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The Med, Red & Dead Seas
Diving Israel

British Columbia
Hornsby Island

Profile
Hubert Chretien

Tech
**Nitrogen
Narkosis**

California
Squid

Falkan's
South Georgia

Malpelo Island
COLUMBIA'S PACIFIC COAST

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by David Hall (www.seaphotos.com)

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Large school of trevally, Malpelo, Columbia. Photo by Wolfgang Pölzer



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Much ado about Tech

X-RAY MAG is intended for all ocean-loving adventurers and divers, the vast majority of which are recreational sports divers who will never become technical divers. So, the now substantial and increasing amount of articles about technical diving in the magazine probably warrants a little explanation.

While we strive for including articles that would be of interest and use for 'tekkies' who have a considerable weight of advanced training and experience behind them, the primary purpose of our coverage of technical diving is to disseminate useful knowledge and insights for the benefit of all divers, regardless of level of training or ambition.

No matter how long we have been diving or how big our ambitions are, we can

all become safer and better divers. We dive because it enriches our lives in various ways. Some of us favour encounters with majestic wildlife or pointing our cameras at spiky critters with psychedelic colours, or exploring wrecks or caves, or searching for treasure—or just having a great time with family and friends.

The safety measures now built into modern cars, such as ABS, was first developed in racing, which is also used by many manufacturers to develop, test and refine new technologies. Airlines are getting safer and better thanks in great part to development first spearheaded by the military and accident investigations.

In the same manner, technical diving is where we find much, if not most, of the development and know how that will

ultimately percolate down to the lower rungs of the ladder and benefit all divers. We are here to facilitate this process.

We need not be twin tank divers or owners of expensive rebreathers to adopt and adhere to the same safety culture as tekkies honor, or to pick up on numerous useful small tips and tricks that make diving life safer, such as streamlining your equipment configuration.

What better way to enjoy your dive even more so than before than with the added benefit and peace of mind of safety first?

Go on, dive, be free—be safe!

— The X-RAY MAG crew

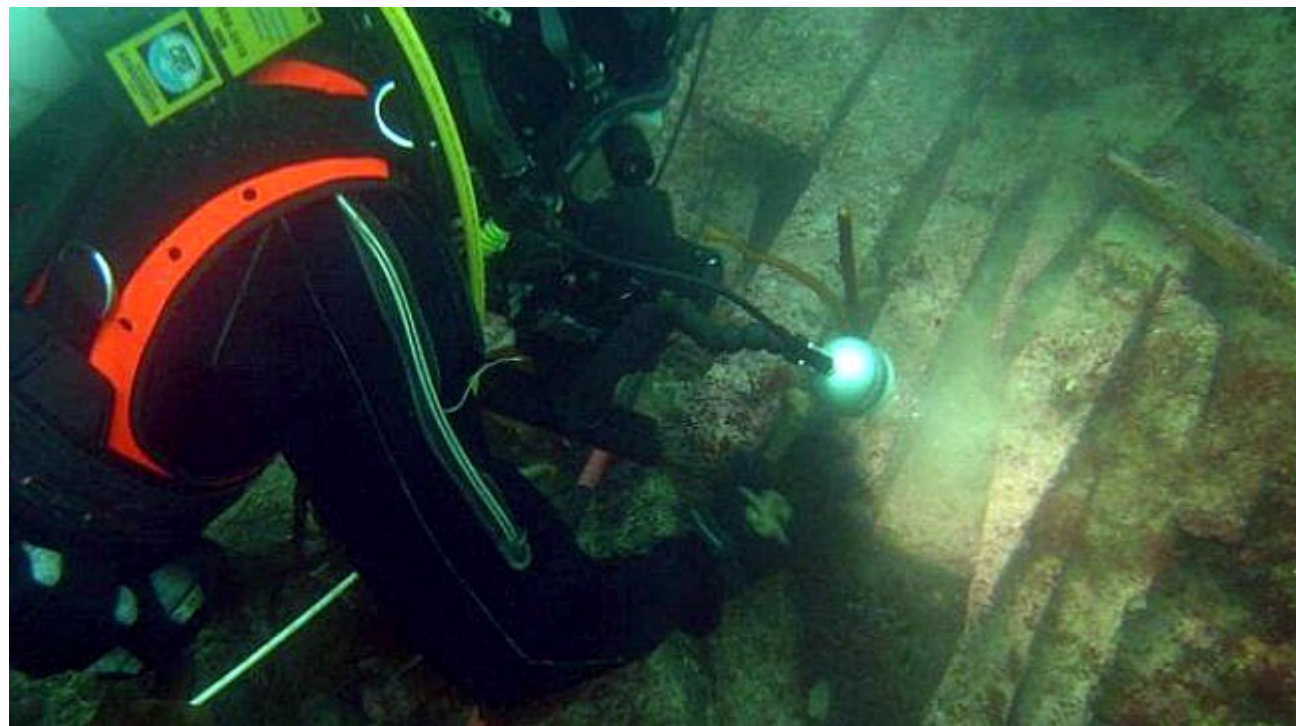


X-ray mag

News edited
by Peter Symes

from the deep
NEWS

Divers find remains of 'Britain's Atlantis'



Divers from St Andrews University find remains of Doggerland, the underwater country dubbed 'Britain's Atlantis'

Doggerland, an underwater world that was swallowed by the North Sea between 18,000 and 5,500 BCE, has been discovered by divers.

The research suggests that the populations of these drowned lands could have been tens of thousands, living in an area that stretched from Northern Scotland across to Denmark and down the English Channel as far as the Channel Islands. The now submerged area of the North Sea was once the 'real heartland' of Europe and was larger

than many modern European countries.

"The name was coined for Dogger Bank, but it applies to any of several periods when the North Sea was land," said Richard Bates of the University of St. Andrews.

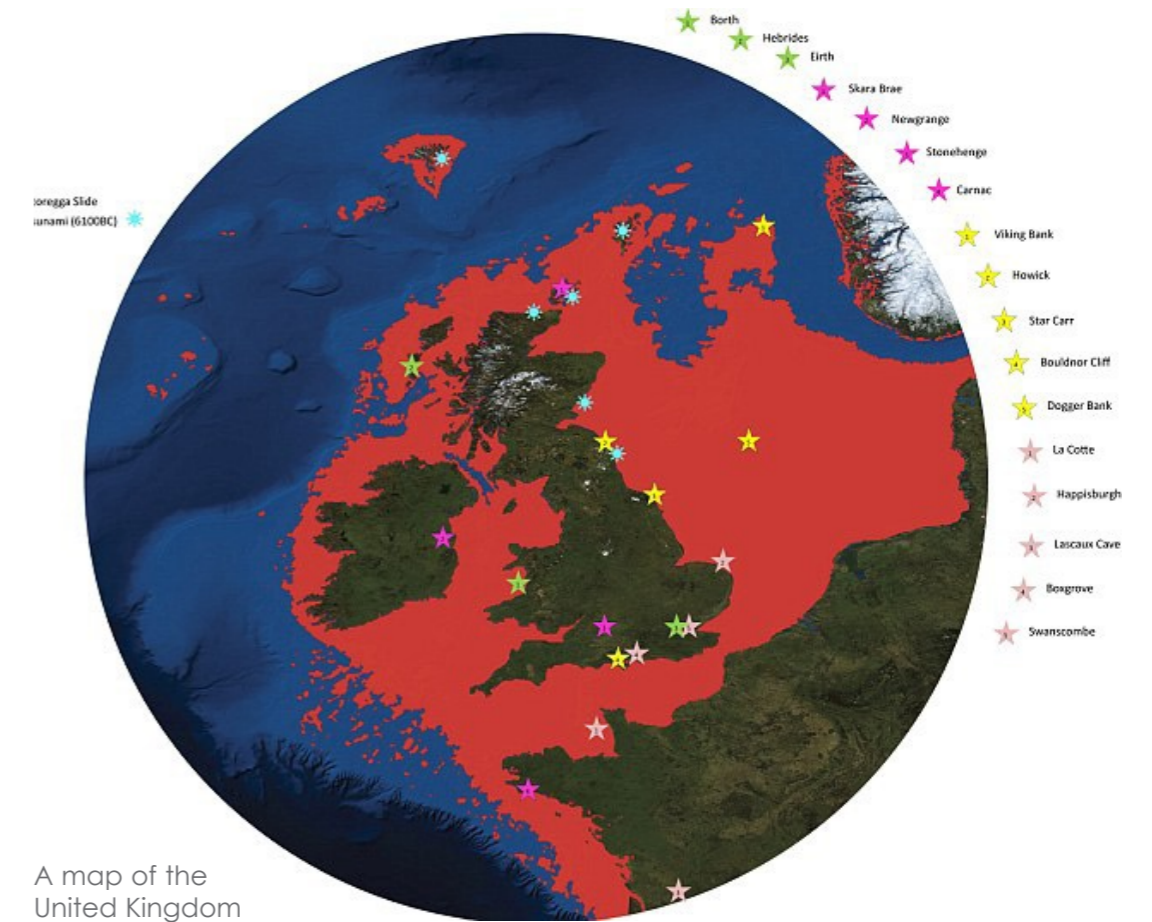
Rediscovering the land through pioneering scientific research, the research reveals a story of a dramatic past that featured mas-

sive climate change. The public exhibit at the Royal Society Summer Science Exhibition brings back to life the Mesolithic populations of Doggerland through artefacts discovered deep within the sea bed.

The research, a result of a painstaking 15 years of fieldwork around the murky waters of the United Kingdom, is one of the highlights of the London event. The interactive display examines the lost landscape of Doggerland and includes artefacts from various times represented by the exhibit—from pieces of flint used by humans as tools to the animals that also inhabited these lands.

Using a combination of geophysical modelling of data obtained from oil and gas companies and direct evidence from material recovered from the seafloor, the research team was able to build up a reconstruction of the lost land.

The findings suggest a picture of a land with hills and valleys, large swamps and lakes with major rivers dissecting a convoluted coastline. As the sea rose the hills would have become an isolated archipelago of low islands. By examining the fossil record (such as pollen grains, microfauna and macrofauna) the researchers can tell what kind of vegetation grew in Doggerland and what animals roamed there. Using this information, they were able to build up a model of the 'carrying capacity' of the land and work out roughly how many humans could have lived there. ■



A map of the United Kingdom with Doggerland marked as red

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Fishing for plastic to save our seas

Fishermen will be paid to catch plastic, rather than fish, under bold new plans from the European Union's fisheries chief, aimed at providing fleets with an alternative source of income to reduce pressure on dwindling fish stocks.

Maria Damanaki, commissioner for fisheries, will unveil a trial project in the Mediterranean that will see fishermen equipped with nets to round up the plastic detritus that is threatening marine life, and send it for recycling.

Fishermen who clear plastic will be subsidised initially by European Union member states. But in the future, the scheme could turn into a self-sustaining profitable enterprise, as fleets cash in on the increasing value of recycled plastics. Cleaning up the rubbish will also improve the prospects for fish, seabirds and other marine species, which frequently choke or suffer internal damage from ingesting small pieces of non-biodegradable packaging.

There is already a voluntary scheme, **Fishing for Litter**, in

place in Scotland with participation of all major ports, which provides collection facilities at ports where rubbish caught can be disposed of rather than thrown back over the side.

Since the Scottish project launched in 2005, the number of harbours and fishermen involved have steadily increased as word spread about how simple yet effective the project could be run.

The initiative not only involves the direct removal of litter from the sea, but also raises awareness of the significance of the problem amongst each community. This pioneering project has expanded from an original pilot scheme in the Netherlands to now be a highly recognisable initiative in the United Kingdom and beyond. ■

NOAA ILLUSTRATION / PUBLIC DOMAIN

Mystery object on the bottom of the Baltic still a mystery

Swedish daily *Expressen* publishes first video from the mysterious object on the bottom of the Baltic, which was first discovered a year ago.



SCREENSHOT FROM VIDEO SHOWN ON EXPRESSENS HOMEPAGE

"We were there to find answers, but only got even more issues," said Stefan Hogeborn, 47, one of the divers from Ocean X Team, which investigated the circle on the bottom of the Baltic.

On June 11 last year, nine divers and wreck hunters went searching for shipwrecks in the Baltic Sea off the Swedish east coast. The divers sailed in zigzag pattern back and forth over a large area to search for a number of specific wrecks when a large, round formation showed up on their scanner screen. They examined the object closely, and what they found puzzled the whole world.

The strange object defied explanation and none of the experts could figure out what the big object was.

Stefan Hogeborn, who has contributed to *X-RAY MAG* in the recent past, described the first dive at the world famous circle in the Baltic Sea:

"The first thing we saw was some kind of rock formation that looked to be cast in cement," he said. When they swam further, they saw several rock formations. It looked almost like a pearl necklace or that someone had tried to make a fireplace with inch-sized rocks on the ocean floor.

I have never, ever, ever, seen anything like it

—Stefan Hogeborn

On the next dive, the team brought a sledgehammer to dislodge a piece of material for sampling. Hogeborn described the sample as being a kind of carbonized material. During the last dive, divers discovered an oblong hole one and a half times the size of the six-inch rocks that formed the circle.

Expressen let Martin Jakobsson, a professor of marine geology and geophysics at the University of Stockholm, see an image from the dive. "There is probably some kind of sandstone. When you look at the structure, it looks like it," he said.

The samples from the discovery in the Baltic Sea have been sent for analysis.

"Since we did not get any answers to the questions we asked ourselves, we have brought this to the experts who may be looking at the pieces we brought up," said Hogeborn. ■

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First to dive across the English Channel

Eight hours in darkness and cold water, combing a distance of around 55 kilometers through waters with strong currents in one of the busiest shipping lanes in the world is the challenge Achim Schloeffel mastered.

A complex interaction of state-of-the-art dive equipment, a logistical masterpiece by the project team regarding the planning of currents, navigation and nautics, and last but not least, the courage and stamina of the professional diver led the ambitious project to its successful completion.

The new world record holder is very satisfied with the result: "A number of divers have failed to

dive through the English Channel. With our successful mission today we have delivered the proof, that the technology for ambitious exploration dives has matured, yet a strong team capable in project planning and logistics and most importantly physical and mental fitness is crucial for success."

The issues Schloeffel was facing during the dive—as expected—included low visibility that in the beginning was far less than one metre, along with the noise from freighters and tankers that passed over when he crossed the shipping lane: "It is already very exhausting if you can hardly see your own hand in front of your face underwater and cannot afford to lose concentration for even a second. If you then add a noise level comparable to a jet landing right next to your head,

it becomes unbearable. Hence, I am happy to be done with this dive. I was able to feel myself how the very sensible acoustic systems of whales and dolphins, who communicate via sonography are tremendously affected, and I can re-assure you that you would not want to experience this for yourself."

Being a project ambassador for the international whale and dolphin conservation society (WDCS), the professional diver uses the dive to raise awareness about the increasing noise and waste pollution of the oceans and is raising funds for the last dolphins in the North Sea.

More information about the dive record is available at: www.xploreyourlimits.de ■

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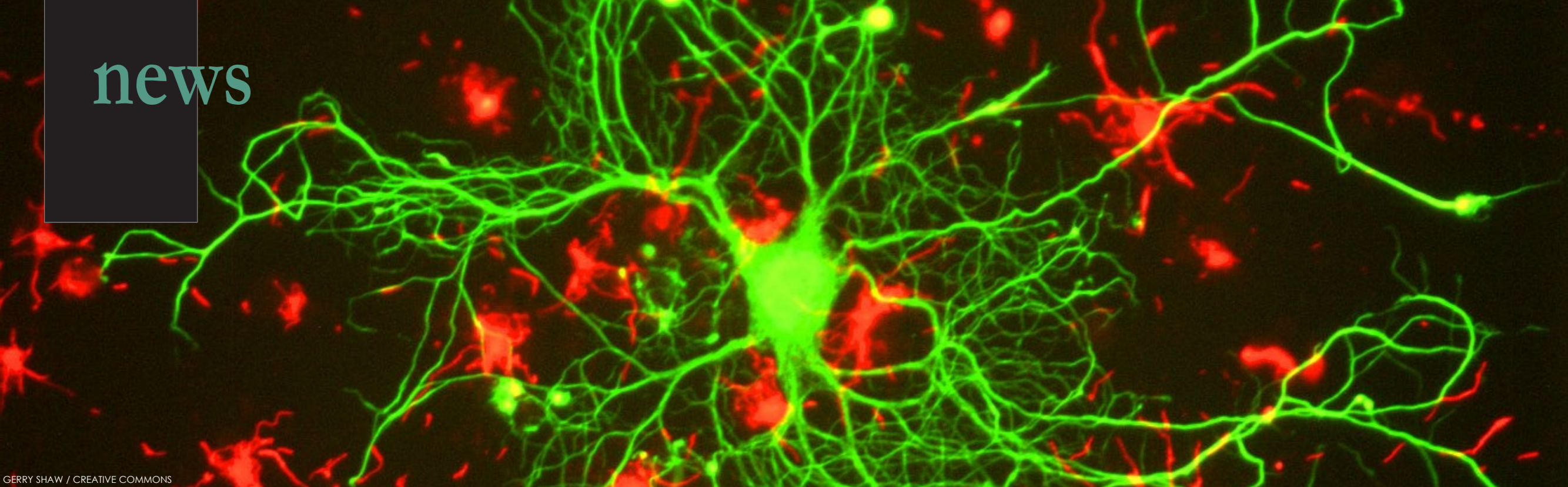
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GERRY SHAW / CREATIVE COMMONS

Diving may revive dormant brain cells

Simulation of dives to 14 meters in a hyperbaric chamber revives damaged brain cells, first studies of hyperbaric treatment effect on brain damage at the Danish National Hospital, Rigshospitalet, finds. The preliminary results are good news for patients with severe brain damage or brain cancer.

Hyperbaric chambers, like the ones used to treat decompression sickness in divers, may also be useful in treating severe brain damage such as the lesions caused by traffic accidents or following brain surgery. The therapy consists of a series of treatments in the hyperbaric chamber. Preliminary results suggest that it stimulates brain cells, which otherwise had ceased to function.

"These kinds of injuries leave some brain cells in a state where they are not dead, but are not working as they should. By providing oxygen under higher pressure, we are able to supply more oxygen to these cells. Apparently, this gets them to

work again," explained Dr Erik Jansen of Rigshospitalet, the Danish National Hospital, who is one of the physicians behind the research.

"This type of treatment is already known in the United States and Russia where it has been used in connection with a variety of therapies, but the effect has never been clinically proven," said Jansen.

A number of wounded soldiers have been treated in the hyperbaric chamber, and the results suggest that the method provides improvements in brain functions, which can lead to both greater independence for the patient and ultimately lower costs to the public health system.

"Even a tiny improvement in an individual patient is very important, as it may enable that person to handle more daily tasks on their own, both for the individual's self esteem and to reduce the need for society to take care of the patient," said Jansen.

"Consider, for example, young people who are diagnosed with brain cancer. Brain surgery and radiotherapy mean that the patient survives, but there is a risk of disability. These patients could be helped to a

better life through hyperbaric therapy."

Brain surgery and subsequent chemotherapy can cause groups of brain cells to enter a dormant state, as seen in patients who have suffered severe brain trauma for example following traffic accidents.

30 times to 14 meters

During the preliminary trials, the hospital performed a range of neurological and physio-therapeutic tests on the patients, including PET scans of their brains, and asked them to describe their condition in their own words. Next, they were given a total 30 hyperbaric treatments in the pressure chamber, where they were subjected to 2.4 bars of oxygen at partial pressure. This is equal to breathing pure oxygen at the depth of 14 meters. (Pure oxygen is provided through masks to avoid having 100 percent oxygen in the whole chamber, which would be very risky.)

Throughout the treatment, a series of measurements are taken, and at the end,

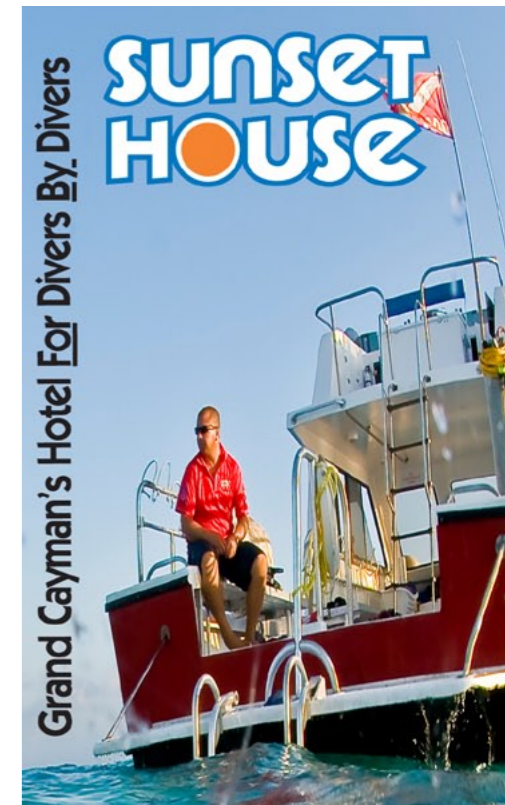
the patient undergoes the same tests as before the treatments began. This has demonstrated an improvement—especially in the patients' description of their condition, but also neurologically, things have changed for the better.

"Aside from improving the flow of oxygen to the cells, we think that new blood vessels are also formed in the brain. American studies have shown that after about 20 treatments, there is a large increase in the number of stem cells. One can assume that the stem cells have a positive impact on the brain's capacity," said Jansen.

"Brain tissue in the traumatized area is often inflamed. During inflammation, there is a tendency for white blood cells to get clogged in the area, which is probably also counteracted by hyperbaric treatment," Jansen said. ■



(Top image: Cortical neuron. Inset: Sketch of brain by Andreas Vesalius, c. 1543)



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Resande Man

The Traveling Man

Text by Millis Keegan
Photos by Peter Jademyr

For decades, the small war vessel *Resande Man* (Swedish for *The Traveling Man*) has been on the mind of every true wreck diver in Sweden. They each have nursed the dream of being the one to find her, and many have spent endless hours in the archives trying to dig up more information on where she could be hiding her remains.

Rumour had it, she carried a treasure, a rich amount of gifts meant to ease the way in negotiations with Poland to create a treaty against Russia. Count von Schlippenbach led the mission, but even before the ship left the southern part of the Stockholm archipelago, a storm intervened and sank the ship, taking the count himself and 36 of the crew members down with it. The month was November, the year, 1660. November storms are still known to be the nasty ones.

According to the records, around 20 men made it ashore in the longboat. The day after,

another seven men were found sitting in the crows nest on the main mast just above the surface, holding on for dear life. Five of them survived, the others froze to death. Anyone who wants to dig into the archives and the dusty paper trail at the Maritime Museum of Sweden can confirm that this was the case.

This little piece of information—that the main mast was sticking up above the surface—told divers in the know that the wreck sank within sport diving depth and could be found, in theory, by anyone. In reality, it was not so simple, even though the position was mentioned in the archives.

Hans Albrecht von Treileben, a salvager who is famous for recovering most of the canons of the *Vasa* when she sank, also salvaged part of *Resande Man's* cargo and canons in 1661. Somewhere between then and now, the wreck got lost, and a myth was born.

Over the years, many have claimed to have found the vessel, but there was never enough evidence to prove it, or evidence proved that these finds were other wrecks. Needless to say, when yet another group

THIS PAGE:
Diver explores
the wreck of
Resande Man



of experienced divers, albeit amateur marine archaeologists, reported the finding of *Resande Man*, there was some scepticism.

After the marine archaeologists and researchers from the Maritime Museum and

Södertörns University research group MARIS inspected the wreck, they came to the conclusion that it seemed highly likely that the amateur Marine Archaeological Society from Grebbestad might actually have found *Resande Man*.

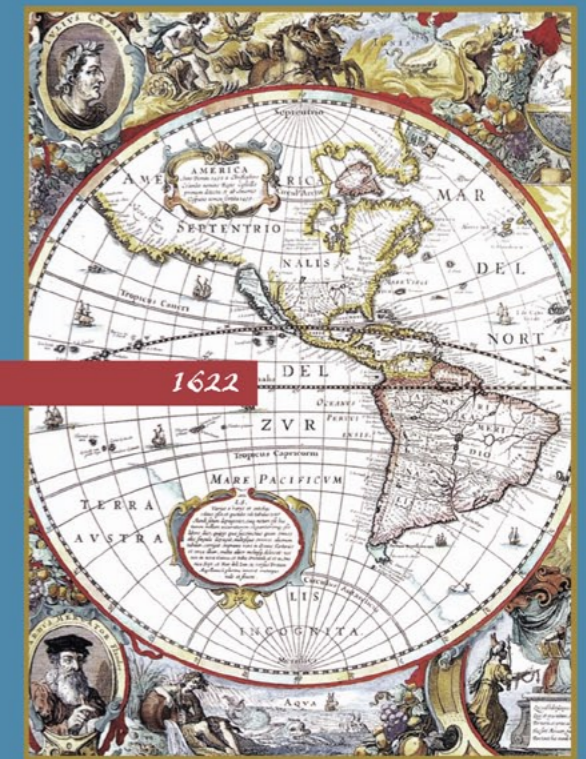


Dive team of the Marine Archeological Society of Grebbestad, Sweden

Maritime Museums in Sweden, the MARIS research institute, and of course, every wreck diver in Sweden, have been following the seemingly never-ending search for the *Resande Man*.

The wreck was recently placed under protection, which means no diving or anchoring on the site. "We will research and salvage some of the items from the wreck. Our goal is to investigate the facts, and hopefully, we will be able to release the wreck to the diving community again in the future," the authorities said. ■

Treasure Coins of the *Nuestra Señora de Atocha* & the *Santa Margarita*



Carol Tedesco

In 40 succinct pages, *Treasure Coins of the Nuestra Señora de Atocha & the Santa Margarita* answers all the most frequently asked questions, including what the coins look like when first discovered, the meaning of the various markings, how they are cleaned, conserved and graded, what they were worth in the 17th century, and the most up-to-date information on the names and periods of office of the men who made them. Of particular interest to 1622 fleet coin enthusiasts is a section devoted to the exceedingly rare Old World minted coins discovered on the *Atocha* and the *Santa Margarita*.

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"It is a very fragile wreck. A coin was found on board that is from 1650, and that is a good indication that it is from the right era, but further research must be made before we can say anything with certainty," said Patrik Höglund from the Maritime Museums. "But we are highly optimistic."

"Even though most of the cargo was salvaged in 1661, and possibly also later by illegal treasure hunters over the years, there are still a number of historical finds of importance to explore and document on the wreck, whether it is *Resande Man* or not," he said.

The war vessel was equipped with 22 canons, but since the famous von Treilleben already in 1661 dove and salvaged items on the wreck, it was believed that there were none left aboard. The dive team that found the wreck beg to differ, "We believe there are both coins and canons still at the site, and we hope to be able to continue to dive on her as part of a research team in the future."

Many are interested in finding out the truth about this mythical ship, which on average has been 'found' every third year by sport divers. Authorities like the National



THIS PAGE: Scenes from the wreck of *Resende Man*

wreck rap



She's still got her propellers, she has her guns and even the life rafts are back on board. You have never, ever, ever seen an artificial reef looking like this, it is magnificent."

—Joe Weatherby, the Reefmakers

USS Mohawk becomes new artificial reef in Southwest Florida

The former U.S. Coast Guard cutter sank in only minutes, once the explosives detonated, to become the first artificial reef in Southwest Florida and the first official memorial reef dedicated to all U.S. veterans. She now rests approximately 27m (90ft) under the surface, some 28 nautical miles from Sanibel Island. The 165-foot *Mohawk* is the last remaining ship from the Battle of the Atlantic.

In recent years, the vessel was docked as a Memorial Museum in Key West, to be enjoyed by visitors. It is fair to say that the *Mohawk* had a bit of an adventure before she was towed to her last resting place.

Prior to her days as museum, she spent more than 15 years rusting in a scrap yard in Staten Island. Frans Boetes, who became president of

the *USS Mohawk* CGC Memorial Museum, found her. She was in need for repairs before she could be towed down to Florida, where she underwent further repairs once she was tied at the old Navy Pier in Key West. The *Mohawk* was then chosen to become an artificial reef to be placed off the Southwest coast of Florida. ■

► **Video of Mohawk sinking**



The Definitive Guide to the Wrecks of Scapa Flow

A new website dedicated to the historical wreck diving site of Scapa Flow has been launched with stunning 3D interpretations of the German High Seas Fleet, incorporating cutting-edge web technology and in-depth information about the history and archaeology of the region, written by true experts in their field. www.scapafloowrecks.com is intended to be the definitive guide to the exciting maritime archaeology and history of the region; the result of a collaborative project commissioned by the Scapa Flow Landscape Partnership Scheme, in which divers, instructors, dive boat operators, maritime archaeologists and historians from Orkney offered their expertise to ensure that the site is as accurate and

useful as possible.

The wrecks of Scapa Flow, are for many, among the top wreck diving destinations of the world, alongside Truk Lagoon, Bikini Atoll, and the Graveyard of the Atlantic off the US East Coast to name but a few. The common misconception that they are dark, deep and often the preserve of technical divers, could not be further from the truth. These wrecks offer a fantastic introduction to wreck diving as well as a challenge for more advanced divers, together with world-class facilities.

The project was completed by 3deep Media (part of the Fourth Element Group) using its unique web technology to produce interactive 3D tours of each of the seven High Seas Fleet wrecks.

Incorporating photos and videos as part of a self-guided virtual tour, each is accompanied by descriptive text written by Bob Anderson of Halton Charters and Emily Turton of Radiant Queen Charters, two of Scapa Flow's most experienced dive boat operators.

Other features include an interactive map allowing users to pinpoint the wrecks, areas of local interest and sites of historical significance, as well as being able to peruse some archival maps of the area. Scapa Flow's role throughout WW1 and WW2 also has unique treatment with an animated timeline of events and historical photos, not available anywhere else in a single online resource.

www.scapafloowrecks.com

Search for legendary aviator goes underwater

Text by Millis Keegan

Born on 24 July 1897, aviator Amelia Earhart was the first woman to fly solo across the Atlantic Ocean. Receiving the Distinguished Flying Cross, one of the U.S. Military's top honours, she became an international celebrity and had an amazing career as an aviator. Her fame continued, breaking one record after another, as she was writing best-selling books. Earhart was keen on promoting aviation, and in 1929, she helped found "The Ninety-Nines", an international organization of 99 female aviators. She became the first president, and today, the organization is bigger than ever before. (<http://www.ninety-nines.org/>)

Earhart was an inspiration for women on the ground as well, being a member of the Woman's Party and supporting the Equal Rights Amendment.

After 75 years, Amelia Earhart is still famous, but for more dramatic reasons. Mysteriously disappearing during an attempt to circumnavigate the globe in 1937, she was last heard from over the central Pacific Ocean near Howland Island.

On the last leg of a trip that commenced in Miami, Florida on 1 June 1937, she had only 7,000 miles to go in order to complete her journey. After stopping in Lae, New Guinea, on 29 June 1937, she and her navigator, Fred Noonan, were never seen again, with contact lost on 2 July 1937.

There are numerous theories behind her disappearance, and every now and then, a new one turns up to add fire to the rumors. Crashing into the ocean is the most popular, although a new theory suggests that the two managed to survive an emergency landing and lived on a deserted island in the South Pacific.

Relatives of Earhart claim her disappearance is a massive cover-up by the government, with the pair being captured by the Japanese and held prisoner on the island of Saipan in the northern Marianas.

75th anniversary takes the search underwater

TIGHARS, the International Group for Historic Aircraft Recovery,

have done several excursions to the South Pacific in an attempt to discover evidence as to what might have happened. The working theory, called the Earhart Project, is that Earhart and Noonan landed and eventually died on Gardner Island (Now known as Nikumaroro in the Republic of Kiribati).

This year, July 2 was the 75th anniversary of the disappearance, and an expedition, the Niku VII, has set out to do some high-tech deep water exploration for the wreckage of Earhart's Lockheed Model 10 Electra aircraft. With recent funding setting the project in motion, the target area is an underwater slope off Nikumaroro's west coast.

Earlier TIGHAR expeditions

revealed aircraft debris had been discovered and used by islanders in a now abandoned village. Although nothing substantial, it was tantalizing enough to plan for the Niku VII expedition.

Commencing this summer, the expedition plans to document and identify any wreckage left on the slope to a depth of 1,500 meters (4,921ft). It is hoped that solid evidence will be discovered, which will once and for all solve

this 75-year-old mystery. Nothing will be retrieved. Findings will only be documented through HD video and photography.

The search will not be an easy one. Along with video cameras, the ROV has a sector scan sonar—although the best images are obtained when the target is on a flat surface, preferably sand. However, the search will be conducted on a sloped reef instead of a sandy bottom. If successful, a subsequent expedition will be one of recovery, which may, once and for all, lay to rest one of the great-

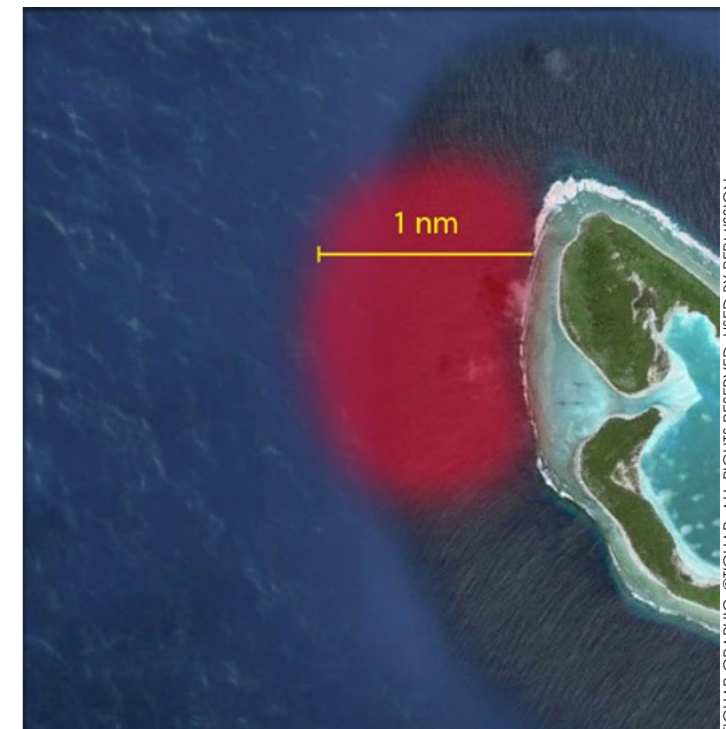


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WIKIMEDIA COMMONS

Amelia Earhart



Search area (above)

est mysteries in aviation. Follow the results on Thigar.org ■

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SS Dago wreck

SS Dago—A British loss by a German bomber off the Portuguese coast during the WWII

Text by Jorge Russo
Photos by Armando Ribeiro,
Jorge Russo, José Alberto
and Manuel Leotte

During WWII, in the early months of 1942, both sides struggled—some to destroy as many ships as they could, others to build them. This was the battle of the Atlantic. During the war, cargo ship convoys and their military escorts were endless in the effort to supply Great Britain of food, parts, fuel and raw materials. One busy route was Liverpool-Gibraltar-Liverpool with convoys OH and HG, respectively. This was the scenario when *SS Dago*—a British 1,757-ton tramp steamer from Hull, England—departed from Liverpool February 21 on convoy OG.80 heading to Gibraltar with Lisbon as its destination.

SS Dago arrived in Gibraltar on March 8. She departed the next day on an independent voyage towards Lisbon where

she arrived the same day. *SS Dago* loaded some cargo there and left to Leixões-Oporto (Portugal) on March 15 with 300 tons of general cargo where she was supposed to unload some goods and then, we believe, head back to Liverpool.

At noon, *SS Dago* left Lisbon on a fine

steamed at 10.5 knots steering 010° until 17:35 when she altered course to 352° in order to pass 2.15 miles off Cape Carvoeiro near the small fishing village of Peniche, Portugal.

At about 18:00 another plane was sighted approaching from land about three miles away, three points on the starboard bow. On sighting, the plane made a sharp turn and crossed the ship from bow to stern at 300 feet. All hands were called to battle stations.

This time, it was a German plane, a long range Focke-Wulf 200 Condor bomber². Two P.A.C. Rockets were fired, unfortunately, too soon. Another sharp turn and the plane flew over the ship again. Every armament on board was fired against the aircraft—twin-marlins on the bridge, Holman projector, stripped Lewis and Hotchkiss aft—but even with tracers apparently hitting the plane, the bullets appeared to produce no

serious damage. We know now that the radio operator was wounded during the attack and that the plane had to return earlier to its base³.

On these two passages, the plane did not open fire or drop bombs. On a third passage from the front, it fired its cannon. But no one was wounded, because most of the shells hit the water



and hazy day when, at about 17:00, the 37-man crew including six navy gunners spotted a plane approaching from the west out of the sun. They opened fire but, fortunately, with no effect because it turned out to be a Short Sunderland Flying Boat¹.

With heavy westerly swell and a southerly wind of force three, *SS Dago*

1 We believe that it belonged to the 10th squadron from RAAF (Royal Australian Air Force) stationed at Mount Batten in Plymouth, southern Britain.

2 It was the Focke-Wulf 200 Condor F8+IH from Lt. Otto Gose of 1./K.G.40 from Merignac.

3 Courtesy of Chris Goss

Steam winches (left); Scale model of *SS Dago* (below)





THIS PAGE: Scenes from the *SS Dago*. CLOCKWISE FROM LEFT: Bow mast load; Stern; An anchor; View from the bow

or the gun shields without penetrating them.

This time, the plane also dropped a stick of three bombs: the first hitting the fore castle; the second one entered the No. 2 cargo hold, which was empty; and the third, a near miss, off the port beam abreast of the bridge.

According to Chief Officer W.G. Gill's testimony, all three bombs exploded on impact; the fore castle was completely destroyed; and the near miss off the Port side seriously damaged the emergency gear on the boat deck, which stopped the engine. So, she still had weight and was sinking at the bow very rapidly.

By this time, the water reached

amidships, probably because the only watertight door on the ship leading to the engine room was open. The damage on the empty No. 2 cargo hold must have been considerable.

Crew members ran to lower the lifeboats while the chief engineer went down to the engine room to stop the engine. The port boat was lowered with two men. But in the rush, someone accidentally let go, and the boat was up-ended. Fortunately, the two men were not thrown out. Chief Officer Gill and 15 men were on this port boat when the engineers came out of the engine room.

The propeller was rising out

of the water, and the boat was dangerously near the blades, which were fortunately not turning anymore. Suddenly the propeller came down again and fell over the boat, damaging it but not too seriously. Yet, two painters were in trouble. Crew member A.B. John Rouse, despite a broken leg, was able to assist them, so all the men were able to drift away.

The captain and another 21 men got off the sinking ship via the other lifeboat.

Accordingly to Gill's testimony, the boat sank in only five minutes

after the bombs exploded. This is consistent with the report from the Fw F8+LL of Hptm. Jope, who was also out that day. He sighted the sinking vessel at 19:15 and reported it sunk eight minutes later. He also reported that two manned lifeboats were sighted and that all aboard were likely rescued by a RN corvette at 19:35. Incredibly, only four men were injured, not seriously, by the attack.

All the confidential books were thrown overboard in weighted metal boxes, and the two lifeboats were left on their own to



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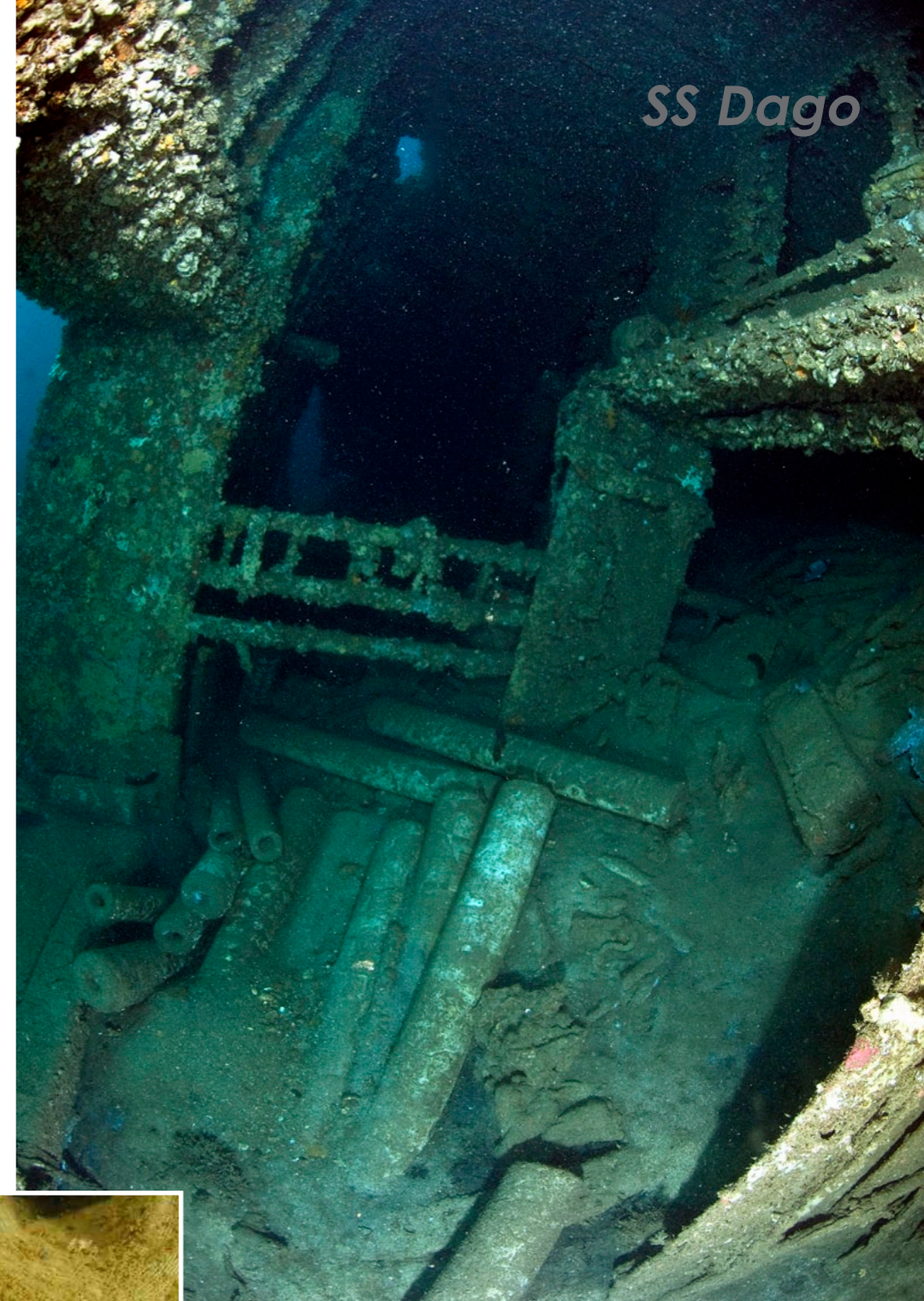
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CLOCKWISE FROM LEFT: Diver enters cargo hold with linoleum rolls; Inside cargo hold; Linoleum rolls; Team member Carlos Gomes measures cylinder diameter

the shot-line was set. After a brief buddy and equipment check, we started our anticipated descent. The water was deep green, and the visibility was very poor. At -12 meters, the water was milky green, and we could see no more than two meters ahead. It was very disappointing when you consider how glorious the day was. Suddenly, at about -20 meters, the water turned deep blue, and the wreck became clearly visible at -50 meters. The visibility was more than 30 meters!



SS Dago

It would be an incredible dive.

On a flat bottom of white and soft sand, the incredible wreck was now clearly visible in all her



splendour. The wreck was broken in two large segments. The stern segment led to the engine room with a huge triple expansion engine standing out on a sea of debris. Two large 200-pound pressure steel boilers were still in

their original position. The effect of many years of corrosion, strong seas and fishing nets were perfectly visible on the scattered steel frames and decks. Only the reinforced superstructure still stood. Large schools of pout (*Trisopterus luscus*) swam around the wreck.

In an oblique position, the bow section almost touched the engine room. This was a very large segment that was better

try to reach the village nearby. About one hour later, one motor boat from Peniche reached the lifeboats and towed them to shore. Despite the heavy swell, with the help of search lights and local fishermen, all the men were safely taken ashore, and the injured ones were carried to the hospital.

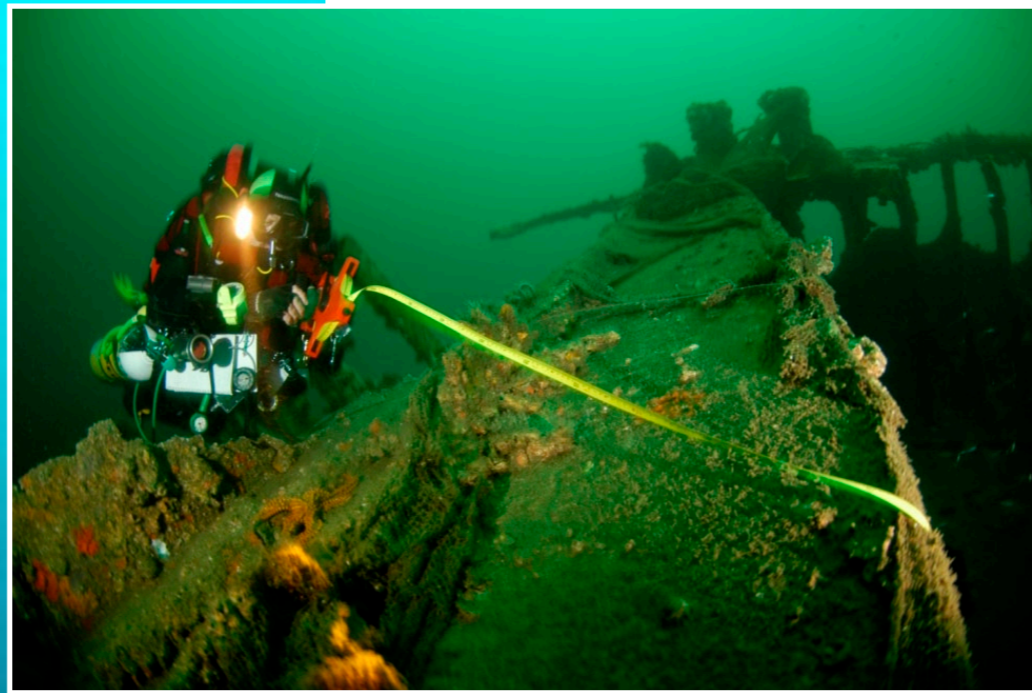
On the next day, the crew was transported by bus to Lisbon and then back to England by sea, with the exception of two men, one of them the brave John Rouse who needed further hospital care. The crew went home with 24 bottles of brandy offered by the Peniche inhabitants, a small but comforting token to the men that were almost killed the day before.

Sixty years later, August

At 6:00 AM, a team from XploraSub left Lisbon towards Peniche with a cargo of diving gear, Trimix and enriched air Nitrox in their green van. We had to be in the water no later than 9:00 AM to conduct the dive between tides and catch the window with no or just a light current. We had one hour to go and come back, or we would be annoyed during the deco time by the strong currents that were quite common four miles off Peniche where the wreck of the so called *SS Dago* rested.

It was a beautiful morning that day—no wind, sunny sky and a very uncommon flat sea. On the site, the wreck was clearly visible on the eco-sounder, and





LEFT TO RIGHT: Triple expansion steam engine and boilers; Team member Pedro Ivo measuring the wreck; Stern section



SS Dago



preserved than the stern segment. The cargo deck was now perpendicular to the sandy bottom. The main deck was long gone. Through the most forward hatch, it was possible to penetrate the cargo hold and look at the remains of the cargo, especially several incredibly well-preserved linoleum rolls. We entered for a brief but breathtaking moment and checked around the cargo, now mostly unrecognizable.

The bow segment was broken on the second hatchway, with the cargo mast leaning over the sand and the steam winches fallen or hanging out from the deck.

The bottom time passed quickly, and we had just a couple of minutes more to check a strange piece of wreckage we found on the most western part of the debris field.

It was now time to come back to the line, crossing the debris field once again, give a final look to the stately steam engine and twin boilers and finish this marvellous dive in Peniche. A long ascent awaited us. This was one of the best wrecks we could dive in Portugal.

The research

Since 1996, we had information on the spot where divers and fishermen claimed

the *SS Dago* wreck was located. The images and reported details were consistent with a small cargo steamer but could belong to any of the hundreds of ships that were lost in Peniche waters during the 20th century. The research data that were made public were at a minimum vague and not at all accurate.

Knowing that only 500 meters away there was another wreck of a steamer, we asked ourselves why people claimed that a specific wreck was the *SS Dago*. We decided to start a research project on the *SS Dago*, simultaneously in situ, using mostly comparative archaeometry, and data from libraries and museums. Our main objectives were to determine if the wreck claimed to be the *SS Dago* was, in fact, the *SS Dago* and to bring to the surface the full story of the *SS Dago*.

After many months of research, we knew from local authorities that there was one British *SS Dago* steamer that was attacked and sunk by a German Focke-Wulf 200 Condor off the Peniche coast. From the Hull City Archives, Hull University, British Maritime Museum and Dundee City Council, we found out that there was an Ellerman Wilson Line *SS Dago* Steamer built in Dundee in 1902, easily traceable through Lloyds Register of Shipping records, and of course, that there was a

SS DAGO TECHNICAL ASPECTS
 Built: Launched on 11 April 1902.
 Completed in May of the same year in Dundee, Scotland, Yard 163
 Register: On behalf of Wilson, Sons & Co. Ltd, in the port of Hull (Kingston upon Hull), England, with the official number 113645
 Owners: Wilson Line, and Ellerman Wilson Line when she was sunk
 Builders: Caledon Shipbuilding & Engineering, Co. Ltd.
 Flag: British
 Gross Tonnage: 1,653 tons when built;
 Lengthened in 1909 to 1,757 tons
 Length: 280 feet when built
 Main Breadth: 37,5 feet
 Depth from top of beam amidships to top of keel: 14.4 feet
 Iron or Steel: Steel
 Engine and boiler room: 42 feet.
 One vertical reciprocate triple expansion steam engine, 154 NHP, 11.5 knots. Two steel boilers, 200 pounds of pressure. 1 single screw
 Sunk: 15 March 1942, 4 miles off Peniche, Portugal
 Sunk cause: Bombed by a German Focke-Wulf FW 200 Condor
 Wreck maximum depth: -50 meters



wreck that everyone called the *SS Dago* and another steamer wreck no more than 500 meters away.

We started looking for distinctive characteristics in *SS Dago* records in order to compare them with the wreck. First things first: the engine. Lloyds and the port register told us that the *SS Dago* had a steam triple expansion engine powered by two 200-pounds pressure steel boilers. So far, so good. Fortunately, the second wreck was discarded, because we found that it had a double expansion steam engine, not a triple one.

But this was not sufficient to securely claim the wreck to be the *SS Dago*. We then went to distinctive details of the ship's measurements. We measured the hatchways' dimensions, counted the quantity of hatchways and cargo masts, and

collected some very unique details—the distance between the stern hull and the propeller shaft via the rudder and the diameter of the engine cylinders. All were a perfect match.

The fact that the wreck was broken exactly at the second hatchway was consistent with the chief officer's report and perhaps explained why the ship sank within only five minutes after the attack, according to crew testimonies. The Focke-Wulf's second bomb and the empty cargo hold must have produced critical damage in the superstructure, especially on the keel, and broke the vessel in two. That must have been why, in a water column of only 50 meters, the two segments were so far apart. It was another clue supporting the theory that this wreck and the *SS Dago* were the same ship.

However, a thorough analysis of the Lloyds Register of Shipping of the *SS Dago* raised a huge problem. In 1945, for example, the *SS Dago* was still on the records and 'our' *SS Dago* was sunk in 1942. Later, we found out that in order to deceive the German war propaganda, Lloyds continued to record ships, even those who were sunk by the axis, until the end of the war. The sunken ships were recorded separately on a specific record, the Lloyds War Losses. When we looked for *SS Dago* on those records, there she was.

The people were right. That wreck was in fact *SS Dago*, the British tramper sunk by a German long range bomber off Peniche, Portugal, a neutral country.

Now, we need to determine what ship the other nearby wreck is... and we will!

The XploraSub

XploraSub is a group of tech divers that has existed since 6 July 2005, developing exploration and research in areas accessible only with advanced diving. Our main areas of interest are wreck and cave diving. Presently, XploraSub is developing several projects on both areas. For more information, visit: www.xplorasub.com

SS DAGO PROJECT TEAM:

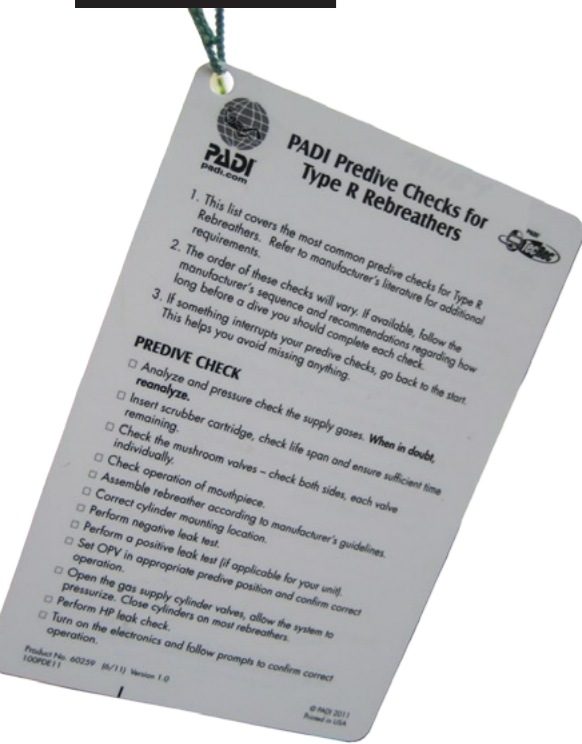
Jorge Russo (Project Coordinator), Pedro Ivo Arriegas, Paulo Carmo, Paulo Correia, Paulo Costa, Pedro Encarnação, João Pedro Freire, Carlos Gomes, Manuel Leotte, Nuno Sous, Luísa Tavares, Carlos Trindade. Invited photographer: Armando Ribeiro



SS Dago

CONTACTS AND LINKS
SS Dago Project on Facebook
www.facebook.com
Jorge Russo, Project Coordinator
russochief@gmail.com

Diver at the stern of the *SS Dago*
 Engine and boilers (top left)



Rebreather Technical Training

open circuit gas supply is possibly safer than an open circuit diver needing to find their buddy for gas (alternative air).

Required underwater time

The more complex failure analysis skill development becomes a big issue when diving beyond recreational limits or when direct 'no stop' access to the surface on open circuit bail out is no longer possible. The correct decision-making process for any given possible rebreather problem becomes an exponential risk. The real issue that must be addressed by training agencies and accepted by divers is that the minimum required time underwater diving a rebreather must be increased beyond the equivalent open circuit requirements for any depths beyond the recreational limits, and that the safety rules are to be followed at all times when using a rebreather.

Beyond minimum standards

Rebreather divers must not be looking for the shortest route and minimum standards when looking for rebreather certification. Any course with the minimal number of hours required or experience to dive deeper than the recreational

limits should be avoided and rejected as unsafe. Open circuit experience, no matter how advanced it is, will only help you with any open circuit bail out—other than that, not much more. In fact, it can even be a disadvantage, leading you to a false sense of security. Technical

rebreather diving requires far more time underwater and development of failure analysis skills, and therefore should require more logged hours than any open circuit equivalent.

The real issue that must be addressed by training agencies and accepted by divers is that the minimum required time underwater diving a rebreather must be increased beyond the equivalent open circuit requirements for any depths beyond the recreational limits and the safety rules are to be followed at all times when using a rebreather.

Text by Barry Coleman

It is widely accepted that rebreather diving has many benefits, and conversely, disadvantages, one of which is the training required to understand and implement the quite complex failure analysis during any dive.

There is, of course, the very simple, acknowledged response to any rebreather problem, and that is to bail out to open circuit and abort the dive. This response would be the same as open circuit training, if you have a problem finding an alternative air source. One could argue that a recreational rebreather diver carrying their own



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OCEANIC



Training bulletin

Edited by
Peter Symes

Build up experience

Many Trimix open circuit divers who have crossed over to rebreather and within a short time are diving to the depths they had on open circuit are dead today. It is an unfortunate fact. Had they spent the time diving a rebreather and put in the same number of open circuit hours or more, building up on rebreather skills, they may still be alive today.

Open circuit experience, no matter how advanced it is, will only help you with any open circuit bail out.

The majority of fatalities are diver error. Had there been more hours underwater between courses and depth limitations, perhaps we may not have so many fatalities.

Necessary number of hours

Training agencies need to assess the number of hours relative to depth certification and ensure they are more than the open circuit

equivalent for the respective depths. They need to implement a higher quality control to ensure training standards are maintained and monitored.

In the past, cave diving had a large fatality compared to the number of qualified cave divers, and upon investigation, many of the fatalities were unqualified cave divers and/or with little experience (time underwater in caves). This resulted in training standard amendments that had a favourable impact, reducing the



fatalities.

It is time divers make a conscious decision, not based on ego, to search out and find an agency with whom the standards

require a greater number of hours underwater between certification levels, materials that are in depth and detailed allowing one to make informed decisions. Do not simply be fooled into believing that you have mastered a rebreather after 25 hours and that you now can take the next step or course and dive to 50 or 60m when nothing less than 50 hours of recreational rebreather diving within the last say 18 months would be more acceptable.

Rebreather divers must not be looking for the shortest route and minimum standards when looking for rebreather certification.

Reducing fatalities

This may be the answer to reducing the fatalities. It may not, but until such time as divers and potential divers consider that rebreather technical diving is more com-

plex and therefore take more time to learn and develop skills to dive deeper, and that they should shun the quick and easy route offered, then we will never know.

Having said this, extended time also breeds complacency, especially when nothing untoward happens to the rebreather diver. The diver then becomes lax and sloppy. This contempt for the rebreather—

because, unwittingly, this is what it becomes—will be the nail in the coffin and must be avoided at all costs.

Training will never change a person's attitude; courses cannot be selective on students' attitude. Instructors can possibly recognise attitude, although it may be so well disguised and alluring that even the best sometimes miss a potential flaw. Before they know it, the diver is a statistic. There is no definitive answer but to increase the certification prerequisite requirements relevant to the depth limits and see if this helps.

Without a doubt, the benefits of rebreather diving are certainly worth any extra effort that may be warranted. ■

The majority of fatalities are diver error.

Edited by
Scott Bennett



Simple rules to saving money on travel

In these days of increasing fares and tightening wallets, a few simple rules can help when planning your next trip. Booking online can help, as can arranging travel in advance or travelling during off season periods. However, never assume that booking through travel websites always provides the best deals, as there are some devious ways they make a little bit extra.

You might not get the lowest price listed first, as they are sometimes listed by airline or hotel chain. Preferred vendors that pay for that status may be listed first. For the lowest price, click on a tab labeled "lowest to highest". However, the good news is that the travel sites must show the final price before any purchase is finalized.

Before commencing your search, clear cookies from the browser cache. Cookies accepted by your browser can allow travel websites to monitor

previous travel purchases as well as see prices you are currently checking out. This can trigger a higher rate at some sites, so be sure to disable cookies and clear what you already have. Doing so may help reset search parameters if you have experienced a fare jump during your booking attempt.

Before accepting a bundle, do some double checking. Hotel fares are sometimes less when booked separately from the airfare. In addition, better room rates can often be found on hotel websites.

Sometimes, getting a package really is cheaper. In other cases, though, you can save by going right to the source and booking your travel a la carte. Try a couple of different scenarios to see what is truly the best deal. ■

Humbolt Explorer newest addition to Galasam liveaboard fleet



Galasam Galapagos Scuba Diving has added the *Humbolt Explorer* to its extensive Galapagos liveaboard fleet. Trips are eight days in duration and feature the north Islands of Darwin and Wolf.

Each of the eight air-conditioned rooms comes complete with private bathroom facilities and can accommodate two passengers. A lounge area features TV, VCR and video library. A satellite telephone is also available for worldwide

emergency calls. The dive deck comes equipped with individual gear bins, large camera table, recharging station and tank racks.

Up to 17 dives are offered during the week depending on the boat and the date of departure. Operations are conducted via two large pangas or tenders.

Guests can experience large schools of hammerhead sharks, Galapagos sharks, mantas, eagle rays, turtles, sea lions, fur seals, tuna, dolphins and large whale sharks. Due to strong currents, trips are recommended for intermediate and advanced divers. Departures are available throughout the year. ■

Girls Go Diving



—*Szilvia Gogh, aka. Miss Scuba, has travel tips for scuba girls on the go.*

More and more women are travelling to dive destinations on their own. A group of them have collected some practical advice and recommended gadgets and gear that make life and dive travel a bit easier for diving women on the go. The Travel Tips web page on Miss-Scuba.com lists tips by female divers from all around the world.

Why re-invent the wheel when someone has already been there and done that? Anything from what to pack to security to how to deal with email while you are abroad, readers can find helpful tips for any upcoming get-away.

Miss Scuba is the brainchild of diver and jewelry maker, Szilvia Gogh of Hungary now based in Los Angeles, California, USA, who fell in love with the ocean while in Greece, so much so that she pursued dive education to become the youngest female PADI course director ever to be certified.

"If I can do it, coming from a country that was formerly Communist with many poor and disadvantaged people, so can others!" said Gogh. And she wants to help other young women and disadvantaged children accomplish their goals and travel for diving.

Gogh herself has gone on dive trips

to faraway places such as Antarctica, Vietnam, Thailand and Alaska. She has also been an underwater film screen double for Drew Barrymore. Gogh wants to continue marketing group packages for dive destinations and scuba retreats to places like Mexico, Costa Rica and Italy where a villa can be rented for guests who will have the choice to do yoga in morning and scuba in the afternoon combined with site-seeing, wine-tasting, white water rafting, surfing, zip lining and bicycling. As a degreed engineer, Gogh said she could have had a job that made more money, however, she doesn't want to spend money on things but rather on travel.

For more information, visit Miss-scuba.com. Photo courtesy of Szilvia Gogh and sister who are wearing their jewelry designs. See our feature on dive jewelry in this issue. ■

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Airline to ditch TVs in favor of iPads

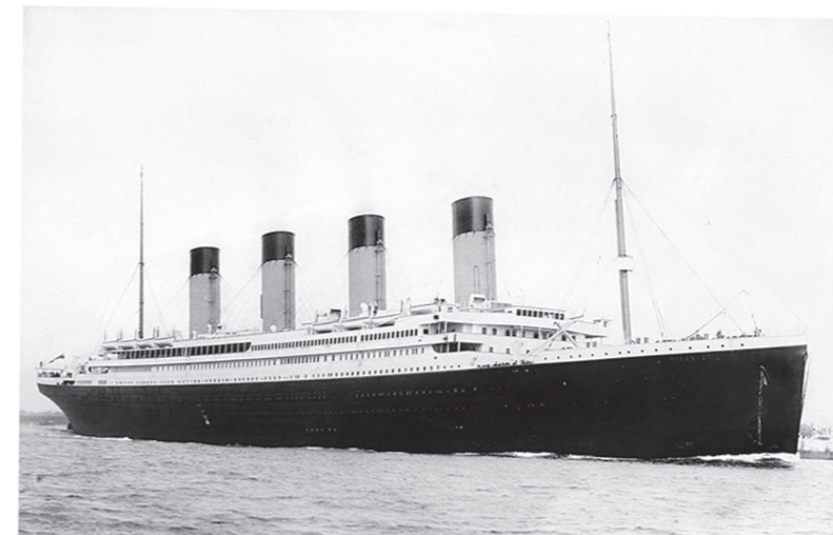
Switch to Apple tablets helps to decrease weight of planes.

As iPads appear in business with increasing frequency, one low-cost carrier has jumped on the bandwagon. Singapore Airlines subsidiary, Scoot Pte, recently launched its low-cost airline carrier, made possible in part by shedding nearly two tons of television and other video equipment in favor of Apple's 1.44-pound iPad.

By renting iPads, providing food and beverages at a cost and charging for other services, Scoot Pte hopes to offset its low ticket

prices. By removing the outdated video equipment, the airline was able to increase its seat capacity by 40 percent and still come in at a weight loss of seven percent. Weight, which directly affects the gas usage, is the biggest factor impacting ticket prices, accounting for approximately 40 percent of an airline's operating costs.

Economy class passengers will be able to rent iPads at a rate of US\$17.00 per flight. The devices will offer music, movies, games and television shows. iPads will be free to business class customers. While analysts are unsure whether the new practice will be sustainable in the long run, decreasing the weight of planes is undoubtedly a good step towards cost control. ■



New safety policies for cruises

The global cruise industry has adopted three new safety policies, which are to be implemented with immediate effect.

The three new policies, which go beyond even the strictest of regulatory requirements, address the issues of passage planning, personnel access to the bridge and lifejackets.

Under this policy, each passage plan is to be thoroughly briefed to all bridge team members well in advance of its implementation, and it is to be drafted by a designated officer and approved by the master. To minimize unnecessary disruptions and distractions on the

bridge, access is to be limited to those with operational functions during any period of restricted manoeuvring or when increased vigilance is required. The number of additional adult lifejackets to be provided must not be less than the total number of persons berthed within the ship's most populated main vertical fire zone. This ensures that the number of lifejackets carried are far in excess of the number of persons actually on board the ship. ■

Cheap fares can be pricey

Leading travel search site Skyscanner, which compares both 'no frills' carriers and scheduled airlines, has found that in many scenarios, low cost carriers can be more expensive than their full fare counterparts, depending on the travellers' individual needs.

Due to the complexity of the fare structures, with additional charges for check-in bags, food, seat selection, and different fees depending on how the flight is paid for, getting the cheapest flights now depends entirely on the individual's travel situation. ■

Are Mac users being overcharged on booking engines?

Wall Street Journal reported Orbitz was steering Mac users toward higher-priced hotels than PC users, based on spending habits discovered by one of the site's algorithms.

Orbitz found Mac users on average spend US\$20 to \$30 more a night on hotels than their PC counterparts, a significant margin given the site's average nightly hotel booking is around \$100, chief scientist Wai Gen Yee told the Wall Street Journal.

CEO Barney Harford told CNN that Orbitz recommendation results are part of an attempt to pair customers with the hotel they'd probably pick. In this case, Orbitz will offer recommendations based on what other PC or other Mac users selected as their final hotel, on the assumption that spending habits are the same, he said. ■



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Freshly squeezed juice? Really? Did you not read the safety rules?

Text by Millis Keegan. Fact check by Steven Mednick, MD

Travelling poses some real dangers, and they should not be ignored. Travellers have paid the price over and over again, many with their lives, many with lifelong suffering, and the main reason is ignorance. That's right, ignorance.

We have listed the most common concerns, which will protect you in tourist areas. After a couple of trips, you will probably become more of a seasoned traveller, and you can start adding in common sense with the rules, which will allow you more 'freedom' with food and drinks. Travelling the road least travelled and beyond is a whole other matter and requires more preparation.

Start at home

Be a good kid and take your medicine! Research the area you are going to and take your shots. A good web site for research is <http://wwwnc.cdc.gov/travel/destinations>.

There you can choose the country and get recommendations. Print them

out and bring them to your health care provider. Get there in good time before the trip. Some vaccines might need to be ordered, and that can take time, too.

See a health care provider at least four to six weeks before your trip to allow time for your vaccines to take effect and to start taking medicine to prevent malaria, if you need it. Do it even if you have less than four weeks before you leave.

Pack a well thought out First Aid Kit. If you will be travelling to remote areas, far away from any emergency room, ask for antibiotics—Tetracycline or Ampicillin.

Hand hygiene is vital

Granted, we tend to

overuse anti-bacterial products in the safety of our own homes, and in the environment our bacteria is in sync with. This is different. While you travel, you are bound to go through places with lots of human traffic, like airports, train stations, buses and more, and you are in areas where your body is not adjusted to that type of bacteria. Keep your fingers away from your mouth, eyes and nose until you have sanitized them and do not drink anything that does not come out of a capped bottle. One trap is a cute child trying to sell you water bottles, chilled and tempting. If the seal is broken it has been refilled in the town well.

The risks are first and foremost traveller's diarrhea and cholera. The Peace Corps has a simple rule, easy to remember, easy to follow: Boil it, Cook it, Peel it or Forget it. At least, do that.

The Cardinal Rules

Safe

Food. Hot and steaming is safe. Bread is safe. Marmalade, jam and syrup with high sugar content are safe. Rice and noodles if—you got it—they are cooked and served steaming hot.

Fruit is safe, if freshly peeled with your clean fingers. Citrus fruits have a high acid count, those are safe, so are cooked and steaming hot vegetables.

Drinks. Soda and water is fine, if in a factory-sealed bottle or a can or a tetra pack. However, you should probably wipe off the top of the can before drinking out

of it or use a straw. A neat trick is to use a wedge of citrus as a wipe around the opening. Where do you think the idea of a lemon/lime slice with a Corona came from?

Water is also safe if boiled or treated with chlorine or iodine, which can be bought off the Internet in most countries and should be in your First Aid and Preparation Kit.

Unsafe

Food. Room-temperature foods and sauces are unsafe. There are no if's, and's, or but's about it. Buffets? Well, choose carefully and follow the Safe Rules.

Previously peeled fruit, raw produce and ALL salads are off-limits. Unpeelable fruit and vegetables like tomatoes and grapes and berries are not safe in some countries where human feces is still used as fertilizer, and E-coli can be in the fruits and berries. It is not possible to rinse that off.

Street vendors. Avoid food and beverages from street vendors. That is part of the adventure for many though, and if you are a seasoned traveller, just use the rules and common sense, and you should be fine. But seriously, even the seasoned traveller should avoid raw and poorly cooked seafood.

Drinks. Avoid tap water and beverages not in factory-sealed containers and milk products, unless boiled or pasteurized. Avoid even wrapped ice cream. Use your common sense. Many

countries to which divers travel do not have a reliable power source, and money is tight. Half-melted ice cream gets refrozen, and the healthy milk bacteria can turn into a nasty cousin. Do I need to mention ice cubes specifically? Unless you freeze them yourself with bottled or boiled water, adapt and drink lukewarm sodas and consider yourself lucky if you get a fridge-cold one.

Paying the price

So, you forgot one of the rules, and you are paying the price. You've got traveller's diarrhea or cholera maybe. What do you do now? First, do not ignore the symptoms; do not believe that it will pass. These are serious conditions that very quickly can get very bad.

Traveller's diarrhea and cholera

Many things—E-Coli, Shigella, Salmonella, viruses and parasites—can cause traveller's diarrhea. The signs are usually diarrhea, with or without fever, and bloody stool. Cholera is a bit different. Rehydration is key for both. You should have been prepared and brought electrolytes in some form.

Signs and treatment

Diarrhea without fever. Take anti-diarrheal, which of course is in your First Aid/Preparation Kit. Follow the instruction on the package. If the symptoms are still there after 48 hours, get medical attention. Do not take aspirin with anti-diarrhea medication. Hydrate, hydrate and hydrate.





Diarrhea with fever and bloody stool. Take antibiotics. Some anti-diarrheal can be used, check before you go.

Cholera. Cholera must be distinguished from traveller's diarrhea. The stool is different. There is no blood, mucus or pus in the stools of cholera victims. An abrupt onset of voluminous watery diarrhea, dehydration, vomiting and muscle cramps is what you are looking for. The onset of the diarrhea is painless and explosive, and you easily lose liters (a gallon) of fluid EVERY HOUR. You will lose salt and water through the stool, and life threatening dehydration is next.

The frequent watery stools will very soon lose fecal matter and odor, and become more like rice water to its appearance. The diarrhea is not bloody, and there is no fever.

Mostly accompanied with vomiting, but not with nausea.

WITH NO TREATMENT, DEATH CAN OCCUR WITHIN HOURS. Immediately start rehydrating yourself, and head to a hospital. Simultaneously, if you can! Rehydration is the main treatment. In this case, oral rehydration solutions are essential. Using it at onset or as soon as possible have saved many lives. Drink 2-3dl (6-8 ounces) after each stool/bowel movement—or more, if you can manage, but not less.

If you can't drink, or if you loose more liquid than you can drink, you need to get to the hospital. If you are vomiting, you need to get to the hospital. If there is a delay in getting you to the hospital, like if you might be on a remote island, start taking Ciprofloxacin 750mg once daily for three days, OR Levofloxacin 500mg once daily for three days, OR Azithromycin 500mg once daily for three days. The adult dose is 250mg four times daily. This is not done instead of going to a hospital; it is to save your life while waiting for transportation. Make sure the medical staff knows what you took in preparation,

down to vitamins. The buddy system should be in the works here, your buddy should be involved from the beginning, since you might be too far gone in your own misery by now.

FIRST AID/PREPARATION

—What should be in your Kit

For Rehydration. Electrolytes in some form. If not available, you can make your own solution of salt, sugar and water.

For Diarrhea. Some kind of over-the-counter anti-diarrhea medicine

Antibiotics. Ciprofloxacin or Levofloxacin or Azithromycin

Simple Rehydration solution.

6 teaspoons of sugar
1/2 teaspoon of salt
One Liter (5 cups) of clean drinking or boiled water and then cooled. Stir the mixture until the salt and sugar dissolve. ■

EDITOR'S NOTE: ALWAYS CONSULT A PHYSICIAN BEFORE ADMINISTERING MEDICAL TREATMENT OR MEDICATION. VIEWS AND INFORMATION EXPRESSED IN THIS ARTICLE ARE GUIDELINES ONLY AND ARE NOT TO BE USED IN PLACE OF, OR AS AN ALTERNATIVE TO, MEDICAL ADVICE FROM YOUR DOCTOR OR OTHER PROFESSIONAL HEALTHCARE PROVIDER.



LACTOCARE
travel



„If the sharks die, the oceans will die!“

Andrew Cobb, Ambassador Sharkproject South Afrika



© Andreas M. Serec/Sharkproject

SHARKPROJECT
www.sharkproject.org

Diving with the Yemaya II in Columbia's

Malpelo Island

Text and photos by
Wolfgang Pölzer





Good size scorpionfish hiding from the strong current. PREVIOUS PAGE: You can even find some spots with colorful coral life on Malpelo

Three of world's best shark spots are located far off the coast of Central and South American, in the eastern Pacific Ocean. The least known of them, the tiny Colombian island of Malpelo, together with Galapagos and Cocos, create a "golden triangle" for big fish fans.

The current tugged at our fins. Severe threshold enables us to the rhythm of the long-drawn swell incessantly a few meters to the front and back. We had long since become accustomed to the incessant beeping of the dive computer display, which did not recognize the rapid changes in pressure. Even here,

a good 20 meters down, the forces of nature had no doubt who was the strongest.

Swarms of doctor-, handle- and butterflyfish could be on anything of it and seemed to dance around us effortlessly. Moray eels, with bodies as thick as a person's arms, were not peering out of their residential holes with only their heads as one usually finds them, but meandered out in the open virtually defenseless between the sparsely colonized rocks. Mostly flat, sharp barnacles were growing on the outcroppings; beautiful pink-colored coralline algae covered the jagged volcanic rock.

A dark gap yawned before us. Not quite three meters wide, but certainly more than ten feet tall, we were lured into the pitch black rock. Startled by

our headlights, a handsome whitetip reef shark peered at us in the distance. Shortly after, we were blocked by a wall of Blaustreifenschnappern in the way. They seemed reluctant to give us room to pass.

Behind the school of fish, a deep blue shadow loomed. The slot-shaped cavity turned out to be about a 20-meter-long tunnel. Shortly before starting their impressive romp, Dickkopf mackerel made their sickle-shaped fins; they were incredibly quick and agile. During the slow ascent to the surface, we were honored by a squad of eagle rays. The graceful animals soared in formation far below us on the barren rocky reef.

After leaving the reef behind, it seemed a long time after we shot our surface marker buoy to notify the dive boat to come to us that they finally



School of snappers at the dive site Cathedral



Malpelo

noticed us. There was extremely great danger in being abandoned, unnoticed out here. Being a good 500 kilometers from the Colombian coast and far away from any shipping routes was really uncomfortable. After a few minutes, neither substrate nor reef could be seen.

An invisible current came at us through the eastern Pacific. At a depth of around five meters, the sea suddenly turned dark ahead of us. Had the current taken us back to the rocks? No, it was a gigantic wall of jacks coming towards us -- the biggest school I have ever seen. Thousands of silvery fish bodies orbited around us, enveloped us, obstructing the view between buddies. We enjoyed the feeling of being part of the swarm for a few minutes. But just as suddenly as it started, the



CLOCKWISE FROM TOP LEFT: Jackfish and grouper hunting in front of a cave; The few corals are either hard and tiny or soft and very flexible to endure the strong currents; Resting grouper; Moray eels are very common at Malpelo and almost always out in the open and swimming freely



Silky shark
(left)
Wrasse
(below)

Malpelo

MV YEMAYA II

YEAR: 1965. Originally built as a supply ship for oil platforms, then a private yacht, floating casino and escort vessel for deep sea fishing. Finally, in 2008 completely renovated and converted into a dive boat.

CREW: Seven-man crew plus two dive guides

LENGTH: 35 feet

SHIP TYPE: Steel ship motor yacht.

ENGINE: 1,300 hp diesel

CABINS: Two double cabins including bath / WC, four double cabins with private sink but shared shower / toilet for two adjoining rooms, as well as two large master cabins. Maximum occupancy is 16 guests. All cabins with individually controlled air-conditioning is not.

FACILITIES: Ample space, upper deck with covered dining tables, lounge and sun deck. Spacious dive deck with lights and camera charger (110V), air shower, two sinks and two showers. Air-conditioned lounge with flat screen TV and DVD player in the lower deck.

Two sturdy eight-meter fiberglass dinghy with 2x2 110 or 140 hp for 12 divers.

Two Air and Nitrox membrane compressor 1, 2 and 3 Water power generators.

ELECTRICITY: 24 hours 110 V, American flat plug (adapter needed) in each cabin, 220 V only in the engine room.



Giant school of jackfish (above); Tiny little corals blooming in the current (right)

swarm was gone. Visibility cleared as the mackerel left us to move with the current.

The otherwise empty desert-like blue sea, however, had another surprise in store for us. About two dozen tuna plowed past us. Their interest in us seemed extremely low. After a few seconds, we had the open ocean back to ourselves. But not for long.

First, only a shadow could be seen on the edge of our vision. I had a little more than a hunch, a hope. Yes, it was a shark. One, no two, no, a whole group! And then the numbers increased very quickly. Out of nowhere, the sharks suddenly appeared everywhere.

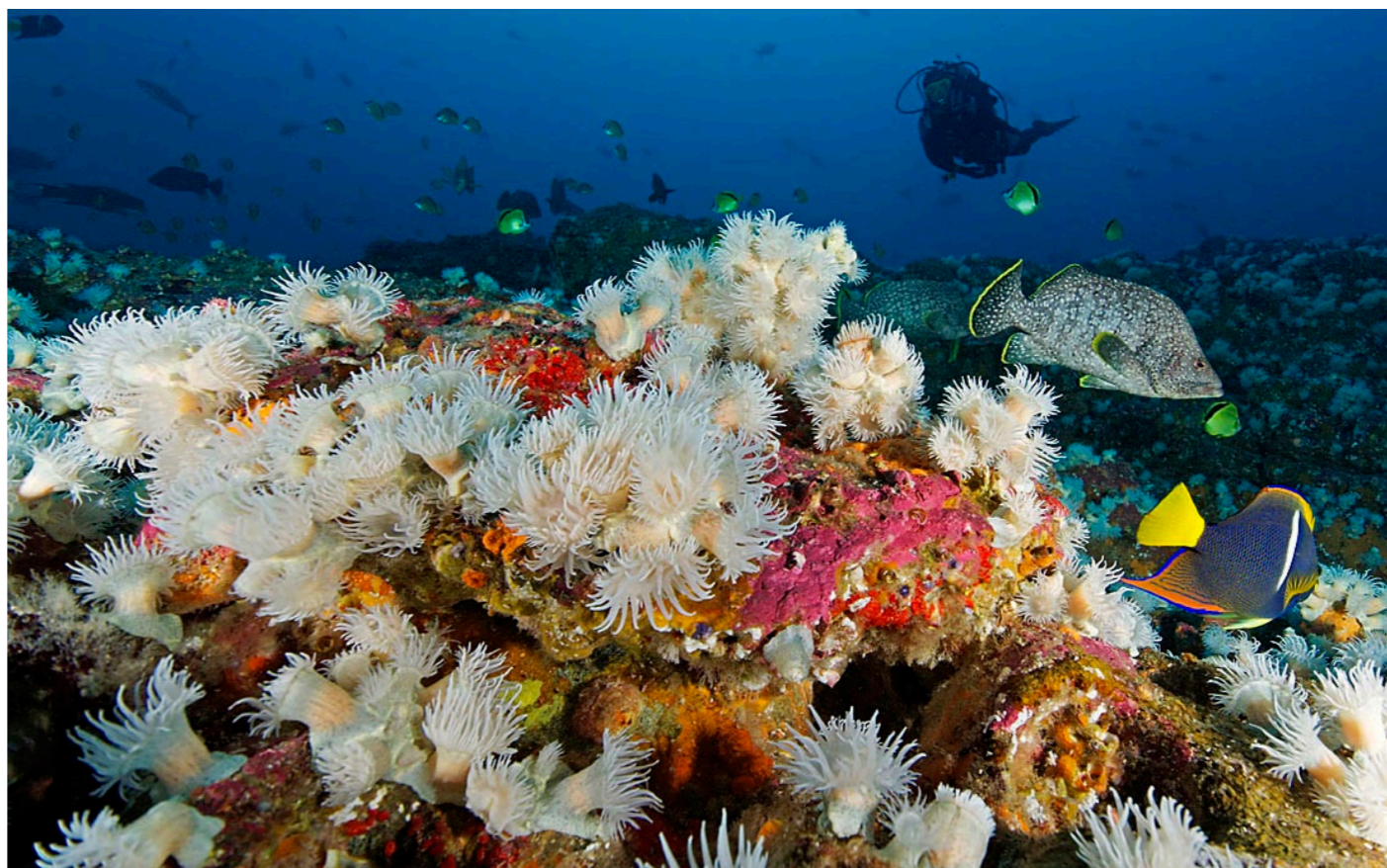
During the entire dive, we had hoped, feared that this would happen. Now, it had come true. We were surrounded by a vast amount of about

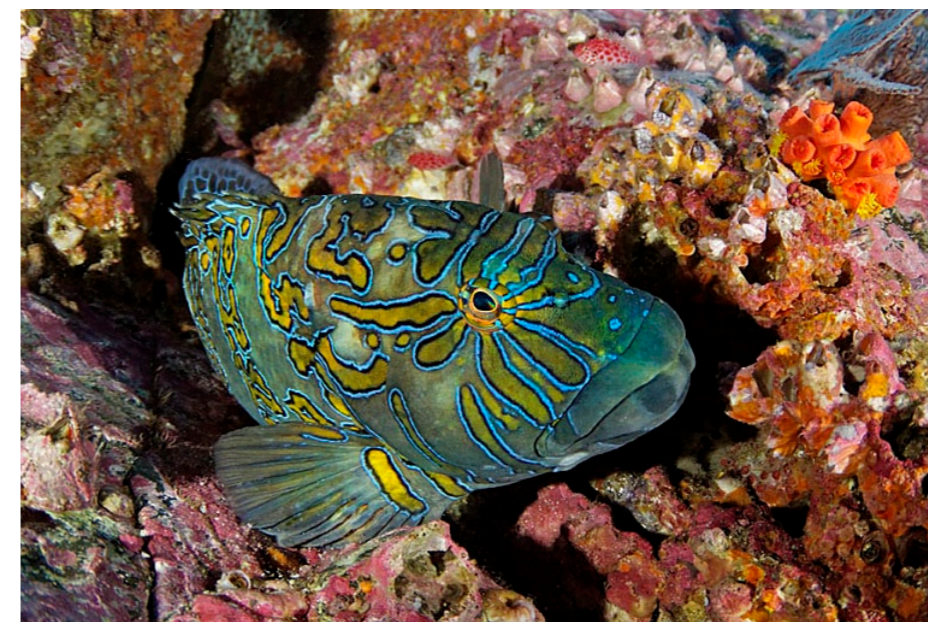
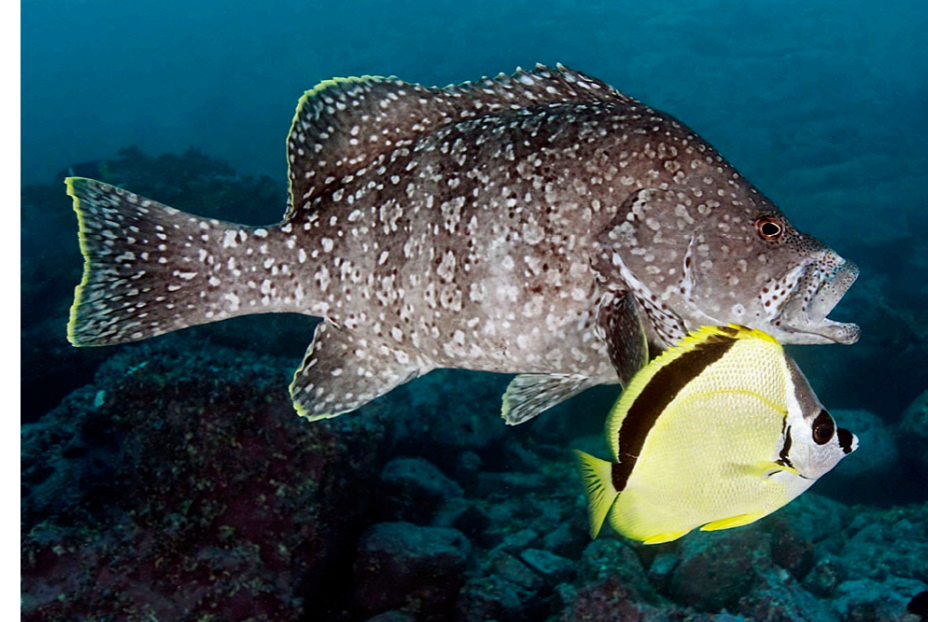
two-meter-long silky sharks! The lean, slightly golden, shimmering predators circled us, swam among us, enveloped us.

Their numbers were difficult to estimate; it was impossible to count them. Who knew how many were still out of sight? With over a hundred schools—some say even up to a thousand—these clusters of silky sharks are found only here at Malpelo and are unique in the world.

The animals seemed curious but not aggressive. Most did not come closer than five meters; some were brave and came within about two meters.

When others approached, they differed simply in their depth. Unfortunately, our air supply dwindled, as did the sharks, and all the schools of fish slowly lost their interest in us. We began our ascent.





MV YEMAYA II

VESSEL OWNER: Otmar Hanser, German, of Panama

EDUCATION: Only PADI nitrox (US\$170)

LANGUAGES: English, German, Spanish

DIVING REGULATIONS: Provides certification, log book and final medical confirmation. Minimum

QUALIFICATIONS: AOWD and 30 dives. We dive for safety on Malpelo (flow) only in groups.

MAXIMUM GROUP SIZE: 8 divers per guide.

MAXIMUM DEPTH: 40 meters.

REQUIRED SAFETY EQUIPMENT at the greatest possible buoy (preferably with 20-meter reel), a whistle and a small mirror. For every free diver is a transmitter of the GPS and radio-tracking system "Nautilus Lifeline" is available.

NATIONAL PARK FEES:
Coiba: \$20 pr person pr trip
Malpelo: \$85 pr person pr day
Cocos: \$35 pr person pr day

NITROX 32% SURCHARGE: \$100 pr person per entire tour

SAFARI TOURS: Year-round 6-15 day tours mainly to Coiba and Malpelo. A few events per year to Cocos.

DECOMPRESSION CHAMBER: Panama City

Just below the surface, we saw an arrow-shaped something shoot toward us, stop about three feet away, turn and disappear just as quickly. We saw just enough to realize that our brief visitor was a marlin. What a dive!

Features of Malpelo

The tiny islands of Malpelo are located about 650 kilometers southeast of Cocos and around 1,200 kilometers northeast of Galapagos in the eastern Pacific. Malpelo is nothing more than the top of a huge undersea mountain range. The island's banks fall into the sea to a depth of about 4,000 meters. Up to eight different ocean currents meet here during the year, all of which bring nutrient-rich deep water, and explain the high volume of large fish.

Around the main island, about 300 meters high, are assembled a dozen small rugged crags; almost all their submerged cliffs and rocky slopes harbor excellent diving spots.

Local fauna include two endemic species of lizards, which thrive here almost exclusively,

as well as terns, gulls, frigate birds and masked boobies. The latter boast a population of nearly 30,000, and are the second largest colony of masked boobies in the world. Important to us divers, however, are the sharks of which there are still enough living around the small island group.

Sharks, sharks and more sharks...

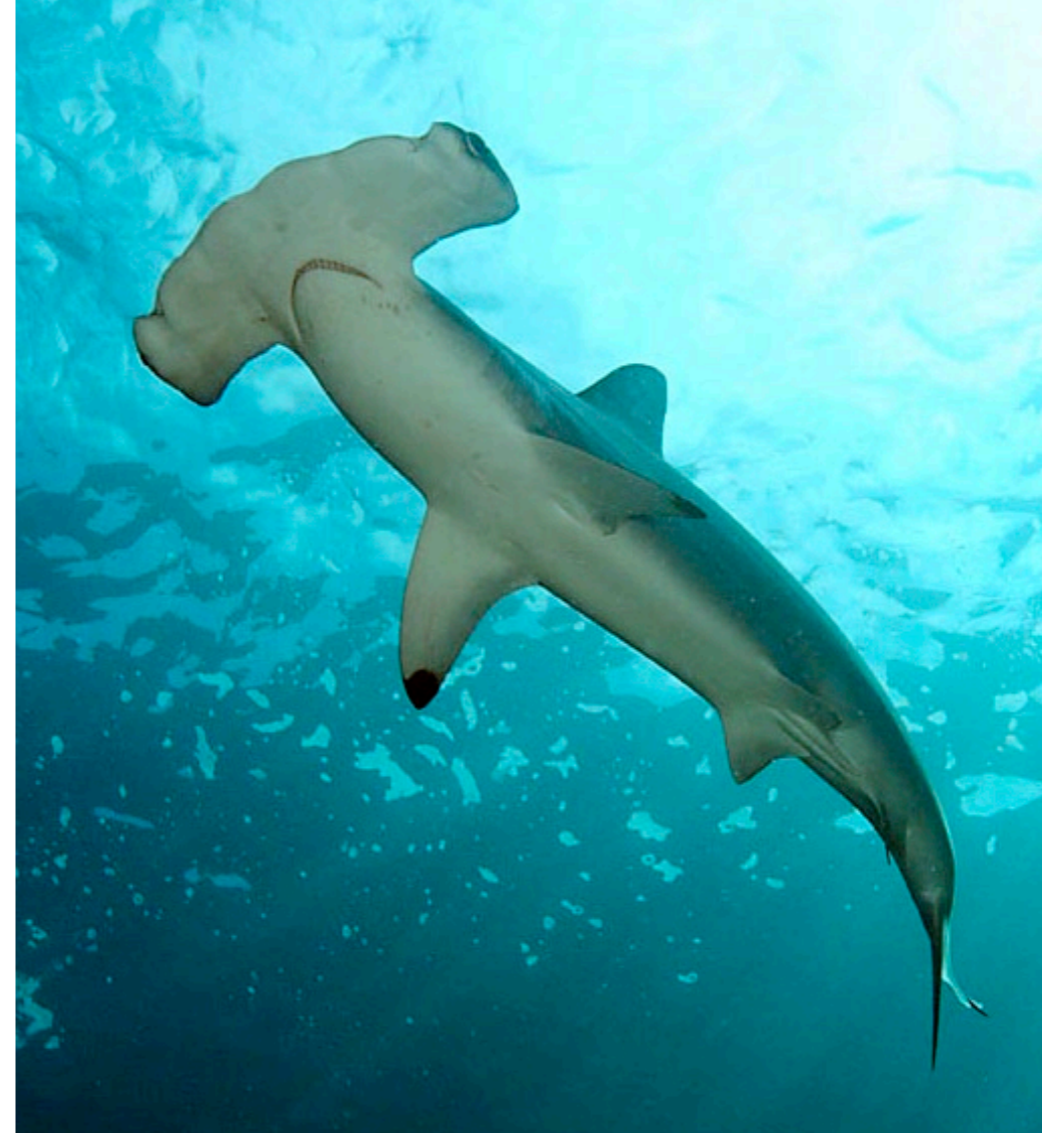
In addition to the aforementioned silky sharks, there are huge schools of scalloped hammerhead sharks, Galapagos sharks, whitetip reef sharks, whale sharks and the rare shield tooth sharks (*Odontaspis ferox* or smalltooth sand tiger shark) which can be encountered only at depths below 50 meters.

Fortunately, the region was formally made into a protected marine reserve in 1995, and in 2006, got on the list of UNESCO World Heritage Sites. Far from the mainland coast and surrounded by legal and illegal international fishing fleets, it is



CLOCKWISE FROM TOP LEFT: Scorpionfish; Grouper getting cleaned by butterflyfish; Giant hawkfish; Sunset at the island of Malpelo





Hammerhead shark (left)

Malpelo

If you are lucky, you can see a school of up to 200 silky sharks! The only spot on Earth where this has been seen before (far left)

MV YEMAYA II

FEATURES: mainly 12 liters and 3 liters piece 15 DIN / INT aluminum tanks—no adapter required. There are six rental equipment available on board—those who arrive without their own equipment, however, should pre-order rental equipment.

PRICE EXAMPLE: 9 nights on board (one dive Coiba and 5 days diving Malpelo), including 3 to 4 dives per day, VP, water, soft drinks, tea, coffee, snacks, round trip transfer to Panama City from US\$3,600, plus National Park fee (1 \$20 x 5 x 85 Coiba and Malpelo) = \$445 plus transfer airport/hotel/airport: \$35 Total: \$4,080.

FUEL SURCHARGE of \$100 is added if the oil price (Brent) of \$100 per barrel. A barrel of oil costs about \$120 will be charged a surcharge of \$160.

WEBSITE:
www.coibadiveexpeditions.com

PROS:

- Unique dive sites
- Stable and comfortable boat
- Excellent food
- Nitrox 32 additional charge
- Nautilus free Lifeline radio per diver

CONS:

- Long, arduous arrival
- Only suitable for seaworthy, advanced divers
- High cost of Malpelo National Park (USD\$85/day)



Whitetip reefsharks are not so common, like on Cocos Island

the major fish stocks that need to be protected at all cost. Located on the barren main island, a small Colombian military unit is stationed, which in recent years has acted on several occasions as an armed force against illegal long-line fishing. In addition, the few dive boats operating locally offer the sharks a little bit of protection, as the divers are vigilant and report to the base any ship that appears in the reserve. Unfortunately, they are not always equipped with a patrol boat.

One must be aware that the exclusiveness of the diving here is due to the low traffic of dive boats -- there are just five dive boats that have permission to operate in Malpelo. However, they are not allowed to operate simultaneously but sequentially.

Because of this rule, only one dive boat at a time is allowed to anchor at permanent buoys.

Of course, not everyone is so spectacular dive from Malpelo as described above, but in fact has just taken place without any exaggeration! On the agenda are meetings with the various schools of fish, groups of grouper, eagle rays, and also almost always on nearly every dive, hammerhead sharks. These range the seas mostly in large schools of up to a hundred animals and head directly to the many cleaning stations on the reef where they can get the full treatment from cleaner fish and shrimp.

Diving

When diving the seas around Malpelo, protective gloves are

recommended. Because you will want to see hammerhead sharks and it is not comfortable just floating through the reef, you will want to cling onto current-protected rocks covered with barnacles that have sharp edges. Furthermore, a large surface marker buoy is recommended, along with a 20-meter-long duty reel, if possible. A strong current breaks away from the reef, so there is a need to be able to have at depth a buoy shot immediately to the surface to mark your location. Diving here can be tedious and is certainly not for beginners, but diligent divers are often rewarded with unusual sightings.

The crossing from Panama to Malpelo takes a whopping 30 hours, and the Pacific Ocean is certainly not known to be



as still as a glassy lake. It is thus only recommended for die-hard divers -- at least bring your seasickness tablets in your pack. Since the tour is usually combined with Coiba, the first stage after eight hours of driving is done.

Travel only about 20 miles off Panama's coastal island group, and the area is still completely unknown. During the last Ice Age, the 27,000-square-kilometer archipelago of 38 islands was still connected to the mainland. The huge main island of Coiba is often referred to as the world's largest uninhabited tropical coral island and definitely has the largest coral reef of the eastern Pacific.

The diversity of the national park and UNESCO World Heritage Site is enormous both above and below the water. It boasts untouched tropical rain forests with a lot of endemic species such as unique

howler monkeys, opossums and white-tailed deer, but also crocodiles and numerous bird species, plus miles of snow-white sand beaches and river systems that can be explored by kayak.

There are about 30 dive sites in the park, which promise sensational encounters with schools of mobulas, cow-nosed rays, huge schools of fish, but also frogfish, sharks and turtles. In fact, whale sharks have been seen more frequently between Coiba and Malpelo than before. Another highlight is that

over 1,000 humpback whales come here to give birth and then to mate again from July to October.

Dive season Malpelo is an all season destination, but divers will find different



Large spiny lobsters are seen very common; Dive boat, *Yemaya II* (right); School of barracuda in crystal clear water (top)



A surface marker buoy with a long reel is an absolute must-have for diving on Malpelo; Diver and corals on the rocky reef (top)





highlights in each season.

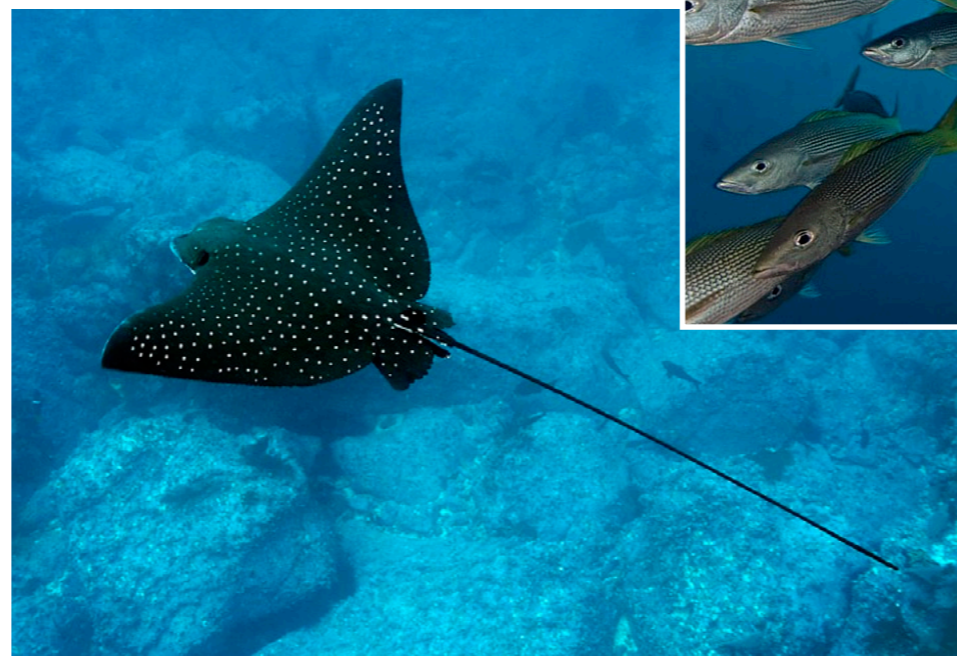
- Large schools of silky sharks (Silky Shark): May to early August.
- Large schools of hammerhead sharks: year-round, best from January to April.
- The rare sand tiger sharks (below 50 to 60 meters!) (Smalltooth Sand Tiger Shark, *Odontaspis ferox*): January to April.
- Whale sharks are kept on all year around Coiba and Malpelo. The best chance you have to see them is from July to September.
- As a bonus, come July-November to find over 1,000 humpback whales in the

waters of Coiba giving birth to young and mating.

Visibility can fluctuate within hours, between ten and well over 30 meters. The best chance for quiet seas is in March and April.

Water temperatures fluctuate throughout the year at the surface, between 26-28°C. There is a thermocline at significantly cooler, deeper water, but it can fluctuate from day to day. It increases from January to April from up to 25 meters to 15 meters. It is usually a little colder than 22°C under the thermocline; from January to April, temperatures may even drop to 15°C. One is usually best equipped with a 5-7mm suit and optional ice vest with hood.

It may all sound like insider's tips, but your dives can also be really sensational. However, one also needs to have a bit of luck. Visibility is generally much more modest in the park than on Malpelo and can often fall back to a few meters. That in this case, neither the past



Booby looking for fish

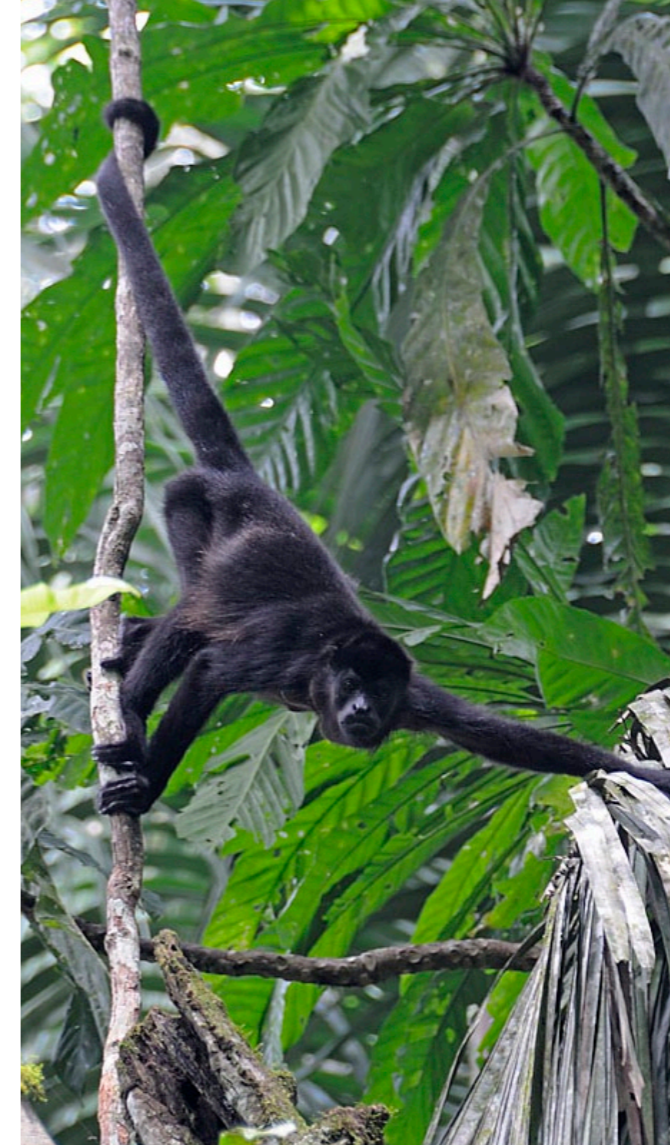
perhaps, or the giant whale shark floating school on skates or even a mother whale with calf gets to face is obvious.

Malpelo is undoubtedly one of the top ten of the world's best shark and big fish-regions. Seaworthiness, a minimum level of fitness as well as some diving experience—mainly current—is strongly

CLOCKWISE FROM TOP LEFT: Malpelo, a group of islands and rocks 500km from the coast; Several moray eels sharing one cave; Snappers; Eagle ray; Scorpionfish



Malpelo



THIS PAGE: On a jungle tour in Panama you find at least three different species of monkeys, colorful insects and fresh water turtles. Location of Malpelo Island on global map

recommended. A trip combining Malpelo with Coiba is definitely worthwhile. You will have the added chance of experiencing sensational dives around Coiba, too.

Top dive sites

Washing Machine. At this site, divers swim over several rocky shoals at the Isla Coiba Jicaron before getting to a minimum depth of ten meters. There are many schools of surgeonfish, jacks and snapper, but also colorful sea fans, anemones and bright yellow lionfish. Groupers, moray eels, eagle rays, whitetip reef sharks, hammerheads and whale sharks are often found. Very strong currents.

La Nevera. This site is located at a stepped, sloping cliff on Malpelo's west coast. The Spanish, La Nevera, refers to the refrigerator-cold deep currents that often attract large schools of hammerhead

sharks to two cleaning stations here at about 20 meters. In addition, there are many moray eels, groupers, stingrays and Galapagos sharks. Very noticeable swell.

Altar de Virginia. This site is located in a 12-meter-deep bay on the east side of Malpelo, near the pier. With a little luck, you can watch up close schools of hammerhead sharks coming to cleaning stations in shallow water. In addition, there are often eagle rays, a large school of barracuda, turtles and Galapagos sharks patrolling the area. Outside the bay, there are often strong currents.

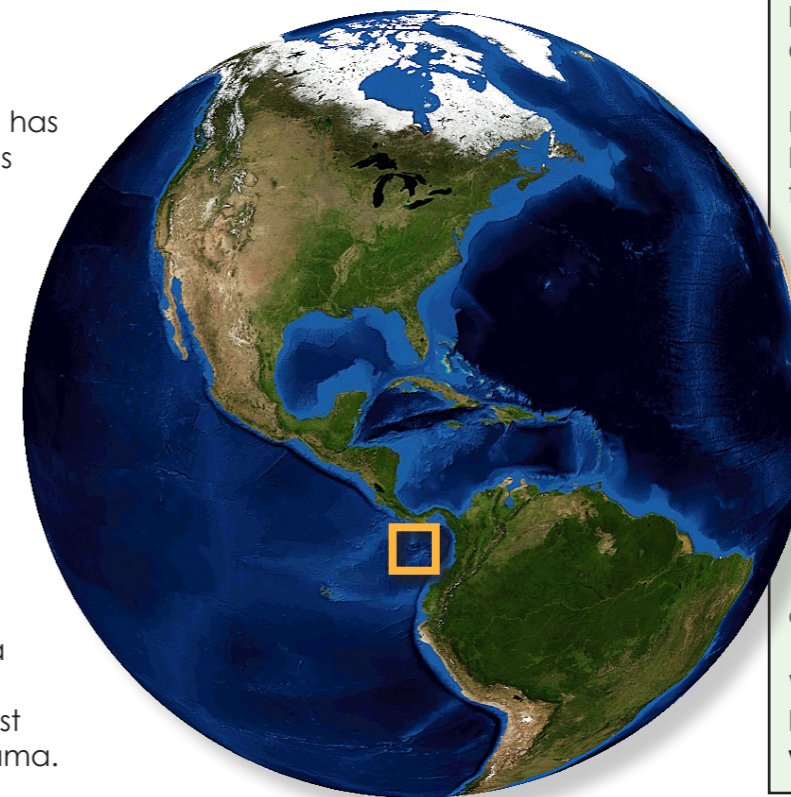
Topside excursions

If desired, you can climb a rope ladder hanging on a metal bridge and climb Malpelo. The barren rocky island is about 300 meters high and houses a small ranger station, a myriad of sea birds and a few

endemic lizards.

Coiba is far more diverse. The largest uninhabited tropical island in the world has very rich flora and fauna with numerous endemic species. As an alternative program to diving, there is trekking by kayak along the rivers of the original, pristine rain forest or walking on deserted white sandy beaches.

Before or after the safari, it is well worth the extra time to spend a few days in Panama. One can enjoy short expert-guided sightseeing tours of Panama Canal, city tours in Panama City, rainforest excursions on foot or by canoe as well as multi-day expeditions in the cloud-enshrouded forests of the highlands or a trip to visit the Kuna Yala Indians on the Caribbean side of the country organized by the Swiss ecologist Rainald Framhein (www.yalatourspanama.com). ■



NASA

FACT FILE

GETTING THERE We took Condor Airlines from Frankfurt to Panama City, with a short stopover in the Dominican Republic (about 12 hours). Usually one night is required before one goes on the four-hour bus ride to Puerto Mutis. *The Yemaya II* departs from this tiny river port, located about ten kilometers from the mouth of the river.

ENTRY REQUIREMENTS Passport (valid at least six months). EU citizens do not need a visa to travel to Panama.

CURRENCY Balboa, linked 1:1 to the U.S. dollar. In fact, there are currently only Balboa coins. Legal tender is, in fact, the U.S. dollar. On the ship, one may pay in U.S. dollars or euros, but only in cash.

COMMUNICATIONS Tri-band capable cell phones work in Panama. The ship usually gets no cell phone reception. For an additional charge, however, a satellite phone is available. Internet is available in Panama City.

DECOMPRESSION CHAMBER Panama City. Due to the distance from Malpelo, a rescue helicopter cannot be used. Conservative diving is therefore advised.

TIME GMT -6 hours (- 7 summer time)

CLIMATE Dry season is from mid-December to early May, and then the rainy season comes, with heavy rain only during the months of October and November.

WEBSITES
Panama Tourism
www.visitpanama.com



A Journey Beyond the Three Seas
Israel

Text by Andrey Bizyukin and Yakov Samovarov. Photos by Andrey Bizyukin, Yakov Samovarov and EPSON Red Sea



ANDREY BIZYUKIN



YAKOV SAMOVAROV

On my first flight to Israel, I stretched out in a comfortable chair on EL AL Airlines, enjoyed a kosher meal and reread notes by the famous Russian traveller and pioneer explorer, Afanasiy Nikitin (circa 1466-1472). Only on the approach to Tel Aviv did I suddenly realize how small a country Israel was, and that it bordered three seas. Now, I had a unique chance (just as the great Russian explorer did) to visit these three seas—the Red Sea, the Mediterranean Sea and the Dead Sea—all in one trip.

My acquaintance with the country began in Eilat—Israel's southernmost city. A line of quaint hotels stretched for several kilometers along the coast, and many dive centers were located here. One can find excellent places for diving at the northernmost end of the Gulf of Aquaba on the Red Sea.

With my dive buddy, Yakov Samovarov, I would dive the missile wreck, *Satil*. I asked Yakov to tell me about the day's dive. "Six or seven years ago, I did my first dive on *Satil*," said Yakov. "It was formally known as the Israeli Navy missile boat with the proud name of *Sufa* (Storm)."

In 1993, *Sufa* was decommissioned from the Navy and sunk in Eilat as an artificial reef. All military equipment was taken out before this procedure. Now, the ship rests on a level keel very close to shore.

The bow of the *Satil* is located at 18m,

the stern, at 21m, with a maximum depth of 24m. The ship has long been overgrown with a thick layer of algae and corals. Inside and around the vessel are darting swarms of sea bass, barracuda, lionfish and rays. Beginners can dive to the top of the wreck, and experienced divers are allowed to penetrate the interior.

We arrived at the Marina Divers club, unloaded the gear from the car, drank some water, heaved our scuba gear onto our backs and headed out to the sea via a cozy beach. The beach crowd slurped ice drinks through straws. Sunbathers lounged in deck chairs under sun umbrellas and looked with interest at the men in black wetsuits, fins in hand and scuba gear on their backs.

We were "men in black", bent under the weight of our equipment, moving in a chain, like ants, eagerly heading

Diver and anthias on coral (above) and with sergeant majors and cornetfish (right), Red Sea, Israel
PREVIOUS PAGE: Underwater photographer and lionfish



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

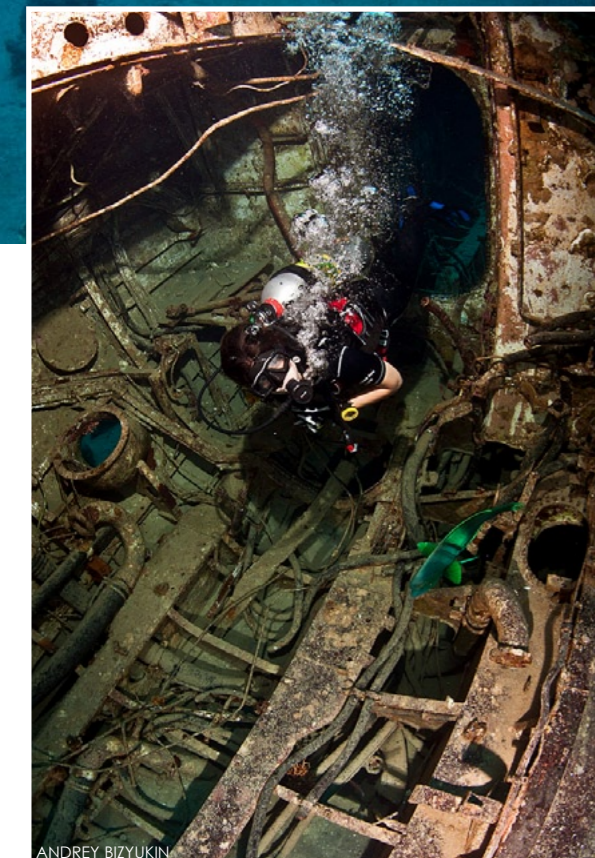
antennae protruded from deep cracks.

In the corner of my eye, I noticed a small white headed snake eel, but there was no time to consider it. I had to catch up and hang out in the wake of a couple of dozen divers kicking their fins, when a huge ship appeared suddenly out of the blue shadows.

It stood exactly on its keel,

and at this point, the deck could not be seen. For some reason, the Flying Dutchman came to mind. In some places, the vessel's rusty sides had had time to acquire hard corals—poles, shrouds and the mast were lushly overgrown with bushes of white and reddish-brown soft corals.

We got to the bow of the wreck, the upper deck, at a depth of 18m. As experience div-



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towards the water. I couldn't help but think what a shame it was that the sun worshippers we passed would not see all the beauty that could be found in the underwater world.

The wreck of the *Satil* was located 90m from shore. Diving there was easy, even for a novice. A striped, red and white buoy marked the location of the wreck. The first time you go, you should probably bring a compass for direction. Frankly speaking, finding a 45-meter ship underwater is usually easy, but here, it's

almost impossible. I say almost, because from time to time, there have been cases where divers have managed it without a compass.

We got in line with Sasha, our dive guide, as two links in the chain of divers entering the water. Sasha had warned me that the bottom was rocky, with a lot of large slippery boulders, so I had better to go slowly, especially if there were waves on the surface, and my hands were busy steadying the equipment. We submerged in the water to our

waists, donned our flippers, spit into our masks to avoid misting, placed our mouthpieces, exchanged okay signals and dived.

We started the dive from a shallow place and quickly reached a steep slope. The depth increased rapidly. At a depth of 10 meters, a small cliff rose two meters from the bottom, covered with corals and shoals of colorful fish scurrying around. White boxer shrimp with long



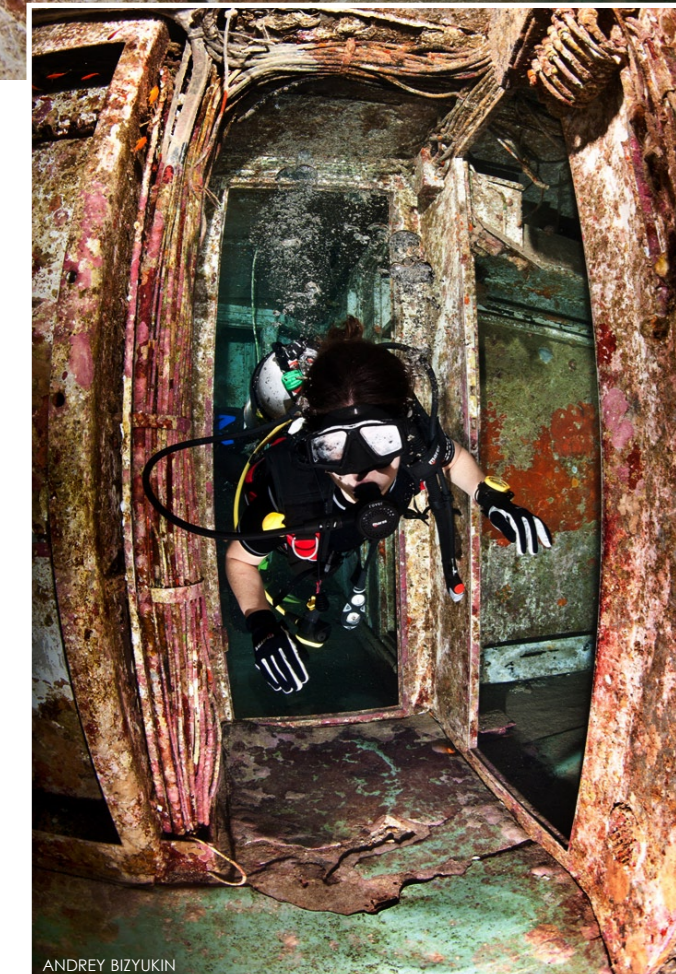
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THIS PAGE:
Scenes from
the *Sufa*
wreck

Inflated
puffer-
fish (left);
Parrotfish
(below);
Spotted
sea snake
(bottom)

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ers, we first inspected the round hole in the bow. This was the position for a 76mm cannon. On the stern, there were two large rectangular cutouts; these were the positions for the missile systems.

It was nice to see so many divers underwater. Some of them swam towards the ship, some swam back. There were divers with single cylinders and twinsets, with nitrox and trimix, with underwater scooters and rebreathers. It felt like a group of European diving elite had gathered here underwater in Eilat.

We looked at the wreck from all sides, climbed up into the hold, inspected the crew cabins and the captain's wheel cabin. We stopped to enjoy the spectacular views of soft red corals. We took pictures. It was a great wreck!

On the way back to the shore, we observed colorful tropical fishes living in coral trees, chasing a striped sea snake, swimming in a flock of curious, striped fish.

When I was on my way back to the



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back to Manta Diving center (the hosting dive center of the Epson Red Sea competition) to change my cylinders, I met a company of cheerful divers: men on a creative scouting trip with underwater photo and video cameras and made-up models dressed in brightly colored ball

gowns and stylish, fashionable clothing. We started talking, and it turned out that the Epson Red Sea competition was going right now, here in Eilat, and all my new friends were participants in this grand event—the

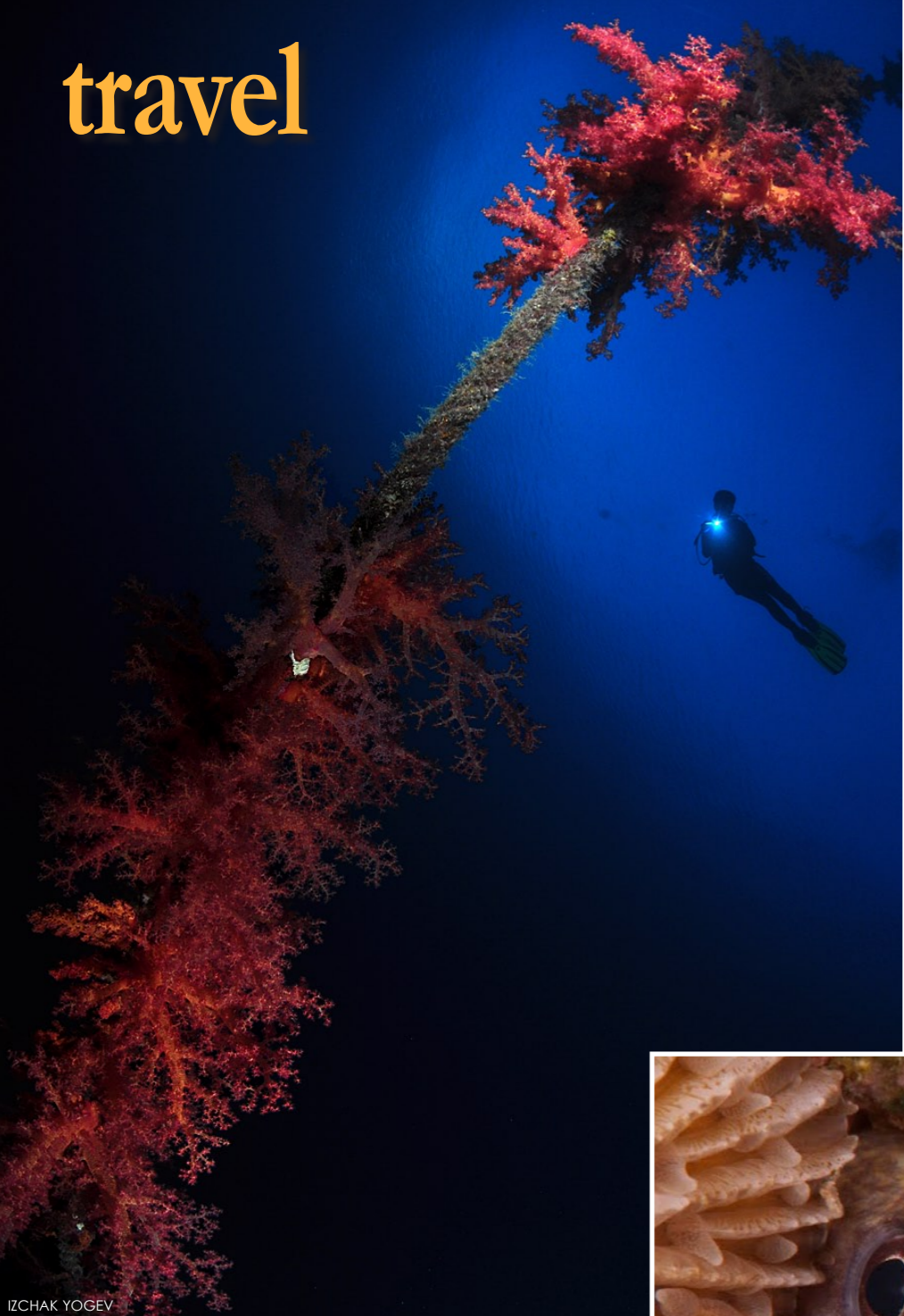


YALOV SAMOVAROV



ANDREY BIZYUKIN





IZCHAK YOGEV



AMIR STERN



ESTEBAN TORE



AMIR STERN

Moray eels (above) and spotted boxfish (top) by Amir Stern, Israel, \$10,000 first prize winner and Corals (top left) by Izchak Yogev, Israel, second prize winner of Five Images Category; Goby (center) by Esteban Tore, Spain, first prize winner of Best Singular Image, ERS 2011



Israel

ALEX VANZETTI

Fashion shot (above) by Alex Vanzetti, Israel, second prize winner and (right) by Vitalii Sokol, Russia, third prize winner in the Fish & Fashion Five Images Category, Epson Red Sea 2011

choose the right place; the Red Sea coast near Eilat was a perfect fit. Pilosof collected the most authoritative international jury. With the credibility of Pilosof and a huge number of his friends, the event has managed to grow without too much difficulty. Upon finding sponsors and money, everything began to turn around, and when Epson Europe joined the festival as a sponsor the festival got a new name—Epson Red Sea.

Today, Epson Red Sea is the joint project of Pilosof and Epson. The next competition takes place 4-10 November 2012. They have a prize fund of US\$100,000 dollars, a large number of partners and



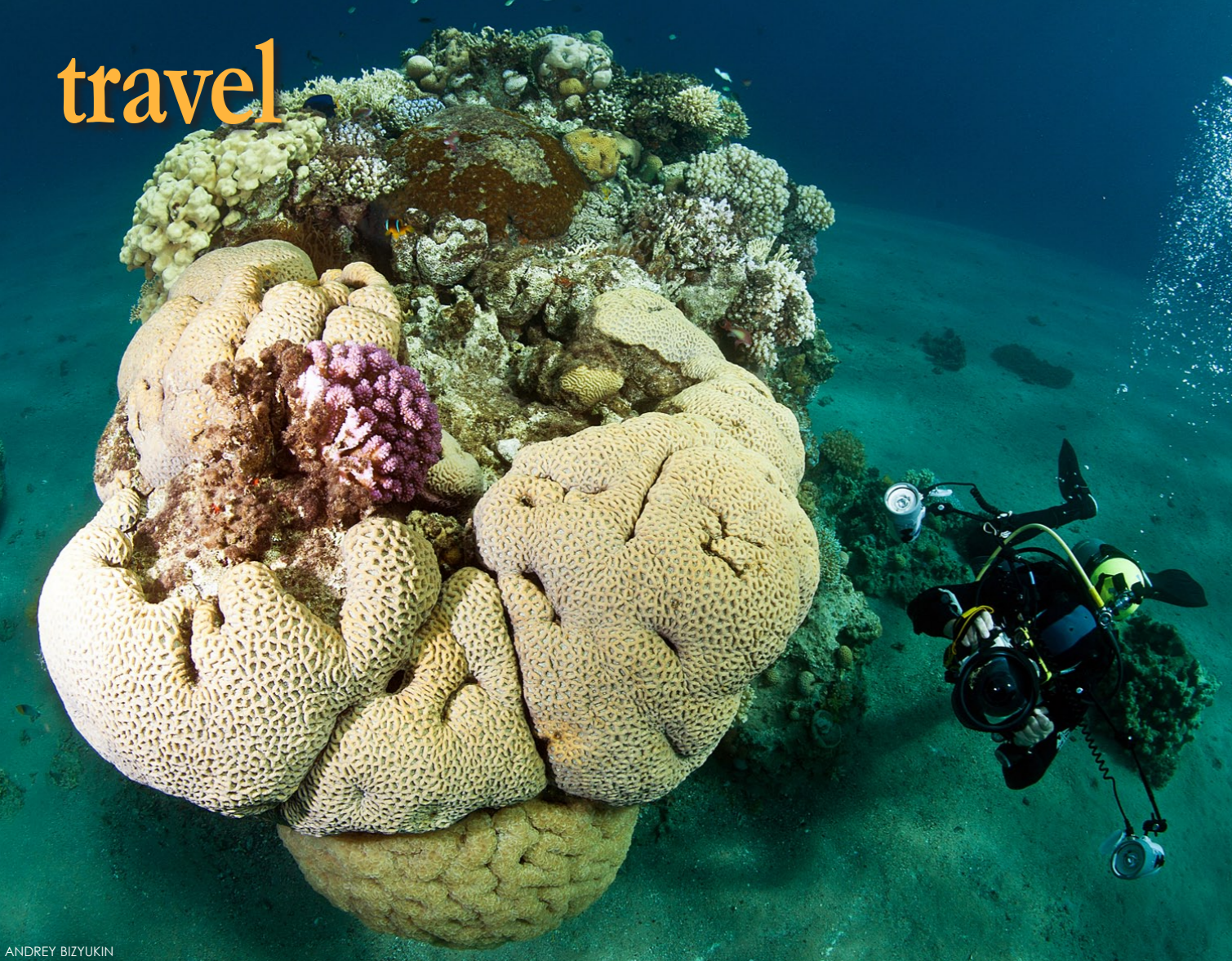
VITALII SOKOL

international festival of underwater photography, video and fashion held annually in Israel.

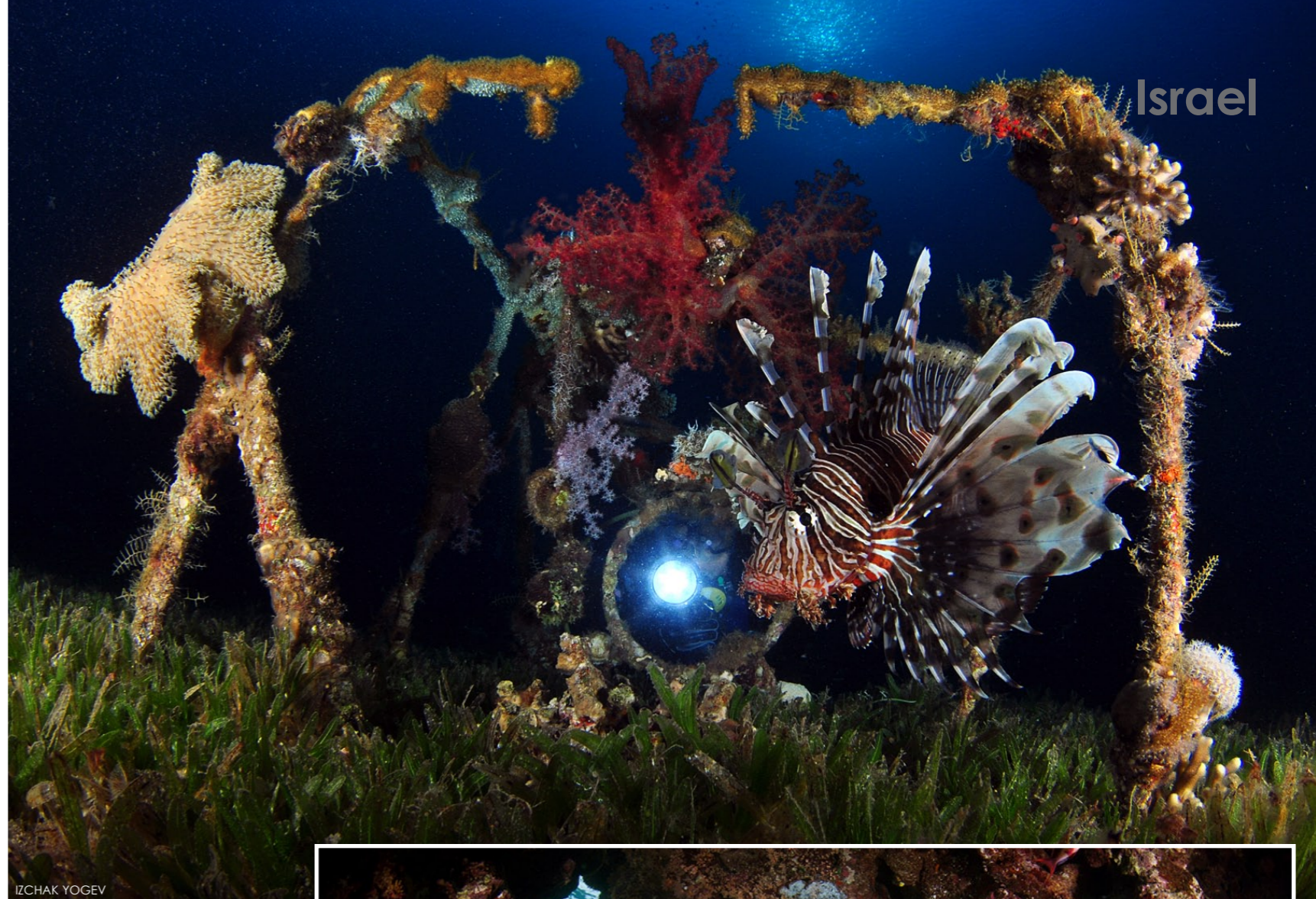
Epson Red Sea 2011

Several years ago, David Pilosof, a renown underwater photographer of Israel, decided to organize a festival of underwater photography, but in a completely new format. The festival would be interesting and attract visitors and participants—talented underwater photographers—from all over the world.

For this purpose, it was necessary to



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IZCHAK YOGEV



YAKOV SAMOVAROV

Corals (top right) by Izchak Yogev, Israel, second prize winner of Five Images Category, Epson Red Sea 2011

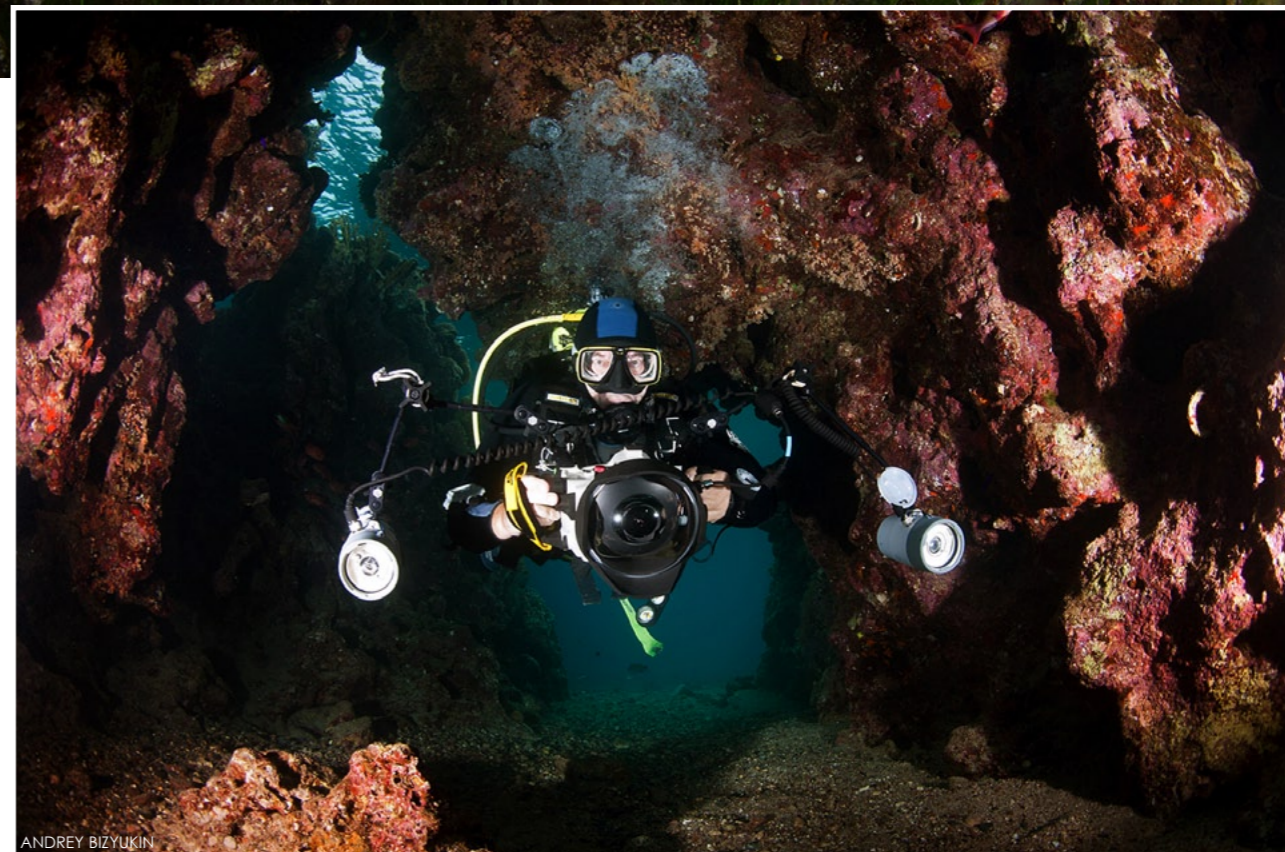
participants from around the world. In order to participate in the event, underwater photographers choose a suitable category for their project, and during the few days of the festival's shoot-out, they have to capture images of the underwater world of Eilat. The categories listed in 2011 included: Five Images (series of five photographs), Best Singular Image, Amateurs (for beginners), Children of Epson Red Sea (images by kids), Fish and Fashion, Fish of the Year, Jury's Prize, The Mayor's Prize, and Video.

In 2012, for the first time, there will be the National Team category. "Each team participating in the National Team category should consist of three photographers from the same country, competing in the Eilat Shoot-Out," said Pilosof. "Photographers can team up independently. Alternatively, photographers can inquire at the competition office about other photographers from their country partic-

ipating in the Eilat Shoot-Out for the purpose of joining forces. There is no restriction on the number of teams originating from the same country." For more information, interested photographers can visit www.eilatredsea.com.

The Red Sea at Eilat

Eilat's underwater world is full of life, and it is extraordinarily diverse. There are many colonies of hard and soft corals scattered along the bottom, attracting a variety of fabulously colorful tropical fish. One can find moray eels, groupers, lionfish, parrotfish, needlefish, rays and underwater snakes, puffers, glassfish, etc.—the typical Red Sea inhabitants. There is always clear, warm water, an absence of strong currents and convenient, easily accessible shore diving, which makes Eilat a favorite place to dive for underwater photographers at any level.



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THIS PAGE: Scenes from the Red Sea at Eilat, Israel. Diver in coral encrusted swim-through (above) Diver and coral garden (top left); Striped nudibranch on red sponge (left)



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Israel



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THIS PAGE: Scenes from the desert near Eilat; Bedouin hospitality (right) tea and flat bread; Heading out to the desert on camels (left)

secrets of the professionals, as well as skills of the best masters of underwater photography from America, Europe and Asia. During break times between dives and before the official gala awards ceremony, we visited with our new friends the ancient copper mines of King Solomon located just an hour's drive from Eilat. What amazing rock formations—works of wind and water over thousands of years. In this place, there was a collection of archaeological sites, ancient rock paintings excavated in the ancient world's smelters, and traces of the thousand-year-old process of the development of humankind. In the past, it was a land full of life. Now, it is a mercilessly sun-scorched desert. There are just a few centimeters of rain for year. Today, this land is the home of the Bedouins. They provide camel rides for tourists and offer tea and cakes cooked over an open fire. This amazing archaeological park with its exotic red rock landscape was disturbing in a way, providing



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glimpses into our genetic memory and ancient civilizations. It did not leave anyone indifferent. We said our goodbyes to our new found colleagues and photographer mates. We had become good friends over these three unforgettable days of diving, and we all had fallen forever in love with the underwater world of Eilat. For me, now, it was time to head north to the Dead Sea.

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The Dead Sea

—How to become a world champion deep sea diver

The opinion exists that the Dead Sea is one of the most saline seas of the world. The salinity of the water is 310ppm, which is almost ten times more salty than ocean water. To dive here, you have to put on about ten times more weight on your weight belt. The whole set of equipment for diving in the Dead Sea will weigh from 65 to 70kg

depending on the weight and size of the diver. Despite glum thoughts about the very heavy weight, I have indeed been able to look at the Dead Sea far below the waves.

Our encyclopedic, erudite guide, Irad, told us that the water of most rivers in the region is now almost entirely used to irrigate agricultural fields in Jordan, but in times past, they filled the Dead Sea. That is why the level of the Dead Sea is falling dramatically—about one meter per year. The current level of the Dead Sea is 420 meters below sea level and the standard sea level of the Baltic Sea.

THIS PAGE: Scenes from the Dead Sea. Photographers can only take top side shots because of the high salt content of the water, which corrodes camera gear

Water is drying up, and the sea is becoming more and more salty. The huge concentration of rare minerals makes this a unique water source for rare and valuable chemicals. Here at the Dead Sea in Israel is the largest factory for the extraction and purification of chemical elements from supersaturated salt sea water. However, prolonged exposure to water of such super saturation can corrode skin and can cause severe burns to the eyes and mucous membranes. It is said that this water can corrode metal and even the rubber seals of underwater cameras. Swimming and diving in this water becomes a real extreme activity, requiring special equipment that is resistant to chemically aggressive environments.

According to the authoritative opinion of *National Geographic*, the Dead Sea was included in the list of the seven wonders of the world in 2012.

We sank, descending deeper and deeper on a comfortable sled tethered to ropes, getting closer and closer to the floor of the Dead Sea. As experienced divers, we knew we had to equalize the pressure in our ears as often as possible in order to reach a depth of 420m. To get to this incredible depth, I did this countless times. Finally, after a half an hour descent, we got to the bottom of a huge valley near the bottom of this legendary sea.

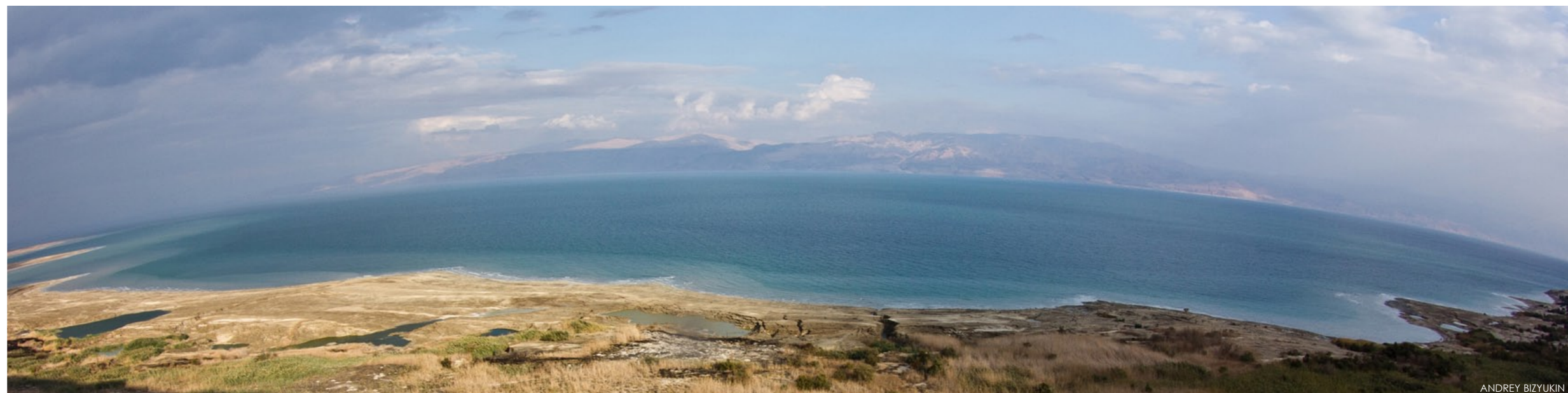
The sea was stormy, even at a depth of 420m. The entire coast line and the slopes into the sea, visible from the shore and disappearing into the depths, were covered with a thick layer of large



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THIS PAGE: Scenes from Jerusalem. View from Mount of Olives (left). Inside the prayer hall of the Western Wall (right); Wailing Wall (below); Prayer room in the Church of the Holy Sepulchre (below left)

dense that one did not even need to move one's arms or legs to stay afloat. Like an unsinkable boat, a person could easily, effortlessly float on the surface of this super saturated salt brine.

We had to be very careful not to splash water and avoid getting water in our eyes and on our lips. A total dive time of only 15 minutes was considered safe and recommended by doctors. Then, we had to come back



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to the shore very carefully, trying not to injure our arms and legs on the sharp salt crystals along the sea's edge. Freshwater showers were highly recommended after the dive in order to save our skin from dehydration and becoming hypertensive to the chemically aggressive solution of the sea.

Finally, the long awaited sweet moment of glory came. The dive record was set: the deepest dive—420 meters—carried out on a sled. It was worth it to take the calculated risks for this very heroic moment.

Jerusalem

We continued our trip to the north end of the country and made a stop at the

watershed area between the Dead Sea and the Mediterranean Sea. We stayed for a day in Jerusalem, one of the oldest cities in the world. It's the city of three major world religions and the capital of the Israeli state.

Making our way through the narrow streets of Old Town, between lots of souvenir shops and high-profile promotional offers, we got to the holy places.

The Wailing Wall—the western wall of the temple of King Solomon—was built over 3,000 years ago. It is sacred to all Jewish people, a place where people prayed in the days of King David. Today, the faithful here, as they did many hundreds of years ago, asked for their deepest wishes, putting little notes in the



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salt crystals sparkling in the sunlight.

But despite the frightening stories told by our guide, it was impossible for us to miss out on the incredible opportunity here. The vain desire to feel like pioneer-

ing deep-sea divers pushed us to take a desperate risk, and so, we dove in.

One by one, we tried to dive into this magical sea. The water was so



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THIS PAGE:
Ruins of
Caesarea,
the ancient
port of King
Herod, not far
from Tel Aviv

north to Tel Aviv—the
second capital of the
Israeli state. Here, the
famous restaurant and
bar, Nanuchka, gave us
the happy opportunity to
experience the night life of
Tel Aviv—an unforgettable
experience for each guest.
With original music, danc-
ing, decorations, food,



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cracks between the stones of the ancient walls. The feeling of holiness in this place was almost palpable. Prayer did not stop here; it went on all day and all night.

The Church of the Holy Sepulcher is the site that has attracted Christian pilgrims from around the world for centuries. It is believed to be the location of the crucifixion of Jesus Christ as well as the place of Christ's burial and resurrection—both the hill upon which Christ was crucified (Golgotha, or Calvary) and the ancient cave where

Jesus' body was laid after removal from the cross. Another sacred place is the Mount of Olives—believed by early Christians to be the site from which Jesus ascended into heaven. Over the centuries, its slopes have been covered with countless tombs—some of the world's most expensive. Today, it is one of the most prestigious cemeteries on Earth.

The Mediterranean Sea at Caesaria

After Jerusalem, our way led farther



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THIS PAGE: Divers explore remnants of ancient ship wrecks in Mediterranean Sea. Jordan River (right) and friendly otter on shore

drinks, and joyful communion in such a friendly atmosphere of good will, it would be difficult to find a similarly creative organization of night entertainment anywhere else in Europe or Asia.

The morning after our evening city tour, we traveled not far from Tel Aviv to the town of Caesarea—the ancient port of King Herod. There were a lot of rare historical artifacts at the bottom of a shallow enclosed bay built here in Roman times. All these objects were being studied by underwater archeologists.

We dived with an experienced guide. The water temperature was cool—21-22°C. Visibility was about three meters. In order not to get lost in such troubled waters, we had to stick



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with the group. We found an ancient marble column not so

far from the royal palace. It had fallen into the sea from aboard a Roman galley over 2,000 years ago. Now, only curious divers and fish were visitors of this exotic underwater museum. We had a great opportunity to admire its grandiose size and excellent quality of marble.

Despite the relaxed feeling of being in a museum, the muddy and cold water made diving here quite extreme. Lagging behind a couple of minutes to take pictures, I got distracted, lost track of our dive guide and immediately got lost in the muddy water. I had a long swim alone among the piles of ancient stones, old anchors and remnants of sunken ships. Only in open sea, in a strong sea swell, did I finally catch up with my friends, finally. They were busy—enthusiastically involved in taking shots among numerous underwater rock ridges.

Jordan River

Continuing on our trip north, we spotted the Golan Heights



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in the distance near to where we would find the Sea of Galilee and the Jordan River—two Christian holy places. These sites were considered holy because of the water. So, we thought there should be a lot of people who would want to immerse themselves in the holy water, underwater.

We investigated these loca-



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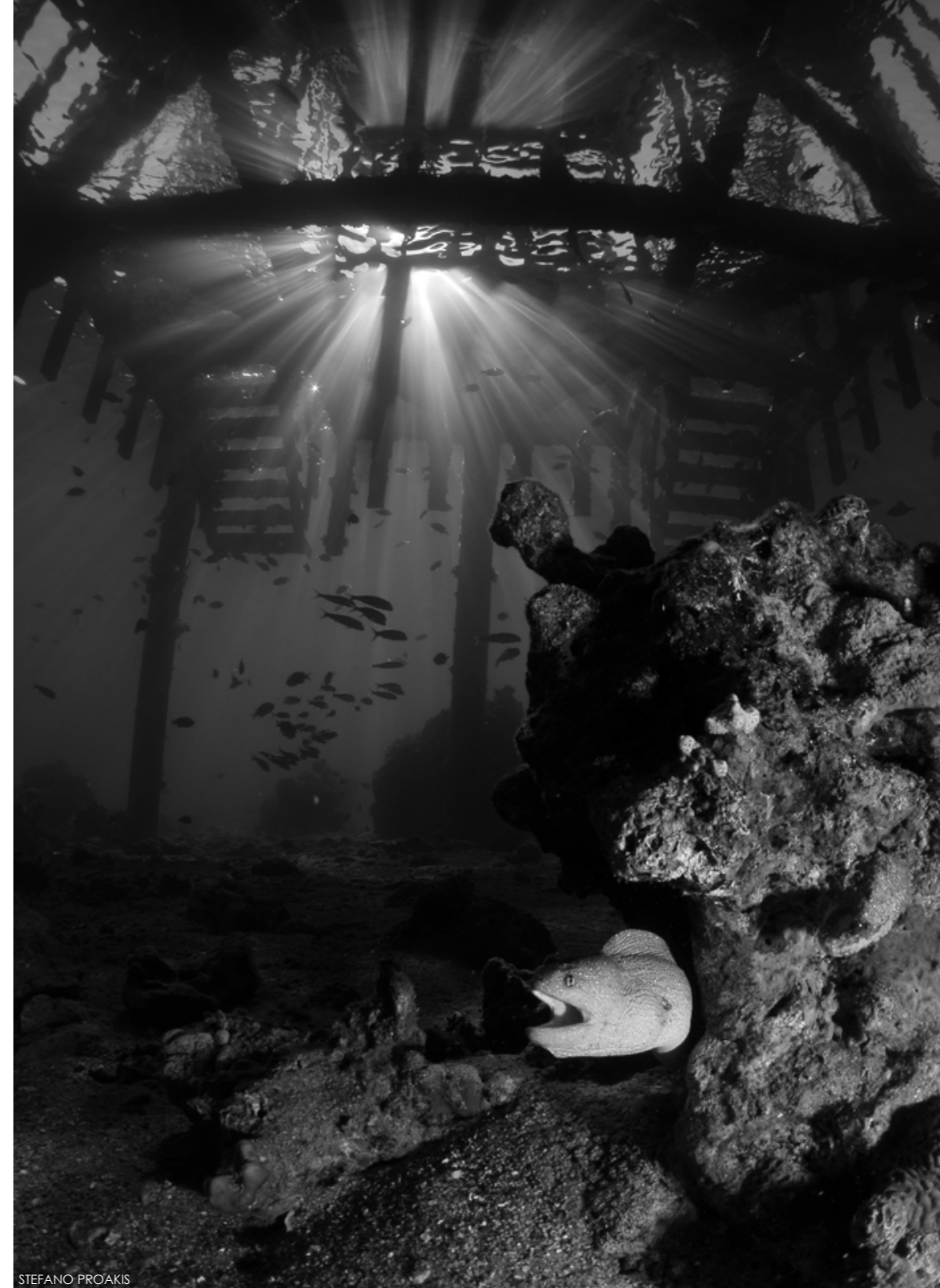




MARK FULLER



JOHANNE FELTEN



STEFANO PROAKIS

Diver and backlit corals (above) by Mark Fuller, Israel, third prize winner in Five Images Category, Epson Red Sea 2011; Fashion shot (above) by Johannes Felten, Israel, winner of \$2,000 Mayor's Prize and the \$2,000 first prize winner of the Fish & Fashion Five Images Category; Fish under pier (right) by Stefano Proakis, Italy, winner of \$5,000 Jury's Prize

tions for the presence of a diving infrastructure. But we were unsuccessful, and found the water of the Jordan River to be incredibly muddy. It was home to a lot of curious otters and catfish, totally unafraid of people. But diving here with scuba would only be possible through touch, as visibility was low to nil.

The house of St. Peter and the ruins of one of the oldest synagogues were

located right on the Sea of Galilee. The water here seemed much more transparent. We had an uncontrollable urge to dive here at least, but we couldn't find a dive center that would help us do so. After making an unsuccessful first reconnaissance trip, we had to just be satisfied with examining approaches to the water and making future plans to come back here again better prepared.

Afterthoughts

On the flight home, I stretched out my legs in a comfortable armchair on EL AL Airlines, enjoyed a kosher meal and flipped again through the travel notes of Afanasiy Nikitin. What else could the renowned explorer have written about this small intriguing country? Israel has absorbed centuries-old cultures, experience, knowledge and traditions of countless peoples

of the world. It has become an historical site, often over the centuries, a center for the suppression of cultural integration of world civilizations. What insights can one reach after a tour here beyond the three seas in these contemporary times? ■

The authors express their deep appreciation and thanks to the Israeli Ministry of Tourism, EL AL Airlines (www.elal.co.il) and

special thanks to Irad Fenichel (irad1@netvision.net.il)—a most encyclopedic, erudite guide who helped us to understand and appreciate the culture and traditions of Israel. Yakov Samovarov and associate editor Andrey Bizyukin are underwater photographers from Moscow, Russia.



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POINT & CLICK ON BOLD LINKS



Equipment *in the news*



Edited by Peter Symes & Rosemary 'Roz' Lunn



Lightmonkey

Back in the day, cave divers would buy a canoeing helmet and promptly snooty loop their lights onto each side. And then helmets fell

out of favour in certain quarters because it was perceived that the diver had rotten buoyancy. Enter stage left, Light Monkey. They understood that accidentally bashing your head whilst scooting in an overhead environment really doesn't make for a happy dive. Available in 'Monkey Brown', the helmet is an injection molded high density polyethylene (HDPE) suspended over an adjustable inner cradle. It has nine ventilation holes on the top and sides to release trapped air and has no foam lining that would make it overly buoyant, and comes complete with an adjustable chin strap and quick disconnect buckle. This comes in one size only, so won't fit everyone, so we recommend that you measure your head to ensure a good fit. Lightmonkey.us

F2

Travelling divers should have a look at this pair of fins. Not only is the F2 lightweight, it uses a shorter blade that packs easily as well. The blade is designed to increase efficiency on both the down stroke and the upstroke, supposedly with any type of kick and eases maneuverability in tight areas. The material is Monoprene and comes with adjustable stainless steel spring straps as standard. Hollisgear.com



D6i White

This Suunto instrument features an integrated tilt-compensated 3D digital compass and comes with an optional wireless air integration showing current cylinder pressure, remaining air time. There are four dive modes: Air, Nitrox, Freedive, Gauge. It has gas-switching capability and full continuous decompression algorithm comes with scratch-resistant sapphire crystal glass and is available with silicone-rubber or steel bracelet, or with black or white wrist strap.

Suunto.com



LED 15

LED15 canister system combines the power of HID with the reliability, durability and efficiency of LED technology. The result is the concentrated beam preferred for exploration diving. The Lithium-Ion Polymer battery is rechargeable; the LED15 burns at over 1,000 lumens of brightness for six hours. The single LED offers the advantage of a long 20,000-hour life and the 8 degree beam width is much tighter than multi-LED arrays. A 90 degree version is available where rear mounting a canister is necessary. Hollisgear.com



Transpac

The new T3300 TransPac XT is designed like a backpack design with an integrated hip belt and ergonomic shoulder pads. Dual density foam pads provides lumbar support and snugly hugs the lower back and promises chafe free comfort around the

shoulders. The weight is evenly balanced across the hips and back, when diving either with singles or doubles. Dive Rite also claims that the easy customization options of the TransPac XT at the shoulder and waist plate makes it fit any size diver, including children. Neutrally buoyant, the TransPac XT weighs less than 2.29kg (5lbs) and packs flat for travel. Diverite.com





Gara

French divers quite like the Gara fin, so much so that they asked Cressi for a reinforced blade. Cressi's response has been to sensibly play the long game, and they've designed a future proof fin called the Gara Modular. This newly launched freediving fin has an interchangeable blade. Simply undo two clips and unscrew the blade and replace it with another. We believe that Cressi is looking to manufacturer up to three blades of differing strengths, thus giving end users more choice. It's hoped these blades will be available within the next 24 months. www.cressi.com

Poseidon Tech

The Tech is the world's first rebreather with a fully automatic bailout system, Poseidon writes. It features a redundant back-up rebreather with fully automatic switching—almost two rebreathers in one. In the event of a malfunction, the Poseidon Tech's safety system switches from the primary to secondary rebreather. With a secondary dive computer, no data is lost during the switch. The diver can then make manual additions to the system, or leave the system in automatic mode. www.poseidon.com



Bonex Ecos

As the underwater scooter races around wrecks grow in popularity, another great use for scooters is found. Although Bonex Exploration Systems clearly didn't have that in mind when they produced Ecos. The mind was set for long explorations, and despite its compact demeanor, the driving time on this handsome puppy is 150 minutes in cruising mode. The total weight, including the battery, is 15kg. Performance contra the low weight is great. If you belong to the more impatient drivers, the scooter will last you circa 90 minutes. Operating depth down to 120 meter. Bonex-systeme.de



Antares Dry Glove System

A new improved Dry Glove System has left the drawing board at Si-Tech. The new ergonomically designed modular quick-change solution comes with oval rings with minimal volume. This gives the diver a slim, comfortable and ergonomic dry glove system. The design follows the arm, wrist and hand anatomy and is built for maximum comfort. Si-Tech.se

D7PRO ISS

Waterproof's D7PRO ISS Cordura drysuit is as equipped as its best-selling D7PRO ISS brethren, but enhanced with a full Cordura outer shell and new blue color accents. The D7PRO's all Cordura exterior offers unsurpassed durability and tear resistance and is an ideal choice for technical divers and divers who appreciate quality construction and performance. Available in standard sizes from S-2XL and 3XLT, the suit comes stock with replacement silicone seals, a H1 5/7mm hood and drybag. Waterproof.eu



Improving Rebreather Safety

How can rebreather diving be made safer? That was the question at the core of the numerous presentations and discussions at Rebreather Forum 3 (RF3) held in Orlando, Florida, this May. Powered by the American Academy of Underwater Scientists (AAUS), PADI Inc., and Diver's Alert Network, the international conclave brought together just under 400 industry-insiders from the sport diving communities, scientific, media, military and various international government agencies diving communities along with other training agencies, manufacturers, instructor/trainers and divers who came to talk rebreathers, learn, share experiences, network, ogle the latest gear and hopefully help steer the community forward.

Text by Michael Menduno
Photos by Peter Symes (EXCEPT WHERE OTHERWISE CREDITED)

The last forum, Rebreather Forum 2.0, which I organized with rebreather builder Tracy Robinette, was held 16 years earlier in 1996, at a time when rebreathers were just being introduced to the sport diving market. In his opening remarks, PADI CEO, Drew Richardson, proposed that the number one goal of RF3 was contributing to rebreather diving safety and reducing incidents.

Some controversy

The issue is of critical importance today when manufacturers like Poseidon Diving Systems Ltd. and Hollis Inc., in conjunction with PADI and other training agencies, are now actively promoting rebreathers for use by recreational divers, which is a source of some controversy. Until recently, rebreather use was limited primarily to tech divers because of their complexity, operational requirements and cost. The concern is that rebreathers may be too complex and time consuming for a typical open water diver who is still mastering their basic diving skills.

A matter of protocol

However, PADI has developed a simplified diving protocol using rebreathers designed specifically for recreational use, which it believes will prove efficacious.

Though no one knows the actual risks, there have been more than 200 reported rebreather fatalities worldwide since 1998, which have averaged approximately ten fatalities per year prior to 2005 and about 20 per year since. To put these numbers in perspective, on average there are about 100-120 scuba diving fatalities annually in the United States, Canada, United Kingdom and Europe combined,



"Men in Black" aka Jan Jørgensen (left) and X-ray Mag editor Peter Symes during CCR training in the Red Sea anno 2000





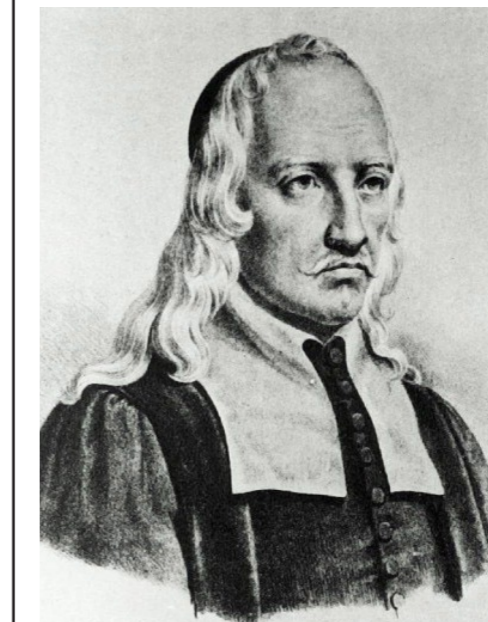
380 delegates from 26 different countries attended RF3.

oxygen rebreathers before them, the technology was primarily limited to military divers until the late 1980s when pioneers like Dr Bill Stone, Olivier Isler, Stuart Clough and Rob Palmer began experimenting with rebreathers for cave exploration, just as technical diving was emerging.

Though the early tech community immediately seized upon their potential for extending bottom times and optimizing decompression, it took until the late 1990s

for the first production units like the Cis-Lunar Mk-IV, Ambient Pressure Diving's Inspiration and the KISS Classic to become available.

Fastest growing segment
Today, rebreather div-



Giovanni Alfonso Borelli (28 January 1608, Naples - 31 December 1679, Rome) was a Renaissance Italian physiologist, biomechanist, physicist, and mathematician. He contributed to the modern principle of sci-

entific investigation by continuing Galileo's custom of testing hypotheses against observation. Trained in mathematics, Borelli also made extensive studies of Jupiter's moons, the mechanics of animal locomotion and, in microscopy, of the constituents of blood. He also used microscopy to investigate the stomatal movement of plants, and undertook studies in medicine and geology.

Borelli is also considered to be the first man to consider a self-contained underwater breathing apparatus along with his early submarine design. The exhaled gas was cooled by sea water after passing through copper tubing. The helmet was brass with a glass window and 0.6 m (2 ft) in diameter. The apparatus was never likely to be used or tested.

— EXCERPTS FROM WIKIPEDIA

Pulling all this together
A combination of equipment resistance, static lung load and dense gas can increase the work of breathing
Maximum ventilation is progressively reduced as depth ↑
Divers tend to retain CO₂ as work of breathing ↑
Rebreather divers should be extremely wary of heavy exertion, or virtually "any" exertion at extreme depths

which represents the majority of the worldwide market. Given that there are millions of open-circuit divers compared to, at most, tens of thousands of rebreather divers, the fatality rate for rebreather diving is evidently much higher than its open-circuit counterpart, as industry-insiders are all too well aware.

Unacceptable record

During one of the opening sessions, Dr Andrew Fock, head of hyperbaric medicine at The Albert Hospital in Melbourne, Australia,

asked for a show of hands from the audience: "How many people in this room believe that the current rebreather safety record is acceptable?"

No one raised a hand.

Concieved centuries ago

First conceived in the 17th century by Giovanni Borelli, closed-circuit rebreathers (CCR) remained an elusive invention until the advent of galvanic oxygen sensors in the early 1960s made their construction possible. Like simple, non-electronic

Associate Professor Simon Mitchell gives a presentation on CCR physiology

ing represents one of the fastest growing areas of sport diving. Poseidon reported at the Forum that they sold more of their recreational Mk-VI rebreathers in the last four and half months than in the prior two and half years, and PADI is certifying new recreational rebreather instructors to meet the demand. In certain countries, such as the United Kingdom, which is regarded as rebreather "ground zero", it's considered "normal" that everyone on a dive boat is diving a rebreather.

Industry insiders estimate there are as many as 10,000 to 15,000

active rebreather divers worldwide, and there are more than a dozen rebreather manufacturers.

At one of the forum sessions, the three oldest technical training agencies, ANDI, IANTD and TDI,



How can rebreather diving be made safer?

which have been responsible for the majority rebreather training to date, estimated that collectively they issued 30,000 basic, intermediate and advanced rebreather certifications from 1990-2011, and are currently trending at about 2,500-3,000 certs a year. (Data from the British Sub-Aqua Club, PSA International, and Rebreather Association of International Divers was not included).

These numbers are likely to grow significantly as PADI recreational rebreather courses proliferate.

Though the number of users is still small, rebreather technology has greatly expanded tech divers' underwater envelope, and has also been a boon to photographers/videographers as well as the early adopters among scien-

Poseidon reported at RF3 that they sold more of their recreational Mk-VI rebreathers in the last four and half months, than in the prior two and half years

tific and recreational divers as evidenced by the community's sessions chaired by explorer and instructor trainer Martin Robson.

Pushing the envelope (again)

Dives that would be logistically difficult or even impossible on open-circuit are routinely done with rebreathers, and some explorers like Robson, Richard Harris and others are now pushing limits of human physiology. During a Friday

afternoon session, Harris detailed his team's exploration dives to 207m (680-feet) at the Pearse River Resurgence (caves) in the South Island of New Zealand, where divers are hitting up against the limits of "respiratory sufficiency" (and arguably surface-based diving).

However, as David Conlin, Chief of Submerged Resources Center for the National Park Service, explained to the assembly, "The real value of rebreathers is not deep diving at all, but staying longer at 21-30m (70-100 feet). You can work at those depths nearly all day long when the conditions are good." Conlin reported that rebreathers have increased Park Service divers productivity by nearly 40 percent. "We gain nearly one day for every three days we're in the field."

Industry insiders estimate there as many as 10,000 to 15,000 active rebreather divers worldwide

Killing them softly Fock, who himself is a very accomplished rebreather diver, took the stage on Saturday morning with an important and sobering presentation

on the risks of rebreather diving, titled, *Killing Them Softly*. One of the problems in the industry is the lack of an accident reporting system that records and details the cause of diver fatalities and near misses, in order to inform and improve diver safety. In many cases, information about specific fatalities is sequestered for fear of litigation. As a result, existing accident data is incomplete, and in many cases, inaccurate.

Fock analyzed available data from multiple sources from 1998-2010 to answer some basic safety questions like:

... there was no difference in fatality rates among manual or electronic units, or specific brands of rebreathers; accidents were roughly proportional to market share

How dangerous is rebreather diving? What causes fatalities? Are manual units (that depend on the diver to manually add oxygen)—like the KISS Classic, which represent about 15 percent of the installed base of rebreathers—safer to dive than their electronic counterparts? Are there any specific brands of rebreathers more dangerous than others? And finally, is the risk reduced when diving within the recreational enve-

lope (i.e. no-stop diving to 40m or 130ft)?

With the caveat that they are "best guess numbers", Fock concluded that rebreather diving is probably 5-10 times as risky as open circuit scuba diving, accounting for about 4-5 deaths per 100,000 dives, compared to approximately 0.4 to 0.5 deaths per 100,000 dives for open-circuit scuba. This makes rebreather diving more risky than sky diving at 0.99 per 100,000 jumps, but far less risky than base-jumping at 43 deaths per 100,000. He found that there was no difference

in fatality rates among manual or electronic units, or specific brands of rebreathers; accidents were roughly propor-



Jeff Bozanic (left) in debate with Dr Siman Mitchell during the concluding session

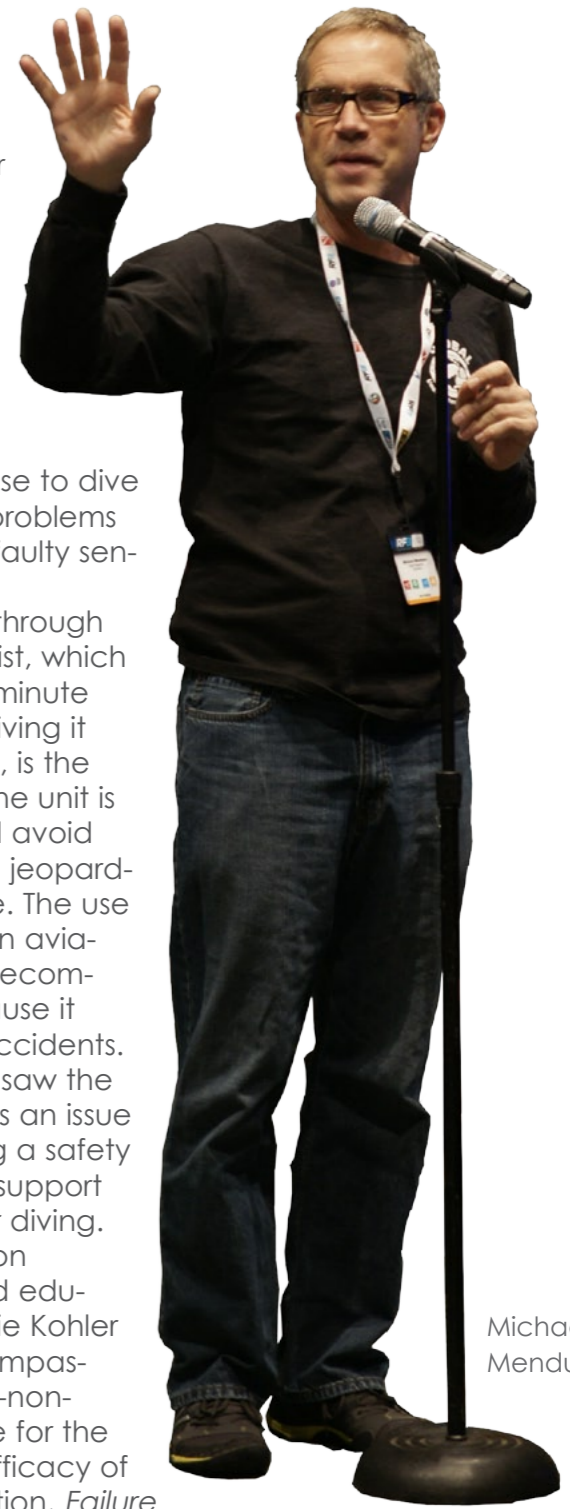


Currently, one of the biggest safety issues surrounding rebreathers is the fact that divers become complacent and don't rigorously adhere to a pre-dive checklist in assembling and preparing their unit for diving as they (presumably) learned in class, and also neglect required post-dive maintenance. (Some experienced rebreather divers don't follow checklists either.) Even worse, some divers choose to dive knowing that there are problems with their unit such as a faulty sensor or small leaks.

Methodically working through your rebreather's checklist, which typically includes a five-minute pre-breathe (and only diving it if everything checks out), is the best way to insure that the unit is functioning properly and avoid any problems that could jeopardize safety during the dive. The use of checklists is standard in aviation and is increasingly becoming so in medicine, because it

reduces accidents. Presenters saw the problem as an issue of creating a safety culture to support rebreather diving.

Expedition leader and educator Richie Kohler made an impassioned, no-nonsense case for the use and efficacy of checklists in his presentation, *Failure Is NOT an option: The importance of checklists*. During the presentation, Kohler put up a picture of eight close friends and mentors including



Michael Menduno

tional to market share. Fock also pointed out that while the data suggests that deeper dives carry greater risks, a large number of rebreath-

fatalities occur in shallow depths within the recreational envelope.

"Pilot error"

As far as the

causes or "triggers" that precipitated accidents, Fock concluded that the source of most problems was the human-machine interface, or so-called "pilot error", involving assembly and pre-dive preparation, maintenance, training and high risk behaviors like ignoring checklists, carrying insufficient bailout

and diving beyond one's limits. "The question," posed Fock, "is whether the risk can best be mitigated by training [reinforced by dive culture] or engineering out potential problems or both."

Creating a safety culture

Though veteran explorers and educators Jill Heinerth and Terrence Tysell chaired an open-discussion session on training, enabling Forum participants to present views on a host of training related topics, the majority of the discussion on improving safety centered around diving culture—what happens after training.

"The real value of rebreathers is not deep diving at all, but staying longer at 21-30m (70-100 feet.) You can work at those depths nearly all day long when the conditions are good."



his rebreather instructor, who lost their lives as a result of pilot error. "They were not fools," explained Kohler, "but each of them made foolish mistakes and died as a result." Checklists are designed to prevent such mistakes from occurring.

In another session, Heinerth presented her "Five Golden Rules" for rebreather diving which included: 1) be properly trained and current for the dive you are about to conduct; 2) follow your checklist;

3) pre-breathe your unit; 4) make the decision to dive (responsibly); and 5) be prepared to abort the dive safely (with sufficient bailout gas!). Heinerth told a story of being on a dive boat with five rebreather veterans. During her pre-breathe, she detected a small problem with her rebreather

The question is whether the risk can best be mitigated by training [reinforced by dive culture] or engineering out potential problems or both

and told the assembly she would be sitting out the dive, only to be pressured by the others divers to make the dive anyway. "It's only a minor problem," some opined, "You can still fly the unit manually." To her credit, Heinerth didn't back down. How do we, as a community, encourage divers to do checklists and support their adoption within the culture?

"Industry leaders need to become role models," offered Heinerth. "We need to make it cool to do checklists." Heinerth along with industry pioneers Dr Richard Pyle, Database Coordinator for Natural Sciences at Bishop

Jill Heinerth presenting her "Five Golden Rules" for rebreather diving

Museum, Kevin Gurr, CEO of VR Technology, and others are now spearheading an effort to create a set of best practices for rebreather diving dubbed, *Blueprint For Survival 3.0*. This refers to the original set of ten safety principles for cave

diving developed by legendary cave explorer Sheck Exley in his monograph, *Basic cave diving: A blueprint for survival*. The early tech community created a similar set consensus-standards for open-circuit mix diving, *Blueprint for Survival 2.0*, which was published in the now defunct *aquaCORPS Journal*. Watch this space.

Engineering the CCR blues away

In addition to training and creating a culture that reinforces safe diving practices, experts agree that a number of safety issues might be resolved through better engineering. Indeed, this is the basis behind PADI's so-called "Type R" rebreathers that are suitable for recreational divers. For example, a Type R rebreather will turn itself on if the user forgets and jumps in the water, and it won't operate without the scrubber canister correctly in place or if the cylinders are turned off.

What became clear at the Forum, however, is that better engineering solutions are needed for one of the most fundamental aspects of rebreathers: knowing precisely the composition of the

breathing gas in the loop at any point in the dive. Unlike open-circuit, of course, where the fraction of gas is constant and known with certainty, the gas mix in a diver's breathing loop dynamically changes with every breath and gas addition.

Ten to 15 years from now

Ten years from now, or 15, we will likely look back at our current technology and regard it as primitive, or what explorer and engineer Dr Bill Stone, CEO of Stone Aerospace, refers to as "test pilot era" technology. "You actually dived those units without knowing exactly what you were breathing? OMG!" It'll be like us looking

back at early cave divers using J-values (reserve) and empty Clorox bottles for buoyancy, and going, "Really?"

Bruce Partridge, CEO of Shearwater Electronics, summed

up the current state of the art in his presentation on information systems this way, "Divers must interpret the readouts from three roaming O₂ sensors, which are known to be unreliable. They dive with no CO₂ gauge, and they don't have good data on the risks or what is most likely to go wrong."

The trouble with O₂ sensors

Most experts agree that current O₂ sensing systems are the weakest links on a rebreather and also the most critical. If the PO₂ in the loop is too low, the diver will suffer hypoxia and go unconscious and drown; too high and the diver risks hyperoxia, convulsions and drowning.

Explorer and engineer Dr Bill Stone, CEO of Stone Aerospace

Limits

But what most divers might not appreciate are the limitations of current O₂ sensing systems on the market, which was made clear in a pair of presentations by biomedical instrumentation engineer Dr Arne Sieber, CEO of Seabear Diving Technology who built his own rebreather, and Nigel Jones, principal at RMB Consulting who works with Stone Aerospace.

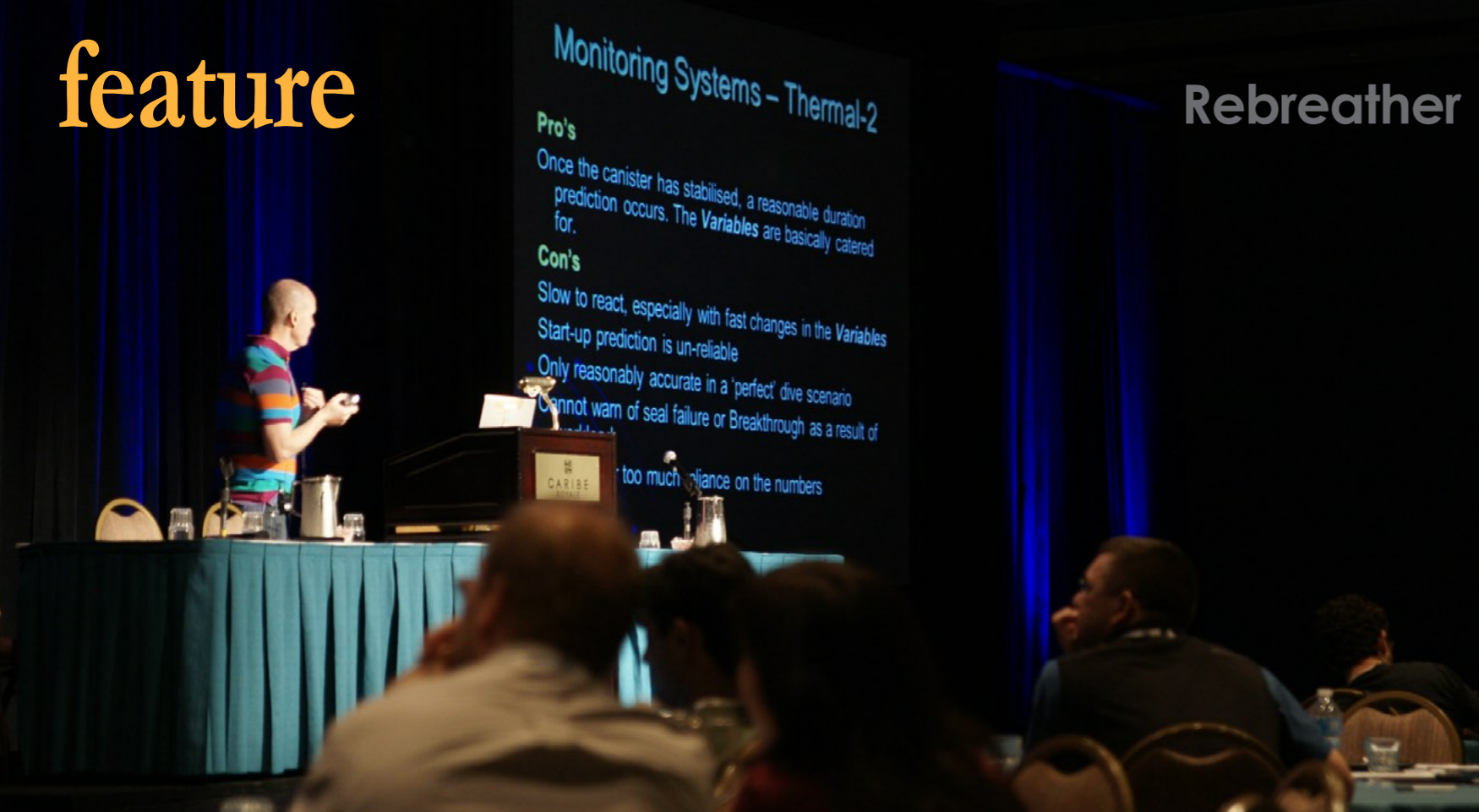
Sensors were not designed with diving in mind

Sieber began by explaining that the galvanic O₂ sensors made for the biomedical industry were never designed to be used in diving and are, in fact, being used outside manufacturer's specs. To wit: sensors are meant to be calibrated under the same conditions that they will be used for in measurement, in the same measurement range and temperature. That's not how it's done in diving.

"Divers do all the wrong things," explained Sieber. "We calibrate

the sensors at 0.2 bar (air) and 1.0 bar (O₂) at ambient pressure and temperature, and then use the sensors at up to 1.6 bar at much





Rebreather

Kevin Gurr, CEO of VR Technology Ltd. went over the challenges with developing CO₂ sensing and how the issue could be solved thanks to recent advances in technology

hotter temperatures." Sieber said that this leads to increased sensor errors as well as a decreased lifespan.

Sensors can fail high or low as a result of the gradual consumption of their reactive material and aging and also fall out of calibration. In addition, they commonly fail from condensation on the sensor. Worse is that "transient failures" from a loose electrical connection, or more commonly condensation, causes the sensor to generate erroneous data and then go back to working correctly when the condition abates. Jones believes that these "transient failures" are insidious and likely the cause or trigger of many unexplained rebreather diver fatalities.

Voting logic

Because of the known unreliability of these sensors, early designers like Walter Stark in the late '60s who invented the "Electrolung" built the first closed-circuit rebreathers with

three O₂ sensors and a voting logic algorithm—the computer averages the readings from the two sensors whose readings are closest and uses that average for its O₂ calculations.

Their idea was that the redundancy of three voting sensors would greatly reduce the risk of sensor failure, and the concept stuck. Today, virtually all rebreathers, except the Poseidon, use this 50-year-old sensing technology. The problem, explained Jones, is that it is simply not as reliable as once thought.

Reducing the benefits

First, Jones showed using probability theory that the voting logic algorithm itself actually reduces the benefits of redundancy. For example, instead of having a system that is "hundreds" of times more reliable (e.g. with pure triple redundancy), a voting logic system can reduce the improvement to single digits.

Questionable assumption

Second, voting logic is based on the assumption that sensors fail independently i.e. the failure of one sensor does not change the likelihood that others will fail, too. Unfortunately, that is **not** the case with the O₂ sensors in a rebreather. The sensors are dependent because they share a common history; they may have come from the same manufacturers lot, they experience similar use, they share a common environment, suffer common abuse and use shared measurement and calibration gas. The lack of independence greatly decreases the reliability. "Having three sensors is barely better than one in some circumstances," emphasized Jones.

Erosion of risk reduction

Third, risk reduction is eroded even further, by the fact that there are more than two outcomes to the system i.e. heads: a correct reading, or



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feature

tails: an incorrect reading. The third outcome is the case when the diver doesn't know if the reading is correct or incorrect, which Jones equated to having the coin land on its edge.

Case story

He offered a real-world example reported by Rich Pyle where



Leon Scamahorn, CEO of Inner Space Systems manufacturers of the Megalodon and Pathfinders rebreather

during a dive, his PO₂ sensors read .4, 1.0 and 1.3 and asked the audience to make the call, "What is the correct PO₂?" (The computer's voting logic would average the 1.0 and 1.3 reading and call it 1.15).

Unfortunately, the majority of the audience got it wrong! The correct answer was 0.4; the system had experienced a double sensor failure. Fortunately, Pyle got it right. If he had ascended at that point in the dive thinking his PO₂ was 1.15, he would have risked hypoxia and possible drowning.

Calculations under duress

An animated discussion ensued prompted by Leon Scamahorn, CEO of Inner Space Systems and manufacturer of the Megalodon and Pathfinder rebreathers, who pointed out that "Meg" users could go the "millivolt screen" on their handset, which shows actually sensor voltage (a linear function of pO₂) and with some simple math determine that the low sensor was correct. This assumes of course that the diver was alerted to the problem in time. [Scamahorn's arguments, however, did not address the limitations of voting logic systems].

I'm sure Pyle, who has thousands of hours on his rebreather, wouldn't have a problem with Scamahorn's procedure (Pyle was tipped off to the faulty sensors by the lack of voltage fluctuations). But I couldn't help wondering if I'd have the calm presence of mind to do "millivolt math" at 100 meters with the stress of a possible alarm and knowing one or

Rebreather

Probability theory demonstrated that the voting logic algorithm itself actually reduces the benefits of redundancy.

more of my sensors were crapping out. Definitely a test pilot-esque notion! Couldn't a computer do this better than me?

Active validation

Both Sieber and Jones urged the industry to develop and adopt "active validation" type systems, such as used in the Poseidon MK-VI, which calibrates and tests the validity of the oxygen sensors (the MK-VI uses two sensors) throughout the dive using onboard diluent and oxygen. Sieber added that solid-state sensors, which are currently in prototype form, also hold promise for the future.

However, several rebreather builders I spoke to disagreed with Sieber and Jones' assessment and said that they overstated the O₂ sensing problem given improvements in sensor manufacturing, testing and voting logic software. As one manufacturer said, "There's more than one way to skin the cat."

Nevertheless, in its consensus recommendations, the Forum strongly endorsed industry initiatives to improve oxygen measurement technologies and advocated consideration for new approaches like "active validation" and alternatives to galvanic fuel cells.

ppCO₂: The dark matter of rebreather diving

Divers face similar sensing problems with respect to pCO₂, which has been dubbed the "dark matter of rebreather diving". High ppCO₂'s (0.03 bar and above) can cause hyperventilation,

Can't resist the call of the deep?



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photo courtesy: Richard Carey

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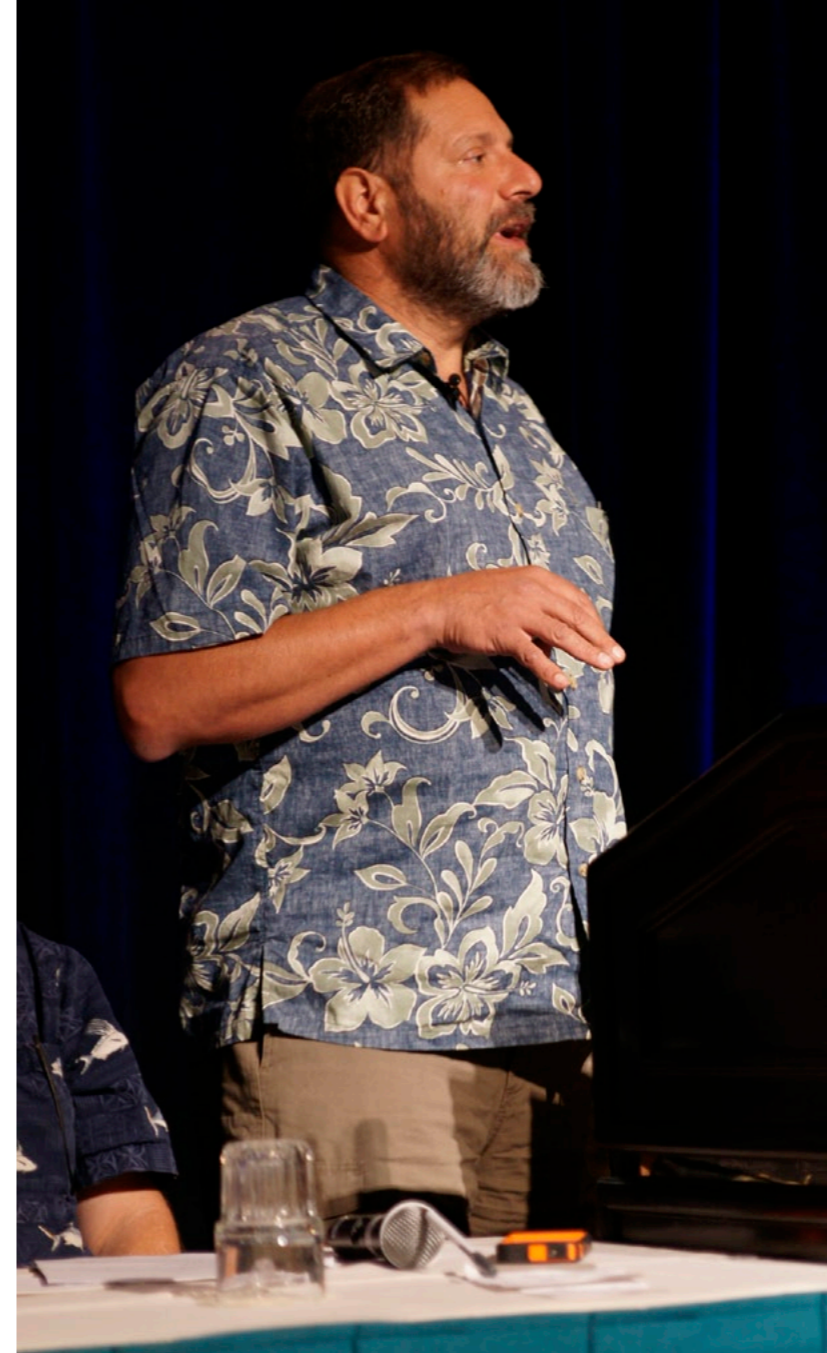




Dr Richard Vann, Duke University and DAN, was a key driving force behind Rebreather Forum 3

had more than one incident), however, 64 percent said that they didn't bailout; 19 percent said they bailed out sometimes. The results suggest better training and a cultural shift are needed!

Gurr next recounted the current methods used to monitor scrubber duration which are: 1) a duration timer based on manufacturer's test data (usually conducted at two depths at 4°C at a specified CO₂ production rate); 2) a timer system based on the diver's oxygen consumption (divers produce about 0.8 liters of CO₂ for every liter of O₂ consumed) which takes account of workload but not depth or temperature; and 3) thermal sensing, also referred to as the "Temp Stik", which measures how the scrubber's thermal reaction front moves through the canister. Gurr explained that the Stik, which is used in the Ambient Pressure, VR technology and rEVO rebreathers, is a reasonable predictor of duration, but is slow to react to fast changing variables like work rate. However, none of these methods are able to detect CO₂ breakthrough!



Jeff Bozanic

Rebreather

Following Gurr, Dr Dan Warkander, from the Navy Experimental Diving Unit (NEDU) who holds a patent on thermal sensing, compared to the days of early scuba when divers didn't have a pressure gauge but instead dived with a J-valve. "Wouldn't it be nice to have a gauge for your scrubber to tell you how much time you had left?" he offered.

Warkander went on to explain how factors such as workload, depth and temperature effect scrubber duration and how difficult it is to predict. For example, hard work can reduce duration by 50 percent, while light work can double duration. He said that scrubber duration can vary by a factor of 5-20 through combined effects of workload, temperature and depth. What's worse, when a scrubber is spent, the threshold between no CO₂ and too



Phil Short, IANTD UK

confusion, mental impairment, unconsciousness and death, may lower CNS O₂ toxicity thresholds and is believed to be a factor in unexplained rebreather fatalities, hence the moniker "dark matter". Worse, the diver may not be aware of the problem before a full onset of symptoms occurs.

which varies with workload, depth, and temperature; second, to detect a CO₂ breakthrough as a result of a spent canister, mechanical failure or channelling.

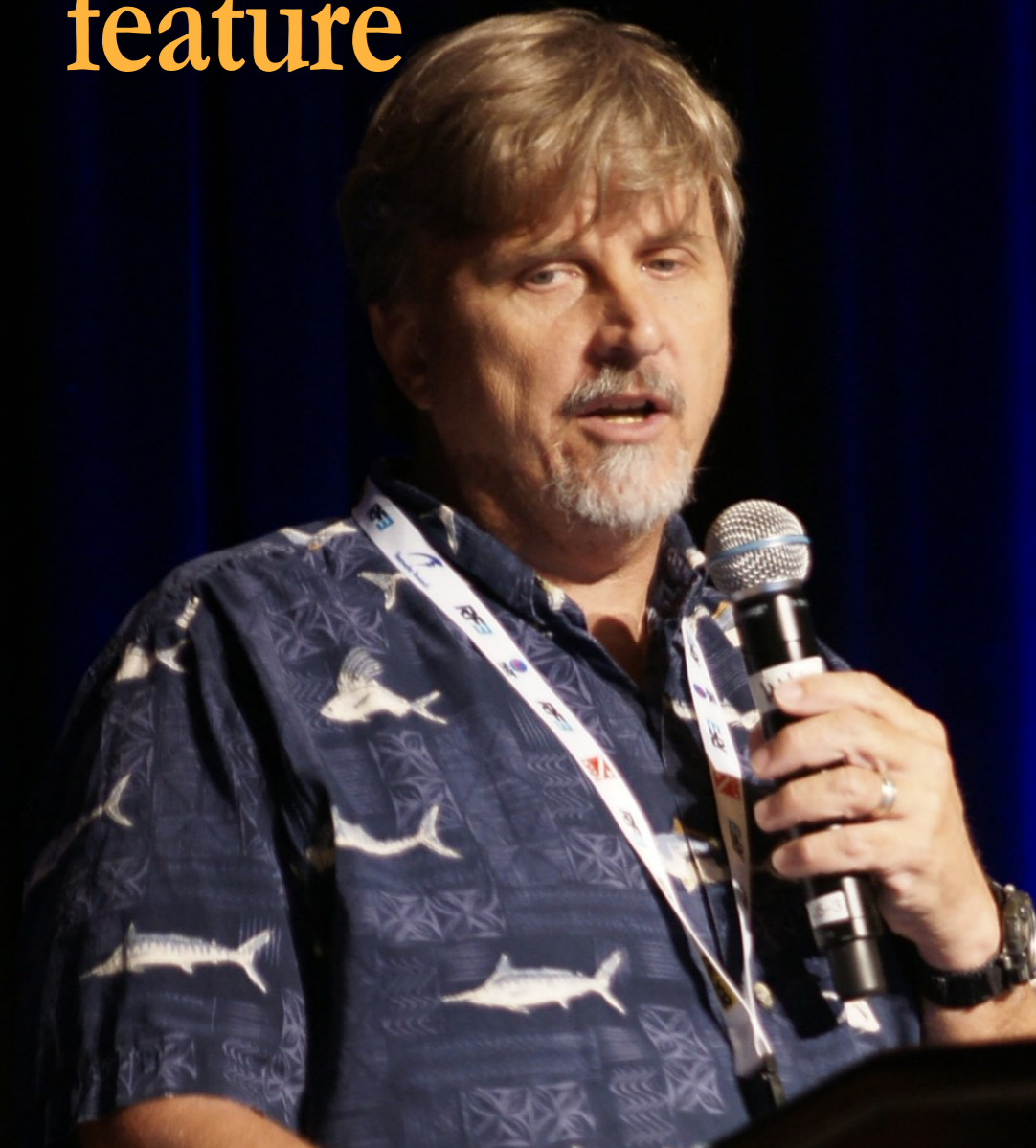
Ignorant divers

Kevin Gurr, who is regarded as one of the gurus on CO₂ sensing, began his session by sharing data from a recent Internet survey of 323 rebreather divers representing 25 different models of rebreathers. The results were surprising. Twenty-three percent of the divers did not know the maximum operating depth of their unit, and another 19 percent did not know the manufacturer's stated scrubber duration. Forty-two percent of divers said that they experienced symptoms of hypercapnia for a total of some 297 incidents (some divers



Steve Lewis, author and technical trainer

Forty-two percent of divers said that they experienced symptoms of hypercapnia for a total of some 297 incidents (some divers had more than one incident), however 64% said that they didn't bailout, 19% said they bailed out sometimes.



Dr Richard Pyle

est in diving automation. "Our goal," explained Poseidon CEO Peter Swartling at the press briefing, "is to increase the level of automation by using smart systems that monitor every breath, make adjustments accordingly and interact with the user only when they need to know what's going on."

In addition to the many automated features in Poseidon's Mk-VI recreational rebreather such as a wet switch, an auto-checklist that verifies that cylinders have the correct gases and their values are open, and auto-oxygen sensor calibration and validation, the new TECH offers a "Dive-by-Wire" handset that is truly breaking new ground.

The device, which is smaller than an iPhone, provides system information to the user and enables them to control the rebreather to the extent of doing a loop flush or adding oxygen at the touch of a virtual button. The computer of course would warn and or prevent the diver from taking an action, like adding O₂ if it was ill advised.

The new Poseidon TECH offers a "Dive-by-Wire" handset



POSEIDON

When a scrubber is spent, the threshold between no CO₂ and too much, can happen in a matter of minutes.

This level of automation gave hee-beegeebes to many of the tech divers I spoke with at the bar following Poseidon's press conference, but I couldn't help wondering if this is indeed the future of dive

automation. Granted, 15 percent or so of rebreather divers prefer a strictly manual unit (sans solenoid) and other groups such as the DIR community don't even trust dive computers, well not the kind that you strap to your arm anyway. Ironically, I'm sure that most of these people have no trouble trusting their ABS brakes in their cars (versus feathering the brakes on their own). In fact, their vehicles depend on computer automation, as do the commercial aircraft that flew them to RF3.

Can we trust automation?

Stone, whose company builds autonomous vehicles for space exploration, addressed the issue head on in his talk, *Hazard Analysis and Human Factors*, posing the question, "Can we trust automation?" As an example, he recounted the development of the autonomous car that can

Dr Michael Gernhardt, NASA astronaut, manager of the Environmental Physiology Laboratory and principal investigator of the Prebreathe Reduction Program at the Lyndon B. Johnson Space Center, compared decompression issues in space with those in diving

navigate city streets sans driver and showed video of prototypes in action. Stone said that within five years, you'll be able to buy a car that will drive you home if you had a bit too much to drink, and it will do it as safe or safer than a human driver.

Could rebreathers be far behind?

One of the major problems in rebreather (read car, train, plane, spacecraft, etc.) safety is humans' ability, or rather inability, to manage and operate complex machines without incident. Stone's solution, along with oth-

Rebreather

ers such as Gurr's soon-to-be released Hollis Explorer, is to simplify the human machine interface by reducing the ways that people interact with these systems, letting the computer do more of the work. "We have to move out of the test pilot era to a new paradigm," he said.

Given that Stone's vision of more than 25 years ago helped

drive the creation of a consumer rebreather market (he could arguably be considered the godfather of modern rebreathers) his ideas should not lightly be dismissed.

15% or so of rebreather divers prefer a strictly manual unit (sans solenoid)



much, can happen in a matter of minutes.

As far as detecting scrubber breakthrough or a seal failure, VR Technology Sentinel is currently the only production unit with a gaseous infrared CO₂ sensor (The Sentinel uses all four methods mentioned above in its CO₂ monitoring package). Gurr said that we are 80 percent there in fully characterizing a CO₂ absorption system properly.

Holy grail

The last piece is a mouthpiece sensor that can measure end-tidal CO₂, which is regarded as the "Holy Grail" of CO₂ monitoring.

Gurr estimated that this is still at least three years away.

The Forum acknowledged the poor of understanding of operational limits with regards to depth and scrubber duration among trained rebreather divers and recommended that training agencies do more to emphasize these issues, and manufacturers make data more readily available.

Dive-by-Wire?

The diving press and interested Forum participants were treated to a preview of Poseidon and Stone's latest lovechild, the Poseidon TECH rebreather, which is scheduled to ship this November and features the lat-



Gavin Anthony, a recognised expert in military and commercial diving equipment and operations and QinetiQ's technical lead for independent diving equipment testing and incident investigation. He provided highly-valued constructive feedback and suggestions to the consensus statements

How to prevent drowning

Though it's not the trigger, the primary cause of death in most rebreather fatalities is drowning. Some of these fatalities might have been prevented by use of a retainer strap to hold in the diver's mouthpiece. Full-face masks and

retainer straps have long been the standard in military diving and they were also a key recommendation from Rebreather Forum 2 (1996). While full masks introduce other problems for our diving applications and are not very suitable to sport diving, retaining straps arguably have the potential of saving lives. Rebreather instructor Paul Haynes who is former military diver and business development director and trainer for DIVEX Ltd., made a strong case for retainer straps at the Forum, which recommended that the efficacy of using straps be taken up as a research question. "We might all consider experimenting on ourselves."

Special thanks Rosemary E. Lunn and the Rebreather Forum 3 team!

"Yes we should," he said. "Within certain parameters." ■

Writer and technologist Michael Menduno published and edited aqua-Corps: The Journal for Technical Diving (1990-1996), which helped usher tech

Rebreather

"Given that the fatality rates are 5-10 times that of open circuit scuba, should we morally offer this technology to the recreational diving community, before putting our house in order?"

"Yes we should! Within certain parameters."

Additional resources

RF3 included several discussions of how rebreather incident reporting and analysis could be improved resulting in several Forum recommendations.

DAN reporting system

In addition, DAN announced its new non-fatality online diving incident reporting system for rebreathers, which was endorsed by the Forum. See: <https://DAN.org/IncidentReport/>. The hope is that the DAN system will provide valuable information for the community.

Rebreather Forum 2 Conference precedings:

<http://archive.rubicon-foundation.org/7555>

Rebreather Forum 3 Consensus Statements:

<http://rubicon-foundation.org/News/rf3-consensus/>

diving into the mainstream of sports diving, and coined the term "technical diving". He also organized the first Tek, EuroTek and AsiaTek conferences, and Rebreather Forums 1.0 and 2.0. Menduno, who is based in Berkeley, California, USA, remains an avid diver.

go quietly, amid the noise and haste...

[3 hours @ 20m - no deco]



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Image by Ray van Eeden of Prodivers, Kuredu, Maldives



Together with an assistant, Hubert Chretien (far left), founder of Freedom At Depth, helps a disabled diver after a dive

Hubert Chretien *Freedom At Depth*

Text and photos
by Robert Osborne

What you need to know about Hubert Chretien is that he had the opportunity to do anything he wanted with his life. He was born the son of one of the most powerful people in Canada—former Prime Minister Jean Chretien. Which means that Hubert was brought up in the company of the most influential people in this country. With those kinds of connections, he could have become virtually anything he wanted—a captain of industry, a power player among the political elite. He could, quite frankly, have even chosen to do nothing. Instead, Hubert set out on a singular and humble path, a path that would lead him to found an organization that would devote itself to helping hundreds of disabled people learn how to dive—Freedom at Depth.

For Hubert, the dream began when he was only 11. It was 1976. Local divers in Ottawa, Ontario, were giving kids at a pool a chance to experience scuba diving. Hubert tried it out and was hooked. That summer, a diver asked to use the dock at the Chretien summer home. According to Hubert, his father gave permission on one condition: that the man would give Hubert some lessons. Under the Christmas tree that year, Hubert found a tank and regulator. Immediately, he excused himself to fill up the bath, then spent a good chunk of the day submerged.

From that point on, every summer Hubert would spend as much time as he could diving in the lake beside his family home. His mother's

condition, he had to tie a rope around his wrist. She would stand patiently on the dock holding the other end—an early safety precaution.

"As I was growing up, I never really knew what I wanted to do. But I knew that whatever it would be, it would be underwater."

Finally, at age 15 Hubert completed his PADI Open Water certification. And over the years, he's accumulated one impressive credential after another: more than 4,000 dives, PADI Master Instructor with ten specialties, National Association of Cave Divers Instructor, Technical Divers International Instructor for deco procedure and advanced Nitrox. But it was the certification he received from the Handicapped Scuba Association that would turn out to be the most meaningful. His position as a Course Director would ultimately inspire the Prime Minister's son to found Freedom At Depth

Freedom At Depth

In a fitting parallel to his earlier life, just as Hubert's mother Aline stood lovingly on the dock holding the rope that enabled her son to explore the world under the dock at their summer cottage, Hubert chose to extend a sort of enabling rope to others.

Hubert had been working with the Handicapped Scuba Association (based in California and operating around the world). In fact, he was the Canadian President of the organization. But Hubert decided that he could do more than just teach—so much more. He decided to found a charity that would devote itself to giving people with disabilities the opportunity to dive—whatever that entailed.

In the 12 years since Freedom At Depth was established, the dream has demanded a lot. It has meant certifying the disabled, providing the opportunities, means and support for them to travel and dive. Sometimes, it has meant



profile

CLOCKWISE FROM RIGHT: Disabled diver, Monique, gets suit on; gets mask on; being geared up; just prior to going under

just being a dive buddy for someone with a disability. Often, it has meant just being a friend.

For Hubert, it is all about giving handicapped people a chance to experience a moment of independence under the water. He said, "I started this group because I don't believe people should be told there are limits to what they can do." He has, himself, certified well over 100 disabled divers, and his organization has worked with over 500.

And working with disabled divers isn't always the easiest task. For a start, there is a lot of lifting involved. Many don't have a great deal of mobility. They have to be put into their gear, carried to the water, carried from the water. The realities of lifting a 200lb man who has little muscle control can be daunting. Another challenge—assuming responsibility for someone underwater who, in some cases, is physically unable to respond to the most basic emergency.

And then there are the special challenges. Ask Hubert about his most difficult challenge and his biggest reward when it comes to working with disabled



Chretien



divers, and he'll respond with one word, "Isabelle."

Isabelle is a 20-something woman from Ottawa with cerebral palsy (CP). She wanted to learn how to dive, but she had problems (as many people with CP do) with muscle spasms—In particular, with her jaw muscles. Which meant that even keeping a regulator in her mouth was a challenge. "I spent 42 hours in the pool working with Isabelle on that," said Hubert. "I even gave her a snorkel to practice on when she was away from the pool."

At any given time, Isabelle could be found diligently sitting in front of the television mouthing a snorkel and practicing muscle control. Ultimately, working together, they managed to control the spasms and perfect her diving skills. Today, Isabelle has more than 60 dives under her belt, and Hubert said she's "one hell of a diver."

But at the end of the day, regardless of the significant challenges, Hubert said there is an enormous reward when it comes to working with disabled divers. "Whenever someone becomes a diver, I get a huge thrill," said Hubert. "I get an even bigger thrill from students who stick with it, who continue to put in 20 dives a year."

The work has demanded so much of Hubert's time that in 2005, he finally admitted to himself it was a full time job—and his chosen life's work. He gave up a promising career in the high tech world and became a





THIS PAGE: Disabled diver, Monique, being assisted down and propelled through the water. Quadrapelagic diver floating in water (bottom left)

Chretien

alegic—on a project that will see the men train to ice dive, train to cave dive and, then, ultimately, join the exclusive group of only a few people in the world to have dived inside an iceberg.

Hubert has recruited world famous cave diver, Jill Heinreith, to help him with the project. He's also trying to find a broadcaster in Canada that will help him film the entire experience. He wants to call the project, *Boundless*, and he's starting on the first phase of the training in Canada and Florida this winter.

Successful or not, one thing is certain, project Boundless won't be the last project he initiates. In his own words, Hubert "plans on working with disabled divers until my back gives out". He's hoping he'll be working with students well into his 60's as much for himself, one suspects, as for the disabled. It's what he's chosen—it's what he lives for. "I push to enable people to dive," he said. They provide the grit; he provides the vision—and keeps a gentle but firm hand on the imaginary rope. ■

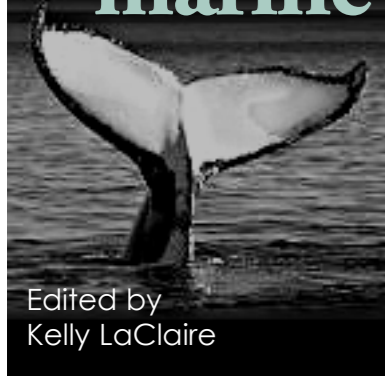
full time director and instructor at Freedom At Depth. Although he drew a salary for the first few years, he's since decided that the money can be better spent on the work of the charity.

He's able to do this because of the support of his family—in particular, his father. The former Prime Minister does much of the fundraising for the charity and has set up a trust fund that provides Hubert with a modest income, which enables him to devote his energy full time to teaching and managing the charity. Hubert has also received a lot of help from his sister, France.

Since turning the work into a full time job, Hubert has set his sights on some impressive goals. While he's realistic about some of the physical restrictions that disabled divers face, Hubert believes that with the right support, there are no boundaries. "You can manage most of their needs and make them into really good divers within their restrictions," he said.

To prove it, Hubert is working with two determined divers—Tim Inglis, who is an amputee, and Bob Brown, who is quadrep-





Edited by
Kelly LaClaire



KAREN MUNRO / SEA WATCH

Killer whales hunting dolphins caught on camera

In late May, whale watchers and a Sea Watch Foundation official observed a group of a half a dozen killer whales hunting five white beaked dolphins near Duncansby Head in Caithness, Scotland.

Karen Munro, who regularly reports sightings to Sea Watch (a non-profit conservation group that monitors sea life in the United Kingdom), photographed the hunt.

"I saw three dolphins breaching right out the water as they were chased," Munro said. "Then it all went quiet and six orca fins rose together but did not appear to be moving.

"A minute or two later they all rose together in the same place which made us think they had caught one of the dolphins. Finally, in true killer whale fashion, they disappeared with us not knowing which direction they went in."

At least one of the dolphins was thought to have been caught and killed.

Orca hunting their smaller cousins is not unheard of, and a quick search

around the Internet will yield a few results, but it isn't all that common either, especially to get such an event on film.

Sea Watch members say it is extremely rare to witness and photograph a hunt of this nature. Danielle Gibas, a sightings officer with the research group stated: "Killer whales are collaborative hunters and many people will have seen them in action in wildlife documentaries filmed in other parts of the world.

"The fact that we can witness such behavior from the U.K. coastline is a reminder of how important our coastal waters are for marine mammals."

The killer whales involved in the dolphin hunt are believed to be part of a small pod of about 30 whales frequently seen off Dunnet Head and Duncansby Head in northern Scotland and are thought to be a part of a larger community of orcas that follow spawning Icelandic herring. ■

SOURCE: BBC NEWS

Call him Ishmael: A passing whale sinks California man's sail boat

Max Young, a 67-year-old retired Sacramento high school teacher has a whale of a tale to tell his friends and family.

While cruising the waters off the coast of Laplaya, Mexico on his 55-foot sail boat, *Reflections*, a whale rammed the back of his vessel, disabled the rudder and tore open a gash in the hull.

The boat immediately began taking on water and Young radioed the Coast Guard before scrambling to stuff a mattress in the hole and began turning on pumps in an attempt to slow the water that had begun to sink the small ship.

To make matters worse, Mr. Young was on the last leg of round-the-world voyage that he had begun 12 years

earlier.

The Coast Guard District Command Center in Alameda received Young's distress signal and dispatched a plane, establishing radio contact at nearly 2:00 a.m. They found Young "trying to bail out water as fast as he could, because he wasn't sure how long it was going to take to be rescued," his wife, Debra, told The Associated Press.

The Coast Guard requested rescue assistance from the Panamanian freighter, the *Ocean Virgo*, that was 60 miles away and the cargo ship arrived at 4:00 a.m. He was taken aboard via a rope ladder that was thrown down by the larger ship's crew just after sunrise—about nine hours after the whale hit his

boat.

Young has been sailing for at least 30 years, and having worked on boats with his father, who was a commercial fisherman, he's been on the ocean most of his life, his wife said. His experience and well designed communications systems no doubt saved his life.

"The safety equipment he had on board allowed us to find him very quickly," said Petty Officer 2nd Class Pamela J. Boehland. "It was a big reason why we were able to rescue him."

Young said it was too dark to see just what kind of cetacean hit him but he guessed the length of the whale that ultimately sank his boat at nearly 60 feet. ■

Unsold: Three-quarters of Japan's NW Pacific whale hunt

Despite repeated attempts to auction it off, three-quarters of over a ton of whale meat resulting from Japan's controversial whale hunt last year was not sold, according to officials.

The Institute of Cetacean Research, which is a partly-public organization that coordinates the nation's whaling activities, reported that buyers could not be found for about 75 percent of nearly 1,200 tons of whale meat from minke, Bryde's and sei whales caught during the deep-sea mission.

There are still buyers for smaller coastal whaling programmes in northern Japan. This is most likely due to the fact that the whale meat is sold in areas with strong whale-eating traditions and that the whale meat sold is fresh, not frozen.

Auctions to sell frozen whale meat from whales caught in Northwestern Pacific waters last summer by the institute were held between November and March. It was the intention of the institute to

promote whale consumption and generate more income through auctions.

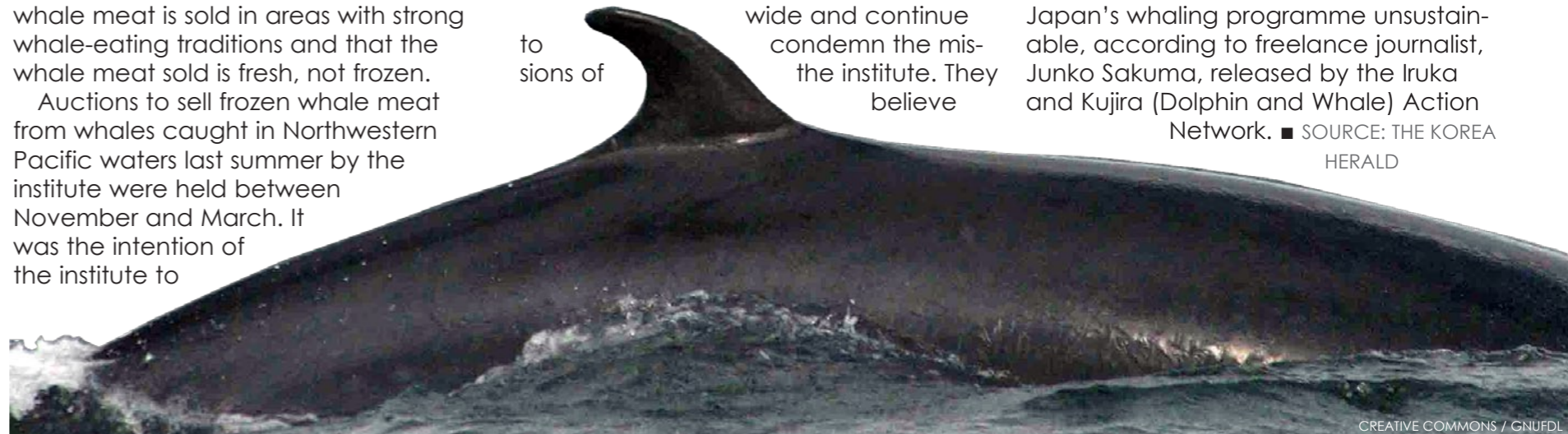
Apparently, food sellers want to avoid trouble with anti-whaling activists, according to an institute spokesman who names this reason as the cause for the "disappointing" auction results. "We have to think about new ways to market whale meat," he told AFP.

There is a loophole in the international moratorium on whaling that allows for lethal research, which Japan exploits. Environmentalists, conservationists and activists from anti-whaling nations say that commercial whaling threatens whale populations worldwide and continue to condemn the missions of the institute. They believe

that Japan uses the loophole as a cover for whaling activities. However, Japan says that the research is needed to support its view that a robust whale population exists in the world today.

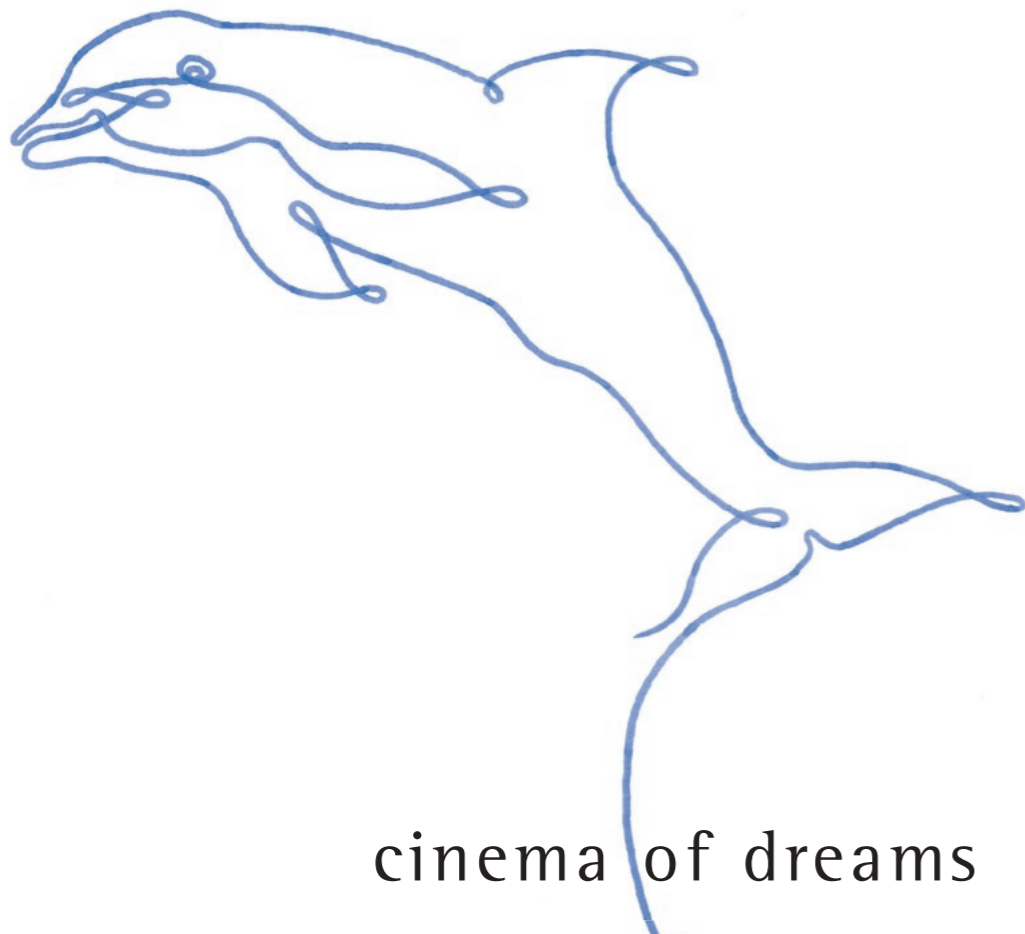
The country also claims that whaling is part of Japanese tradition and accuses Western nations of cultural insensitivity. No compromise is the motto of Japan's powerful fishing industry and right-wing activists. However, Japanese anti-whaling activists said in a report that the poor auction results confirmed that whale meat is no longer popular with Japanese consumers. The low demand is leading to oversupply, which is making Japan's whaling programme unsustainable, according to freelance journalist, Junko Sakuma, released by the Iruka and Kujira (Dolphin and Whale) Action Network. ■ SOURCE: THE KOREA

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New sensory organ found in whales

Scientists have discovered a sensory organ in rorqual whales that coordinates its signature lunge-feeding behaviour and may help explain their enormous size.

The new sensory organ has been found within the chin of rorqual whales, lodged in the ligamentous tissue that connects their two jaws. It is responsible for coordinating the biomechanics of their extreme lunge-feeding strategy.

Lunge feeding is an extreme feeding method in which the whale accelerates from below a bait ball to a high velocity and then opens its mouth to a large gape angle. This generates the water pressure required to expand its mouth and engulf and filter a huge amount of water and fish. Lunge feeding by the huge rorqual whales is said to be the largest

biomechanical event on Earth. Blue whales can swallow almost 2,000,000kJ (almost 480,000 calories) in a single mouthful of krill, and eat 90 times as much energy as they burn during a dive.

The study, to be featured on the cover of the journal *Nature*, details how scanning of the whale's chin revealed a grape fruit-sized sensory organ, located between the tips of the two lower jaw bones. The organ, composed of connective

and nervous tissue from an ancestral front tooth socket still remains in today's whales and connect to the sensory organ. Evidence indicates that the sensory organ responds to jaw rotation when the whale opens and closes its mouth and when the whale's throat pleats expand as it takes in water.

Fossil records show that the bottom jaw of baleen whales has been unfused, or separated, at its tip since the late Oligocene epoch (23-28 million years ago). Despite the long expanse of time to the present, this organ represents an evolutionary novelty for rorqual whales, based on its absence in all other modern species of baleen whale, such as gray and right whales. ■

In terms of evolution, the innovation of this sensory organ has a fundamental role in one of the most extreme feeding methods of aquatic creatures.

—UBC Zoology Prof. Bob Shadwick

tissue with papillae (protrusions) that contain nerves, is suspended in a gel-like material. Vascular

SOURCE: DISCOVERY OF A SENSORY ORGAN THAT COORDINATES LUNGE FEEDING IN RORQUAL WHALES, NATURE 485, 498-501 DOI:10.1038/NATURE11135



GEORGIA EVELYN STANTIS VIA WIKIMEDIA COMMONS.

A group of humpback whales lunge through the centre of their bubble net





Edited by
Kelly LaClaire

Nat Geo photographer captures first ever photo of humpbacks mating

National Geographic photographer Jason Edwards has done what no photographer in the history of the world has ever been able to do.

In August 2010, Edwards took the first still image of humpback whales mating after a “heat run” the photographer and several other researchers witnessed.

The heat run—when adult males compete with each other to see who is going to get the female—apparently went for several hours. “It was amazing,” Edwards said. “There were four or five males vying for her attention and while the larger ones were busy jostling each other, the smallest one swam away with the female. Their coupling lasted less than 30 seconds, which might explain why it’s never been captured on film before.”

Edwards and his colleagues spent over two hours following the heat run, jumping in the water whenever possible to capture footage of the giant mammals. Edwards told reporters that he was stunned by the brief but tender moment.

Heat chase

“When the successful male mated with the female, he came in from above and behind her. He clasped her between his pectoral fins, and whilst they floated along

together, he was stroking her flanks with his pectoral fins.”

The photos and video taken of the heat chase and the actual mating itself may shed tremendous light for scientists on the behaviors of these mysterious animals. Currently, more is known about the gestation period of the species—roughly 11 months—than is known about their sexual activities.

Already for example, a few details are coming to the forefront. Despite humpback whales being known for their songs, Edwards says absolutely no sound was heard during the mating act,

although it’s possible that noises may have been emitted from the whales above or below the audible frequencies of humans.

Blowing bubbles

The female however, was heard and seen blowing bubbles from her mouth following the copulation but just why this was done scientists can only speculate.

“The purpose of this bubble release is still unclear, however it may have signaled to the male that the reproductive act was over. Further research is still needed to confirm whether this is a common sexual practice or simply a random

occurrence,” Edwards said.

“When we came upon the heat run, it was the last day of my shoot. I didn’t have a single frame of these animals from the whole trip. All I kept thinking was ‘don’t mess it up’. I was just supremely lucky to even be there, let alone capture this incredibly intimate moment on camera.”

According to National Geographic, the pictures Edwards took were kept secret for nearly two years but a gallery of the images is scheduled to make their first public appearance at Auckland Museum this month. ■
SOURCE: THE DAILY TELEGRAPH



JASON EDWARDS



PROTECTED RESOURCES DIVISION, SOUTHWEST FISHERIES SCIENCE CENTER, LA JOLLA, CALIFORNIA, USA

False killer whale

False killer whales able to focus their echolocation beams on targets

Toothed whales and dolphins (odontocetes) rely on echolocation to locate food with incredible precision. These marine mammals produce their distinctive echolocation clicks in nasal structures in the forehead and broadcast them through a fat-filled acoustic lens, called the melon. It has been known for a while that odontocetes have the ability to control the shape of the echolocation beam, and it was assumed that they are using the melon to focus the sound.

However, it was up to Laura Kloepper from the University of Hawaii, USA, and her PhD supervisor, Paul Nachtigall, to discover how false killer whales are able to focus their echolocation beams on targets. Their findings are described in a recent issue of *The Journal of Experimental Biology*.

The false killer whale (*Pseudorca crassidens*) is a cetacean, and the third largest member of the oceanic dolphin family (*Delphinidae*). It lives in temperate and tropical waters throughout the world. As its name

implies, the false killer whale shares characteristics, such as appearance, with the more widely known orca (killer whale).

The challenge

The width of an acoustic beam is determined by the frequency of the sound. But how could the team tell whether a change in beam width was due to the killer whales focusing the sound or simply due to the physics of acoustics? Using statistical analysis, it was established that a relationship exists between beam area and frequency.

“Squint”

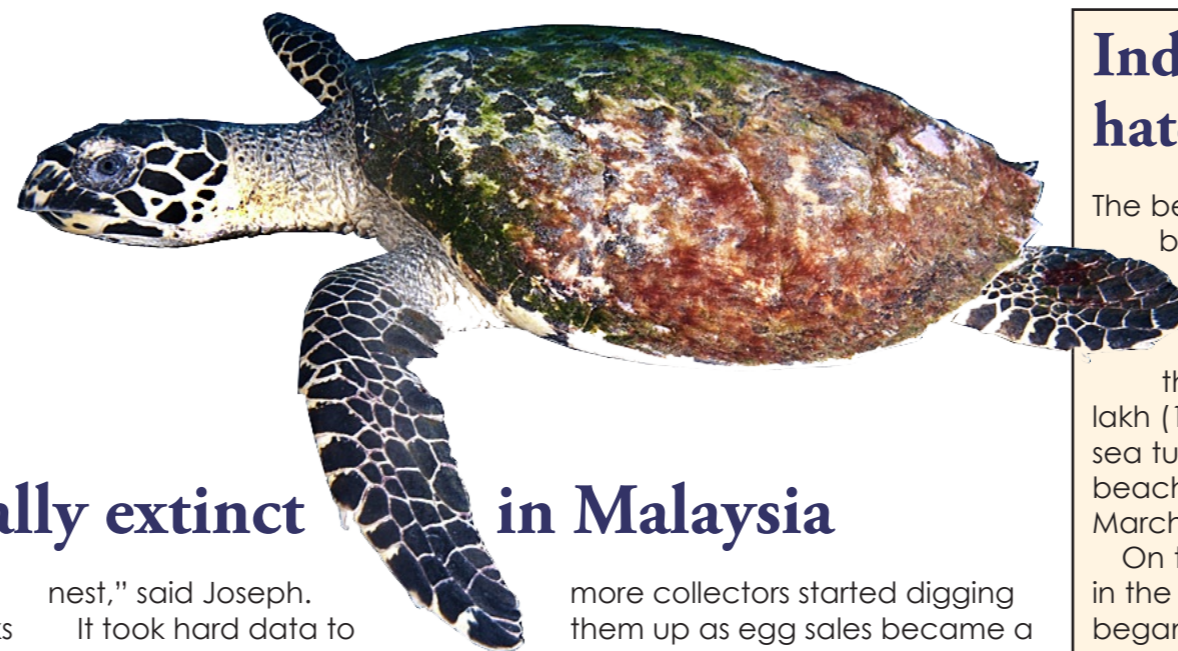
Training a false killer whale to discern between cylinders of the only marginally different diameters of 6.553mm and 6.35mm presented at mammals at random at various distances, it was discovered that the false killer whale was effectively ‘squinting’ and adjusting the size of her echolocation beam in response to the more difficult tasks. ■

SOURCE: ACTIVE ECHOLOCAATION BEAM FOCUSING IN THE FALSE KILLER WHALE, *PSEUDORCA CRASSIDENS*. *JOURNAL OF EXPERIMENTAL BIOLOGY*, 2012 DOI: 10.1242/jeb.066605





Edited by
Bonnie McKenna



The leatherback sea turtle is virtually extinct in Malaysia

It is too late for the Malaysian leatherback, but there is hope for the three remaining sea turtle species. The decline of the leatherback was set in motion before anyone truly understood the gravity of the situation.

Universiti Malaysia Terengganu marine biologist Juanita Joseph has spent the last decade re-

searching Malaysian turtles and does not believe the leatherbacks are ever going to recover.

"This is because sea turtles return to breed at their natal beaches. They may travel thousands of miles to reach foraging grounds, crossing transnational borders, but all turtles return to the area where they were born to breed and

nest," said Joseph.

It took hard data to convince the Terengganu state government, once one of the most significant leatherback hosts, of the need to ban leatherback turtle egg consumption. Communicating the situation's urgency, especially to the older generation of Malaysians in the states of Kalantan and Terengganu, where turtle eggs are considered a delicacy, remains notoriously difficult. Because turtles lay so many eggs, in Malaysia turtle eggs are still allowed to be sold in markets in Kuala Terengganu.

Joseph likes to retell the tale of how the leatherback has disappeared from their shores. She reiterated that it is a story that should not be forgotten because it illustrates why it is in everyone's interest that we start saving the other turtle species.

Thousands of leatherbacks used to frequent the sleepy shores of Rantau Abang, a small fishing village on the coast of Terengganu. Eggs were aplenty. Hundreds of thousands were buried in scattered clutches across the shore, far more than egg collectors could carry, and plenty for the locals to eat. With road expansion, turtle eggs were soon transported to new markets as far afield as Kuala Lumpur. The eggs became a commodity, prices rose and

more collectors started digging them up as egg sales became a lucrative source of income for the under-developed state.

In Rantau Abang, scenes of large groups of tourists crowding around a single nesting female were commonplace in the 70's and 80's. When the tourists left, the eggs were scooped up for sale. At the same time, a rapidly developing fishing industry led to leatherbacks being caught in nets.

Leatherback eggs laid in Terengganu dropped from 10,000 clutches in 1955 to about 3,000 in 1965. In 1999, only two percent of that number was found, and by 2002, only three female leatherbacks came to the beach.

Once it was realized that the numbers were dropping, conservationists and the state initiated efforts to protect the turtles. The first leatherback hatcheries were established in the 1960s, but only four percent of the eggs were protected. Considering that only 0.001 percent of hatchlings will make it to adulthood, that figure was not enough to preserve the leatherback population.

Joseph explained the situation, "Only a handful of female leatherbacks have returned to Rantau Abang to nest in the last few years, but none of the clutches hatched." Joseph believes that could be a symptom of man-

India reports millions of Olive Ridley hatchlings head to sea

The beaches along Gahirmatha beach have brought cheers to conservationists as they watched millions of hatchlings head for the sea. Approximately 1.68 lakh (1 lakh=100,000) Olive Ridley sea turtles arrived at the nesting beach between March 20 and March 28 to lay their eggs.

On the first Saturday of May, in the late evening, hatchlings began to emerge. The wildlife officials who are stationed on Nasi-2 Island were witness to this

natural occurrence.

Tourists and researchers were denied access to the island to witness the hatchings because the islands are located close to a defense test range, a prohibited territory. During the week of the hatch-out, the one kilometer beach was virtually littered with hatchlings. The babies literally jostled for space to move about the beach before heading to the sea. It is estimated that nearly two-million hatchlings emerged in a 24-hour period. ■



THE HIGH FIN SPERM WHALE AT EN.WIKIPEDIA

made distortions in the sex ratio of Malaysian leatherbacks because reptiles will lay eggs even if they are not fertilized. To make things worse, lights from resorts along the coast and vehicles ridden by sanctuary personnel patrolling the beach have disoriented the nesting females and hatchlings.

Efforts to save the other species of marine turtles

According to the International Union for Conservation of Nature (IUCN) Red List, green turtles are endangered, Olive Ridley's are vulnerable, and hawksbills are critically endangered. In Peninsular Malaysia, none of these turtle eggs are banned from consump-

tion. In addition, turtles are being picked off by poachers.

Earlier this year, World Wildlife Fund Malaysia has made fresh calls for the government to amend the Fisheries Act of 1958 to ban the eating of all turtle eggs. Sabah instituted a ban on commercial egg collection 30 years ago, and there has been a three-fold increase in its breeding population of green turtles despite the ongoing poaching in Borneo.

Conservationists have this message: Turtle egg consumption is no longer a sustainable practice. Unless action is taken now, seeing turtles on Peninsular Malaysia will eventually become only a memory. ■



PUBLIC DOMAIN



Baby logger-head sea turtle



USNIPS

Promoting Conservation Policies in Albania

Three year research by The Mediterranean Association to Save the Sea Turtles (MEDASSET) has confirmed that Drini Bay, on the northern coast of Albania, is an important habitat for sea turtles in the Mediterranean. Turtles use the bay for foraging, as a refuge and are part of a key migratory corridor between the Ionian and Adriatic Seas.

Information on the sea turtle population visiting Albania's waters had been scarce and research fragmented until 2008. Based at the Patok Lagoon area of Drini Bay, the project's researchers systematically collected data during the summer months by monitoring the sea turtles captured incidentally.

A remarkable 407 sea turtles were studied and released back into the wild: 402 loggerhead turtles (*Caretta Caretta*) and five green turtles (*Chelonia mydas*), confirming that Albania is a range state for green turtles.

Of the captured sea turtles, 27.5 percent were males (35 adults, 77 sub-adults). In contrast to females, males never return to land, and therefore, scientists' understanding of the distribution and marine ecology of males is very limited. "This discovery has increased importance due the impact of global climate change, as sand temperature during incubation is the sex determinant of hatchlings and an increase of just one or two degrees could lead to more female than male hatchlings

being produced," said Dr. Michael White, Project Lead Researcher.

The project revealed Drini Bay is used by both adult and subadult loggerheads, and occasionally by green turtles for foraging or migration. Juvenile loggerhead and possibly green turtles are using the area as a developmental habitat. There are indications that loggerheads may be staying in the bay during the winter months. This conclusion is also supported by the preliminary results of the first satellite tracking program of sea turtles in Albania that was launched through



Tracking continued until September 2011 and has confirmed the timing of the return of two out of the three tracked turtles to Drini Bay for feeding.

A waste pollution survey was conducted in the coastal zone of Drini Bay and upstream in five rivers. It was noted that there is widespread presence of marine litter in Drini Bay, in conjunction with the omnivorous nature of loggerheads means the consumption of plastic and other debris is highly probable. The illegal use of dynamite for explosive-fishing was monitored, and the first ever systemati-

cally recorded evidence was provided to the authorities.

MEDASSET's second project was to train 11 Albanian university students as research assistants, enabling them to monitor the sea turtle population. The project also offered a unique opportunity to over 250 Albanian university students to attend workshops at the project field station.

MEDASSET worked with Prof. Idriz Haxhiu, Director of the Herpetofauna Albanian Society and sea turtle researcher, to raise awareness locally and nationwide through local and national media. The researchers worked with the local fishermen, demonstrating good animal-handling skills and advocating conservation practices.

The sea turtle population in Drini Bay has yet to be completely understood. However, the findings and conclusions of MEDASSET'S three-year project led to the formulation of recommendations and a "National Sea Turtle Management Strategy". The long-term aim of this project is for Drini Bay to be recognized as a nationally and regionally important foraging and developmental habitat for sea turtles in the Mediterranean and that these endangered species are fully protected under Albanian national law. ■

Uncontrolled development on Specially Protected nesting beach in Fethiye Turkey, taking its toll

MEDASSET's complaint submission to the Secretariat of the Bern Convention stated that unplanned construction and developments to accommodate tourism are threatening Fethiye, one of the most important nesting sites for loggerhead turtles in Turkey, even though the whole bay area is designated as FethiyeGöcek Specially Protected Area.

Wetlands have been bulldozed for the construction of hotel complexes; snack bars and cafés are situated right on the nesting beach; motorized water sport activities are taking place in the bay; wooden walkways have been built on the sand; and dense rows of beach furniture remain on the beach on a 24-hour basis.

Strong lighting is used during the night

and visitors freely roam the beaches until the small hours. Artificial plastic carpeting covers part of Çalış nesting beach, and huge stones have been placed to delineate this area. Fourteen rows of acacia trees, an introduced species known for their extensive rooting, were densely planted along a 150 meter stretch of this beach. Quads and trucks pass freely through the beaches, and there is car access to virtually every beach. The garbage problem is entirely unsolved; there has been sand removal and fishing occurs directly off all three of Fethiye's nesting beaches. It is not to wonder why the number of nests has been notably declining since the early 1990s as tourism developed. ■

Zakynthos, Greece...the problems continue

In mid-July 2011, following a delay of nine months, the Greek Ministry of Environment, Energy and Climate Change finally released the operational funds to the Zakynthos national Marine Park (ZNMP). The funds covered salaries owed to the staff since November 2010 and should cover management costs of the park for the next five years. The delayed disbursement caused numerous problems to the management team during the summer nesting season. Some of the problems encountered are insufficient patrolling of the marine park,

construction of an illegal parking lot, construction of an illegal underwater stone breakwater in front of the Marathonissi islet, a decrease in the number of nests and a highest ever recorded number of turtle deaths.

Despite the European Commission's intervention on illegal landfills in Greece, they continue to operate within the ZNMP and have expanded construction of two illegal additions. Nesting in the summer was reduced to 786 nests. The high number of dead turtles (45) was indicative of the numerous violations in Laganas Bay. MEDASSET continues to monitor and assess conservation activities at the ZNMP, but they are concerned that the loss of the large number of adult turtles may irreversibly affect the loggerhead population that reproduces in Zakynthos. ■

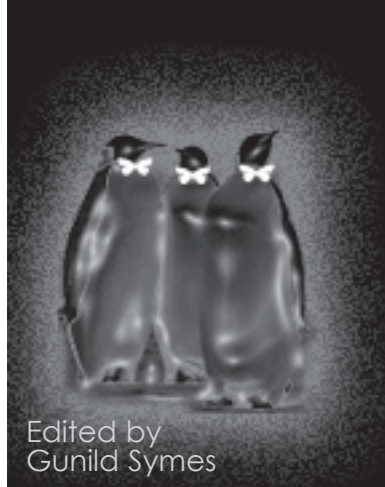


BRIAN GRATWICKE / CREATIVE COMMONS

Loggerhead sea turtle resting



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Dive Jewelry

Don Your Diving Pride

Gogh Jewelry Design

Capturing the essence of the ocean and its graceful, shy creatures is the goal of diver and jewelry maker, Szilvia Gogh of Hungary (now based in California, USA), who has created a collection of pendants especially for scuba divers and ocean lovers. The most popular item in her ocean collection is this personalized necklace, which features fine industrial sterling silver charms on a sterling silver chain. You pick your favorite charms from Gogh's various ocean themed collection of charms embracing myth and realism. Gogh, who studied jewelry making at the prestigious Budapest Art Institute, became the youngest certified female PADI Course Director in the world. She celebrates the underwater realm in her designs, which aim to empower the individual, while exuding tranquillity and style with a subtle European flavor. The pendant measures approximately .75-1inch (15-25mm) in diameter. Price: US\$149.00

Goghjewelrydesign.com



Sea Wolf

This handcrafted sterling silver Wasco pendant was created by Haida artist Robert Cross. The Haida people are the indigenous people of British Columbia, Canada. Robert Cross is of the Eagle clan of the Haida people and learned the craft of carving from his father, Gordon Cross, and metalwork from his cousin, Nelson Cross, both renowned artisans. What is a Wasco? It is a sea wolf of Haida legend with elements of both whale and wolf. Legend says that wolves hunting whales in the sea got lost in a fog and couldn't find their way back to shore. So, they decided to stay at sea and became Wascos. Price: US\$199.00 Size: 1 1/8 x 1 1/8 inches (28x28mm) Silvertalks.com



Dive4Jewelry

Show your love of one of the most intriguing creatures of the sea with this elegant manta ray pendant crafted of solid sterling silver and dangling on a black neoprene necklace. Created by divers, Dive4Jewelry, based in Sydney, Australia, offers two necklace sizes: 16-18inches or 18-20 inches with chain extender. Pendant measures 2.85x2.35cm in solid stamped 925 sterling silver with anti-tarnish rhodium finish. Price: US\$30.00 www.etsy.com



ZulaSurfing

This eye-catching unisex sterling silver scuba diving pendant by ZulaSurfing Studio based in New York City, USA, is designed for divers and casted in 925 sterling silver. It is also available in gold. ZulaSurfing showcases work by artists Gil Tsafir, who works in dichroic glass (see next page), and Irena Tsafir, who works in metals. Pendant weight: 8 grams. Satin finish 925 sterling silver pendant measures 1/2 x 1 5/8 inches (13x 41mm). Price: US\$129.00 www.etsy.com





dive jewelry



ZulaSurfing

This Scuba Diving Dichroic Glass Pendant with leather cord is created by artisan Gil Tsafrir of ZulaSurfing Studio in New York City, USA. The pendant is made of fused dichroic glass with silver foil. The artist describes the process on his Etsy web page: "Glass is fused to 1500 degrees and annealed for durability and strength." The adjustable 1.5mm black Greek leather cord measures 13-24 inches (33x61cm). A metal necklace bail is also available. The pendant measures .625 x 1.25 inches (16x32mm). Price: US\$32.00 www.etsy.com



Big Blue Aquatic Gifts

Elegant simplicity in this sterling silver Seaplicity Seahorse Pendant is created by diver, artist and conservationist Roland St. John of Big Blue Aquatic Gifts in Rhode Island, USA. It measures approximately 1.25 x 2.25 inches (32x57mm). Shown with an optional 2mm Omega chain. Price: US\$80.00. www.bigbluedive.com

FantaSea Jewelry

Self-taught American artist Liz Tylecki, formerly a jet-setting fashion designer in Chicago and New York City, has settled on the island of St. Croix in the U.S. Virgin Islands to design jewelry and save sea turtles. The artist uses the lost wax process and various hand fabrication techniques. All pieces are solid 925 sterling silver or 14kt yellow or white gold, set with gemstones or diamonds on request. The artist donates proceeds towards Caribbean Conservation and volunteers to help leatherback, hawksbill and green turtles during nesting season. Above are sea turtle earrings inspired by ancient petroglyph drawings. They measure 1.25 inches (32mm) with sterling silver French ear wires. Price: US\$45.00 www.fantaseajewelrystx.com



Octopus or jellyfish? This sterling silver sea pendant (left) holds a genuine rainbow moonstone and sky blue topaz gemstones in its tentacles. Measures about 3 x 1.75 inches (76x44mm). Price: US\$130.00 www.fantaseajewelrystx.com

Price: US\$45.00 www.fantaseajewelrystx.com



Mystic Diver

Get in tune with your inner Zen amphibian. Combine your love of diving and your love of yoga with this extraordinary Filigree Ohm Pendant Necklace by diver and jewelry designer, Szilvia Gogh. This handcrafted piece exudes an elegant style and relaxed attitude. The pendant measures 2 inches across. Available on a 16- or 26-inch necklace chain that looks heavy but is actually light weight. The pendant features an OHM sign and a black onyx stone wrapped in silver as well as several sterling silver circles or "bubbles" floating in a circular realm. Price: US\$499.00

Goghjewelrydesign.com

Dive4Jewelry

We love whale sharks! This pendant is a beautiful replica of one of the most amazing sea creatures of the deep and will certainly draw attention to your love of the underwater world. Dive4Jewelry based in Sydney, Australia, created this stunning piece, which comes with a black neoprene necklace in two sizes: 16-18 inches or 18-20 inches. The pendant is solid stamped 925 sterling silver with an anti-tarnish rhodium finish and measures 3.5x1.5cm. Price: US\$50.00 www.etsy.com





Edited by Peter Symes

Common market squid mating and laying egg casings

Text and photos by Matthew Meier

My first experience diving with mating squid was in September of 2000 during a rare late summer event off La Jolla Shores of San Diego in the U.S. state of California. To date, it still ranks as one of my all time favorite dives. Hovering at 50ft, encased in darkness, I watched in spell-bound fascination as tens of thousands of mating squid pulsed in front of my light, and wave after wave of predators swooped past to feed. There were harbor seals, California sea lions, leopard sharks, sting rays, bat rays, guitarfish and even cormorants flying by underwater. None of them paid me any attention, as the squid tirelessly bounced off every inch of my body.

Midway through the dive, something big enough to spin me around, hit me from behind and scared me silly. I don't know if the culprit was a sea lion, shark, bat ray or something otherworldly, and perhaps it is simply better not to know, but my adrenaline was pumping on overdrive for the remainder of that

dive. While I do not have pictures from that epic night, I was lucky enough to photograph another squid orgy this past December.

About squids

Common market squid (*Loligo opalescens*) live in the Eastern Pacific

Ocean, ranging from Alaska down to Baja California, Mexico. They migrate in gigantic schools and have a lifespan of only 12-14 months. These creatures grow quickly and procreate at about one year of age. Market squid reproduce in a continuous spawning activity that can last for weeks or even months. Commonly

called squid runs, these spawning events typically occur after dark, on muddy or sandy bottoms above submarine canyons. During heavy squid runs the mating activity may even continue through the daylight hours.

Southern California squid runs typically happen during the colder winter

months but if conditions are right, they can occur in late summer or fall. On those years when the squid migrate up from their deep-water homes to mate at depths shallow enough for recreational diving, this nighttime activity should not be missed. Being engulfed in the mating frenzy can be an awe-inspiring experi-

Diving into a Squid Orgy





Squid



CLOCKWISE FROM LEFT: Diver hovers over thousands of squid egg casings; Slender cancer crab foraging in a large bed of squid egg casings; Angel shark resting on the sandy sea floor after feasting on squid; California sea hare feeding on a dead common market squid



ence. The squid tend to gravitate to dive lights and swarm from every direction, often making it difficult to see more than a few feet. Add in the occasional sea lion, bat ray or shark and you can quickly go into sensory overload and forget about your depth, air supply and dive buddy. Luckily, turning off or shielding the light occasionally will allow you to catch your breath, disperse the teeming squid and collect your bearings.

Squid are members of the mollusk family known as cephalopods and their

relatives include octopus, cuttlefish and chambered nautilus. Common market squid are 12 inches long, iridescent white in color and like other members of their family, capable of changing color in reaction to their environment.

When a male grasps onto a female during mating, it's arms and tentacles change from white to a deep reddish-brown. This may be a sign of excitement or perhaps a warning for other males to stay away. However, even with the warning, it is not uncommon to see several males attached to a single

female, each attempting to mate with her.

After mating, female squid deposit a single, 6-8 inch egg casing containing 200-300 eggs in the sandy bottom and fertilize the eggs with sperm packets placed in their mantle cavity by the male during mating. Millions of mating squid produce immense numbers of egg casings, which create enormous egg beds that can cover acres of sea floor. Females are thought to be able to produce 20-30 egg casings before they die in this terminal breeding pro-

cess.

As the squid eggs mature and develop, the egg casings start to yellow and turn brown. In 3-5 weeks, depending on the water temperature, the eggs produce hatchlings that look like tiny adults. Paralarvae, as the new hatchlings are called, are dispersed by ocean currents to start their brief life cycle anew.

Market squid are also commonly known as Calamari and frequently appear as a fried appetizer on restaurant menus. They are a good source of



protein, riboflavin, selenium and B12 and in 2010; over 250 million pounds of market squid were caught off California's coast, representing the bulk of the world's harvest. In the wild, market squid are a vital food source for a large assortment of marine mammals, birds and fish.

Dances with squid

Photographing within the thick soup of mating squid is challenging indeed. The constantly changing scene dancing in front of your lights makes it very difficult to compose properly, and it seems that the longer you wait for a shot, the more the squid congregate and obscure the front of your lens. In order to capture the action without the squid blocking out the entire landscape, it is necessary to point your lights away from the desired backdrop and then bring them back again once the chaos has cleared. It becomes a game of moving the lights

in and out to control the ebb and flow of the squid, in hopes of encapsulating a manageable number of subjects in the frame.

A daytime dive during a squid run reveals expansive egg beds, now devoid of the thousands of squid in the water column, along with throngs of scavengers feasting on the dead and dying squid. Angel sharks, bat rays, sheep crabs, spiny lobster and countless other critters stuff themselves on the casualties from the previous nights orgy. It is absolutely fascinating to watch the circle of life in action and observe how Mother Nature uses the demise of one generation to provide for so many others. If you have



the opportunity to witness a squid run in person, I highly recommend the experience. Bring your sense of adventure and prepare to be amazed. ■

CLOCKWISE FROM TOP LEFT: Common market squid mating and laying egg casings; Detail of common market squid mating and laying egg casings; California rock lobster foraging for food



Electroreceptors are different in different species

The electrosensory system of sharks and stingrays differ greatly between species as a result of individual needs and reflect the environment in which they live.

Electroreception used in shark repellents may be ineffective, because not all species of sharks respond in the same manner, University of Western Australia (UWA) Marine Neuroecology PhD student Ryan Kempster has found.

Professor Shaun Collin from UWA's School of Animal Biology said that understanding the basic neurobiology and neural basis of shark behavior might help to develop more effective shark repellent devices.

The results might indicate the need to target a variety of senses at a range of thresholds rather than aim for a 'blanket' repellent that might focus solely on one sensory system to repel all sharks in the same manner," he said.

Sharks may even remember the stimulus and then not respond to it at all after multiple encounters, which would negate the effectiveness of such a device. ■

China bans shark fin soup at official events

The Chinese government has announced it would prohibit official banquets from serving shark fin soup, a pricey and popular delicacy blamed for a sharp decline in global shark populations.

The ban, reported by the state-run news agency, Xinhua, could take three years to take effect and comes after Premier Wen Jiabao in March called for an end to using public funds to purchase cigarettes and "high-end" alcohol. It remains unclear how widely it will be imple-

mented across a nation where orders issued by Beijing are often shrugged off by officials in remote regions.

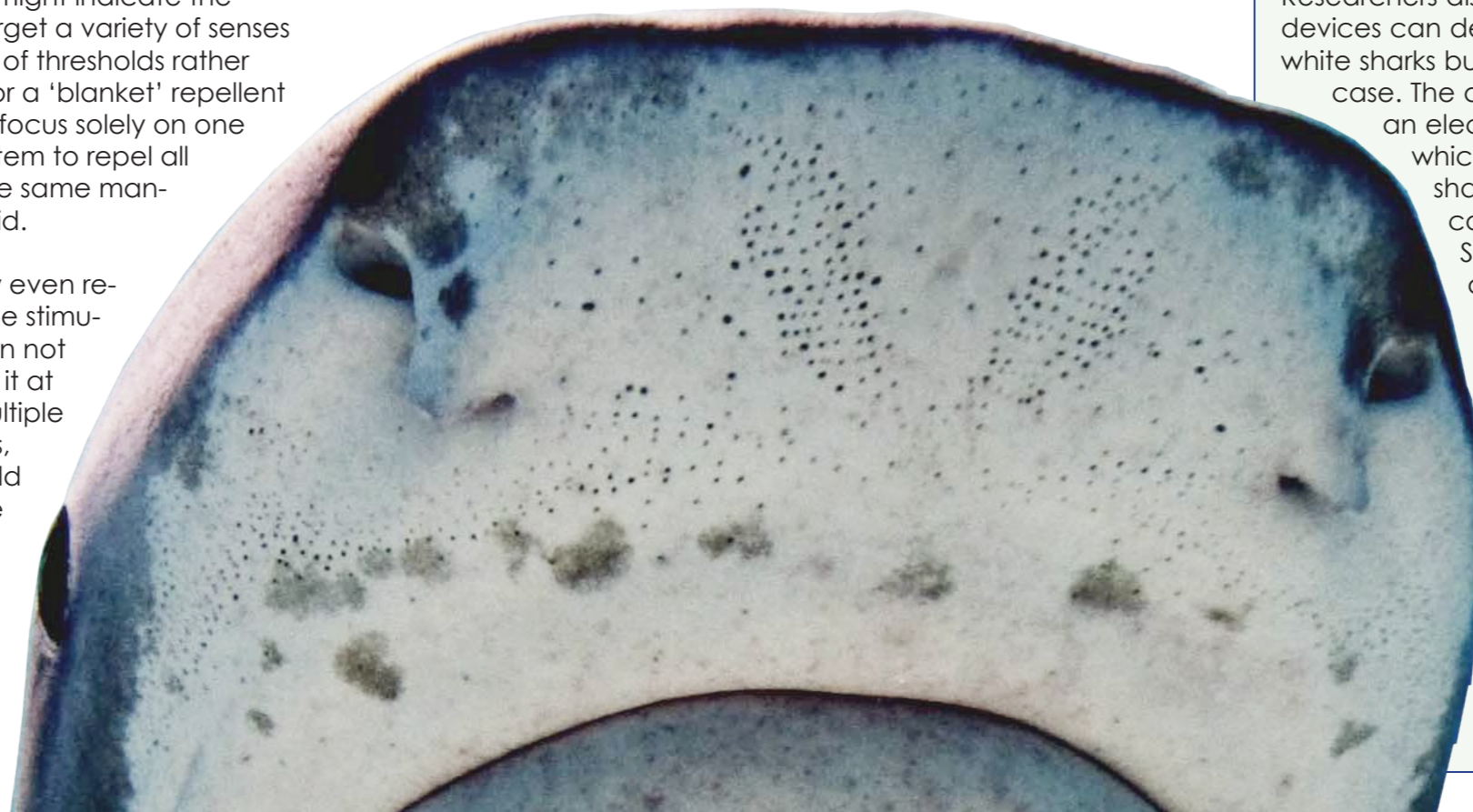
Reuters reports that many netizens are taking issue with the ban's three-year implementation window, arguing that sharks could be extinct by then. Many also view the consumption of shark fin soup at government

Ordinary people eat starch noodles, officials use the people's money to eat shark fin.

banquets an unnecessarily lavish expense. In the words of one user. ■



As the distribution and abundance of electroreceptors that make up the electrosensory system of sharks clearly differ between species, it tells us that a single repellent device is probably not appropriate and would not be effective on all sharks.



Shark shields prove ineffectual

A study of the effectiveness of electronic shields to prevent shark attacks has discovered them to be unreliable at best. Researchers discovered the devices can deter some great white sharks but not in every case. The device sends out an electronic pulse,

which is said to repel sharks. The study was commissioned by SafeWork SA to assess the effectiveness of the devices for commercial fishing crews.

Researchers used static tuna baits off Neptune Island in South Australia and seal decoys in South Africa to measure

whether sharks were deterred by the electrical pulses. "In South Australia with the static bait, we did not find any differences in the proportion of bait being consumed by white sharks whether the shield was turned on or off," said researcher Charlie Huvener. "There are situations where the white sharks were still capable of getting very close to the shark shield, within half a metre, and was still capable of consuming a bait.

In South Africa, researchers found the shield was more effective in deterring an attack. Although researchers concluded the risk of an attack may be reduced, the shields failed to repel great whites in all cases. The report recommends more research into other shark species and tests in areas without tuna baiting, which is done for tourist cage-diving to see sharks. ■

79 Potentially New Shark Species Found

A recent genetic study of thousands of shark and ray specimens has revealed a plethora of potential new species, fuelling debates between biologists over the organization of their family tree. Although sharks and rays are apex predators, their life cycles and population numbers remain poorly understood.

Charleston in South Carolina, sequenced samples from 4,283 specimens of sharks and rays

imately 1,200 species thought to exist worldwide.

more than one species out there," stated Naylor.

Naylor is now working on a project with the U.S. National Science Foundation to catalogue the diversity of sharks and rays to assist the International Union for Conservation of Nature (IUCN) to map species' locations worldwide.

"This will have an impact on what is considered endangered and the fragility of different organisms," he said. "These are sentinel species of all sorts of other organisms in the sea, which are probably undergoing similar or worse kinds of impacts," he added. ■

The possibility has also been raised that some species are even more endangered than previously believed, as some had gone undetected

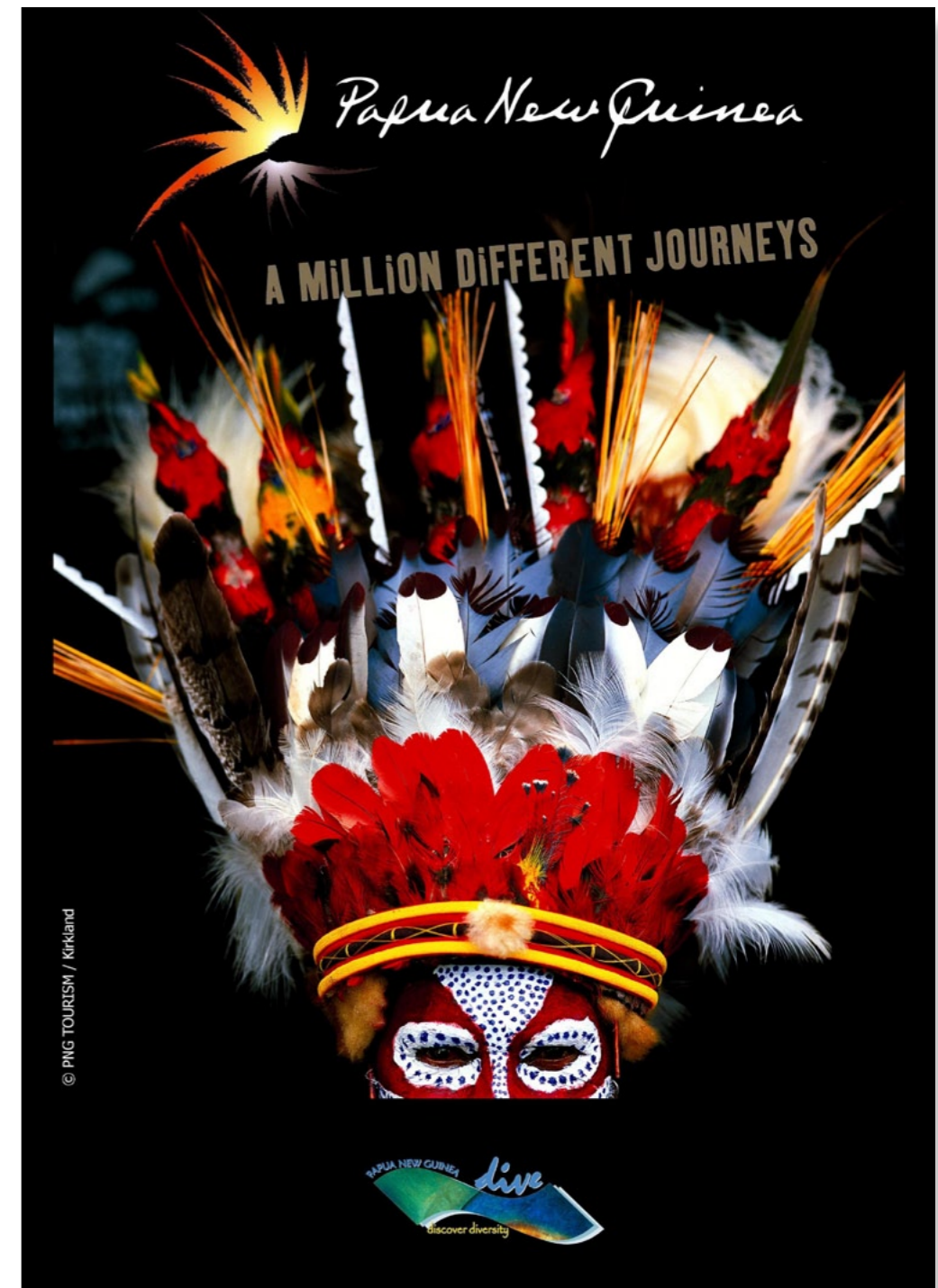
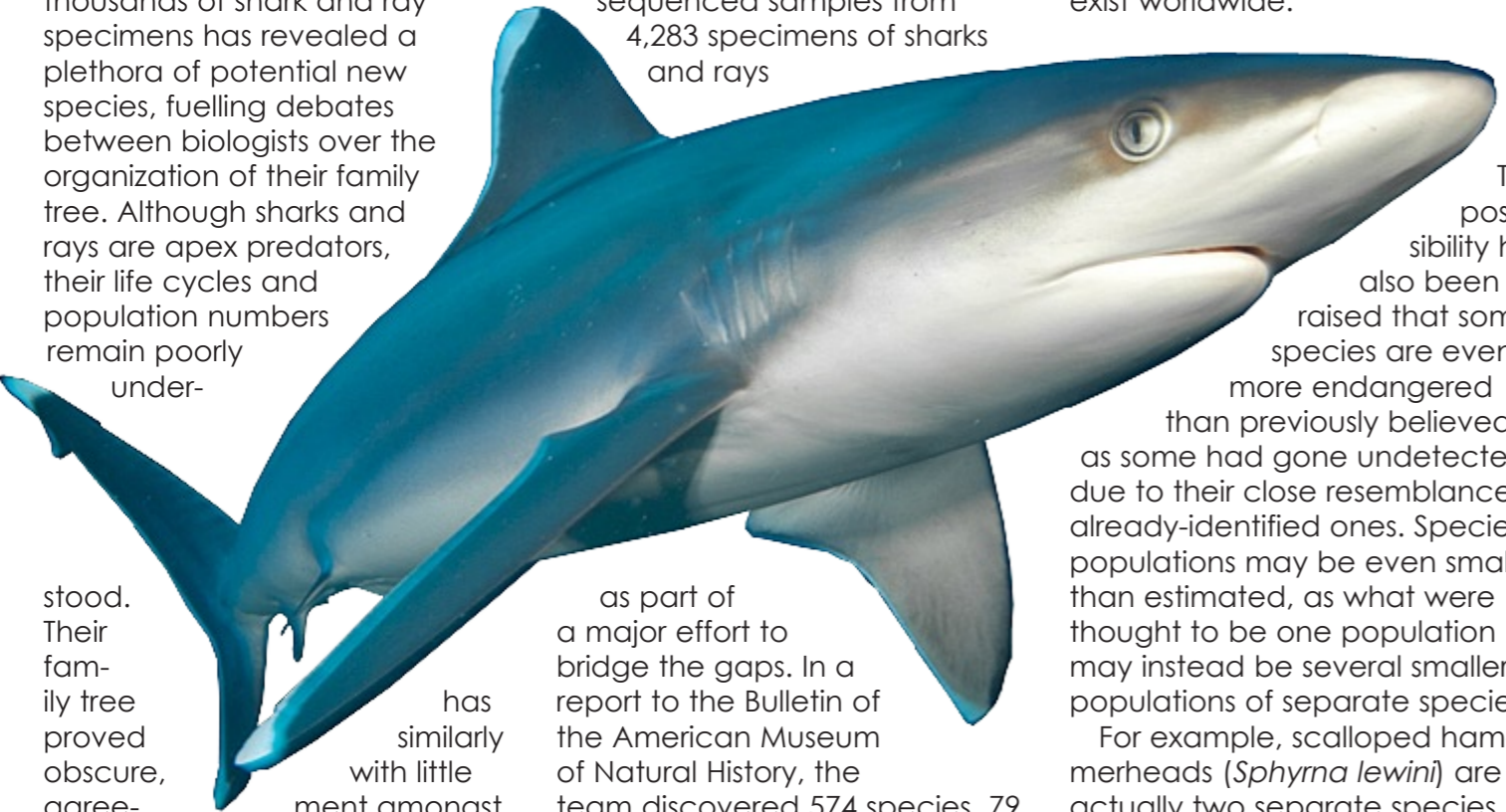
Their family tree proved obscure, agreement amongst evolutionary relationships.

Biologist Gavin Naylor and his colleagues at the College of

as part of a major effort to bridge the gaps. In a report to the Bulletin of the American Museum of Natural History, the team discovered 574 species, 79 of which were potentially new. Naylor was "flabbergasted" by the result, as the sequencing encompassed half of the approx-

The possibility has also been raised that some species are even more endangered than previously believed, as some had gone undetected due to their close resemblance to already-identified ones. Species populations may be even smaller than estimated, as what were thought to be one population may instead be several smaller populations of separate species.

For example, scalloped hammerheads (*Sphyrna lewini*) are actually two separate species. "Scalloped hammerheads in general have taken a huge hit, so it may be even worse than has been documented if there's



Are sharks our distant cousins?

Humans evolved from a prehistoric shark that roamed the seas more than 300 million years ago, say scientists.

A primitive fish named *Acanthodes bronni* was the common ancestor of all jawed vertebrates on Earth—including humankind, according to new research. *Acanthodes*, a Greek word for "spiny", existed before the split between the earliest sharks and the first bony fish-

es—the lineage that would eventually include human beings. Fossils have been found in Europe, North America and Australia. The study, published in *Nature*, found acanthodians as a whole, including the earliest members of humans' own deep evolutionary past, appear

to cluster with ancient sharks. This new revision of the lineage of early jawed vertebrates will allow paleontologists to dig into deeper mysteries, including how the body plan of these ancient species transformed over the transition from jawless to jawed fishes. ■

Edited by Peter Symes

Bacteria that live in a sack under the eyes make the lanternfish glow. *Photoblepharon palpebratum* often appears along seaward reefs near or along steep drop-offs with caves. In some areas, it may approach the surface. It stays well hidden in caves and rarely seen during the day. Usually feeds in large groups away from the reefs at night

Lanternfish

Lanternfish are aptly named after their conspicuous use of bioluminescence. They are a large family of oceanic fish consisting of over 200 different species, which may account for as much as 65 percent of all deep sea fish biomass.

Lanternfish are well known for their daily vertical migrations. These fish live in the mesopelagic (also known as the twilight zone), which is that part of the pelagic zone that extends from a depth of 200 to 1,000 metres (650 to 3,300 feet) below the ocean surface. Towards sundown, the fish begin to rise into the epipelagic zone, between 10–100 metres (33–330 feet) deep to follow the similar migrations of plankton, which serve as their primary food

source. It is thought that these migrations may also serve to help the lanternfish avoid predation, and return back to the deep midwater before daybreak. There is great variability in migration patterns within the family. Some deeper-living species may not migrate at all, while others may do so only sporadically. Migration patterns may also be dependent on life history stage, sex, latitude and season.

Most species prefer to remain close to the coast where they are commonly found in large schools near the continental slopes. Different species have been known to separate themselves according to depth forming dense layers according to species.

Bioluminescence

The light is produced by symbiotic bacteria within light-emitting cells called photophores. It is produced by a chemical

reaction when a substance called a luciferin is oxidized. When the light is released, the luciferin becomes inactive until it is replaced by the animal. Some animals can make luciferin themselves, or it may be synthesised by symbiotic bacteria inside the photophore.

The arrangements of lanternfish photophores are different for each species, so it is assumed that their bioluminescence plays a role in communication, specifically in shoaling and courtship behaviour. The characteristic distribution of photophores on the flanks of the fish also suggests that their luminescence reduces the sil-

houette when viewed against a background of downwelling light. The lanternfish have direct neural control of the photophores and can regulate the brightness of the bluish light to match the ambient light level above, effectively masking the lanternfishes' silhouette when viewed from below. This strategy is also known as counterillumination.

Yoshi Hirata, underwater photographer and owner of Club Paraiso Resort and P-com Diving of Cebu in the Philippines, writes: "The lanternfish that we see in a nearby cave are very beautiful to behold with their fantastic light

displays. They are very difficult to photograph but easy to capture on video. We have two species in the same cave, and during the daytime, we can see them at the bottom of the cave. At about 4pm, they start moving slowly from the end of the cave towards the entrance. *Anomalops katoptron* comes out of the cave as a school and return by early morning. *Photoblepharon palpebratum* form couples that stay the whole night at the entrance of the cave, but sometimes venture out to mate. ■

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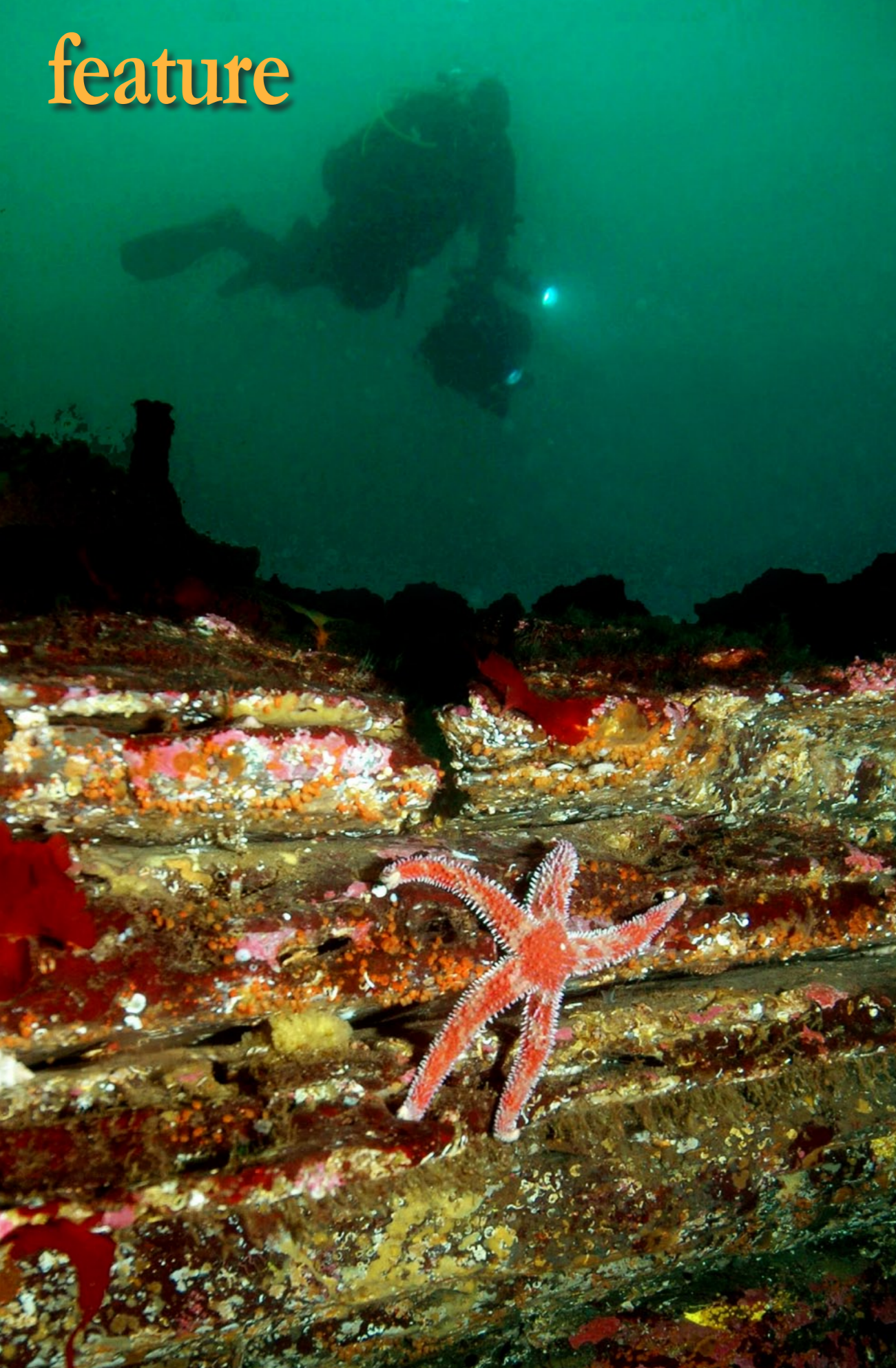
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British Columbia Getaway Hornby Island

Text and photos by Barb Roy
and Wayne Grant





Hornby



After my husband and I returned from an exhilarating encounter with a group of playful sea lions at Norris Rocks, I must say, our visit to Hornby Island was a great dive escape in British Columbia, Canada! When we weren't playing tag with sea lions, we were exploring unique underwater terrains or photographing wolf eels, Puget Sound king crabs, rockfish, rose sea stars and other colourful invertebrates.

I can't think of a better place to be with your favorite dive buddy or friend, than spending a relaxing weekend at a top-notch dive resort where one naturally falls into the routine of eat, sleep and dive. And need I say, the food was always fresh, well prepared and delicious. The operation, Hornby Island Diving, is run by Rob and Amanda Zielinski, who cater their professional service to divers and their families almost year round.

"The sea lions are the main attraction during the winter months," said Rob with a big smile, "They arrive in October, so we dive with them in November and January through March."

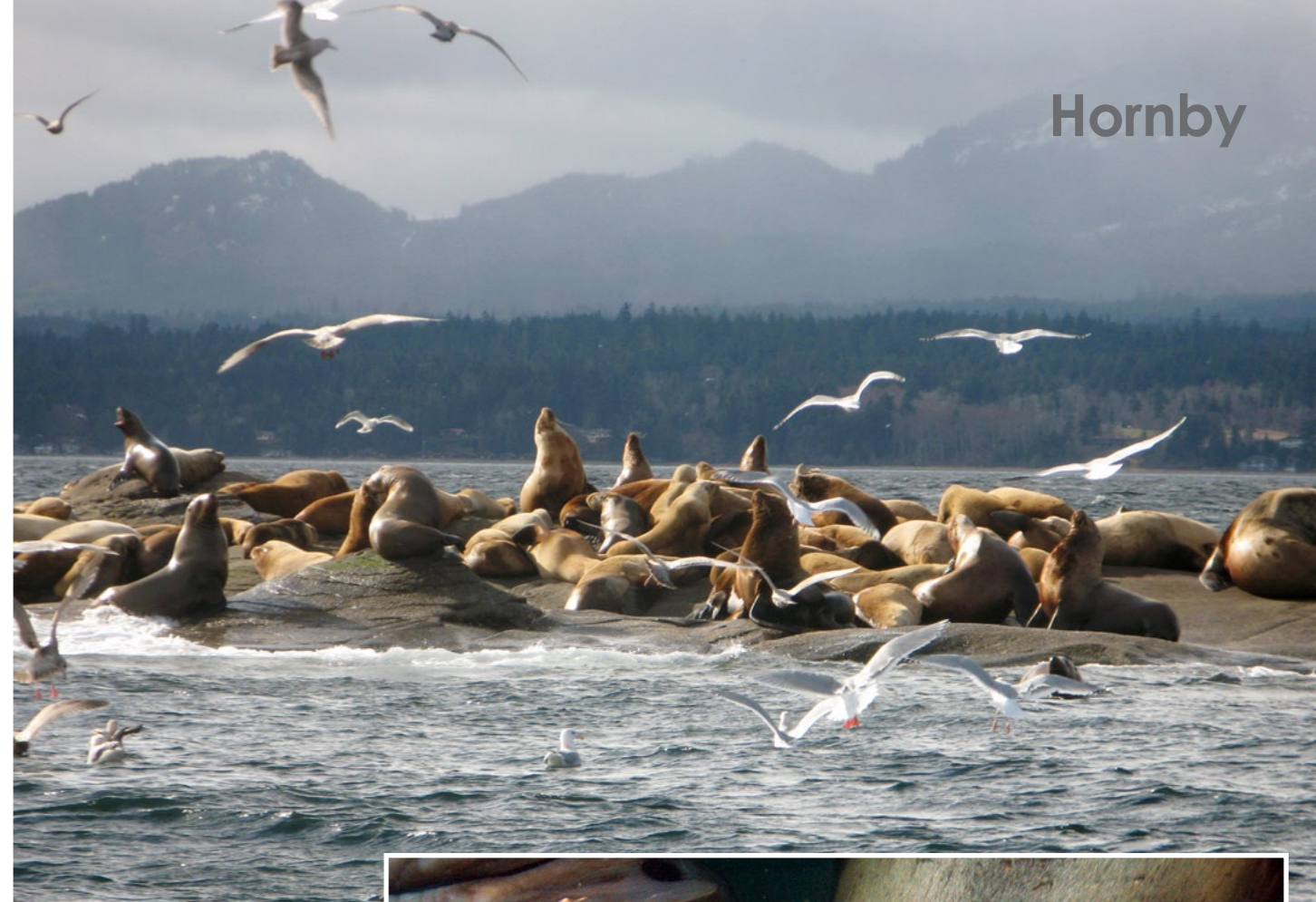
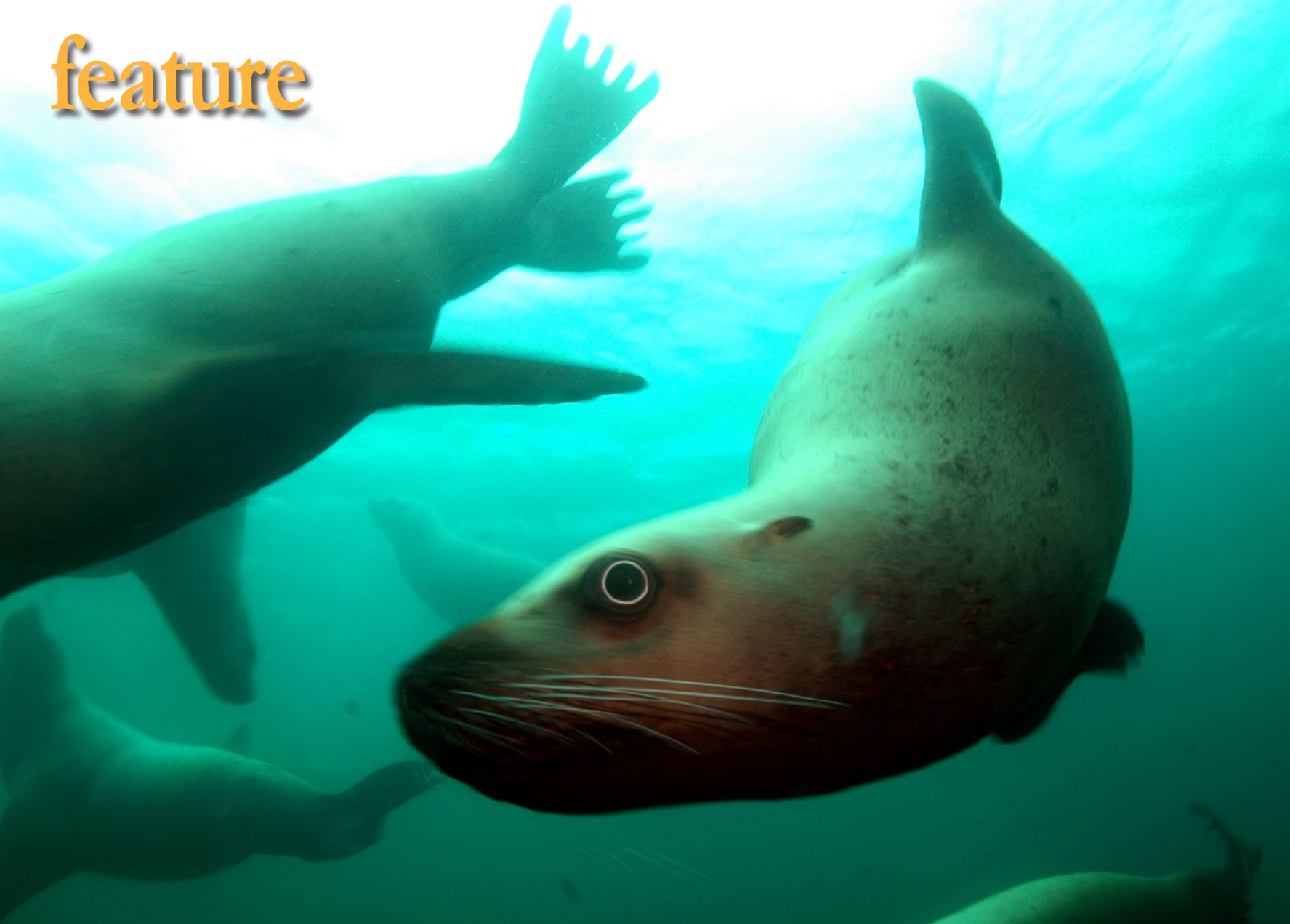
Our journey actually took place in March of this year, just before the her-



ring spawn, so underwater life in general was a bit on the wild side with several other marine species getting ready to spawn as well. Visibility was good. For our first dive, Rob put us in with the sea lions.

CLOCKWISE: Diver and seastar. Playful sea lions; Crab PREVIOUS PAGE: Curious sea lions with diver





CLOCKWISE FROM LEFT: Sea lion takes a closer look into the lens; Sea lions on the rocks; Whiskers on the sea floor; Curious sea lion checks out the video equipment



I could just imagine what the huge critters were thinking as our group of divers entered the water, "Hey, it's the scuba toys again!" Or maybe it was more like, "Look, the chew toys are back!"

Staying in the 20- to 30-foot depth range and careful not to get too close to the reef where the huge males were lounging, we sat in what Rob called a 'chicken circle' and waited with cameras and videos in hand.

I remember last year's encounter and sitting with other divers gave the critters someone else to pick on, so no problem on my part being part of a chicken circle. It didn't take long before about 20 began buzzing the divers; some came through individually and others in small groups, but all were fast moving.

Several made a point to rub up against the divers while others would hang upside down right in front of us and stare with their big

round puppy-dog eyes. It was so cool when they noticed their reflections in our dome ports.

On occasion a mob of them would rush from the surface down to one of the divers who usually strayed from the circle. This is when I discovered it was possible to actually yell into my regulator! I'm sure after that they just targeted me to hear the squeaky toy make noise.

Other critters

Aside from the sea lion harassment, I mean encounter, we went to several sites where the pace was a bit slower. On one of the dives in

30-40 feet of water, tube-dwelling anemones covered a sandy bottom, nourished by a gentle current. Orange sea pens, painted anemones, rock scallops and small fish enjoyed the



flow along with nudibranchs, gobies and sea stars.

Fortunately, I had changed to my camera lens to a 50mm on my Nikon DSLR and was enjoying some close-up photography when I came across a great sculpin guarding eggs. Delighted with my find, I proceeded to snap away until a young wolf eel appeared, maybe two to three years old.

Needless to say, I was distracted and began to follow the wolf eel on its hunt for snacks. After a dozen or so images and not much action, I again became distracted by the multitude of great sculpins guarding nests of eggs. Later, Ron Akeson, the owner of Adventures Down Under in Bellingham Washington, told me he took up where I left off and followed the wolf eel for video footage. I listened with excitement as he told how

the wolf eel kept going up to the sculpin eggs and gulping mouthfuls! When one of the guarding males protested and bit the wolf eel, it turned and grabbed the fish and shook it! I should have waited.

Keep in mind, this was just two of the weekend's dives. With an average of two to three dives per day at over 30 main sites, divers are sure to have a memorable holiday.

"Since we mainly dive mostly around southern Denman and Hornby Islands, our longest boat ride is only 15 minutes from the lodge," said Amanda. "Our weekend dive package includes two boat dives,

one night of accommodation, all meals, airfills, tanks and weights. Non-divers are also welcomed."

CLOCKWISE FROM ABOVE: Copper rockfish hides in a crevasse; Tiger rockfish; Sea pen; Young wolf eel; Sculpin guarding eggs



Dive resort

It was 1972 when Bob and Ann Zielinski began offering diving services on Hornby Island. They also bought the 42-foot boat *Oceaner* in that same year. Business quickly grew into a thriving operation where many dive shops brought their students to do their checkout dives or recreational divers to see the mysterious sixgill sharks. Needless to say, Rob grew up around diving, getting certified in 1988.

After taking over the family business in 1994, Rob was joined later by Amanda in 1997 when the lodge underwent a complete rebuild. The following year they had a new 35-foot custom dive boat

said Rob, "We like to either take out only recreational divers or only technical divers."

This is good, because technical divers usually have a lot of gear!

designed and built, accommodating up to 12 divers with single or double tanks or even rebreathers. After personally diving on the boat, I really like how easy it is to enter and exit the water.

"When we take groups out,"



Topside excursions

As far as topside activities, Wayne and I visited Helliwell Provincial Park to photograph scenic ocean views, island shore birds and other wildlife. The organic farms were fun to purchase fresh fruit

and veggies from, but Wayne's favorite stop was at Island Spirits Distillery where PHROG gin and vodka is made, infused with various flavors. I think he really liked the taste testing best.

CLOCKWISE FROM LEFT: Sunstar spawning; Dive boat at dock; View of beach at Provincial Park; Painted anemones





CIA WORLD FACTBOOK

NASA



available if needed. During my stay, I took advantage of the sauna to warm my bones and the heated drying room for my dry suit undergarment. Wayne said he gained five pounds over the weekend from all the seemingly endless good food. I was pleased they could handle my special vegetarian dietary needs.

Rob holds a Divemaster rating and Amanda is a Dive Instructor. Charters usually consist of a weekend excursion, arriving on Friday for dinner with two to three dives on Saturday and two dives on Sunday. This leaves plenty of time for catching the two small ferries back to Vancouver Island and connecting up with the larger ferry back to the mainland. See: www.bcferries.com.

Let their experience and professional attitude carry you away on an unforgettable journey under BC's emerald paradise. Information and directions can be found on Hornby Island Diving's website at www.hornbyislanddiving.com ■



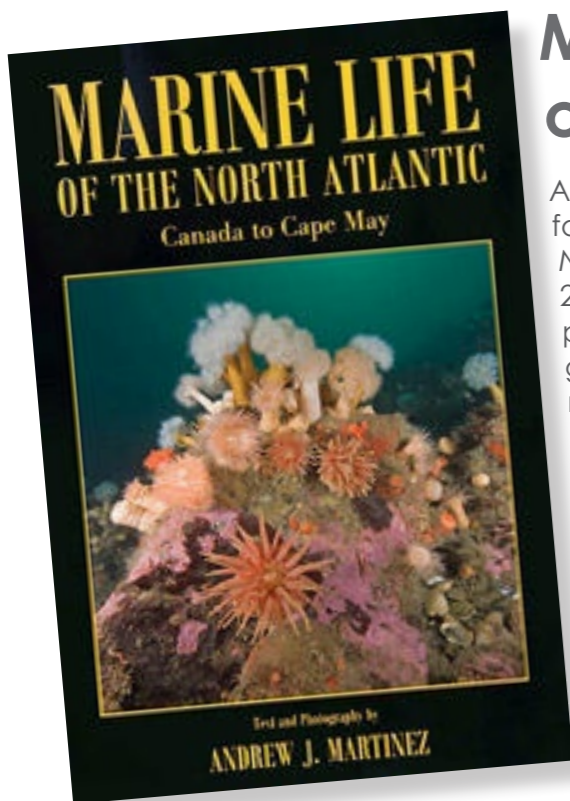
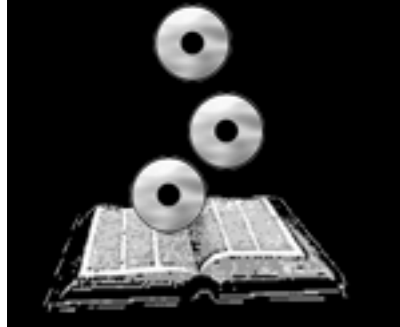
Travel Information
 DIABC—Dive Industry Association of British Columbia
www.diveindustrybc.com
 BC Ferries www.bcferries.com
 Hornby Island Diving
www.hornbyislanddiving.com
 Adventures Down Under – Dive store in Bellingham, Washington, USA www.adventuresdownunder.com ■



Our hosts—Rob, Amanda and Ava

CLOCKWISE FROM FAR LEFT: Rose star; Brittle star; Location of Hornby Island on satellite image of Vancouver Island; Dive boat with happy divers

One of the sites in the area preferred by technical divers is to the wreck of the *Capilano*. Up to 20 can stay comfortably in the 11-guest room two-story lodge. A large common area and a place to hang and wash dive gear is available for use. For visiting underwater photographers, there are two workstations and a well-equipped library for identifying the critters. Their compressor pumps regular air or nitrox. Argon and mixed gases are also



Marine Life of the North Atlantic

Author Andrew J. Martinez released the fourth edition of his book, *Marine Life of the North Atlantic: Canada to Cape May*, in 2010. This revised version includes a comprehensive, informative and accurate guide to marine life in the waters off the northeastern coast of the North American continent. The single volume covers 278 species with 390 underwater photographs of fish, invertebrates and marine plants. Find identification tips and information on the size, habitat and geographical range of individual species. 304 pages. Price: US\$35.00 www.reef.org/node/449

Fish ID app

Marine biologist Marcelo Szpilman and Caranx Informatica Ltda also offer a fish identification app produced in several languages including English, French, Spanish and Portuguese based on his book, *Peixes marinhos do Brasil: Guia prático de identificação (Marine fishes of Brazil: A practical identification guide)*. Divers can use this app to identify over 200 species of marine fish. You can search by name, family or genera with the quick and easy-to-use rotation system. There are tips for visual identification with 184 black and white illustrations as well as a list of 778 fish species' scientific names and their common names in English, Portuguese and Spanish. Plus, you will find 170 fish cards with color illustrations and photographs. The cards include the scientific and common names of fish in several languages as well as size, color, characteristics, range, habitat, behaviors and threat of extinction status of various fish species. In addition, you can have fun playing two games to exercise your fish identification prowess. New fish and new photos will be added in updates. Price: US\$6.99. itunes.apple.com



Shark ID app

Marine biologist Marcelo Szpilman Caranx Informatica Ltda have just launched a shark identification app produced in several languages including English, Spanish and Portuguese based on his book, *Tubarões no Brasil: Guia prático de identificação (Sharks in Brazil: A practical identification guide)*. Divers can refer to the easy-to-use, fully interactive app to identify over 50 species of sharks and rays. Includes lots of color illustrations and photographs as well as descriptive fish cards you can flip through with a finger using the app's rotational system. Look up common names of species in English, Portuguese, and Spanish. Plus, there are two entertaining games for fun with identifying sharks. Price: US\$3.99-5.99 itunes.apple.com



Pearl Man

This retro, arcade style iPhone game by MC Pacific Holdings, LLC, is a new scuba diving game experience in which you are a scuba diver who must dodge dangerous elements underwater and collect pearls in a certain amount of time. If you collect them all, a large shell will open, and you obtain the special pearl. See if you can beat all the levels. Addicting. Price: US\$0.99 www.pearl-man.com





Text by Mark Powell

Technical diving instructor Mark Powell discusses nitrogen narcosis, one of the most underestimated risks to the technical diver but, with the use of the right breathing gas, one of the most easily avoided.

Of all the physiological factors that affect us as technical divers nitrogen narcosis is the most common but also the most widely misunderstood. Narcosis occurs as we dive deeper and becomes more severe the deeper we go. It has several side effects all of which serve to impair our ability to carry out basic tasks. Narcosis was most famously described in Jacques Cousteau's book, *The Silent World*, where Cousteau describes the symptoms and named it the "Rapture of the Deep".

The cause of narcosis has not been definitively proven, although it is widely believed to be caused by the anaesthetic properties of certain gases at raised partial pressures. Many divers incorrectly

consider narcosis to be a black and white issue, either they are suffering from narcosis, or they are not. Furthermore, many divers claim that they have never suffered from narcosis. This shows a misunderstanding of the properties of narcosis and a lack of understanding of the symptoms.

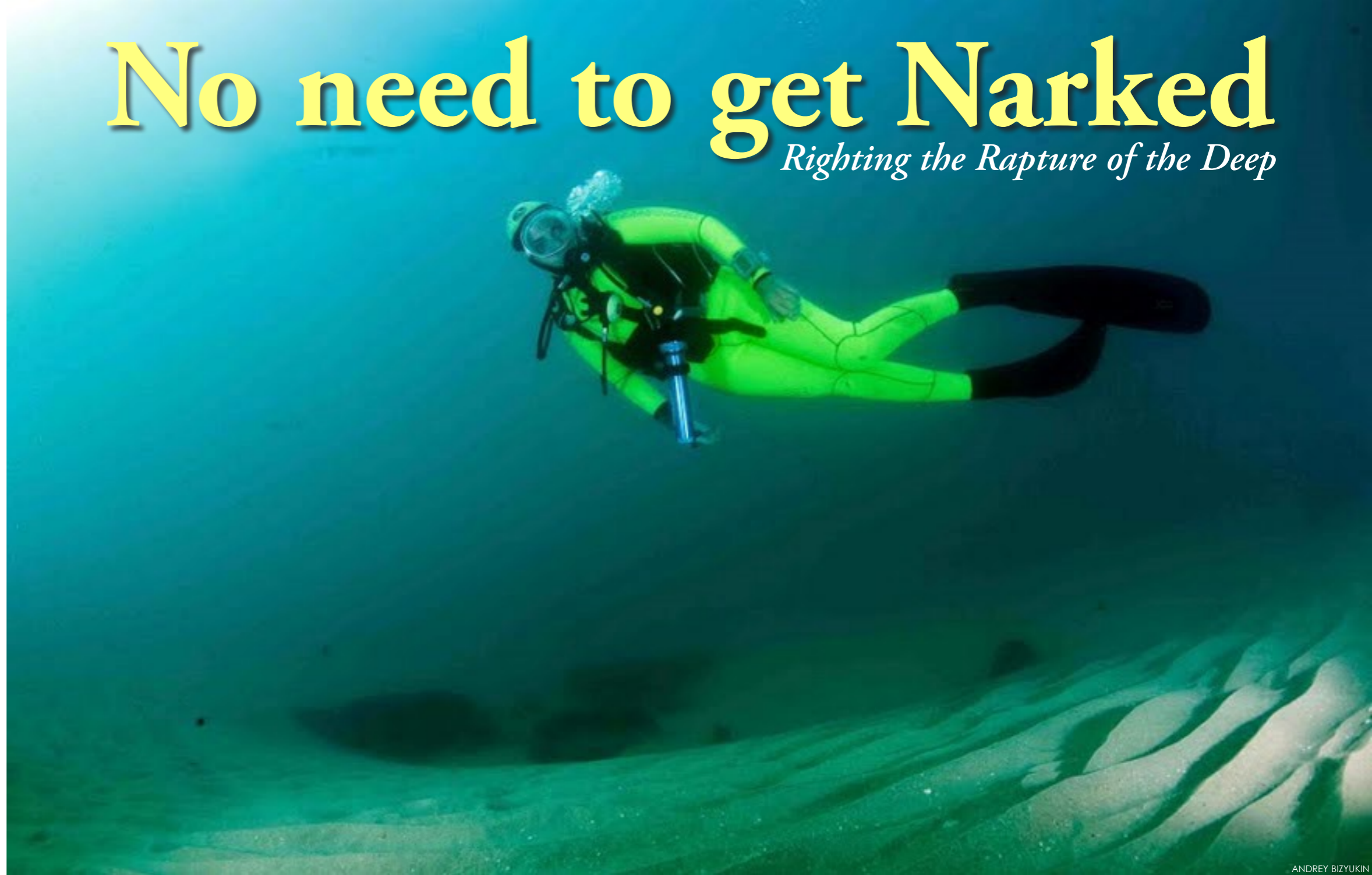
If, as we believe, narcosis is caused by the anaesthetic properties of gases at increased partial pressure, then the level of narcosis experienced should be proportional to the depth. As the diver descends, the narcosis should build up gradually. Those divers who claim never to have experienced narcosis have just never noticed the effects.

Effects

There are many effects of narcosis. The two most widely known are the extreme feelings of either euphoria or panic. In many ways the diver who experiences these feelings of panic and doom is

No need to get Narked

Righting the Rapture of the Deep



ANDREY BIZYUKIN

lucky in that this type of narcosis is acting as a failsafe and preventing them from going deeper and experiencing more narcosis. The diver who experiences euphoria is potentially at more risk, as they are more likely to take risks or act dangerously. However, these two symptoms are not the only effects of narcosis.

There is a wide range of other effects. These may not always be as obvious as a feeling of over-

whelming panic. Symptoms can be much more subtle and so are not always immediately obvious.

Lack of judgement. Divers suffering from narcosis often show a lack of judgement. They don't always make the best decisions, or in some cases, take an inordinate amount of time to make what should be a simple decision. I once watched a diver on a wreck penetration course take

several minutes deciding which of two points to use to make a tie off. Until pointed out later, they didn't realise that they had taken this long to make the decision.

Memory loss. Narcosis appears to affect our memory. Divers who report no other symptoms of narcosis frequently show a lack of memory of certain parts of the dive. I spoke to a diver a few years ago who had just done

the same dive as I had. I was on Trimix, and he was on air. The diver confessed that, despite a 20 minute bottom time, he couldn't remember any specific detail of the dive.

Loss of dexterity. Tasks which are easy in shallow water for some reason tend to become more difficult at depth. Loss of dexterity or motor control is a frequent symptom of narcosis. On many occa-



sions I have seen someone send up a DSMB from 10m in just a few seconds only to have exactly the same task take several minutes at depth.

Task fixation. Narcosis often causes perceptual narrowing or task fixation. Divers become obsessed with completing the task they have begun, even when other tasks have obviously become a much higher priority.

Slower response. Divers suffering from narcosis often respond slow-

er than they would in shallower water. These extra seconds can make a vital difference at depth.

Emergency situations

It is interesting that many of these additional symptoms of narcosis are not noticeable unless a problem or emergency occurs. If everything is going well, then the fact that tasks take a little longer is no problem, especially as both parties are likely to forget many of the details of the dive anyway.

However, narcosis becomes much more of an issue if a problem occurs. In this case, the diver now has to assess the situation, make a judgement and act on it. All three of these abilities may be affected by the diver's level of narcosis. This means that the diver is much less able to deal with a problem due to his or her level of narcosis.

We are lucky that the vast majority of dives do not involve an incident of any kind. During the dives that go well, we can tolerate the level of narcosis that we experience. It is only when dives don't go well that the level of narcosis becomes dangerous. Unfortunately, I still haven't been able to reliably identify in advance the dives when things will go well and those when an incident will occur. Until then, I will remain wary of narcosis.

Divers that claim never to have experienced narcosis are focusing on the obvious symptoms and are ignoring, or forgetting, the more subtle symptoms. If you can feel that you are affected by narcosis



Narcosis

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then the symptoms probably started 10-15m shallower than when you noticed them.

Environmental factors

For any given breathing mixture the level of narcosis is related to the depth of the dive, with technical diving we are almost by definition involved in deep diving. However, there is more to it than that. Depth is only one of the factors involved. The environmental and personal factors also play a significant part in narcosis. Environmental factors can increase your susceptibility to narcosis and can increase the symp-

toms at any given depth.

Visibility is one of the biggest factors in susceptibility to narcosis. Consider a dive where you have 20m visibility and plenty of ambient light, but then a week later you do the same dive, and this time, the visibility is less than a meter, and there is no ambient light. The second dive is much more likely to produce symptoms of narcosis than the first.

Current can also be a major factor in bringing on narcosis. If you are fighting against a current and breathing faster than usual due to working hard to swim down a shotline, then you are at

a higher risk of experiencing narcosis.

Minor equipment problems can also induce narcosis. A slight equipment problem which, in itself will not cause any issues, may be enough to induce narcosis. This is related to other psychological causes of narcosis. Concern over the dive, diving with unfamiliar equipment or unfamiliar buddies, cold, drugs, fatigue, stress, motion sickness and motion sickness medications have all been linked to an increase in the likelihood of narcosis.

All of this means that the depth in itself is not the only factor that

determines your level of narcosis. As such, it's impossible to draw an arbitrary line where you can say air/nitrox is safe at this depth but no deeper.

Psychological factors

It is clear that psychological factors affect narcosis. There have been a number of studies which have attempted to show the psychological aspect of narcosis. Tom Mount and Dr Gilbert Milner carried out a study in 1965 that demonstrated that divers tend to experience a level of narcosis that is consistent with the level they expect to experience.

ANDREY BIZYUKIN



tech talk



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A more recent study carried out for the HSE by the Diving Diseases Research Centre and Plymouth University supported the importance of psychological aspects in addition to the bio-physical impact of narcosis. One of the conclusions from this study was that narcosis is not simply an objective measurable phenomenon; it also has a subjective facet.

Nitrox

Until very recently it was commonly accepted that the use of nitrox would reduce narcosis. On the face of it, this seems to make sense. If an increased partial pressure of nitrogen causes narcosis, then if we replace some of the nitrogen in the breathing mix with oxygen, we will reduce the partial pressure of nitrogen at a given depth.

The majority of nitrox courses taught exactly this reasoning until quite recently. However, it is now believed that it's not just nitrogen that causes narcosis, but that different gases result in varying levels of narcosis. Nitrogen has a high level of narcosis but is not the only narcotic gas.

As there is no definitive explanation for the causes of narcosis, it is difficult to prove which gases have more or less potential to cause narcosis.

The best estimate for the levels of narcosis is derived from a theory that says the level of narcosis caused by an individual gas is related to the solubility of that gas in a fatty substance. This is known as the Meyer-Overton hypothesis. Using this measure oxygen should be more narcotic than nitrogen. If this is the case, then nitrox will not reduce our levels of narcosis, as we are just replacing one narcotic gas with another.

It would be nice if we could prove this argument one way or the other by comparing the narcotic effects of air and nitrox. Unfortunately, it's not that easy. In order to ensure that we had a measurable level of narcosis, we would need to be at a significant depth.

At these depths, the risks of CNS oxygen toxicity means that we would have to reduce the amount the oxygen in the breathing mixture to the point where it would be too small to

Narcosis

be able to distinguish between the effects of air and nitrox. The result is that the question of whether oxygen is more or less narcotic than nitrogen can generate some interesting discussions but is effectively irrelevant for recreational technical divers.

As we dive deeper the effects of narcosis become more and more significant. We have seen that using nitrox does not help in reducing narcosis. Furthermore, the increased levels of oxygen limit the depth that we can dive using nitrox without risking CNS oxygen toxicity. So, for deep diving, we must look at another solution.

Deep diving

We know that different gasses have different narcotic properties, and so the best solution is to find a gas that is considerably less narcotic than either nitrogen or oxygen and use this to replace some of the nitrogen in the breathing mix. Helium and neon both have properties that predict that they would be considerably less narcotic than nitrogen, and experiments have shown this to be the case. Neon is prohibitively expensive, and so helium, though still expensive, has been used as the gas of choice for deeper diving.

Helium is considerably less narcotic than nitrogen, and so, as we replace some of the nitrogen with helium, we are reducing the overall narcotic effect of the combined gas. As we increase the amount of helium in the mixture, and so further reduce the amount of nitrogen present, we further reduce the narcotic level of the overall gas.

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Commercial and military divers often replace all of the nitrogen in their breathing mixture and just use a mixture of helium and oxygen. This is known as *heliox*. This produces virtually no narcosis, but due to the cost of helium, it is a very expensive option. Recreational technical divers tend to use a mixture of helium, oxygen and nitrogen, known as *trimix*. By adjusting the level of the three gases, the diver can select a mixture that has the desired level of narcosis.

Trimix

A trimix diver can perform a dive to 80m but can choose his breathing mixture so that they experience a level of narcosis that is the same as if they were breathing air at 35m. On a subsequent, deeper dive to 90m, they may be 10m deeper but can choose a breathing mix that still gives the same level of narcosis. This is known as the Equivalent Narcotic Depth (END). In this case, a trimix diver at 90m may be experiencing less narcosis than



a recreational diver at 40m on air.

As we have seen, trimix allows the diver to reduce the level of narcosis they experience so that the END is shallower than the actual depth, and the trimix diver can choose their own END. This

leads to the inevitable question of just what END should we choose? Some agencies mandate a maximum END. This limit could be 24m, 30m, 40m, 50m, 55m or in some cases even deeper.

One answer is to simply stick to the maximum END recommended or mandated by your agency. This has the advantage of standardisation whereby all members of a team or diving group are working to the same END and so will end up with standard gas mixes. This can greatly simplify dive planning and gas mixing. The downside of this approach is that with a variation of 24m to 55m, there is a huge difference between the various recommendations.

Which is right? With different groups and agencies advocating different limits, it can lead to pointless discussions about whose limit is right. Each group is convinced they are right and provides anecdotal evidence of the fact that they were or were not marked at various depths. These differences in experience should not be too much of a surprise.

As was found in the Mount and Gilner study, divers who expect to get narcosis at a particular depth are more likely to actually experi-

ence symptoms of narcosis at that depth. This means that if you believe that you will get narcosis below 30m, then you are more likely to experience symptoms if you are below 30m. On the other hand, if you have been told that you won't experience it until much deeper, then you are much less likely to experience symptoms in the 30-40m range.

So, how should we choose the operating END, and as a result, the appropriate trimix mix to use for a given depth. As we have seen above, the actual depth of the dive is only one aspect of narcosis, and by simply focusing on the depth, we overlook all of the other psychological factors.

There are times when an END of 24m might be too deep and other times when an END of 45m might be perfectly fine. The choice of END should depend on the full range of factors—conditions, familiarity with the site, whether it is an overhead environment, whether there is a current or not, visibility, familiarity with your kit, buddies, the site, etc.

One approach is to take a baseline END, say 35m, and then reduce that END for every factor that is less than average, or increase it for every factor that

is better than average. So, for a dive in cold, dark conditions, wearing a rebreather in an unfamiliar overhead environment then, taking these five factors into account, you might want to plan on an END on 25m. On the other hand, in warm, clear water with a buddy you are very familiar with and diving a site you know very well, then with these four factors being above average, you might be happy with an END of 43m.

A clearer head

It is clear that the reduction in narcosis introduces a number of advantages. A clearer head allows divers to enjoy the dive and actually remember what they see down there. There is little point in exploring a wreck if you don't remember the experience after.

In addition, the reduction in narcosis removes the lack of judgement, loss of coordination and inability to resolve problems. This can give the technical diver a huge safety advantage, especially in the case of an emergency situation that requires judgement, coordination and the ability to resolve problems.

As divers go deeper and the risks increase, divers can help to reduce those risks by reducing their level of narcosis. With trimix relatively easily available in so many places around the world these days, there is really no reason for divers to risk diving deep on air and inducing symptoms of nitrogen narcosis. ■



ANDREY BIZYUKIN



photo & video

Text and photos
by Larry Cohen

When it comes to cameras, traditionally, gear is divided into compact point-and-shoot or single lens reflexes (SLR). By definition a SLR camera had a mirror and prism positioned inside the camera, so the photographer could look directly through the lens. This way, they could see the exact framing of the image. When the shutter opens, the mirror quickly moves out of the way, so the film or sensor could be exposed to light. SLRs are advanced cameras with manual exposure control and interchangeable lens systems. In the past and today, these cameras are used by professional photographers and advanced amateurs.

Digital single lens reflexes are referred to as DSLR cameras. They have very little shutter delay and can shoot uncompressed RAW files. The sensor that captures the

image, is larger than the sensor in a point-and-shoot camera. So, the pixels are larger, and the image quality is better. Many shoot video files that could be used for broadcast productions. The disadvantage is these cameras and accessories are expensive, large and heavy.

Compact point-and-shoot cameras, on the other hand, are simple devices that many people use just for snapshots. In the days of film, the camera would have a separate window viewfinder. The disadvantage was that the photographer would see the scene from a different angle and placement than the lens. So, one would not see the image exactly the same way the lens would capture it. Some digital point-and-shoot cameras still have these viewfinders, but most don't. The camera uses a LCD screen that obtains the image through the lens.

Typically, point-and-shoot cameras have built-in lenses. In order to keep the price low, the lenses are not as sharp as the ones designed for SLRs. Some compact cameras are compatible with add-on conversion lenses to expand their range.

Many point-and-shoot cameras only have automatic exposure control. The ones that do have manual controls are limited. Many of these cameras only shoot compressed jpg files, but all of them have a video mode. These cam-

Diver with Nikon Coolpix P7100 in the Fantasea P7100 housing, Sea & Sea YS-01 strobes, Light & Motion Sola 1200 with Beneath the Surface tray and arms at the pump house in Dutch Springs quarry

eras and accessories are more economical than a SLR camera. They are easy to travel with because of their small size.

There is now a new category, the mirror-less camera. These cameras are in the middle. No mirror, so they are smaller, but they have interchangeable lenses and advanced controls. Some of them are very fast. These cameras and underwater gear will be discussed in a future article.

The past

Digital photography has changed the way we document the world. In a very short period of time, film and silver halide prints—once the standard—have become an alternative process. This major change has affected the way the high-end professional photographer to the snap-shooter create images.

This revolution in imaging has had a major influence in the world of underwater photography. We are no longer limited to 36 frames of film per dive. Since the more we shoot, the better our images, this is important.

We now get to see our image instantly on the camera's LCD screen. This allows us to review the image, make corrections and reshoot. Back in the days of film, sometimes one would not have a chance to process the film until one was back home.

In the early days of digital



Point & Shoot





photo & video



Diver with Fantasea P7100 housing, BigEye dome, Sea & Sea YS-01 strobes, Light & Motion Sola 1200 with Beneath the Surface tray and arms photographing turtle in Bonaire

posable cameras. They started making housings for the Nikon Coolpix 990 in 2000. These days, Ikelite manufactures housings for more camera models than any other company.

Camera manufactures including Olympus, Canon, Sony, Fujifilm, Casio and others started manufacturing their own low-cost underwater housings for simple digital cameras. This allowed any scuba diver, snorkeler or beach bum to protect their camera and produce images around and under the sea. This brought underwater imaging to the masses.

Notice that Nikon is missing from the above list. In 2002, Howard Rosenstein started Fantasea Line. Their first housing was the CP4 for the Nikon Coolpix 885 and 4300. This low-cost

imaging, SLR cameras were large and expensive. So many photographers starting using compact, point-and-shoot cameras to do serious underwater photography. Many of these early digital cameras had professional features including manual control, hot-shoes, and could shoot RAW files. Most were also very slow.

Light & Motion made a housing for the Olympus C3030 back in 2000. This was an aluminum housing with bulkheads for the strobes and complete camera control access. In 2002, they came out with the Titan for the Olympus E-10. This was an over-sized point-and-shoot camera that did have a through-the-lens viewfinder. So technically, this was the first

housing for a DSLR. Since the camera did not have interchangeable lenses, it still shared many characteristics with point-and-shoot cameras. Before this Light & Motion manufactured video housings and were primarily a producer of bicycle lighting.

Aquatica, a major producer of SLR film camera housings, started in 2000 with the Coolpix 995. This aluminum housing had dual bulkheads and shared many of the features of their film SLR housing. They produced their first DSLR housing for the Nikon D100.

Ikelite always produced reasonably priced polycarbonate housings for film SLRs. They also had low cost options for film, point-and-shoot, and even dis-

housing still had many features needed to do serious underwater photography. This allowed many people to be able to afford shooting with their Coolpix camera underwater. Today, Fantasea Line still produces housings for the Nikon Coolpix Line, and other reasonably priced underwater photo accessories.

The present

Today, the number of compact point-and-shoot cameras is staggering. Cheap auto-only cameras seem to dominate

Diver with Fantasea P7100 housing, BigEye dome, Sea & Sea YS-01 strobes, Light & Motion Sola 1200 with Beneath the Surface tray and arms photographing turtle in Bonaire

the market. There are still some cameras with advanced features that are suitable for underwater imaging. Nowadays, the price of DSLRs have dropped dramatically, but using a point-and-shoot camera does have some advantages.

Besides the price, point-and-shoot cameras are small and easy to travel with. Now that airlines charge us as much for our gear as our seat, size and weight does matter. Although they have limitations, the simplicity of a point-and-shoot camera does appeal to many photogra-

phers of different levels.

The principals of producing a well-crafted underwater image have not changed. The rules stay the same for film, expensive digital pro or inexpensive snapshot cameras. Let's explore these rules and how they relate to our gear choices.

Get close

The less water between the camera lens and the subject, the better the images will be. In order to get close to the sub-



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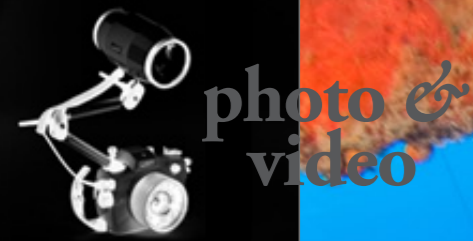


photo & video



ject, one needs to have a wide-angle lens for large subjects or a macro lens for small subjects. All point-and-shoot cameras have a macro mode. Cameras with small sensors excel at small subjects. All one has to do is put the camera in macro mode (usually a flower icon) and move in close.

Many housings allow the use of optical accessories on the lens port. Use of a close-up lens will allow us to have a little more distance from the subject, but still get the magnification. This has two

advantages: first, we will not scare a camera shy subject; second, it gives us room to be creative with lighting.

Large subjects are harder to deal with when shooting with a point-and-shoot camera. By design, these cameras do not have interchangeable lenses. So, we need to start with cameras that have a wide-angle lens. In the past, most cameras had a lens with an equivalent angle of view of a 35mm lens. Add in the 25 percent size distortion that happens underwater, and we have to move too

far back. Nowadays, we do have cameras with 28mm and even 24mm equivalent focal lengths. Although this is an improvement, it is not wide enough. So, the solution is to use wide-angle conversion lenses on the outside of the housing port.

These lenses will have a magnification factor of around 0.56X. By multiplying this factor with the focal length of the lens, we get our angle of view. A camera with a 28mm lens will have an angle of view of a 15.68mm lens when using this con-

Diver with Fantasea P7100 housing, BigEye dome, Sea & Sea YS-01 strobes, Light & Motion Sola 1200 with Beneath the Surface tray and arms on the HILMA HOOKER wreck in Bonaire

version lens.

Our other problem is vignetting. Unless the conversion lens is designed for the optics on a particular camera, we might get cut off in the corners. Even if we have to zoom in a little to remove this, we are still better off using a conversion lens.

Some housings use a conversion dome instead of a conversion lens. This corrects for the 25 percent size distortion that happens underwater. The camera's built-in lens will have the same angle of view underwater as it does above. Ikelite uses a conversion dome on many housings for cameras where a conversion lens would not be effective. This includes their Canon G12.

Fantasea Line also has a conversion dome they call the BigEye. Besides having the dome for their P7100 housing, you could get them for certain Canon, Sony, and Fujifilm housings. They also make one that fits housings with a 46mm filter thread. The problem with these domes is they could cause flair. If you are filtering for color, this is not an issue. If you are using dual strobes, you might get flair that could be retouched or cropped out.

An advantage of this kind of optical system is that conversion lenses or domes can be attached or removed underwater. This allows us to shoot macro and wide shots on the same dive. With a DSLR, we have to pick a lens and stick with it for the entire dive. So, we always see that rare nudibranch when shooting wide-angle, and the whale shark when shooting macro!

When picking a housing, it is important to make sure some sort of optical accessories are supported. Many of the housings manufactured by the camera companies might not be compatible with any optical accessory.

Color correct

Water changes the color of our image. Warm salt water will turn your image blue, while fresh and cold salt water will



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Using the Fantasea P7000 in the ice fields of Alaska

have a green look. Sometimes this color shift will add spice to an image. Certain subjects including shipwrecks could benefit from this color shift. Usually, we will want to correct this shift so we can see the natural colors of the underwater world.

Many point-and-shoot cameras will have an underwater mode. This is like putting a digital orange color-correcting filter over the lens. It will correct your image when shooting in blue water. This gives you an average correction. Sea conditions and depth will change the color and might need a stronger

amount of filtering. All digital cameras have a custom white balance mode. By using a white colored target, the camera will create a digital filter pack to correct the color for the current conditions. This takes slightly more skill than using underwater mode, but it will get you better results.

Using filters is another way to correct the color. Both Fantasea Line and Ikelite produce blue and green water color correction filters.

Magic filters are a gel filter that can be cut to size. One would then attach the filter to the lens or place inside the

lens port. Magic filters are available for green or blue water. These filters are designed to do a custom white balance along with using the filter. They will get you the best results and will be effective even in deep water. The company also makes a filter to be used with an auto white balance setting.

Filters are effective in shallow water, and they flatten out the image. This is because they are color correcting the background and the subject.

By using a strobe, the daylight balanced light will bring back the natural color of the subject. By their nature,

Point & Shoot

strokes will only light up a small area. So, the background will continue to have a vibrant blue or green colorcast. This could create a very dramatic image. Never use a filter, underwater mode, or custom white balance when using a strobe. Auto white balance will work best when using strobes.

Since we want to work close, with a wide-angle lens, strobes with a wide beam angle are needed. If our flash has a continuous power dial, this will make exposure control much easier. Traditionally, the strobe connects to a waterproof bulkhead on the outside of the housing. There's a connection on the inside to the camera's hot-shoe. The problem is, not every point-and-shoot camera has a hot-shoe, but they all have a built-in flash.

The camera's flash is not powerful enough and is in the wrong position to use underwater, but it could be used to trigger an external strobe. The external strobe has to have a built-in slave sensor, or we need to be able to add one. When the camera's flash fires, it will set off the external strobe.

The camera's built-in flash fires off a pre-flash to gather exposure information. It is important that the slave sensor can recognize this pre-flash and only fire the external strobe when the shutter is open. Some systems now allow the external strobe to mirror the pre-flash information and give you automatic flash exposure. This is called DS-TTL. Using a strobe with an exposed slave sensor will also be triggered by other photographers strobes.

Some companies including Sea & Sea have their slave sensors setback. Here, we need to use a fiber optic cable to move the light from the camera's built-in flash to the slave sensor. This is a very efficient way to fire a strobe. Now many housings for advanced DSLR cameras use this system.

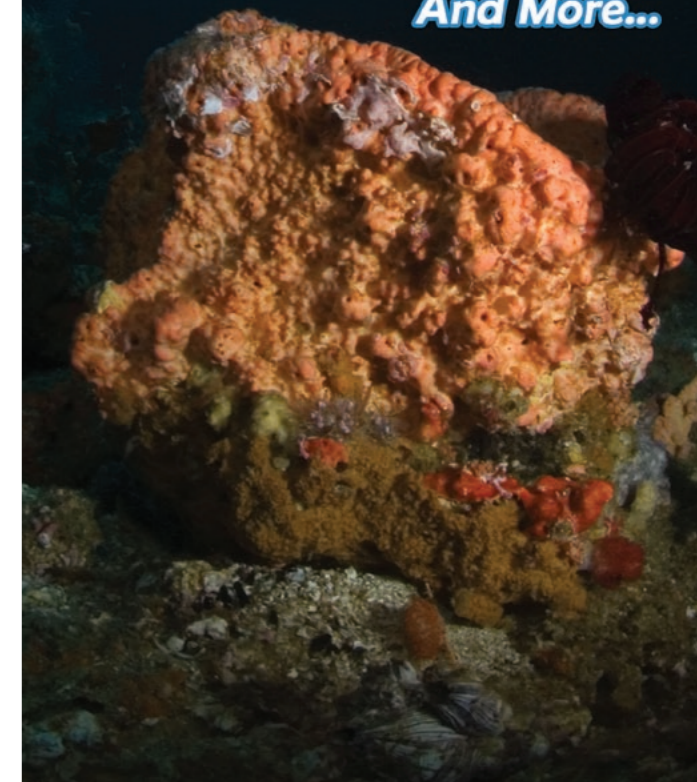
Manual exposure

Automatic and program modes are set-up to work with surface conditions.

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| <p>ADVANTAGES</p> <ul style="list-style-type: none"> • Economical • Compact and easy to travel with • Simple to use • Conversion lenses can be attached or removed in the water. Allows for both macro and wide-angle subjects to be photographed on the same dive. | <p>DISADVANTAGES</p> <ul style="list-style-type: none"> • Smaller sensors—image quality not as good as a DSLR • Built-in lenses not as sharp as lenses designed for DSLRs • Less control • More shutter delay • Many point-and-shoot cameras shoot jpg files only. The ones that shoot RAW files are very slow. |
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Point & Shoot

The underwater environment will confuse these systems, and one will get over or under exposed images. When using an external strobe, the background is affected by the available light exposure. This is controlled by the shutter speed and f-stop.



we could use exposure compensation to control available light. The problem is the camera might change the f-stop as well as the shutter speed. This of course will also

pressed file with minimally processed data. They require post processing in the computer. This takes more skill and time, but allows us to really tweak the image to perfection.

Since these are larger files, they could slow down a compact camera. DSLRs have large buffers and can handle these files better. Some point-and-shoot cameras have larger buffers, so they can capture RAW files without putting you into deco.

The foreground is affected by the strobe. We control this with the camera's f-stop and the strobe-power. Often, a correct exposure might not be what we want. Usually, we will want to under-expose the available light, so the background gets darker. This way our subject will stand out, and our image will have more contrast. This is why it is important to work in manual mode.

Many of today's compact digital cameras have auto and program modes only. In program or aperture priority mode,



change our foreground exposure. So, ideally, we want to use a camera with manual mode.

Speed

In the past, point-and-shoot cameras focused very slowly, and there was a delay between pushing the shutter button and the shutter opening. This is called shutter delay and is responsible for many photos of fish-butts. These days, compact digital cameras are much faster, but there is usually some shutter delay. In order to get fish heads instead of fish butts, we should use a camera with as little shutter delay as possible.

The file format could also affect the camera's speed. It is best to shoot RAW files. This is usually an uncom-

Housings

It seems obvious, but make sure there is a housing for the camera. No housing, no underwater images. It is amazing how many people get a camera

and then try to find a housing for it. They are disappointed when they discover none exist. It is also important to make sure the housing has the required features. If we are doing a 300-foot tech dive, we need a housing rated to that depth. It is important to make sure the housing can access all the major camera con-

trols and accepts optical accessories on the lens port. We also need to be able to easily attach a strobe arm and be able to fire our strobes. When shopping for a camera to take under-



water, we need to look at the housings at the same time as the camera models.

Choices

Point-and-shoot cameras have an extremely short life span.

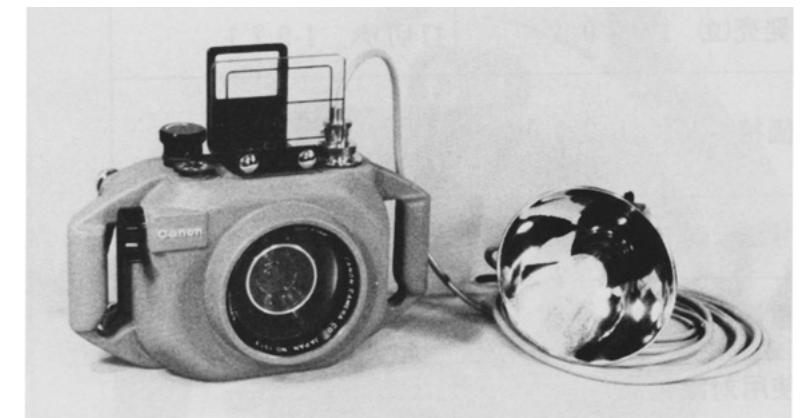
So, the models we talk about today might not exist an hour from now. We need to ask ourselves the question: why are we taking photos underwater? The

majority of divers will be happy with an advanced point-and-shoot camera. Many of us just want images to show our non-diving friends why we spend so much time underwater.

The advantage of a small travel-friendly system that is simple to use is huge compared to a DSLR system. The explorer that is already burdened with heavy dive and scientific gear will also find a compact camera a blessing. The important thing is to make sure the camera, housing and strobe work together the way you need it to.

In the next issue, we will discuss compact camera models that are best suited for underwater photography. We will also go over housings and other accessories.

CLOCKWISE FROM TOP RIGHT:
Fantasea FP7100 housing for the Nikon COOLPIX 7100;
Olympus PT-050 housing for the Olympus XZ-1; Ikelite wide-angle conversion dome for the Ikelite G12 and other housings; Ikelite housing for the Canon PowerShot S100; Ikelite housing for the Canon PowerShot G12



Canon made their first underwater housing in 1959 for the Canon VT 35mm rangefinder camera



Edited by
Don Silcock

Canon Rebel T4i/EOS 650D DSLR

Canon has announced the release of the Rebel T4i/EOS 650D DSLR camera, which features an 18 megapixel APS-C sensor and DIGIC 5 processor with a native ISO range of 100 to 12800. The sensor is stated to be a "hybrid" design, with pixels dedicated to phase detection autofocus (AF) to improve the performance of AF in Live View mode and provide continuous AF in video mode. The 650D can capture 1080p HD video at 30-, 25- and 24fps and has touchscreen control on the LCD which provides focus point selection and shutter Release in Live View, multi-touch type gestures for image review and menu selection. The Rebel T4i/EOS 650D will ship at the end of June for an estimated retail price of US\$850.



Sea & Sea Canon EOS 5D Mk III Underwater Housing

Sea & Sea has released CAD drawings of their new housing for the Canon EOS 5D Mark III SLR. Although full details and specifications of the housing are not currently available, Sea & Sea stated that it will be available in July 2012. It appears that the housing will continue with electrical strobe triggering and that the controls and latch system will be very similar to those of the previous MDX-5DMkII housing.

Aquatica A5DMkIII Canon EOS 5D Mk III Housing

Aquatica has announced the release of their A5D Mk III housing for the new Canon EOS 5D Mark III SLR. The new housing features a redesigned camera tray and both the zoom/focus gear and the lens release lever can now be retracted to provide additional room to allow larger lenses to be inserted. Aquatica has clearly prioritized the housing for video use, a major strength of the 5D cameras, and the video controls are very easy to reach. Plus, they have provided a total of three ports to allow for monitors, etc., to be added. Additionally, the AF-ON and star button now has a locking collar to prevent the control from being activated by water pressure, and the zoom gear has been redesigned to enable a smoother action—another key feature for video users. The Aquatica A5D Mark III will retail at US\$3,199.



Nauticam NA-5DMKIII Canon EOS 5D Mk III Housing

Nauticam has released its NA-5DMKIII housing for the Canon 5D MkIII DSLR. The housing features a double paddle lever for the right thumb that activates AF-On and Record plus "piano key" controls for the Set and Quick Control functions, and a multi controller pad for the camera's joystick. In addition, the ISO, Live View/Movie and Focus point selector controls are all available from the right hand handle. Nauticam has released the NA-5DMKIII housing initially with a Nikonos-type sync port, although other bulkheads are available, but it appears that a fiber-optic solution for the housing and camera will be offered in the future. The housing retails at US\$3,600.



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World ShootOut 2012

This is the second year in a row that the World ShootOut universal underwater photo competition takes place worldwide, including a special new category for children.

Introducing new categories and glorious prizes, the organization is proud to invite all divers, underwater photographers, diving centers, liveboards and media partners to take part in one of the most innovative, creative, international and festive events ever produced.

During the month of August 2012, the whole underwater world will be performing as a huge underwater festival, hosting young, amateur and professional photographers from all over the world, competing with each other for some very worthy prizes, including cash prizes, luxurious diving trips, diving equipment, photo gear and more.

Producer David Pilosof initiated the first World ShootOut competition in

2011, breaking all boundaries and introducing an international competition as never featured before. Hundreds of photographers from 27 countries around the world took part in the first World ShootOut competition and over 1,500 images were submitted, ranging from those that captured the calm lakes of the Nordic countries and Canada to others that showcased the exotic secrets hidden in Alaska and dramatic images of the great white shark in the Gulf of Mexico.

Up until now, the competitions have awarded underwater photographers with over half a million dollars of prizes!

Please see the competition website for full details on this year's ShootOut: Worldshootout.org

Acquapazza APSO-NEX5N housing for Sony NEX-5N

Acquapazza has announced the release of its housing for the Sony NEX-5N EVIL camera. The APSO-NEX5N is available with either a bayonet or threaded port attachment systems and Acquapazza offers a total of eight ports, which cater for virtually all the Sony lenses available for the camera including the A mount 16mm wide-angle, and the 50mm and 100mm macro manual focus lenses. Acquapazza offers both mechanical and magnetic zoom/focus control, with the possibility of both being available, and the user can vary the LCD viewing angle via an external control. Comes in 14 cool colors!



Sony DSC RX100 High End Compact Camera

After a seven-year absence at the very top end of the compact digital camera market, Sony has returned with a vengeance and announced its new DSC-RX100 enthusiast compact. The highlights of the RX100 are its impressive 20.2MP 1-inch digital sensor and Carl Zeiss sensor 28-100mm f1.8-4.9 zoom lens. The sensor is at least double the size of the ones in the other cameras competing at the premium end of the market—the Canon S100 and Olympus XZ-1. The lens is also one of the brightest available. The camera also features 1080p60 HD video and is equipped with extensive manual camera controls and RAW image capture making it a very appealing candidate for underwater photography. It is expected to generate a lot of interest among the housing manufacturers. The RX100 will be released in July and is priced at US\$649.



Watershot V1800 Action Sports Camera Lighting Kit

Watershot has released an underwater lighting kit that is designed to be used with both video and still cameras. The kit uses a 1,800-lumen video light that's configured with a mounting bracket and is powered by Watershot's eGrip rechargeable batteries that are stored inside the handle grip. The light delivers an evenly distributed 75-degree flood beam pattern and provides 1.5 hours of illumination when set on full power, and up to six hours when set to low. It has a battery level indicator located on the light head. Depth-rated to 492 feet, the light offers four modes: high, medium, low and strobe. The kit retails at US\$979.



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South

Text and photos by Bartosz Stróżyński

Georgia

Unique Dive Site

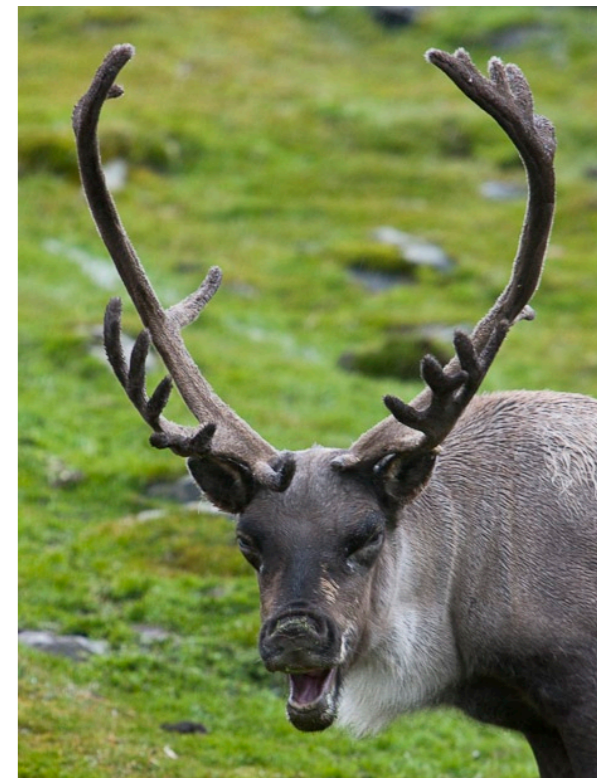
South Georgia is the most well-known of the Falkland Islands, also called *Islas Malvinas*. It lies nearly at the end of the world in the Southern Atlantic Ocean. To find this place on the map, draw an equilateral triangle with one vertex on Cape Horn and another on the Antarctic Peninsula. The third vertex in the east is our destination. Cold, windy, raw landscapes are characteristic of this mountainous, breathtaking, pristine place. It's a living paradise where large concentrations of animals amaze all who visit.

South Georgia has an interesting historical heritage. It is a whale sanctuary and a cemetery. On the island, one can find the grave of one of the most famous explorers in history, Sir Ernest Shackleton, an undisputed symbol of leadership and courage.

The territorial affiliation of the island is under diplomatic dispute. It's currently under the jurisdiction of the United Kingdom, but Argentina is questioning the claim. This conflict even led to war in 1982.

South Georgia is a very remote place. From Europe, one must travel to Buenos Aires in Argentina, then fly further south to get a ship and finally cruise to the island. It took a really long time and a lot of money to get here.

There is no tourism infrastructure on the island. All activity is done from a liveaboard boat with catering done on the deck. Due to rapidly changing weather conditions, there



South Georgia amazing underwater kelp forests, often patrolled by leopard seals





Fur seal (left) defending its rock, very curious and active, moving around all the time; King penguin pair (above) and seals on beach; Female elephant seal (right) swimming in one of the South Georgia bays



is no guarantee of success on any expedition. Getting to land requires a Zodiac boat, and operating it on the rough seas in the area may be very dangerous, often impossible. Despite the challenges, there are many operators offering this destination in their portfolio.

Ghosts of the past

South Georgia holds inglorious reminders of the extensive sealing and whaling activities in the region of the past. There are numerous remains of whaling stations and whaling boats laying around, with no access, due to safety. They make a very strong impression when seen from the liveaboard.

One of these sites, called Grytviken, was cleaned and made available for visitors. Tourists can walk around and get a feeling of how the whaling process

worked, what type of equipment was used and actually how brutal the process was. Several whales skeletons may be seen laying about as well. All those frightening artifacts bring about real emotion and deep reflection among visitors.

Today, South Georgia is the location of two research stations working on conservation and protection of the unique ecology of this region.

An established museum also plays an important role in preserving the historical heritage of this place, especially its sinister whaling activities of the past. It is seen as symbol of what people should never repeat. A lot of unique exhibits may be seen at the museum such as everyday objects that belonged to whaling station workers, equipment used at the time, tools, etc. There is also a section exhibiting the flora and fauna of South Georgia.

In addition, there is a very specific room dedicated to Sir Ernest Shackleton and his spectacular achievements.

Sir Ernest Shackleton

Hailing from Ireland, Shackleton was an early 20th century polar explorer whose ambition was to make the first crossing of Antarctica from the Weddell Sea via the South Pole to the Ross Sea. He did not manage it, but he still became one of the most famous explorers of his time, thanks to everything that happened during his expedition in 1914-17.

Shackleton reached Antarctica with his crew, but his ship, *Endurance*, became trapped in pack ice in the Weddell Sea and eventually sank. Having lost the ship, the captain and crew decided to travel north over the ice to Elephant Island in the South Shetland Islands, where they

spent the following days relying only upon themselves. They had some equipment they saved from the ship. They slept in tents, ate seals and penguins and waited for rescue in an extremely difficult and demanding environment.

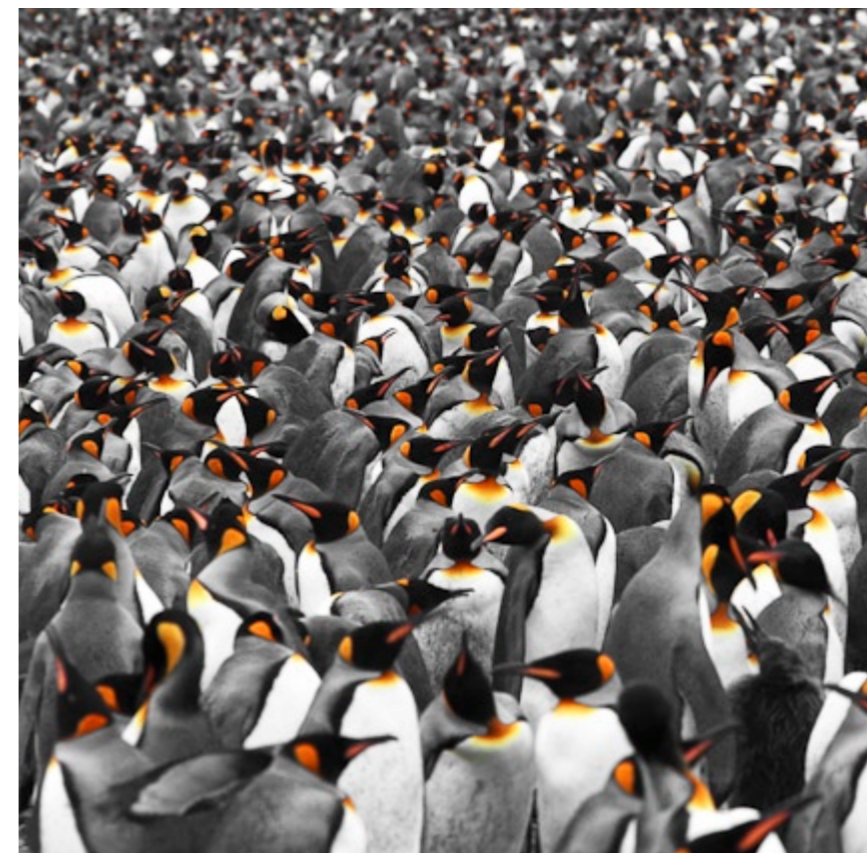
Unfortunately, nobody knew about

their situation, which concerned the captain a great deal. When the weather got better, Shackleton decided to sail in a small wooden lifeboat, saved from the *Endurance*, to South Georgia and alert the world to the crew's desperate situation.





Unique Dive



Colourful heads in harmony—King penguins strolling the beach. Images are usually taken *en-face*, because when we look at them, they look at us; for me, it was really difficult to capture them from the back. A nearly endless colony of King penguins (left). South Georgia is famous for the largest King penguin colony in the world, around 300,000 in one place. Fascinating forest of heads despite disgusting smell

concentration of King penguins, making this place uniquely interesting for scientists and tourists. On the island, there are around 600,000 King penguins in total. The largest colony contains about 300,000 individuals. It is an amazing feeling watching this endless, smelly and

The captain was a really brave man. The plan to cross the distance of 1,300km in open ocean on extremely rough seas in such a tiny boat after an exhaustive time spent on the ice seemed insane, but he was really determined to save his crew.

When looking at a map, South Georgia is a tiny spot in a huge area of ocean. It was amazing that without computers, just simple navigational tools, Shackleton was able to find his way over the ocean to land on the island of South Georgia. His extensive experience and understanding of the currents paid off.

We can only imagine what could have happened if he had passed South Georgia and missed it. But this was not the end of the story. Shackleton reached the island landing on the far side. To get to the whaling station, he had to cross the mountains.

Today, it is known all over the world that Shackleton's spectacular navigational efforts ended with his successful cross-

ing of the island and alerting the world of his stranded crew. His outstanding courage and leadership was rewarded. After 18 months of an unbelievable fight for life in the Antarctic, the crew was saved. Shackleton returned home a hero.

Unfortunately, during his next expedition, he died, and his remains were buried on South Georgia. His grave is one of the main memorial attractions to this day.

Diving

Scuba diving is limited on South Georgia. Most of the significant attractions here are on land. Despite this, it was worth getting wet to experience this beautiful place underwater as well. Diving was mostly about watching aquatic mammals playing around, everywhere, from small bottom dwelling creatures to amazing underwater kelp forests patrolled by leopard seals.

South Georgia is really full of life; sometimes it is difficult to cross over a beach due

to the number of seals resting there. Once, when watching seals playing, somebody said to me: "If I were a seal in my next life, I would like to live in South Georgia." The sentiment described very well the friendly atmosphere here, untouched by human beings, raw and really free.

Penguins

South Georgia hosts the world's largest

noisy family.

King penguins are beautiful birds when they reach adulthood. This may be a kind of compensation for childhood, because they are awfully ugly as chicks. I am not a biologist researching King penguins, but I made some intriguing observations about their lives.

On first sight, such a large colony looked like a monolith, but when I watched a bit





Unique Dive



Fur Seal on the rock (above). This image was taken in washing machine conditions—very rough, strong waves, dark weather, cloud covered mountains and hundreds of fur seals jumping, playing, fighting and swimming like missiles. The purpose of this shot was to capture one seal separate from the colony, a break in the never ending action, expressing at the same time the very specific feeling and raw atmosphere of the South Georgia landscape. Portrait of King penguin in early morning shower (far left)

Based in Poland, Bartosz Stróżyński is a nature and underwater photographer, composer, lyricist, author of music videos and multimedia projects, graphic artist and sculptor with several international photo competition awards including the International Photography Awards, European Wildlife Photographer of the Year, International Nature Photo Competition Asferico and the Great Photographic Competition of National Geographic. He has participated in many photographic expeditions including the Elysium Epic Shackleton's Antarctic Visual Epic Project. For more information, visit: www.fimufo.com

hand. It is a memorial of spectacular courage and, at the same time, it has been caught in political and armed conflict.

Yet, the royalty of South Georgia is unquestioned. With 600,000 King penguins on just 3,600 square kilometers of land, living together in harmony among themselves and other species, is it not possible for us to learn to exist this way in a 21st century world? Yes, we can hope that it may be a bit inspiring to us all. ■

leaders, followers, shy ones, brave ones, extraverted, introverted, etc. It amazed me, how they could live together in one place, in a limited space, and manage it well. It was incredible.

King penguins are very faithful and loyal. They normally have only one partner their whole life. As with all penguins, they feed on fish and krill. When in the water, they transform from funny, swaggering, proud animals into sleek, underwater missiles. We watched groups of penguins walking along the beaches and, time after time, jump into the water to hunt and feed. This crowded seaside looked like Copacabana—a beautiful, busy and playful place.

Seals

Seals can be found in many places on the planet, but probably nowhere with such huge concentrations as on South Georgia. Fur seals, elephant seals and Weddell seals were everywhere. If we

consider that humans decimated their populations over the centuries by extensive hunting, the restoration of the species seems to have come quite quickly.

Diversity

The richness of life on South Georgia is not a miracle. There's a reason for it. The currents flowing from Antarctica mix around the island and bring a rich river of krill to South Georgia, which feeds most of the animals living here. It explains the wildlife phenomenon of this place. But year after year, there is more and more concern about fluctuations in krill populations, the reasons for these fluctuations, and their impact on the environment in the future.

South Georgia has many faces and inspires extreme emotions. It is a beautiful, incredible dream of freedom and life on the one hand, and a frightening reminder of the brutality of the sealing and whaling of the past, on the other



longer, a continuous interaction among penguins could be observed, including very aggressive attacks on each other. It was similar to what people do. I saw