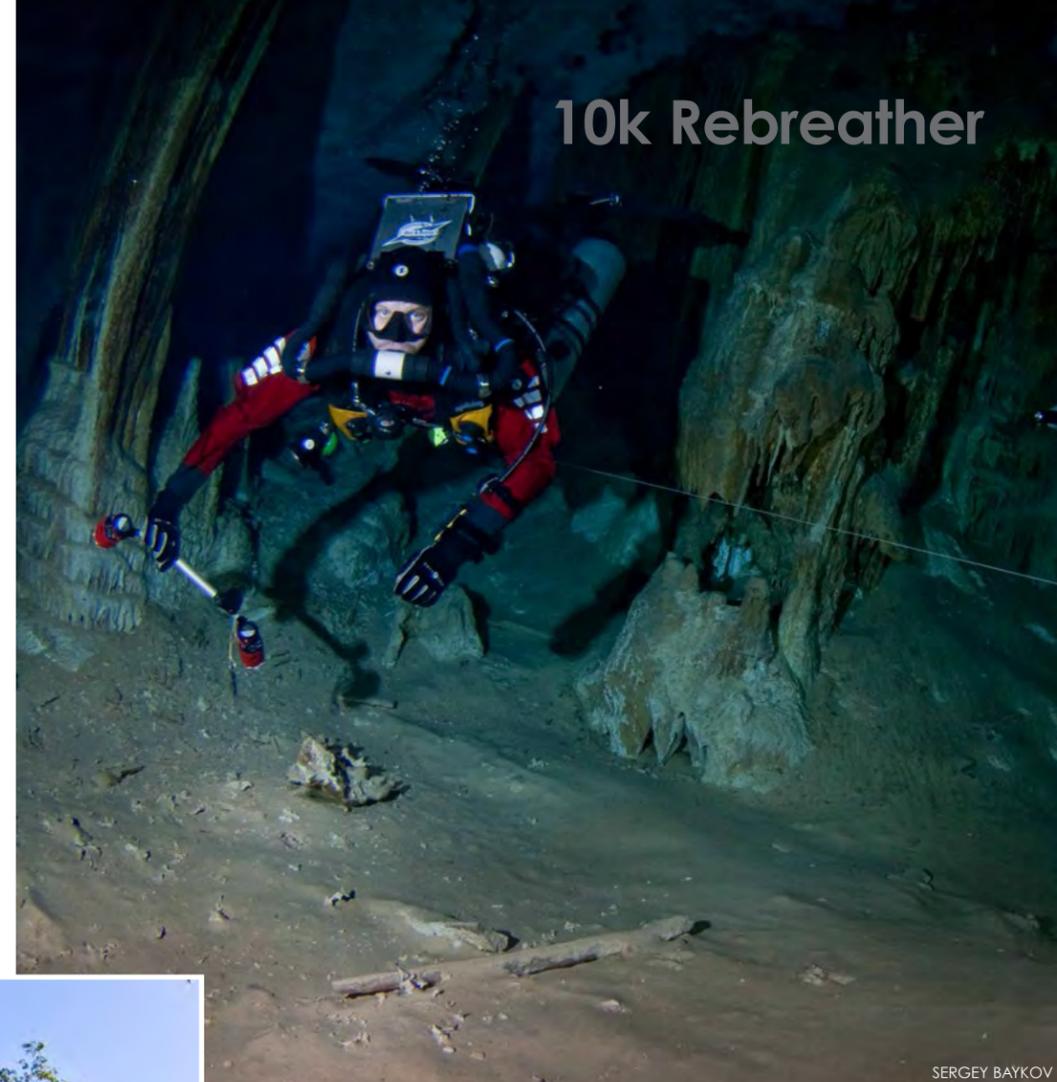
Test in the hard conditions of the White Sea (below)

Training in a Mexican cenote (right)



SERGEY BAYKOV

Sergey Baykov and the first modification of his rebreather (left)



## 10k Rebreather

SERGEY BAYKOV

To remedy the situation, we took three days to complete the additional course. During the training, we found out that the frames of our rebreathers were very cumbersome, and, in fact, we spent a lot of energy on overcoming the apparatus' drag underwater. Moreover, our experience with the equipment was not a good one.

However, the conclusion we reached at the time was that the trip to Mexico was not done in vain even though we had not completed the task we set out to accomplish. The "long dive" did not happen. But we did not let ourselves get bothered by the delay. The process of preparing was something we enjoyed.

### Back to the drawing board

Periodically, we dived on our rebreathers, we made measurements and analysis of what was happening. I moved towards upgrading the supporting frame of my rebreather. The new construction allowed for the use of different tanks and, with the right approach, saved on weight as well as improved the streamlining of the apparatus.

I spent a lot of time making a plastic prototype, measuring millimeters of gaps and then made the product from stainless steel. I tested the prototype during one of our trips to Dahab in the spring of 2012 and I was satisfied with its performance. After that I made a titanium version, which was more robust and lightweight at 2.5kg.



SERGEY BAYKOV

The beauty of the Mexican cenotes was astounding. Above is an entry into a Mexican cenote

Still, for greater streamlining, I moved my rebreather's lung bags back to the shoulders. The idea was not new, but in the standard configuration of the Inspiration rebreather there were front lung bags. The manufacturers changed the trim, adding buoyancy to the shoulders and decreasing the buoyancy of the legs.

This problem was especially felt in a wetsuit.

We had to exert more energy to keep the horizontal position of the body. Well, of course, it was extra physical work and effort. I should mention that I made the shoulder lung bags in 2014 and tested them over the summer in the Barents Sea and in the Baltic. Indeed, it turned out to be a good and necessary device.

Gorpinyuk also worked on the project. For example, in the summer of 2012, he made a long dive in Dahab—lasting six hours. He proved that a long dive was really possible.

Even then, he brought with him underwater some condensed milk snacks and water in plastic bottles, and he also worked out a surface detection system. Every hour he threw a buoy to the surface for three minutes.

I also checked the perfor-



10k Rebreather

Dahab Coast, Egypt (above); The Three Sergey's (top left) preparing for the long dive—Sergey Baykov, Sergey Zakhvatov and Sergey Gorpinyuk

diving rebreathers since 2011. He was an athletic person with good sports facility. So The Three Sergey's with three rebreathers set out, with three different configurations of frames, to test the physical capabilities of

Despite the fact that all the equipment was prepared and checked the day before, we woke early and met at 6 AM at the dive club, Planet Divers. Once again, we tested the rebreathers, spoke about the details of the

a safety-diver, whose task was to observe the sea surface and always be ready to rescue a diver in need.

At 8 AM we embarked onto the dive boat. After a brief administrative examination by the police, we headed out to sea. We sailed northeast along the coast. If you've ever been to Dahab, you know that the boats

are moored in the lagoon, and the place of our entry into the water was 15km from the dock.

**Taking the plunge**

The site we chose from which to start the dive was El Bells, which is the most northern dive point in Dahab. For one and a half hours, we journeyed into the wind (in Dahab the wind is almost always



mance of the rebreather. I dived in different conditions and with different lengths of duration underwater in various locations such as the Maldives, Egypt, the Barents Sea, the Baltic, local ponds, Orda Cave, and other locations.

**Dahab**

Conclusions were drawn and details were specified. And so it was on 14 August 2014 that we took the plunge for the "long dive" in Dahab.

At that stage, Sergey Zakhvatov joined our team. He had been



both human being and machine, on a long dive, compounded with physical exertion.

upcoming dive and coordinated the dive with a security team, which included a dive boat and



LOWER LEFT TO RIGHT: Final check; Entry into the water; Photo op before the dive

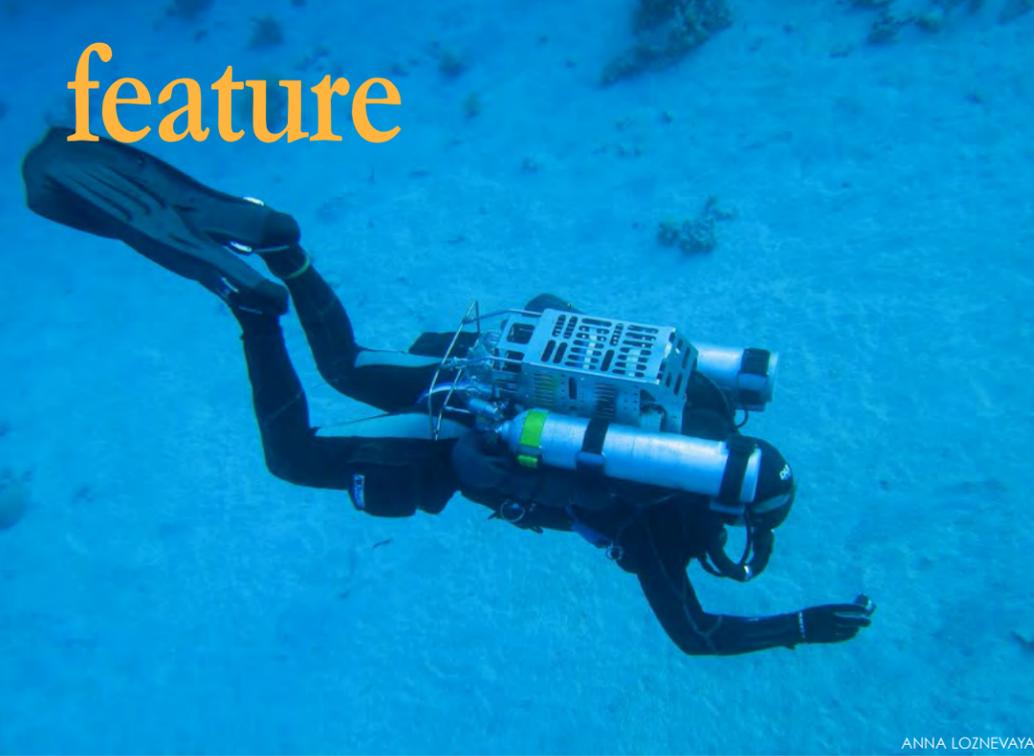
ANNA LOZNEVAYA

SERGEY BAYKOV

ANNA LOZNEVAYA

ANNA LOZNEVAYA

ANNA LOZNEVAYA



ANNA LOZNEVAYA

Member of the dive team underwater (left) with clear view of altered rebreather rig from above; Emerision of dive team member, Sergey Zakhvatov (right); National Russian energy drink (below)

dens, gorgonians and other reef life.

### Current issues

After some time, we figured out that the current wasn't helping us. How so? According to our calculations, it should have carried us four hours more. But nature has its own laws. And because of the topography of coastline, current can go in the opposite direction. As a result, for two hours we swam without current. We were still deploying the buoy every hour,

northerly) until we came to the dive site. We quickly threw on our rebreathers and jumped into the water. With us was Anna Loznevaya—a journalist from the local "Russian Club" and her assistant—who jumped into the water with the team. Their task was to take underwater photos of the beginning of the dive.

The little photo session took place and we started the dive at 10:00 AM. It was to be a 10m dive, the optimum depth for a nondecompression dive. The electronic rebreather itself supports PpO<sub>2</sub> 0,7ata, which is comparable to diving on EAN-35. Rebreathers use 6-liter tanks. In one tank is oxygen and in the other is air, a diluent gas, which is in this case a bail-out or emergency gas. Six liters of compressed air is enough to ascend from a depth of 10m.

The configuration of our team was obtained fairly easily. We were swimming efficiently. Moreover, the current was on our side. And after 1.5 hours underwater, we reached the dive site called Canyon. Over the next 30 minutes, we swam to the turn at Abu Helal. It was about 3km



ANNA LOZNEVAYA

from the start of the route. We threw out the buoy and had a rest. Sergey Zakhvatov decided to have a snack—quality condensed milk from Belarus. The plastic packages were very useful for underwater eating. Sergey showed us that it was tasty!

We reeled in the buoy and proceeded further. On the way, we observed the amazing underwater world of the pristine dive sites—they were very impressive, with brilliant colors of coral gar-

and while it was on the surface, we had three minutes to rest.

Four hours after the start of the dive, we found that the current was still obstructing us. And the next four hours were spent swimming against it. Initially, the current was weak, but by the last hour it was very strong. We were underwater and could only guess where we were, but our security team saw us clearly via the buoys. According to the observation of the team, the first three hours we



ANNA LOZNEVAYA

went half of the way, and over the next five hours, we covered the second half, because the current affected the time it took to travel the distance.

### Scrubber warning

At the end of the seventh hour, Sergey Zakhvatov had a problem with his rebreather computer. A "Scrubber Warning" alerted him that the sofnoalaym had worked out its time. (Sofnoalaym is a powder necessary for the utilization of carbon dioxide). It can be pos-

sible to rate the performance of the absorbent by warming of the tempsteak (special temperature sensor, that is mounted inside the powder and shows in what place it is warming). One segment was still working and, therefore, we decided to continue to the dive, carefully monitoring Sergey Zakhvatov's state of health—watching for hypercapnia and so forth! Sergei Gorpinyuk took on this task. In the next half-hour, though, his computer had the same problem.



ANNA LOZNEVAYA

Diver underwater with view of altered rebreather frame

## 10k Rebreather

As I wrote earlier, we wanted to test the human body underwater, and so we continued our journey. The experience gained during the previous dives allowed us to adequately observe the situation. In the case of excess carbon dioxide, we could switch to open circuit and safely go to the surface from the 10m depth. We do not advise others to repeat our actions! Experiments always involve risks.

The end point of our trip was near. It became clear after the passage to the dive site El Garden. Many places in Dahab we know by heart. After the next 30 minutes, my computer started to "swear" at me too. Perhaps it was the constructive improvements made on my equipment that made it possible to save power and, consequently, reduce the oxygen consumption and carbon dioxide production.

### The final finish

Finally, we reached the dive site called Lighthouse—our last stop. Sergey Zakhvatov decided to float on the external side of the reef. I came up with him, and Sergey Gorpinyuk continued the dive until he reached the edge of the corals on the reef. After surfacing and getting back aboard the dive boat, we heard loud applause and photos were taken to commemorate the occasion. After 20 minutes, we were joined by Sergey Gorpinyuk.

The eight-hour dive was completed safely, with The Three Sergey's, three rebreathers and one very good idea accomplished. It was clear, we did the hard work, with our flippers finning 10km in 500 minutes. □



# Dealing with the Aftermath

— *Post Traumatic Stress Disorder in Recreational Dive Rescuers*

**We are taught how to rescue other divers in emergency, but who prepares us for the aftermath and effects of witnessing a tragic event up close? Rescue attempts do not always end well, and even when they do, Post Traumatic Stress Disorder (PTSD) is a very real possibility for those who have just been involved with a life or death situation in a recreational dive setting.**

Text by James Lapenta  
Photos by Svetlana  
Murashkina

On a dive boat everything is going well and all are having a good time. Suddenly a shout for help is heard from the port side. Looking over, a pair of divers is seen and one appears to be unconscious.

Two members of the party dive in and assist the buddy in getting the stricken diver to the swim platform. Stripping the gear from the diver takes but a few seconds. Getting them into the boat takes a little less than a minute more.

Once on the boat, it is soon determined that the diver is not breathing and has no pulse. CPR is started and after a couple of minutes a pulse is found. The team begins to relax when suddenly the diver convulses, begins spewing a bloody froth, and collapses. The diver does not regain consciousness.

Shortly after, those divers who were directly involved in the rescue begin to have problems. One has nightmares and cannot get the deceased diver's face out of

his mind. Another suddenly begins selling off his gear and no longer returns calls from anyone associated with scuba. The diver who was the actual buddy of the victim is killed in a car accident while driving drunk. Prior to the event, he had never been known to over indulge in alcohol.

## Missing diver

A dive outing at a local quarry and a group of Open Water students are enjoying their checkout dives. At the end of dive number two, a student diver surfaces saying she's lost her buddy and he has not surfaced.

While quickly scanning the surface for bubbles, the instructor and divemaster get all the students to shore and sound an alarm. Those on shore take action by notifying the quarry owner, calling emergency medical

services (EMS), and gathering information from other divers coming out of the water.

The instructor and his assistant search in the last reported area the diver was seen. It is near an underwater platform used for training. They spot a fin tip sticking out from around the corner

or the platform. It is the missing diver—a 60 year old man, eyes wide open, and with his regulator out of his mouth. They bring him to the surface and begin with in water rescue breathing followed by CPR once they reach shore but it is too late. The diver never regains a pulse and is

taken away by EMS personnel.

During these events, the man's buddy—his wife—is hysterical and begins screaming at the instructor and his assistant demanding to know why they were not watch-

ing them and did not know where they were. Why were they so far ahead of the class and did not know her husband had gotten separated from the rest?

An autopsy will show that the man suffered a massive heart attack from a previously unknown condition. Yet the assistant cannot get the man's face out of his mind—underwater, no regulator, eyes open, but lifeless and staring straight ahead. Mixed with that is the woman's accusing voice that haunts him.

He has difficulty sleeping, withdraws from his friends, and though he still dives, he no longer will assist with classes. The instructor suddenly cancels all classes and ignores his other students' calls and emails.

He is cleared of criminal wrongdoing but receives a reprimand from his agency for not being in control of his students and not adhering to standards. Soon he drifts out of the local dive scene and moves away with no forwarding address.



## Withdrawal

It's a warm sunny day and a group of friends are having a good time at a local lake. One member of the group had previously been involved in the rescue of a diver a couple months earlier that did not turn out well. Yet until this time, he had not been suffering from any after effects of that incident.

Suddenly one of his friends suffers a severe leg cramp and yells for help. Others rush to his aid and pull him from the water. He suffers no serious injury and soon recovers with some stretching and massage of the leg muscles.

Another diver looks at the one who had been involved in the previous rescue and asks why he did not respond as he was so close. The diver says nothing and turns away from the group, packs up his gear, and speeds from the site.

A few days later he brings his gear to the local shop and asks them to sell it. He refuses to take calls, does not answer emails, and is heard to be having problems at his job. Yet he will talk to no one and is about to be fired when his boss

sends him to an employee intervention program.

Here he discovers that his first rescue experience that did not turn out well caused him to not respond to a rather simple need for assistance. The guilt he felt over that as well as subconsciously feeling he could have done more in the first scenario and perhaps changed it to a more favorable outcome turned into something serious that affected his entire life.

With the help of a trained professional he was able to come to terms with these events, but he never dived again.

## Haunted

During a series of open water dives, an individual in group of divers using rental gear suddenly has a regulator begin to free flow towards the end of the dive, which quickly empties his tank of his remaining air. The diver signals an OOA to his buddy and the buddy donates his octopus.

As the diver with the free flow takes the octopus, the cover falls off, and he is left



holding an octopus that does not work. He heads for the surface while continuously exhaling. His buddy follows and soon surfaces beside him.

He is congratulated for executing a successful self-rescue. The buddy apologizes profusely and is told that it really wasn't his fault but that of the crappy rental gear. They laugh it off and decide to end the diving for the day and both seem fine.

That night, the diver whose regulator fell apart catches himself analyzing the incident until he realizes that he is up much later than he should be. He sleeps fitfully and has rough day at work.

It happens again two days later. The diver with the free flow finds that on the next dive outing that he spends much of the first dive tense and preoccupied with his air supply, to the extent that he loses track of his buddy and has to swim hard to catch him.

The next dive is not much better. He enjoys neither of the dives. The next weekend he begs off one of the days and soon finds that he is not interested in going at all.

## A very real possibility

These four scenarios are fictitious and are not taken from any one actual event. All of them are used to illustrate the effects that Simple Post Traumatic Stress Disorder or Simple PTSD may have on a diver who rescues another.

The idea for adding this topic to the Scuba Educators International (SEI) Diver Rescue and Accident Management (DRAM) course is the result of having been involved in a few rescues of recreational divers. It is also a result of speaking with other divers who were able to be of assistance to one of their own. Finally it is from reading the reactions of divers to events that did not turn out well and the

effect the incident had on them.

Not all rescues will have positive outcomes. Even those that do may have effects that the rescuers may not see coming.

Those effects may present themselves to varying degrees over different lengths of time. They may not have much effect on the rescuer. When they do though, they need to be addressed and dealt with.

Post Traumatic Stress Disorder, or PTSD, is a very real possibility for those who have just been involved with a life or death situation in a recreational dive setting.

Scuba diving is an activity that for many people is filled with adventure, knowledge and enjoyment. It is an activity that is safe as long as one follows his or her training and experience.

Pushing those limits too far, too fast can, however, result in an accident that



*Anyone involved in a serious rescue scenario with a fellow diver stands a chance of being injured by that scenario. Not physically injured but injured mentally.*

on them—that even though they may have performed thousands of them, one particular rescue may be the event that has affected them for a long time.

Military personnel who have seen the effects of combat and had to pull buddies and parts of buddies out of that hell are most often cited as likely to experience PTSD. It was first in these members or our armed forces that PTSD was diagnosed and described.

Soon psychiatrists, psychologists, and therapists began to see the exact same signs and symptoms in patients who had never experienced combat or saw the effects of it. What they realized was that these people were experiencing the same effects as a result of having been involved in traumatic events, or in some cases from witnessing these events.

Whatever the cause, the end result can be summed up by saying that anyone involved in a serious rescue scenario with a fellow diver stands a chance of being injured by that scenario. Not physically injured but injured mentally.

### Mental injury

PTSD is sometimes referred to as a mental injury. This is different than a mental illness. It is also nothing to be ashamed of or hidden from everyone. It is a treatable condition that according to the National Institute of Mental Health in 2006 affected 8 million Americans.

But what we are talking about here is not the same type of PTSD that is manifested in those who are exposed to mental trauma

day in and day out. What we are talking about here is the PTSD that is brought on by a single event. Known as Simple PTSD, it is a reaction of the subconscious mind to a single violent or

frightening event.

For our purposes, this single event is a diving accident. It need not be a fatality or even a life threatening event to shock the system and produce signs and symptoms of PTSD. Even an event with a successful outcome can have long lasting effects.

Let's look at what PTSD is and what the signs and symptoms are.

### Signs of PTSD

A frequent sign of PTSD is repetitively thinking about the event. These thoughts may suddenly come into your mind even when you don't want them to. They may come in the form of nightmares or flashbacks about the event.

These flashbacks can result in inflated reactions at inconvenient times. You may get upset simply by being reminded of what happened. You may react when someone mentions it, when you see a picture of the place where it occurred, or when you see another person who was there.

Another common sign of PTSD is hyper-vigilance. Hyper-vigilance is brought on by a mental injury. It is a state of heightened alertness. Many situations call for one to be extra alert and watchful.

But the person suffering from PTSD is often like this constantly. They are not able to relax, and the smallest disturbance can create an overblown reaction.

can have devastating physical effects and may result in death. Even when all the rules are followed, changing dive conditions, weather, currents, tides, and even marine animals may cause injury to a diver necessitating a rescue.

A previously unknown medical condition may also cause a diver to require assistance. Another possible cause of a diver's distress may be from becoming entangled in fishing line or kelp. Careless boaters may also result in injured divers. And all too often it is the diver themselves, through

error or carelessness, which will put their own safety and life in danger.

Regardless of the cause, the diver will require assistance—perhaps life saving assistance. You, the rescue diver, are likely to be the one looked to for that assistance.

A Rescue course is arguably the most important course you can take after Open Water. Some agencies require you to also have advanced training before the Rescue course along with a minimum number of dives—perhaps

as many as 20.

Scuba Educators International (SEI) only requires Open Water and ten dives. SEI recognizes the importance of having the ability to not only provide assistance to another diver but to prevent issues from turning into accidents from the earliest possible opportunity.

This is one reason why some of the skills in the DRAM course are also taught in the Open Water class. Divers not taught under the SEI system may not have had any rescue skills other than a tired

diver tow.

If the only problem a new diver could be expected to encounter is a tired one, I, for one, would be extremely happy. Reality is far from that ideal. What we are concerned with here is dealing with the effects of the need to rescue a diver that may be felt after that incident by those who provide that assistance.

The rescue of anyone is a profound experience. Ask any firefighter, police officer, or EMT. Any one of them will tell you honestly that each rescue has an effect



the world itself as something to be feared.

Chronic fatigue is another possible sign that something may be wrong. Especially if no physical cause can be pointed to as the source of the tiredness. In fact, the body needing to fight the other symptoms may in itself contribute to the feeling of fatigue.

It takes a great deal of energy to maintain a hyper-vigilant state. Not being able to rest or sleep only adds to that. The panic attacks also use up valuable energy.

There may be other subtle signs that in and of themselves do not seem as serious as those noted here. All of us at times go through periods where we

This hyper-vigilance may also result in a sense that you are somehow less than worthy of other's attention and consideration. This may lead to depression.

You may also suffer from insomnia. The thoughts and images of the event may cause you to lose sleep or keep from getting truly restful sleep. In some cases medication may help but only for a short time. Using medication for extended periods to deal with insomnia presents its own issues of possible dependency.

You may find yourself going to great lengths to avoid things that remind you of the event: the location of the event, the people who were there, perhaps even the activity itself, in extreme cases.

Some people involved in the rescue of a diver that may not have had a good outcome may go so far as to stop diving. This may or may not be an extreme response. If the events are so traumatic and upsetting that recalling them

detracts from the dive planning process so that diving itself now becomes unsafe due to inattention to detail, then perhaps it is for the best that the diver stops diving.

You may also experience panic attacks. These appear as a feeling of intense fear accompanied by shortness of breath, dizziness, sweating, nausea and a racing heart. Some mistake panic attacks as heart attacks, as they may also be accompanied by tightness or burning in the chest.

Other physical symptoms may be chronic pain, headaches, stomach pain, muscle cramps, or low back pain. Not all of these symptoms will occur at the same time but any of them could at any time.

Feelings of mistrust is another common experience. These feelings may be towards strangers, friends, family, or the world in general. This can result in feelings of loneliness and isolation. In addition, you may lose trust in others and look at

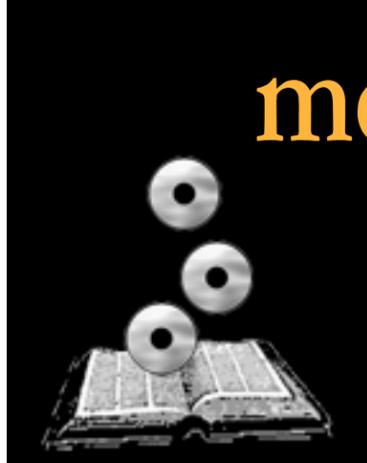
are easily distracted, lose our train of thought, or get irritated at small things. The difference though with PTSD is that these small things can be nearly constant or such that they interfere with simple daily living. Further indicators may need to be diagnosed by a professional.

Help with PTSD should also be sought from a person with specific training in the diagnosis and treatment of PTSD. Finding a therapist, psychologist or psychiatrist who specializes in treating those suffering from PTSD can be done via a number of routes. One of the first avenues to consider in locating treatment may be consulting your family physician and asking for a referral. Another possible source may be a member of the clergy. Your community mental health agency or local hospital may also have information to aid you in seeking treatment. □

*Based in Pittsburgh, James Lapenta is a technical diver, SEI, SDI/TDI and CMAS\*\* dive instructor, co-author of Search and Recovery and entry level Public Safety Diving courses, as well as author of the book, SCUBA: A Practical Guide for the New Diver, available on Amazon.*

*You may find yourself going to great lengths to avoid things that remind you of the event: the location of the event, the people who were there, perhaps even the activity itself, in extreme cases.*



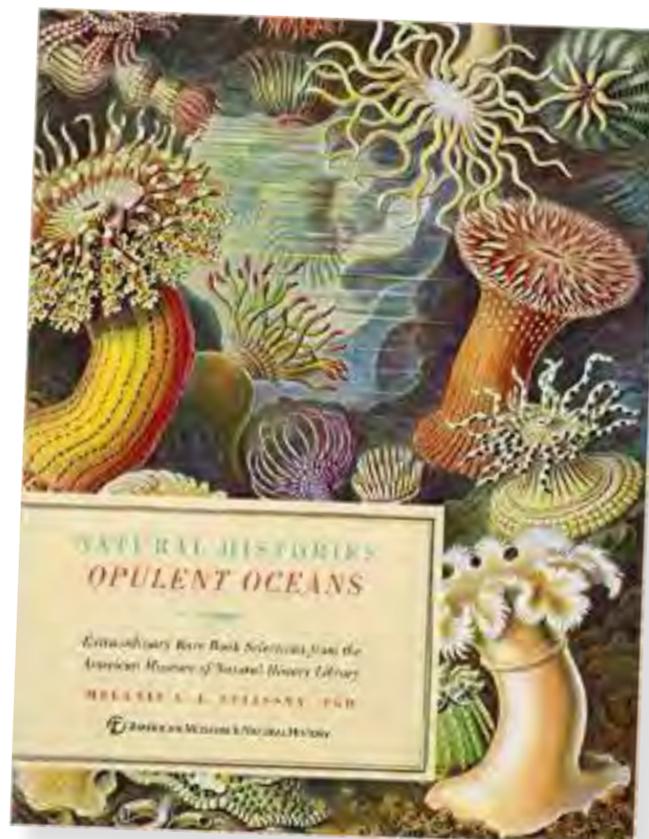


## About a Seal

*A Seal Called Andre*, by Harry Goodridge. Basically, this book tells the true story about a man named Harry Goodridge and a seal named Andre. For 25 years,

they shared a friendship that transcended the boundaries between man and animal. Andre grew up in the Goodridge household, and was treated as a member of the family. As an adult, Andre was free to return to the wild, but every spring, he would return to the harbour he grew up in. This book is a reprint of the 1976 book of the same name, and includes an afterword written by Goodridge's daughter, which covers the final decade of this special friendship.

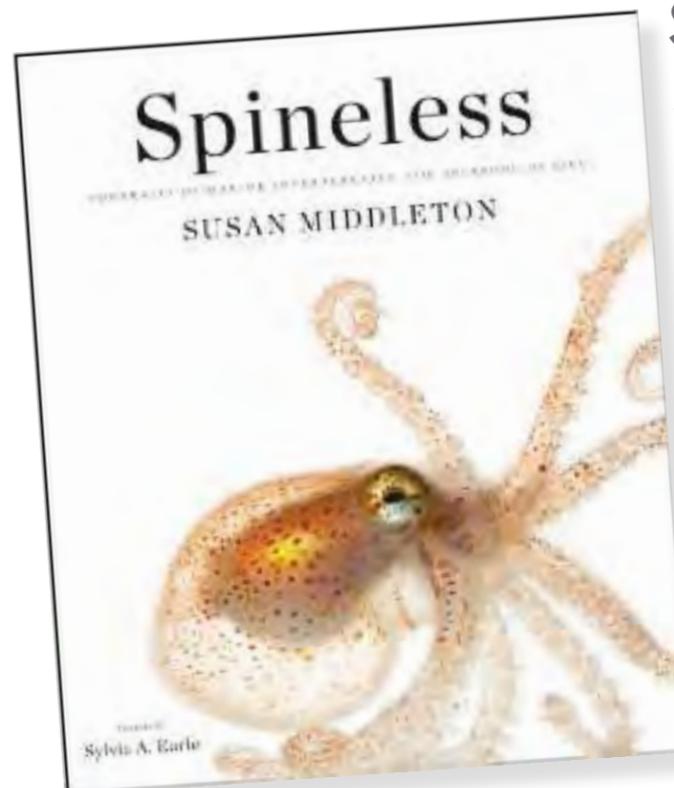
Paperback: 200 pages  
 Publisher: Down East Books, U.S.  
 Date: 7 Oct 2014  
 ISBN-10: 1608932958  
 ISBN-13: 978-1608932955



## Oceans

*Opulent Oceans (Natural Histories)*, by Melanie L.J. Stiassny, PhD. Take a look at the early history of our marine life in a whole new perspective. Whether you're a scientist, an artist or a curious browser, this book is filled with many intricate close-up illustrations of marine and coral life to provide hours of fascinated study. The illustrations, and their accompanying essays, are taken from the Rare Books Collections of the American Museum of Natural History and compiled by Melanie Stiassny, the museum's curator. This book is the latest in the Natural Histories series.

Paperback: 176 pages  
 Publisher: Sterling; Box edition  
 Date: 7 Oct 2014  
 ISBN-10: 145491341X  
 ISBN-13: 978-1454913412

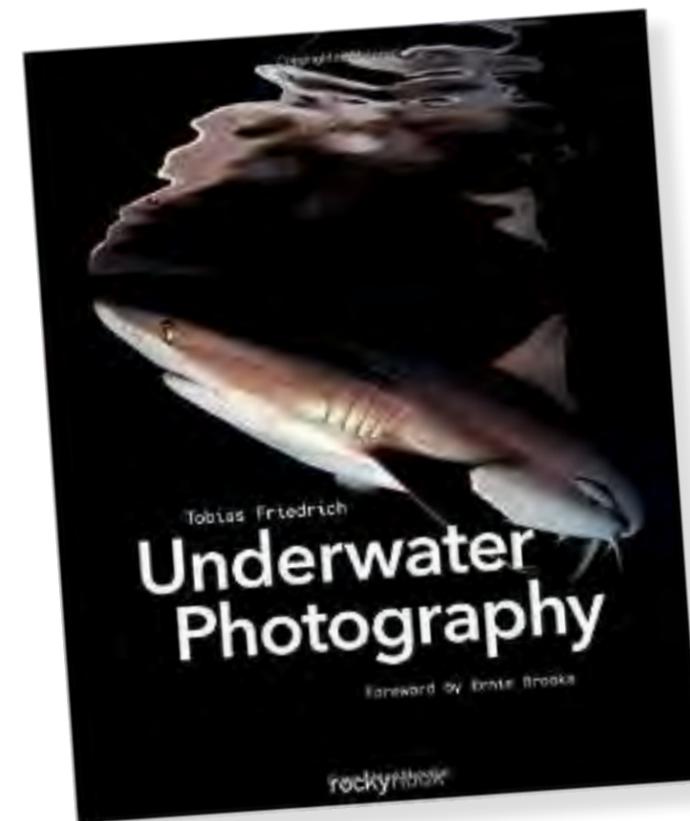


## Spineless

*Spineless: Portraits of Marine Invertebrates, the Backbone of Life*, by Susan Middleton. Marine invertebrates come in all shapes and sizes—literally. Photographer Susan Middleton takes us on a journey into the bizarre and alien world of these fragile creatures, highlighting their vital role in the foundations of life itself.

While the book may not have stunning visuals of underwater landscapes, the pictures are nevertheless stunning. Each invertebrate is photographed simply, against a white background. By not showing the creature in its natural habitat, Middleton intends to show that for many of the creatures, a healthy habitat is lacking—"The isolation speaks to something in their reality," she explains.

Hardcover: 256 pages  
 Publisher: Abrams  
 Date: 21 Oct 2014  
 ISBN-10: 1419710079  
 ISBN-13: 978-1419710070



## Photography

*Underwater Photography*, by Tobias Friedrich. Here's your chance to be coached on underwater photography by an award-winning photographer, via this comprehensive, no-holds-barred book. Tobias Friedrich takes the reader step-by-step through the entire process of taking photos below the ocean's surface, from equipment selection and picture composition to lighting and even image editing. Different aspects of the genre—like macro and wreck photography—are examined, alongside many words of advice and accounts of Friedrich's personal case studies.

Paperback: 216 pages  
 Publisher: Rocky Nook; First edition  
 Date: 20 Sep 2014  
 ISBN-10: 1937538524  
 ISBN-13: 978-1937538521



Text by Simon Pridmore  
Photos by Scott Bennett

**The other day I watched a dive instructor take two students out on a night dive for their Advanced Open Water Diver course. He prepared the gear, packed the truck, picked the students up, then unpacked everything at the beach, supervised the students as they set up their equipment, then gave a briefing. Everyone put their gear on and he tidied up the dressing area before leading them into the water.**

After the dive, the instructor again took care of everything, including handing out drinks and snacks and driving the students back to their hotel.

The instructor was rushing about everywhere, working very hard and his students obviously had a great time but it made me think, "Why doesn't he have anyone to help him?"

**What If?**

Both students and instructor would have benefitted greatly from the presence of other members of staff around on the



*Scuba Confidential*

# Help! I Need Somebody

— *The Value of Assistants in Dive Operations*

beach, in the water or both.

The instructor would have had much less stress and fewer distractions before the dive so he could have focussed more on the students and the actual teaching. During the dive, he would not have had nagging on his mind the safety of

the pile of expensive equipment he had left on the beach unattended. And after the dive, he could have left the logistics to his assistants while he debriefed the students.

With my technical diving "What If?" hat on, I thought about the safety issues too.

Without an assistant: what if the instructor had become incapacitated during the dive, either through sudden illness or a marine life sting? How would the two new divers rescue him, remove him from the water, administer oxygen and/or First Aid and summon assistance?

What if a current had picked up or weather set in, making it impossible for the instructor and students to return to their starting point?

What if one or more students had encountered a problem early on and had to abandon the dive?



the dive—be it failure to equalise on descent, an involuntary rapid ascent, an equipment problem or something else—the instructor has three alternatives.

1. Abandon the student with the problem and stay with the majority of the class.
2. Take care of the student with the problem and abandon the others.
3. Assemble the whole group and abort the dive.

Of course, option 3 is the one that any right-thinking instructor would take but it is far from a satisfactory option as it involves wasting the time of those on the dive who did not have a problem but have paid for the instructor's time.

If the instructor has a little help at hand, either at the surface, underwater or ideally both, then his options are much wider and considerably more attractive.

**Common sense**

In the United Kingdom, there is legislation governing recreational scuba diving instruction and any circumstances where a diver is "at work." For every open water dive, the minimum supervisory team size is three, the instructor, an assistant in the water and

another assistant on the surface.

The assistant in the water, who must be a qualified Rescue Diver, gives the instructor a second pair of eyes and looks after the other divers if the instructor's attention is diverted by the need to take care of one particular student.

The in-water assistant is also there to step in and deal with the emergency if the instructor gets into difficulty during the dive—hence the requirement for at least Rescue Diver qualification.

The assistant on the surface can help the instructor in a whole host of ways but their primary job is to arrange and supervise the removal of an unconscious casualty to a point of safety. The concern is that an instructor and in-water assistant in full gear with a number of other divers to take care of would not be able to do this effectively. As a minimum the surface assistant should have First Aid and CPR qualifications and be able to use

the on-site oxygen administration equipment.

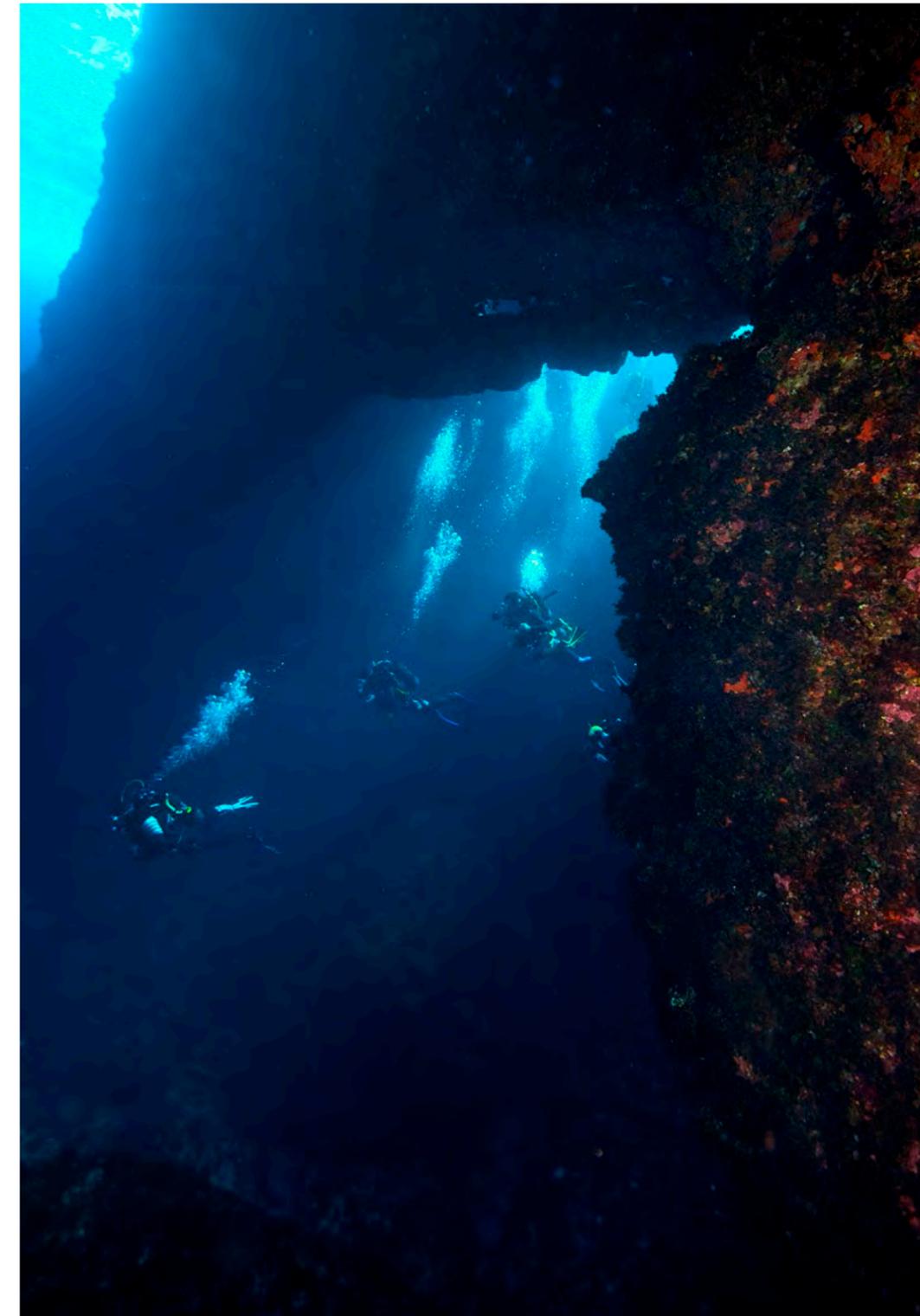
This legislation was brought in following a series of accidents. Investigators concluded that, left alone, the scuba diving world would not be able to act on its own to create and enforce procedures that, it seemed to them,

were just a matter of common sense. So the State stepped in.

**A guide only**

Instructors are not the only ones

who could use a little help from time to time. A guide on a dive boat in Malaysia, who always used to run the diving on his own, tells the story of the time he



**A little help**

Of course, the last point in particular is something that instructors teaching classes with multiple

students alone have to deal with all the time. If a student has a problem during a class that means they have to abandon



dropped in to check the current while his group was gearing up on the boat. While he was down, the boat drifted near some rocks and the driver fired up the engines to take them clear. The jolt caused one of the divers, who was newly certified and had been sitting precariously on the gunwale, to fall into the water and start drifting away.

The boat driver evidently decided to wait for the guide to ascend before going to recover the drifting diver. However, seeing that the boat was not coming, the diver concluded that the best thing to do was to go and find the guide so descended and disappeared from view. Luckily, another, more experienced diver on board, quickly assessing the situation, dropped into the water too and took care of the situation, bringing the first diver back to the surface and inflating a marker buoy.

When they got back to the dock, the guide insisted that the diver who had saved the day be given a refund for his dives. That was the last time he ever ran a trip without an assistant on board!

### Why so helpless?

Why do dive centres often not provide instructors with assistants when they teach?

With just a little thought, it is easy

*With just a little thought, it is easy to see the huge value of assistants, identify the sort of problems that can occur when a dive is under-staffed and understand how difficult situations can be prevented and avoided simply by assigning more staff to the job.*

to see the huge value of assistants, identify the sort of problems that can occur when a dive

is under-staffed and understand how difficult situations can be prevented and avoided simply by assigning more staff to the job.

Do some operations shirk the responsibility and leave it up to the instructors? Do they not realise that dive accidents are very costly to dive centres, both economically and in terms of the damage that can be done to their reputation? Are instructors too proud to ask for help? Are the commissions they earn for courses too small for them to share with an assistant or two? Or do they believe their own propaganda and think that their superhuman skills extend to being in more than one place at a time?

My best guess is that, in these days of cost-cutting competition, it is sometimes the case that safety issues are ignored in favour of economic considerations. If fewer staff are employed for a task, then costs are lower, cheaper prices can be offered and cost-conscious shoppers will buy, ignorant of the safety compromises that have made the cheap prices possible?

This is another area where divers must learn to look intelligently at how dive operations run dives, assess the risks, ask their own "What If?" questions and vote with their feet and wallets. □

*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, also called Scuba Confidential, is available in paperback and e-Book on Amazon.*



Malaysia's  
**Pom Pom Island**

— *Diving the Celebes Sea*

Text and photos by Larry Cohen  
and Olga Torrey





OLGA TORREY

Pom Pom Island dive boat ready for departure (above); Light filtering through structure, Mataking House Reef (right).  
PREVIOUS PAGE: *Hypselodoris bullockii* 2 nudibranch

**Borneo is the third largest island in the world. It is the home to three countries—Indonesia to the south, Brunei and Malaysia in the north. The Malaysian states of Sabah and Sarawak are located on the island. Our journey to Pom Pom Island took us to the Tawau airport in the state of Sabah. This was a two hour and 40 minute flight. We then had to take a van another hour to the port city of Semporna. This is the starting point for all dive resorts in Malaysia.**



OLGA TORREY

Clown fish on night dive in front of Celebes Beach Resort



LARRY COHEN

Prior to the journey, my partner, Olga Torrey, and I were invited to do presentations at the Asia Dive Conference (ADCON) in Kuala Lumpur Malaysia and dive at Pom Pom Island with the Celebes

Beach Resort. This would be the perfect trip to see how my new camera system would perform.

It was the ninth year Ness Velu and her staff have been running the Malaysia International Dive Expo (MIDE). The expo has

many exhibitors including dive operators, gear manufacturers, shops and training organizations. During the conference there were many speakers including Michael Aw from Ocean Geographic Magazine. Non-divers could



TOP LEFT TO RIGHT: Petronas Twin Towers; Fountain on Dataran Merdeka (Independence Square); Guard at the King's Palace; Kuala Lumpur is a major cosmopolitan city; View from the Petronas Twin Towers with Panasonic 8mm Fisheye lens (top far right); The Olympus 40-150mm lens was used to photograph a dance performance at the National Museum (inset far right); Mother and child watch dance performance (right)

try scuba in the pool with a PADI instructor. This is the first year Ness added the Asia Dive Conference (ADCON) were experts gave presentations on photography and technical diving. Olga and I were honored to be among the presenters that also included photogra-

pher with Scubazoo Christian Loader, editor-in-chief of Action Asia Magazine Steve White, technical dive instructor with Blue Label Diving Ben Reymenants, ITDA Regional Director William Ong and underwater photographer Ab Lee.

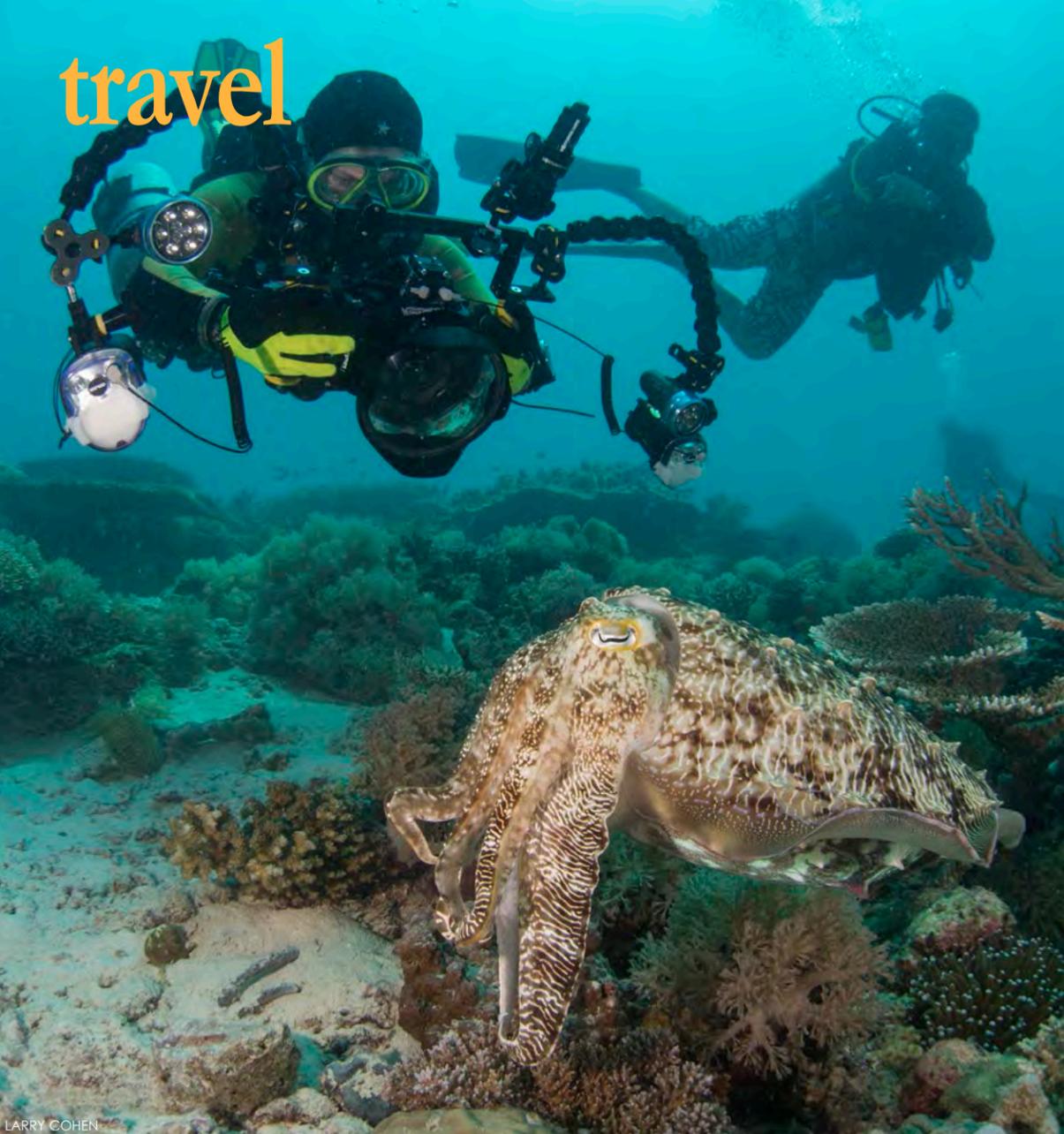
Kuala Lumpur is a major cosmopolitan city that is worth exploring with many photo opportunities. From Chinatown, the Petronas Twin Towers to the King's Palace, the architecture is varied and interesting. Working close, the 8mm fisheye could be used to create an interesting prospective with distortion. The

Panasonic 7-14mm allowed a wide view without the distinctive curve of a fisheye lens. The King's Palace is behind a gate, but from the hill, one could get a clear view. The Palace was in the distance, but by using the 40-150mm lens, it was possible to get an image without cropping.

Just like most major cities, the residents are the true soul of the city and need to be documented. Most people are extremely friendly and are more than happy to be photographed. Sometimes the problem was to get a natural candid look. When faced with a camera many people would look directly in the camera, smile and make gestures.

The 12-40mm f/2.8 PRO and Olympus 12-50mm f/3.5-6.3 ED M.Zuiko EZ were usually the lenses of

choice for these images. The lenses are wide enough for environmental portraits and street photography. The 40-150mm was useful when photographing scenes in the distance such as the dance performance at the National Museum.



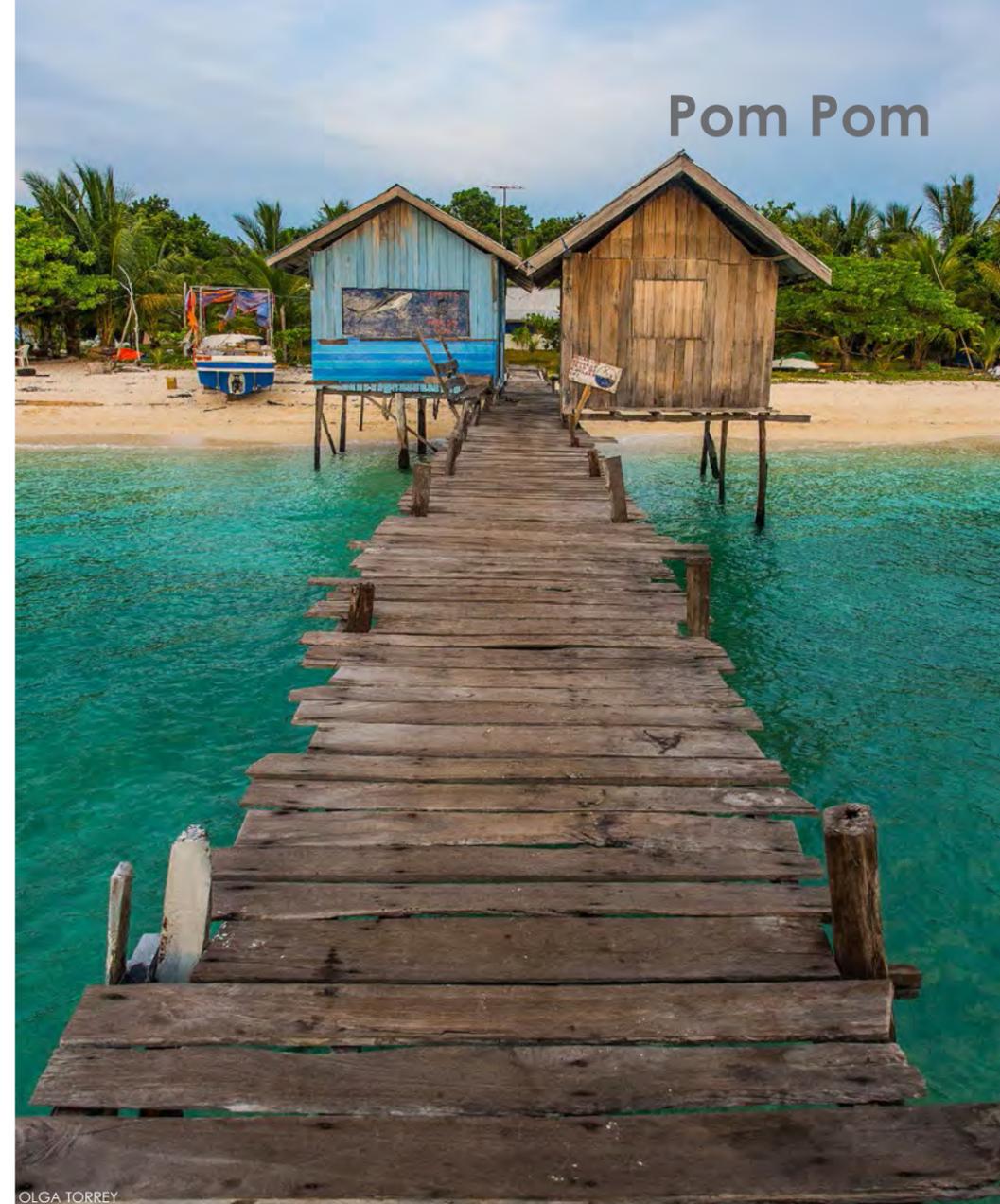
LARRY COHEN



LARRY COHEN



LARRY COHEN



Pom Pom

OLGA TORREY



LARRY COHEN

LEFT TO RIGHT: *Chromodoris willani* nudibranch; Olga Torrey with cuttlefish, Mantabuan Island; Lionfish at Cleaning Station, leaf scorpionfish during night dive, and the pier at Celebes Beach Resort

small huts all along its length. Each hut was the office for a different resort. The Celebes Beach Resort's office was a nice space to relax out of the heat and have some water while the final paper work was taken care of.

To the right and left of this dock were many shacks on stilts. The residents of these structures are the Bajau people also known as Sea Gypsies. Once nomads who spent their entire lives on boats

traveling from island to island, they have now settled in the area. According to the January 2007 Monthly Statistical Bulletin, Department of Statistics Malaysia, they are the second-largest ethnic group in the Malaysian state of Sabah, making up 13.4 percent of the total population.

Using the 40-150mm lens, we were able to zoom into these people's lives. June is the rainy season in Malaysia. We were very

lucky and got little rain. The hour we spent on this dock, there was a downpour. The OM-D E-M1 and OM-D E-M5 are weather sealed. But not all Olympus and Panasonic lenses are. So it is important to keep your rig dry when using a non-weather sealed lens. Luckily the dock with all the dive resorts offices was covered. So was the small boat we boarded for the 45-minute ride to Pom Pom Island in the Celebes Sea.

Pom Pom Island

Pom Pom Island is small, with two resorts on the Island. Celebes Beach Resort is three and half years old at this writing. The clientele were mostly from Mainland China, Europe and Malaysia. Being from the United States, we were in the minority. The 16 rooms were in eight different buildings. The rooms were modest but clean and comfortable. The air-conditioning was strong and there was plenty of room to store extra gear.

The main pavilion housed the dining area and dive center office. The gear area had plenty of bins for gear storage and

places to hang wetsuits and BCs. There were also wash bins dedicated to certain gear. One was for cameras, another for regulators and another for wetsuits. At the time of our visit, air was the only gas available. Getting heavy gear onto the island was not easy. The staff at Celebes Beach Resort had been waiting patiently for their new nitrox system to be delivered. The nitrox system was installed just after our visit.

We had already met our dive guides for the week—Sherwin Shim, Jackson John and resort manager, Nurul Yazid—at ADCON and on the plane to Tawau.



LARRY COHEN



LARRY COHEN

Clown frogfish

The waters around Pom Pom Island are known for macro life. Nurul, Jackson and Sherwin are skilled at spotting the tiniest of creatures. Exhausted from our travels we still decided to do a 6PM dive on our first day at the resort. The site directly in front of the resort is known as the Cleaning Station. I set up my housing with the 60mm macro and Olga had the Olympus 12-50mm lens with macro button on her Olympus OM-D E-M5.

Sherwin and Jackson started searching a gorgonian for pygmy seahorses. While they searched we took portraits of a nearby lionfish. Our guides



LARRY COHEN



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banged on their tanks to get our attention. Using their pointers they pointed in excitement. I saw nothing. Not wanting to insult our guides, I blindly pointed my camera in the direction of their pointers. Figuring there was something really small, I manually set the camera to the closest focusing distance.

This would give me a life-size image on my camera sensor. This is known as shooting a 1:1 magnification ratio. I then moved in. When what looked to me like just a coral stem was sharp, I pressed the shutter release, expecting to have

nothing of interest in the frame.

Later, when looking at the images on the computer, everyone said you got the pygmy seahorse; I still did not see it. A life size 1:1 image of a creature that is smaller than your thumbnail was still too small. After doing some cropping, I finally saw that I got my first image of this tiny creature. Not a very good image but to my surprise it was in the frame.

For this subject I should have used the Aquatica +10 Wet Diopter Close Up Lens. This lens has a 67mm filter thread and would have been mounted



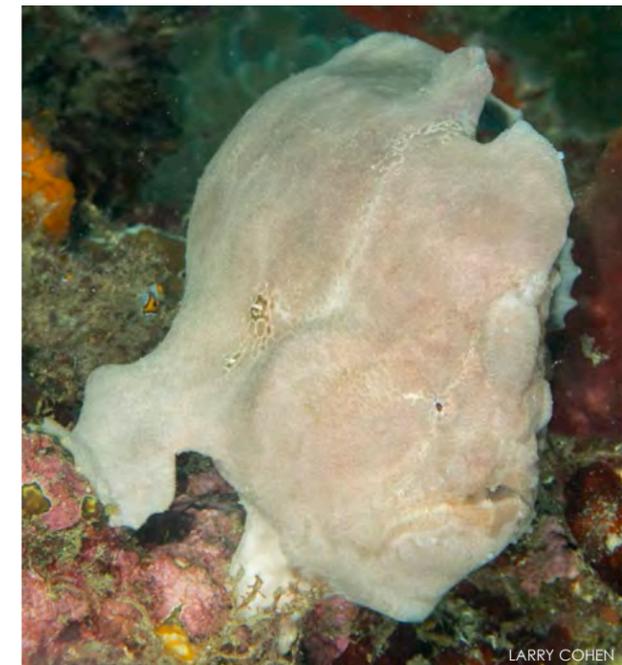
Pom Pom

LARRY COHEN

directly to my lens port. Then I would have been able to produce an image with a 50 percent increase in magnification. Of course, actually getting it in the frame is another matter.

Moving on, I was able to photograph many small creatures that I could see. Tiny clownfish would dart in and out of an anemone for protection. Anemones are poisonous to most marine life, but they have a symbiotic relationship with the clown fish.

Whenever you have on a macro lens, you see interesting large subjects. A large sea turtle and a blue spotted stingray allowed us to get extremely close. With the 60mm macro, all I could do was a turtle head-shot and a close-up of the ray's eye. Not bad for the first dive of the trip!

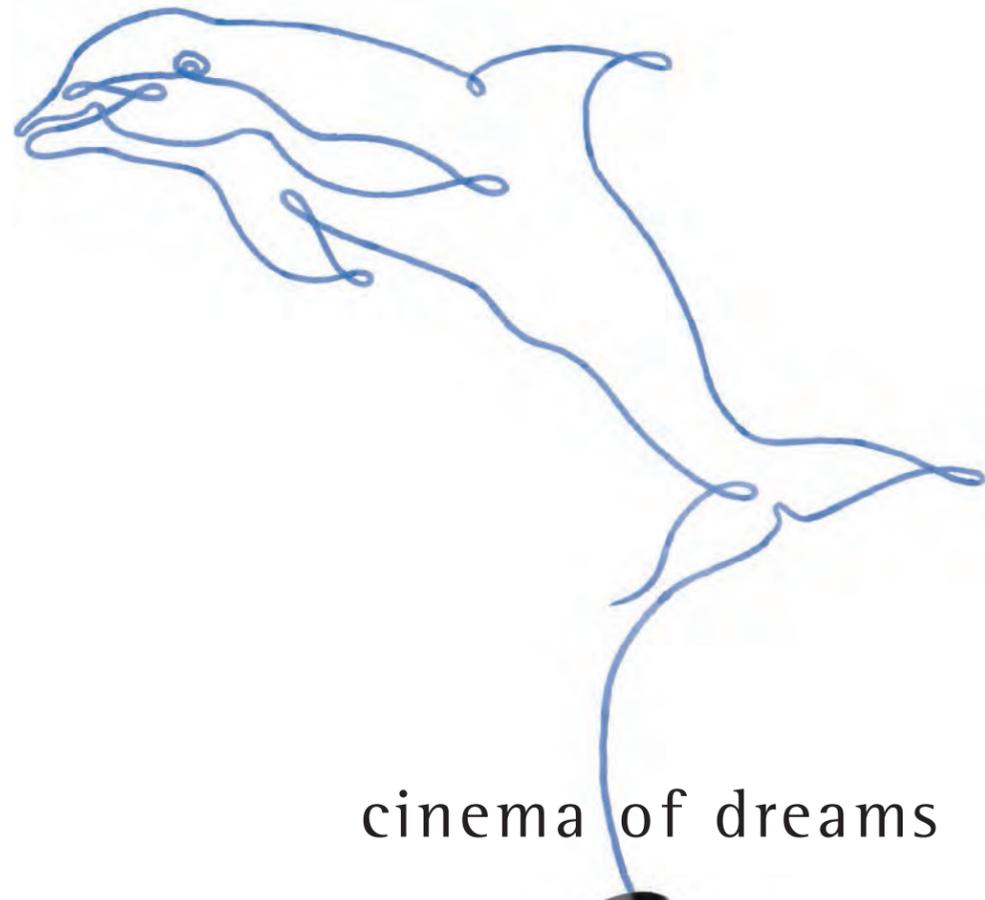


LARRY COHEN

TOP LEFT TO RIGHT: Huge barrel sponge at D'Wall; Close-up of blue spotted stingray with Olympus 60MM Macro lens; A large anemone with clown fish sits on deck behind cabin of Sipadan Mermaid wreck; Green sea turtle at Aquarium; Giant frogfish at Dulang Island's Two Sisters (above)

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### Mataking Island

The first dive of day two was off Mataking Island on the Sipadan Mermaid wreck, also known as the Shipwreck Post. This artificial reef was once a liveaboard and is now an underwater post office. One can seal a postcard in a waterproof pouch and place it in the mail slot on the wreck.

The inscription on the main Post Office in New York City reads: "Neither snow, nor rain, nor heat, nor gloom of night stays these couriers from the swift completion of their appointed rounds." In Malaysia it could read, "Neither 5-knot current, nor high seas, nor

bad vis, nor gloom of night stays these couriers from the swift completion of their appointed rounds!"

Setting my camera up with the 8mm fisheye lens, I was now in my comfort zone. The Sipadan Mermaid was a wonderful background for capturing images of the marine life that call this wreck home. A large anemone with clownfish sat on the deck just behind the cabin, and lionfish picked at the growth for food. Spotted hind, butterflyfish and other tropicals were easy to capture. Large schools of fish inside the wreck were good subjects. The

ship's engines were worth photographing. To add a human touch to the wreck photos, Sherwin and Jackson were willing models.

Diving in shallow water under piers is always very productive. These structures attract marine life and also add to the background. The pier known as Mataking House Reef was outstanding. The light filtering through the structure nicely illuminated schools of batfish and huge schools of bait fish. Scorpionfish rested on the bottom while trumpetfish did their best to look like part of the structure.

This site was very tide dependent. We did this dive when the

TOP RIGHT: Diver at mailbox on the Sipadan Mermaid wreck, also known as Shipwreck Post



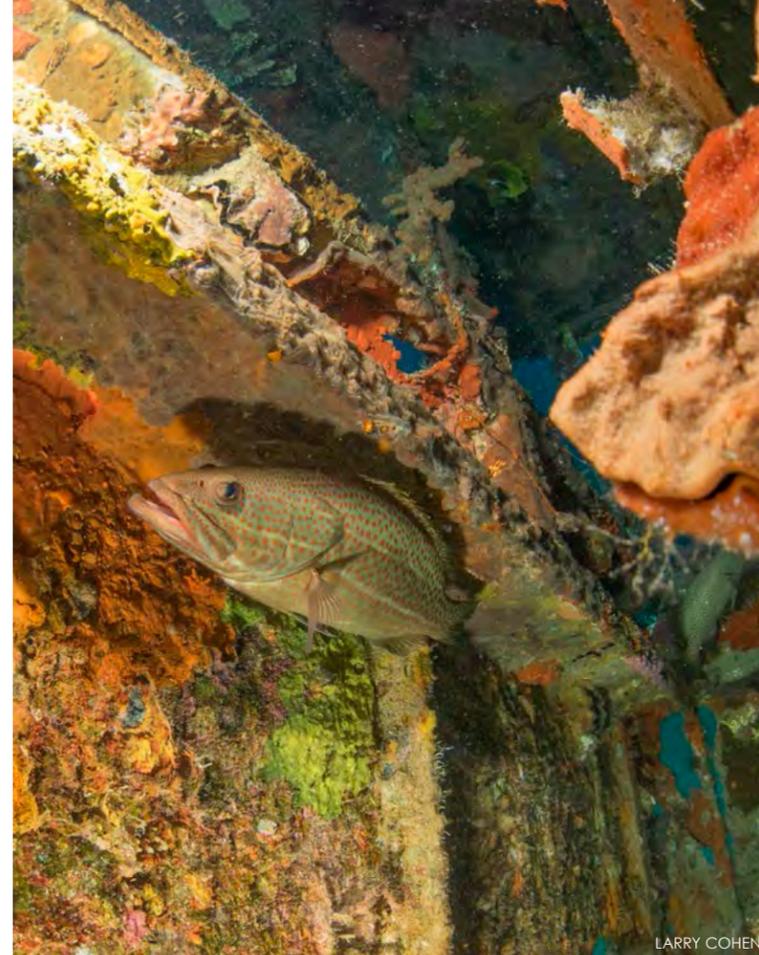
LARRY COHEN

tide was going out. So we had to deal with a two-knot current. The boat dropped us off up current, so we easily drifted under the pier. Once we got to our destination, we had to hold on for dear life. The technique that worked was to brace our backs against part of the structure so we could stay steady and frame our images.

After a brief rest back at the resort, we went out to dive the Sipadan Pom Pom Resort wreck. This was the supply boat for Pom Pom Island Resort. The boat was sunk on the house reef just a few days before we arrived. This gave us the opportunity to photograph a clean

wreck without marine growth. It was fun to place our models inside the wheel-house next to the engine throttles and around the construction machinery on the deck.

The boat sits right side up. In the stern we photographed our dive guides next to the propeller. It would be interesting to come back in six months to see how much marine growth develops on the wreck. Next to the wreck was a healthy reef filled with colorful hard corals and sea fans. Anemones with clownfish were layered on top of large plate coral, giving us plenty of opportunity to use wide-angle or fisheye lenses.

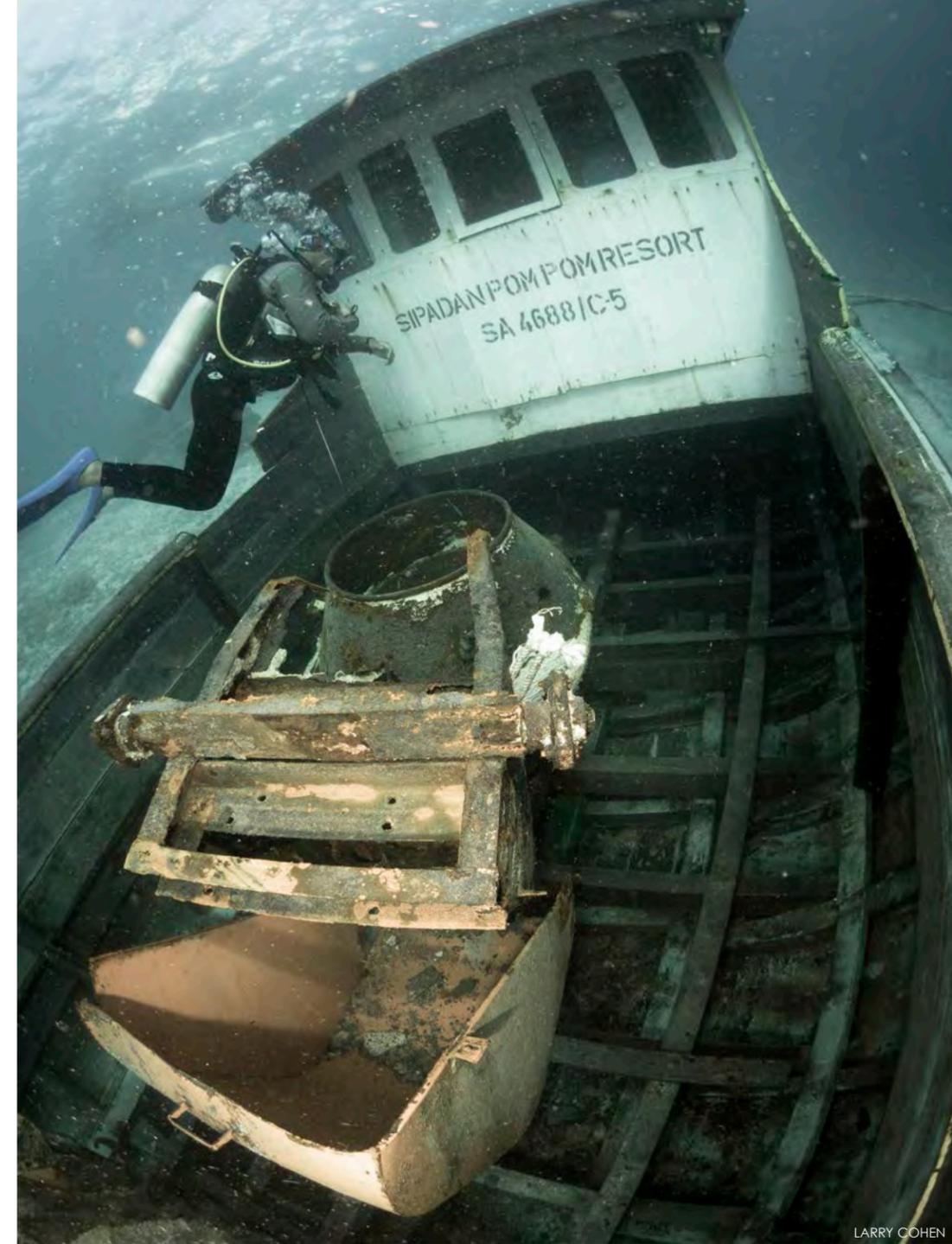


LARRY COHEN



COLGA TORREY

LEFT TO RIGHT: Large schools of sweepers, slender grouper and lionfish on Sipadan Mermaid wreck; Sipadan Pom Pom Resort wreck was sunk a few days before we dove it; Divers at engine throttles and by propeller (far right)



LARRY COHEN



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THIS PAGE: Cuttlefish at the Aquarium, Mantabuan Island; Using a 4-inch dome with Panasonic 8mm fisheye dome allowed this shy cuttlefish to be photographed (left); Cuttlefish and tridacna clam (below); Sea stars at North Point (center inset)

usually they were too far away to photograph. When we did get close enough, the turtles were not happy to be photographed and only gave us a few minutes to set up the shot. Being able to use the zoom, Olga had better results with the 7-14mm lens than I did with the 8mm fisheye. I decided I would add the Olympus M.Zuiko Digital ED 9-18mm f/4.0-5.6 lens and



**Mantabuan Island**

On our third day of diving, we decided to stay with the fish-eye and wide angle lenses. Heading to Mantabuan Island, we would dive in the Malaysian national park site known as the Aquarium. Our first dive would be on the side of the reef with large numbers of hard corals while our second dive would be in an area with soft corals. The area was also known for a large population of turtles.

We did see many turtles but

Aquatica SW8 dome, 30602 extension ring and 30505 zoom gear to my underwater toolbox.

The highlight on these two dives was the cuttlefish encounters. These intelligent cephalopods are closely related to octopuses and squid. We saw them on both dives. They changed color and did not seem pleased to model for us but

they stayed their ground. This gave us time to properly set up our cameras for each photograph. One shy cuttlefish did back himself up into a small coral overhang. Having the small 4-inch fisheye dome attached to my housing, I was able to pull in my strobe arms and position my rig in front of the opening. I blindly fired the shutter and moved to a second opening on the side. I again fired blindly, figuring it was worth a try. To my surprise, I got two perfectly framed images.



**North Point.** Our third dive of the day was on North Point. We went

down the wall to 120 feet and worked our way up. The coral was lush on the deeper part of the wall. As we reached the shallows, the

Green sea turtle with remora at North Point, Mantabuan Island





LARRY COHEN



LARRY COHEN



OLGA TORREY

reef showed signs of stress. El Nino, dynamite fishing and industrial run-off were the causes. Even though the coral was not in the best shape. There was a nice variety of tropical fish, nudibranchs and turtles. Still we wished we had nitrox, so we could have stayed deep longer.

### Bohey Dulang Island

The next day we decided to arm ourselves with our macro lenses so we could capture the tiny creatures for which this area is known. Our destination for the first two dives of the day was Bohey Dulang Island's Two Brothers and Two Sisters. We joked, asking where the uncles, aunts and cousins where.



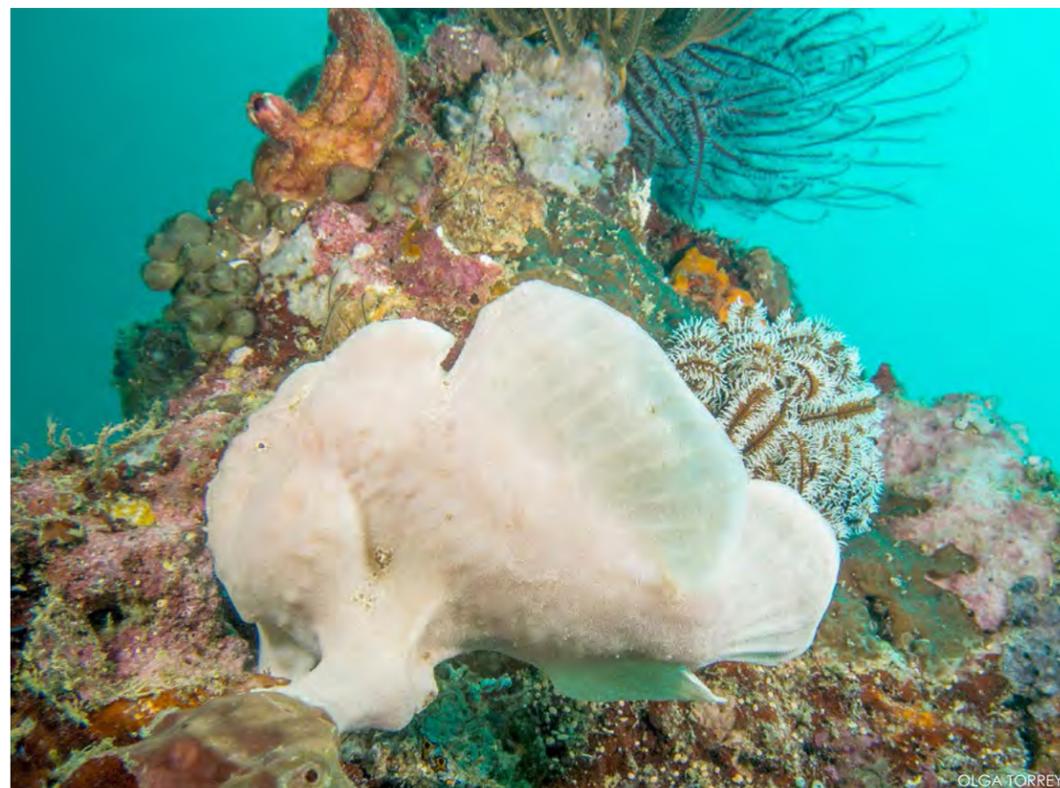
OLGA TORREY

You could spend one hour and only move a few feet on these sites. The variety of nudibranchs was staggering. We also photographed many tiny fish including a boxfish that looked like a cartoon character. There was also a

THIS PAGE: Macro life at Two Brothers, Bohey Dulang Island. CLOCKWISE FROM TOP LEFT: School of juvenile striped eel catfish; *Nembrotha milleri* nudibranch (left inset); Boxfish; Giant frogfish on reef; Commensal shrimp on anemone

large school of juvenile catfish and a variety of different frogfish. We also saw leaf fish and orangutan crabs.

On the third dive, we went back to the Matakang House Reef and the pier. We tried to time this so we



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Pom Pom

LEFT TO RIGHT: Celebrating Olga's 400th dive with a group photo; Mugshot of bearded scorpionfish on night dive in front of resort; Banded sea urchin (right inset); Juvenile golden batfish at Matakning House Reef pier



would have less current than our previous dive. This was also a special day being Olga's 400th dive. The Celebes Beach Resort staff created a Happy 400th Dive slate. We did group photos to celebrate this landmark dive in her career. Arranging a group of four divers is a bit of a challenge even if you are an experienced event photographer on land. Since there is no gravity restriction one could position some of the divers above the group without needing steps. Just like on land, the slate has to be angled down so it does not pick up the reflection from your strobes.

After the group photo we proceeded to swim to the pier. We seemed to have miscalculated the tide. The current was even stronger than our first dive at this site. We were also now down current and I felt like a salmon swimming up stream. Jackson and Sherwin decided

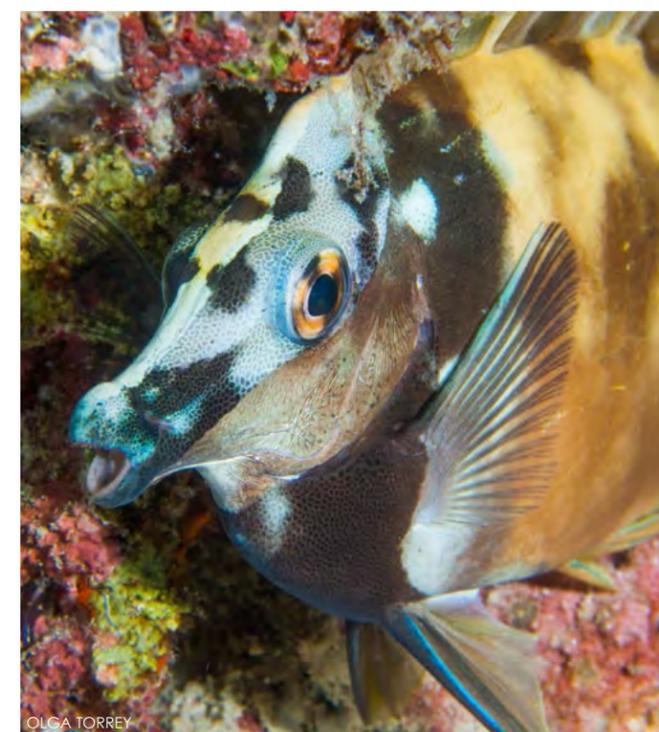
to help me by dragging me to the pier. I figured with the current this strong, being under the pier would not be productive. I tried to communicate that I wanted to stay in the area with less current. They proceeded to drag me to the pier as I was shaking my head nooooo! With the pier in site, they finally realized I wanted to go back to the reef. When they let go of me and the rocks, the three of us flew back in the current like an out-of-control airplane. Meanwhile Olga and Nurul, crawling hand over hand, did make it to the pier.

The current was so strong, Olga's Beneath The Surface Flex strobes arms swayed back and forth like they were being blown in a strong wind. She did get stunning photographs of the school of baitfish creating living patterns in

the current. Once I blew back to an area with less current, I concentrated

on shooting coral formations and sea fans. In some of the images, I used Sherwin as a model. Just like photos of wrecks, models add scale and a human element to the photo. We now know that sea fan is larger than the diver's head.

With one more day of diving left, we decided a forth dive was in order. I usually am not a fan of night dives. I enjoy balancing my strobe lights with the available light underwater to create a natural balance. When shooting inside a cave or shipwreck, we will use three to four strobes. This way we could still light the background by bouncing the extra



Nembrotha nudibranch, Celebes Beach Resort

Colorful reef fish at Cleaning Station



OLGA TORREY



OLGA TORREY



OLGA TORREY



OLGA TORREY



LARRY COHEN



OLGA TORREY

look like moving Easter bonnets, inching along the bottom. Ghost pipefish, eels and other nocturnal animals come out to feed.

The autofocus on our cameras worked well in low light. But a good focus light helps especially on night dives. Since there was no available light, we used a fast shutter speed. This stops moving subjects and you do not see the effect of the focus light.

**D' Wall.** On our last day of diving, we headed back to Matakating Island to dive D' Wall. Large coral formations and sea fans were all along the wall and there were also huge barrel sponges. Blue sea stars, giant calms and shrimps could be seen at this site.

**Mandarin Playground.** That evening we did a twilight dive at Mandarin Playground back at Pom Pom Island. The plan was to photograph mandarinfish mating. You really need the patience of a saint, staying in one spot for what seems like an eternity. Finally the very colorful and speedy mandarinfish started to



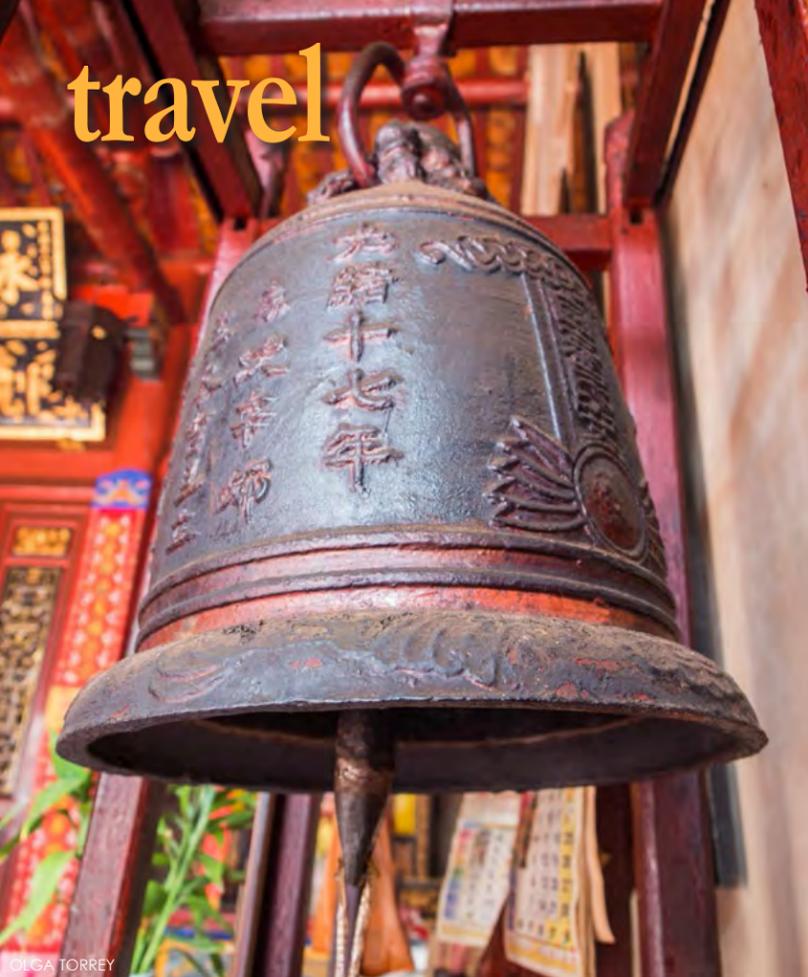
OLGA TORREY

strokes off the cave or wreck wall. This is not possible when shooting on a reef at night.

After dark the waters just in front of Celebes Beach Resort come alive with some of the wildest creatures you can imagine. Different varieties of lionfish, frogfish and scorpionfish can be found everywhere. Decorator crabs

CLOCKWISE FROM TOP RIGHT: Octopus at Mandarin Playground, Pom Pom Island; Juvenile solar powered nudibranch at D' Wall, Matakating Island; Christmas tree worms, Celebes Beach Resort; Tires and other structures used to rebuild reef, Matakating Island; Mandarinfish at Mandarin Playground, Pom Pom Island; Hermit crab, Celebes Beach Resort

Saddled toby at Mandarin Playground, Pom Pom Island



Bell in Chinese temple (left); Entrance of Chinese temple (above)

dart in and out of the coral. The camera has to be ready since mating happens extremely fast. With all the other nudibranchs and colorful fish around, I only lasted at the site as long as an excited male mandarin fish. Being more patient, Olga stood her ground and was rewarded with a single male mandarin fish looking for his honey.

**Topside excursions**

The plan for our last day on Pom Pom Island was to go over to Bohey Dulang Island to hike up 600 meters to the peak. Due to bad weather, this was not possible. We did a small hike around Pom Pom Island and spent the day relaxing and sharing the week's stories with our new friends.

From the Kuala Lumpur airport, we drove two hours to the historic city of Melaka. This city is a UNESCO World Heritage Site since 7 July 2008. Malacca was a fishing village inhabited by local Malays people and was the location of the first Sultan. The local monarchy was abolished when the

Portuguese took control of the area in 1511. We visited and photographed historic buildings and forts in the very busy tourist area. The streets were crowded and families were stuffed into bicycle rickshaws decorated with Hello Kitty dolls.

In order to get clean photos without the hordes of tourists, we had to use the 40-150mm lens and shoot up from a distance. At times we did use the 12-40mm, 12-50mm and 7-14mm lenses. But this required patience. We had to wait until the extra people and Hello Kitty vehicles exited our viewfinders.

Exploring the side streets, we were able to find areas of interest that were less crowded. There was a Chinese Temple, which we were allowed to enter and photograph. A mosque up the street from the temple was closed, but we were able to photograph the exterior. We talked to two men that were freediving without gear in the river. On every breath hold, they would surface with coins and broken pottery from times long ago.

After diving in warm 30°C water with 100 feet visibility, it was time to head

back to New York, with 30 feet vis average and water so cold we need dry-suits. We are looking forward to heading back to Malaysia where both the water and the people are warm. □

*Larry Cohen and Olga Torrey are well-traveled and published underwater photographers based in New York City, New York. They offer underwater photography courses and presentations to dive shops, clubs and events. For more information, visit: [Liquidimagesuw.com](http://Liquidimagesuw.com)*



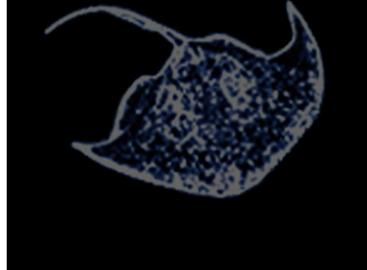
Ancient coins found by freedivers without gear in the river



Historic Melaka is an UNESCO World Heritage Site



# fact file



## Malaysia



SOURCES: U.S. CIA WORLD FACTBOOK, XE.COM, TRAVEL.STATE.GOV, POMPOMISLAND.COM, PANDA.ORG

**History** Great Britain established colonies and protectorates in the area of current Malaysia during the late 18th and 19th centuries. Japan occupied these areas from 1942 to 1945. The British-ruled territories on the Malay Peninsula formed the Federation of Malaya in 1948. In 1957, it became independent. When the former British colonies of Singapore and the East Malaysian states of Sabah and Sarawak on the northern coast of Borneo joined the Federation in 1963, Malaysia was formed. The new nation faced challenges in its first several years including a Communist insurgency, Singapore's secession from the Federation in 1965, Indonesian confrontation, and Philippine claims to Sabah. However, Malaysia was successful in diversifying its economy from dependence on exports of raw materials to expansion in manufacturing, services, and tourism during the 22-year term of Prime Minister Mahathir bin Mohamad (1981-2003). Government: constitutional monarchy. Capital: Kuala Lumpur

**Geography** Malaysia is located in southeastern Asia. It includes the peninsula that borders Thailand and the northern one-third of the island of Borneo, which borders Indonesia, Brunei, and the South China Sea, south

of Vietnam. Coastline: 4,675 km. Terrain: coastal plains that rise to hills and mountains. Lowest point: Indian Ocean 0m. Highest point: Gunung Kinabalu 4,100m. Note: Malaysia lies in a strategic location along the Strait of Malacca and the southern end of the South China Sea.

**Economy** Malaysia, a middle-income country, has transformed itself since 70's from a producer of raw materials into an emerging multi-sector economy. Under current Prime Minister Najib, Malaysia is attempting to achieve high-income status by 2020 and to move farther up the value-added production chain by attracting investments in Islamic finance, high technology industries, biotechnology, and services. The government has also taken steps to liberalize some services sub-sectors as well as boost domestic demand and reduce the economy's dependence on exports. Nevertheless, exports—particularly of electronics, oil and gas, palm oil and rubber—remain a significant driver of the economy. Bank Negara Malaysia (central bank) maintains healthy foreign exchange reserves, and a well-developed regulatory regime has limited Malaysia's exposure to riskier financial instruments and the global financial crisis. In September 2013 Najib

launched the new Bumiputra Economic Empowerment Program (BEEP), policies that favor and advance the economic condition of ethnic Malays.

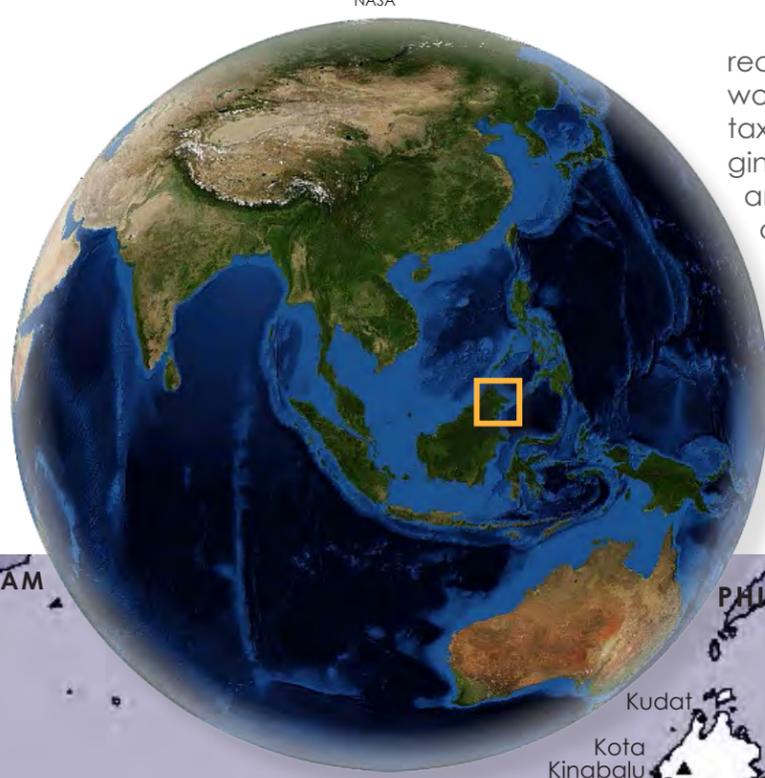
**Climate** Malaysia enjoys a tropical climate with high temperatures and humidity year round. There is an annual southwest monsoon from April to October, and a northeast monsoon from October to February. Natural hazards include flooding, landslides and forest fires

**Environmental issues** Malaysia has a relatively positive track record on the environment, but still faces challenges including deforestation, soil and coastal erosion, overfishing and destruction of coral reefs, as well as air and water pollution, and problems in the disposal of waste.

**Currency** Ringgits (MYR) Exchange rates: 1EUR=4.15MYR; 1USD=3.27MYR; 1GBP=5.32; 1AUD= 2.86MYR; 1SGD=2.57MYR

**Population** 30,073,353 (July 2014 est.) Ethnic groups: Malay 50.1%, Chinese 22.6%, indigenous 11.8%, Indian 6.7%, other

RIGHT: Global map with location of the Malaysian state of Sabah on the island of Borneo  
BELOW: Location of Pom Pom Island on map of Malaysia



recommended that especially women travelling alone hail taxis by phone rather than flagging one down on the street and then checking the cab driver's license upon entry, as there have been recent violent incidents against foreigners by local taxi drivers. For more detailed information, check with your state department for the latest updates on security issues in Malaysia.

**Health** Contact your state's health advisory for updates on warnings and appropriate inoculations for travelers. In Malaysia, there is an intermediate degree of risk for food or water-borne diseases such as bacterial diarrhea, mosquito-borne diseases such as dengue fever, and water contact disease such as leptospi-

0.7%, non-citizens 8.2% (2010 est.) Religions: Muslim (official) 61.3%, Buddhist 19.8%, Christian 9.2%, Hindu 6.3%, Confucianism, Taoism, other traditional Chinese religions 1.3% (2010 est.) Internet users: 15.355 million (2009)

**Language** Bahasa Malaysia (official), English, Chinese (Cantonese, Mandarin, Hokkien, Hakka, Hainan, Foochow), Tamil, Telugu, Malayalam, Panjabi, Thai. There are several indigenous languages in East Malaysia; Iban and Kadazan are most widely spoken

**Visa** Passport valid for six months, with at least one blank page for entry stamp. No tourist visa required

for stays less than 90 days. Note: There are strict laws against drug trafficking, including possession of heroin and marijuana, with convictions leading to a mandatory death penalty.

**Travel advisory** There have been recent attacks by terrorists and extremist groups against foreigners in the region. The U.S. State Department warns citizens to avoid travel to coastal eastern Sabah (Eastern Malaysia). However, the Malaysian government has placed added security (police and military personnel) at the resorts in this area. Direct transit with reputable tour companies is advised. In urban areas, it is

rosis. The highly pathogenic H5N1 avian influenza was identified in Malaysia but there is a negligible risk with very rare cases possible among visitors who get in close contact with birds (2013).

Make sure you bring adequate travel health insurance and repatriation funds.

**Decompression chamber** Decompression Chamber Kota Kinabalu Chamber (60) 88 251326

**Links** Tourism Malaysia [tourismmalaysiausa.com](http://tourismmalaysiausa.com) Sabah Tourism [www.sabahtourism.com](http://www.sabahtourism.com)



## tech talk

Text by Steve Lewis, with thanks to Neal W. Pollock, Ph.D., Research Director, Divers Alert Network  
Photos by Andrey Bizyukin and Benjamin Martinez

**One might be forgiven for assuming that as a certified diver, one would understand the science and common-sense behind the basic guidelines governing our approach to decompression stress. After all, a good part of a diver's initial training (and, hopefully, much of the curriculum for more complex programs), explained the vagaries of breathing compressed gas underwater. However, there seems to be a huge gap between the average diver's approach to decompression stress, and that approach in a "perfect world".**

The issue with diving—at least for this discussion—is that as a diver descends in the water column, he or she has no option but to breathe compressed gas. Because of this, the inert gas contained in whatever is being breathed is stored in the diver's body. This is sometimes called inert gas uptake.

At the end of a dive, on the way back to the surface, the process is reversed,

the stored inert gas is released by the diver's body. This is called inert gas elimination, or more simply, decompression. These two processes are part of every dive—even seemingly benign sport dives to shallow depths for short periods of time. Every dive really is a decompression dive.

When diving, tracking and understanding how to best manage inert gas uptake and decompression within safe limits, is second only to making sure one has something other than water to breathe. If we "get it wrong" and remain at depth too long, ascend too rapidly, breathe the wrong gas, or simply have

a bad-luck day, we run a higher than usual risk of suffering decompression sickness (DCS). Getting *bent*, the colloquial term for DCS, is a collection of disorders caused by a portion of the inert gas stored in a diver's body bubbling out of solution too rapidly. The consequences of being bent run the gamut from nausea,

fatigue, mild joint pain and dizziness all the way through paralysis and death.

The uptake/elimination cycle is complex and quirky. For example, it's believed the speed of inert gas uptake is different (faster) than the speed of inert gas elimination; but this is theory rather than proven fact.



### *Decompression Safety for Recreational Divers*

# But I can't be bent

*— My computer says I did everything right*

BENJAMIN MARTINEZ





ANDREY BIZYUKIN

Not only are uptake and elimination most likely to NOT be lineal mirror-images of each other, several other variables are thought to play important roles in the uptake/elimination processes as well. I used the phrase, "are thought to play important roles", because the variables—the bio-physical processes at play within a diver's body—are complex and not completely understood.

In a word, the factors governing decompression safety are effectively capricious. We might say with some

uptake and elimination is the dive computer.

Personal dive computers (PDCs) have evolved astonishingly rapidly in the past 20 years. The current generation does a very good job of tracking the mathematical prediction of inert gas uptake and elimination even when the person wearing the device is diving deep, for long periods of time, and breathing multiple flavors of gas. However, a PDC offers no iron-clad safe-guard that its user will not suffer a DCS episode.

authority that because of its complexity and variability, DCS is the bête noire of divers and diving. It certainly scares the bejesus out of me, and many of the men and women who are my dive buddies.

In the vast majority of recreational dives, the inert gas in question is nitrogen, but when a second inert gas is introduced into the breathing mix—helium for example—a whole new array of complications is unleashed. Diving with two breathing gases—oxygen and nitrogen—presents us decompression challenges: diving with three magnifies the challenge considerably.

### Dive computers

An ally in the fight for information about and a better understanding of gas

*... a computer, even when used correctly, provides no more than superficial protection from DCS—just the very first-level of information. We need to dig a little deeper into what affects decompression...*

Accepting the ever-present risk of DCS and understanding the erratic character of this risk, is a pre-requisite of becoming a responsible and informed diver, regardless of whether your dives take you to 10 metres or 100 metres, or last for 20 minutes or 200.

A personal dive computer—like any computer, big or small—is very good at crunching numbers. It excels at calculating gas uptake based on depth, time and breathing mix; and, with the help of a decompression algorithm, showing users how fast or slow to ascend, where to stop in the water column, and for how long. However, this is all theoretical. Decompression theory is just that; and a decompression algorithm is simply a mathematical model that postulates what happens to in a diver's body when he or she is diving. That's right, deco theory is woven throughout with guesswork: some of it informed, some not so much so.

The shortcoming of any decompression algorithm and therefore of any dive computer is that the relevance of its calculations to you and me are limited because it cannot adequately account for the numerous biophysical variables particular to us as individual divers. You and I may be similar perhaps, but certainly we are not the same. We can wear the same brand and model of PDC and dive very similar profiles breathing the same flavor of nitrox (or trimix), but the two of us will most certainly on-gas and off-gas at different speeds and with different levels of efficiency. And those differences will vary from day-to-day, dive-to-dive.

As a direct result of this, you and I could well go diving together tomorrow morning and one of us might get bent while the other is completely free of any

signs or symptoms.

Adding yet another complication is that there are simply dozens of dive computers on the market and several substantially different decompression algorithms at their core. Indeed, some models of PDC are capable of running more than one algorithm, and often those running the same algorithm interpret its suggestions for gas uptake and elimination differently. This makes it close to impossible to give useful suggestions detailing the pros of each and how to work around the cons. Nevertheless, there are a few recommendations that apply to PDC use generally.

### Do's and don'ts

1. Read the user's manual. Have the computer beside you as you do so. Get to know what your new tool is capable of and how to activate any bells and whistles it may be fitted with. Learn what button does what and how to access

## Safe Deco



the type of information that is going to help you stay safe on your dive. Absolutely have as an end goal of your "getting to know you" session, understanding what algorithm your computer uses, how to adjust its conservatism factors, and the potential effects of more or less conservatism on you and your health.

2. Use it according to the guidelines in the user manual and whatever common-sense you have been gifted with. In attempts to reset their PDC because of a recent transgression (usually something that came close to getting the user bent), I have witnessed divers pulling out batteries, hanging computers in the water "to decompress," and even leaving their PDC on the boat for a dive to "cool off." None of this is a good idea. Seriously.

3. All late generation dive computers deliver warnings when their users mis-





behave. These take the form of audible alarms (bells and buzzers) or visual warnings flashing colors, changing colors on output screens, symbols or messages. Some combine both visual and audible warnings. However yours is designed to deliver cautions to the diver, take note of what it "says" and modify your behavior accordingly.

I once shared a decompression station and an annoyingly long stop with someone whose PDC chirped ceaselessly at him (and anyone else within earshot). He had NOT read the user's manual before the dive, and therefore was unable to switch it to make adjustments to the ascent schedule for any of the three decompression gases being used on the dive. While the whole dive team was hanging out at six metres or so, his computer wanted him to return to 30 metres and start a whole new decompression schedule.

4. Understand that a PDC, even one with a four figure price tag, is not a panacea. At most, and following the best possible scenario, all a dive computer can supply its user with is an approximate guide to their decompression status, and a rough guess at their proximity to decompression stress.

**What the experts say**

Paraphrasing Dr Neal Pollock, Research Director at Divers Alert Network and a researcher at the Center for Hyperbaric Medicine and Environmental Physiology at Duke University Medical Center, a computer, even when used correctly, provides no more than superficial



protection from DCS—just the very first-level of information. We need to dig a little deeper into what affects decompression, and understand a little more about our PDC than when to change its battery if we want to mitigate the risks of decompression sickness.

Pollock tells us there are more than two dozen factors influencing decompression safety. These include the obvious, such as time and depth, as well as the less obvious and less easily defined and quantified such as epigenetics, atmospheric pressure, and pre-dive exercise.

Essentially, Pollock's research underscores the difficulty of produc-

ing a "magic silver bullet" capable of protecting us completely from DCS. He also suggests that often divers who suffer DCS look for some way to shift blame.

*...there are more than two dozen factors influencing decompression safety. These include...time and depth, as well as the less obvious and less easily defined and quantified such as epigenetics, atmospheric pressure, and pre-dive exercise.*

They tell us their incident was "unearned." "Hey, I did everything right... exactly the same as many times before." They express surprise that their computer did not warn them they were on a collision course with a chamber ride.

In fact, one often hears a diver express confusion because their dive computer did not get bent and they did. Dive computers are not magic and are incapable of making allowances for every one of the factors Pollock identifies as influencing factors in decom-



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## Safe Deco



ANDREY BIZYUKIN

pression stress.

He says if we fail to recognize errors in our own behavior, our pre-dive preparations, or the influence of our personal makeup and fitness to dive, "and we refuse to take personal responsibility," the learning process breaks down. In essence, he is saying that it's not our computers that are wrong, it's us.

Pollock explains that many of us focus on only a small part of the overall picture regarding decompression safety. He uses the example of hydration. Divers routinely blame poor hydration for causing their DCS, but few have a realistic handle on what constitutes good hydration, and fewer yet on the many other factors that contribute to deco stress.

"Proper hydration MAY play a role in decompression safety, but throwing back a half-litre of water immediately before diving does nothing except make you pee," he explains. "The "hydration"

goes right through without any appreciable effect."

So where does this leave you and me?

*It's not our computers that are wrong, it's us.*

If your diving exposures are mild, you are certified to use and indeed use the appropriate nitrox for your dives, you behave responsibly and cautiously, and follow the best

practices suggested by organizations such as DAN, the chances are good you will never experience DCS.

If your diving is a touch more radical, and you routinely conduct staged decompression dives, the advice is to dive especially conservatively. Research and understand all the many factors that may have an impact on your safety, and plan accordingly.

Most of all, take responsibility for your actions and don't make a challenge out of who can get out of the water fastest. Better to enjoy a slightly delayed post-dive beverage with your mates than

spend hours in the chamber wondering why it is you're bent but your computer isn't. □

*Author's note: Tremendous thanks to Dr Neal Pollock for his research, without which we would all be floundering around in the dark, and for his help putting together this short treatment on the subject of decompression safety. This piece first appeared in slightly different form on the Techdivertraining blog.*

*Steve Lewis is a British diver, instructor, dive industry consultant and author based in Canada. He teaches and lectures at home and abroad. His main focus is to dive safety and to make each of us aware of the things that will make us better divers than we are now. His latest book, Staying Alive: Risk Management Techniques for Advanced Scuba Diving, is available through Amazon. For more information, visit [www.techdiver-training.org](http://www.techdiver-training.org) or [www.crcave.training](http://www.crcave.training).*

„If the sharks die,  
the oceans will die!“

Andrew Cobb, Ambassador Sharkproject South Afrika



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[www.sharkproject.org](http://www.sharkproject.org)





# photo & video

Traveling with dive gear and underwater photo equipment is problematic

Text by Larry Cohen  
Photos by Larry Cohen  
and Olga Torrey

**Anyone who has been on an airplane in the last five years knows the number of bags and weight limits keeps dwindling. This is very problematic for the traveling photographer. Add scuba gear and housings and the problem multiplies.**

I have been an Olympus DSLR user for many years. I continued to use the Olympus E-620 after the camera was discontinued and the system was no longer supported. My travel rig consisted of two E-620 bodies, the 14-54mm f/2.8-3.5 II Zuiko and 18-180mm f/3.5-6.3 ED Zuiko lenses for topside photography.

Underwater the 7-14mm f/4.0 Zuiko ED was my go to lens with the Olympus 50mm f/2.0 Macro ED Zuiko lens for small subjects. I used the Olympus PT-E06 underwater housing with Olympus ports. This system is much smaller than most DSLR rigs but it still filled the bags and took me to the weight limit when traveling.

The old four thirds system still performed well, but it was time for an upgrade. After looking at all the options, I decided to stay with Olympus and their OM-D E-M1. This is the top-of-the-line pro micro four



LARRY COHEN

# Have Camera, Will Travel

— *Tips for the Traveling Underwater Photographer*

thirds camera.

Starting in 2008 both Olympus and Panasonic went over to the micro four thirds system for mirrorless cameras. The sensor size is the same as my original

four thirds system. Unlike four thirds systems, the micro four thirds system does not provide space for a mirror box and a pentaprism, which is the traditional design for SLR cameras. Using just the

LCD and in some cases, an electronic viewfinder, smaller camera bodies could be designed. The lenses have a shorter flange focal distance, so the lenses are much smaller. Many other lenses could

be used on these camera bodies if a lens adapter exists. But at this time, very few underwater housings are compatible with these lenses and adapters.

Because of the small size of the cam-





LARRY COHEN

era and lenses, housing companies can produce smaller housings and ports. This is a benefit to the traveling underwater photographer. Because of the small size and the availability of lenses, I decided to embrace this system.

For topside I use the M. Zuiko Digital ED 12-40mm f/2.8 PRO and the M. Zuiko Digital ED 40-150mm f/4.0-5.6 R lens. Underwater, the Panasonic Lumix G Fisheye 8mm/f3.5 has become my main lens, and I use the M. ZUIKO DIGITAL ED 60mm f/2.8 Macro for small subjects. These lenses perform equally well on land. All of these lenses and two bodies fit in a small camera bag.

## Housings

I used Aquatica housings back in the



LARRY COHEN

Panasonic 8mm fisheye allows for a close-up of the volitans lionfish and still have a wide view of the reef. The fisheye creates an interesting curve to the background



LARRY COHEN

days of film. I was very happy to see the Canadian company is now supporting small mirrorless cameras. I was able to purchase one of the first Aquatica AE-M1 housings for the Olympus OM-D E-M1.

This anodized aluminum and stainless steel housing is only 9 x 6.25 x 4.5", and weights 2.1kg/ 4.75pounds, but is built like a tank.

The housing can access all important camera controls. The controls are placed for easy access. I did find that the front control dial was easier to reach without moving my hand from the grip than the rear dial. The camera's default controls allowed you to access the aperture from the front dial and the shutter speed from the rear dial. Since I change the shutter speed more often than the aperture, I customized the controls. Now the rear dial accesses the aperture and the front dial the shutter speed.

Underwater photographer Alex Mustard explains how to customize the OM-D E M5 for underwater use in the Nauticam housing in this WetPixel article: <http://wetpixel.com/articles/using-the-olympus-om-d-e-m5-underwater/> (If you read this with the camera in your hand, it

lock button.

Focus lock by holding the shutter button down half way is a technique used by many photographers. But it is not easy to feel the halfway point when the camera is in a housing.

On both the OM-D E-M1 and 5, you could customize the controls so the video

Olympus 9-18mm is good for reef scenes when you don't want distortion (left); Panasonic 8mm fisheye used to photograph a diver (far left). The lens is wide enough to show the environment

makes perfect sense.)

The recommendations are excellent and work with the OM-D E-M1 in the Aquatica housing. One of the best recommendations is how to change the video button to a focus

## Tips



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Seaweed blenny taken with Olympus 60mm macro

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# photo & video

Circuit board inside housing is both a moisture and vacuum alarm



OLGA TORREY

Bubble coral photographed with the Panasonic 8mm fisheye (right); Olympus 9-18mm is a good lens for large subjects when you cannot get really close (below)

## Strobes

I continue to use dual Olympus UFL-2 strobes. These strobes have been discontinued. But I find being able to control the strobe power from the camera to be a useful. The strobes are

button locks in focus. This way you hit the lever that is usually used for video to lock in the focus, rather than just pushing the shutter release to capture the image.

## Lenses and domes

When I first got the housing I used the 4-inch fisheye dome for the 8mm lens and the 0-60 flat port for the 60mm macro. The 4-inch dome is made with BK-7 glass and the macro port is made of optical grade acrylic. I also have manual focus rings on both lenses.

Later I added the Olympus M.Zuiko Digital ED 9-18mm f/4.0-5.6. In the 30205 SW8 optical grade acrylic dome with 30602 extension ring this lens performs better than the Panasonic 7-14mm. Corners are sharper and in general the lens is sharp and produces images with

good contrast. The lens is wide enough to get close to subjects but by zooming to 18mm is good for subjects a little farther away and close-up wide-angle.

Since the Olympus



LARRY COHEN

M. Zuiko Digital ED 12-40mm f/2.8 PRO uses the same dome and extension, I purchased the zoom ring. This lens is very good for small to medium size subjects that are too large for the 60mm macro lens.

mounted on TLC ball joint arms consisting of two 8-inch sections.

The OM-S E-M1 does not have a built-in flash, but the small FL-LM2 hot shoe mounted flash is included with the camera. The Aquatica housing is designed so you could attach the flash and use



LARRY COHEN

it to fire external strobes with fiber optic cables. You do have to set the camera so the flash will fire in the down position.

The housing has dual fiber optic cable ports that are compatible with Sea & Sea style cables. Inon adapters are included.

The fiber optic cable ports are positioned above the flash. There is an aluminum reflector inside the housing so the light will bounce up and hit the fiber optic cables.

It is important to have quality cables or the strobes might not fire. The new Sea & Sea Fiber-Optic Cable II works without problems. My five-year-old Sea & Sea Fiber Optic Sync Cable L-Type did miss fire at times.

## Seals and sensors

The Aquatica housing features the SURVEYOR moisture and vacuum sensor alarm. This system includes the Surveyor moisture and vacuum sensor circuit, a pressure valve and vacuum pump. The SURVEYOR circuitry integrates a water detection function that remains on when a battery is inserted. Should the

slightest amount of water make contact with the sensor probes, it will trigger an alarm using both an audible signal and a rapidly flashing red LED light.

To fully test the sealing integrity of the housing, you use the optional vacuum pump and pressure valve to create a vacuum. All you have to do is push the



LARRY COHEN



OLGA TORREY

Pressure valve on the AE-M1 housing

Create a dark background by using a fast shutter speed





photo & video



LARRY COHEN

## Tips

Portrait of Olga Torrey underwater with her rig, taken with Olympus 12-40mm lens

manually. Since it has a continuous power dial this is easy. The Beneath the Surface 1/2-inch Double-Ended Ball Flex Arms easily support the weight of both lights. By using the Beneath the Surface Arm Triple Clamp the

on button and attach the pump to the valve. After pumping out all the air a green LED light blinks every 5 seconds. This way you know the SURVEYOR system is monitoring the housing and that it is safe to enter the water.

If the vacuum is lost, the alarm warns you with both an audible signal and a rapidly flashing red LED light. Creating the vacuum also seals the housing so it is impossible to open the housing by accident. This definitely gives you a warm and fuzzy feeling.

### Same same but different

My dive buddy Olga Torrey shoots with the Olympus OM-D E-M5 in a Nauticam housing. She has the Olympus 12-50mm f/3.5-6.3 ED M.Zuiko EZ and the Panasonic Lumix G Vario 7-14mm f/4.0 ASPH. Lenses. Having the same system we could share lenses but not ports.

The Olympus 12-50mm lens has a macro button. Nauticam designed

an interesting gear for this lens. In the port the gear not only allows zooming but you could access the macro button. This way you could capture tiny and medium size subjects on the same dive.

Olga captures both stills and video with her camera. She has a video light and Sea & Sea YS-02 strobes mounted on each side of her housing. The YS-02 is a powerful small strobe with a wide beam angle and fast recycling time. The strobe power has to be controlled

strokes could be mounted right next to the video light.

After assembling all the camera gear, it is time to jump on a plane and do some traveling! □



OLGA TORREY

Using the vacuum pump to create a vacuum

# 41<sup>ÈME</sup> FESTIVAL MONDIAL DE L'IMAGE SOUS-MARINE

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photo & video

Edited by Don Silcock

PRODUCT SHOTS COURTESY OF THE MANUFACTURERS

### GoPro Hero4

GoPro have announced the release of their new HERO4 models. The HERO4 Black features 4K video and will retail at US\$499, the Silver has a built-in touchscreen at will retail at US\$399. Both camera feature improved user interfaces and manual color, sharpness, exposure and ISO control using Protune. GoPro also announced a budget camera, the HERO which will retail at US\$129.



### Seacam focusing for Nikon D810

Seacam has announced the release of its new Silver housing for the Nikon D810 DSLR. The housing is milled out of a saltwater-proof light metal alloy that has been twice hardened and high-value anodized and features the use of high quality stainless steel, anodized aluminium and premium synthetic fittings throughout. All control shafts and buttons are double sealed with seamless, high-quality precision O-rings and Seacam state that all of the D810 functions can be accessed.

### Nikon D750

Nikon has released another full frame FX DSLR camera - the D750. The new camera fits in between the D610 entry-level FX model and the highly regarded D810 DSLR. The D750 features a new 24.3 megapixel CMOS sensor, Nikon's EXPEED 4 image-processing engine and is claimed to have image quality that surpasses the 36 megapixel D810 at high sensitivities. The camera will shoot at 6.5 fps, has an AF system works down to -3 EV and the body retails for US\$2300.



### Venom 50

The Venom 50 is a very compact video light suitable for both stills and video and comes fitted with white, red and UV LED's in one small unit. The lamp which will be available from mid Nov will according the manufacturer be the smallest 5000 lumen rated light available. Burn time 1 hr. Remote control by IR with optical cable is optional.



### Canon EOS 7D Mark II

Canon has raised the stakes in the cropped APS-C/DX sensor cameras with the release of their long awaited successor to the 7D SLR camera. The new EOS 7D Mark II features a new 20.2 megapixel APS-C Canon CMOS sensor and Dual DIGIC 6 Image Processors. With an ISO range of 100-16000, a burst rate of up to 10fps and 65 point auto-focus that will operate down to -3 EV the new 7D is a very capable camera which also features Canon's Dual Pixel CMOS AF system and iTR (Intelligent Tracking and Recognition) scene recognition system. The EOS 7D Mark II is available from November 2014 at a retail price of US\$1800 for the body only.



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# Anne-Catherine Becker-Echivard



## P O R T F O L I O



*Incertitude (Uncertainty)*, 2003, by Anne-Catherine Becker-Echivard

*Nostalgie du Passé Immédiat (Nostalgia of the Immediate Past)*, 2003, by Anne-Catherine Becker-Echivard  
 PREVIOUS PAGE: *Leçon d'Anatomie (Anatomy Lesson)*, 2003, by Anne-Catherine Becker-Echivard

Text edited by Gunild Symes  
 All artwork and photos by Anne-Catherine Becker-Echivard

**Merging humanity and animality in art is a device that can be traced back to the bestiary art and stories of the Medieval era, a time when mythical beasts combining animal and human characteristics were born and locked into our collective consciousness.<sup>1</sup> French artist Anne-Catherine Becker-Echivard's surreal artworks give us hints of these undercurrents, as she creates meticulously detailed dioramas of humanity using actual fish heads for faces in compelling scenes that address issues from profound political controversy to bizarre and humorous expressions of daily life to the downright absurd.**

*X-RAY MAG:* Tell us about yourself, your background and how you became an artist.

ACBE: I was born in Paris in 1971 to a French general practitioner mother and a German neuropsychiatrist father. My brother and I grew up in Berlin and enjoyed a liberal education, always in company of animals.

Actually I wanted to have a career as an athlete. My discipline was the 800m. But I had to end this career due to a triple torn ligament. Though I continue to do intensive sports, it's not as a professional anymore.

In 1987, I went to the United States

for one year and graduated from Dublin High School in Ohio. I came back to Berlin in 1989. That was the year the Berlin Wall came down and we all lived a series of radical political changes.

I also graduated from German High School and then studied law. At the same time, I started traveling a lot, mostly alone; the camera was my constant companion.

*X-RAY MAG:* Why fish heads? How did you come to this concept and how did you develop your art work with fish heads over time?

ACBE: I was going for a walk on a

sunny day in 1996, whistling, hands in my pockets. I was going, as usual, to the fish market, when a giant fish falling down from the sky said to me: "You!" Then I lost consciousness. When I woke up, I was told that a large fish-shaped restaurant sign got loose and hit me. Since then, I see fishes everywhere, in every area of the world. I have seen them working in factories, drinking, cheering, coming, bawling, dying... I've seen them on TV endlessly discussing modern times... Anyway, they are part of me now. Since then, I've learned that we do not see things as they are, but rather as we are. I started taking pictures at that very



<sup>1</sup> WIKIPEDIA.ORG, ARTISTBESTIARY.WORDPRESS.COM



moment.

I went to a photojournalism school in Paris, and then I started a report on human being, through the fish, as man comes from the fish.

I was not looking for it; the fish imposed

itself on me. Having said that, I have always been deeply grateful towards the fish; I have a true, deep empathy for it. I partially grew up by the sea, on the lower Normandy coast. I lived with fish. It was our food, our toys, and our life...

The day it fell on my head, it became my obsession.

*X-RAY MAG: What is your artistic method or creative process? How do you create your artworks and what do you do with*

*the fish heads once you are done?*

ACBE: A vague idea is born and matures. At a given moment, I have little idea of how to translate the idea into a symbol (because all my work is based on sym-

bols and caricatures). I start drawing, specifying the lines and colors—they basically decide the dynamism of the image. Then I translate the drawing into a 1:1 proportion, to set the dimensions of different objects to build. The compo-

## Becker-Echivard

*Dr Yes*, 2006, by  
Anne-Catherine  
Becker-Echivard



accompanied the fishermen. They explained their jobs to us and we became friends.

The sea taught me deep respect. I sensed a huge unexplored underwater world which impressed me infinitely.

Fishermen told me a bunch of superstitious stories, like weird noises they heard at sea they would attribute to mermaids, or sirens, creatures that were half-women-half-fish singing bewitching songs. I was six years old and wanted to believe them.

Underwater photographer Eric Hanauer gives a good description of the stories I heard:

"Sailors had a fatalistic view of drowning. Most of them couldn't swim, so even bathing in the ocean was considered a dangerous temptation of fate. The object of survival was staying out of the water, so nobody went in unnecessarily. If someone fell overboard, they might not even be thrown a rope because of the belief that their death was already preordained. 'What the sea wants, the sea will have,' was a fatalistic belief. Besides, a sacrifice to the sea gods might placate them so no more of the crew would follow ... The tides were thought to have an effect on death. If someone was gravely ill or wounded, death would come on ebb tide, as though life were ebbing away."<sup>2</sup>

All these superstitions became ingrained in me and nourished my imagination incredibly.

sition is about 2m wide and 1m high. Sometimes I change things along the way, random things appear quite often; it is a fragile but essential dialogue in my work.

The set up takes almost three months; the shoot takes 24 hours. On that specific day, I buy the fish. One fish can weigh up to 1.8kg; they are quite big. I cut off

the heads to put on the models; the bodies will be eaten. Life is a recycling process. The fish gets a second life and I can feed myself.

*X-RAY MAG:* What is your relationship to fish and the underwater world?

ACBE: As I said before, I partially

grew up by the sea, in a small fishing town called Pirou Plage, across from Jersey. My brother and I learned snorkeling very early on, around four or five. We

*Soccer Cheese Balls,*  
2010, by Anne-Catherine  
Becker-Echivard

**X-RAY MAG:** *In your relationship with fish and the sea, where have you had your favorite experiences?*

**ACBE:** When I was little, maybe five years old, I was very impressed by the celebration in honor of St. Peter, the patron saint of fishermen in memory of the sailors lost at sea—a religious festival with a procession carrying the statue of the fishermen, the solemn Mass in the open air, the jettison of wreaths at sea.

In 1976 Pirou Plage had only 1,016 inhabitants, almost all of them were fishermen, so nearly every family had at least one person lost at sea; the St. Peters Day was taken seriously. It was the first time I saw the ocean full of roses and wreaths. It was very impressive.

**X-RAY MAG:** *What are your thoughts on ocean conservation or sustainability in fisheries and how does your artwork relate to these issues?*

**ACBE:** I agree with what Greenpeace has written: "You and I are alive right now because of the oceans. There is no other place in the universe so full of life as this planet—so green, so rich in diverse, beautiful, weird and wonderful, large and small species, on land and at sea—and it is all because Planet Earth is Planet Ocean."<sup>3</sup>



Most fisheries can be made sustainable with current technology and management.<sup>4</sup> However, we all can make our small contribution to it, like, making safe,

sustainable seafood choices, not purchasing items that exploit marine life, educating oneself about oceans and marine life, traveling the ocean responsibly

and finally, following the ethos: "Ethics, too, are nothing else than reverence for life." (Albert Schweitzer)

I just read on the Greenpeace

website that the longest mountain range on Earth is not on land but underwater. The mid-ocean ridge system wraps around the planet from the Arctic to the Atlantic

oceans and is four times longer than the combined ranges of the Rockies, Andes and Himalayas.

Can you imagine that more people have stepped onto the

<sup>3</sup> GREENPEACE.ORG  
<sup>4</sup> EDUCATION.NATIONALGEOGRAPHIC.COM



Artist's Loo, 2009, by Anne-Catherine Becker-Echivard



Global Overfishing, 2013, by Anne-Catherine Becker-Echivard

moon than have gone down to see the deepest ocean trench? The explored regions of all the oceans amounts to less than five percent.<sup>5</sup>

When it comes to the oceans, we are ignoramuses.

The ocean teaches me and nourishes my art and all relates directly to it.

I want to do something wonderful, because I deeply believe in it. We can make a change in our minds, in the way we think, and call for ocean conservation to foster sustainability in fisheries. I believe in our future. I believe in the idea: "Do something wonderful, people may imitate it." (Albert Schweitzer)

*X-RAY MAG: You use a lot of humor in your pieces as well as more profound political statements. How do you come to your ideas and what or who inspires you?*

ACBE: In 2011, I made a series of four pictures about what runs this world: money, guns, sex and drugs. In 2013, I started a series about our planet's three major challenges: population growth, planet capacity and social cohesion. These topics are unlimited and our malaise is huge.

*X-RAY MAG: What is the message or experience you want viewers of your artwork to have or understand?*

ACBE: Being an artist also means having a responsibility, trying to think, asking questions, answering back, even being denounced.

I convey the message that the fish asked me to transmit. I am its voice, since it is silent! It has taught me that if I cannot control my life, I can however control the way I see this world. I see that world through the fish, and I translate it in my compositions.

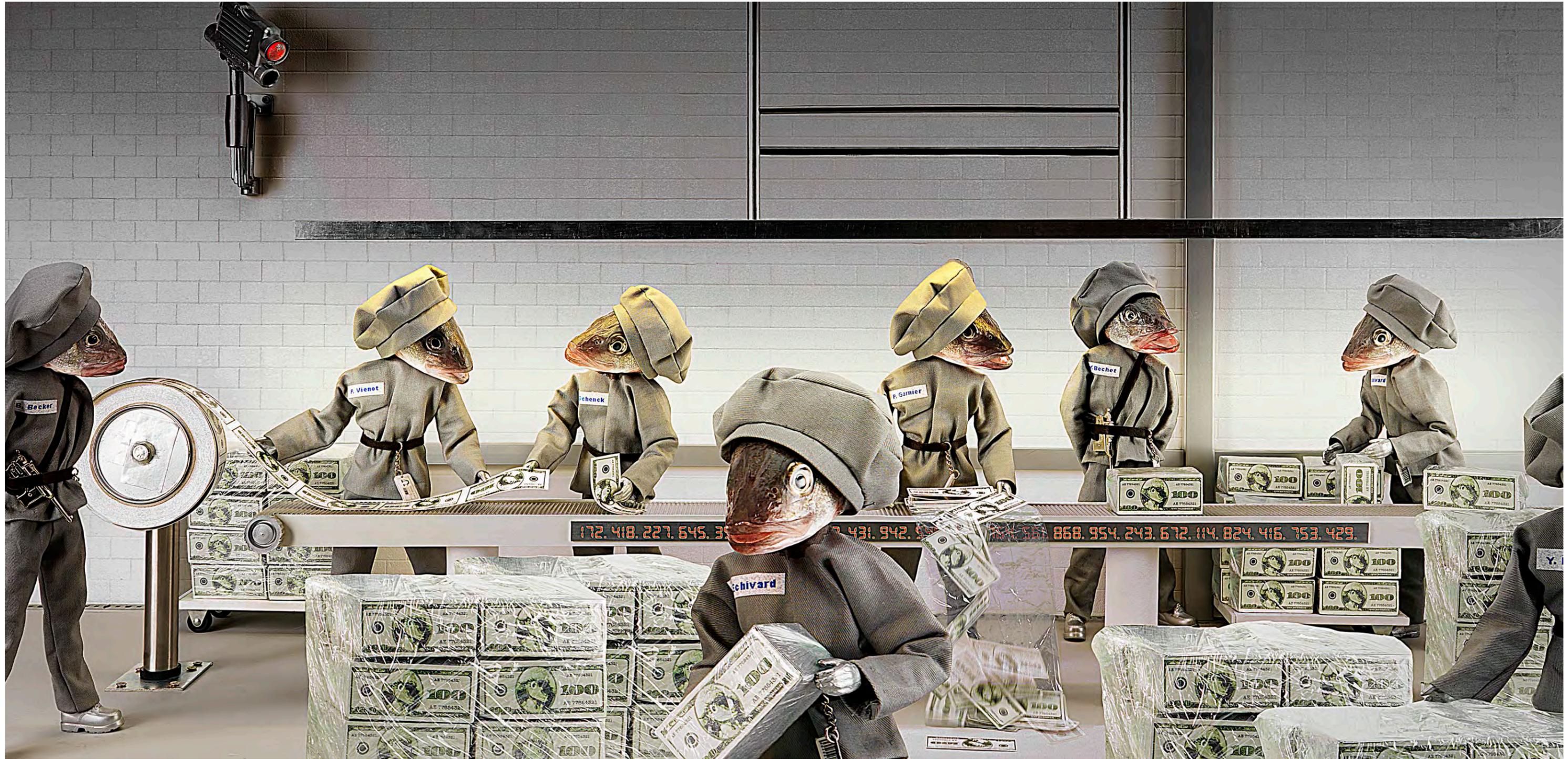
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## Becker-Echivard



Le Pisseur (The Wall), 2006, by Anne-Catherine Becker-Echivard

<sup>5</sup> GREENPEACE.ORG



ous comedy. While they are entertaining, they also make us think, and even if the compositions are not real, they are always reflecting humor through the fish's world.

Chaplin said: "In the creation of come-

dy, it is paradoxical that tragedy stimulates the spirit of ridicule; because ridicule, I suppose is an attitude of defiance: we must laugh in the face of our helplessness against the forces of nature—or go insane." (from *My Autobiography*, by

Charles Chaplin)

*X-RAY MAG: What are the challenges and/or benefits of being an artist in the world today?*

ACBE: I agree with what artist, Lori McNee, has written: "Artists truly are the movers and shakers of the world. The ages demonstrate that artists have been at the forefront of every epic era. Oscar Wilde's famous quote, □Life

imitates art far more than art imitates life', illustrates this. Art has been said to be 'an expression of both hope and despair', which embodies all facets of the human condition ... Art in all its forms, is a universal language ... the great



equalizer and thinking agent. Art reaches across borders and connects the world ... I believe the worse things get, the more indispensable Art becomes."<sup>6</sup>

X-RAY MAG: With all the press coverage

*you and your artwork have received, what opportunities have opened for you?*

ACBE: I am more and more asked to stand up for environmental issues, which

is what I like to do. It is our future. For example, I recently accepted an offer to go to China for several months (Qiandao hu) to work on a cultural project about sustainability in fisheries and environmental ecosystems. They want a concept

for a visual identity. There will also be an exhibition in a cultural center. It is exciting doing this in China.

X-RAY MAG: What insights have you gained from the process of showing your

*work to larger and different audiences?*

ACBE: That it's worth continuing.

X-RAY MAG: What are your upcoming projects or events?

<sup>6</sup> FINEARTTIPS.COM





ACBE: Besides that project in Qiandao hu, China, I have been asked to make movies. I have been thinking about it for several years. I would love to have my characters come to life and to tackle a technique other than photography.

We will make short movies for tv and for mobile apps.

*X-RAY MAG: Is there anything else you would like to tell our readers about yourself and your artwork?*

ACBE: I would like to express my respect for Anita Conti, the first woman oceanographer. Between the First and Second World Wars, she started to draw the first fishing maps, when, at the time, there were only navigational charts. Her scientific

work helped to refine offshore practices. Already in 1939 she was alarmed at the overexploitation of the seas and the consequences of overfishing. Raising awareness of environmental issues, her findings showed that the ocean is not an

infinite, limitless resource.<sup>7</sup> □

For more information, visit the artist's website at: [www.acbe.eu](http://www.acbe.eu)

<sup>7</sup> WIKIPEDIA.ORG

