



GLOBAL EDITION  
Feb :: Mar 2007  
Number 15



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**COVER PHOTO**  
*A Diver Explores Riviera Maya Caves*, by J P Bresser

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Divers explore Riviera Maya caves, J P Bresser



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# Exploration & Evolution in Diving

History is made by people. Passions, visions and a sometimes restless energy forces them to be on the move, transport things, twist the nuts and bolts and to dive in places where nobody has been before. It is these people driven by their zest for knowledge and awed by what lies behind the next threshold that started the evolution of diving.

Genetic scientists studying the process of evolution use laboratory mice and fruit flies as their generation time is very short. Those who want to study how diving evolved can take a look at the cave divers. This unique brotherhood constantly alters, invents and experiments with dive equipment. Cave divers always were and remain an elite and advanced research group of divers—pioneer explorers of caves and scientists. These are the people who are constantly pushing

the boundaries and taking technology to its limits, leading the way to further achievements in technology, discovery and adventure.

Where do we find the last white spots on the map of the world other than in the underwater underground labyrinths? It is only here the modern disciples of Magellan, Jules Verne and Norbert Castere can realise themselves.

And that's what this issue is all about—exploring the inner and outer boundaries. We are about to go cave diving and climb down some very deep holes.

Come join us as we dive into the cenotes of Mexico and visit the deepest cave in the world, Varonya in Caucasus.

—Andrey Bizyukin, Associate  
and Editor, Russia



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# The shark finning continues Shame on them



As we all know, shark finning is not only unbelievable cruelty to animals, but totally unnecessary, as shark fins have no nutritional value whatsoever (they do, however, contain a lot of heavy metals).

As most of us are also painfully aware, shark populations are dwindling worldwide and crashing in places to the point where this important group of apex predators is becoming 'ecologically extinct'—meaning, that their numbers have been reduced to such an extent that they cease to play a regulatory role in the ecosystem. This is about to happen in the Great Barrier Reef where sharks were once plentiful.

Yet, the sharkfinning industry goes on. In a recent report to the UN, it came to light that the true numbers of killed sharks were probably four times higher than previously estimated. Simply because the catches evaded being reported through official channels, which perhaps isn't so surprising.

**This bloody business has to stop.** Shark fins and other shark products have been, and still are, traded by some of the biggest online trading platforms such as eBay, Amazon and, most notably, Alibaba. Since it was drawn to the attention of fellow divers, diving media and environmental organisations this past fall have placed mounting pressure on these platforms to stop the trade going through their portals. Amazon consequently removed the shark products from their webshop.

Meanwhile, Alibaba.com and others have bluntly refused to do so and continue to permit the trade—even after being thoroughly informed and asked the nice way. By their refusal they are now **knowingly** driving several unique and important species to the brink of the extinction and impoverishing the biodiversity of the planet to the point where whole ecosystems are collapsing.

All just for the sake of a meager

profit. They should be put on trial for crimes against humanity, or rather against the whole planet. Alas, we lack the laws to do so. You can be sent to the war crimes tribunal in The Hague and put away for life if you commit genocide, but other species don't count. Never mind if you wipe out the sharks. They have only been around for a couple of hundred million years anyway.

But that is not to say that the traders are going to get away with it. There is actually something you can do. Get on the case; get on their backs. Write a letter of protest to the management of Alibaba.com by following **this link on www.shark-life.co.za**.

And watch out for news about an upcoming boycott campaign on our website.

—Peter Symes

Publisher and Editor-In-Chief



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This issue of X-RAY MAG and others includes news and press releases from NAUI in sections designated by the NAUI logo. While the page design is done by X-RAY MAG as an integrated part of the magazine, these news stories are brought to you by NAUI at NAUI's discretion.

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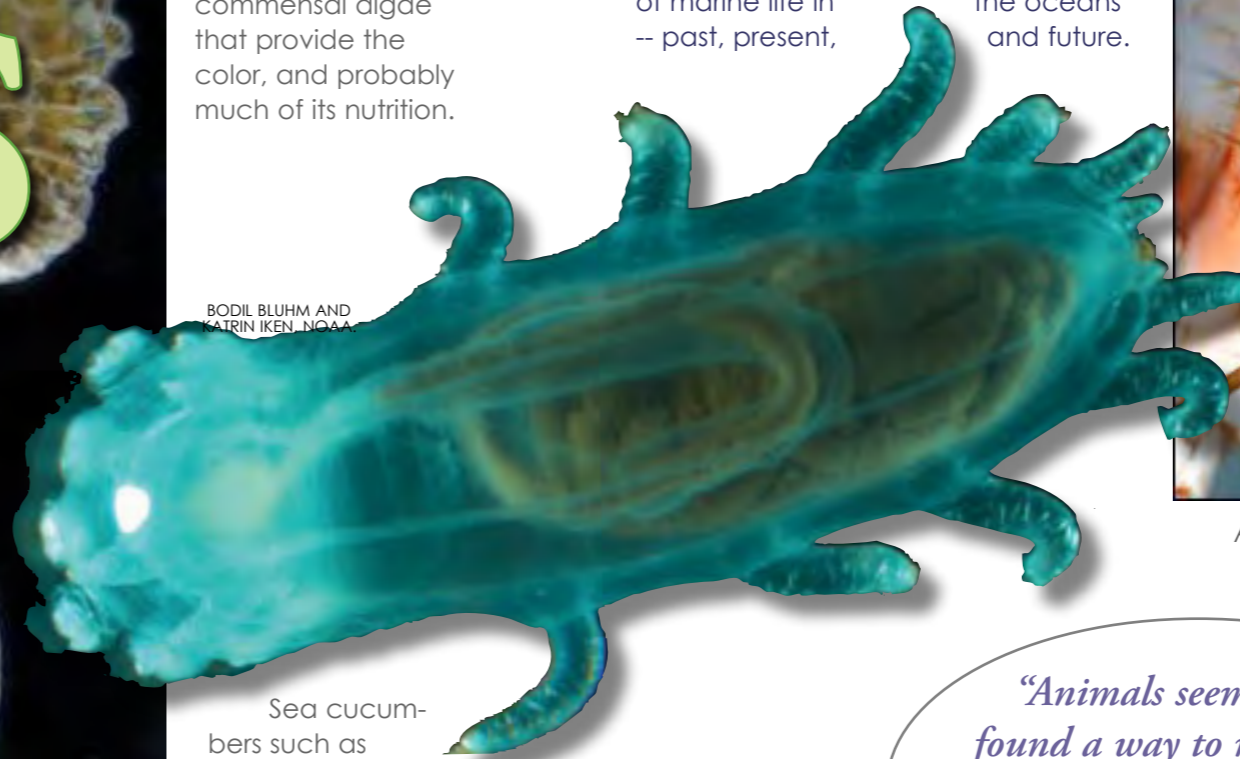
News edited by Peter Symes

# NEWS



*Linuche unguiculata* - thimble jelly - ~1cm - This species was packed with commensal algae that provide the color, and probably much of its nutrition.

BODIL BLUHM AND KATRIN IKEN, NOAA



Sea cucumbers such as *Kolga hyalina* were the dominant sea floor fauna at several stations during an expedition to the Canada Basin

COMIL - RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS

and 70,000 kinds of marine mammals. A couple of thousand have been discovered during the census. They include life adapted to brutal conditions around 407°C fluids spewing from a seafloor vent (the hottest ever discovered), a mighty microbe 1 cm in diameter, mysterious 1.8 kg (4 lb) lobsters off the Madagascar coast, a US school of fish the size of Manhattan Island, and more unfamiliar than familiar species turned up beneath 700 meters of Antarctic ice. An underwater peak in the Coral Sea was home to a type of shrimp thought to have gone extinct 50 million years ago. More than 3 miles beneath the Sargasso Sea, in the Atlantic, researchers collected a dozen new spe-

The Census of Marine Life is a growing global network of researchers in more than 70 nations engaged in a ten-year initiative to assess and explain the diversity, distribution, and abundance of marine life in the oceans -- past, present, and future.



Anemone crab with striped eye stalks collected during a Census expedition off Hawaii

*"Animals seem to have found a way to make a living just about everywhere"*

Jesse Ausubel  
Sloan Foundation,

Leptocephalus - this is an eel larva. They are flat like a ribbon with transparent bodies reaching up to 30cm long before they move to the seafloor.

cies eating each other or living on organic material that drifts down from above.

### Other highlights

— Found alive and well, in the Coral Sea, was a type of shrimp called *Neoglyphea neocaledonica*, thought to have disappeared millions of years ago. Researchers nicknamed it the Jurassic shrimp.

— Satellite tracking of tagged sooty shearwaters, small birds, that mapped the birds' 43,500-mile search for food in a giant figure eight over the Pacific Ocean from New Zealand via Polynesia to foraging grounds in Japan, Alaska and California and then back. The birds averaged a surprising 217 miles

COMIL - RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS



## Census of Marine Life

# Amazing marine life forms revealed

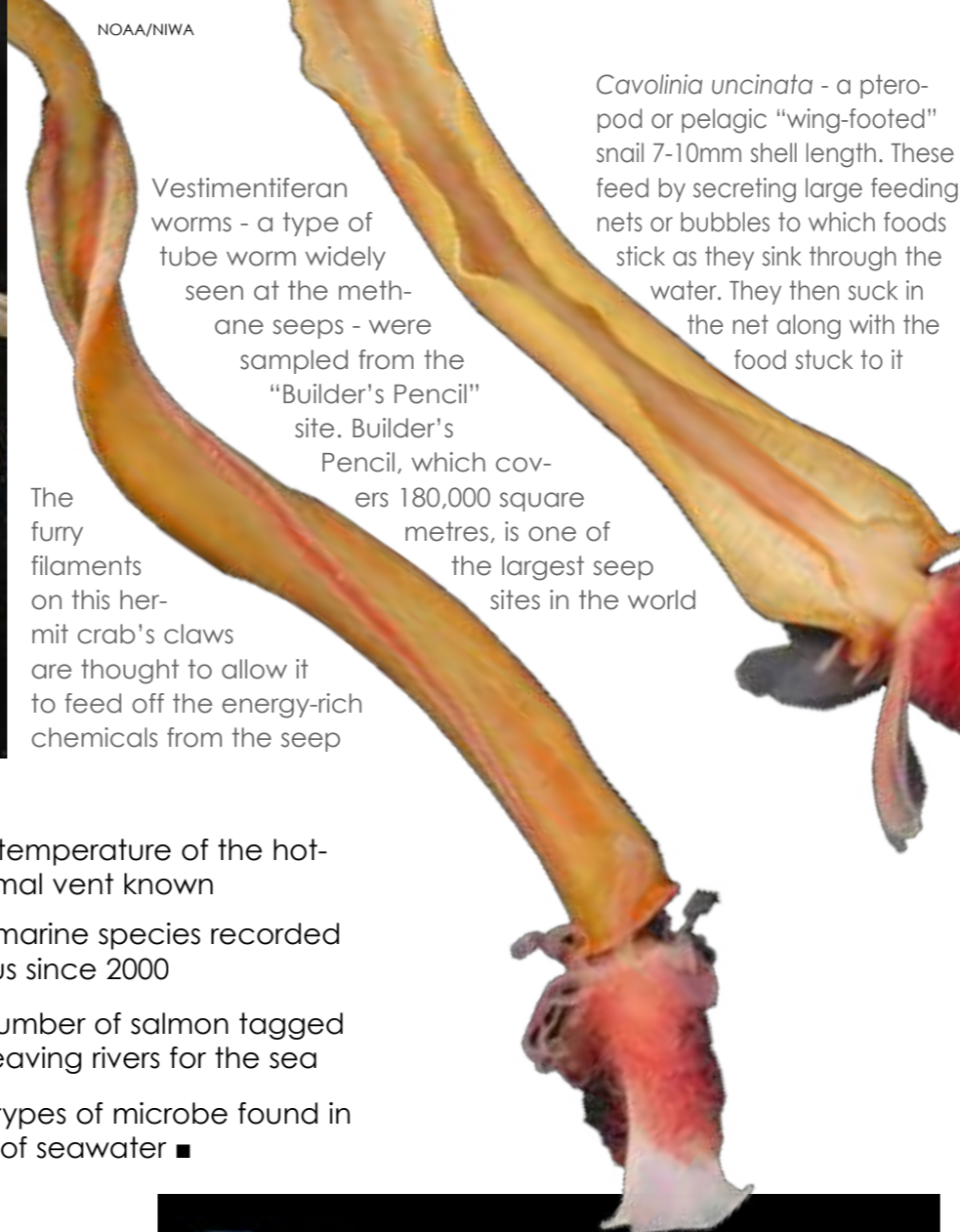
A host of record-breaking discoveries and revelations that stretch the extreme frontiers of marine knowledge were achieved by the Census of Marine Life in 2006.

Thousands of new species have been discovered during the census in which 2,000 researchers from 80 countries participated. The researchers con-

ducted 19 ocean expeditions this year; a 20th continues in the Antarctic. In addition, they operated 128 nearshore sampling sites and, using satellites,

followed more than 20 tagged species including sharks, squid, sea lions and albatross. There are nearly 16,000 known species of marine fish





NOAA/NIWA

daily. In some cases, a breeding pair made the entire journey together.

— A single-cell creature big enough to see, in the Nazare Canyon off Portugal. The fragile new species was found 14,000 feet deep. It is enclosed within a plate-like shell, four-tenths of an inch in diameter, composed of

mineral grains.

— A new type of crab with a furry appearance, near Easter Island. It was so unusual, it warranted a whole new family designation, *Kiwaitidae*—named for Kiwa, the Polynesian goddess of shellfish. Its furry appearance justified its species name, *hirsuta*, meaning hairy.

### Tidbits

- 407°C temperature of the hottest thermal vent known
- 78,000 marine species recorded by census since 2000
- 2,600 number of salmon tagged before leaving rivers for the sea
- 20,000 types of microbe found in one litre of seawater ■

*Phronema* - This amphipod is sticking its head of its house, the hollowed out living body of a salp, where it will eventually lay its eggs and raise its family

### Doubling Zooplankton

Census zooplankton researchers discovered 3 new genera and 31 new species of copepods and mysids, small crustaceans, in Southeast Asian, Australian and New Zealand waters. Analysis of collections from biodiversity hotspots, the deep sea, and other unexplored regions is on track to double the number of known zooplankton species

A 4 kg rock lobster, *Palinurus barbarae*, found off Madagascar



COMAL - RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS

## Jellyfish surge endangers fish stocks

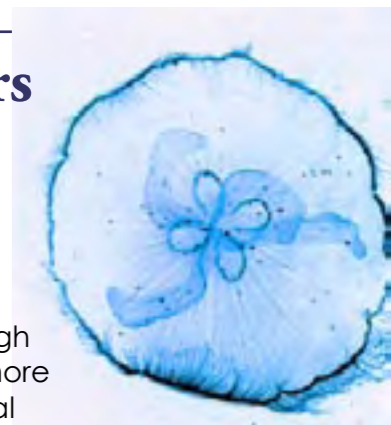
A dramatic increase in jellyfish populations are now threatening fish stocks around the British Isles, according to a group of marine scientists. Warmer ocean temperatures have already seen jellyfish numbers surge in the North Sea and scientists fear they may soon dominate at the expense of other marine life.

The predictions look particularly bad for cod stocks, which have already plummeted through over-exploitation by fisheries. Cod larvae hatch in waters that are rich in plankton, but these are also feeding grounds for the jellyfish. Many of the jellyfish species feed directly on fish larvae or on the plankton and tiny crustaceans that make up the larvae's sta-

ple diet, before they are big enough to hunt more substantial prey.

As ocean temperatures rise over the next century, jellyfish populations will continue to grow, putting further pressure on fish stocks already devastated by overfishing.

"Looking ahead over the next 50 to 100 years, all climate projections expect the North Sea to become warmer, so jellyfish will become more common in our waters," said Professor Attrill, whose study appears in the journal, *Limnology and Oceanography*. ■







At Daikoku and Nikko volcanoes in the Marianas, tonguefish and crabs cover the seafloor in some areas



NOAA

The remotely operated submersible *Jason II* caught this image of a tonguefish swimming in front of the camera (foreground). Notice the other fish scattered on the unsedimented bottom of the fossil sulfur lake

## Strange Flatfish Thrive in Extreme Conditions —Water Up to 180°C

**Scientists on a NOAA expedition have witnessed the extreme lifestyle of tonguefish that like to skip across pools of molten sulphur**

Huge numbers of these flatfish—that belong to the taxonomic genus of *Symphurus* but are a species new to science—were seen to congregate around the sulphur ponds that well up from beneath the seafloor in the Mariana Arc.

“There are a lot of toxic heavy metals coming out of these active volcanoes,” Dr John Dower, a fisheries oceanographer told BBC News. “The water is very warm, and it can be very acidic, the pH can be as low as two, like sulphuric acid. And yet, here we’ve got a group that has not previously been seen in this type of environment and they’re doing very well—they’re actually thriving.”

The Mariana Arc is a 1,200km chain of volcanic seamounts and islands between Guam and Japan. It hosts a number of hydrothermal vents—rock systems that draw water through cracks in the seafloor, heat it to temperatures which can be well above 100C, load it with dissolved metals and other chemicals and then eject the hot fluid back into the ocean.

### Measured temperatures above 180°C (355°F)

“These flatfish live right up against the edge of the pools, and in a couple of cases, we saw them out on the surface of a pool,” said Dr Dower to BBC.

“We have video of a fish sitting on the molten sulphur and then moving off after a couple of minutes, apparently unharmed. They seem to be able to tolerate an environment that no other flatfish, and very few fish in general, are found in.”

### So what do all these fish live on?

“The density of these things is remarkable; we’ve determined that the abundances are actually about 100 times higher than what one typically finds on the continental shelf,” said Dr Dower.

But what sustains all that biomass? The researchers speculate the flatfish may be living on resources in the sediments, possibly worms or even bacteria. But they may be omnivores. On one occasion, tonguefish at the vents were seen to rip apart a dead fish that had fallen out of the water column above. SOURCE: NOAA and BBC News ■

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the shark & whale experts

## 30 New Fish Species Discovered on Borneo

At least 52 new species of animals and plants have been identified this past year on the island of Borneo, according to a report compiled by WWF, including 30 unique fish species.

The finds include a miniature fish measuring less than one centimetre in length and found in the highly acidic blackwater peat swamps of the island; six Siamese fighting fish, including one species with a beautiful iridescent blue-green marking; a catfish with protruding teeth and an adhesive belly which allows it to literally stick to rocks; and a tree frog with striking bright green eyes. ■

*‘The more we look, the more we find’*



## Sharks on Great Barrier Reef Face ‘Extinction’

**Sharks living around the coral reefs of Australia’s Great Barrier Reef (GBR) face imminent “ecological” extinction unless urgent action is taken to protect them from fishermen and poachers, according to the first study of the animals’ survival on the GBR.**

Grey reef shark densities are 97% lower on fished and poached reefs compared with strictly protected no-entry zones and

a remote Indian Ocean atoll. Grey reef shark densities are 97% lower on fished and poached reefs compared with strictly protected no-entry zones and a remote Indian Ocean atoll. This is according to Howard Choat, who carried out the study with colleagues at James Cook University in Townsville, Australia.

Choat’s team predicts that numbers of grey reef shark will continue to decline at the rate of 17% per year, and the numbers of whitetip shark by 7% per year, unless urgent measures are taken to prevent over-fishing.

### Shark-fin soup

“The fishing pressure on sharks is increasing dramatically. The total biomass of reported shark catches on the GBR has increased four-fold in the last decade,” says team member Sean Connolly. Sharks are fished for meat, or for their fins, which are sold to Southeast Asia for soup.

Although the sharks are not in imminent danger of extinction, they are at the top of the coral-reef food chain, and play a key role in maintaining the health of its ecosystem—a role they will not be able to perform if their numbers fall below a critical level. “They will be ‘ecologically’ extinct,” says Connolly. SOURCE: *Current Biology* (Vol. 16, Page 2314) ■





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## Tuna quotas cut as stocks decline

The annual catch of bluefin tuna in the Mediterranean Sea and eastern Atlantic Ocean is to be cut by one-fifth in an attempt to conserve dwindling stocks. The 42-nation International Commission for the Conservation of Atlantic Tunas (ICCAT) agreed the quota cut at a meeting in Dubrovnik, Croatia. Scientific advice prepared for the ICCAT meeting concluded that catches in the eastern Atlantic and Mediterranean were about three times above sustainable levels. ICCAT also agreed measures to combat illegal hunting of the giant fish. Conservation groups however criticised the scale of the cuts

as "weak, scandalous and inadequate".

The environmental group, WWF, says many EU fishing fleets are breaking the law and catching far more tuna than allowed. ■

### Illegal fishing hits tuna stocks

Bluefin tuna stocks in the East Atlantic and the Mediterranean are being stripped bare by illegal fish-



ing, WWF has warned in a report. WWF found that the annual fishing quota of 32,000 tonnes, set by ICCAT, has been smashed for the past two years. In 2004, the actual catch was 44,948 tonnes and this rose to 45,547 in 2005. A campaigner says the real figure may be well over 50,000 tonnes. ■

## Farming Endangered Blue-Fin Tuna



SYDNEY UNIVERSITY

Tuna is hard to cultivate because it is difficult to recreate the conditions they are used to in the wild. But in the city of Shizoka—in a small shed on a university campus—Akito Yamamoto is trying to recreate the oceans that the tuna are used to. The tanks are specially designed to keep the tuna happy and the light is dim. Tuna, it seems, are rather sensitive to daylight and to pretty much anything else. The water pumped up from deep down under the surface is just about as clean as you can get—no bac-

teria, no viruses and no parasites. The water flows in circles in each tank—creating an effect like a tread mill for the 15 fish in each tank. They need to keep moving to keep breathing. Normally well-travelled fish, they are capable of crossing the Atlantic in less than 50 days.

The tuna have to be shown where to swim, so there are streams of bubbles flowing away from the edges of the tanks, which guide the tuna away from the sides. The blue-fin will not be big enough to breed or be eaten for at least three years.

"I know some people are puzzled about why I am spending so much on this," said Mr Yamamoto. "But I am trying to make a facility that could be used for 10 or 20 years."

"However much we spend it's worth it if we can provide safe food for consumers." ■

## White Marlin May Soon Become Protected Species

The swift billfish, the White marlin, which inspires huge investments each year in boats and tournaments by New Jersey sportsmen, may become listed as a threatened or endangered species.

Federal officials are examining the species after pressure from two environmental groups. A federal judge approved a settlement to a lawsuit which followed a negative ruling by the National Marine Fisheries Service to protect the White marlin, that included a reconsideration by the agency.

Environmentalists say that the White marlin are overfished by sportmen. Fishermen say current regulation and recreational catch-and-release measures reduce the numbers killed. *SOURCE: Asbury Park Press.* ■

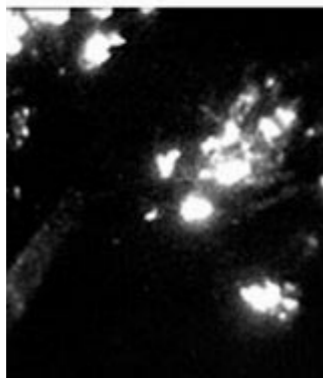
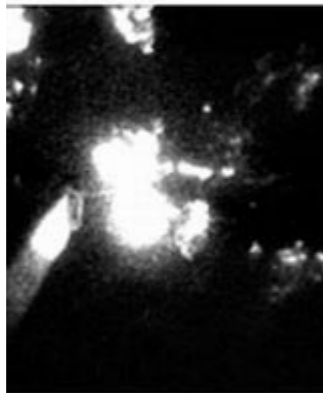
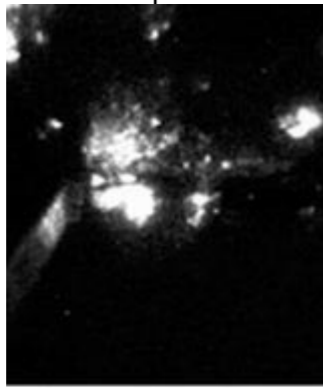


NORTH CAROLINA DIVISION OF MARINE FISHERIES



Edited by Peter Symes

MONTY PRIEDE



Lights appearing at baits on the sea floor at 1000m depth off the west coast of Ireland

# Mystery Lightshow Witnessed in the Deep

Researchers have published two papers that announce the discovery of deep sea lights in the Atlantic Ocean. The research team assembled from Oceanlab, University of Aberdeen, National Oceanography Centre Southampton and the University of Bristol recorded the spontaneous display of light by small abyssal creatures with the aid of a new *stealth* unmanned vehicle that has a high sensitivity camera.

Prof Monty Priede said "We have seen three kinds of displays, single flashes of light, animals swimming along producing repeated flashes of light and animals squirting a luminescent substance into the water".

The source of the light is still a mystery, but it is thought to be small shrimp-

like creatures swimming just above the bottom of the sea. Why the animals produce the light is also not understood. However, the squirting of luminescent materials is most likely a way the animals defend themselves.

Researchers have discovered two hot spots so far of this mysterious deep sea light. Off the tropical West African coast, there is one spot at 3200m depth. The other is off the west coast of Ireland at a depth of 1000m where some luminescence squirted by animals reach football-size balls of light. *SOURCE: University of Bristol via Physiorg.com* ■

See streaming video of the bioluminescence caught on tape here: [www.oceanlab.abdn.ac.uk](http://www.oceanlab.abdn.ac.uk)

## Potential Global Demand for Golden Bath Sponge

The golden bath sponge has been found to have surprising benefits for agriculture, medicine and pearling, said marine researchers.

A researcher from the Australian Institute of Marine Science, Dr Chris Battershill, says that more study is needed to farm sponges successfully. "In the

agricultural sector the leads can be taken right through to market and quite quickly," he said.

Australia is a global leader in many areas of farm husbandry and maintenance and can provide the capability of taking things into a clinic setting. *SOURCE: ABC Rural* ■



## Cave Sponges Play Important Role in Coral Reef Nutrient Cycle

Dutch biologist, Sander Scheffers, has found that sponges in caves play an extremely important role in the coral reef's nutrient cycle.

By investigating sponges in the coral reefs off the Caribbean island of Curaçao, he gathered valuable information for nature conservationists who steward the coral reefs. Indeed, the researcher says the sponges probably play the most important role in the ecosystem.

Scheffers used a special underwater camera to capture images of the marine organisms and their communities in almost inaccessible caves.

The resulting film revealed that the animals as well as tube worms, bivalves and tunicates fill more than 60 percent of the coral cavities. In addition, it was noted that these caverns had eight times the surface area as that of the

coral reef according to divers viewing the area from above.

A larger living surface means a larger filtering surface according to Scheffers. This organisms feed by filtering water and taking up plankton particles at a high rate.

Because of their incredible capacity to convert large quantities of organic plankton into inorganic material, the hidden organisms like sponges play a key role in the marine nutrient cycle according to Scheffers. *SOURCE: Netherlands Organization for Scientific Research via Innovations Report.* ■



## Plastic particles are clogging the seas

Small particles of plastic could be poisoning the oceans, according to a British team of researchers.

They report that small plastic pellets called "mermaids' tears", often smaller than a grain of sand, have spread across the world's seas.

Dr Richard Thompson at the University of Plymouth is leading research into what happens when plastic breaks down in seawater and what effect it is having on the marine environment. Sturdy and durable plastic does not bio-degrade, it only breaks down physically, and so persists in the

environment for possibly hundreds of years.

Some are the raw materials of the plastics industry spilled in transit from processing plants. Others are granules of domestic waste that have fragmented over the years. Plastic rubbish, from drinks bottles

and fishing nets to the ubiquitous carrier bag, ends up in the world's oceans and are almost impossible to clean up. Findings estimate there are 300,000 items of plastic per sq km of sea surface, and 100,000 per sq km of seabed. Dr Thompson's team also set out to find out how small these fragments can get. So far, they've

identified plastic particles of around 20 microns—thinner than the diameter of a human hair.

The scientists are worried that these fragments can get into the food chain. Among clumps of seaweed or flotsam washed up on the shore, it is common to find mermaids' tears, small plastic pel-

lets resembling fish eggs.

Thompson and his team conducted experiments on three species of filter feeders in their laboratory. They looked at the barnacle, the lugworm and the common amphipod or sandhopper, and found that all three readily ingested plastic as they fed along the seabed. ■





Prince Pieter-Christiaan with a student



His Royal Highness Prof. mr. Pieter van Vollenhoven ready to enter the water

## The Dutch Royals Take Disabled Diving

Special guests on NAUI and IAHDs Dive challenge day were the Dutch Royal family, HRH and father Pieter and son prince Pieter-Christiaan van Vollenhoven, who took several disabled divers on their first intro-dive. This Dive challenge tour was made possible

through several sponsors to organise a 'Make a difference day'. As the pictures show, all involved had a great time. A good attention value for the organisation and the dive-industry, HRH Pieter van Vollenhoven promised to stay in contact and do more together. ■

HRH mr. Van Vollenhoven helping the disabled for their first intro-dive



Ready to dive!



Everone had a great day



## NAUI Airforce?

NAUI CD Wilson van Heugten trained a complete team of the Royal Dutch Airforce from Scuba Diver up to Instructor.



## NAUI Service Center Receives Award from Africa's Largest Boat Show!

Michael and Ursula van Neikerk, operators of NAUI's South Africa Service Center, were the recipients of the

"Outstanding Exhibitor Award" during the 2006 WesBank National Boat Show which was held in Johannesburg, South Africa.

The "Outstanding Exhibitor Award" recipient is determined by show organizers and is awarded to the exhibitor who is considered to be the best at the show. Of

the 180 exhibitors who attended the show, NAUI was the only exhibitor to receive this honor!

"We are truly honored to be recognized as the "Outstanding Exhibitor" of the 2006 show," said Michael van Niekerk. "We have attended this show for the last five years because it is the largest of its kind on the African

continent and our experience has been that this was our best show ever! This year's show incorporated the Dive 2006 pavillion, which was dedicated to the scuba diving industry and showcased scuba diving gear and equipment, accessories, services, training and education, and travel destinations. ■







NAUI Europe acknowledges the National Dutch Underwater Federation (NOB)

NAUI Europe are working closely together with the National DUTCH UNDERWATER FEDERATION, to create new divers, keep existing divers diving and make convincing prospects to start a diving career. This project has run for more than a year and has been joined by PADI and SSI making it a truly joint effort.

NAUI Europe has presented the NOB with a certificate of appreciation. The certificate was presented on the holiday exhibition by Jelle Buisman, NAUI Europe training director, and he mentioned the unique fact that the 4 major agencies work together and that they are all on the same page. ■

## Visit NAUI During the following International and Regional Trade Shows in 2007!

### Asia

TEDX Show – Bangkok, Thailand (May 24-27)  
 MDT Show – Kuala Lumpur, Malaysia (July 6-8)  
 CDEX Show – Beijing, China (August 25-27)  
 CDEX Show – Hong Kong (September 14-16)

### Europe

Duikvaker – Utrecht, Netherland (February 10-11)  
 EUDI – Roma, Italia (March 9-12)  
 The Dive Show – Birmingham, England (October)

### USA

Our World Underwater – Chicago, IL (February 9 -11)  
 Beneath The Sea – Secaucus, NJ (March 23-25)  
 Ocean Festival – Ft. Lauderdale, FL (April 20-22)  
 Sea Space – Houston, TX (March 31-Apr 1)  
 Scuba Show – Long Beach, CA (June 2-3)  
 DEMA – Orlando, FL (October 31-Nov 3)

Plan to visit the NAUI booth at each of these shows to catch up on the latest news, view new products or get together with your fellow NAUI members.

## Tiny Crabs Keeps the Coral Clean

Tiny crabs that live in coral help to prevent the coral from dying by providing regular cleaning "services" that may be critical to the life of coral reefs around the world, according to scientists reporting in the November 2006 issue of the journal *Coral Reefs*.

The relationship between the corals and the trapeziid crabs is mutually beneficial, or symbiotic. The coral provides a home and protection for the crabs. The little crabs, measuring only a centimeter wide, make their home in branching corals like *Acropora* or *Pocillopora*. The crabs provide "house-keeping" duties for the coral, routinely "sweeping" out sediment that falls onto the coral, according to the study. The accumulation of sediment on coral tissue is known to reduce metabolic and tissue growth

rates of coral, increasing the probability of bleaching and coral death. Many corals can remove some sediment from their surfaces but high sediment loads can be deadly. Predicted increases in sedimentation threaten coral reefs in many near shore areas around the world.

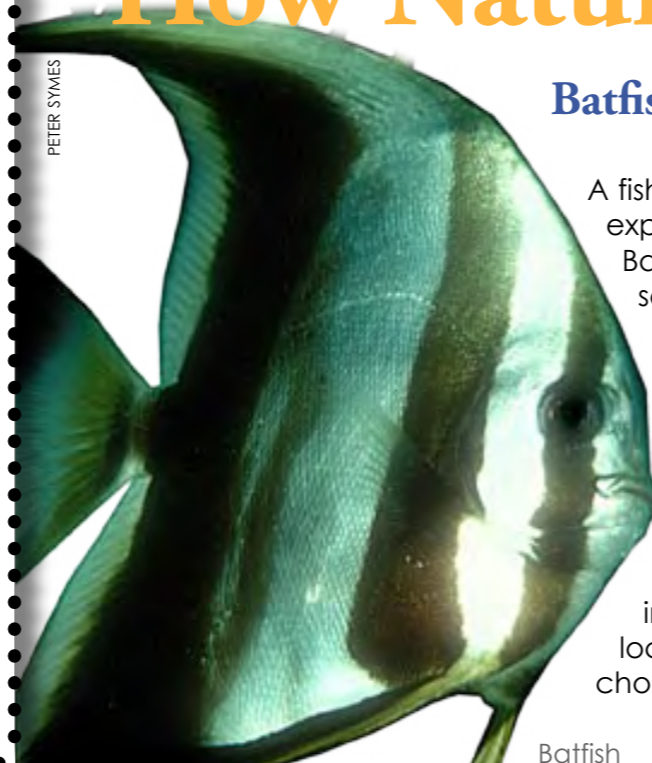
Coral reefs are threatened by a variety of environmental changes. For example, higher water temperatures and increased ultraviolet radiation, which are associated with climate change, are sources of widespread coral bleaching. Changing land use patterns, caused by population increase on the coasts increases the sediment load on coral. This is due to the higher amount of water run-off from development, deforestation with erosion, and expansion of agriculture. ■

PETER SYMES



The scientists showed the importance of trapeziid crabs by gently removing crabs from sections of the two species of branching corals on a coastal reef. This resulted in 50 to 80 percent of those corals dying in less than a month. By contrast, all corals with crabs survived. (Filephoto)

# How Nature Keeps Coral Reefs Healthy



PETER SYMES

## Batfish Increases Reef's Recovery Capacity

A fish that gatecrashed an experiment in Australia's Great Barrier Reef has surprised scientists by emerging as an unexpected weapon against the worldwide decline of coral reefs. Part of the research involved generating a bloom of the tropical kelp sargassum weed to mimic the effects of choking invasive weeds and seeing if local weed-eating fish would chomp their way through it.

Batfish

While herbivorous species like the parrotfish and surgeon fish only nibbled disinterestedly at the algae, the batfish (*Platax pinnatus*) turned up and cleared the weed within two months.

Professor David Bellwood from James Cook University said the batfish's voracious appetite for weed saved the coral from being choked to death.

"The surprising finding was that a different group of fish was responsible for reversing the algal bloom. Batfish are normally considered to be plankton feeders so

we were amazed when we captured on video the effects those fish were having. In five days they had halved the amount of weed. In eight weeks, it was completely gone and the coral was free to grow unhindered," he said.

Bellwood said declining coastal mangroves serve as nurseries for batfish, which are found in reefs around the world.

This highlights the need to preserve mangroves and protect these accidental weed warriors, he said. ■





Edited by  
Willy Volk



Lt. Jessica Hill and Petty Officer 2nd Class Steven Duque

U.S. COAST GUARD

## US Coast Guard divers' deaths attributed to "a chain of events and decisions which, had any link been broken," would not have occurred

On August 17th, Lt. Jessica Hill and Petty Officer 2nd Class Steven Duque undertook what the Coast Guard has repeatedly referred to as a "cold water familiarization exercise." Reportedly only diving to a depth of 20 feet—to inspect the rudder of their ice-breaker, the Healy—the divers were tethered to a support team on the surface. Despite this, both divers drowned. In November, Hill's father released the autopsy results of his daughter. According to the autopsy summary, Hill suffered "an uncontrolled descent to a possible depth of 189 feet." But wait—weren't the divers only supposed to descend to a max depth of 20 feet? Why had Hill descended to 189 feet?

According to the Coast Guard's recently-released report, multiple regulations were violated that contributed to the deaths of Hill and Duque, including expired dive certifications, untrained personnel put in charge, faulty equipment used, and the presence of alcohol. Apparently, when Hill and Duque entered the water, they were carrying more than twice the amount of weight required for the dive. Unable to ditch the weight, the pair quickly entered free fall. Single jerks on the line signaling "stop" were misinterpreted by unqualified dive tenders who—distracted by the so-called "ice liberty" party going on topside—erroneously paid out more line. Hill descended to 187 feet, and Duque plummeted to more than 200 feet. By the time the tenders realized what happened, the pair was dead. The Coast Guard has vowed to take steps to ensure this will never happen again, but for the families and friends of Hill and Duque, of course, it's already too late. *SOURCES: CNN, Seattle PI, Military.com* ■

## Did Norway drug some of its commercial divers?



Kari Todnem, medical director at Norway's St. Olav's Hospital, believes some North Sea commercial divers in the 1960s were systematically and unknowingly drugged in hyperbaric chambers during ascent in order to calm them -- and to spare diving gas. Todnem came to this conclusion after analyzing nerve and lung damage among the divers, interviewing surviving divers, and inspecting hospital records, which refer repeatedly to drugs such as Medrol and Valium. Why would a government drug its citizens? According to Todnem, "The only reason I can think of for this being done is a form of trickery, a way to decompress the divers without them getting symptoms of decompression sickness. This is criminal." The surviving divers are trying to sue the state for compensation, arguing that Norway was aware of the dangers posed by their diving. So far, the state has refused to accept responsibility, though some payments were approved by parliament in 2004. The case goes to court in March. *SOURCE: Aftenposten* ■

## Two men rescued after being trapped in a sub for 13 hours

If you think being trapped in traffic is bad, imagine being trapped in a submarine 130 meters below the surface of the ocean—for 13 hours. That's what happened to a pair of men in December. Performing a bi-annual certification of a submarine rescue vehicle (the Remora, a 16.5-ton remotely-operated rescue vehicle with room for seven people), the men were inside the sub as it was being winched in by a ship when the cable failed. While rescuers riddled out how to bring the men to safety, the sub was lowered to the sea floor -- 130 meters below the waves. Battling high seas, it took three rescue attempts to finally bring the men within 15 meters of the surface, at which point rescue divers assisted the men in their escape. While the submariners were uninjured, this is a terrible setback for the Remora. Since the



rescue vehicle failed its certification test, if there is an accident on an Australian navy submarine, help will have to come from either Singapore or the US, which could mean a delay of more than 24 hours. *SOURCE: news.com.au* ■



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Edited by  
Willy Volk

## Scuba diving professor wins climate change research award

James Crabbe, a scuba diving professor at the University of Bedfordshire, studies climate change by looking at the world's coral reefs.



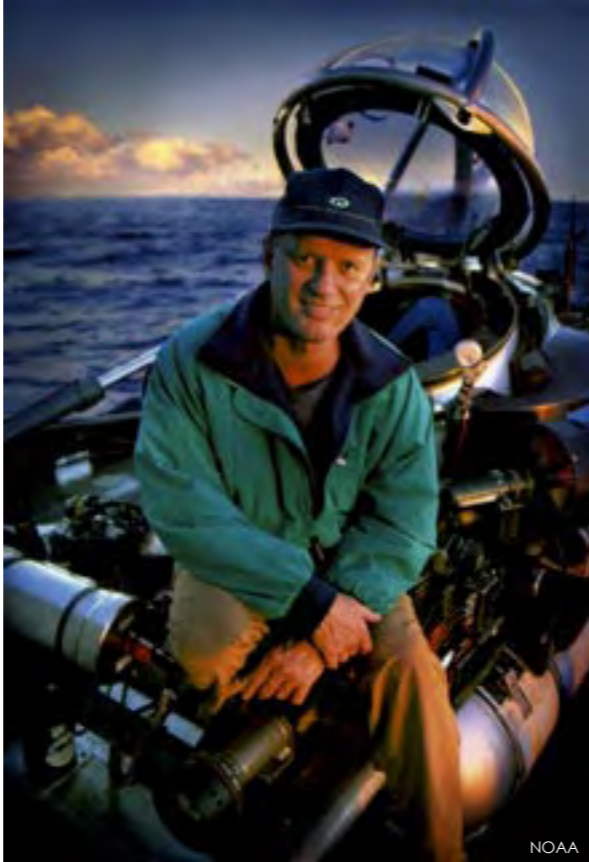
UNIVERSITY OF BEDFORDSHIRE

Ultimately, Crabbe hopes to produce a predictive model for the effects of climate, climate extremes, and anthropogenic changes on the growth, physiology and biodiversity of tropical coral reef colonies.

Recently, Crabbe was awarded the Aviva/Earthwatch Award for Climate Change Research. Worth £6,000, Crabbe

Professor James Crabbe

plans to buy a video ray underwater ROV with the money. Not to be confused with a death ray, the state-of-the-art video ray will allow him to analyze coral at greater depths, even when dive teams are not present. Crabbe plans to visit Jamaica this winter with his ROV to collect more data, and will head to Belize next summer. He also plans to launch new projects in Mauritius and China. *SOURCE: Bedford Today* ■



Dr Robert Ballard

## Ballard to explore the Gulf of Mexico—from Connecticut

Famed explorer Dr. Robert Ballard is about to embark on an unusual underwater exploration of the Gulf of Mexico's Flower Garden Banks. What's so unusual about that? He'll undertake the investigation from his offices at the Mystic Aquarium -- in Connecticut. Through satellite technology, a virtual submarine command center will allow him to see what's going on

at the site from the comfort of his offices. Interestingly, this exploration will not focus on marine life. Rather, it's an investigation into the human activity of an area previously above water. According to Ballard, "We're pretty convinced that ancient native Americans actually were living there. So we're going to the Flower Gardens with this technology to see if we can find evidence of human habitation when it used to be land." *SOURCE: WTNH* ■

## Herbert Nitsch breaks static apnea record in Hurghada

On December 13, 2006, Austria's Herbert Nitsch -- the first freediver to reach 100 meters using his own strength -- turned in a static apnea performance of 9 minutes 4 seconds, setting a new world record. Static Apnea is timed breath-holding and is usually attempted in a pool, or -- if you're David Blaine -- in a giant sphere. *SOURCE: Deeperblue.net* ■

See NITSCH'S other records



HERBERTNITSCH.COM

## Moonie pastor arrested for his involvement in trade of leopard sharks

A British pastor of the Moonies church, Kevin Thompson, will soon be sentenced for his involvement in a worldwide shark-poaching and -smuggling racket. Thompson, based at the Unification church in San Leandro, California, is one of six men arrested for taking and selling thousands of undersized California leopard sharks. Investigators charge that Thompson paid fishermen \$2-3 for each baby shark they provided and, in turn, he sold the sharks to international dealers for \$20-35. Reportedly, his shark operation grew so big that he had to store some of the fish at his church! Authorities became suspicious of Thompson when dealers he supplied were caught and testified against him. Thompson faces up to eight years in jail and fines of up to \$1 million. Investigators believe that Thompson was trying to impress his leader, the Reverend Sun Myung Moon, who frequently extols the virtues of fishing and refers to himself as King of the Ocean. Lucky for Thompson, he'll soon be able to refer to himself as King of San Quentin State Prison pool. *SOURCE: Independent* ■



## Belize suspends dive guide's license for a minimum of 5 years

In October 2005, a seemingly innocent pleasure trip turned deadly. When divers on an outing with Belize's (ironically-named) Advanced Diving experienced a power outage on their vessel, they decided to swim for shore rather than float aimlessly. Ultimately, three of the divers spent three days and two nights adrift before being rescued; a fourth diver, Abigail Brinkman, died. In December 2006, Belize suspended the license of Advanced Diving's Vance Cabral for a minimum of five years. In addition to citing his gross negligence--on top of allowing the divers to leave, Cabral operated a single-engine boat that evidently had (a) no working radio; (b) no emergency signaling equipment; and (c) no drinking water for a trip to a destination located 20 miles offshore--Belize's Tourism Board noted that Cabral's behavior had placed Belize's entire tour operating profession in disrepute. Cabral will not face criminal charges, however, because police dragged their feet for 13 months before charging him. The statute of limitations expired after 6 months. *SOURCE: Channel5belize* ■

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Edited by  
Willy Volk

## Ikelite's Ike Brigham dies

In the early 1960s, Ike Brigham and his dive buddies would gear up and explore Indiana's flooded limestone quarries. Not happy diving in the dark, and not having access to quality lighting, Ike set out to design a small, robust light for himself and his friends. After fiddling around in his kitchen, Ike ultimately devised a way to make

an inexpensive light quickly and cheaply -- in his oven. Word soon spread about "Ike's Light," and dive shops around the Midwest began calling in orders. Ikelite was born. Ikelite has come a long way since since 1962, and today the company provides divers with housings, strobes, strobe controllers, arms, trays, flashlights, and compasses. Dedicated,

innovative, and constantly trying to make a better product, over the years curmudgeon-y Ike made many friends in the diving community, worked tirelessly to provide the best customer service possible, and truly revolutionized both the sport of diving and the discipline of underwater imaging. Ike passed away on December 20th, 2006. According to his daughter, Jean, he had been fighting lung cancer. He will be sadly missed. *SOURCE: Scubadiving.com* ■



Ike Brigham

## Underwater photographer Alessandro Dodi dies during rebreather course

According to a friend, underwater photographer Alessandro Dodi was participating in a rebreather course in Italy's Lake Como in November, 2006. Apparently, Dodi made a dive using one rebreather, surfaced, switched to another unit, and descended again. Dodi's buddy surfaced when he lost sight of Dodi and, having established that he was not at the surface, re-descended to find him motionless, on the bottom of the lake, his regulator out of his mouth. Dodi was a winner in Diver Magazine's Image 2003 photo competition, taking four medals including gold in the Grand Master (Marine Life/People/Scenery Prints) category. In 2004, Dodi's website won the Best Artistic site award at the Antibes Festival. *SOURCE: Divernet* ■



WWW.MAR.ROSSO.IT

## Diver survives spear gun shot through his neck

On Christmas Eve, a 27-year-old man was spearfishing with friends off South Africa's East London coast when he was accidentally shot in the neck. According to the National Sea Rescue Institute, fellow divers sounded a distress call and alerted authorities. Rescue officials were slow in arriving, however, so the divers pulled the spear from the diver's neck, since it "had missed vital organs, including the jugular vein." The spearfisherman was delivered to the hospital later that afternoon and released the following morning. While it may sound macho, self-removal of the spear is the recommended course of action. *SOURCE: news24* ■



## Squid mail

Residents along Japan's southeastern coast have been using "Surumail" -- edible postcards made from squid -- since 2000. Produced by the Susami fishing cooperative, Surumail postcards consist of surume squid, which has been dried, flattened, and vacuum-packed. Used in conjunction with the conveniently-provided adhesive label (for postage, delivery address, and a short message),



The fishing cooperative claims they've sold 4000-5000 of these \$3 cards since their inception. Fittingly, this is the same community that installed an underwater mailbox off its shore a few months ago. *SOURCE: Pinktentacle* ■

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## Drowned diver failed to turn on equipment

In September 2005, diver Nigel Peter Lees was diving alone off a chartered boat anchored near Ship Cove, New Zealand. Planning only to check his gear, clear mussels off the mooring line, and collect crayfish, Lees was gone from the boat for a long time. Later, his boatmates found him dead at 15 meters, with his equipment switched off. Ordinarily a methodical diver, Lees evidently failed to use his equipment properly. A recently-completed investigation revealed that Lees' electronic handsets had not been turned on, and additional oxygen was not being put into the system to compensate for that which was being used. *SOURCE: Stuff.co.nz* ■

## Julio Cesar Cu wanted to be an oceanographer. Instead, he wound up as a sewer diver in Mexico City

Mexico City, home to 18 million people, has some filthy sewers. They're not just regular filthy, though: they're dangerously, disgustingly, putrefyingly, puke-inducingly filthy. In addition to all the poop that sewer diver Julio Cesar Cu is forced to swim through, Julio frequently encounters far more wretched items, like severed animal heads and decaying human bodies. Clearing the 20-foot-wide pipes beneath the streets earns him \$400 a month. While many people would probably grumble about his job, Julio has a bright outlook: "I like diving as a sport. As a job I like it even more. I do a job that benefits a lot of people." Thank God for people like Julio. *SOURCE: Signonsandiego.com* ■



# SSI Introduces Technical Diving

SSI enters the technical diving market with the official launch of "TXR", the SSI Technical Extended Range program

The TXR product launch includes four courses which are: Technical Foundations, Decompression Procedures, Normoxic Trimix and Advanced Decompression.



The academics for the four courses will be presented in one manual with four sections. There will be an accompanying interactive CD and a series of dive planning slates. The TXR program has been designed to provide both students and instructors with an unprecedented level of flexibility. The four courses are building blocks, which can be taught individually and sequentially or combined to meet specific training objectives. The SSI TechXR program is designed to meet the needs of divers and dive lead-

ers. The instructor can formulate training around each customer's individual goals and objectives as students who just want to learn more about the right decompression procedures can stop after the second course. Others who would like to go through the entire program to become a TEK DIVER have the option to do so. The program has also been designed to seamlessly integrate with the traditional SSI recreational products.

## Xtreme Training

The SSI TechXR program was designed and tested under the most demanding conditions. All of the complex information has been broken down and made simple to teach and understand. The training materials for both the student and instructors were developed by industry professionals with years of technical experience. SSI's signature training method, the SSI Diver Diamond and Comfort Through Repetition, has been applied to keep the programs consistent and provide the same high quality education as other SSI products.

If you want to know more about TechXR, contact your local SSI Facility or [www.ssiusa.com/txr](http://www.ssiusa.com/txr). ■



## Updated B2B web shopping cart for PADI Members

PADI continues to develop digital tools designed to make it easier for PADI Members to succeed. One exciting new development is a completely revamped business to business web shopping cart.

The new iteration of PADI's online shopping cart uses the latest technology as part of the organization's overall move to help members embrace the internet and expand their business perimeters throughout the online world. "As part of the PADI commitment to helping members succeed in the digital age, the PADI organization is reviewing and upgrading online services while continuing to explore additional online offerings," said Budd Riker, PADI Director of eBusiness. "The updated web shopping cart will include a web catalog, enabling PADI Members to order training materials any time of day that's most convenient." ■

## SEEING IS BELIEVING! NASA Puts More Ogle in Your Goggle!

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PADI International writes:

## No Barrier Tour Celebrates Its 10th Anniversary

The No Barrier Tour was established in 1996 in the UK by Fraser Bathgate, PADI's Adaptive Techniques Adviser and the first paraplegic person to become a PADI scuba diving instructor. 2006 saw the Tour celebrate its 10th anniversary—a real milestone for everyone involved.

No Barriers was devised to bring a new dimension in sport for disabled people, initially catering to those with spinal injuries, but over time reaching out to people with other dis-

abilities such as cerebral palsy, Down's syndrome and muscular dystrophy. The name, No Barrier, was inspired by the belief that there are really no barriers in the water, and everyone can experience the freedom that scuba diving brings. Originally, No Barrier began in the UK, but during the past five years has also worked internationally.

PADI wishes the No Barrier Tour every success for the future, in their 10th anniversary year. To find out how you can get involved, contact PADI International Ltd. by calling + 44 (0) 117 300 7234. [www.padi.com](http://www.padi.com) ■





wreck  
rap



## Treasure from the *Wanli* wreck to go on exhibit

In year 1625, a Portuguese vessel set off from China on a voyage to the Straits of Malacca. Onboard were tonnes of china-ware and pottery that would bring lucrative profits for the Portuguese. However, the ship now named "Wanli" never reached the Portuguese fort of Melaka as she sank half way sailing through the South China Sea. The ill-fated voyage of *Wanli* remained a mys-



WWW.TRADEWINDTREASURES.BIZ

tery until almost four centuries later when her wreckage was discovered buried deep in the ocean off the coast of Terengganu (Malaysia) together with her precious cargo.

A team of researchers led by a Kuala Rompin-based marine archeologist, Stan Sjostrand, discovered the shipwreck in November 2003. During the team's search and investigation in 2004, parts of the cargo comprising the priceless blue-and-white pottery and other wares were also recovered.

The highly prized Ming Dynasty's blue-and-white porcelain found onboard *Wanli* also indicated that the Portuguese had access to better quality Chinese wares than the Dutch, while the *Wanli* vessel itself was believed to have been constructed somewhere in Southeast Asia.

Meanwhile, various steps have been taken by the Museums and Entiquities Department to extensively promote and inculcate better understanding of the country's rich underwater heritage. Among them is a plan to create a permanent gallery for the maritime history at the National Museum. ■



JIM KENNARD/WWW.SHIPWRECKWORLD.COM



An early 1800's schooner has been discovered in deep water off the southern shore of Lake Ontario near Oak Orchard / Point Breeze, New York. Shipwreck enthusiasts, Jim Kennard and Dan Scoville located the old schooner utilizing sophisticated side scanning sonar equipment. *SOURCE: Shipwreckworld.com*

## 19th Century Schooner sits almost intact in Lake Ontario

Shipwreck explorers Jim Kennard and Dan Scoville who located the schooner *Milan* in the summer of 2005 about five miles off Point Breeze, off Rochester, New York, have now videotaped the 93-foot-long, square-stern vessel using an ROV built with the help of college students. The ship sits evenly on the lake bed; its masts

extending 21m (70ft) up in a dark, almost oxygen-free setting. Its rigging and sails have long disintegrated, but much else appears largely undamaged. Both anchors are firmly in place near the bow. The tiller, a large handle for turning the rudder, is intact. *SOURCE: International Herald Tribune.* ■

## Mica wreck offers glimpse into early shipping in the Mexican Gulf

The *Mica* wreck, measuring 20m and laying under half a mile of water on the seafloor of the Gulf of Mexico, is a bit of a mystery. Why was the hull covered by copper sheets?



U.S. MINERALS MANAGEMENT SERVICE

Such a coating, often too expensive for small merchant vessels, was commonly applied to large vessels by ship builders from the late 18th century to the mid-19th century. It protected ships from wood-eating creatures such as barnacles. ■

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# wreck rap



## Truk's Wrecks an Environmental Disaster?

Truk Lagoon is arguably the world's premiere wreck diving location. Boasting dozens of wrecks (destroyers, transports, cargo, subs, tugs, carriers, tankers and other vessels) in her waters, the island's economy centers around these sunken ships. However, Micronesia's greatest asset may also be its greatest liability: massive oil leaks from the tankers, destroyers and other WWII relics are

threatening the island's coastline. Local blast fishermen have illegally fished the area for decades, causing damage to the wrecks. Consequently, the wreck's disintegrating hulls are beginning to leak diesel fuel, oil and other toxic chemicals.

According to Joe Konno, former Director of the Truk Environmental Protection Agency, "If one of those ships happens to break loose in the lagoon or

on the reef, you can imagine the damage it will cause from the loads of fuel being released."

Although Micronesia profits from the vessels through tourism revenue, maritime law dictates that Japan still owns the sunken ships and planes. Together, these two governments will have to come to a solution—and swiftly!—otherwise these divers' dreams may mutate into environmentalists' nightmares. ■

# German WW2 Sub Wreck With 65 Tons of Mercury Has Started to Leak

More than 60 years after being torpedoed by the British navy, the rusting wreckage of the *U-864*, a German submarine, now poses a major environmental threat due to its poisonous cargo. At the time of the sinking, *U-864* was on a top-secret mission to supply Japan with advanced weapons technology. As the German vessel sank in two parts into more than 120 meters of water, it took with it not only the 73 men on board, but also 60 tons of mercury for the Japanese munitions industry and, some historical accounts say, a newly developed German jet-fighter engine—technology that was supposed to give the Axis powers an edge in the closing stages of the war.

The long saga of the *U-864*, however, is far from over. Many of the canisters containing the liquid mercury are corroding. Small amounts of mercury have seeped out and Norwegian government tests around the wreck have detected slightly raised amounts of the metal in crabs and fish—the country's second biggest export after oil and gas.

The Norwegian Government has announced that the most likely treatment for the toxic threat posed by a



*HMS Venturer* (Lt. J.S. Launders) torpedoes and sinks the German submarine *U-864* in the North Sea west of Bergen, Norway, in position 60.46N, 04.35E. This is the only known incident in all of naval warfare in which one submarine sinks another while both are submerged

sunken wartime U-boat is entombment. The wreck will probably be covered by a gigantic mound of gravel and sand, concreted for stability and extending 12m above it to allow for a shifting seabed.

*U-864* was sunk by the British sub *HMS Venturer*—the only recorded fight to the finish by two submarines.

The remarkable story of the duel between *HMS Venturer* and *U-864*, and the results of a recent diving expedition to the U-boat wreck, was screened on a BBC2 Timewatch documentary on 2 January. ■

ROV footage of the wreck shows the progressed deterioration



Sidescan sonar image showing the broken *U-864* on the seabed

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For 65 years, the wreck of the *USS Arizona* has been leaking oil from its grave at the bottom of Pearl Harbor, staining the water, visitors often say, as if it were the ship's blood. The leaks come from about 500,000 gallons of thick, bunker C fuel oil that remain trapped in the deteriorating hulk—oil whose "catastrophic" release experts now think is inevitable





## Divers find three U-boats wrecked by secret war-time minefield

Divers have uncovered the wrecks of three Second World War German submarines off the British coast, shedding light on a British operation that has remained secret for more than 60 years. Historians were amazed at the discovery of the severely damaged U-boats. The submarines are all lying close to each other seven miles off Newquay in Cornwall, an area where no U-boats had ever been recorded as being lost.

After extensive research using declassified wartime documents, historians revealed they were victims of a deep minefield laid to defend supply lines. After the British intercepted a radio message from a U-boat commander

His boat had sunk a British destroyer after discovering a gap in the Irish Sea minefield that allowed supply ships in to Cardiff and Bristol. He radioed the news to Germany but his message was deciphered by British Intelligence. The British then laid deep mines to allow ships through but trap U-boats. ■

## Japanese WW2 Minisub found off Sydney

Divers have found the wreck of a Japanese midget submarine that attacked Sydney Harbour in 1942 and brought the Second World War to Australia's biggest city, ending a 64-year mystery over its fate.

Divers were since told not to visit the wrecks, with a government minister saying the vessel might have unexploded weapons inside. The Federal Government has warned of huge penalties for anyone who disturbs or interferes with the sunken vessel.

The missing two-man submarine M24 was one of three Japanese midget submarines that launched a surprise attack on Sydney Harbour. In darkness it slipped in past protective nets stretched across the harbour entrance on May 31, 1942, with the plan attack shipping, including the American battle cruiser USS Chicago.

Two of the 46-ton subs were sunk. But the M24 fired two torpedoes, one of which sank the converted ferry HMAS Kuttabul, killing 19 Australian sailors and two Britons before vanishing under heavy fire. The other torpedo failed to explode.

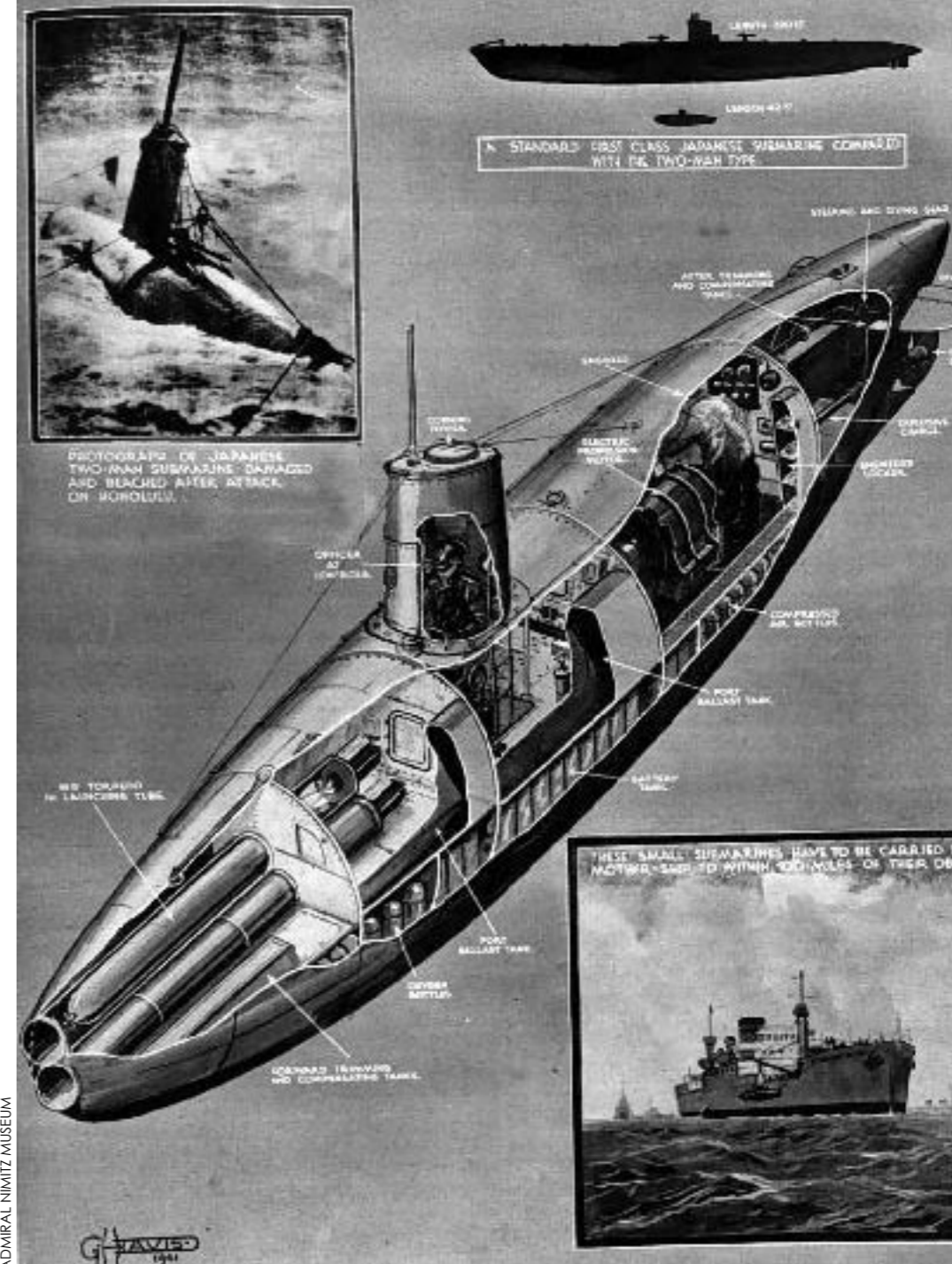
Filephoto of another midget submarine



What became of the M24 after the attack was carried out has remained a mystery until recently when the wreck of the long-sought submarine was found by recreational divers in deep water 5.5km off Sydney's north coast.

After several days of examination by navy divers, Environment Minister Ian Campbell confirmed the wreck was the missing M24.

"The resident expert in the Royal Australian Navy tells us that from what he has seen, this is the one. This will give the people of Australia and Japan the final piece of this maritime heritage puzzle," Campbell said in a statement. ■



## The hunt for Chile's first submarine

The search for the first submarine designed and built in Latin America has brought together public attention and Chilean history with civil, military, academic leaders and artists. The Flach submarine was launched in 1866 to protect Valparaiso harbor from attack by the Spanish fleet. But the unique pedal-powered vessel sank just days after its unveiling. Nine crew members, the sub's designer, Karl Flach a

German immigrant to Chile, and his young son were aboard the sub when it sank.

The Chilean President José Joaquín Pérez had commissioned the submarine to assist the war effort between Chile, Peru and Spain from 1864 to 1866.

A filmmaker, Juan Enrique Benítez, has researched the sub for the past year and coordinated an effort to locate the vessel in collaboration with Navy divers

and researchers from the department of sub-aquatic archeology at the Universidad Internacional SEK in Santiago. State-of-the-art equipment including high-frequency sonar to detect objects on the ocean floor and a low-frequency depth profiler to locate objects buried in the sea floor as well as an electromagnetic scanner to identify metallic objects, was used in a four-day survey of Valparaiso harbor. ■

## 19th Century Shipwreck Recovered in Chile

A sub on a routine mission fell upon one of nearly 600 shipwrecks resting in the bay of Valparaíso. Artifacts found are of British origin and include nautical telescope, dishes, a sailor's shoe buckle, metal handheld lamps and bottles dating back to 1850 according to the experts.

Archeologists say the vessel appears to be an English merchant ship. Vessels such as this ran a route from Great Britain to the west coast of North America. Most of the shipwreck is buried under sediment at a depth of 17 meters. It is thought that the ship is split in two. ■

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## Scapa Flow's Ghost Ship

Underwater archaeological experts have now created the most detailed sonar images to date of the *HMS Royal Oak*, which sank to the bottom of Scapa Flow in 1939.

The battleship took less than 15 minutes to sink with her crew of more than 1,200,833 who perished with her. U-boat ace Kapitänleutnant Günther Prien of U47 was responsible for her demise as he slipped through Royal Navy defences in Orkneys and shot four torpedoes into the warship.

Oil leaking from the ship's fuel tanks have presented a problem, much of it pumped out of the wreck, but still up to 286,000 gallons are thought to remain trapped in the hull of the ship.

In order to find out what state the wreck was in and how stable it was before attempting to empty the inner tanks, the Ministry of Defense called on Adus, wreck survey and sonar experts from the University of St Andrews. Computer wizardry turned data collected into 3D images of the wreck.

Maritime archaeologist with Adus, Martin Dean, said, "The sonar images are of such accuracy that even small changes in the hull over time can be monitored closely year on year... This will not only help reduce the impact of a catastrophic failure of the hull should it occur but, better still, allow a much greater understanding of how and when the wreck might break up." *SOURCE: Navynews.co.uk, Diving-News.com* ■

## British War Graves Vulnerable to Desecration by Foreigners

Vessels sunk with British servicemen inside are under the protection of the British Protection of Military Remains Act of 1986. A loophole in the law which stops British citizens from penetrating the wrecks doesn't bar foreigners from diving them.

Evidence of this form of desecration come in the form of videos posted on the internet by foreigners. In addition, items taken from the wrecks are showing up on eBay and on DVDs, which include footage of human remains. Companies are now taking divers into battleships according to officials. Foreigners cannot be prosecuted for diving on wrecks in international waters, since there is no law protecting them from this activity.

There are individuals calling for a change in the law according to officials. The new law would ensure that wrecks would get the same respect as war cemeteries do. While visiting the outside of the wrecks are permitted, entering the wrecks is restricted. *SOURCE: icwales.icnetwork.co.uk* ■

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## Can Visitors Enter the Largest Marine Sanctuary on Earth in 2007?

The Northwest Hawaiian Islands National Marine National Monument is the largest marine sanctuary on earth. It boasts over 7000 species, a fourth of which do not exist anywhere else in the world. It is the largest protected area governed by the U.S. The large atoll in the island chain, Midway, was once accessible to divers. But it has been closed for about five years. It is pristine territory, remote, untouched... a diving wonderland. Three governmental agencies that run the Sanctuary have devised a plan that would allow visitors access to the area in mid-2007. There will be a limit on the number of visitors per night—30 per night in 2007 and 50 per night in 2008. Activities like snorkeling, kayaking, hiking and sight-seeing historic military sites on the island are listed as appropriate activities. Diving is not mentioned, unfortunately. *SOURCE: Seattlepi.nwsourc.com* ■

## 16th TDI Pro Development Center on Grand Cayman

Divetech on Grand Cayman Island is now one of only 16 TDI Professional Development Centers in the world. In order to gain such a status, the center must have two certified Instructor Trainers on staff. Returning from Maine, USA, world headquarters of SDI/TDI, Divetech's Nat Robb carried a new certification as an IT with TDI and SDI. He was awarded several IT ratings including: TDI Advanced Trimix, Trimix, Extended Range, Advanced Nitrox, Decompression Procedures, Nitrox Diver, Nitrox Gas Blender, SCR Drager Dolphin, CCR Inspiration, CCR Inspiration Mixed Gas, CCR Inspiration Advanced Mixed Gas, CCR Evolution, CCR Evolution Mixed Gas, CCR Evolution Advanced Mixed Gas, CCR Kiss, CCR Kiss Mixed Gas and SDI (Recreational). Robb and Nancy Easterbrook now carry the flag as the two IT on staff at Divetech, which can now offer with their presence instructor level training for divers who want to become instructors. *SOURCE: Caycompass.com* ■

## Grenada's Underwater Sculpture Gallery



Underwater sculpture garden, Grenada

In May 2006, artist Jason Taylor opened his Underwater Sculpture Gallery in Grenada. The unique artistic display celebrates Caribbean culture while it explores the constantly changing relationship between art and the environment. More importantly, the Gallery is a fascinating dive destination. Though sculpting the pieces and placing them underwater looks time-consuming and labor-intensive, for divers exploring Taylor's work, it's

worth it. The pieces aren't just statues or swim-throughs; they're gorgeous, multi-dimensional displays of genius. La Diabliesse, for example, is fashioned from concrete and steel and secured to the ocean substrate. The effect is a sublime underwater goddess -- at once beautiful and wretched -- watching over the reef. Meanwhile, The Lost Correspondent is a forlorn, amazing work totally incongruous at his desk under the waves. There's no way words can convey the beauty -- and the unusual-ness -- of Taylor's work. To begin to understand his art, check out his gallery of images. Better yet, watch the video on his site that takes you through his otherworldly underwater world. *SOURCE: Underwatersculpture.com* ■

## Gozo Gets New Hyperbaric Unit

At Gozo General Hospital, Prime Minister Lawrence Gonzi inaugurated a new hyperbaric unit. The unit is located in a converted laundry room that now houses the sophisticated equipment to treat divers with decompression illness.

Arrival of this new unit makes Gozo a safer and more attractive place to dive, since the center is just a few minutes away from dive locations. It is all part of a marketing campaign to strengthen Gozo's position as a quality dive destination. Other measures included the scuttling of the *MV Cominoland* and the *MV Karwela* in August. The total investment for the niche tourism project of Gozo is 1.3 million euros. *SOURCE: MaltaMedia.com* ■



Walt "Butch" Hendrick, of Lifeguard Systems will design the UDC course

ous challenges are set up to identify a team of Ultimate Divers and, later, a single Ultimate Diver. To determine the Ultimate Diver, participants will demonstrate knowledge of the fundamentals of diving; perform safety drills; demonstrate navigation and search skills; deal with emergency situations; and participate in a wild, day-long beach party. Oh, wait—the beach party isn't actually part of the competition. That's part of the closing ceremonies. *SOURCE: Ultimatediverchallenge.com* ■

## Think you're the World's Ultimate Diver? Prove it.

The Ultimate Diver Challenge is a Survivor for scuba divers, designed to test the dedication, skills, and knowledge that goes into protecting the reef and engaging in safe dive practices. Scheduled for August in Cozumel, the competition's various challenges are set up to identify a team of Ultimate Divers and, later, a single Ultimate Diver. To determine the Ultimate Diver, participants will demonstrate knowledge of the fundamentals of diving; perform safety drills; demonstrate navigation and search skills; deal with emergency situations; and participate in a wild, day-long beach party. Oh, wait—the beach party isn't actually part of the competition. That's part of the closing ceremonies. *SOURCE: Ultimatediverchallenge.com* ■

## Cayman's Stingray City rules to change

The Marine Conservation Law on the Cayman's has recently been amended to help regulate the amount and type of food fed to the stingrays of Stingray City as well as activities in other Wildlife Interaction Zones. There is now a limit of the number of boats that access the zone at specific times and the number of passengers that can be taken to the sites. The measure was inspired by a growing concern that human interaction might be having to heavy an effect on the rays. Stingray City offers visitors an unique opportunity to interact with a lot of wild but friendly stingrays. It is not the rays' natural habitat, but they have been coming here for decades after they were initially attracted to the area by the tasty morsels the fishermen cleaned off their boats. *SOURCE: Caycompass.com* ■



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New in the land down under is a spectacular 20-day cruisetour on the Sapphire Princess. From Sydney, visitors go on an eight-day escorted land tour after freshening up at the Rydges Jamison five-star luxury hotel in the center of the city. Then, it's off to Ayers Rock in the deep Outback where guests will spend the night at the Sails Resort.

Next stop on the list is Kakadu National Park with a peak at ancient Aboriginal art sites and tons of wildlife. Onto Cairns where the real fun begins on a catamaran for a full-day tour of the Great Barrier Reef. This is where the snorkeling and submarine tour come in.

Breakfast and then back to Sydney where visitors climb aboard the Sapphire Prince to visit ports such as Melbourne, Hobart, Fjord-land National Park, Christchurch and Tauranga in New Zealand, finally ending in Auckland. The fun never ends.

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# Rebreather Events in the Dominican Republic

—Silent Seas (16 – 21 April 2007)

—Shipwreck 2007 Xploration (22 – 27 April 2007)

Pirate's Cove Dive Centre—the Dominican Republic's latest state-of-the-art technical diving centre—is proud to announce two weeks of mouth watering special-interest diving in April.

The second Silent Seas (Pirate's Rebreather Week) will be in April. Last year's Silent Seas was quite a special event, attended by many like-minded divers, and they are hoping to repeat the same experience this year. Silent Seas is for all levels and experience (including interested open circuit divers) allowing everyone to share the best of all worlds.

This will be followed on the 22nd April by Shipwreck 2007 Xploration. This unique event will include a wide range of activities, training, dives, presentations and the opportunity to interact with some of the leaders in the wreck diving community.

Shadow Diver, John Chatterton, will be a keynote speaker at Shipwreck 2007 Xploration. "This is a one-of-a-kind event where we are actually going to try to find a new wreck. I'm very excited about this, as it will be a great opportunity for people to take classes and learn, and then put what they learn into practice and have a lot of fun doing it."

If you would like to join Silent Seas or Shipwreck 2007 Xploration, please go to [www.piratescove-divecenter.com](http://www.piratescove-divecenter.com) for registration details and additional information.

■



JILL HEINERT

## Colombian Navy Goes After Shark Finners

The Colombian Navy's Pacific task force devotes most of its time to the pursuit of cocaine traffickers. However, lately the group has cast a wider net. Cruising the seas, looking for illegal shark finning boats, the Navy has started working to halt the cruel poachers that ply its waters. Not surprisingly, laws in the region are lax, and the Navy doesn't have jurisdiction when it comes to finners. For example, when the

crew discovered a boat with 14 dead hammerheads on it, Navy Captain Luis Rodríguez was only able to cite the vessel for having too few life jackets. Of course, many of the locals residing in the coastal villages depend on the fishing industry, are they are not pleased with the navy's new "pro-shark" stance. Believing the "government is trying to screw

## National Park Service Announces Ocean Park Stewardship Action Plan

At an event celebrating the 50th Anniversary of the Virgin Islands National Park, the US National Park Service has announced the release of the Ocean Park Stewardship Action Plan—a comprehensive plan by the agency for restoring and maintaining ocean resources in the national park system. The Ocean Park Plan will focus the organizational and scientific capacity of the Park Service on conserving marine, estuarine and Great Lakes resources, in collaboration with state and federal agencies and park stakeholders.

"The comprehensive program represents a commitment to restore and maintain productive fisheries, habitats, and wildlife in the ocean parks, and ensure the recreational opportunities they afford to hundreds of communities and millions of visitors. The Ocean Park Plan highlights collaborations with the National Oceanic and Atmospheric Administration and private partners, including our recent agreement for a seamless network of ocean parks, wildlife refuges, marine sanctuaries and estuarine reserves." SOURCE: U.S. Department of the Interior ■

us over," many do not support the Navy's new endeavor. SOURCE: *Financial Times* via *Diverster.com* ■

The Colombian submarine *ARC Pijao* patrolling



US NAVY

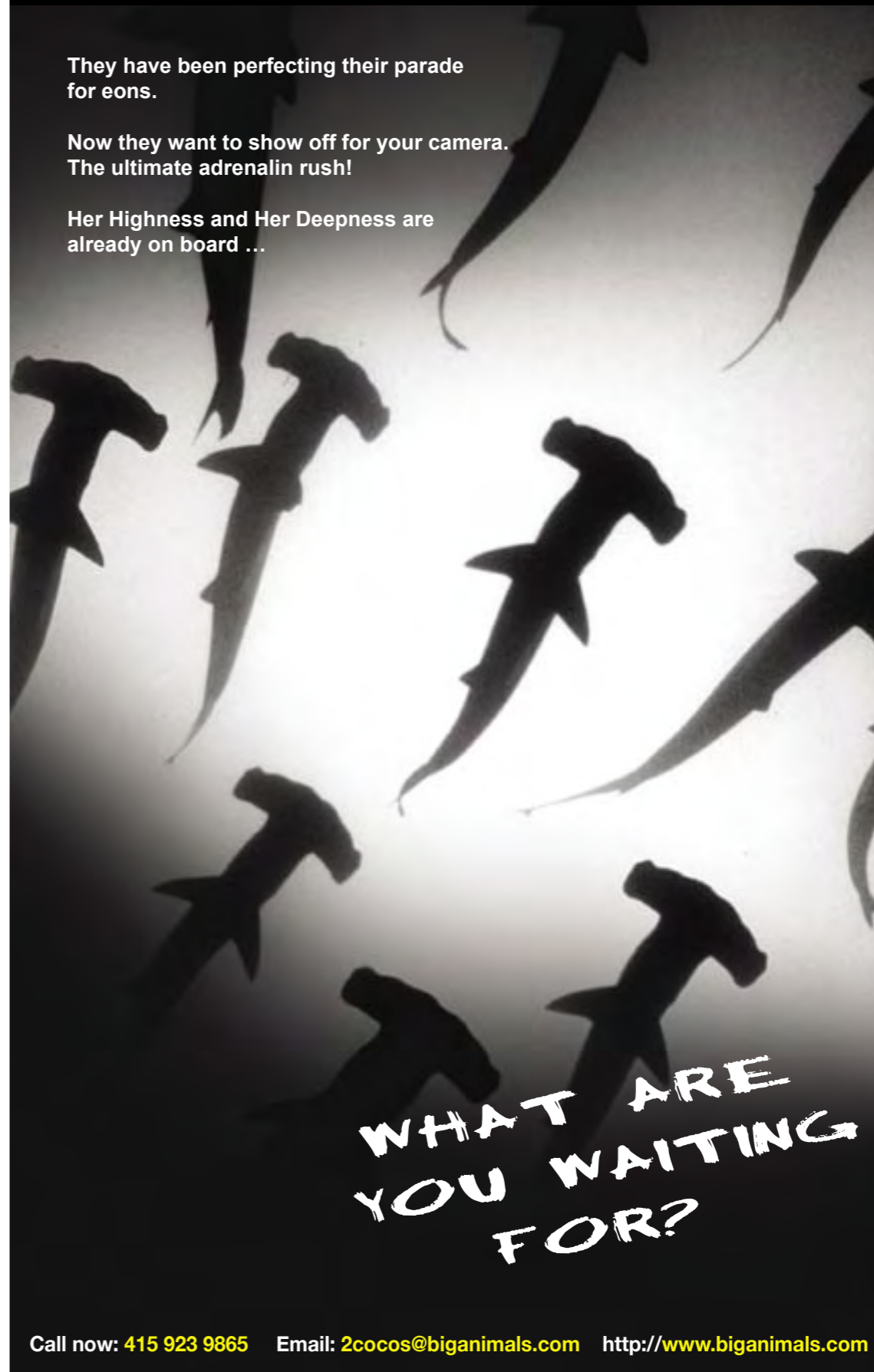
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Scientists, filmmakers and sport divers have made the pilgrimage to Cocos and Malpelo to experience and photograph the overwhelming sight of schooling hammerhead sharks, awe-inspiring whale sharks and the visceral thrill of witnessing a bait ball.



Join DR. KATHRYN SULLIVAN, "Her Highness," May 21 – June 05 '07, on a diving adventure

to Cocos. Dr. Sullivan, a Ph.D. in oceanography, was the first American woman to walk in space and was inducted into the Astronaut Hall of Fame. Dr. Sullivan has served as Chief Scientist of NOAA. She is a passionate advocate of science education and conservation.



Join DR. SYLVIA EARLE, "Her Deepness," May 17 – June 3 '07, on a diving

voyage to Malpelo and Cocos. Dr. Earle, a world-renowned marine biologist, is an explorer-in-residence at the National Geographic Society. Dr. Earle holds numerous diving records, including the women's world depth record for solo diving.



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# Riviera Maya

*Diving the Ancient Mayan Underworld*

The Yucatan Peninsula is located in the south of the contiguous Mexican states. The ground here is heated by the tropical sun—35°C makes for a hot and impassable jungle. The bogs—littered with iguanas, snakes and crocodiles—are drying up. A rare tropical storm suddenly and unexpectedly flies up from the Caribbean Sea. Black clouds, peals of thunder, bright lighting, squalls of wind and rain last no more than 15–20 minutes and again the damp stuffy mind-melting weight of the stifling heat returns. It is not the best place to dwell for the white man. But this land saw an era over 1000 years ago, when it was occupied by a surprisingly small-in-stature, dark-skinned people—the Maya.

Text by Andrey Bizyukin  
Edited by Gunild Symes  
Photos by Andrey Bizyukin  
Brigitte Veldman, J P Bresser  
Alexander Andrianov  
and Peter Symes





CLOCKWISE FROM TOP: Mayan ruins; The coast of Yukatan; The mysterious underworld of the ancient Mayan people  
PREVIOUS PAGE: Diver explores cave

The Mayans completely adapted to the conditions of their environment, with superb observations of the nature around them, learning to cultivate maize and settling throughout their lands. In homage to their Gods, they constructed temples, pyramids and observatories. They developed an alphabet and wrote texts. They devised their own calendar, composed legends and wrote down history of unique peoples. Mayans have maintained their unique guttural language and the original tenets of their culture up to current times.

Over 30 years ago, the government of Mexico made a decision that changed the life of its native peoples. The government set out to construct a new resort on the southeast coast of the Yucatàn Peninsula on a place hitherto unknown in a small fishing village. The city is now known as Cancun, which translated from the Mayan language means “the nest of the Snake” (or the



place where the Mayan god lives), and includes the area adjoining it which has been built up with luxurious hotel—the Riviera Maya.

Today Cancun and the Riviera Maya

are popular vacation spots and make-up the diving capital of the Mexican Caribbean islands. Here, one will find smart hotels, splendid palm trees, snow-white beaches of coral sand, the azure

sea, everywhere smiling cheerful people with fins, snorkels, masks and cylinders on their backs, a casino, noisy discos, night clubs and the popular Mexican bullfight every Wednesday. There are huge divers' supermarkets where it is possible to buy everything one needs for diving. There are fleets of dive boats heading out to sea every morning with enthusiastic skin divers onboard.

Certainly, there is interesting for everyone in plunging into the underwater world of the Caribbean Sea, to admire the multi-colored tropical fishes, to dive in thickets of soft corals, to take pleasure in the strongest sea currents around and to explore the underwater bronze guns of Spanish galleons even though the maximal diving depth in this

area does not exceed 18 meters, and in the vicinity of the city, there is only one wreck. But one can see the same diving pleasures you can find here in any other place around Caribbean basin. So why do experts recommend coming to this location? To go here only for sea diving? Definitely not. So why then, during the high season, do 70,000 visitors come when all the local hotels have put up the “sold out” notice? Why do these people choose Cancun and the Riviera Maya? The answer to this question is that only here, on the Riviera Maya, is it possible to see one of the truly great diving miracles of the world—the surprising and exciting world of the underwater caves of the Yucatàn.

An old Mayan legend tells a story about how the gods, when they created the land, filled the peninsula with fresh water, which they say is the “blood”





feeding the ground of the Maya. When limestone collapses within a cave, freshwater lakes (in the Maya language is "cenotes") become the inputs to the magical underground world of the ancient Mayan gods. In the past, during seasons of heavy draught, cenotes were for Mayans the unique, sacred sources of fresh water. Here, at the cenotes edge, Mayan priests made human sacrifices and dumped the bodies of the victims into the caverns. From here, they took water for irrigating maize fields. But the terrible pagan customs are long past gone in history, and now the underwater

caves have become the focus of mass pilgrimages of skin divers from all over the world.

People that come here in the hottest part of the day will take pleasure in the crystal clear cool waters (+24°C) and swim for a while at the mouth of a cavern with only a mask, a snorkel and a small torch in hand. Those who are more brave dive here with a skilled guide—an instructor with one cylinder behind his back and a noisy cheerful company of friends. The rules of cave diving are simple enough: one guide should have no more than four underwater tourists,

and it is necessary for all participants on the cave diving excursion to have an Open Water certificate.

**Cenote Etiquette**

At the entrance of the cenotes, you will have to hear a short lecture on how to correctly do the frog kick with your fins, how to show signals by torch, how to use a guide line and how to use the "one third" tank rule. As a rule, beginning

cave divers dive in water with a visibility of no less than 10 meters, a depth of no more than 33 meters and a distance from the cenote's entrance of no more than 65 meters. Often, the dive group's departure is a distance of 300-400

meters for 35-40 minutes from the entrance of the cave, and on many sites of such routes, there is



CLOCKWISE FROM LEFT: Mayan warrior dances to invoke the spirits; Divers explores cenote caverns; Cenote welcome sign





Riviera Maya



absolutely no daylight visible.

During these routes, it is always possible to find several air chambers under the arch of a cave or outputs in dry cave halls. The popularity of cave diving here has become so great that all dive centers offer similar rounds and will organize excursions almost daily. In the afternoon, at an input to a cenote, it is sometimes possible to see the lines of several divers who are waiting for an opportunity just to begin a dive. People go cave diving here only for the pleasure of it. This is the reason why it is has become so attractive for so many people.

Underwater caves expand the diver's erudition and open for them the mysterious world of the Mayan culture. What you will see here completely contradicts preconceived opinions... that cave diving is only for the elite—groups of single-minded people who always put on black equipment and cannot live without the feeling of constant danger... those who like to

“sit on an adrenaline needle” for a long time.

**Cave Diving Tourism**

Perfectly organized mass cave diving tourism is the brightest distinctive feature and unconditional advantage of Cancun and Riviera Maya dive centers. It is a real cave diving paradise. To be on the Yucatàn and never dive the underwater caves is to miss an opportunity to achieve a diver's greatest success.

On the peninsula today, it is known that there are over 3,000 cenotes, entrances to underwater limestone labyrinths. Through the efforts of many brave cave divers, it was possible to prove that many of these cenotes were connected with each other and had a general hydrological system. This means that if you dive in one of these cenotes, you can find an exit on the surface far from the place where you started your dive and come out in another part of the jungle. So Nohoch

Nah Chich, one of the longest cave diving labyrinths, having a total extent of underwater passages of more than 68 kilometers. And in the deepest cave system, Dos Ojos, a depth of 106 meters has already been reached. Modern explorations and scientific research confirms the old Mayan legend about the huge underground

THIS PAGE: Divers swim through passages and narrow crevasses. INSET: Ancient Mayan art





river which connects together all the cenotes of the peninsula. It is my opinion whatever it is that exists here under the Yucatán will be explored, and one of the greatest underwater cave systems of the world will be discovered. Even though our time was short here, our team decided to try to make a few research dives into some of the most known cenotes.

### Cenote Dos Ojos

A one-and-a-half-hour race with a small minibus at high-speed on a concrete-surfaced road takes us to a huge sign with the inscription "Welcome to the magic cenotes world". We turn off onto a dirt road which winds into a dense jungle. Reed huts and native people are at patrol. We brake, exchange greetings and pay eight dollars to a person for the right to stay on their land and the permission to dive here. Another couple or three kilometers of ground, and we are at the site.

With anticipation, we jump out from the vehicle and run to examine the limestone collapse. We find vertical walls covered with moss, roots of trees hanging down and collecting water from the underground lake at the bottom of the pool where every stone is visible. It would be great to take a dip right now, but we are limited in time, and it is necessary to prepare our equipment.

As always, we run through the habitual procedure of

checking equipment functionality and capacity, one's own and one's buddy's regulators, gauges, torches, reels, etc., as well as complete a bubble check. Once again we repeat the dive plan, and then we commence the dive.

Water tenderly embraces us, fins wave easily, and we plunge into the delightful world of Dos Ojos. We do a circle of the



perimeter of Entrance Lake. Solar beams play and shimmer in the water and on the walls of the collapse. Underwater labyrinths open from different directions.

Above the entrance, hanging like the huge teeth of a dragon, are conical black stalactites. Our Mexican colleague, Huan, finds the gold guide line and fixes a jump-reel onto it. He then invites us to continue the dive. We begin to journey into the gloom, switch on our HID torches from which bright blue light





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Performers in traditional Mayan costume



emanates filling the caverns all around us. Visibility of the water is more than 20 meters, and we soar over sandy dunes into the underground tunnel.

Our way is blocked by a disturbing sign with an image of an old woman—she is Death with a scythe in a bony hand. The inscription on it says: "More than 300 divers, including open water scuba instructors, have died here in caves just like this one. You need training to dive. You need cave training and cave equipment to cave dive."



ABOVE: A group of snorkelers meet the team of cave divers as they emerge from the depths

Without cave training and cave equipment, divers can die here." It is obvious that it is an advertisement for selling cave diving education courses. Passing it, we take some photographs and continue on our path.

Tunnels branch and the yellow guide line looks endless. The stock of air in our twin sets steadily expires to "one-third". We understand that only more skilled teams of cave divers can pass this point. Dos Ojos is not easy to navigate. So, it is time for us to go back.

We are met by snorkeling divers at the cenote's

entrance. They are entertained by the sight of us, as if we are some kind of heroes with doubles coming back from the underground depths. They have the same enthusiastic interest in our group that visitors at a circus might have, who, for the first time, see an elephant. They examine us and our equipment. Some of them even dive toward us to check us out or even to shake our hands.

## Grand Cenote

Our friend, Rahelio, looks like a tough guy—short cropped hair, ears sticking out of his head, a chain with the tooth

Cave diver and writer, Andrey Bizyukin after a good dive

## Riviera Maya

of a prehistoric shark hanging around his neck and an upper body covered with tattoos. He's a really big fan of sharks and cave diving. We joke, that all he







Performer in traditional Mayan costume invokes the spirits



Mayan sculpture

Underwater photographer hovers under stalagmites.

needs now is a ring in his nose. Despite all of this exuberant body décor, Rahelio is still a fine cave diving instructor.

He suggests that we dive Grand Cenote, a grandiose cenote indeed, where we will dive as far as it is possible. We reach the next limestone collapse and locals collect an entrance fee from us. With a wide step, we enter the clearest, cleanest lake I have ever seen. It is teeming with darting little fish. Huge stone columns block the entrance to the cave. We swim between them and take a quick look back

to say goodbye to the daylight.

A great number of a most exotic array of cave formations confronts us—forms that seem inspired by a god's amazing imagination—including a plethora of stalactites, stalagmites, columns, limestone curtains and simple thin hollow tubes (spaghetti). There is simply no place free of limestone formations.

As always, in serious caves, we are met with a menacing poster: "Stop: Diving beyond this point is only possible for specially trained divers". We certainly accept the charges on our account and continue the dive.

Large cave catfishes are disturbed by our bright lights and majestically withdraw back into the darkness. We are already quite far from the entrance, but from time to time we meet small silvery fishes. They follow us into the depths of the cave or swim back to meet us. What is the reason that has brought them here? Why are they bewitched by the gloom of the cave gloom just like us? How are they guided here without daylight? It is a riddle of nature.

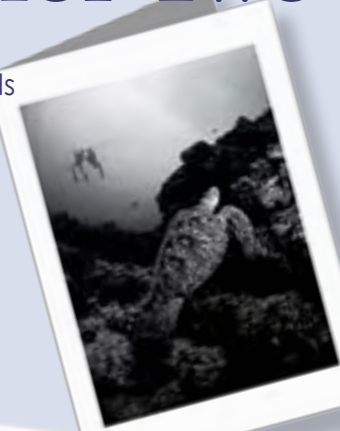
Rahelio gives us a signal that we have come close to the goal of our journey, so we add some speed. The opportunity to find something new in the cave gets us carried away like bloodhounds. But suddenly, my buddy's primary torch starts to blink and then switches off. Mentally, I take into consideration that he might have insufficient light to be accurate in navigating the cave, but I believe that it should be enough for him to use just a few small back-up lights to continue the dive. But in the back of my mind, I think in this particular spot of the cave,

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THIS PAGE: Scenes from the cenote caverns. RIGHT: Sunset over Yucatàn

was an "ambush". Instead of exploring further, we have to drag our legs away from here. In this incident, we feel something abnormal, even mystical, happened. It may be just that the great Grand Cenote

decided not to share its secrets with us casual visitors.

A small freshwater turtle met us on the entrance from the cave. As indemnification for an unsuccessful dive, we follow her, take some pictures and enjoy diving on the border of light and darkness.

### Cenote Chac Mool

The huge influence that ancient beliefs of the Maya have on the modern culture of Mexico is evidenced in the symbol of the eagle holding a snake in its claws. It is the symbol of Chac Mool, one of the supreme Mayan gods, the god of a rain and lightning. He is represented even on the national flag Mexico. Our next journey is to the Cenote Chac Mool.

We are again in the jungle, and ancient worn stone steps take us into the depths of the next cave we will explore. An underground lake is hidden under a stone arch. A few shafts of daylight pass through a narrow crack somewhere above us. Careful not to frighten away the underground spirits, we enter silently into the blue lake and begin one of the most

exciting dives of our trip.

There is a narrow underwater passage. We squeeze into it to follow our guide and come into the next cenote. Sunlight is seen again. The smooth surface of a silent forest lake is above us, and green crowns of trees are visible through the incredible clear water.

We pass through narrow underwater tunnels from cenote into cenote, admiring the play of light and shadow. But soon our road leads far under the arch of the cave. We proceed deeper into the cave and hit a halocline. The feeling is like being pierced through a liquid mirror. All of a sudden, it gets toasty warm (+28°C). The water reminds me of warm milk. We stop to take the heat

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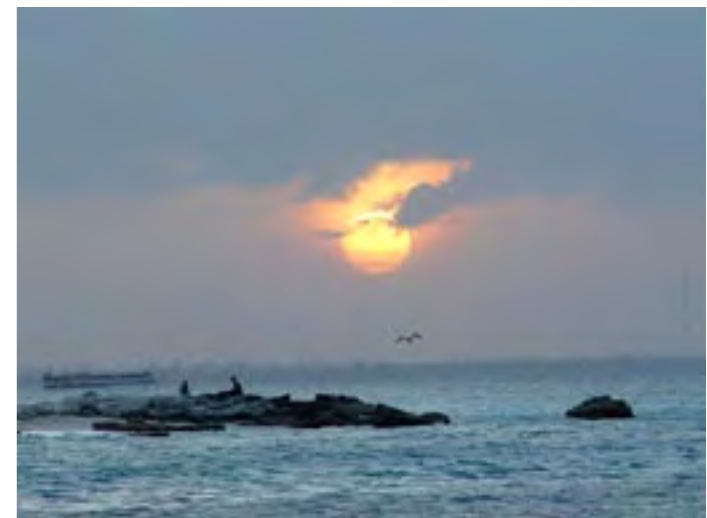
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into our bodies, and then continue on our path to acquaint ourselves with the cave.

Underwater tunnels, narrow passages, huge stones of a fallen arch and the gloom of the cave—it all seems to us already to get a little monotonous after just a few cave diving days, but at the next turn we stop with sheer delight. A huge, absolutely black cavern gapes before us, and a laser beam of light—similar to the blue light of the swords of





LEFT TO RIGHT: Maps of the Yucatan; Hibiscus flower; Mayan ruins at Tulum overlooking the Caribbean Sea



even to touch it with our hands.

We try to take photographs of the beam, and each stop closer to the beam to be better than previous. Hence, we spend all our film here. Now, we have absolutely forgotten boredom, and the pioneering passion wakes

up in us immediately. We are again full of determination to dive and explore new miracles of the underground world.

**Island of Swallows**

Cozumel Island in the Maya's language means "Island of Swallows". The small island is only 16 by 48 kilometers long and only 19 kilometers, or a half hour by ferry, from Cancun. It seems that it is very close, but everything is so different on Cozumel.

The first Europeans visited the island in 1510 when one of the Spanish ships wrecked at its coast. Only two of the crew survived. One of them was Gonzales Ortega who accepted the Mayan culture, lived on the island, married an Indian princess, had children and eight years later, together with the native people, fought against the Spaniards. The second time the island was explored was in 1518 by a Spanish expedition under the command of a nephew of the governor of Cuba. Forty-thousand natives lived on the island at that time, but in a few years of war, not more 300 individuals remained. In the 17th century, the island became a favorite base for pirates from which to attack "Gold Spanish carracks". But modern diving days, or the Gloria of Cozumel, began in 1961 when the team of Jacques Cousteau shot a movie about the fantastic underwater world of the island.

Cozumel, today, is the standard of the Mexican sea diving. One city is on the island. It stretches for many kilometers along coast. There are small, cozy streets and many tequila bars and restaurants

to entice tourists. All the other parts of the island are covered by jungle, and there are also ruins of Maya pyramids.

There are 39 reefs surrounding the

island to satisfy any, even the most exacting of divers. Dive centers are located in each of the 21 hotels on the island. They carry compressed air, nitrox and rebreathers. Divers will find fascinating recreational diving down to five meters just off the beach as well as good diving on wrecks with penetration, underwater flights in currents with five knots speed or 100-meter walls for technical divers with trimix. The island survives only due to the dive-industry.

Yes, everything is more expensive here—about 30 percent more than on the continent—but on Cozumel, it is absolute rapture of the sea. Inspired sea landscapes and warm turquoise Caribbean waters entice thousands of divers daily. They arrive with huge cruise ships, ferries from the continent or via the local international airport. All dive sites are located on the western side of the island, which is protected from northeast ocean winds. It is always the quiet sea one finds here as well as currents, various depths and the most beautiful relief of the sea floor.



The encounters between the first Europeans and the Mayans were rarely happy ones





CLOCKWISE FROM BOTTOM LEFT: Iguana; Sea turtles; Matador and bull; Puma; Tree monkey; Land turtle; Dive writer, Andrey Bizyukin and zoo staff with crocodile

### Diving Cozumel

We have arrived on the island only an hour ago, but already we are preparing for the next dive. How often do you think it's possible to see—on one dive—ancient anchors, Spanish canons, statues and Maya sculptures, bright tropical fishes, huge barracudas and an underwater cave with an underground river running into the sea? Well, it is possible, if you dive on Cozumel at a place called Chankanaab.

Colombia reef is really an exotic dive site off the island. Here, there are huge columns of freakish forms of heights up to 20 meters with coral labyrinths. It's very easy to lose one's way. There are mustached lobsters,

huge sea turtles, porcupine fish and hundreds of other kinds of fish that have found a haven here. The current is so strong that in 40 minutes we drifted three kilometers. Picturesque reef swept by before us with the speed of an underwater express train. It is a pity that to photograph on such speed it is simply impossible! It was necessary to embody only all visual textures in memory.

Twelve days is too short a time to get acquainted with Mexico and even more so with Yucatàn. But to us, it has been an incredibly lucky opportunity open to experience the unknown—the underground world of the Maya—the world of stones and water, the world full of miracles and

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riddles, the world accessible to everyone who comes here with an open heart and a pure soul. This is indeed the eighth miracle of the world, worthy of respect and admiration.

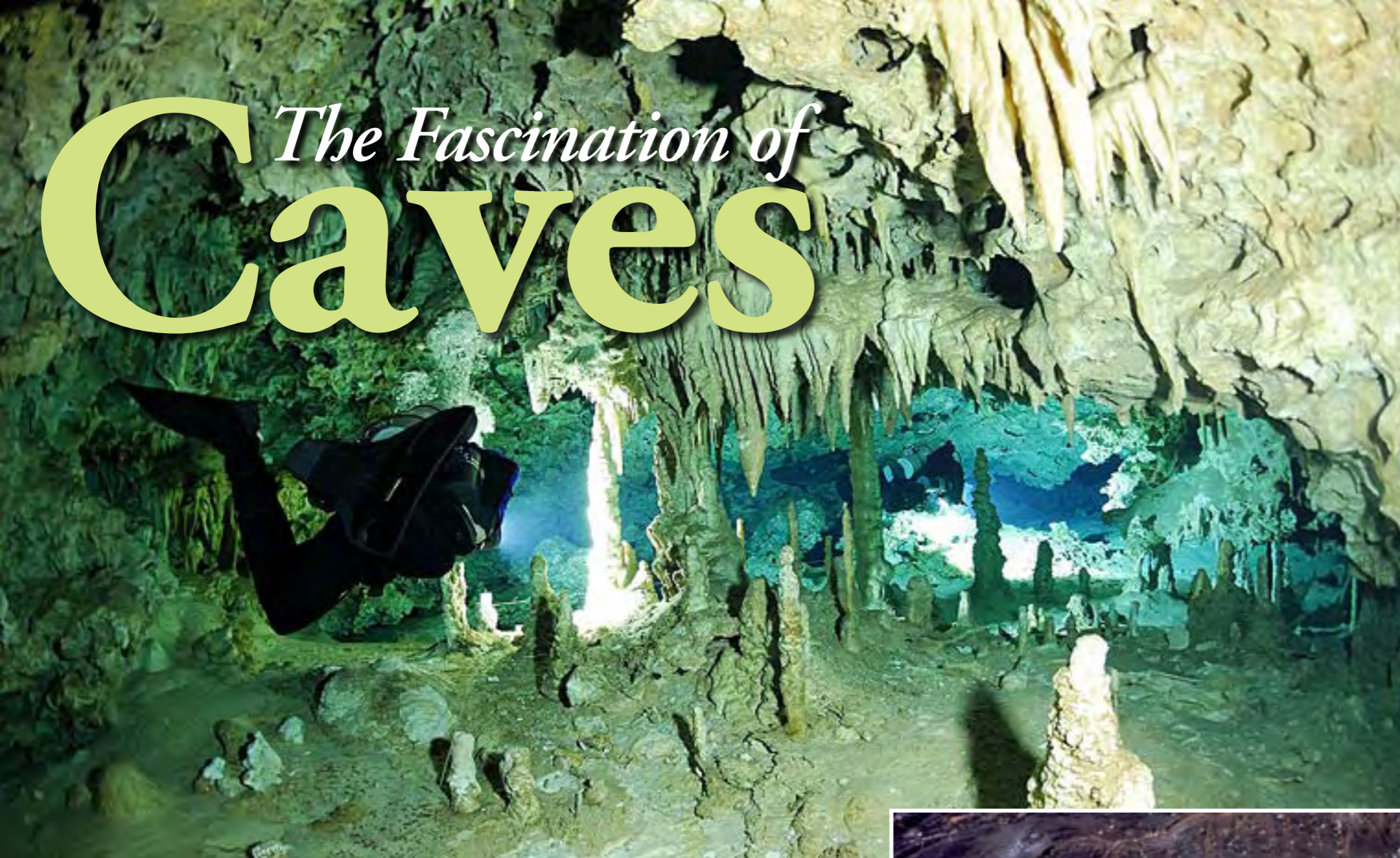
We shall return back to you, Yucatàn. ■

The Monument of Gonzales Ortega





# C *The Fascination of* Caves



Solution cave

Ice cave

## Types of caves

Generally speaking there are four main types of cave:

**Solution caves:** These are formed in carbonate and sulphate rocks such as limestone and marble by the action of moving water that dissolves the rock to form tunnels and caverns.

**Lava caves:** These are formed when the outer surface of a lava flow hardens while the molten lava within continues to flow and eventually drains out to leave a tube.

**Sea caves:** These are formed by the action of waves attacking the weaker parts of rocks along the shores of oceans and lakes.

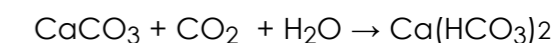
**Glacier caves:** These are formed by the drainage of melt water through the ice.



## The formation of solution caves

This type of cave is of the most interest to tourists and to divers, as they are the ones containing dripstone formations of stalagmites and stalactites. Such caves can be formed in a number of ways but all of them must originally have been formed above water level, be it sea level or water table level, since stalactites and stalagmites, and curtains of dripstone, form only in the air. Their existence in a cave indicates that the cave was, at some time, above the water table while the dripstone was forming. This occurred, for example, during the last glaciation, about 20,000 years ago, when so much water was locked up as snow and ice that global sea level was then about 130 meters lower than today.

The process of forming these caves is a very slow one, and is primarily due to rain. Falling through the atmosphere, rain absorbs a small amount of carbon dioxide, CO<sub>2</sub>. Further amounts of CO<sub>2</sub> are taken up by the rainwater as it percolates down through the soil to meet the underlying limestone substrate. Now, limestone is basically metamorphosed chalk i.e. calcium carbonate, and is therefore practically almost insoluble in water with only about 0.014 g of calcium carbonate per litre of cold water. However, the presence of CO<sub>2</sub> in the water changes the situation drastically because calcium carbonate will react with water that is saturated with CO<sub>2</sub> to form the soluble calcium bicarbonate.



From the earliest days of mankind humans have been interested in caves as a shelter from both the elements and from predators. It was in caves like those of Lascaux, in the valley of the Vésère in France, that humans also first expressed their artistic urges with their wonderful depictions of animals.

Today, caves, especially underwater ones, still seem to fascinate people, though not for their domicile properties. Speleologists go down into caves for the sake of pure adventure while the same may be said for divers entering underwater caves. However, it is also the beauty of many of the caves and caverns themselves, with their magnificent formations of stalagmites and stalactites, that attract the visitors, be it the ordinary tourist visiting the large Adelberg caves near Trieste, say, or the Carlsbad Caverns in New Mexico, USA. For the diver, though, there are also the attractions of visiting underwater caves such as those in Mexico.

A lava tube on the island of Hawaii, taken just above a lava fall. The floor is cauliflower pahoehoe, a rougher form of pahoehoe. Note the tree roots coming in from the ceiling. Lava tubes tend to be fairly close to the surface



Text by Michael Symes  
Photos by J P Bresser



## Cave Formation



The  $\text{HCO}_3^-$  ion is known as the bicarbonate ion, and calcium bicarbonate, which exists only in solution, is up to 100 times more soluble than calcium carbonate.

As this weak solution of carbonic acid seeps through the rock it forms cavities and channels as it moves downward and laterally. Thus, after thousands of years underground caverns and caves can be formed. Initially, these caverns will be water-filled but when the sea level goes down they empty, partially or wholly. However, the acidic rainfall still occurs with its consequent dissolving of the limestone. When it reaches the caves below it can drip from the ceiling forming dripstone formations such as stalagmites and stalactites.

### Stalactites & stalagmites

As each drop of water hangs from the ceiling, it loses carbon dioxide. The acidity of the water is thereby reduced so that the calcium bicarbonate cannot remain in solution. This causes precipitation of calcium carbonate to be deposited as a dripstone – in this case a stalactite which is slowly built up drop by drop, as it hangs down from the ceiling, over hundreds or thousands of years.

Stalagmites grow upwards from the floor of the cave, generally as a result of water dripping from the overhanging stalactite.

### Alternative cave formation

A new theory suggests an agent other than carbonic acid may be responsible for creating some of the largest cave systems in the world. It has been discovered that sulphur was responsible for carving out enormous cavities from the limestone of Capitan Reef, the fossil reef that contains New Mexico's Carlsbad Caverns.

Several million years ago hydrogen sulphide gas escaped from the oil deposits underlying Capitan Reef. This gas mixed with oxygen in the groundwater, and sulphuric acid was eventually produced. Sulphuric acid is capable of dissolving vast amounts of limestone, much more so than carbonic acid. This can explain the size of Big Room. After the water table had dropped the cave floor was exposed to reveal large gypsum (calcium sulphate) deposits, a by-product of a reaction between sulphuric acid and limestone.

Kane Cave in northern Wyoming, USA, is also thought to have been formed by the same process.

Cave of Lascaux, France—Hall of Bulls



Stalagmites create a hand of stony fingers surrounding a diver

### Cenotes

In the Yucatan peninsula are to be found the world famous underwater caves known as cenotes. These are freshwater pools with underwater caves and caverns that are favourite places for snorkeling or scuba diving. The word cenote is derived, via Mexican Spanish, from Maya conot. They were often used as a sacrificial site by the Mayas.

They were formed some 1.5 million years ago, during an ice age, when the sea level sank about 100 meters. At this time, the rain water had carved holes in the limestone ground, and when the ice began to melt again the sea level rose and the caves were again flooded. However, in places the soil had been washed away causing the overlying limestone crust to collapse, and thus exposing the water filled caves beneath. They are therefore often referred to as sinkholes or water-holes.

The water which fills the caves is partly intruding seawater but mainly fresh rain water. As the fresh water has a slightly less density than that of sea water it 'floats' on the sea water to give it an oily appearance, and is called a halocline. ■

## COMMUNICATING IN DIVING The Most Common Handsigns

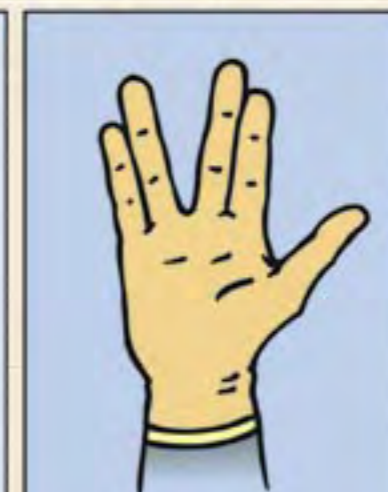
PART 17



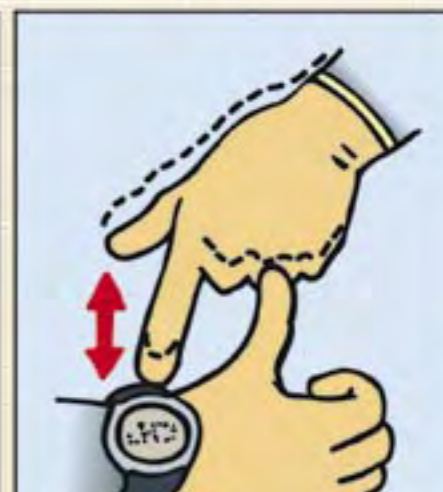
1. I am on my way to watch penguins, do you by any chance know where South Pole is?



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# Riviera

# Maya

## *A Journey to the Underworld*

Text by Peter Symes  
Photos by Andrey Bizyukin and J P Bresser

**It was a strange feeling, frolicking around in the shallows. I found myself sitting there in the tropics, in clear fresh water, not at the beach as one might expect but in a hole in the ground deep inside the jungle looking around at cliff walls and staring up under trees hanging over me.**

There were lily pads around me and lush underwater vegetation of a species I forgot to ascertain but perhaps it was just strands of the omni-present Canadian water weed (*Elodea canadensis*) which is known to every aquarist.

It was a tranquil scene, the water was clear and still and not many sounds were to be heard. Yet my state of tranquillity was blended with a simmering uneasiness. Was it due to the fact that I was just about to go diving into a cave, my first venture of the sort, where I would be swallowed up by a dark hole that led to who knows where? Perhaps that had something to do with it, but there was something else to do with it as well.

It wasn't the somewhat mind-boggling fact that these sink holes, the cenotes in which I was now sitting, were once sacred places for a grand civilization that had built palaces and temples around these parts long ago.

Divers swim through the clear fresh waters of the Yucatán

J P BRESSER

What started the dream: Reading Uncle \$crooge & Crown of the Mayas



I realized that my mental state had something to do with a childhood memory coming back to me—reading a Donald Duck comic strip for a good night story while sleeping over at my grandparents' house. In a now classic adventure, the famous ducks go to the Yucatán to search for archeological treasure—Indiana Jones style—the riches being gold and silver sacrificed by the Maya into these ancient sink holes in the jungle.

As a little preschool kid, I was not only entertained, but also intrigued and a little bit spooked reading the passages of the ducks jumping into these dark watery holes in pursuit of the treasure.

The story was penned down by the legendary Carl

introduction to anthropology and archeology. So, don't say that nothing good comes out of reading comics. It kindled my interest in these disciplines.

So, here I find myself—a good third of a century later—sitting waist deep in water, trying to connect all the dots.

Diving in under the ledge and into darkness, leaving the

Barks in an era that predated the 'scuba industry' as we know it and certainly dive travel as we know it. Come to think of it, this story was probably my first

Yellow-headed parrot  
ANDREY BIZYUKIN







Divers head down a passage adorned with sculptural forms of limestone  
BELOW: Swallowtail Butterfly

## Riviera Maya

### Weird

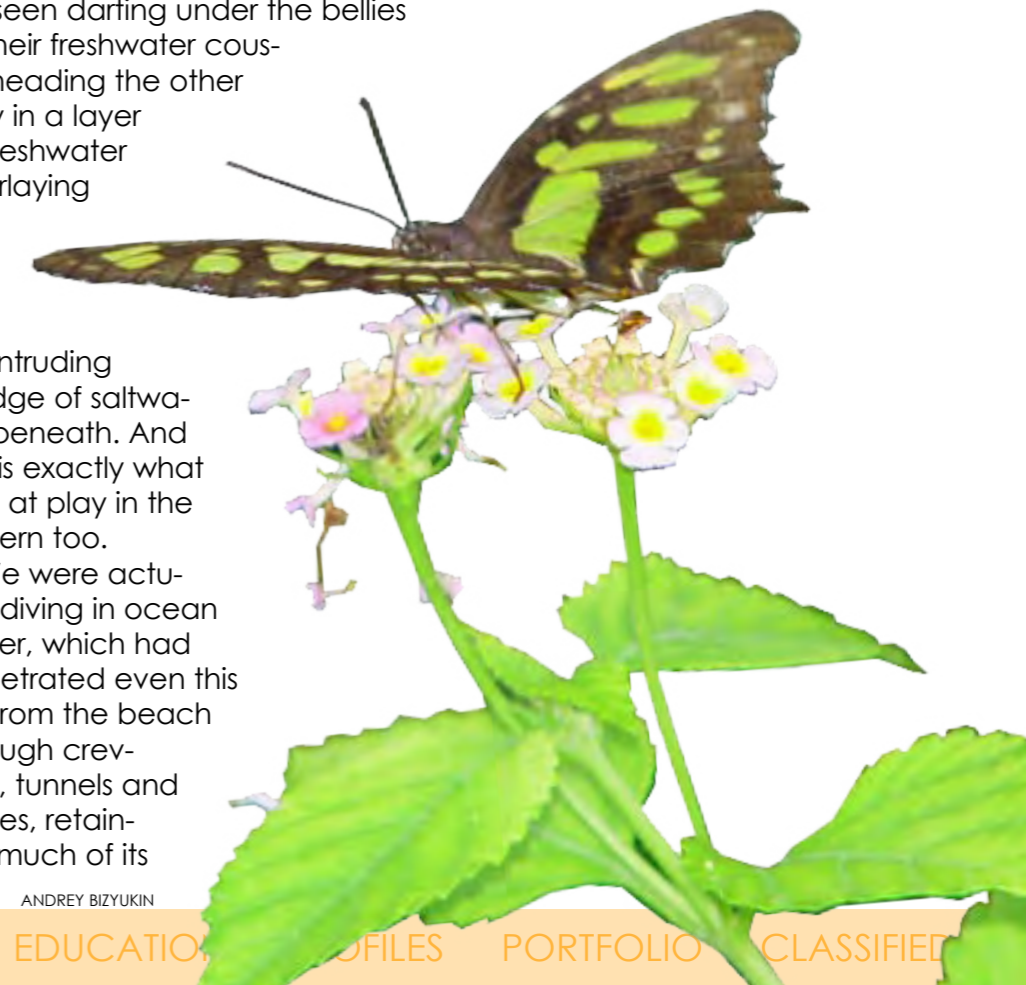
Furthest into the cavern, there was a corner that was located much deeper. Here, we were about to experience a weird phenomenon. We spotted a silvery layer of water with a different consistency, clarity and colour. It was cloudy. We descended slowly into this soupy substance, and we were struck by a contrasting overlying layer of clear cool water. It was also – and this is the strange part – warmer.

This was no thermocline, although it had some resemblance to it. It was a halocline, a separation of water layers that is caused not by a temperature gradient but by a difference in salt concentration, which creates a difference in density stronger than the one caused by temperature. This phenomenon can sometimes be observed at estuaries where saltwater flatfish can sometimes be seen darting under the bellies of their freshwater cousins heading the other way in a layer of freshwater overlaying

warmth in the process. Under the halocline, the visibility was pretty mediocre, so we didn't hang out for long.

Ascending through the non-transparent halocline once more to pop up into a cool but clear realm above was once again a somewhat weird experience—one you have to try to really comprehend.

Once back at the surface and de-kitted, I soon enough saw myself heading for one the best ice teas I have ever had and a light snack before a very well-deserved siesta in a hammock under the palms. When in Rome, do as the Romans... so since we are in Mexico, we'd better test all the customs—all in a day's work for this dutiful travel reporter in pursuit of doing the proper research for this story, of course. ■



an intruding wedge of saltwater beneath. And this is exactly what was at play in the cavern too.

We were actually diving in ocean water, which had penetrated even this far from the beach through crevices, tunnels and caves, retaining much of its

ANDREY BIZYUKIN

sun behind us, I was still a mixed bag of emotions and somewhat filled with doubts about the sanity of my present undertaking as I headed straight into an overhead environment. But it lasted only for the few transient moments it took my eyes to adapt to the dim light inside the spacious cavern that opened up beyond the entrance. I was in... a cathedral.

Well, that was my first thought anyway. The architecture inside had pretty much the dimensions, and some resemblance, of some of the huge medieval cathedrals in Europe. However, in this case, the master sculptor was not some human Michelangelo but Mother Nature herself.

Everywhere there were organ pipe-like sculptures of stalagmites and stalactites. And at the far end where the altar would be, there was

a faint light from another hole to the outside, allowing the greenish hue of sunlight passing through foliage to stream down from above.

The room was vast, the water crystal clear. One of the classic Cousteau quotes spring to mind. It went something like "diving is like flying, only without wings". The exact wording escapes me, but you get the drift.

Here, the 'flying sensation' is dramatically boosted by the clarity of the water and the distance between the floor and the ceiling. I definitely got a kick out of zooming around in all three dimensions in a manner you really can't do in the ocean or a lake.

One is still in shallow water here, so decompression issues are not really a consideration. But mastering buoyancy control is. This is defini-

tively not the place to go bumping into walls or ceilings with their delicate structures like a bull in a china shop. Not only would you most likely hurt yourself, but you may also risk breaking the delicate structures which in some places have the appearance of being pencil thin delicate structures. They have been millennia in the making—much longer than the coral we are also told not to touch as they re-grow slowly. Most importantly, these stalactites and stalagmites only form in air, not underwater. They were formed when the sea level was much lower and the caves were flooded much later, after their creation.

The place is a magic one, and it plays all one's senses. You are truly in another world, or at least, at the very entrance to it. That was what the ancient Mayans believed.



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*“Because it’s there.”*  
—British climber, George Leigh Mallory, when asked why he wanted to climb Mount Everest

Cave diving is a type of technical diving in which specialized SCUBA equipment is used to enable the exploration of natural or artificial caves, which are at least partially filled with water.  
—Wikipedia

*No amount of previous open water diving experience or training can adequately prepare you for cave diving*  
—National Speleological Society

**Spelunking, or caving, is what you do when you explore a cave just for the hell of it. Or as my husband likes to say, inspired by George Leigh Mallory, because they are there and because we can.**

Text by Millis Keegan Photos by JP Bresser and Deep Sea Production, [www.deepsea.se](http://www.deepsea.se)

We have come a long way since the first diver ventured into caves. Today's training and equipment goes well beyond just having an explorers' mind, some wit and lots of luck.

Basic cave diving training teaches you skills well beyond recreational dive training. To perform safe diving in a closed environment, you need to become self-confident, and you need to be self-reliant at all times. There are no short cuts if you want to survive in an environment where you have no direct access to open air. The only way to get there

is by practicing techniques, over and over again. In the process, becoming a cavern/cave diver not only teaches you proper cave diving techniques, the training helps you know your limits and your potential on a personal level too.

Through exercises, you learn equipment familiarity. That includes basic equipment training such as handling a reel and dive lights, using proper finning techniques and mastering emergency procedures such as handling an out of air situation, valve shut downs and regulator switches.



## Basic Safety Rules for Cave Diving

- ▶ **No cavern/cave diving without proper training**
- ▶ **Dive within your limits**
- ▶ **Use a continuous guideline to the cave exit**
- ▶ **Rule of thirds**

Always follow the 1/3 rule, that means turn around when 1/3 of your gas supply is used up. The reason is that loss cir-

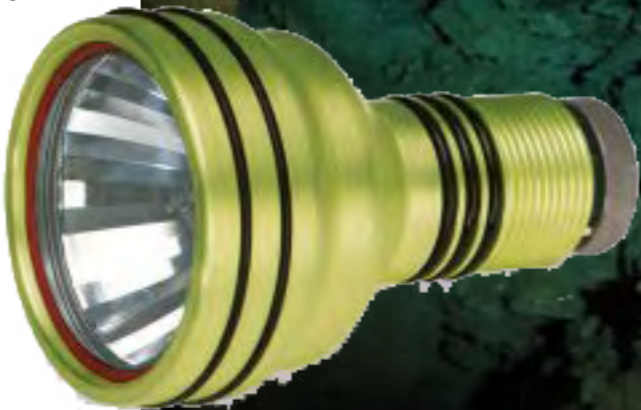
cumstances like loss of visibility, sharing gas, even a temporary loss of guide line contact, are all situations when the gas consumption can increase.

### ▶ Three sources of light

Always use three sources of light. It is not a question of whether a dive light will or will not fail, it is a question of when, and you should be prepared for that. Loosing a light could lead to difficulties in finding the guide line. Finding

the continuous guide line in complete darkness is part of the training, but it is a risky task, and unhooking your second light beats the fibbling in the dark. In cave diving, three battery powered lights is mandatory, one primary and two back up lights. In cavern diving, two battery powered lights, one primary and one back up, since the light from the cavern opening is considered to be the second back up light. ■

You need three sources of light







Note the line cutter used for cutting line if entangled—a potentially dangerous situation

### “Deep Silt”

Don't get your self into “deep silt”. A diver can stir up a lot of sediment with the wrong fin kick. While cave diving, propulsion techniques truly become an art form, there are fin kicks that leave virtually no traces, even when the bottom sediment is easily stirred up. Training propulsion techniques used in a cave is something anyone can benefit from. We are sure everyone has a story to tell about careless divers leaving a trail of silt behind, destroying the visibility for others.

### Get a kick out of it

Fin kicks used to avoid stirring up silt are variations of Frog kicks, Flutter kicks, Roof Walking and Shuffle kicks.

*What you are training for is a rehearsed response to an emergency, which could save your life.*

## Getting Certified Where do I begin?

A very popular way to start is by taking a three-day combination package, usually provided by probably every cave diving organization—the Cavern Diver/Intro to Cave Diver combination. These are cave diving classes that allow you to do single tank dives only into caverns/caves. It is a good way to find out if this is something for you, and an opportunity for personal growth. It is a great experience and will give you experience you can use in your future diving whether you decide to continue your cave diving training or not.

To become a fully certified cave diver, you have to pass three levels of training before you can sign up for the Full Cave Diver Course.

### The certification levels:

- Cavern Diver
- Intro Cave Diver
- Apprentice Cave Diver
- Full Cave Diver
- Advanced Cave Diver

### Cavern

The first level is the cavern course. This class takes you through the basic planning and organization of cavern diving, the hazards of diving in an overhead environment and the special equipment needed. The dives take place in a cavern, meaning a total distance of 40 metres/130 feet from the surface at any time. Minimum four dives over two days.

### Cave

The second level is the intro to cave diving class. In this class, you leave the cavern zone and the daylight and make it into the cave system using the main lines of a cave system. You get some serious use of your basic overhead environment skills; you will train emergency procedures in the cave, get good use out of the propulsion techniques you picked up during your cavern class and learn some new ones. Even though this class will get

you penetrating a cave system, it will be a limited penetration, and you are no where near the skill level needed for cave diving on all levels.

### Apprentice cave

The third level is the apprentice cave diving course. In this class, more focus is placed upon expanded dive planning skills through conducted dives. The class also gives an introduction to jump and gap procedures. The class is held over two days and includes at least four dives.

### Full cave

Finally, you are ready for the Full cave diving course. This course focuses on proper procedures for completing traverses and circuits. During this course, you will be responsible for all dive planning, gas management and the execution of the dive, which you—thanks to the first levels of training—should be fully ready for. ■

# 3<sup>rd</sup> INTERNATIONAL CAVE DIVING CONGRESS

18-19 MAY 2007 SAINT NAZAIRE EN ROYANS (FRANCE)



Rhône-Alpes



THAÏS : 50 YEARS OF CAVE DIVING

WWW.CONGRESIPS.COM



## Cave Diver Training

The following is an (incomplete) list of agencies who offer cavern/cave diving training.

### Worldwide organizations

► IANTD  
 IANTD World Headquarters  
 1545 NE 104 Street  
 Miami Shores, FL 33138-2665 USA  
[www.iantd.com](http://www.iantd.com)

► Technical Diving International (TDI)  
 International Training  
 18 Elm St  
 Topsham, ME 04086 USA  
[www.tdisdi.com](http://www.tdisdi.com)

► NAUI  
 NAUI Worldwide Headquarters  
 PO Box 89789  
 Tampa, FL 33689-0413 USA  
[www.nauivv.org](http://www.nauivv.org)

► PADI  
 30151 Tomas Street  
 Rancho Santa Margarita  
 CA 92688-2125 USA  
[www.padi.com](http://www.padi.com)

### Training agencies found in USA

► NACD  
 National Association For Cave Diving  
 P.O. Box 14492  
 Gainesville, FL 32604 USA  
[www.safecavediving.com](http://www.safecavediving.com)

► GUE  
 Global Underwater Explorers  
 15 South Main Street  
 High Springs, FL 32643 USA  
[www.gue.com](http://www.gue.com)

► NSS/CDS  
 National Speleological Society, Cave  
 Diving Section  
 NSS-CDS Administrative Office  
 2109 W US Hwy 90, Suite 170-317  
 Lake City, FL 32055 USA  
[www.nsscds.org](http://www.nsscds.org)

# Equipment “A tonne of stuff”

Cavern and cave diving in any form is a very equipment intensive hobby. Below is a list of the minimum requirements. Note that when you make this decision, you take your diving to a new level, and you should commit to this configuration of your dive equipment. If you don't understand that, you are not ready. You need at least:

3 line arrows per diver

Slate & pencil

A safety reel with a min. of 75'/23 meters of line. A primary cave diving reel with approximately 350'/106 meter line

2 individual tankvalves/2 first stages

Duct tape (to tape mask and fin straps)

A 7 1/2 meter long octopus hose for alternative air source

*The question is not whether a dive light will or will not fail but, rather when.*

A dive suit fitting the environment you will be diving in

Alternative Air source attachment

Submersible dive tables

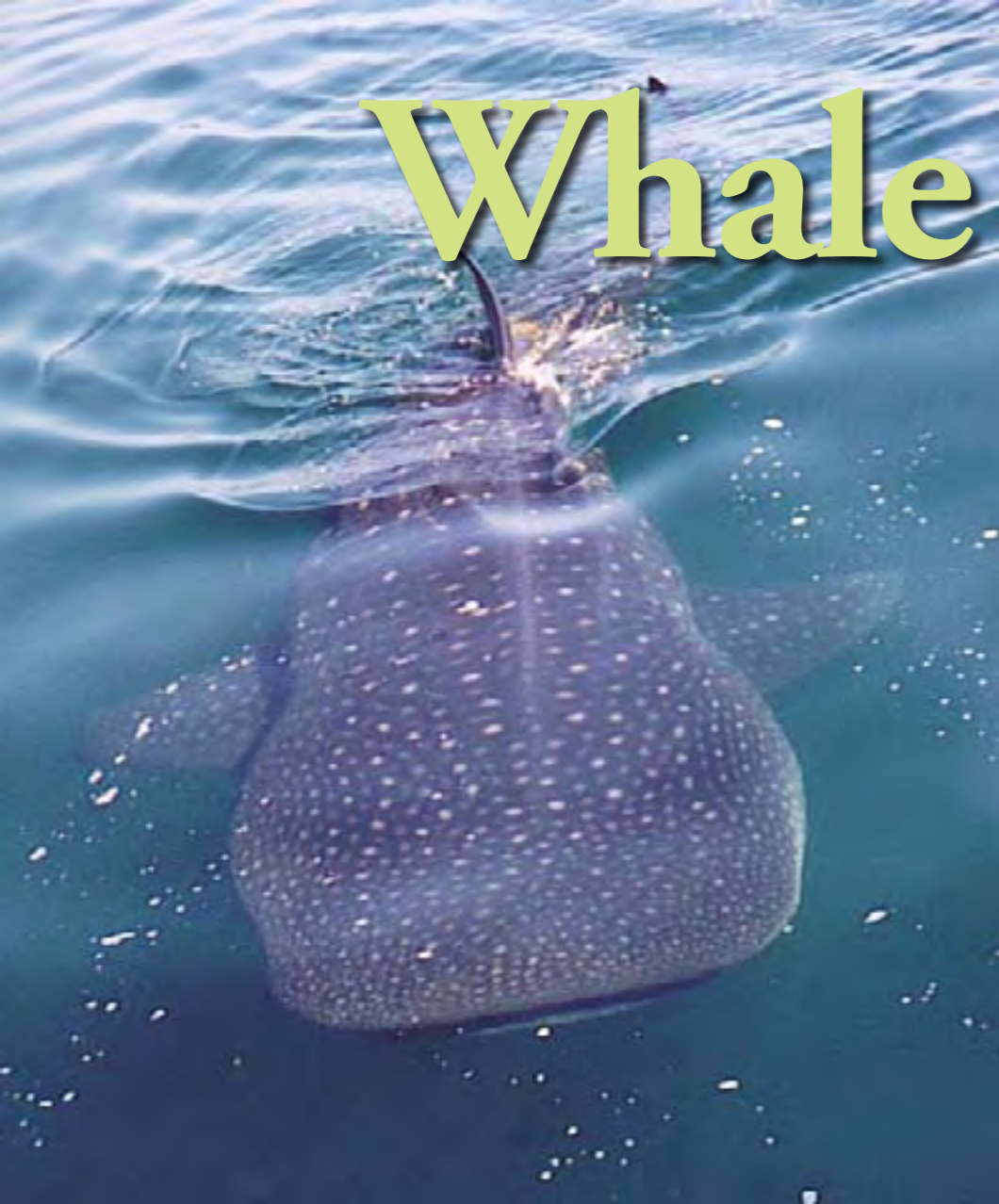
Three battery powered diving lights, one with at least 30-50 watt power

A tank that holds a minimum of 71.2 cubic feet or 2 cubic meters with a dual orifice (Y) valve or (H) valve





# Whale Sharks off Yucatàn



THIS PAGE: Views of a whale shark. Snorkelers enjoy the company of a whale shark (above)

Text edited by Gunild Symes  
Photos courtesy of Yucatek Divers

**The world's largest fish, whale sharks, or *Rhincodon typus*, can grow up to 15 meters in length according to experts. It was thought that some could reach up to 20 meters in length, but these individuals are no longer common due to the threats that the species currently faces including over-fishing for**

**whale shark fins or meat, injury through collision with marine traffic and habitat loss. Whale sharks are now listed as an endangered species and protected under CITES.**

The huge fish is found worldwide in tropical and warm temperate seas between latitudes 30° North and 35° South. Their migratory path brings them to the tropical waters near Isla Holbox (hol-



bosh) in Mexico. It is one of the few areas on Earth they like to visit often.

About 1,500 people live on this 26 mile long island located near the northeastern tip of the Yucatan Peninsula in the state of Quintana Roo of Mexico. It is part of the Yum Balam ecological reserve and is separated from the mainland by the Yalahua Lagoon.

The whale sharks congregate here each year between June and September. This is a time when the ocean is rich with plankton. Regardless of their massive size, these great fish are docile creatures and feed on huge quantities of plankton. They do not attack humans.

In 2002, Underwater Editions (UWE) launched a long-term video and photo identification behavior research project of the whale sharks in cooperation with the local community of Isla Holbox.

As tourist interest grew in the whale sharks, UWE developed Eco-Tourism guidelines in 2003 to help protect the species and provide guided opportunities for tourists to swim and snorkel with the whale sharks. Later in 2004, the organization and CONANP helped educate and train local guides, establish rules and guidelines for interaction with the whale sharks. The program continues to run today. **SOURCES: CITES, Shark Trust, Yucatek Divers. ■**





# travel

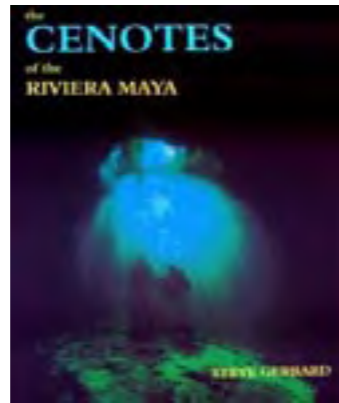
## The Cenotes of the Riviera Maya

*A Complete Guide for Snorkeling, Cavern and Cave Diving the Cenotes of the Riviera Maya* by Steve Gerrard

Publisher: Steve Gerrard  
Puerto Aventuras, Quintana Roo, Mexico  
Paperback: 244 pp. ISBN: 0-967 7412-0-3  
Price: US\$49.00

Appointed with page after page of incredible photographs of the mysterious underwater world, this book is more than just a complete guide for snorkeling, cavern and cave diving the Cenotes of the Riviera Maya. This book includes over 200 colour photographs that show the breath-taking wonder of the crystal clear water and incredible sights of subterranean Mexico. Not just a coffee table book, Cenotes provides practical details of where and how to swim, dive and enjoy these beautiful caves located on the Caribbean coast of Mexico's Yucatan peninsula.

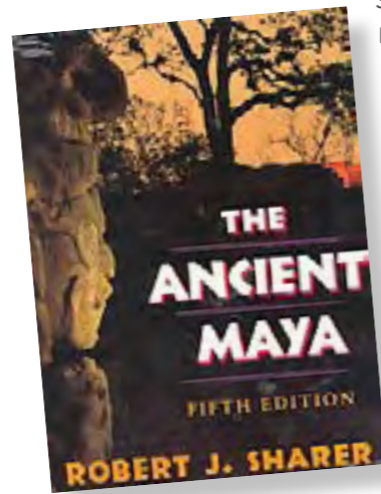
**AquaQuest.com**



## The Ancient Maya

by Robert J. Sharer, Loa P. Traxler  
Publisher: Stanford University Press; 6th edition  
Paperback: 931 pp. ISBN-10: 0804748179  
Price: US\$25.50 **Amazon.com**

This book traces the evolution of Maya civilization through the Pre-Columbian era, a span of some 2,500 years from the origins of complex society within Mesoamerica to the end of the Pre-Columbian world with the Spanish Conquest in the 16th century. The sixth edition presents new archaeological evidence and historical studies and offers the most extensive revisions of this classic work to date. The result is the most thorough and incisive study of the origins and development of ancient Maya civilization ever published.



The result is the most thorough and incisive study of the origins and development of ancient Maya civilization ever published.

## An Album of Maya Architecture

by Tatiana Proskouriakoff  
Publisher: Dover Publications  
Paperback: 144 pages  
ISBN-10: 0486424847  
Price: US\$13.22

This magnificent guide presents 36 sites from Central America and southern Mexico as they appeared more than a thousand years ago: Temple of the Cross, Palenque; Acropolis and Maya sweat bath, Piedras Negras; Red House and north terrace at Chichén Itzá; more. Each illustration features text of archeological finds and line drawing of remains. 95 illustrations.

**Amazon.com**

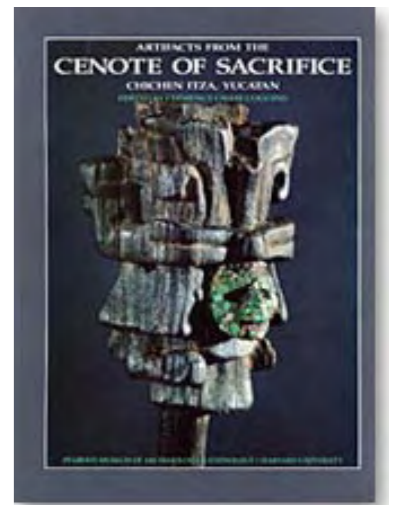


## Artifacts from the Cenote of Sacrifice, Chichen Itza, Yucatan

Edited by Clemency Chase Coggins  
Harvard edition World  
Paperback: 408 pp., 30 line illustrations, 300 halftones, 2 maps, 32 tables  
ISBN 0-87365-694-6

Price: US\$75.00 **Amazon.com**

In this abundantly illustrated third and final volume on the artifacts found by Edward H. Thompson in the Well of Sacrifice, specialists analyze the great variety of objects and debate whether they represent evidence of dateable prehistorical ritual. The collection includes the rare remains of hundreds of textiles, wooden objects, and copal incense offerings that were preserved in the waters of this limestone sinkhole, as well as the lithics, ceramics and bone and shell artifacts commonly found in Maya burials and caches and about 250 mammalian remains. These objects are remarkable for having been cut, torn, broken, and burned before they were thrown into the green waters of the sacred well at Chichen Itza. See companion book below:



## Cenote of Sacrifice

*Maya Treasures from the Sacred Well at Chichen Itza* by Orrin C. Shane (Editor), Clemency Chase Coggins (Editor)  
Publisher: University of Texas  
Paperback: 176 pp.  
ISBN-10: 0292710984  
Price: US\$11.50  
**Amazon.com**

## Sunken Cities, Sacred Cenotes and Golden Sharks

*Travels of a Water-Bound Adventurer*  
by Bill Belleville  
Publisher: University of Georgia  
Hardcover: 248 pp.  
ISBN-10: 0820325929

Sale Price: US\$22.76  
This collection of essays is about places that are noted for archaeological treasures, rare plants and animals, or great scenery. For example, in the Amazon, it is the quest is for a freshwater dolphin, and in the Florida Keys, it is the quiet past-preserving backwaters.

**Amazon.com**







# fact file

## Yucatán Peninsula, Mexico



**History** An ancient land of advanced Amerindian civilizations, Mexico succumbed to Spanish rule for 3000 years before gaining independence in the early part of the 19th century. Mexico was thrown into economic turmoil after a devaluation of the peso hit the country in late 1994. It triggered the worst recession in over 50 years. But the country continues to make leaps in its recovery while economic and social concerns continue to challenge the nation, including underemployment for large numbers of citizens, low real wages, unequal income distribution, and few opportunities for advancement for Amerindian individuals in the poor southern states. In 2000, election results marked the first time since the Mexican Revolution in 1910 that the opposing party defeated the incumbent party in government, the Institutional Revolutionary Party (PRI). In December of that year, Vicente FOX of the National Action Party (PAN) became the first chief executive elected in free and fair elections. Government: federal republic. Capital: Mexico (Distrito Federal)

**Geography** Mexico is located in central or middle America, bordering the Caribbean Sea and the Gulf of Mexico, between the US and Belize and bordering the

North Pacific Ocean, between Guatemala and the US. The country's terrain is filled with high, rugged mountains and plateaus, low coastal plains and desert. Lowest point: Laguna Salada -10 m; Highest point: Volcan Pico de Orizaba 5,700 m. Coastline: 9,330 km.

**Climate** varies from desert to tropical. Natural hazards: hurricanes on the Pacific, Gulf of Mexico, and Caribbean coasts, tsunamis along the Pacific coast, volcanoes and destructive earthquakes in the center and south.

**Environmental issues** include a lack of proper hazardous waste disposal facilities and natural fresh water resources with pollution marred by the northern reservoirs, poor quality or inaccessible sources in the rest of the nation; industrial pollution and raw sewage affect rivers in urban areas; rural populations are moving to urban areas, widespread erosion; desertification; deforestation; deteriorating agricultural lands; serious water and air pollution in the nation's capital and urban centers along US-Mexico border; groundwater depletion causing subsidence in Valley of Mexico. Note: Lack of clean water and deforestation are now considered national security issues by the government. Mexico has entered some international agreements

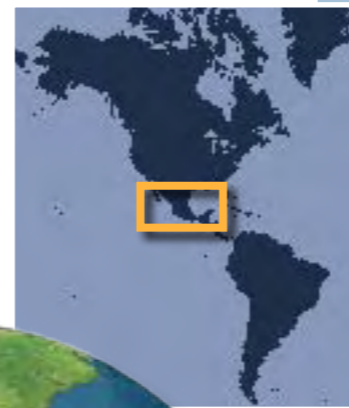
including Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Marine Dumping, Marine Life Conservation, Ozone Layer Protection, Ship Pollution, Wetlands, Whaling.

**Economic** Mexico's free market economy has recently entered the trillion dollar class. A blend of modern and outmoded industry and agriculture is increasingly dominated by the private sector. The government has expanded competition in seaports, railroads, telecommunications, electricity generation, natural gas distribution and airports. Per capita income is one-fourth that of the US. NAFTA has tripled trade with the US and Canada since 1994. Ninety percent of Mexican trade is under free trade agreements with over 40 countries including, Guatemala, Honduras, El Salvador, the European Free Trade Area, and Japan. Current administration is mired by congressional opposition against measures to improve infrastructure,

modernization of the tax system and labor laws, and allowing private investment in the energy sector. Challenges also include boosting economic growth, improving Mexico's international competitiveness, and reducing poverty. Natural resources: petroleum, silver, copper, gold, lead, zinc, natural gas, timber. Agriculture: corn, wheat, soybeans, rice, beans, cotton, coffee, fruit, tomatoes; beef, poultry, dairy products; wood products. Industry: food and beverages, tobacco, chemicals, iron and steel, petroleum, mining, textiles, clothing, motor vehicles, consumer durables, tourism. Note: Corn (maize) is thought to have originated in Mexico. It is one of the world's major grain crops.

**Currency** Mexican peso (MXN).

LEFT TO RIGHT: Globe map showing Yucatán; Western Hemisphere map showing Mexico; View of the ruins of Yucatán



Exchange rates: 1EUR=14.14 MXN, 1USD=10.95 MXN, 1GBP=21.47 MXN

**Population** 107,449,525 (July 2006 est.) Ethnic groups: mestizo (Amerindian-Spanish) 60%, Amerindian or predominantly Amerindian 30%, white 9%, other 1%. Religions: nominally Roman Catholic 89%, Protestant 6%, other groups 5%.

**Languages** Spanish, various Mayan, Nahuatl, and other regional indigenous languages.

**Deco Chambers** César Soto Fernández, MD Diving and Hyperbaric Medicine Hiperbárica Cancún On Call 24-hours State-of-the-art chamber Speaks English, German, Spanish

Alcatrazes L44, M10, SM 22 77500 Cancun , Q. Roo, Mexico Phone/fax: 52-998-892-7680 Mobile: 998-105-7791 [www.hiperbarica-cancun.com](http://www.hiperbarica-cancun.com)

Cozumel Recompression Chamber Radio VHF 16 and 21, 872-23 87 and 872-1430, Calle 5 Sur #21B

Cozumel Hyperbarics Chamber Radio VHF 65, 872-3070, Located in the "San Miguel Clinic", Calle 6 (between Ave 5 & Ave 10)

Scuba Doc Mexico Directory [scuba-doc.com/divmex.htm](http://scuba-doc.com/divmex.htm)

**Web sites** Mexico Tourism Board [www.visitmexico.com](http://www.visitmexico.com) ■



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

POINT & CLICK  
ON BOLD LINKS



Edited by  
Millis Keegan  
& Peter Symes

# Show me the Equipment



## Signature series

These tough headlamps for scuba, snorkeling, military and marine research, uses different colored LED lights for better vision. At crime scene investigations, blue light traces fibers and hairs. Blue and green light minimize the disturbance of marine life and allows the scuba diver to get closer to the marine life. [www.foxfury.com](http://www.foxfury.com)



## Dental Work

Tired of aching jaws after a dive? With the Seacure mouthpiece that molds to fit your mouth, that pain could be just a memory. An orthodontist has designed this mouth piece, which molds to a good fit around your teeth, gums and jaws. [www.seacure1.com](http://www.seacure1.com)



## Pocket your light

The compact size Scubapro NOVA fits in the pocket of most BCs. A perfect little back-up light with a bright uniform beam. It is light weight, has a comfortable grip, and it is reliable too. Promises burn time up to 6-8 hours. [www.scubapro.com](http://www.scubapro.com)

## Dry or wet?

Ever wish you could get a drysuit with a streamlined fit for the price of a quality cold water wetsuit? Me too, and now we can—the Fusion from Whites. The Fusion consists of two layers. The inner layer (Dry Core) is a membrane suit with latex seals, a dry zipper and air intake and exhaust valves. The removable outer layer of durable stretch fabric is attached to the Dry Core at the wrists, ankles, valve openings and zipper to create the form fit. The Fusion is loaded with great features, easy self entry, heavy-duty, UV-resistant seals, Si Tech valves, reflective piping and an anatomically correct CAD-designed pattern for a perfect fit. [www.whitesdiving.com](http://www.whitesdiving.com)



## Dual Purpose

The Poseidon Platform, a back plate designed with a simple quick release to change from tank to tank, is the first product launched after Poseidon and Cis-Lunar joined forces. The back plate can be used for both tanks and rebreathers. One size fits all. An ergonomical fit promises to give good back support to the diver no matter his/her height even on land. [www.poseidon.se](http://www.poseidon.se)

## Manta Necklace



This regulator necklace is derived from the home-made gizmo made out of surgical tubing that technical divers used to keep their back-up second stage close when needed. The material is soft silicon rubber, it comes in two sizes and in four colors including hot pink. [www.mantaind.com](http://www.mantaind.com)





## Kicking Lightly

The Twin Jet Fin has it all, at least according to its maker. The split fin propeller technology delivers a more forward motion, with less effort than traditional blades. Equipped with drag-reducing vents, it promises to decrease resistance on both the up and the down strokes in a way you will notice. [www.scubapro.com](http://www.scubapro.com)



## Zeagle

Bouyancy Control Belt. This "BCB" is a buoyancy device specially designed for a freediver. A 4-cubic foot air cylinder, and a Razor valve regulator first stage combination will allow the diver to use the buoyancy advantages of a BCD and a tank. Saving energy during descend and ascent, the BCB will cut down on the risk of shallow water black out when passing through the danger zone. [www.zeagle.com](http://www.zeagle.com)



## UK International

And there was light. Provided by an ampted pair of 5-watt white LEDs, this is the brightest light in its class. A unique optical design unites the two high intensity LEDs into one beam, creating twice the intensity that lasts to the bitter, I mean battery, end. You can switch between full and half power to save battery life. Rated to 500 feet.

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



## Geo

Yet another dive watch enters the world, and it is digitalized all the way down. What GEO has that makes it stand out, is the possibility to set it in Air, Nitrox and Free Dive modes, allowing it to double as a backup to any dive computer. Includes advanced digital features, like stop watch, daily alarms, alternate time zone and more. And it is sportylicious as well. [www.oceanicworldwide.com](http://www.oceanicworldwide.com)



## Storm Power

This futuristic designed wetsuit comes in 7/5 mm and 54mm. For comfort, it promises some extra stretchy features and the Kevlar compressed kneepads will keep the wear and tear off a little longer. This suit design comes in 5 or 7 mm. Plus, it's made with a built in sixpack. [www.ralftech.com](http://www.ralftech.com)



## Aeris

The ATMOS LX has a large rear-inflation bladder, designed to wrap around for maximum lift. The integrated weight system for up to 20 pounds has a "positive-lock" system to keep the weights where they are supposed to be. Rear trip pockets for non-dumpable weight and a padded backpack with lumbar support for comfort. [www.diveaeris.com](http://www.diveaeris.com)







## Ralf Tech

The all new BC for the Ralf Tech range—'Club Tech'. Ideal for the beginning diver, traveling diver or dive school, it's a great product at an attractive price. Comes in XXS, XS, S, M, L & XL. [www.ralftech.co.uk](http://www.ralftech.co.uk)

## Scubapro Module Light

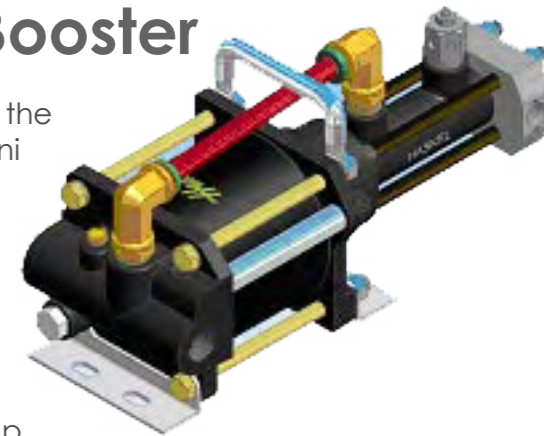
Versatility is the key with this modular light system from Scubapro. The light system gives the user flexibility with its interchangeable heads. Top that with a battery pack and housing adaptable to a hand-held or umbilical configurations and you have quite a nice package to light your way. [www.scubapro.com](http://www.scubapro.com)



## Haskel Mini Sport Booster

Haskel International scored big in the dive market by unveiling this Mini sport booster for charging O<sub>2</sub> cylinders for rebreathers at the DEMA Show 2006. The 4" Drive air driven gas booster is lightweight for great portability.

Charges gases up to 3500 psig with inlet gas pressures as low as 100 psig. [www.haskel.com](http://www.haskel.com)



## Swiss

This very marine, very blue, very limited edition diver's watch is heading to be a collector's item. You want the Maxi Marine Diver or something else unique? Check out the home page for your nearest dealer. [www.ulyse-nardin.com](http://www.ulyse-nardin.com)



## Surfacemarker

Using a webbing system, this safety sausage promises a more easy way to deploy your marker when at a safety stop. The idea is to reduce the risk of entanglement normally faced with a free-floating string. The compact lanyard is secured with an elastic cord and automatically unravels itself underwater upon deployment. [www.surfacemarker.com](http://www.surfacemarker.com)



## Immersion & Aquanaut

Very few watches on the market can stand up to the daily abuse of saltwater and sand—dive watches are among them. Freestyle presents the Aquanaut stainless steel men's watch, and the Immersion—with all the features a dive watch should have—designed for watersports-minded people. The black dial face of the Aquanaut includes oversized Arabic numerals at 6, 9, and 12 o'clock, luminous stick markers, and, of course, the oh-so-important scratch-resistant mineral crystal.



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



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

The Immersion comes with a screw down crown and night vision backlight display.

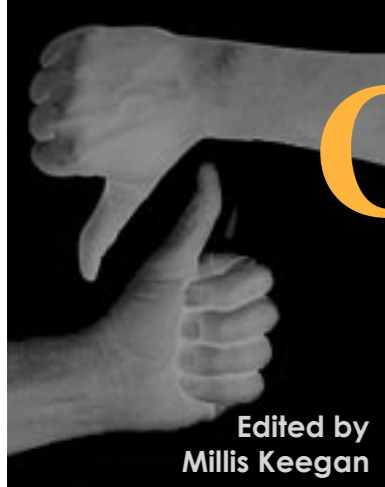


## Neptunic

Featured on Animal Planet, Discovery Channel, and History Channel, the shark suit first tried out by Valerie Taylor 1978 has come a long way. The technology is basically the same, the design not quite, but it still does what it promises, prevents a shark bite from breaking the skin. Neptunic builds full body shark suits, the design resembles something out of early Star Trek movies. The designs of these protective suits are outstanding, and some of the suits are actually shown at museums. [www.neptunic.com](http://www.neptunic.com)







Edited by  
Millis Keegan

# Opinions *Letters &*

All perspectives expressed in this section are those of the individual author and do not necessarily reflect the views of X-RAY MAG, DiveGuru.Net, or their associates

## What do you think?

Get heard! Send us your opinion to [diveguru@xray-mag.com](mailto:diveguru@xray-mag.com) by Jan 10, 2007, and get a chance to win these exquisite Silver Hammerhead Cufflinks generously sponsored by ReefJewellery.com



# Shopping for Dive Equipment Online vs. In-Store

**Online shopping is growing at an incredible fast speed making it tougher and tougher for small business shop owners to succeed. Even though many shop owners like to play the ostrich game, online shopping is here to stay. They will have to adapt.**

*It is not all bad, of course. Many dive shops run successful operations while some are struggling. We would like to hear from the latter.*

*How does online shopping affect your business, and what are you doing to counteract the negative effects of Internet-based shopping?*

*We would also like to hear the view of customers. So, Shoppers, where do you shop and why? To spice it up a bit, and to get you started, I took the liberty of asking some divers aboard a dive boat in Key Largo about their preferences.*

—Millis Keegan

### From Florida:

I live in Pompano Beach and got certified in Mexico last spring. It was such a great experience, and I was psyched. When I came home, I wanted to get my own equipment and also take another class or two. I found a dive shop nearby and went there to talk to a professional that could help me choose my equipment. I had a lot of questions. Half way through, I noticed that she got more and more frustrated with me and my questions, and all of a sudden she blurted out: "Are you going to buy something or what!" Then she flat out told me, that she thought I asked too many questions, and that I probably was going to go home and shop online after using her services.

There are many more dive stores around here, and someone else got the sale. I personally prefer to shop in a store. I don't even mind paying a bit extra for the service. But let me tell you, behavior like that is not okay.

—Mary, Pompano Beach, FL

### From Canada:

You need a local dive shop for your air fill. They can't live on that alone, so if you want them to be around, support them by shopping there.

—Kate and Dave, Canada

*How does online shopping affect your business, and what are you doing to counteract negative effects of Internet based shopping?*

### From Washington:

I enjoy shopping in the stores, more than I do online but only because I enjoy being in the vicinity of other people and because it gives me a chance to physically see, feel and try out what I'm buying.

—Mike G, Seattle, WA

### e-Shopper:

I do prefer online shopping—100 percent. And yes, I do shop some of my dive equipment online. Why shouldn't I? I get so much more information about the products over the Internet, and there is more to choose from. Plus, I can chat and get feedback from others. An added bonus is that I find information and links to new places to dive, and I get knowledge in general about what's up in the dive community. What's not to like?

—The Ibuy freak

### Mr Congeniality

When and where I shop is none of your business, it's my almighty dollar. I am just here because my wife told me to be here. What is online shopping anyway?

—Non-diver

### From Pennsylvania:

I love not getting what I want immediately. I like coming home from work and finding a box outside my door. It's like Christmas all over! But when it comes to my dive equipment, I shop in-store. To me, it is all about safety while diving.

Perhaps I am lucky, but the staff in my dive store really know their stuff. I trusted them with my training, of course, I trust their judgment. They have good arguments and every purchase I have made has been a good one.

In conclusion, yes to online shopping, and yes to in-store shopping. Why choose when you can have the best of two worlds?

—Jake Bunt, Philadelphia, PA

### STILL AT LARGE:

*Is it right or wrong, to feed the marine life?*

Is it right or wrong for Dive centers and Dive resorts to enable fish feeding by selling this kind of products?

We would like to think that divers bring to the water the notion of Take nothing but memories, Leave nothing but bubbles. However, we all know, that that is not always true, and in many cases bad behavior is encouraged by the dive centers and dive resorts. Feeding fishes while diving is a popular activity to bring the marine life to the divers/snorkelers in a misguided attempt to enhance the underwater experience.

We noticed that the Holidays put a dent in the number of replies to the Diveguru. Well, the holidays are over, and it is time to have an opinion again. We are leaving last issue at large, and adding another hot topic. ■

### About the DiveGurus

Millis Keegan, owner and founder of Diveguru.net, the homepage that answers questions for divers, snorkelers, anyone with a love for our oceans, is a new member of X-Ray Magazine. With the help of reputable experts, [www.diveguru.net](http://www.diveguru.net) will find the answer.





# whales & dolphins

Edited by  
Peter & Gunild Symes



## Extinct: Baiji Dolphin

The baiji dolphin, one of the world's most endangered dolphins, is now presumed extinct by zoologists working in China. According to researchers, these rare dolphins lived along the lower end of the polluted Yangtze River where they were thought to have lived for about 20 million years, unchanged as a species for at least 3 million years. Upon confirmation, the baiji will be remembered as the first large aquatic mammal driven to extinction in our times since the Caribbean monk seal was overfished to extinction in the 1950s.

August Pfluger, director of baiji.org, told the BBC, "We lost the race... It is a tragedy, a loss not only for China, but for the entire world." He was the joint-leader of a six-week expedition using both visual and acoustic monitoring equipment to search for the endangered creature. They found none. What they did find is that another dolphin is also feeling the effects of pollution in the river, Yangtze finless porpoise, whose numbers have fallen below 400.

Nicola Hodgins, director of the Whale and Dolphin Conservation Society's International Projects said in the organization's newsletter, "The demise of the Baiji should be viewed as a warning and a reflection of the way the actions of human kind can have a devastating effect on wildlife and our natural resources. The Yangtze River, now one of the most highly polluted rivers in the world, supports some 350 million people, as well as wildlife. It has never been more important to act to avoid mass extinction of other vulnerable cetacean species." ■



Poster from the Adopt a Hector's Dolphin Challenge of the WWF-New Zealand. [www.wwf.org.nz](http://www.wwf.org.nz)

which they become entangled and die a long excruciating death. It is estimated that more than 100 Hector's dolphins may be succumbing to death in this way each year, each one a dignificant death as each can have a serious impact on the survival of some dolphin populations. Apparently, fishermen are not following the voluntary codes of conduct, which request that they not set their nets in sensitive areas. The New Zealand government has put forth new measures, also based on voluntary control, to protect the dolphins. If you would like to send a letter to the New Zealand Ministers for Fisheries and Conservation urging them to do more to save the Hector's dolphin, go to the WDCS e-campaign page here: [wdcs-uk.org](http://wdc-s-uk.org). SOURCE: WDCS ■

## Living on the Edge: Hector's Dolphins

Hector's dolphins are one of the smallest species of dolphins to hit the endangered species list. They may be facing extinction. Found around the New Zealand coast-line, the dolphins meet their fate all too often in gill-nets and trawl-nets in



## 2007 is the UN's Year of the Dolphin

The UN has designated this year as the Year of the Dolphin in an effort to protect dolphins from threats to their survival and possible extinction. Working in collaboration with the Whale and Dolphin Conservation Society, the United Nations Education Program has plans to involve governments, conservation

organizations and members of the private sector to increase awareness of the plight of the dolphin species and the need to protect them. As part of the program, various pro-dolphin events will be organized around the world. To join the effort or submit your ideas, go to: [www.yod2007.org](http://www.yod2007.org) ■



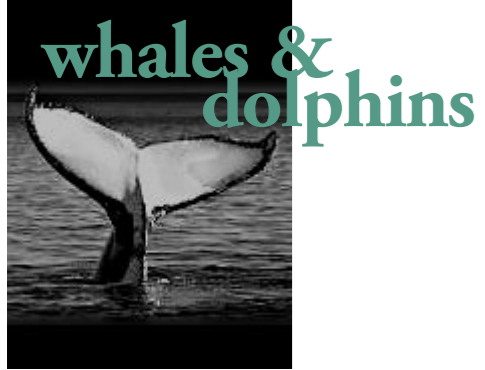
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## It's Open Season on Dolphins in Japan

An estimated 20,000 dolphins are killed each year by Japanese fishermen. They call it "pest control". Slaughtered behind giant tarps, which mask the bloodbath, the dolphins are killed because they eat too many fish. Even though there has been mounting international pressure to stop the brutal killing, a small coastal town in Japan called Taiji has launched their yearly culling season. The fishermen there say that the dolphins are the same as fish and killing them is the same as killing cows for beef. Ric O'Barry of SaveJapanDolphins.com told the Independent that the slaughter is more about reducing competition for fish rather than ancient Japanese tradition. As 2007 has been declared the Year of the Dolphin by the U.N., there is ongoing speculation as to what role the organization will take in this matter. ■

## Leaping Dolphin Injures Boat Passenger

A 27-year-old New Zealand woman aboard a boat in the Bay of Plenty was struck by a dolphin which jumped from the sea into her boat. The dolphin caused a number of injuries to the woman who was rushed to intensive care, while the dolphin swam away unharmed. Alan Baker, dolphin expert, told New Zealand Radio, "I've been studying dolphins for 40 years and this is the first time I've heard of a dolphin jumping into a boat." SOURCE: int.iol.co.za ■



## Attack of the Killer Dolphins!

The setting is the chilly Black Sea; the victim, a drunken Ukranien; the situation, he decides to go for a swim. What happens next? A pod of dolphins attempts to push him out to sea. Soon the rescue workers come to his aid. They hit the water with clubs to scare away the dolphins, then, retrieve the intoxicated man, reportedly in good condition, although bewildered as to what was in his drink. It is thought that the dolphins saw the man as competition for the fish upon which they were feeding. SOURCE: int.iol.co.za ■

## Near Record Deaths for Florida Manatees in 2006

Red tide is to blame for a near record-setting year for the number of deaths in the endangered manatee populations of Florida, according to state wildlife officials. In 2006, there were 392 manatee deaths compared to 415 deaths in 1996, when red tide, a deadly marine algae bloom, was also a factor. Boat collisions were also to blame, claiming 82 manatee lives. While the annual survey claimed manatee populations have risen from 1,267 in 1991 to 3,117 in 2006, scientists argue that the increase is mainly due to better techniques for locating manatees. While the manatees are still protected by the federal Endangered Species Act of 1973, the Florida Fish and Wildlife Conservation Commission voted unanimously in February to take the manatee off the endangered species list. Now it is identified as a threatened species since its population is on the rebound according to the recent survey, even though scientists continue to warn government that the manatee population will drop 50 percent over the next 50 years due to habitat loss, red tide and boat collisions. SOURCE: The Ledger ■



## Thwaps, Waps, Grumbles and Snorts —Whales Have Elaborate Vocabularies

Researchers at the University of Queensland in Australia have discovered that humpback whales have a much broader vocabulary than previously thought. From land, the scientists monitored humpback sounds and activity along the whales' migratory routes off the east coast of Australia, the breeding grounds inside the Great Barrier Reef and the Antarctic feeding grounds.

Rebecca Dunlop, one of the scientists involved with the research, told LiveScience, "The most surprising thing was there were 35 different types of sounds found. We were expecting less

than ten."

Ranging from underwater sounds including what could be underwater blows as well as surface generated sounds created by breaching and slaps of the tail or fins, the whale language seems to have social uses that help mothers and calves stay together. The study also suggests that some sounds are competitive calls between groups of adults that could be specific to one sex. A previous study also found that the whales practice grammar. The male whale love song appears to have song units key to sexual signals when single males joined females.



However there are times when a whale will make sounds by itself, thus suggesting that whale language is not limited to social intercourse.

The study is important in helping scientists and governments understand what impact the noise of ships and other industrial sounds have on whales. The ocean is becoming more and more noisy according to Dunlop, and researchers have yet to find out how this noise pollution is affecting the whales. The first step to understanding is to find out how whales communicate in a noise-free ocean, said Dunlop. ■

## Whales Attacked by Seagulls

Off the coasts of Argentina's Valdés Peninsula, the southern right whale is being attacked by blubber craving seagulls. Authorities blame uncovered garbage dumps and waste from fish-processing operations to the increase in the number of kelp gulls in the area. While the gulls usually feed on dead animals and blubber dislodged by whales when they breach, some gulls are getting much more aggressive with their feeding habits. They love blubber and some of them will land on the whales and peck through the skin to get to the blubber, which is a calorie rich source of food for the birds according to Marcelo Bertelotti, a biologist at Argentina's Patagonia University.

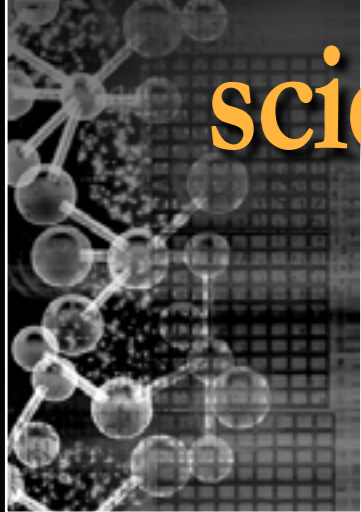
The birds nest near prime breeding waters of the endangered whales, and mothers and calves are most often attacked by the voracious birds since they spend more time at the surface. The wounds inflicted often become infected with bacteria and viruses. The calves have the worst of it as their skin is softer and they spend the most time at the surface.

This situation is causing a change in the normal behavior of the whales. Bertelotti told National Geographic that the attacks force the whales to dive and flee which interrupts crucial feeding and rest periods, thus causing the animals to expend energy normally used to create fat. This fat is important for long migrations and the production of mother's milk. Now, the whale mothers spend up to a quarter of their day fleeing gull attacks. SOURCE: National Geographic ■



DANIEL GAMMERT





# science

Text by Michael Symes



## Underwater visibility

# VIZ

**In a previous issue the reason for the blue colour of water was discussed. For the purposes of simplification it was assumed that the only phenomenon affecting the passage of light through water was the absorption coefficient of pure water. Now any diver knows that the visibility through sea water is not always very good. It can, in fact, be terrible.**

Visibility is often affected by inorganic particulate matter such as silt particles or organic matter such as algae. Although dissolved substances such as inorganic salts can also affect the colour of the water, and thereby the visibility, it is the particulate matter that is the greatest factor affecting visibility.

### Scattering

Light passing through a medium is said to be scattered by particles suspended in it, i.e. it is the process of changing the direction of the light. We observe scattering, for example, when we see suspended dust particles dancing in the air in a beam of sunlight. The dust particles are very small, and it is this scattering of light that makes them easily visible to the naked eye. Another well

The term Tyndall effect is usually applied to the effect of light scattering on particles in colloid systems, such as suspensions of particles in water. Colloids may be colored or translucent because of the Tyndall effect. (Location: Cenote in Mexico)

known effect is the scattering of the particles in a colloidal suspension, known as the **Tyndall effect**. This is seen when light passes through spilt milk, for example, when it has a bluish appearance. Even the blue colour of the sky is caused by the scattering of sunlight by molecules in the atmosphere. Both these two latter processes are caused by the scattering of the shorter, blue wavelengths of the incident light.

The amount of light scattered by a particle or molecule depends on its size and shape, and is a function of the wavelength of the incident light.

### Types of scattering

There are three types of scattering, depending on the size of the molecules and particles that cause the scattering.

**Raman scattering:** occurs when the incident light interacts with molecules. The scattered light is of a different wavelength from the incident light and the scattered intensities are low. This type of

scattering has therefore little influence on visibility.

**Rayleigh scattering:** occurs at molecules and particles that are small with respect to the wavelength of light i.e up to about one tenth of the wavelength, which means about 50 nm. It is the source of the blue of the sky, and, as we can all see by looking at the sky, intensities can be quite high.

**Mie scattering:** occurs with particles that are larger than the wavelength of light. It typically occurs with microscopic organisms such as phytoplankton which are 20 - 200 µm in size. (Visible light has a wavelength of 0.4 - 0.7 µm). It is this form of scattering which is most important for visibility under water. Unlike Raman and Rayleigh scattering, the scattered light has the same wavelength composition as the incident light, i.e. it is "white". Such a

Lake Thingvellir, Iceland, boasts probably the best visibility on the planet. And, yes, those ARE divers in the distance

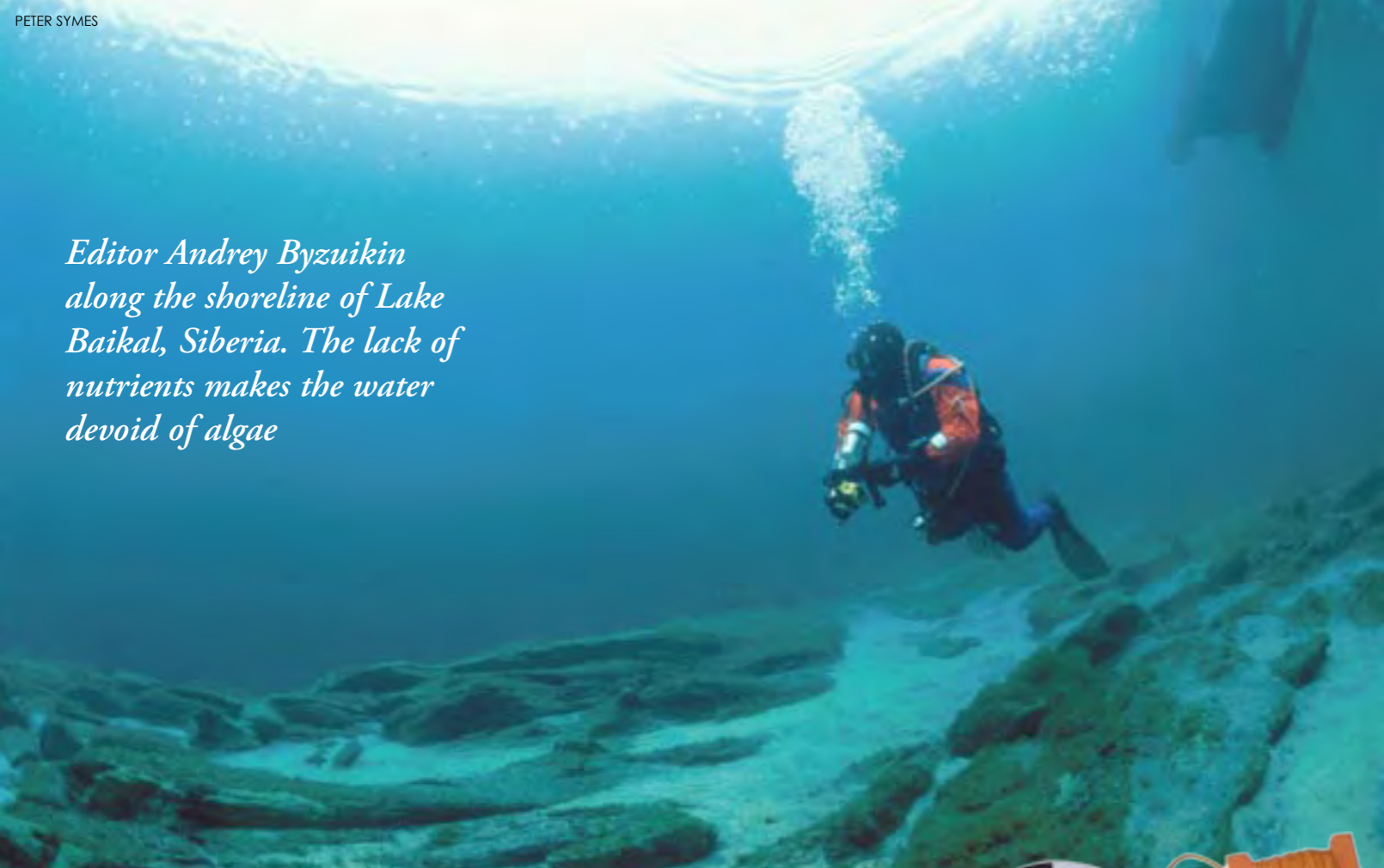
*Rayleigh scattering is the source of the blue of the sky*



PETER SYMES



*Editor Andrey Byzuikin  
along the shoreline of Lake  
Baikal, Siberia. The lack of  
nutrients makes the water  
devoid of algae*



scattering effect is generally called turbidity.

**Measurement of Turbidity**

There are several ways to quantify turbidity, the most direct being some measure of attenuation of light as it passes through a column of water. However, the most meaningful measurement of turbidity in water is obtained by determining the amount of scattering directly. Turbidity measured this way uses an instrument called a nephelometer (from the Greek word for cloud). It does so by employing a light beam and a light detector set to one side (most often at 90°). This method generally provides a very good correlation with the concentration of particles in the water that affect clarity.

A nephelometric turbidimeter always monitors light reflected off the particles and not attenuation due to cloudiness. The units

of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units, NTU. In the United States, for example, the allowable standard for turbidity for drinking water is 1 NTU. This amount of turbidity is easily observable.

Turbidity standards can be obtained with various values of NTU's. These are mostly used to calibrate nephelometers. There are also portable turbidity meters available for the measurement of turbidity over the range 0 to 4000 NTU.

In a simpler, and cheaper but more approximate, way turbidity can be measured using a Secchi disc. This is a black and white disc which can be lowered into the water until it can no longer be seen. This Secchi depth is then recorded as a measure of the transparency of the water which



Secchi disc

is inversely proportional to turbidity. However, this method has the disadvantage that it cannot be used in relatively shallow waters where the disk can still be seen on the bottom.

Although it appears to be a very simple phenomenon, turbidity is a very complex analytical measurement which can be affected by many factors. Most divers, though, will just use their eyes to estimate visibility under water, and be perfectly satisfied with that. ■

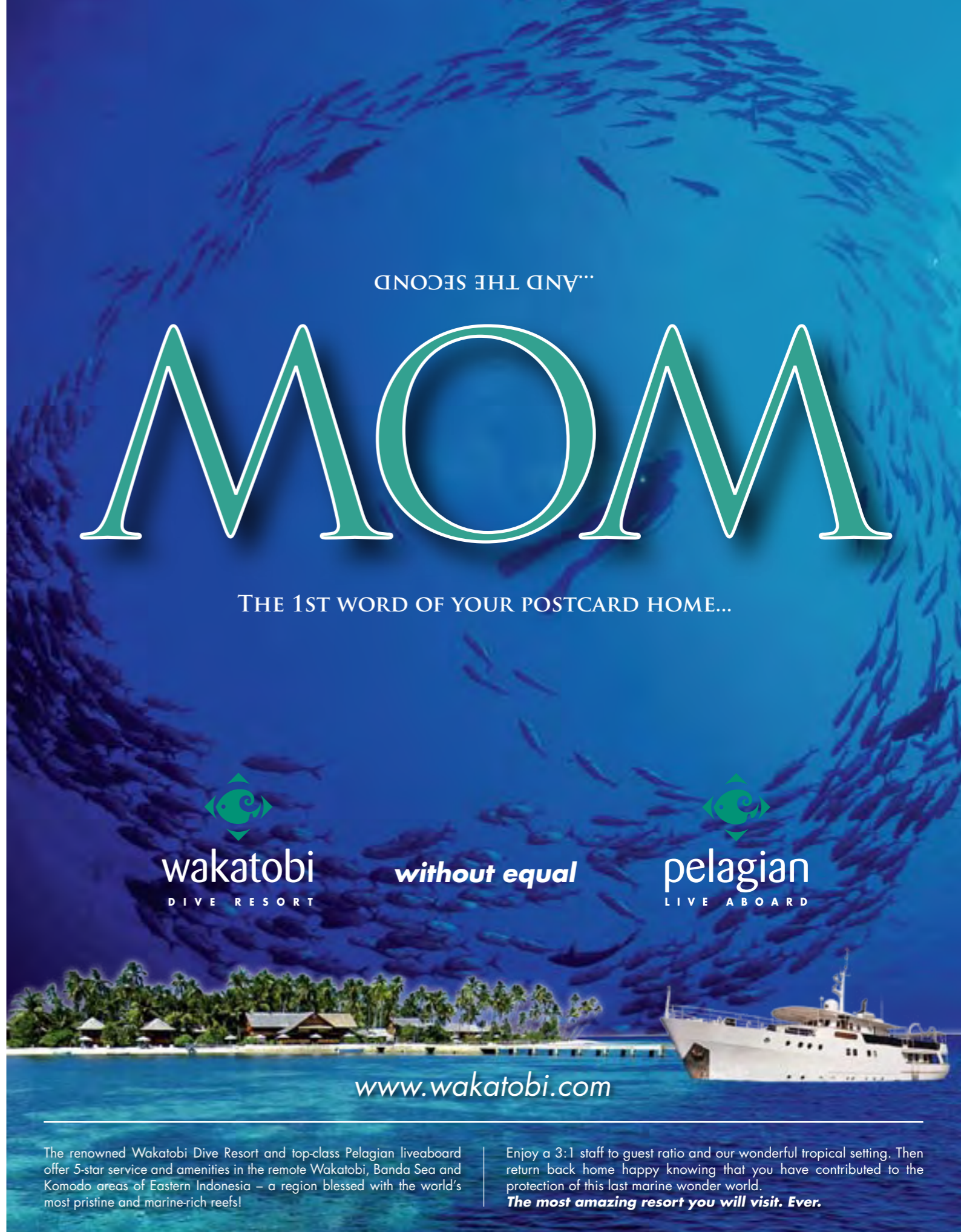
A digital nephelometric turbidimeter



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# Eat Kelp

Text by Arnold Weisz  
Photos by Stein Johnson  
and Peter Symes

**Did you know that kelp is an ingredient in many household foods? Edibles like frozen foods, cakes, puddings, salad dressings, shampoos and even toothpastes contain alginate. Alginate is an apparently safe derivative of seaweed (kelp) and is used to maintain the desired texture in many products.**



This food additive is the dehydrated and ground product prepared from different species of kelp: *Macrocystis pyrifera*, *Laminaria digitata*, *Laminaria saccharina*, and *Laminaria cloustonii*.

Giant kelp is one of the fastest growing plants in the world. When conditions are good, kelp can grow two feet per day! Giant kelp prefers water temperature in the 50-65°F range. Kelps occurs at and below low-tide levels in cool temperate regions throughout the world. They are a group of large brown seaweeds that live on the rocky sea bed as far down as sunlight penetration will allow. The plants often grow together in large numbers to form dense forests, usually composed of a single kelp species. A giant kelp plant can live up to six years. The plant is continuously pushing up new fronds to the surface, while the older fronds break off. Reaching lengths of more than 30 meters, it is the largest marine algae.

(Hudson) Lamouroux,  
*Laminaria digitata*



## The rainforest of the ocean

The kelp forest has a high production and very high biological diversity. Kelp forests are among the most productive and species-rich ecosystems in the world. Kelp plants create a structural complexity throughout the water column that provides habitat for many kinds of fish, invertebrates and other algae. This makes the kelp forest an amazing place to scuba dive. If coral reefs are said to be the cities of the ocean, the kelp forests have to be the rain forest of the ocean.

In the shadows within the kelp forest, hundreds of species of fishes and invertebrates ply their trades. The kelp forest also offers a great place to grow offspring. Many vulnerable larvae of fish spend their formative months in the kelp forest instead of having to face the dangers of the open ocean.

Just as in the rain forest on land, the kelp forest houses different species at different levels. While some fish thrive under the canopy, other animals make their lives further down in the aquatic forest. Various predatory snails and gaily colored nudibranchs graze on the stem and

Bladder Wrack, *Fucus vesiculosus*

(Hudson) Lamouroux,  
*Laminaria digitata*

## Kelp harvesting

Kelp harvesting takes place in several countries around the world. The harvesting of kelp for the manufacture of food additives and agrochemical products is a significant business in Asia, Europe and parts of North America. Giant kelp has been harvested off the southern California coast for more than 90 years. In the 1970's, yearly harvests of more than 170,000 tons supported a California kelp industry worth US\$40 million. Also



the kelp leaves. Within the labyrinth of the kelp forest, many shrimp, crabs, sea stars and anemones also find their food and housing. Scientists have counted up to 100,000 life forms on a single kelp.

A kelp dredge harvests kelp with its large rake-like teeth that can rip dozens of kelp from rock at a time







TOP: A common Baltic shrimp traverses Toothed Wrack fronds  
 BOTTOM: Toothed Wrack, *Fucus serratus*

Norway is also harvesting kelp on a large-scale base—170,000 tons are harvested on the Norwegian west-coast every year. Kelp harvesting is undertaken by tug-sized custom-built vessels with open holds the size of large caravans. Kelp harvest-

ing is managed on a rotational basis, ensuring that each area is harvested only once every four years to allow regrowth of the plants. The kelp dredge itself resembles a huge, iron garden rake—3m wide with elongated spiked teeth—



which is carried along the sea bed on raised skis. The weight of the dredge as it is pulled forward rips dozens of kelp plants from the rock, holdfast and all, which are then caught between the teeth.

At the end of a harvesting run, the dredge may have been drawn 50-250m along the sea bed, and have over a tonne of plants hanging in a compact mass from its teeth.

The process at the factory begins with the harvested seaweed being thoroughly washed in sea water to remove sand, silt, shells and small stones. Rotary drum dryers are used to dry the seaweed to be processed into seaweed meal.

### Resource management

Kelp harvesting is not without criticism. Several past and current on-going studies reveal the impact of commercial harvesting. Kelp harvesting impact on invertebrate species, seabirds and other marine mammal populations has not been satisfactorily investigated. Invertebrates, of all the groups of species that rely on kelp forests for their habitat, may be the most affected by

Carrageenan or Irish Moss, *Chondrus crispus*

kelp harvesting. In Norway, the Institute of Marine Research (IMR) started a long term project in 2003 to investigate the effect of kelp harvesting. According to IMR only about 0.3% of Norway's kelp are harvested, but up to 40% are eaten by sea urchins. Nevertheless, disappearing kelp forests may contribute to



## Kelp

Red Rags,  
*Dilsea Carnosa*

the depletion of fish stocks, as the kelp forest is a nursery for juvenile fish and are also major feeding grounds for blue water species. Less fish could also mean fewer seabirds. It will take some time before this study and others around the world can give satisfactory answers on whether commercial kelp harvesting is sustainable or not. ■



Kelp is a rich source of minerals and trace elements—iodine in particular, an adequate supply of which is essential to the proper functioning of the thyroid gland and the many important bodily processes controlled by it. Each tablet provides 150mcg of iodine which assists thyroid hormones control metabolism, growth and development. [Healthydirect.co.uk](http://Healthydirect.co.uk)



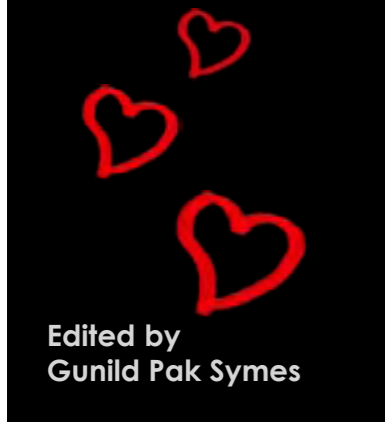
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POINT & CLICK  
ON BOLD LINKS



# Valentines

*Gifts for that special diver in your life...*



Edited by  
Gunild Pak Symes

ALL PHOTOS COURTESY OF THE VENDORS

## Two Playful Dolphins

encircle one another to form this beautiful ring from Seaside Designs in Florida, USA. A lustrous 5.5mm pearl balances between dolphins with diamond eyes totalling .04ct. Measures about 5/8" wide. Also available in white gold or 18k gold on request.

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## Truffles For Your Inner Dolphin

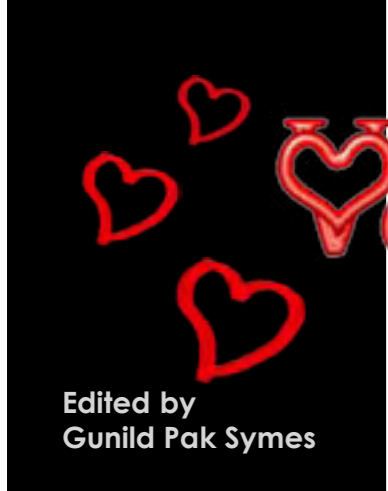
Dan's Chocolates in Vermont, USA, makes very fresh chocolates using a combination of American and European ingredients. Each gourmet truffles has a thin shell filled with creamy chocolate or ganache. Give your special someone 1lb. of 36 heavenly truffles or 16 chocolate bars in boxes with images of dolphins and whales on the covers. Flavors include Peppy-R-Mint, PB Hazel Collision, Caramel River, The Caffeinator, Trail Hound, White Delight, Lot-A-Choc and PB Eclipse. Price: US\$34.99. [www.dans.com](http://www.dans.com)

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# ...Gifts Valentines



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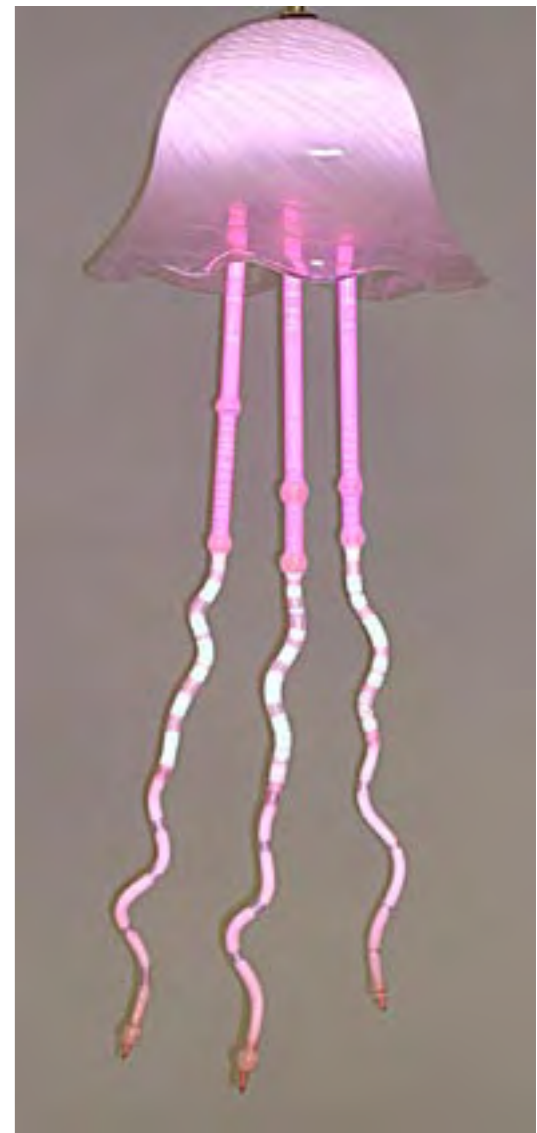
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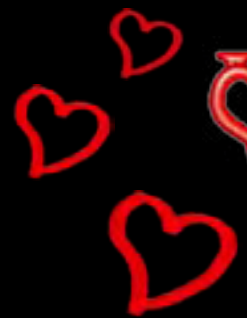
**Pink Neon Jellyfish Sculpture**  
by Eric Ehlenberger  
New Orleans, USA  
Handblown glass, neon  
Approximately  
16" x 16" x 36"  
Price: US\$2250.00  
Forget flying pink elephants—floating pink jellyfish are the *in* thing! Ehlenberger's interest in neon, metal and glass began with his childhood fascination with prisms, rainbows and colored light. Now he creates neon sculptures with abstract themes to fantastic representations of flora and fauna. See his gallery: [www.neon-sculpture.com](http://www.neon-sculpture.com)



◀ LEFT TO RIGHT:  
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◀ **Maori Symbols of Love in Pacific Pearl Carvings**  
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Edited by  
Gunild Pak Symes

# ...Gifts Valentines



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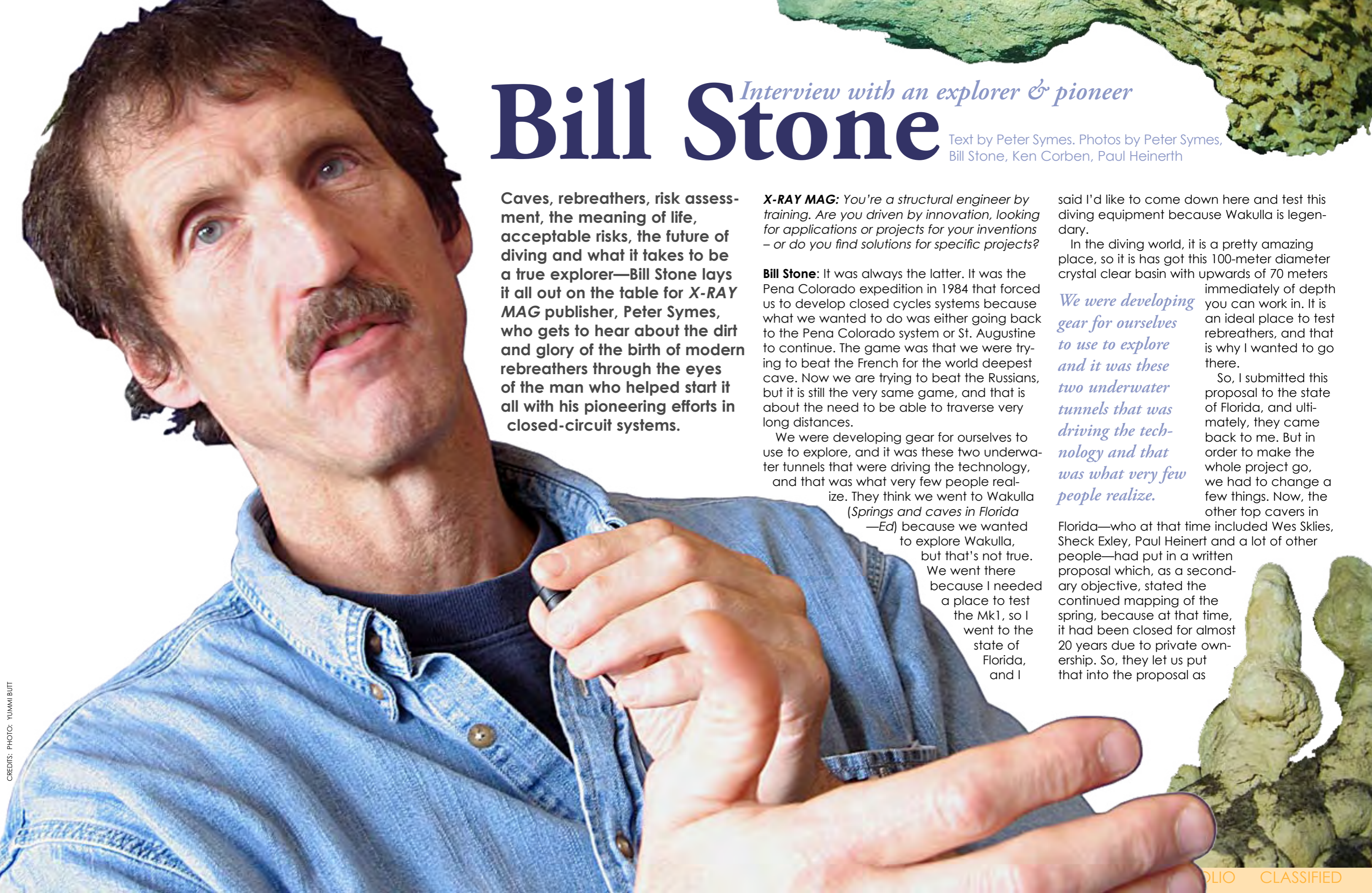


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# Bill Stone

*Interview with an explorer & pioneer*

Text by Peter Symes. Photos by Peter Symes, Bill Stone, Ken Corben, Paul Heinerth

**Caves, rebreathers, risk assessment, the meaning of life, acceptable risks, the future of diving and what it takes to be a true explorer—Bill Stone lays it all out on the table for X-RAY MAG publisher, Peter Symes, who gets to hear about the dirt and glory of the birth of modern rebreathers through the eyes of the man who helped start it all with his pioneering efforts in closed-circuit systems.**

**X-RAY MAG:** *You're a structural engineer by training. Are you driven by innovation, looking for applications or projects for your inventions – or do you find solutions for specific projects?*

**Bill Stone:** It was always the latter. It was the Pena Colorado expedition in 1984 that forced us to develop closed cycles systems because what we wanted to do was either going back to the Pena Colorado system or St. Augustine to continue. The game was that we were trying to beat the French for the world deepest cave. Now we are trying to beat the Russians, but it is still the very same game, and that is about the need to be able to traverse very long distances.

We were developing gear for ourselves to use to explore, and it was these two underwater tunnels that were driving the technology, and that was what very few people realize. They think we went to Wakulla (*Springs and caves in Florida —Ed*) because we wanted to explore Wakulla, but that's not true. We went there because I needed a place to test the Mk1, so I went to the state of Florida, and I

said I'd like to come down here and test this diving equipment because Wakulla is legendary.

In the diving world, it is a pretty amazing place, so it is has got this 100-meter diameter crystal clear basin with upwards of 70 meters immediately of depth you can work in. It is an ideal place to test rebreathers, and that is why I wanted to go there.

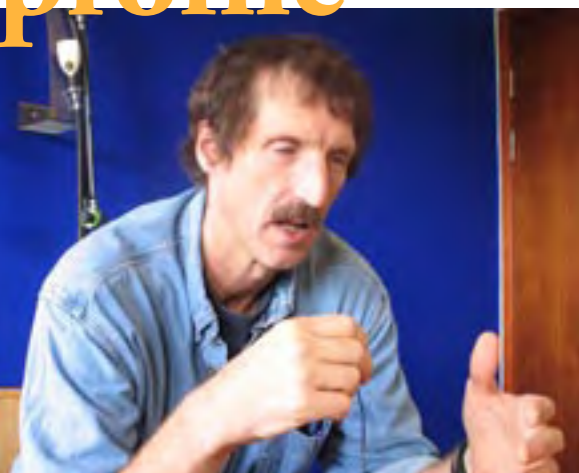
So, I submitted this proposal to the state of Florida, and ultimately, they came back to me. But in order to make the whole project go, we had to change a few things. Now, the other top covers in

Florida—who at that time included Wes Sklies, Sheck Exley, Paul Heinerth and a lot of other people—had put in a written proposal which, as a secondary objective, stated the continued mapping of the spring, because at that time, it had been closed for almost 20 years due to private ownership. So, they let us put that into the proposal as

*We were developing gear for ourselves to use to explore and it was these two underwater tunnels that was driving the technology and that was what very few people realize.*

CREDITS: PHOTO: YUMMI BUTT





*“Robots are not and will never be a substitute for human exploration, simply because it is in human nature to be curious”*

an objective because diving equipment had changed quite a bit in the past 20 years. The State of Florida came back to us and said, “All this is very interesting, but we are interested in the spring”. So, they asked us to change the priorities and make the exploration of Wakulla Springs the first priority. We said, “Ok, that is fine.”

We still got the permission to test the rebreather. So, as a result of that change of priority, we were immediately confronted with the problem that everyone knew the place was going to be deep, pushing 90-95 meters.

And so, we started thinking, as early as January 1986 or so, that we needed to do something about decompression.

**Ultimately** the design came out of this variable depth decompression habitat, this ice cone shape thing with 12,000



Wakulla project.

It was kind of a sideshow that we did all this rebreather testing, culminating with this 24-hour underwater test we did on December 3rd and 4th, 1987. I did that in a Poseidon Unisuit, ending up reading two books

underwater and also ended up filling the drysuit up full of pee. So, by the next afternoon, I was pretty darn cold. In order to stay warm, I had to come up with something. OK, Wakulla springs has got this 30-degree sand slope that goes down towards the entrance. So, I had all these guys bring in a lot of lead, and I would take my fins off and walk down the slope with my Mk1 on my back. I would then run back up to get warm; I just kept going up and down that hill. I did that all afternoon on December 4th to stay warm until I could get out.

When we got to the shore, there were about 12 journalists from various press, and we cracked this bottle of champagne. But the interesting thing about that was that we only used half of the supplies—half the life support that was in the rig.

**X-RAY MAG:** How did you get it all in there?

**Bill Stone:** Oh, we didn't get in the cave at all. It was really about testing the equipment. Did the electronics work? Does the breathing system work? What

The Cis-Lunar MK-2R included dual rebreathers and six onboard computers. Nigel Jones is shown debugging the initial embedded controller circuitry [photo ©1990 Bill Stone]

kgs of lead at the bottom of it. And we ended up getting ROLEX to fund that—the open circuits plus the vehicles which sleds and everything is what became the

## Bill Stone

problems are there with breathing? There are a thousand little questions about how you use a rebreather that we learned for the first time in 1987—y'know, what works, what doesn't, what swimming attitudes were best...

We had streams of data from that dive and a dozen other dives, which enabled us to move on to more generations of the rebreathers all the way up to Mk5.

### Exploring Huautla with Mk4s

But it was the Mk4 was the one that was specifically developed to go back to Huautla plateau to continue on the work we left off with in 1984. So, it took us ten years to get to the point where we were able to go back—as we did in 1994.

We used the MK4 to crack that tunnel that was 600 meters long, and we explored another 3kms on the other side before we hit another underwater tunnel at a distance of about 7kms from the

*“That call of the raw unknown has a certain subliminal beckoning to a rare few true explorers”*



### Brief Bio

Doctor in Structural engineering, Ph.D. P.E

Professional Affiliations:

- American Institute of Aeronautics & Astronautics
- American Society of Civil Engineers
- Tau Beta Pi & Chi Epsilon National Engineering Honorary Fraternities
- Member, AIAA Task Committee on Aerodynamic Decelerator Systems
- Member, ASCE Committee on Space Engineering & Construction
- Member, CII Committee on Wireless Data Communications
- Member, ASCE Committee on Automation and Robotics in Construction

Holds 11 patents, including Digital Waterproof Lap Counter, Breathing Apparatus Mouthpiece, Breathing Apparatus Gas Routing Manifold, Breathing Apparatus, High Speed, Amplitude-Variable Thrust Control, Breathing Apparatus Mouthpiece, High Speed, Amplitude Variable Thrust Control Method

Technical Experience:

25 years of structures, dynamics, systems design, spacecraft, and life support research work, including the development of:

- Non-Line-of-Sight real-time metrology
- Virtual construction site simulators
- Automated control systems for construction machinery
- Procedures for conversion of Space Shuttle external fuel tanks into safe, low cost laboratory facilities in low earth orbit
- An intelligent, piezoelectric spacecraft reaction control system
- The MK1, MK2, MK3, MK 4 and MK 5 Cis-Lunar rebreathers







PAUL HEINERTH

1998 - Bill Stone drives the 3D DWM (digital wall mapper) back to the surface at Wakulla basin

## St. Augustine

When we went back to St. Augustine in 1994—we were there for 4.5 months and most of it went to logistical setup, logistical derigging—there was only one period of about seven days that we spent beyond that, on the underwater tunnel. All the rest in between were exploratory dives.

I think we did over 22 missions out of this incredible, remote place. People don't appreciate that there were 3km of rope rigged, and you—in order to get to this place—had to go rappelling down all these ropes just to get to the place where the dive started. There were 3kms of ropes going down into a hole in the ground where there were three underground camp sites, which were moving inwards day by day to get to the point where we wanted to be.

The final camp was located outside the dive site, and there was no dry land there. We had to build platforms suspended three meters above the water, so if there was a flood, we weren't going to be swept away.

There were hammocks on rock bolts in the roof, so we slept there. But we did 22 exploratory missions before we actually broke through. Some of those diver were of the order of two to three hours duration at 30 meters depth.

Of all those dives put together, the total gas consumption was 100 24-liter bottles of Heliox 86/14 and one 2000-liter bottle of oxygen. Those were our supplies for that entire expedition.

**X-RAY MAG:** *That must have been a logistical nightmare when you also considered food and other supplies.*

**Bill Stone:** Yes, and had we had more time—we still had the logistics of taking the rebreathers down to the sump—we would possibly have broken the world

*Beyond the Deep* by Bill Stone and Barbara am Ende chronicles the exploration of the "Most Treacherous Cave"—Mexico's Sistema Huautla. [Amazon.com](http://Amazon.com)

## Bill Stone



KEN CORBEN

1997 - Richard Pyle preparing for the first-ever deep dive with a MK5 rebreather

record that spring. But as it turned out, the thing was much more difficult when it came to the raw logistics. We had rope transport, food transport and what not. But from a diving view point, it was an enormous change.

It was when we came back that Richard Pyle contacted me regarding using the MK4 that was a leftover from the 1994 expedition, which was a National Geographic project.

At that point, he started off using MK5s, and we got the chance to go back to Wakulla Springs in 1999, and from that point, two things happened.

One, is that we commercialized the MK5 and sold 100 of those. The other was that we developed a lot of new equipment

for Wakulla Springs, including the 3-D mapper, micro sat systems and propulsion gear... and things like that. It has been a continuous string of expeditions. But from an equipment development view point, it has been driven by a desire to go some place that one wants to go, but wasn't able to get to before.

And that is really the thing. It wasn't driven by commercial economics or, "Hey, let's build this piece of equipment... Now, let's see what we can do with it". No, it didn't work that way.

We developed this gear for ourselves, and we were the test pilots. When you think that way, you design it completely different from somebody who designs it for the military. They are engineers and

- The portable 6-person underwater habitat used on the Wakulla 1 project and the launch system for the saturation habitat for Wakulla 2
- An autonomous 3D digital full-wall mapper for automated cave surveying

## Selected Expeditionary Experience:

**1994** San Agustin expedition (4 1/2 months), Oaxaca, Mexico, expedition leader. Reached -1475m beyond San Agustin sump.

**1988-91** Four expeditions to Cueva Cheve, Oaxaca, Mexico (4 months total), expedition co-leader. Extended Cheve to present depth at -1386m.

**1987** Wakulla Springs Project (10 weeks), Florida, expedition leader. Three kilometers of new discoveries mapped at 90m water depth.

**1984** Pena Colorado expedition (4 months), Oaxaca, Mexico, expedition leader.

Nine kilometers of new discoveries near Huautla resurgence.

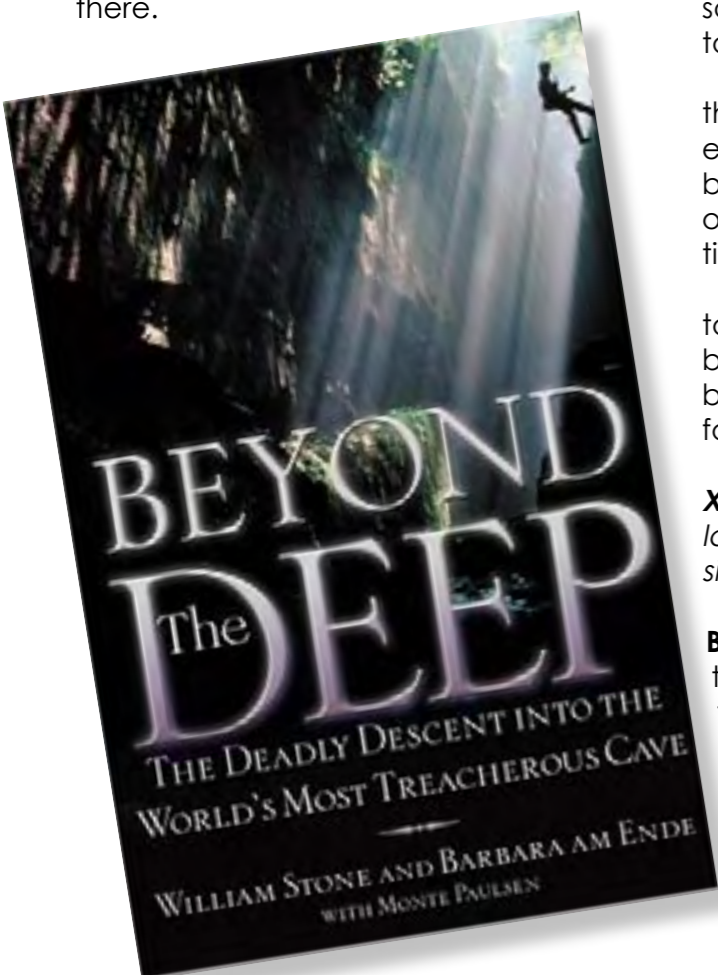
**1981** Agua de Cerro expedition (4 months), Oaxaca, Mexico, expedition co-leader. Sistema Huautla extended to -1253m depth.

**1980** Rio Iglesia expedition (4 months), Oaxaca, Mexico. expedition co-leader. First American team to reach -1000m.

they don't care. They are not going to use it, and if someone is going to die, so what? It is a military man, and occasionally, you are going to lose a few people—or something like that. Sure they might think it is bad if you lose someone, but it is not *them*—it's not *their* families.

In our case, we were the end users, and that makes you think completely differently about what you are going to design. You start thinking, how do I design this rig for survival? How do I make it lightweight, since I am going to carry it? How do I make it impact resistant? All these things.

**X-RAY MAG:** *I read a quote from your exploration of Cheve Cave: "When we*





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*"It wasn't driven by commercial economics or 'Hey, let's build this piece of equipment... Now, let's see what we can do with it'. No, it didn't work that way"*

*reached sump two (the second underwater tunnel—Ed), it felt like we were on the other side of the Moon—and that was still only a quarter of the way. To go all the way would be a +30 day journey in total darkness beyond all hope of rescue. But that call of the raw unknown has a certain subliminal beckoning to a rare few true explorers."*

**Bill Stone:** That is still true. That place is still a much greater exploration challenge than we experienced at Wakulla, which isn't finished by the way. The reason why we left Wakulla is that we discovered Cheve Cave, which gives us the opportunity to beat the

## Bill Stone

Russians. Wakulla does not. So, in these small international games we are playing, you go where the opportunity is.

**X-RAY MAG:** *But where is the limit—when you say, OK, I am doing something that is, quite obviously, very dangerous. I trust my equipment, but we are pushing it. Where is the edge of the envelope?*

**Bill Stone:** It becomes a psychological issue once you have broken certain ties. With the rebreather, we broke the tie with the compressor. We are doing the same thing with other techniques that contribute to the logistics.

This past year, we were working in another element of the Cheve system called the J2 and were 1200 meters deep and 9 km again from the entrance. These were separate pieces of a giant system

that focused together like a tree. The two elements were coming together in a nexus more than 20 kms away—which is incredibly remote. You can't just imagine that. It is days and days of traveling time, and it is physically threatening in terms of i.e. huge water falls coming down. So, you have to constantly think, second by second. You can't go lax. If you miss a connection with a carabiner...then ....

But to make a point... What we have learned is to minimize the equipment yet include what is most likely to go wrong.

So, a lot of thought goes into the spares kit. How do you repair something if it breaks? What happens if the

*The reason why we left Wakulla is that we discovered Cheve Cave which gives us the opportunity to beat the Russians. Wakulla does not.*

## (What's) Wakulla Project?

Groundwater is a critical resource and springs provide valuable information on the quality and quantity of this water. Wakulla Spring is one of the world's deepest springs and one of Florida's largest individual springs in terms of average flow. Wakulla cave is a branching flow-dominated cave that has developed in the Floridan Aquifer under the Woodville Karst Plain of north Florida. The Wakulla Project aimed to investigate and map these resources



WAKULLA SPRINGS STATE PARK

Wakulla Springs are classified as a First magnitude spring and is the longest and deepest underwater cave system in the world. Wakulla Springs is a major exposure point for the Floridan Aquifer. The spring forms the Wakulla River which flows several miles to the south where it empties into the Gulf of Mexico.

The **Woodville Karst Plain Project** or WKPP, grew out of a cave diving research and exploration group established in 1985 to map the underwater cave systems underlying the Woodville Karst Plain, a 450 square mile area that runs from Tallahassee, Florida, USA to the Gulf of Mexico and includes numerous first magnitude springs, including Wakulla Springs, and the Leon Sinks Cave System, the longest underwater cave in the United States.

WKPP is the only organization allowed to dive these caves, which are all on State, Federal, or private land, due to the extreme nature of the systems and the discipline required to safely explore them. This has been a controversial issue at times, as many people think these caves should be open to the public.

SOURCES: FLORIDA SPRINGS, HYDROGEOLOGY CONSORTIUM





The Rio Iglesia Falls at -1450 m. One of the most important discoveries of the 1994 expedition was the junction between the Rio Iglesia and the subterranean Rio San Agustin. Their junction forms the "Main Drain" for Sistema Huautla, through which the majority of the water for the vast karst plateau flows. Rio Iglesia, by comparison, carries nearly 4 times the water previously seen in Sistema Huautla. Barbara am Ende illuminates the spectacular 13 meter waterfall that marks the junction

## Bill Stone



**X-RAY MAG:** So a big part of it has to do with dealing psychologically with being so far away? And the real barrier is that you can't go beyond what it possible logistically.

**Bill Stone:** Yeah. The thing you always need to be thinking about is what is the emergency bail out path, and what do you need in terms of the very bare minimum to make you comfortable to do that.

One of the things that has changed over the years is that we have developed a single wire communications system that we run with us. Normally, that was one of

tried fiber optics in 1994, and that had its own issues. But lately, we've been using this very thin single wire system that uses the earth, ground, for communication. Up at base camp, you just put a stake in the ground and with the proper amplification, you can actually talk with people across 9 km.

That has dramatically changed the logistics because there is less error in the communications. Before, it was all done by messenger that had to go back to the last camp, where another would relay the message on to the next camp and so forth. Now we just call the surface directly i.e. if we are running low on food.

**X-RAY MAG:** It sounds similar to the problems engineers are currently discussing in regard to sending people to Mars. How do you deal with it, not only practical sense, but also psychologically, when you have a little group of people who must get along a rely upon each other under stressful conditions in a remote location beyond any practical rescue?

*...it makes you think about how you are going to fix things.*

Bill Stone: As I said, it makes you think about how you are going to fix things. I believe that the Russians are far ahead of anyone in space in terms of fixing things psychologically. We are starting to learn that on the International Space Station—but, yes, that is how we think underground.

We always think about where our spares are, where our spare gas is... everything that you need to get out of there again in an emergency, but on your own. If you break a leg, and you are beyond a

couple of kilometers of underwater tunnels down 1500-2000 meters and 10 km from the entrance, there is nobody that can drag you out. There are not enough people in the world trained to do that. At the very best, we have started training people now to go back to J2 in 2008.

### Going back with rebreathers

We hit a third underwater tunnel at 1200 depth. The idea is to go back there with very compact rebreathers. Put 6-8 people through there who are going to be self-contained for upwards of 25-30 days beyond the last crew at camp 3, and we will see how far we get.

The logistic maps that we have projected from that point onwards are looking at a 22-day round trip just to get to the most remote camp we expect to see established.

Usually, you then have about ten days exploration beyond this point. So, that will be 30, 35 or 40 days in total. We can do that in just a couple of years.

### Last frontier

And there is no other place on Earth that you can do this. If you go into a jungle, you can be extracted by a helicopter. Pretty much the same thing if you are anywhere underwater—if you are in a submersible or whatever. But this is real exploration, and that is what attracts me. It is the last good frontier on Earth before we make the leap outward—and there we've got projects we are working on as well.

**X-RAY MAG:** What goes through your head when you come around the next corner and see the next section that

nobody has seen before.

**Bill Stone:** I used to have canned answers for when people asked me these things but in most cases, it is just more of the same, like another canyon. But every once in a while, if you have gotten past some really tough obstacles, sometimes when you go back to camp at night you get this wow-sensation... I had one of those in 1994 when we had gotten past the St. Augustine sump and 1 km beyond camp 6.

### "This is it"

We had been going in and out of all these little bypasses and finally came to this one place, and we said, "This is it". There was another sump, and we had made a firm decision that we weren't going to do any more diving as we were only two of us and only a couple of people at the supply camp further back. So, we thought we better not screw up.

But we came to this place that went



"There is no other place on Earth that you can do this... This is real exploration and that is what attracts me"

those things we never did—the two-wire military systems didn't work well. We also

in an emergency, but on your own. If you break a leg, and you are beyond a

cable to the display on my rebreather breaks? What I am going to do? What if a battery goes flat when you go there? Or you tear a hole in your counterlung? All these ideas go into the spares kit.

When you go into these underwater tunnels with a crew, you start thinking where to place emergency depots and what should be in them. You always have to think of the retreat. Where to put rope stashes. What if someone breaks a leg? Then I need to have enough equipment to hoist the injured out. Where do I put sleeping bags?

If I make it to a chamber, I can't sit in my dive suit as I would go hypothermic. So, I need to have sleeping bags and foam pads and hammocks. So, how can you make those things as small as possible? How do you communicate with the people on the surface—that's a big one.







At about 2,900 feet (900 meters) deep, Marcus Preissner eases his way across a pool of water in Cheve's Black Borehole. For safety, expedition members carefully rig rope systems wherever possible

After 160 feet (50 meters) of squeezing through a ceiling collapse 3,200 feet (1,000 meters) down, caver John Kerr is on his way to more open terrain in Cheve Cave

tion. You couldn't see anything up, anything left, or right and nothing ahead of you. It was all total blackness. So it was like, I have just stepped onto the back side of Pluto.

I yelled, and that echo just carried on for ten seconds. That still sends shivers up my spine. Just to walk into a place like that, and you know that nobody ever even conceived that a place like this existed. It was over 200 meters wide and 80 meters tall, and it was more than enough to suck

up every photon that was coming off our lights. It just went on and on for quite a way until it finally narrowed back down to a general river passage. That is the kind of thing people get excited about if you go underground.

### Just seeing blackness

The other really good one is coming around a corner and looking down and just seeing blackness. And you say, "That is an interesting place." You pick up a rock and toss it, and you start counting. After about

*I yelled and that echo just carried on for 10 seconds. That still send shivers up my spine.*

six seconds something clicks over in your head that goes, "Holy shit!", before you count to seven, eight, nine, ten... And the point when the rock hits the bottom, it still takes the sound a second and a half just to get back to you before you hear that roar down there echoing in the distance.

That sets off all kind of thoughts. The first is that you back away, right? Because you just realize that what you just thought was trivial, now turns out to be higher than the Sears Tower or the Petronas tower—and you are standing over it without a rope on.

The second one is "Oh man. We need to get a lot of rope."

### When a buddy dies...

**X-RAY MAG:** *Do you ever get to the point where you start to question these explorations and whether it is worth the risk and when the price for curiosity is too high. For example, when somebody dies, like your friend, Ian Rolland, did in Oaxaca?*

**Bill Stone:** Yeah, there were emotions on all kinds of levels going on right then. Probably the biggest one in the back of our minds was—and probably in me more than anyone else on the team because I had designed the gear,



BILL STONE

although I knew the gear was good, I had no doubt about the gear—the real question was: *Why did he die?*

And nobody really understood that, and because of that, there was a lot of freak factor going on. Normally, rational people like engineers, scientists and technical people who should know better, were constructing gremlins: "If it killed him, it is going to kill me." So, the expedition almost collapsed at that point.

And that expedition had been ten years in the making—Wakulla was just an incident on the way to that expedition. So, by the time we got there and already spent four months on the site, it was like number one—yes, we lost a good friend. So, the question was, what the hell happened?

The second one was, we can't lose everything that took ten years to get this far. You don't think like this, if you have just come on board as a team member. But you do if you have organized it.

You got 60 corporate sponsors, National Geographic, Rolex... Everybody who would ever possibly back your expeditions in the future is sitting there silently looking over your shoulders thinking, "Well, what is he going to do?"

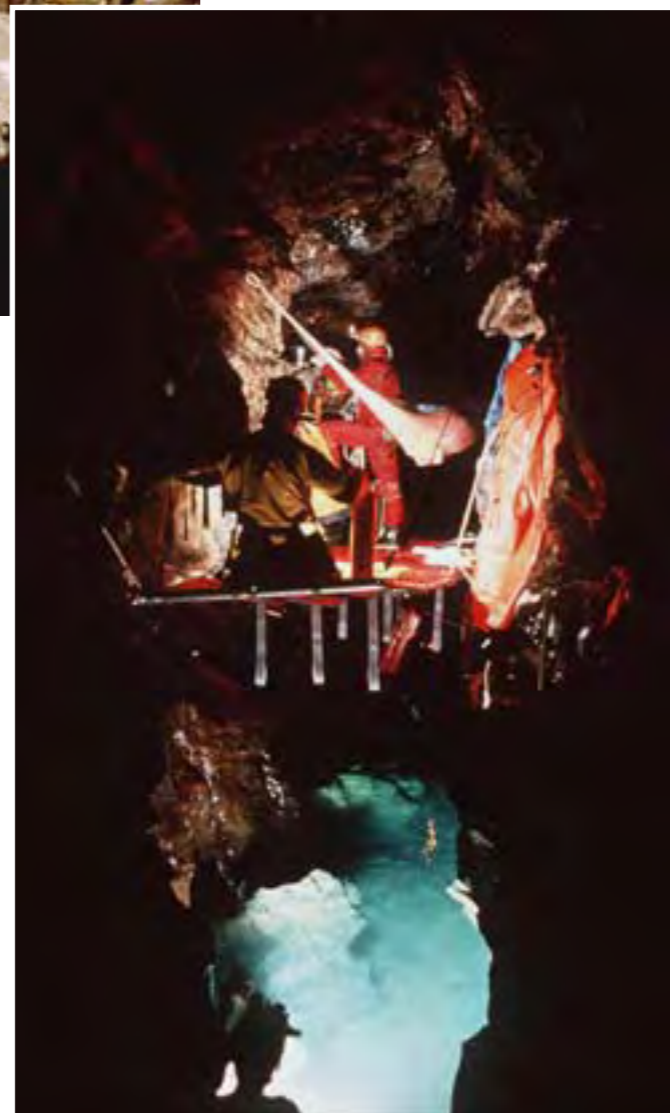
Half of you says: "I wanna get out of here. I want to get home." But the other half then says: "Wait a minute. There is too much invested. This is an unfinished piece of business, and we got to carry it through."

**X-RAY MAG:** *So, how did you handle it?*

**Bill Stone:** We stowed the equipment and then went over to England and had a big wake. Ian was a great guy. He was an extraordinary explorer. I can't say enough good things about him.

The one thing that was a problem for him was that he had acquired adult onset diabetes about a year prior to the expedition. As he had been with the project for about eight years it was a very difficult subject to deal with. So, we talked with all of the endocrinologists and as a many experts that we could get hold of. They concluded that he was good and an asset to the expedition. And as long as he was able to maintain his insulin levels under exertion, then they couldn't see any reason to stand in his way. So, for 3½ months everything went great.

What we believe happened is the following:



off in four different directions, and I looked at the three of them, swam over and took a look at them, but there was nothing there.

The final direction looked deep, with the ceiling coming down in the distance, and it looked like one of these low air spaces where you just have to taut your neck and put your nose up and then it ultimately becomes an underwater tunnel. Well, it was a mirage.

### ...the back side of Pluto

When I got further into it, the ceiling slowly started to lift up, and it was a reflection. So, it looked like it was closed. But suddenly, it opened up to this sand beach on the other side. From that point onward, you couldn't see anything in any direc-





Jack Harrison Schmitt on the Moon

He and Kenny Broad had just surfaced behind 600 meters of tunnels and found this earth-filled chamber. Now Kenny was not a dry cave explorer. But Ian was this multi-discipline guy who was not only a diver but also a top-rated rigger and dry cave explorer. So, I said to him, "Why don't you go?" And so, he did.

Well, in the world of exploration of underwater tunnels—particularly where low or zero visibility is a factor—it's generally consensus to do solo diving. That's a subject for another whole discussion—but this is just the way it is. If you go to the UK or anywhere else, they will tell you that a partner is a greater risk to your life than yourself with a whole lot of redundant systems.

So, Ian was over there, and in the excitement of doing what he was doing, he over-exerted himself. He actually had to get out of the water and walk 100 meters, and his gear was heavy.

We had the Mk4 plus two bailout bottles and tackle bag. That is probably 70 kg. He only weighed 65 kg, so getting out of the water and all that... But he had candy bars in his belt that he was going to eat. He then headed off, and he got about 30-40 meters into the next tunnel

*"What you find, almost invariably, it is human error that kills"*

where he realized that something was wrong and just didn't make it back to shore.

**X-RAY MAG:** So it was essentially the diabetes that killed him, not an equipment malfunction?

**Bill Stone:** Yeah, from hypoglycemia. Because, unlike any other piece of diving apparatus to that date, we had a black box in the MkV, and we interrogated it.

And sure enough, the Oxygen level was well within breathing range and there were no other signs of distress.

He didn't die from heart attack either. He was very fit. This was pretty cut and dry—we investigated everything. There is a 25-page report with all the physicians giving their say and looking at the data. The conclusion was, for sure, that there

was nothing wrong with the rig. We knew that for a fact, as Barbara Am Mende used the very same rig for the final push with no change.

### Tough one

The tough part was, of course, learning that fact for the first time when Kenny Broad marched into camp three after midnight after everyone had gone to bed with the news that somebody is not coming back as planned. This happened periodically, and you just get this gut feeling that we got a serious problem and what are you going to do? You just got to go do it.

Kenny did the reconnaissance to find out what happened, and I went in to collect the data. We actually had slates on which we wrote up all the dates in case the battery died. Power was still running though, so we got a huge amount of data just off the screen in addition to what the black

*Everybody who would ever possibly back your expeditions in the future, is sitting there silently looking over your shoulders thinking, "Well, what is he going to do?"*



## Bill Stone

*I never considered myself a diver. It was just an exploration tool for going deeper into the Earth*

You try to rationally limit the risk to the point where you hope that you can reduce the probability of hardware failures that will kill you—or environmental factors that will kill you—as much as possible. And what it then really reduces down to is the probability of human failure.

I have lost 16 friends on expeditions—not all on my expeditions. We had four fatalities on the 53 projects that I have run. What you find, almost invariably, is that it is human error that kills. So, what do they do?

### A lesson from Cheve Cave

Well, there was this fella in 1991 in Cheve Cave who came down and—against all advice—tried to go to a second underground camp straight from the surface. Well, the distance was too far, and he got fatigued and started making mistakes until finally, when he was going down a fairly steep shaft—and you have re-rig points on the ropes to prevent abrasion and things like that—he just didn't clip in for safety, and he put his descending device on the rope below, and jumped on to that.

Guess what? That clip, that carabiner, that connected to his harness was not locked. So, here we have three errors in a row. One, caving while he was fatigued. Two, not clipping in his safety device. And three, not bothering to check whether it was locked for his descent.

All these things summed up. So, ultimately when he sat down, his carabiner

box recorded. So from then on it was just: "Ok, all right, how are we going to get him out of here?"

### Risk assessment

**X-RAY MAG:** So, are fatalities like that are just a price that you have to accept when exploring?

**Bill Stone:** In 2004, NASA asked me to participate in a very small workshop on risk and exploration. There were some wonderful proceedings that came out of it. There were mountaineers and astronauts like Jim Lovell from Apollo 13, Jack Harrison Schmitt and others of that caliber. What we concluded was that exploration, by its very nature, is...risky.

*Look for the signs that tell you when things don't feel right. And if you sense those signs, stop.*





BILL STONE

Careful to avoid rocky edges and a roaring waterfall (right), members on the 2003 expedition take turns dropping 490 feet (150 meters) into the vast beauty of Saknussem's Well in Cheve Cave.

involved at the bottom of a deep cave—in particular if I am not the lead diver. I take the person aside and I say: "Look, don't let those people pressure you into diving if you don't like the situation you're in. If you get down there—you might have had 25 support personnel turning all of your equipment, rebreathers, tanks, back-up lights, reels ...everything, hundreds and hundreds of kilograms of gear kilometers down there, and it might have taken four or six weeks—and you find you have a leak in a high pressure hose, or you don't like the way the electronics are powering up on your rebreather, then abort. That is it! No question asked. Stop! And then reassess."

## Control & stress

**Bill Stone:** To me, I start to lose stress when I arrive at base camp, because then I am in control. And that is one of the beautiful things about exploration

in my mind, at least here on Earth, because you are dealing with a static adversary.

Now, it might be slightly different underwater, you may go into a place and while it has very low probability, a lot of sharks may show up. That is what falls into the category of unknown or uncontrollable risks. That is, by the way, the reason why I don't do high-altitude mountaineering. There are too many uncontrollable risks, like weather, crevasses that you don't know the shapes of, avalanches... Some of the best mountaineers in the world are dead simply because of random probability, such as they were in the wrong place when the avalanche occurred.

To me, it is about choosing your frontier—but mountains are not frontiers anymore. They have been climbed. We

have them underground and underwater. That is what is left. And in our free time we are trying to figure out how we get back to the Moon.

**X-RAY MAG:** *What is the main thing about exploration that gets you?*

**Bill Stone:** It is about the thrill of going some place where no one has gone before. For a tech diver, it might be about going down and finding a 500-year old galleon or something. I can really appreciate the excitement in something like that. It is just not where I would like to go. I like geographic exploration as opposed to artifact localization and such. But the feeling for those people, I believe, is the same. It is what excites you in life. It is the curiosity that you are satisfying.

**X-RAY MAG:** *So, if you were to sell the idea of diving to a mixed audience, what would you emphasize?*

**Bill Stone:** If you talk about strictly diving, I never considered myself a diver. It was just an exploration tool for going deeper into the Earth that I was looking for. I never spent much time in the ocean. For many reasons. One being that when you go into the ocean you are entering the food chain, and therefore, you are entering a higher risk environment that is unpredictable, and I like to control risk. That is one thing.

But, I was out in Hawaii with Richard Pyle, and that was shortly after the MkV had become commercially available. We

Bill Stone struggles through John Kerr's dig in Aguacate's sump (flooded tunnel) bypass

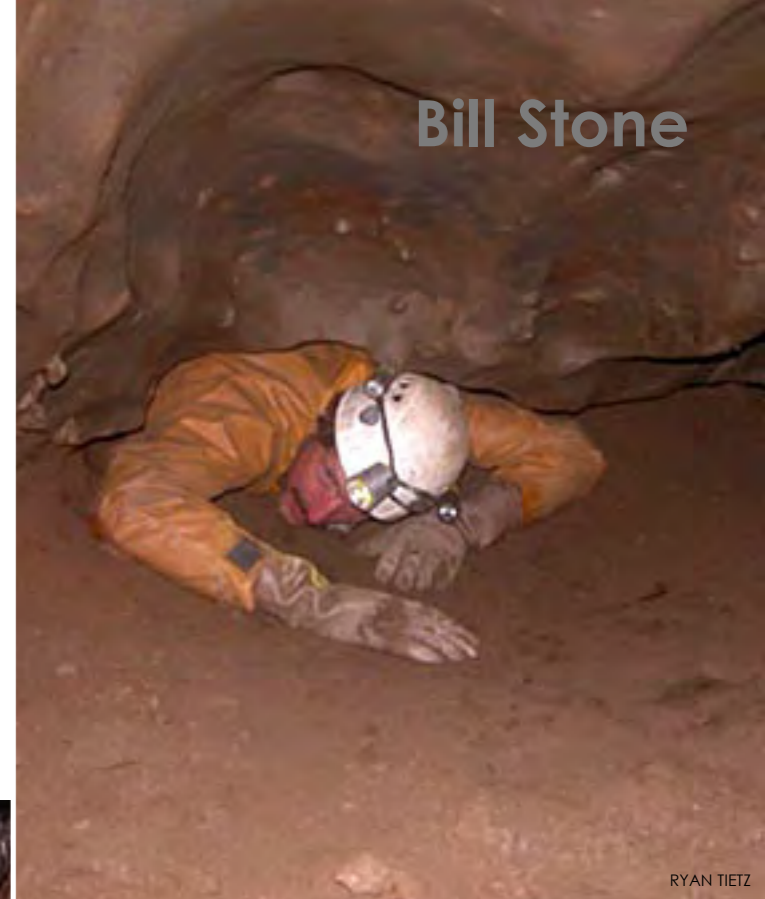
went out and did a dive on corals and followed a slope down and ended up at plateau around 87 meters where Richard showed me some of the wildlife.

We spent a couple of hours down there, before we decided to go up. Then, as we hung out at around 40 meters with some hours of decompression still to go, Richard suggested that we go over to have some fun around some commercial tourist submarines.

They were a couple of kilometers away, so we started swimming, went over there and swam back, doing our decompression all the



ANDY HUNTER



## Bill Stone

RYAN TIETZ

way along. When we surfaced after about six hours we felt great—as we were diving on Heliox and didn't really think about the distance and time we had spent underwater.

It was only afterwards, when we got back to shore, we both realized that this had been really special because we felt so natural and at home down there completely forgetting about the fact that we were underwater and for that long. It was like, "Hey man, let's go over there and see the subs, what the hell?"

How many people would decide to go on a four-hour swim at 40 meters depth and come back and think nothing of it?

It didn't occur to us that this was anything eventful. We had just suddenly become elements of the environment. We were just underwater and that is where we belonged. And coming back up was actually the stranger part.

That is what sold me on rebreather diving. I believe that kind of experience is life-changing for people who experience it. You won't get it with open circuit scuba. It was a fundamental change during which we lost contact with the

2004 - Bill Stone rappels out after completing the second pitch of the Aguacate dome climb





# profile



BILL STONE

After traversing 4.6 miles (7.5 kilometers) from Cheve's entrance, caver Bart Hogan wades through the entrance of a gorge 4,300 feet (1,300 meters) deep. The team schedules its trips to Cheve in the middle of Mexico's dry season to avoid dangerously high water levels and flooding.

## Bill Stone

today is too big and bulky and only something that your typical male tech diver will wear.

It is not a thing that a teenager or the average adult female diver finds desirable. So, how do you design a comfortable unit that everyone can easily carry? Secondly, how do you design them so they are inherently safe?

Because rebreathers have followed a technical dive path and been associated with complicated projects, all kinds of stories also flourish—like if you are going use them you are going to die on them.

### Yes and no

They were complicated technical devices that in many senses were over-engineered with a lot of options. But if you start looking at the problem

from the other end and look into designing them from the ground up, where the rig is looking after you and the procedures are simple—so you can get the perfect rebreather experience—this will all change. That is the next threshold.

Rebreathers need to be very small and very light and look after you.

### The revolution is coming

But this step is already on the horizon, and when it happens, diving is going

*Almost everything will be closed circuit because it is so cool... It will not be a toy. It will be the beginning of the revolution"*

to be revolutionized. Because people will start realizing they can start on a rebreather and not open scuba where you learn some nasty skills that have to be unlearned later when you go on rebreathers. Once the training organizations realize this, everybody will shift and fall in line.

So, you will have: Intro to rebreather, Advanced rebreather, Technical rebreather courses and so forth. But a lot of other stuff will be gone, such as nitrox and trimix, as it is inherent in the rebreather.

It can happen soon, as early as in the next two to three years. I don't think any longer than five... Market forces will drive it that way. Once the Club Med diver has started having fun on these, that will be it.

And all those tech divers that are out there now... they are going to look down on it and call it a toy. But it will not be a toy. It will be the beginning of the revolution. Eventually, they will start tinkering with it too, because it can fit in your suit case.

To me, there is another aspect to it and that is, once you understand how it works, and you have it working well, you have all the time in the world to resolve problems underwater. One of the leading causes of fatalities with open circuit diving is panic in wrong situations. But on a rebreather you are not going to alter the duration if you breathe a little faster—you still have hours to figure it out.

I believe they are safer in every respect. They require a different discipline than open circuit, but I take that they are much safer. So, when you see 500,000 rebreather divers as opposed to 500,000 open circuit divers, I believe the accident rates will be lower because you won't have panic failures and time related failures that will kill people. There you go. ■

*Once the Club Med diver has started having fun on these, that will be it.*



fact that we were in this environment.

This is what the new diving experience is going to be and it is coming with rebreathers. There will be institutional resistance. But it is going to come to a point where rebreathers will supplant open circuit diving. Almost everything will be closed circuit, because it is so cool.

**X-RAY MAG:** What will it take to get to that point? What are the main challenges when it comes to technology, physiology and pedagogy?

**Bill Stone:** There are two fronts: How do you build something that is really compact? Everything we have

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# Voronyya Cave

*The World's Deepest*



*Taking your dive gear down to 2158 meters—in Caucasus*



Text by Tatyana Nemchenko,  
Russian Geographical Society

Photos by Teodor Kisimov  
and Constantine Stoilov

Author Tatyana Nemchenko  
before her dive in the sump

The Mexican cenotes and springs in Florida may all be places of pilgrimage for technical divers. You can often watch brave men and cool-headed women laying out their guidelines as their frog-kicks take them further in through awesome arches and into this mystic realm lit only by the powerful beams of their HID torches. But there are also other caves in the world, less famous ones perhaps, but caves that are yet even more impressive, with shafts that keep on dropping into the abyss in seemingly endless cascades of deep pits.



CLOCKWISE FROM TOP LEFT: Base camp on Gagrinsky Ridge; Descending the cascading pits of the cave; Dropping into the pit of the sump



# Voronya Cave

Pit dropping into the Kvitochka sump

## Fitness required

In such caves there are passages, which are completely filled with water. Cave divers dive into these submerged tunnels, which are called sumps. These adventurers are not only divers, but capable mountaineers who are able to climb both upwards and rappel downwards on ropes. These people are very fit, as they need to be able to bring with them into the cave cylinders and all other sorts of heavy equipment.

## Where?

But do you know where the deepest cave in the world is located? Believe it or not,

it is actually very close to Europe. It is in Abkhazia, which was once a Soviet republic.

When Juri Kasjan, in 2004, declared that an expedition of the Ukrainian



Speleological Association under his leadership had penetrated the cave of Krubera (Voronya)—which lies in the Gagrinsky range in the Caucasus—to the depth of 2080 meters, the world was awestruck. At that time, only about ten vertical caves around the world had actively been explored down to 1,500 meters. But this cave went to an astonishing depth of two kilometers! There are, at present, no comparisons or competition for Krubera (Voronya) cave's status as the deepest cave in the world.

The entrance of the deepest cave is located in mountains at an altitude of 2240 meters, and the bottom point (as it is presently known) is about 100 meters above sea level. It is not surprising that there are sumps, or flooded passages (also called 'siphons') at the bottom of these caves. These sumps are the deepest in the world in regard to their position under the surface. So, it is no wonder that ambitious cavers and divers from the Ukraine and Russia have begun a private competition in attempting to dive through to the lower sumps and penetrate further into the cave system.

## Kvitochka: 1980m below ground

The expedition detailed in this article, under the leadership of the same Juri

1980 meters below the ground, divers gather in Kvitochka sump

Ascent up from the pit of Kvitochka sump





# Voronyya Cave



Camping in the cave

Kasjan, took place October 2006. For a whole week, cave explorers moved all needed equipment to the bottom of the cave inluding underground living and diving exploration for two cave divers, Gennady Samokhin and Juri Kasjan, who dove through the sump, Kvitchka, at the depth of 1980 meters underground. This sump was 20 meters long with a depth of four meters.

With them, they carried cylinders and diving equipment for the next dive. They descended into the next deep pit cave passage that wasn't flooded. It seemed like there was just a little water here, so the caver divers followed it into unknown underground spaces.

## Flooding

But then something unforeseen happened. Sudden warming of temperatures outside the cave led to fast melting of snow on the surface, leading to underground streams becoming overfilled by water. Waterfalls started roaring in the cave.

*The powerful roar that announced the beginning of the underground flood gave the cave explorers time to evacuate*

Fortunately, the natural cataclysm began at night, when the cave explorers were resting in the underground camp. The powerful roar that announced the beginning of the underground flood gave the cave explorers time to evacuate from their dangerous position. The water level rose rapidly in the bottom part of the cave, and further

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# Voronya Cave



Transportation of equipment

explorations were now out of the question.

This September, the team made another attempt, which was successful. They descended along air filled passages beyond the Kvitochka sump, found a new and unflooded passage and dived into a new sump at 17 meters depth and 40 meters in length, at the end of which they found a huge rock blocking the narrow sump. Now, the depth of the deepest cave penetration stands at 2158 meters.

What lies further ahead? "We shall look into how we can better forecast weather and foretell floods. Certainly, we'll continue our cave diving exploration because we like it, because this is very interesting to us and because we want to know more. What is there on the bottom of the world's deepest cave so very close to sea level?" said Juri Kasjan. ■

Crawling through the toothy narrows on the way to the bottom of the cave

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SS President Coolidge

# The Lady & The President

Henry Nelson. Does the name ring a bell? You'll not find him in any history book or see any monuments to his honor. However, the thousands of scuba divers who visit Vanuatu every year should bless this name. This former French/English colony, which was named New Hebrides till

1980, was also the second most important US base in the Pacific during WWII. The 80 islands strategically located between Fiji and Australia is still home to some remains of this strange time. Amongst them is the wreck of the SS *President Coolidge*.



Text by Cedric Verdier. Photos by Cedric Verdier and Allan Powell



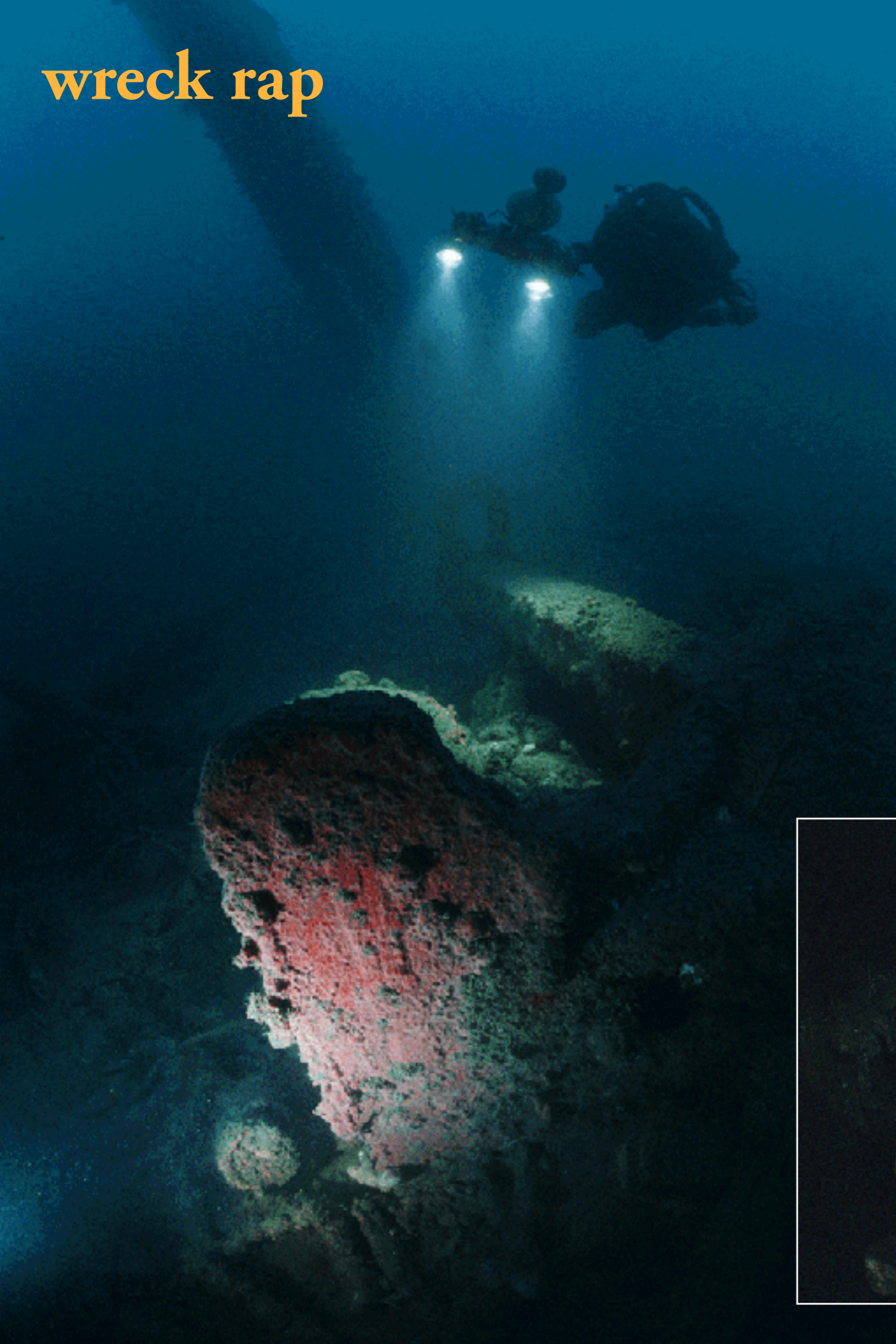
The Lady and the Unicorn, symbol of the SS President Coolidge, used to be located in the 1st class smoking room

This huge luxury cruise liner used to travel between San Francisco and the Pacific Rim before being transformed into a troop carrier in 1941, under the same captain, Henry Nelson, who was already 63 years of age. October 26th, 1942, the *SS President Coolidge* came back to Espiritu Santo carrying more than 5,000 US soldiers and a whole load of military and medical supplies.

Because of a communication problem, the captain was not made aware of a mine field that was laid down around Luganville, the main harbour in Santo, to protect the area from lurking Japanese submarines. At 09:30, there was a loud explosion. The ship struck two mines. After having considered his options, the captain decided to beach this 200-meter long ship on the near-







## SS President Coolidge

by shore. All the men on board were able to safely swim and walk to the shore.

But due to the shape of the seabed and the tide, the luxury cruise liner sank on a gentle slope at a depth of 20 to 70m, only an hour later.

Today, the *SS President Coolidge* has become the biggest, most accessible wreck in the world—a dream come true for scuba divers all over the world. Now divers can just walk into the site right from the beach, swim 50 metres and explore this huge shipwreck.

### Diving *The President*

Everything is interesting on what the local divers call, "The President". Thousands of fish swim around or stay protected in the cargo holds. Huge groupers and moray eels are so accustomed to divers that they act like pets, distracting visitors from the impressive number of jeeps, vehicles and military supplies that lie everywhere. With nine decks, the wreck is so complex that it looks like a maze—a feeling intensified by the fact that the ship rests on her port side. Navigating inside the wreck could be quite challenging, except for the native dive guides who find their way to the most interesting artefacts on a daily basis.

Maybe the most amazing feature of *The*

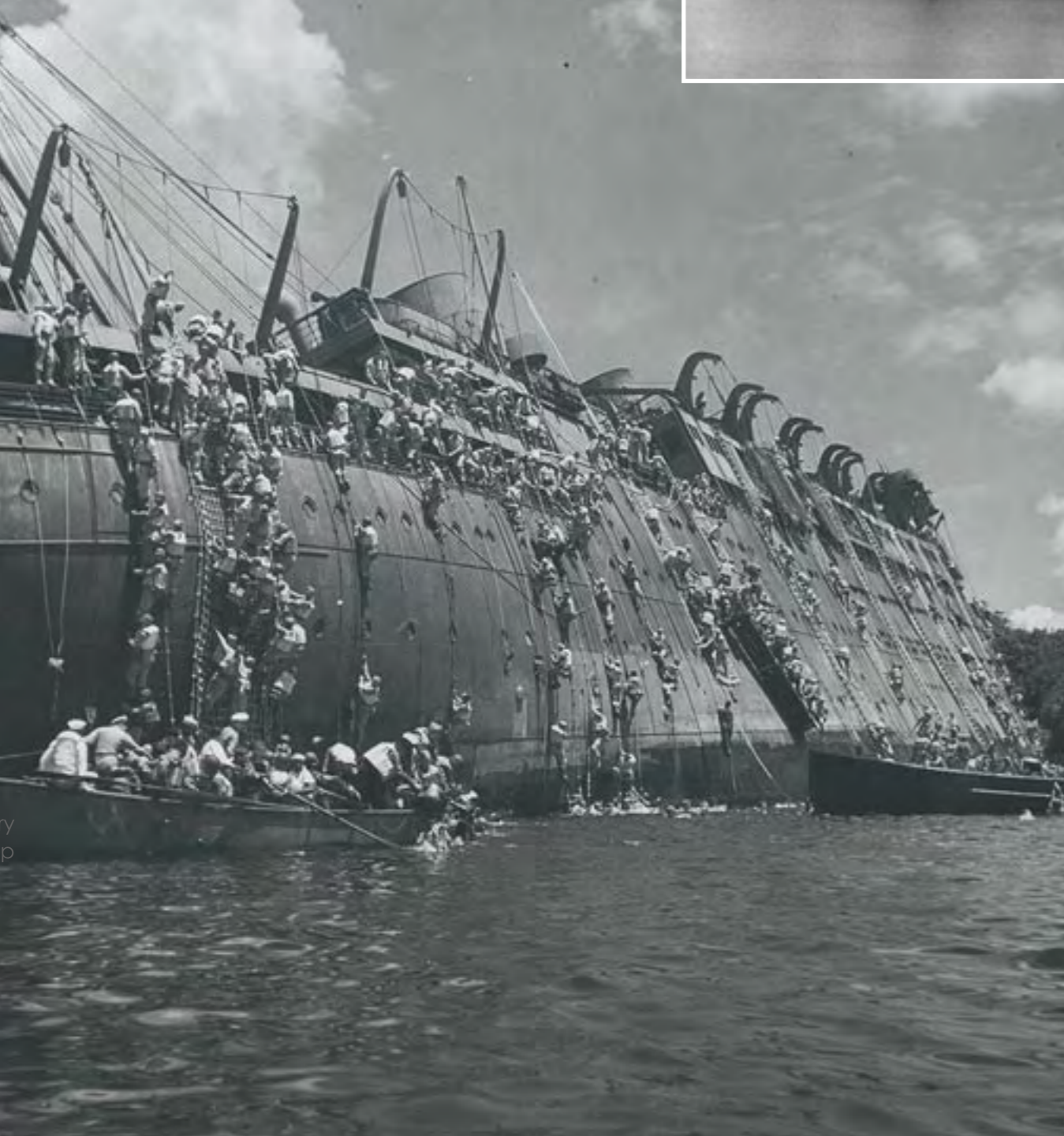


*President* is her good state of preservation even after more than 50 years on the seabed. Twice a day, avid wreck divers explore this 'Titanic of the shallows'. Through the hull—which has been opened up several times for salvaging operations—the divers swim into a living museum full of helmets, gas masks, guns and china. Divers look for the barbershop, the post office or the huge machine room. They take pictures of the several guns that were supposed to protect the ship from the Japanese threat she never met. They dream about the peaceful time when rich passengers were swimming in the multi-coloured swimming pool that now rests at 55m. Then

CLOCKWISE FROM LEFT: The anchor; Artist's rendering of the wreck; The bow. INSET: One of the jeeps in the first cargo hold



# SS President Coolidge



View of the swimming pool aboard the wreck. INSET: The SS President Coolidge in its glory days. LEFT: Magnificent lamp fixture on the ceiling of a dining room

shop, multiple smoking rooms and dining rooms. Their immense size—200m long by 25m wide, and weighing in at almost 22,000 tons—made these vessels the biggest merchant ships of the 1930s. Two huge propellers give them the ability to reach 21 knots and the SS President Coolidge went on to hold the speed record in the Pacific Ocean twice. Only a few years later however, the President Hoover would end her life on the shores in Taiwan.

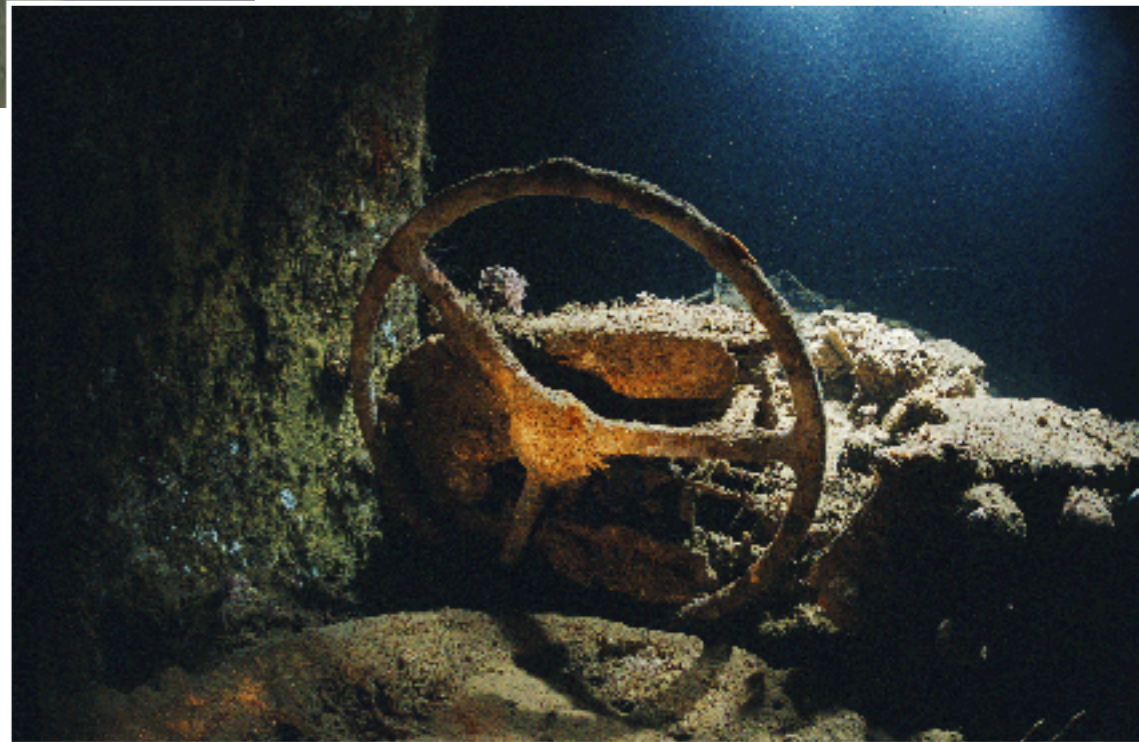
The SS President Coolidge came to a similar end, but not until 1942. She was repainted green. All her precious wooden furniture was removed and guns

they stop and quietly contemplate the symbol of this forgotten cruise liner—a bas-relief that used to be in the first class smoking room named, 'The Lady and the Unicorn'.

**The history of the SS President Coolidge**  
Launched in 1931, during the Great Depression in the US, by Dollar Steamship line (after its owner Robert Dollar!) the SS President Coolidge and her sistership SS President Hoover are among the most luxurious ships of their day. Designed to carry 1000 passengers and 380 crewmembers, they both boasted a gymnasium, a theatre, two swimming pools, a ballroom, a library, a barber-

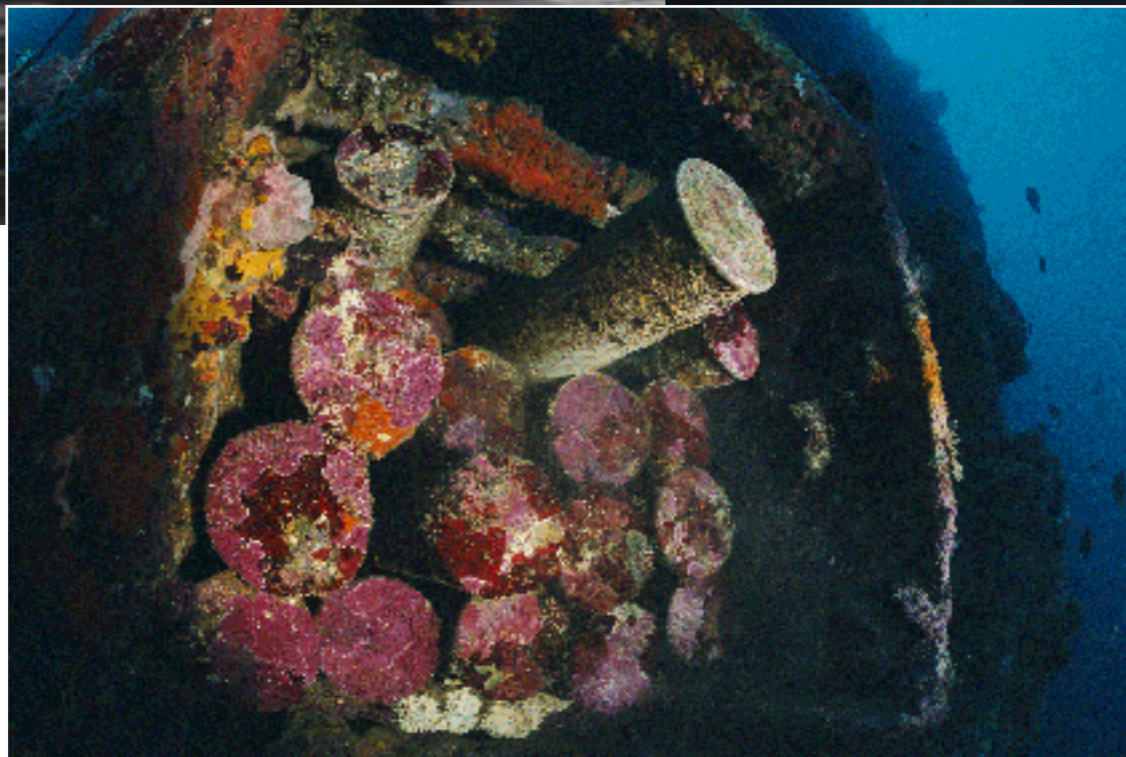
Crew leaving the foundering SS President Coolidge

Steering wheel of submerged jeep





## SS President Coolidge



CLOCKWISE FROM ABOVE: Crew members deserting the foundering SS President Coolidge; The wreck's telegraph and compass; Shells and munitions

and extra toilets were installed. Why? To carry four battalions, light tanks and all the supplies including the malaria drug, quinine, for the Pacific operations. For months, the US Navy tried to prove that her captain (a merchant navy officer) was the main person responsible for the tragic loss of the ship, strongly refuting the fact that no information about the new minefield was ever sent to the ship.

Only an Artillery officer and a fireman was killed, the rest of the passengers calmly waited to climb into a rescue boat or

simply climb down a ladder and walk to the beach.

The minefield never hurt any Japanese targets, but sank an American destroyer, the *USS Tucker*, just a few weeks before they caught the *SS President Coolidge*. At the end of the war, various Australian and French companies salvaged the two shipwrecks for their propellers and contents in their cargo holds.

### The Americans in the New Hebrides

200,000—That's the number of

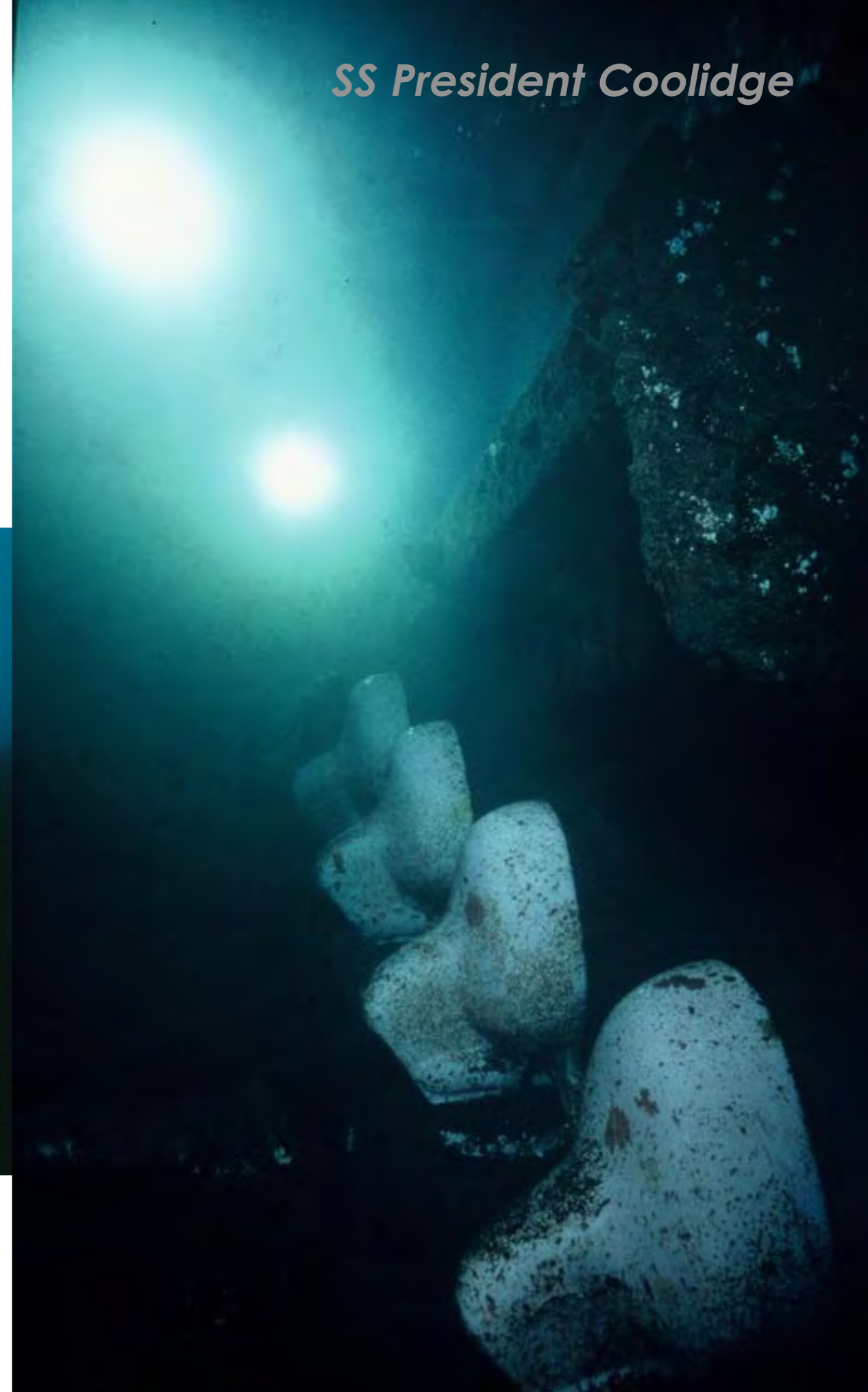
US soldiers who were sent down through Luganville, the main city of Santo Island, in 1942. Before the invasion, Luganville used to be a small trading post with a few hundred inhabitants. But in just a few months, the troops built up an entire city, with a square grid of streets full of jeeps. As the main base for the US Army in the Pacific, Santo became the starting point of all the military operations around Guadalcanal and the Solomon Islands. Fifty years later, almost everything is still there: buildings and Quonset huts (standard



# wreck rap



CLOCKWISE FROM TOP LEFT: Medical artifacts on the wreck; Divers' lamps shed light on secret areas of the wreck; Remaining quonset huts of the once bustling US military base on Santo are now used for workshops; Stern of the *SS President Coolidge*



## SS President Coolidge

size: 30 x 12m) are now used as workshops. Commercial airlines took over the airport that was used by the Corsair fighters. But at the end of the war, all the trucks, jeeps, cranes and forklifts of the US Army were dumped into the sea, as they became useless and too expensive to bring back to the US.

This dive site, now known as Million Dollar Point, is an impressive pyramid of vehicles from 40 metres deep up to the surface. Nature came back and lots of fish swim between tires, trailers, half-tracks and bulldozers—a very strange vision of American logistics, fully appreciated by the tourists to whom the locals kids sell small bottles of Coca-Cola they've apparently found in this huge historical junkyard. ■



### About the Author

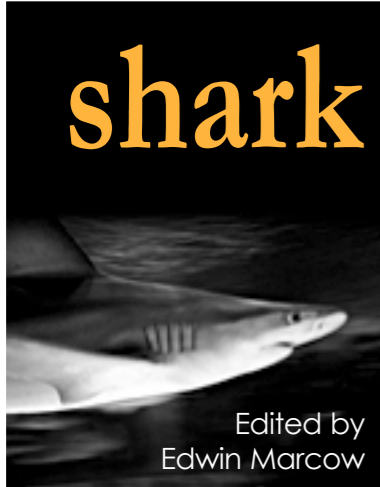
Cedric Verdier is the founder of the TRIADE Project, established in 1999, discovering and exploring more than 20 virgin wrecks located in the south of France between 70 and 130m (230 ft) and 430 fsw. In 2002, he was the first diver to identify and dive the British cruiser *HMS Manchester* off Tunisia. Amongst

other dive firsts, he pushed the limits of the Sra Keow cave in Thailand in May 2006, using his Megalodon Closed Circuit Rebreather, to an Asia-Pacific cave depth record of 201m (660 ft). He is currently planning the Yamashiro Project, an international expedition aiming to dive the Japanese battleship *HIJMS Yamashiro* sunk in the Battle of Leyte in the

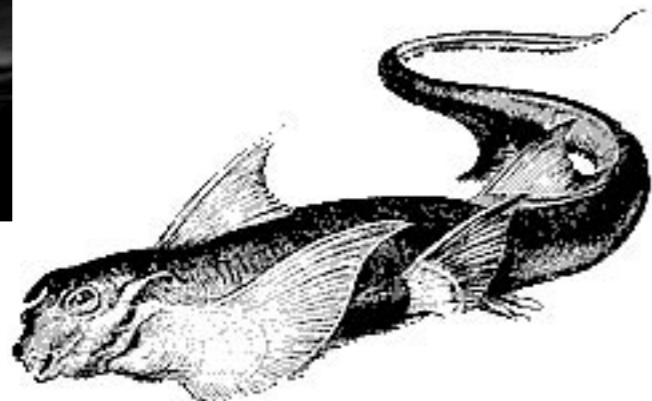
Philippines in November 1944 and resting at a depth of 200m (660 ft). Cedric is a PADI Course Director and a Trimix Instructor Trainer for IANTD, PSAI, ANDI, DSAT and TDI. He spends most of his time teaching cave and mixed-gas rebreather courses at the diver and the instructor level. He is a past Regional Manager for PADI Europe and DAN and has written five books and more than 150 articles about diving. As he is always travelling all over the world, you can mainly contact him by email at: [info@cedricverdier.com](mailto:info@cedricverdier.com) or visit his website at [www.cedricverdier.com](http://www.cedricverdier.com)







Edited by  
Edwin Marcow



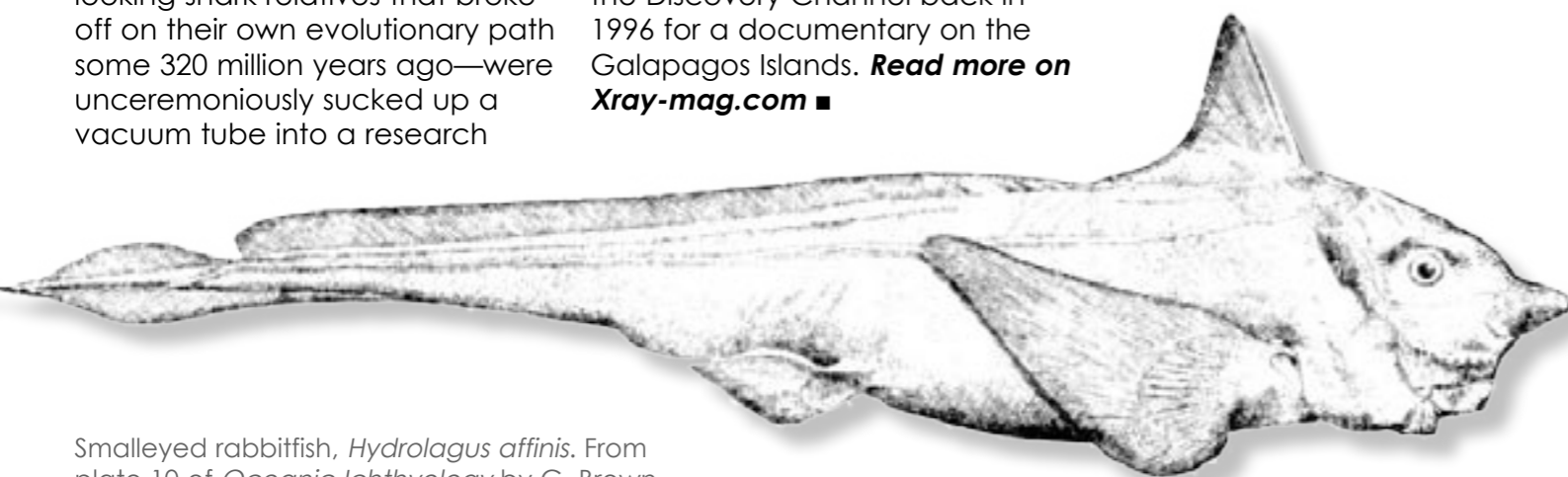
## New Kid On The Block!

320 million years in the making, having swum the ocean depths before the beginning of time, and an incredible further 12 years of research to positively identify and match these two new species—the two fish in question are the Galapagos and Whitespot Ghost shark discovered near the Galapagos Islands in 1995 and found at a depth of plus 1,200 feet. "It's amazing what you find lying around the bottom of the ocean," as St. Mary's College Professor Douglas Long has discovered.

The two deep-sea fishes—odd-looking shark relatives that broke off on their own evolutionary path some 320 million years ago—were unceremoniously sucked up a vacuum tube into a research

submarine. Professor Long and his team of researchers then spent more than a decade ensuring these two new species were exactly that, before publishing their results in the journal *Zootaxa* in October and December 2006. Among the first to see these new species was John McCosker who found the Galapagos Ghost Shark on his 50th birthday in honour of his new scientific find, the fish was named *Hydrolagus mccoskeri*.

More than a dozen new species were documented on this same expedition, along with the Ghost and Whitespot Shark funded by the Discovery Channel back in 1996 for a documentary on the Galapagos Islands. **Read more on [Xray-mag.com](#)** ■



Smalleyed rabbitfish, *Hydrolagus affinis*. From plate 10 of *Oceanic Ichthyology* by G. Brown Goode and Tarleton H. Bean, published 1896

## The passing of Ralph

It is with great sadness I report that Ralph, one of four whale sharks housed at the Georgia Aquarium who was profiled in the last Sharktales, died suddenly on Thursday, January 11th.

Ralph stopped swimming on Thursday and was quickly moved to another part of the aquarium. There, staff tried to revive him, but he lost his fight for life some eight hours later. 15 specialists performed a necropsy on Ralph's remains to try to determine the cause of death. This is the first time this procedure has been performed in the US.

Ralph's remains were later cremated. This tragedy follows less than two weeks after the death of the aquarium's Beluga whale, Gaspar. **Read more on: [Xray-mag.com](#)** ■

EDWIN MARCOW



## They're coming cloooser

"Close to 100 bull sharks were sighted near to the shore along the St. Lucie County Coast Florida," reported the local sheriff's department. It appeared that this mass gathering were stalking baitfish close to the shore. It has also been noted that along this coast from Daytona Beach to Palm Beach, sharks are preying on baitfish from the Indian River Lagoon's inlets to warmer waters near the Gulf Stream. A number of warnings were given to people from a PA on a circling helicopter to keep their distance.

In the previous edition of Shark Tales, I mentioned the theories of Michael Brown of Australia who stated that as global sea temperatures rise, this could bring sharks closer to shore—thus closer to humans, resulting in tragedy.

However, all evidence is still anecdotal, and one cannot jump to conclusions based on individual cases such as those in Florida.

### Climate change

Michael Brown is not alone in his thinking. "Climate change could cause those sharks that pose the highest risk to humans—including The Great White, the Bull and the Tiger—to travel further south and feed more voraciously," said Terry Walker from the Department of Primary Industries Australia. "The implication is, when waters are warmer, they tend to feed more voraciously or are more active... I don't think the temperatures of the water have changed enough for that to have happened

yet," said Dr Walker.

For those scuba divers who don't like sharks and are about to hang up their scuba gear, you can take comfort that shark attacks along the Florida coast are substantially lower than the 2000-2003 average of 33 attacks according to the Florida Museum of Natural History. In Cape Town, South Africa, at Muizenberg beach—a popular beach with swimmers and surfers—Great White sightings are down a staggering 65%.

For now I think the jury is out. ■



Bull Shark

FISHBASE.ORG





# Preservation Issues

Critically endangered and overfished in the Atlantic oceans, the Spiny dog fish and the Porbeagle sharks are considered critically endangered. The Shark Alliance is placing immense pressure on the European Union to follow scientific advice on the precarious future of these two fishes' futures.

Their mission is to get all EU

states to adopt and support Germany's proposals to list these two species on the CITES list and to further restrict trade of these two fishes under CITES Appendix II.

## Collapsing populations

Sadly, their fate is not alone. Coral Reef Shark populations on the Great Barrier Reef are in

tragic collapse, Australian scientist William Robbins at James Cook University has remarked. Grey Reef Shark numbers have fallen by around three percent of unfished levels. Their numbers are declining so fast that within 20 years, they could collapse to 1/1000 of unfished levels. "Reef sharks are effectively on a fast

track to ecological extinction becoming so rare, that they will no longer play their part in the ecology and food web of the reef," stated Robbins.



Face of spiny dog fish



NOAA



NOAA

Far Left: Spiny dog fish being handled during one of NOAA's surveys.

Left: Porbeagle shark

More depressing news is that about 100 decapitated shark heads were washed ashore at Erton, putting the little town on the map. A commercial fishing boat operating in local waters is suspected of committing this barbaric act.

## On a lighter note

In all this depressing news there is some good. From April 2007, within a 200 nautical mile zone around New Zealand, Great White sharks currently included on the CITES Appendix II will be protected

from fishing by NZ flagged boats. Anyone violating this law will be fined NZ\$250,000 and face up to six months in prison. It will be illegal to hunt, kill, or harm a Great White shark within this exclusive economic zone. It will also be illegal to either possess or trade any part of a Great White shark. ■

## Meet Your Cousin Shark

Researchers from Singapore and the States have made a surprising discovery. We humans and the Elephant shark found in the oceans around New Zealand and Southern Australia, share an astonishing large amount of DNA. This could potentially have far reaching implications in the future for medical research and treatments. DNA in the human genome controls genes that produce proteins that are fundamental to the body's development. Any disruption in the

control of these genes is believed to be the cause of many human illnesses.

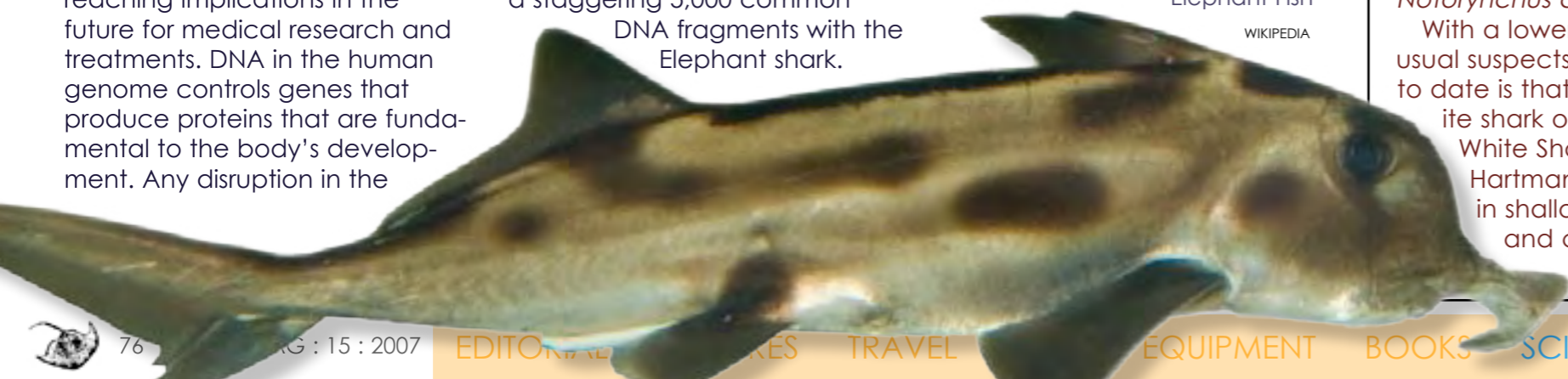
The teams from Singapore's Institute of Molecular and Cell Biology and the J Craig Venter Institute began their research last year and found that we share a staggering 5,000 common DNA fragments with the Elephant shark.

"It will take at least two more years to sequence the entire shark genome," said Associate Professor Byrappa Venkatesh.

Could man and the Elephant shark be closer than we think? ■

Australian Ghost Shark or Elephant Fish

WIKIPEDIA



## Hell at Bells... (why you should dive, not surf)

At Bells beach in Victoria, Australia, 25-year-old surfer Peter Galvin was attacked 100 metres from shore as he sat on his surfboard with his feet dangling over the sides of his board at dusk. The suspected culprit is the lesser known Sevengill Shark, *Notorynchus cepedianus*.

With a lower profile than the usual suspects, its greatest claim to date is that this is the favourite shark of legendary Great White Shark wrangler Andre Hartman. It is found mostly in shallow waters, bays, and close to shore in Australia, South

Africa, Namibia, and the Pacific. The Sevengill can grow up to four meters in length. With its distinctive broad head and unique seven gills, this very active and sometimes aggressive shark will cruise near the surface.

## Mistaken identity?

Capable of sudden bursts of speed and power, the Sevengill feeds on salmon, anchovies, smaller sharks and eagle rays. One can only guess that at dusk this was a case of mistaken identity.

Senior Constable Lisa Kennedy of Torquay Police said, "He was

sitting on his board with his legs dangling over the side and the shark came up from underneath and grabbed his leg in the calf and thigh area." A chunk was also taken out of his surfboard, and the unlucky victim was left a tooth in his wetsuit as a memento!

Another surfer helped Mr Galvin to shore where paramedics treated him. Mr Galvin sustained very large lacerations to the back of his knee with gaping wounds. "It appeared that the shark mauled him rather than bit him," reported one of the attending paramedics. ■





## Books Film DVDs CDs

Edited by Peter Symes  
& Michael Symes

POINT & CLICK  
ON BOLD LINKS



### Whales' Angels

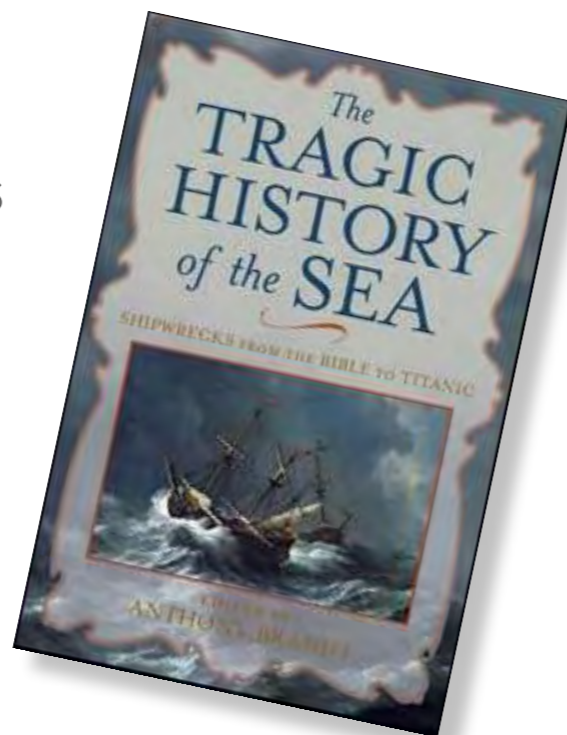
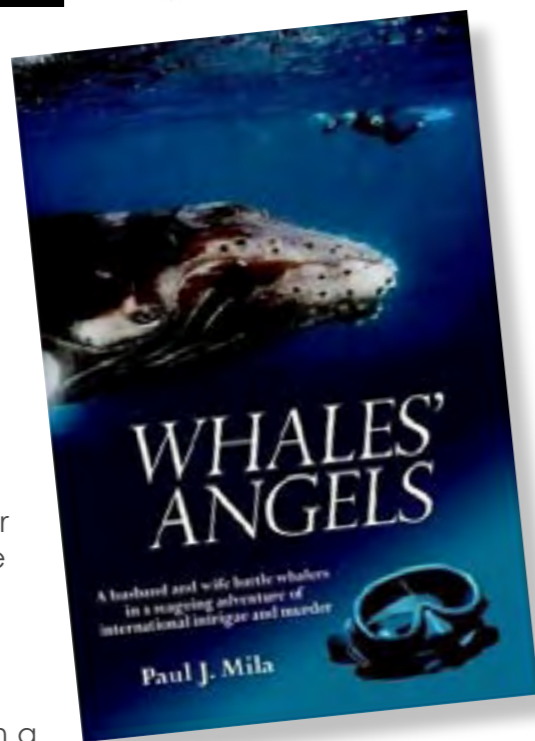
*A seagoing adventure of international intrigue and murder*

By Paul J. Mila  
Publisher: AuthorHouse  
Book Publishing Company

ISBN: 9781425939373  
Paperback: 268 pp.  
Price: US\$15.99

Newlyweds Terry Hunter and ex-NYPD detective Joe Manetta are busy running their Cozumel dive operation and starting a family. But a chance encounter with a female diver from Holland leads them on a globetrotting adventure. While diving with humpback whales in the Dominican Republic, they learn a rogue sea captain is illegally hunting whales and killing activists attempting to stop the hunt.

But far more dangerous for the whales is a conspiracy led by Japan, Iceland, Finland and Norway, to overturn the International Whaling Commission's whaling ban at the Commission's upcoming meeting in Iceland. Terry and Joe travel to Iceland offering their assistance to save the whales and solve a cover-up reaching the highest levels of government. Their involvement entangles them in a dangerous world of international politics, intrigue, and murder, where fate has a surprise in store for them. **Amazon.com**

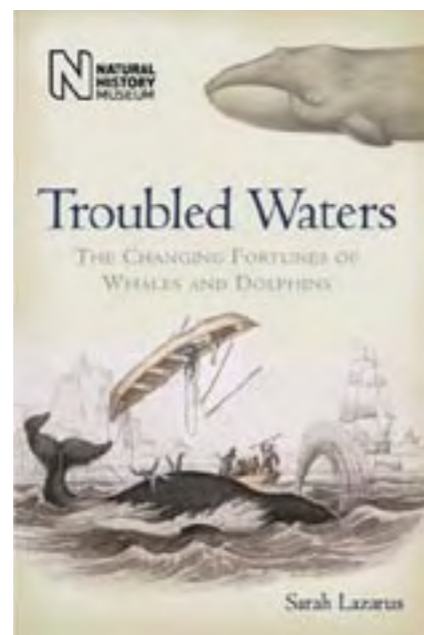


### The Tragic History of the Sea

*Shipwrecks from the Bible to Titanic*

Edited by Anthony Brandt  
Publisher: National Geographic Books  
Hardcover: 329 pp.

List Price: US\$24.00 Sale Price: US\$17.52  
The editor has compiled 29 tales of shipwrecks from the past 2,000 years. Each true story is reproduced in its original form, with an introduction by Brandt. The Tragic Story of the Sea makes a welcome addition to the library of historians and landlubbers alike. **Amazon.com**



### Troubled Waters

*The changing fortunes of whales and dolphins*

By Sarah Lazarus  
Publisher: Natural History Museum, London  
Hardback: 224 pp, 8 pp colour section plus scattered b&w illustrations  
ISBN: 0 565 09192 1  
Price: GB£12.99

Dispelling common misconceptions – are dolphins really supernaturally intelligent? Are the great whales in danger of extinction? – and opening up current arguments, this gripping investigation explains just why whales and dolphins became one of the major harvests of the sea, and how humans are destined to affect their future.

For centuries, whales and dolphins were

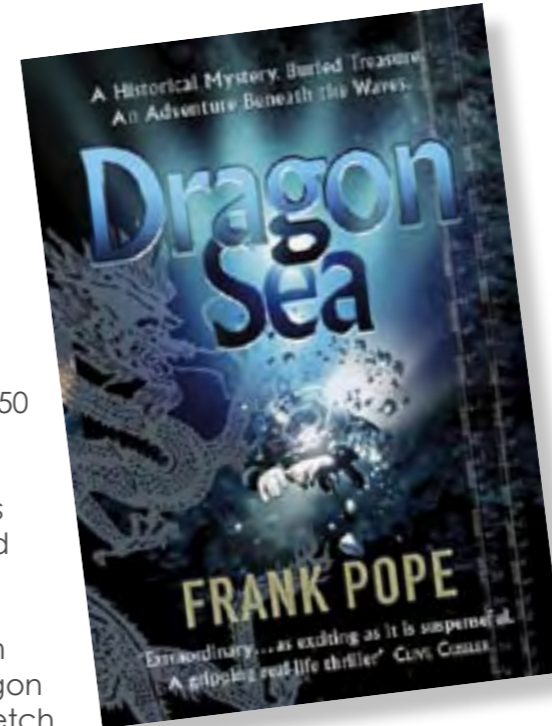
### Dragon Sea

*A true tale of treasure, archeology, and greed off the coast of Vietnam.*

By Frank Pope  
Publisher: Harcourt  
Hardcover: 368 pp.  
ISBN-10: 0151012075  
Sale Price: £11.66 / \$16.50

#### Amazon.co.uk

In this gripping true thriller the author takes us inside the daring bid to raise the precious sunken cargo of 15th century porcelain from the depths of the Dragon Sea, a treacherous stretch of water off the coast of Vietnam. The tale of the dramatic deep sea recovery of the cargo from the Hoi An wreck has a cast of compelling characters. Renowned Oxford archaeologist Mensun Bound teamed up with a financier, a crew of hardened saturation divers and the Vietnamese military in a test of ingenuity and resolve. The stakes were high, but so were the potential rewards. If they could survive the threat of typhoons and pirates, Bound would have the chance to discover a lost era in Vietnamese civilisation, and his backer stood to make millions at the auction block. This is a page-turning real-life thriller packed with danger, adventure and ambition. It is a fascinating object lesson in what happens when scholarship and commerce combine in the recovery of lost treasure. **Amazon.com**



### Giant Stride

Divers Alert Network (DAN) will launch a new edition of Giant Stride, the organisation's publication aimed at prospective, student and new divers, in early 2007. Giant Stride introduces new divers to the sport through information, stories and safety tips.

Each student enrolled in DAN's Student Membership Program will receive a complimentary copy of Giant Stride. The publication is also available for distribution to all dive centers and instructors at no cost.

The magazine covers such topics as an introduction to scuba, what to expect during training, resources at a diver's disposal, dive safety and etiquette, profiles on divers who have made the sport their careers or hobbies and common medical issues of interest to new divers. Giant Stride is scheduled to be published once a year and is distributed throughout the dive industry.

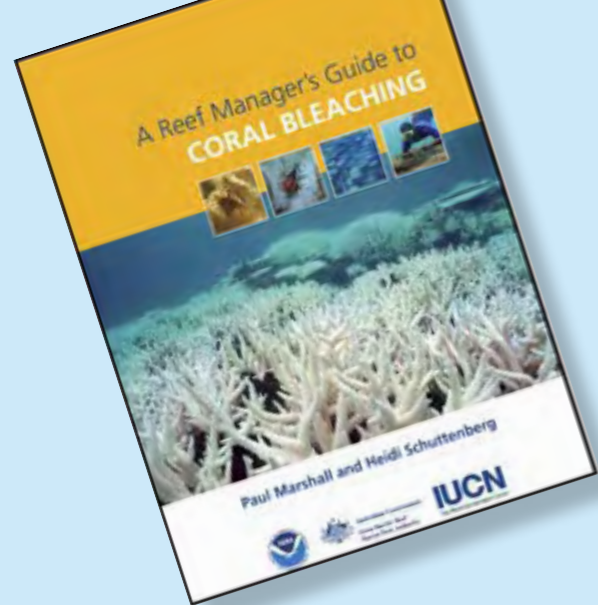
Divers Alert Network (DAN) is a non-profit medical and research organisation dedicated to the safety and health of recreational scuba divers. The Student Membership Program is open to all entry-level divers, and any certified scuba instructor in the DAN Americas region may enrol their students. A new DAN Is My Buddy DVD is available to all instructors for use in their classes.

A new interactive website, [www.danismybuddy.com](http://www.danismybuddy.com), was created to answer questions and concerns commonly expressed by new divers and to provide excitement and information when a new diver wants it most.

For more information or to request materials, please call (919) 684-2948.







## A Reef Manager's Guide To Coral Bleaching

Mass coral bleaching events have increased in frequency and severity over the past two decades associated with anomalously high sea surface temperatures. These events have produced wide-spread coral mortality and significant ecological, social and economic impacts to coral reefs and the communities that depend on them. What can local coral reef managers do to address coral bleaching events?

The Reef Manager's Guide provides information on the causes and consequences of coral bleaching, and management strategies to help local and regional reef managers reduce this threat to coral reef ecosystems.

Produced by the National Oceanic and Atmospheric Administration (NOAA), the Australian Great Barrier Reef Marine Park Authority (GBRMPA), and the International Union for the Conservation of Nature (IUCN), the Reef Manager's Guide includes contributions from over 50 experts in coral bleaching and coral reef management from 30 organisations.

For hard copies contact:

[BleachingGuide@noaa.gov](mailto:BleachingGuide@noaa.gov)

[info@gbmpa.gov.au](mailto:info@gbmpa.gov.au)

[books@iucn.org](mailto:books@iucn.org)

For more information contact:

[Paul.Marshall@gbmpa.gov.au](mailto:Paul.Marshall@gbmpa.gov.au) or

[Heidi.Schuttenberg@jcu.edu.au](mailto:Heidi.Schuttenberg@jcu.edu.au)

DVD

## Facing Darkness

A film by Nathalie Lasselin

This film is a documentary about caves and cave diving. In the Peacock cave system, like in most of the cave system, passages can be really different from one to the other. Explorers as Sheck Exley, Lamar Hires gave names to these passages. Other explorers dived there hundreds of time to survey and map these systems. With a line and a boussole, just imagine the kind of work done there. Thanks to these people, new cave divers can now travel through these systems in a much more safe way. Productions Pixnat, 2006. 45 min. Price: US\$29.99. [Amazon.com](http://Amazon.com)



## The ShipSinkers

This is a hi-definition video documentary showing the processes of preparation and scuttling ships as part of the world-wide ship reefing programme. Shot mainly on location aboard F69. It is definitely worth getting a copy when its available online. The producers, Sea of Steel Productions, is planning on providing a source for this high definition DVD. ShipSinkers tells the story like it is, with all of the suspense that's there right up to sink time. Happy to take pre-orders via

[shipsinkers@divewreck.co.nz](mailto:shipsinkers@divewreck.co.nz)

## Welcome to Underwater Video Basics

Emmy Award winning Cameraman and

Divemaster Steve Miller provides you with the most comprehensive instructional program for divers who want to take the plunge into the world of underwater video. In this DVD, you'll learn about:

- Equipment Selection
- Camcorder Selection and Operation
- Underwater Housing Operation
- Setup and Maintenance
- Camera Shots and Moves
- Dive Skills and Safety Tips
- Communicating Underwater
- Storytelling Techniques
- Interaction with Marine Life

Publisher: AuthorHouse Book

Publishing Company

Price: US\$29.95 [Amazon.com](http://Amazon.com)



## Saipan diving sites now on DVD

A DVD containing scenes of the many diving sites on Saipan is now available, not merely for the diving aficionados but for everyone who wants to have a memento of the numerous beauty spots on the island. Producer and underwater cinematographer and videographer Mike Tripp recently finished work on the DVD film, called The Underwater World of Saipan. Tripp said his 105-minute interactive DVD provides a picture of the "incredible beauty and bio-diversity of Saipan's underwater world." The DVD, under the Mike Tripp Productions, is now available for US\$25 a copy. Tripp said it is now being sold at the CNMI Museum of History and Culture, PHI Pharmacy in Dandan, CNMI Council of the Arts on Capital Hill, Joeten Susupe and Garapan, Hotel Nikko Saipan, and the Managaha Island Gift Shop.



## Washed Up

*The Curious Journeys of Flotsam and Jetsam*

By Skye Moody

Publisher: Sasquatch Books

Paperback: 240 pp.

ISBN-10: 1570614636

Sale Price: US\$13.22 [Amazon.com](http://Amazon.com)

In late 1990, hundreds of Nike shoes began washing up on the beaches of Vancouver Island and Queen Charlotte Sound. They were relatively new shoes, and local flotsamists amassed a substantial collection of them. There was only one problem: The majority of shoes pulled from the wrack were right-footed. Meanwhile, farther south, in Cannon Beach, Ore., other Nikes were appearing, most of them left-footed. Beachcombers up and down the Pacific Northwest were scratching their heads.

W. James Ingraham and Curtis C. Ebbesmeyer, oceanographers who track flotsam to better understand currents, stepped in to decipher the source of the

ocean

mismatched shoes. A container vessel, en route from Korea to the United States in May 1990, had encountered severe weather in the North Pacific and lost 21 of its containers overboard, five of which held about 80,000 Nikes.

The shoes drifted for more than 200 days, the right-footed ones tacked north-eastward into the Alaska Current, while the left-footers joined the California Current. This "spill of opportunity," although surely a headache for Nike and the insurers of Hansa Carrier, resulted in a boon of data for Ingraham's Ocean Surface Currents Simulation computer model. All this and more is chronicled in Skye Moody's book, who's subject is anything that floats on, sinks in or washes up from the sea: ambergris, seed pods, driftwood, barnacles, beeswax and messages in bottles. She covers Taiwanese propaganda set adrift for the Chinese mainland, beached sea monsters, lost BMWs, floating glass balls and, of course, shipwrecks. ■







Edited by Brian Keegan



A collection of classic regs: Scubapro MK25 and X650, Mares V32 and Abyss, Legend LX ACD, Apeks ATX100, Beuchat VX200, Aqualung Titan LX Supreme, Poseidon Xstream.

# How to choose a regulator



After my very first pool session, I was hooked. Every thought I had circled around diving and dive equipment. I could not wait for my next session. The instructor was a God, and what he said must be true. I was an easy target! By the end of the class, I walked out of there with an Open Water dive certificate and a great deal on a dive package.

**Or so I thought...** Living in Sweden, in the Northern part of the world, the weather is not always at its best behavior and definitely not warm most of the year. I mean, the Polar circle cuts through my home country for crying out loud! A month later, I had my first free flowing experience, and let me tell you, was I glad we practiced that in class! Escorted by bubbles from a lively mouth piece, I made it to the surface. My mind was racing. What can I do to avoid this in the future?

Well, the almighty instructor said that with a different breathing and handling technique, I could avoid these incidents in the future, and he was right; there are things you can do to avoid freezing regulators, but they are not bullet proof. Trying not to reveal my age, it was back when only a few regulators were made to withstand arctic temperatures. Poseidon was one of them and still going strong. Most regulators were made for diving environments like the Mediterranean Sea, which even during winter provides a different water temperature than the cold lakes and the Baltic Sea up north provide us Viking-spirited divers.

Today, you will find a number of high-quality cold water environmentally sealed regulators on the market. Most of them meet the European standard (EN250) for cold water—a standard you can use when choosing your weapon of arms.

Text by Millis and Brian Keegan





*“What kind of diving will you be doing, and in which environment are you going to dive?”*

First, ask yourself

# What kind of diver are you?

There are different kinds of regulators. While the basic function is to provide you with air, you will find that there are different regulators for different kind of activities. We will go through what you need, step by step. The first thing you need to decide is what kind of diving you will be doing and in what environment you are going to dive. This is perhaps the most important piece of your dive equipment and nothing to be rushed into.

## What kind if diver are you?

What environment are you going to dive? Identifying your needs will help you choose the right regulator for your activities.

### Are you a Warm Water Diver?

A warm water diver is someone who dives only in warmer water temperatures who does not require extreme measures to be safe and comfortable while diving. According to the EU norm cold water diving begins when the temperature of the water is equal to or drops below 6°C (50° F).

### Then choose:

While it never hurts to buy the best equipment you can, under those circumstances where there is no risk, at any time, that your regulator will freeze while breathing—it is not necessary to buy a top-of-the-line regulator.

### Or a Cold Water Diver?

When diving in cold water, it's vitally important that you use regulators designed for cold water. You will be looking for both a first stage that limits formation of ice, as well as second stage that doesn't freeze in an open or closed position when the warm moisture in the diver's breath touches the cold regulator.

### Then choose:

This should go without saying—use regulators designed for cold water diving! Look for regulators that meet the EN250 standard for cold water performance. Cold water regulators are either environmentally sealed or use something called a 'heat sink'. A heat sink uses the cold water to 'warm' the first stage, which limits the formation of ice. By default, cold

### Can I use a cold water regulator in warm water?

Yes. A regulator designed for cold water is by necessity a top performance regulator that can handle the most extreme conditions. Any good quality regulator from a reputable dealer will provide you with air in a safe way, when diving in warm water.

Regulators

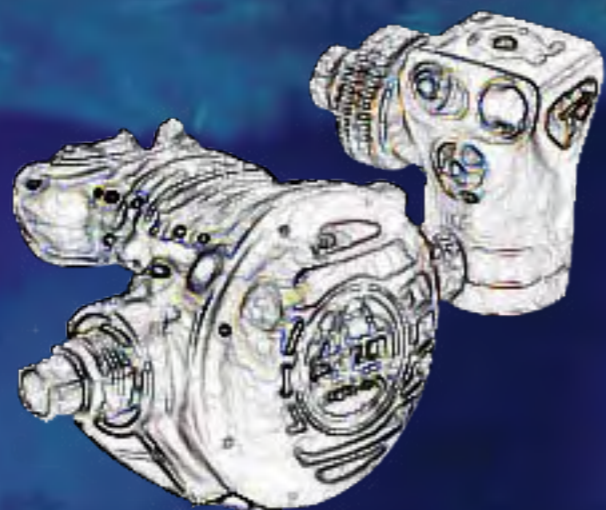


### Heat sink:

Many piston regulators utilize some heavy metal parts, like the spring or part of the body to transfer warmth from the water to help keep the water around the piston from freezing.

### 200bar (2900psi) or 300? (4350psi)

SCUBA tanks come in a variety of pressure ratings from around 200 to 300 bar. Different pressures are common in different countries.





# tech talk

water regulators are high performance regulators.

## Are you considering Nitrox?

A recreational nitrox diver is a diver that uses nitrox during a dive for a safer dive, by using the air tables. When diving with the gas mix nitrox, there are certain things to consider. You will dive with a higher content of oxygen in your tank, which is a flammable gas, and you need to adjust your equipment for this.

## Then choose:

First, make sure you are trained for nitrox diving. Dealing with nitrox means dealing with a risk of explosion, albeit small. Your dive equipment needs to be grease free. Because mistakes can be made in mixing the O<sub>2</sub> and air to get the appro-



## DIN or Yoke? Which is better?



DIN connectors are rated at 200 and 300 bar / 3000 and 4500 psi (ISO12029-2) and yolk connectors are rated at 230 bar / 3450 psi (ISO 12209-1). Also DIN connectors provide a sturdier connection, drop a SCUBA package on the first stage and it can come dislodged from the valve.

# Which brand?

Sorry, but here is no straightforward answer. There are a lot of great regulators on the market and an almost bewildering variety. Look for well reputable makers, narrow down the choices and concentrate on them. Do your research and don't be afraid to ask questions when you shop around.

priate mixture, each tank needs to be analyzed for O<sub>2</sub>.

Most new high performance regulators are either nitrox-compatible or ready for nitrox use, with a DIN or yoke first stage.

## Ask your local dealer

At this stage, you should now be concentrating on details like comfort and airflow. If the sales person tries to baffle you with

technical phrases and fancy words, call him/her on it and have them explain. That is what they are there for, and one good reason to spend your money in a dive shop instead of shopping online.

## Don't be cheap

To think cheap can be costly. There are sometimes huge price differences on dive equipment in different parts of the world, and although you might be tempted to save money while traveling, don't do it unless you have done your research before the trip. If you do buy a regulator made overseas, stick to an international brand, or you could be in for an expensive surprise when it is time for service. Sure, your regulator was a find, but if your new find is not sold in your country, it is quite possible that you won't be able to find a service technician trained for that brand in your neck of the woods. On top of that, if you do find someone, the parts might have to travel overseas as well. You do the math. Make sure you know what brands sell in your country, and if the warranty is valid in your home country, before going on a shopping spree. ■

## A few points to check

Does the second stage feel comfortable? Is the mouth piece a good fit for you? Bear in mind the mouthpiece can be changed. Consider the dental ones

Is the second stage heavy, does it "drag" in the corner of your mouth. Details like that can get real old real quick, believe me.

Do you want to be able to adjust your second stage air flow?

If you do do, can you handle the adjustment easily, with and without gloves?

Will you travel with your equipment? Include weight and size in your requirement for a good regulator.

Does the regulator come with a warranty? And if so what is covered. Can your regulator be serviced regularly?

If the second stage feels like dragging, perhaps try one with a different hose configuration.



*Can you handle the adjustment easily, with and without gloves?*



who said drysuit diving wasn't hot?



product shown:  
drybase: ultra fast  
wicking base layer

**fourth element**  
don't you deserve to dive warmer?

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





# How does it work?

*and what differentiates regulator from another?*

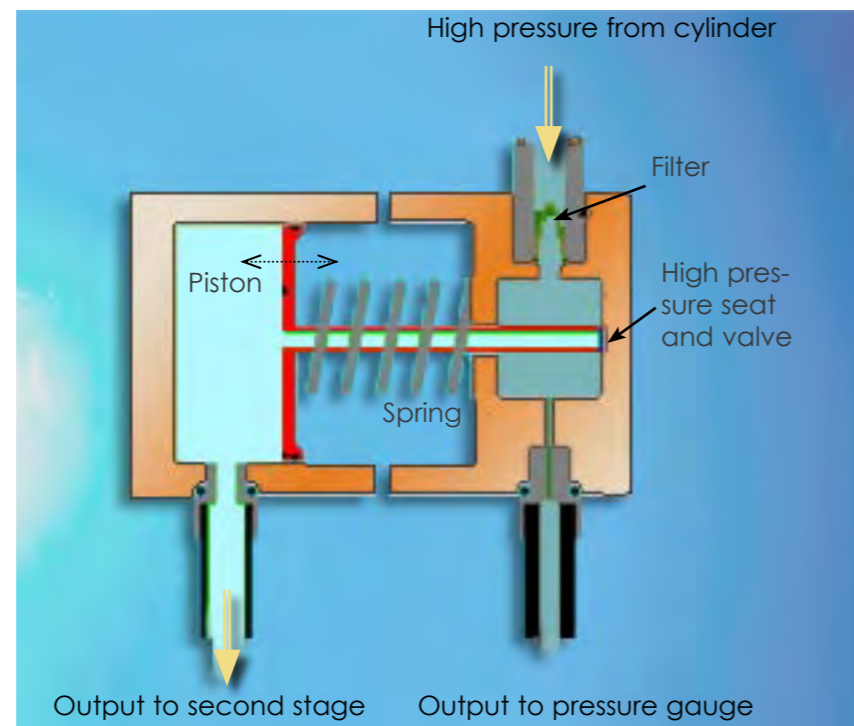
**First stages can process very large volumes of air. At 200 Bar some can process much more air in one minute than most scuba tanks hold. So how does the regulator transform that high pressure air to a steady supply of ambient pressure air when you need it?**

It's a two step process and your regulator has two parts or stages to do the job. The part you attach to your tank valve is called the first stage. It's job is to supply air at a fixed pressure above the ambient pressure. The second stage uses this to supply you with breathable air on demand.

There are two main types of first stages, the piston and diaphragm.

**The balanced piston first stage**  
The piston first stage has a piston that has a sharp knife edge that seals against a high pressure seat. A spring and the ambient pressure push one way against the piston and try to move the knife edge of the piston away from the high pressure seat and let high pressure air flow through the piston to the intermedi-

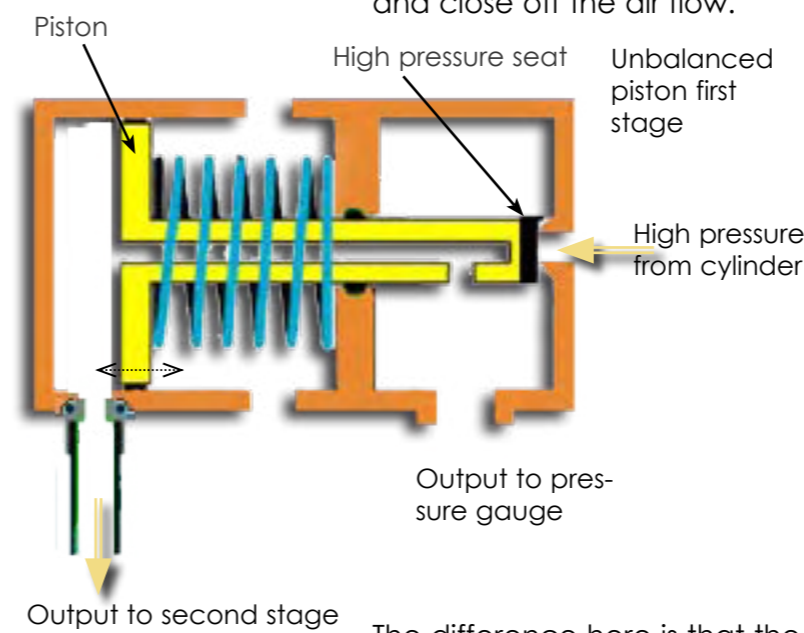
ate pressure side and down the hose to the second stage. When the pressure on the intermediate side gets high enough, its force against the other side of the piston overcomes the combination of the spring and ambient pressure, and the piston slides so that the knife edge once again seals against the high pressure seat and cuts off the air flow.



Balanced piston first stage

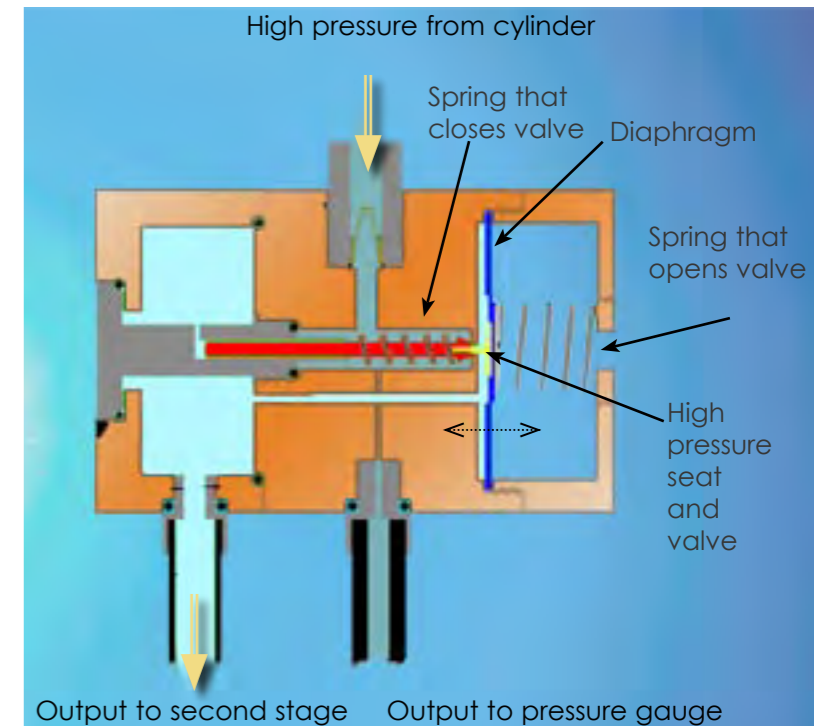
Piston-type first stages are simpler to make than the diaphragm type. They provide higher performance when breathed at depth. They need more careful maintenance because some of the internal moving parts are exposed to water and contaminants in the water

**The unbalanced piston first stage**  
In an unbalanced piston first stage, the high pressure seat is mounted in the end of the piston shaft and seals against the knife edged orifice through which the high pressure air flows. As you see in the diagram—just like in the case of the balanced piston—the spring and ambient pressure act to move the piston and open the flow of air and the intermediate pressure acts to move the piston the other way and close off the air flow.



The difference here is that the high pressure air is pressing against the high pressure seat and is helping the spring and ambient pressure to move the piston and open the flow of air. The problem is that this force varies as the tank pressure changes. As the tank pressure drops during the course of the dive, it takes less and less intermediate pressure to close off the air flow. This is what makes it unbalanced. Since the second stage is built to work with one specific intermediate pressure, as the intermediate pressure drops in the regulator, it gets harder to breathe.

**The diaphragm first stage**  
The diaphragm first stage has a flexible diaphragm that separates the internal parts from the surrounding water. On the water side, the water pressure and a spring provide a force to help open the valve. When you breathe and the intermediate pressure drops, the spring and water



Diaphragm-type first stages are more complex and have more components than the piston type. They are more responsive; they provide gas when the diver uses little inhalation effort

pressure flex the diaphragm in and lift a poppet. Depending on the model of the regulator, the poppet has either the knife edge or the high pressure seat. The air flows until the intermediate pressure and a small spring on the same side win the battle and reseat the poppet.



### Ports!

There are high pressure ports for pressure gauges and low pressure ports for most everything else. In some older regulators the ports were the same size. Don't put a low pressure hose in a high pressure port!

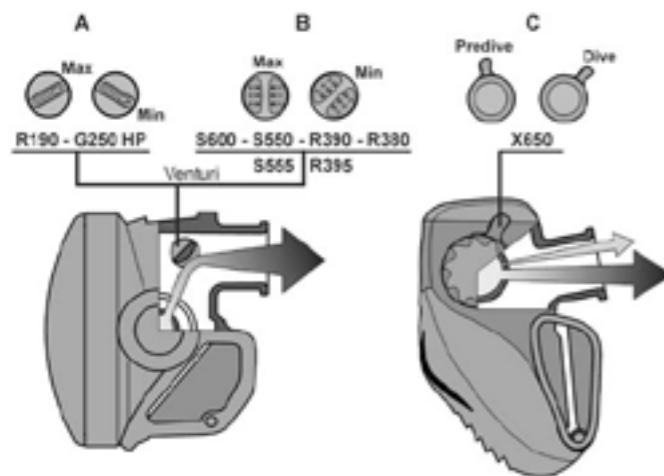






## The Second Stage

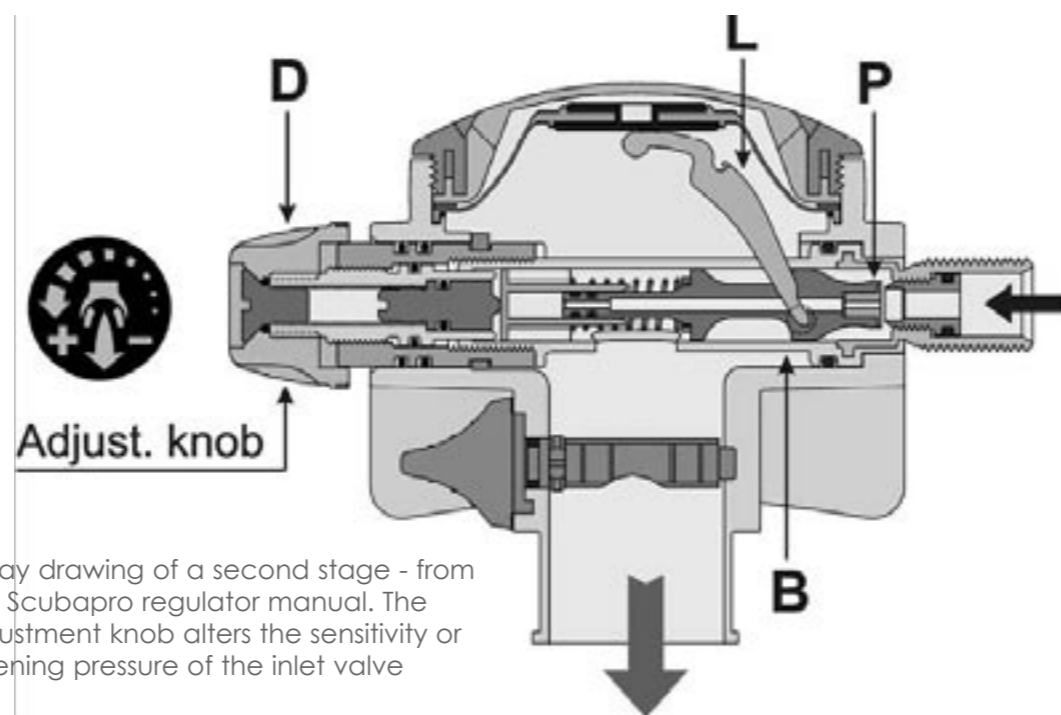
The second stage's job is to take the intermediate pressure air that comes from the first stage and deliver it to you at ambient pressure when you demand it. There are a variety of basic designs of second stages. In the most common design, when you inhale, the drop in pressure inside the second stage draws in a large, flexible diaphragm. The diaphragm depresses a lever that acts to move a low pressure seat away from a knife edge and allow air to flow. When you stop inhaling, the air flow allows the diaphragm to return to its original position, and a spring presses the low pressure seat against the knife edge around the inlet orifice. When you exhale, an exhaust valve allows the exhaled air to flow out.



## Air on demand

Even though there are other variations of basic second stage designs, one of the characteristics that all modern designs share is that they have demand valves that only deliver air on demand instead of a constant flow of air. Most, called downstream valves, are designed to free flow if supplied with excessively high pressure air. That might not sound so good but considering that the alternative is that the valve slams shut and will not open it's

not so bad. Some models, from Poseidon for instance, are upstream valves. Their diaphragm activates a very sensitive pilot valve. The airflow from this pilot valve opens the main valve. At the end of the breath the pilot valve is closed by a very small spring and the closing of



X-Ray drawing of a second stage - from the Scubapro regulator manual. The adjustment knob alters the sensitivity or opening pressure of the inlet valve

Medium pressure from 1st stage

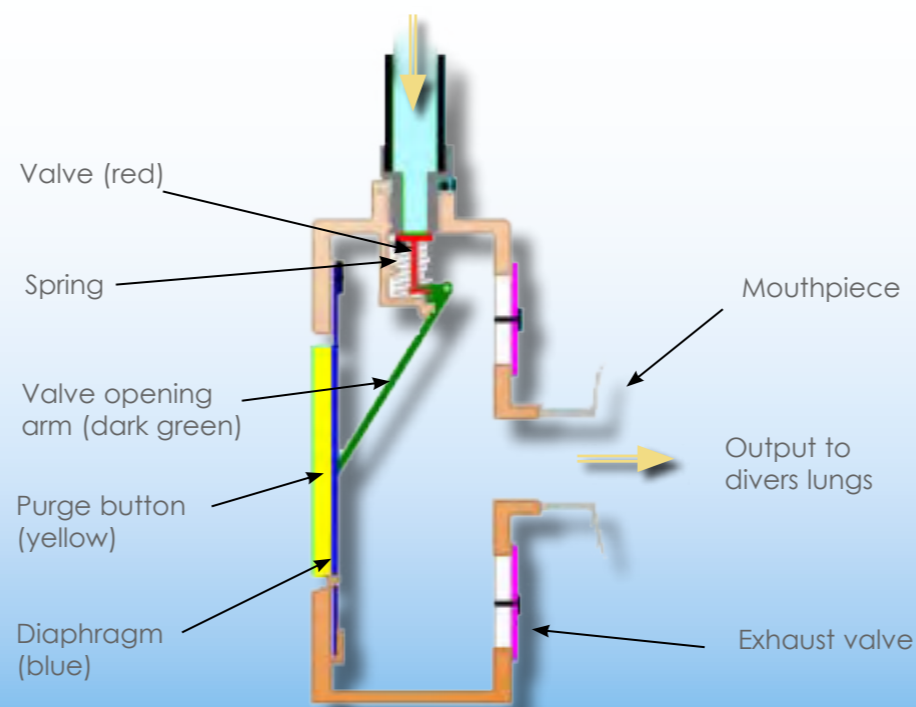


Diagramme over a second stage

## Venturi Effect

All the manufacturers that use it have their own clever name for it, but the principle is the same. With this venturi or vacuum assist effect, once air flow is initiated, it takes little or even less than no effort to continue the inhalation. The way this is accomplished is that the air flow is designed to hold the diaphragm drawn in until the diver stops inhaling.

that valve causes the main valve to close and stop the air flow. They can provide extremely easy breathing but can't handle very high supply pressure. The hoses that come with these second stages have a built in over-pressure relief valve. It is very important that they always be used with the correct type of hose.

## Balanced or unbalanced

Second stages can be balanced or unbalanced. In balanced second stages, air flows through the part that holds the low pressure seat into a chamber at the other end. This helps counteract the force of the air pushing the low pressure seat away from the knife edge. The reduction of this force allows the use of a weaker spring to close off the airflow. The effect of this for you is that the weaker spring reduces the amount of force needed to start the air flowing.

Many second stages now come with external adjustments. Scubapro was the first to provide an adjustment knob for the spring tension that closes the second stage. This can be used at times, such as when entering the water, to increase the breathing effort when entering the water or swimming in a head down position. It can also be used to help stop some

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## One or two hoses?

A twin hose regulator, with a diaphragm first stage, can offer complete environmental and freeze protection—no water comes in contact with any moving parts. They are popular with some photographers, biologists, etc., because the exhaust bubbles are behind your head rather than in front.

types of minor free flow that may develop between servicing.

Some second stages also have a small knob that adjusts a vane or other device that effects the characteristics of the air flow inside the body. In these models the air flow is designed to hold the diaphragm drawn in until the diver stops inhaling. With this Venturi or Vacuum assist effect, once air flow is initiated it takes little or even less than no effort to continue to inhale. This is handy when





# tech talk

you are breathing but can cause the regulator to free flow when it's in the water and out of your mouth. The adjustment allows you, for example, to stop that effect and help prevent free flows when you are at the surface and not using the regulator. Before a dive I often tune mine to the point just before the regulator free flows after the purge valve is pressed. During the dive if I feel that the breathing effort is too high I adjust it to full venturi effect. But that's just my personal preference, you should experiment and find the settings that suit you best.

## Service

Regulators should be serviced once a year or about every 100 dives whichever ever comes first. The limit on the number of dives covers excessive wear and the time limit covers aging of the soft parts. Over the course of time the soft parts deteriorate and take a set over time.

It's easy to damage a regulator during service and special tools and instruments are needed to properly work on, assemble and adjust a regulator so service should only be performed by a trained technician who has access to the latest from the manufacturer.

During service the soft parts of the regulator are changed, like the o-rings and pressure seats. Also the knife edges, diaphragm, exhaust valves, mouthpieces, etc are inspected and replaced as necessary. If there's any corrosion or buildup of salt, lime a s o, on the metal parts they can be cleaned in an ultrasonic cleaner. Both stages will be properly lubricated during service, reassembled and the intermediate pressure (IP) and breathing resistance will be checked.

The regulator should also be checked for leaks. Hoses can develop leaks, espe-

*Regulators should be serviced once a year or about every 100 dives whichever ever comes first*



cially the high pressure hose that connects the pressure gauge. If you look carefully at that hose you can see a line of small perforations. These are pin holes through the rubber outer layer of hose. The inner layers contain the pressure and the holes allow you to see when the inside of the hose has developed a leak. In the old days before the perforations the outer layer would swell up like a balloon. Another common place for a leak to develop is at the end of the hose where the pressure gauge is mounted. There is a little adapter with two small o-rings that goes in between the hose and the gauge and these o-rings, which are exposed to the outside environment don't last forever.

Except for the parts covered by the warranty that must be returned to the manufacturer, all the old parts should be returned to you so you can see what you paid for.

## Warranty

In the US the warranty usually covers defects and the parts needed for standard maintenance. Most manufacturers will require as terms of the warranty that the regulator be serviced once a year by an authorized dealer using only parts supplied by the manufacturer. As we mentioned before regulators are life support equipment so regular, qualified maintenance is important for your diving comfort and safety. The service replacement parts are also an important part of the warranty. Over the course of the regulators lifetime the cost of the replacement parts can easily add up to more than the original cost of the regulator. The warranty can differ from country to country, keep that in mind when you buy. Will the warranty be as good as it would be if I bought it at home? Will I be able to get authorized service and replacement parts?

## Maintenance

When you are in the water check for air leaks. Be a good buddy and look for leaks in



## Regulators

your buddies gear, it's easier for you to see them. Check for the kind of leaks around the hoses we mentioned in the service section. After each dive you should rinse off the regulator especially after diving in salt water. The best way to do this is to soak the regulator in water, preferably warm water. Leave it attached to the tank with the air turned on. This keeps water from getting in where it shouldn't be. If you can't soak it, disconnect it from the tank, dry the first stage dust cap and secure it in place. It's ok to dry the dust cap with air from the tank but be careful not to blow any water into the inlet of the first stage. If the dust cap is supposed to have an o-ring make sure it is in place. Then you can use a hose to rinse with. If you do it this way be sure not to press the purge button, which would allow water to enter the hose. Be careful when you rinse the second stage, don't blast water at it, as it can displace or damage the delicate diaphragms. After rinsing, allow to dry thoroughly. You can give it a shake and pour water out of the second stage or wipe the outside with a cloth to help it along. It is best not to store the regulator by hanging it or curling the hoses too tightly. This stresses the hoses and can cause them to fail prematurely. One thing you can do to help the hoses is to have hose protectors put on them. These are plastic sleeves that are placed up at the first stage end of the hoses to distribute the stress of bending the hoses. The sleeves should be constructed so that they drain water and don't promote corrosion.

Between servicing you can check out the mouthpiece, check to see that the bite blocks are not partially bitten off. Check for cracks and splitting, especially at the end of the part of the second stage body that the mouthpiece is mounted on. They are prone to splitting right where the tube like section they are mounted on ends. ■

## Some cool Accessories



"Remove before Dive" Dust cap with extra o-ring from German Divedelight protects your precious reg when not in use. [www.divedelight.de](http://www.divedelight.de) (NB: Site in German)



Hoseprotectors



Swivel for second stage hose - eases the pull on the jaw. This one found at [www.zeagle.com](http://www.zeagle.com)



Suffering from jaw fatigue? Try a different mouth-piece. This one from Seacure uses your own dental impression. [www.seacure1.com](http://www.seacure1.com)



The Isolator Valve is used to shut off the air supply in any situation where 2nd stage isolation is desired. [www.zeagle.com](http://www.zeagle.com)





Text: Millis Keegan  
Images: Peter Symes

# How to avoid free flows Freezing & Freeflows

and the zen of being a cold water diver

**All regulators will perform differently in cold water compared to warmer water temperatures. If you dive in cold water, chances are you will experience a free flow sooner or later. It is not a matter of if, it is a matter of when. No regulator, no matter how well manufactured and full with fancy features it is, can safeguard you completely**

Since you are a diver, you should already know that gases heat up during compression, (i.e. while filling a tank), and that they cool during expansion which is what happens you breathe them from a scuba tank. This cooling may affect the regulator in various ways. When air from a cylinder undergoes a drop in pressure, which happens when air passes through the first stage, the pressure is typically reduced to 11 Bar (the interstage pressure) before

it enters the second stage. In each stage of the regulator, the air temperature keeps dropping, and droplets inside the mechanism may form ice crystals, which in turn can cause a malfunction such as a free flow.

When water temperature reaches 5°C and colder, a regulator is at risk of freezing. The first stage freezes in an open position, which causes a free flow of air. It is designed to do so, as a failsafe feature, since the option would be blown hoses, which is an experience we could do without while diving. The rapid airflow in turn can cause the second stage to freeze. While not being in a pleasant situation, one can still breathe from a free flowing regulator ...until it runs out of air.

Cold water divers may also choose to dive with two independent scuba regulators for extra safety.

## Precautions

It is important that the air in your tank is dry. Usually vapor will be trapped by the compressor,

Then make sure that your tank valve orifice is dry before attaching your first stage to avoid moist being drawn into the inside.

Cold water divers may also choose to dive with two independent scuba regulators for extra safety.

## Prevention

The key to avoiding free-flowing incidents is prevention. While the use of a cold water regulator is the first step of prevention, the second step is to minimize the demand on it. Use these simple precautions and you are way on your way to become a true cold water diver.

Take every opportunity to practice in safe conditions, simulating a situation by pressing the purge button. This way you will find what works for you.

## Breathe only under water

In winter, the air will often be colder than the water so avoid breathing from the 2nd stage out of the water when the air temperature is low.

A cool 1st stage can, however,

be warmed by the surrounding water. Therefore keep the 2nd stage under water until it is time to dive. Put the mouthpiece in as you submerge and take your first breath with it under water. If you for any reason need to stick your head above the water again before the dive, remove your mouthpiece in water and keep it submerged.

Inflate your BC slowly, preferably while you exhale, to reduce the stress of the first stage.

If you have a second stage with a breathing resistance adjustment, set the adjuster to minimum when not in use.

If you dive with a redundant air supply, switch to that and then shut off the tank valve a few minutes and then turn it slowly back on.

Do not use your buddies air supply for this exercise, since the extra demand on his regulator can cause his equipment to freeze as well.

*While the use of a cold water regulator is the first step of prevention, the second step is to minimize the demand on it*





Rehashing your basic training

## Breathing from a Free Flowing Regulator

### What to do:

Hold the regulator second stage loosely in your mouth, allowing excess air to escape. If possible angle your head slightly to avoid bubbles in front of your eyes.

### No-nos

- Avoid taking a "test" breath from your regulator in temperatures near freezing. The moisture in the atmosphere and your breath can easily cause icing in the second stage.
- Avoid pressing the purge button.
- Avoid heavy breathing
- Avoid adding air to your BC in small bursts
- Avoid using your regulator for secondary use. While filling up a safety sausage use your exhaust valve, and if you need to fill a lift bag in cold water, consider using a spare tank for that purpose.

When a regulator suddenly free-flows it can be very startling as there is a sudden roar of bubbles and visibility is reduced.

The main strategy is to:

- **Remain calm: Stop - Think - Act**  
If you are confident in breathing from a free flowing regulator do so, but check and prepare alternate sources just in case.
- If an alternate air supply is preferred and available switch to it.
- Head for the surface.
- If a buddy is available, or you can reach the cylinder valve, switch off the cylinder and slowly switch it back on.
- If you run out of air then the only option is a free ascent, possibly accelerated by removing the weight belt. Ensure you don't hold your breath, and the air inside the lungs will expand. ■

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foto: John Neuschwander (Noordpool, in Otter Ultimate droogpak)

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# How to understand the Breathing Diagram

## Why is it an important tool?

Let's make one thing clear, it is not an important tool for you while choosing a regulator, but it is an important tool for a manufacturer while designing a regulator. What you, as a recreational diver should look for when shopping for a regulator is whether it passed the US Navy tests, and/or EN250 standards.

Text by Brian Keegan

### ANSTI

Those tests are done on a system called The ANSTI Demand Regulator Test Station. The system scientifically evaluates a regulator's performance, simulating human breathing. It is designed to measure the dynamic performance of SCUBA demand regulators to 80 metres at the maximum ventilation requirements of EN250. The ANSTI can identify if a regulator passes or fails a test criteria.

During the testing, the ANSTI system takes continuous readings, a work of breathing diagram is generated by a breathing machine simulating a human breath. It shows how much effort it takes to complete a breathing cycle under different circumstances, like diving at different depths, and in different temperatures. The effort is referred to as the Work of Breathing (WOB).

The machine also supplies pressure, simulating the air pressure in a tank to create a realistic diving situation. The regulators are tested at several different breathing rates. When the regulators are tested, the ANSTI measures the inhalation and exhalation in liters per minute (RMV\*) times the size of the breath (Tidal Volume).

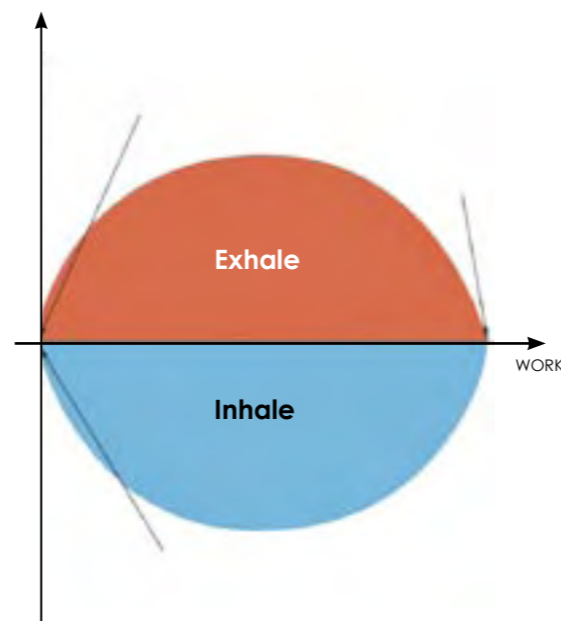
**Example:** At an RMV of 37.5, a diver's lungs are filled with 2.5 liters of air on every inhalation and forcing the same amount out on every exhalation. The RMV at 15 breaths per minute would be 18.75 liters per minute during inhalation and 18.75 liters per minute during exhalation, which equals total air moved

RMV: RESPIRATORY MINUTE VOLUME IS THE VOLUME OF AIR WHICH CAN BE INHALED (INHALED MINUTE VOLUME) OR EXHALED (EXHALED MINUTE VOLUME) FROM A PERSON'S LUNGS IN ONE MINUTE

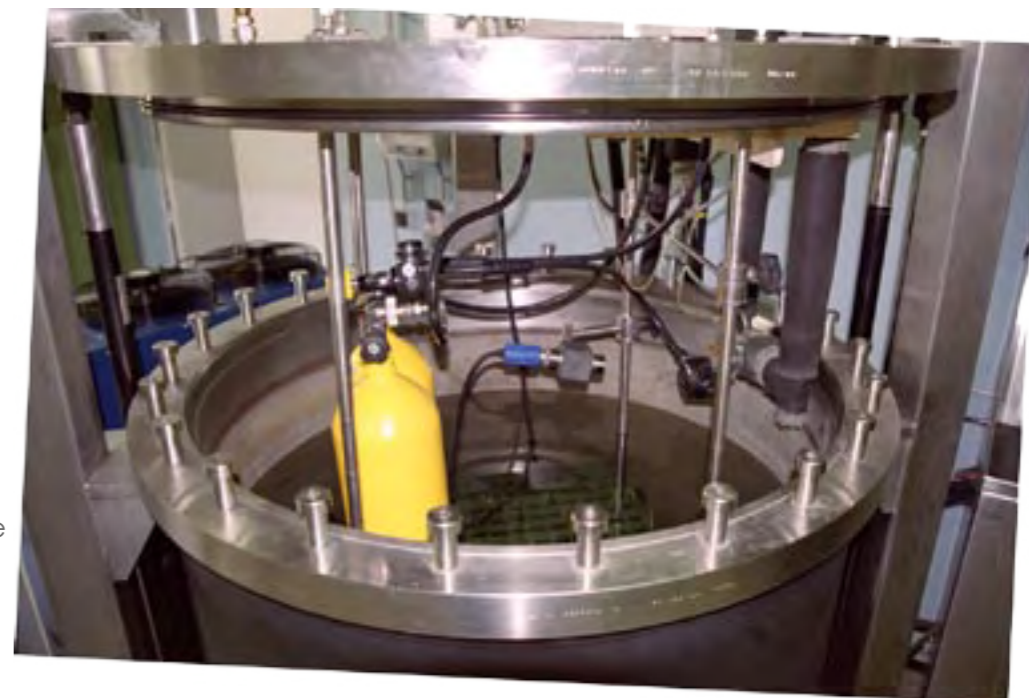
Ansti Test Systems Ltd specialises in the design and manufacture of test facilities for performance measurement of underwater breathing apparatus. The facilities are turnkey packages, which utilise computerised data acquisition techniques to display in real time the dynamic performance of the breathing apparatus under test. [www.ansti.com](http://www.ansti.com)

through the lungs—37.5 liters in one minute.

An average breathing rate during a stress-free dive is generally between 25-31 RMV. The initial testing begins at 37.5 RMV—a number chosen because it best represents a regulator's performance during a dive made by an average fit diver. A higher work rate—standards used both by the US Navy and the European EN250 while evaluating a regulator's performance—is used during the second test, which is done at 62.5 RMV.



The regulator is connected to an air supply and placed in a hyperbaric chamber. The chamber is filled with water and pressurized to the test depth



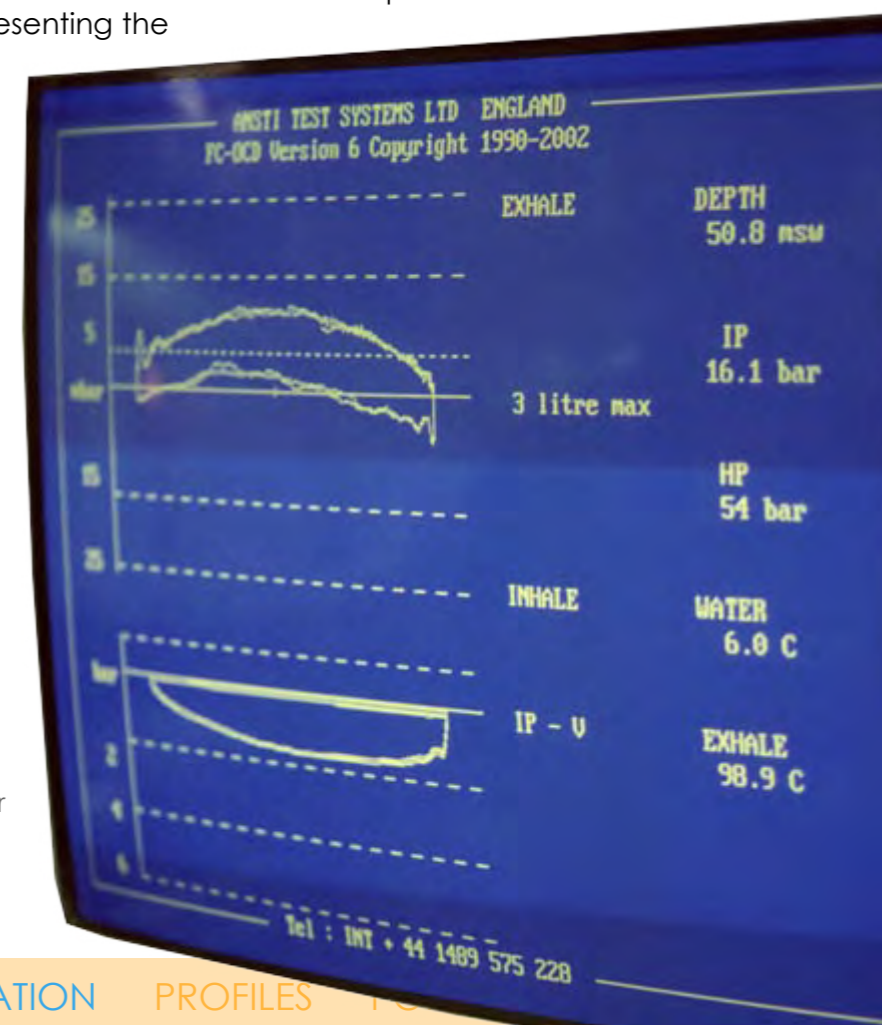
### Reading a breathing diagram

Lets look at a work of breathing diagram. If we start on the left side, the curve above the horizontal axis represents the exhalation. The area under that curve (S1) is the effort required to exhale a breath. Then, the inhalation curve runs from right to left with the area above that curve representing the effort required to inhale the breath.

Thus, the total work of breathing is represented by the sum of the two areas

European standard EN 250 demands, that total work of breathing from a regulator on depth in 50 meters at intensity of breathing in 62.5 liters per minute and cylinder pressure in 50 Bar does not exceed 3 J/l.

This is done by the machine making 25 inhalations per minute with vol-



The display of the ANSTI machine shows the results of a breathing test in the form of a Breathing Diagram. The diagram give researchers and designers an idea of how a regulator performs during a breathing cycle.





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# tech talk

ume of 2,5 liters of air per inhalation. This is considered representative of a diver performing hard physical work. The regulator is supplied with air at 100 bars.

The inhalation phase is the part of the breath that really differentiates regulators these days. Along with the total work of breathing effort, we can get a better idea of how this relates to the way it feels to breath on a particular regulator. Lets look at Fig 2.

## Phase one

We see the beginning of the breath in phase one. When the diver starts to breath in and sucks air out of the second stage, the diaphragm is drawn in and eventually opens the second stage valve and starts the air flowing. This is commonly referred to as the cracking effort, and we see this as an initial spike in the curve. Too much cracking effort doesn't feel natural, you have to really work hard and all of a sudden – woosh, lots of air.

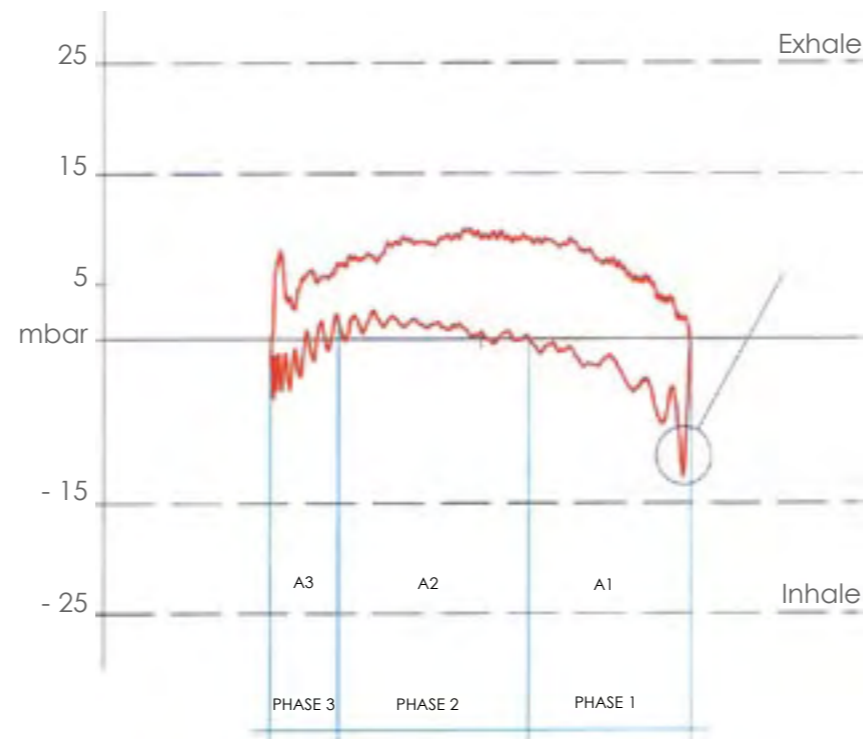
## Phase two

Now that the air is flowing, the breathing resistance drops. The air is coming from the hose and the intermediate pressure area in the first stage. If the second stage has a venturi assist feature, the air flow holds the valve open, and the flow of air can actually exceed the demand. If this is excessive, you feel like you are being force-fed air. Not having to work is nice, but the regulator designers don't want you to feel like you're being inflated like a balloon. As we near the end of phase two, the intermediate pressure is dropping to the point where the first stage will open and start to replenish the available air with air from the tank.

## Phase three

The first stage is opening now. If it is poorly designed and waits too long to open or can't supply air fast enough, we would see an increase in WOB effort here. Note: With modern regulator design that is no longer a common problem.

This WOB graph, shows phase 1, phase 2 and phase 3 as mentioned in the text.



# Regulators

## Conclusion

In conclusion, don't get too hung up on the numbers. On the one hand, lower WOB is better, but on the other hand, the quality of your breathing experience is also greatly influenced by how natural each part of the breathing cycle and the cycle as a whole feels.

Add to that, that even if the ANSTI machine is very sensitive and can measure differences down to 0.1 J/l, you can't. A human being is only able to feel a difference in the effort down to about 0.5 J/l. ■

*The inhalation phase is the part of the breath that really differentiates regulators these days*

## Common standards

Here are three standards that regulators are judged by:

### U.S. Navy Class B

Depth of 40 m with a supply pressure of 100 bars, 25 2.5 liter breaths per minute with WOB less than 1.4 joules per liter.

### U.S. Navy Class A

Same criteria as Class B except at depth of 60 m.

### European Standard EN250

Depth of 50 m with a supply pressure of 50 bars, 25 2.5 liter breaths per minute with WOB less than 3.0 joules per liter

## Tidbit

The most powerful breathing machines is found in the possession of Aqualung. It can simulate a dive down to 100 meters in water temperature down to 0 degrees



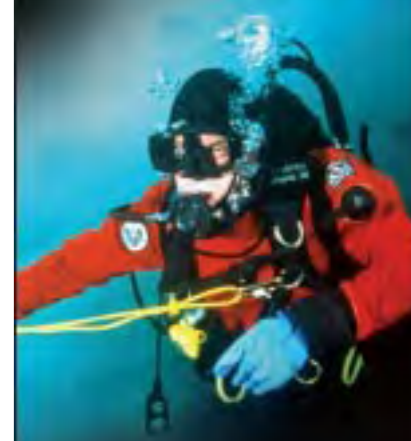
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Edited by  
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# Photo & Videography

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Magic Filters get results

# Filters

*Performing Magic with*

*When using the Magic Filter, it's important that you set your white balance and adjust it every time you change depth to ensure accurate colour reproduction*

UR-PRO filters have been popular on compact cameras because they can be mounted to the outside of a camera housing, can be removed if not needed and can be used at the same time as an external wide angle lens. Some video camera housings have a built in filter-drawer, leaving the filter easily accessible in case it's needed, or easily removed if the shooter chooses not to use it.

## Types

There are a couple of different types of URPRO available. The original CY filter has an effective range of around 5-20 metres, and is designed for use in blue water. There are now a couple of other different models available, including one for use in shallow water and one for use in green water. Last year, a brand new type of filter was released. The 'Magic Filter' was developed by British photographer, Alex Mustard, and has been adopted as an essential piece of kit by many leading underwater photographers. The Magic Filter has really changed things. Exploiting the ability for digital cameras to fine-tune white balance, some of the images that photographers are creating with this new technology are really unique.

What makes the Magic Filter so special is that it has not been designed to provide optical cor-

rection for seawater, but instead to produce a colour balance that cameras own white balance can correct. This means that you can use the Magic Filter over a large depth range; from the surface down to around 15 metres, and generate photographs with colour that penetrates much deeper into the image.

## Using the Magic Filter

Understanding white balance, and how to successfully calibrate your white balance is key to developing your filter photography. For a long time now, video cameras have had the ability to manually white balance, and so filters have been used in underwater video for a long time. Many

experienced underwater cinematographers have the internal Neutral Density filters in their Digi-Beta or High-Definition cameras removed and replaced with an underwater filter.

When using the Magic Filter, it's important that you set your white balance, and adjust it every time you change depth to ensure

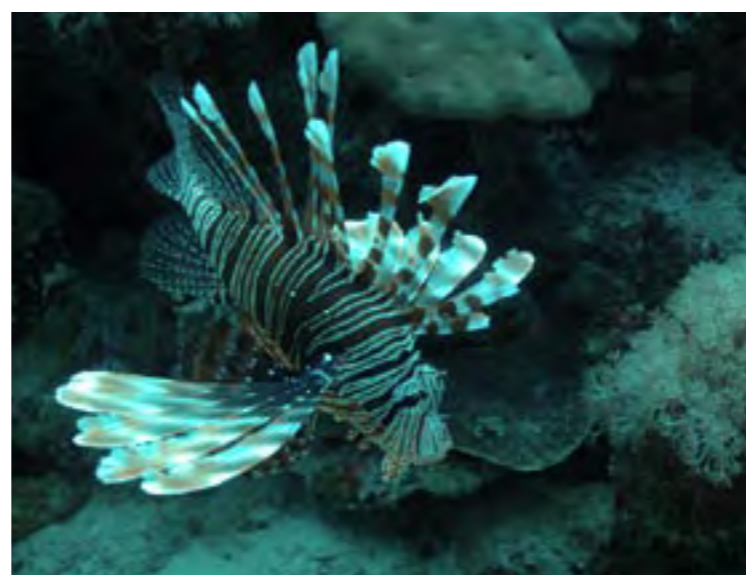


The standard grey card has a 18% reflectancy (middle). This is the golden standard against which light meters are calibrated and white balanced measured

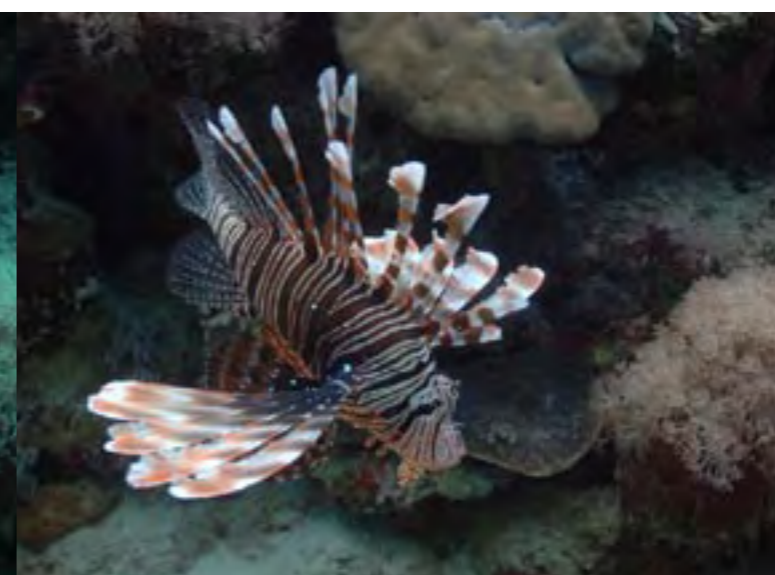
accurate colour reproduction. To set your white balance, either manually white balance off your subject—be sure it fills the frame—or white balance off a grey card. Again, be sure it fills most (70% or more) of the frame. It's important to become familiar with setting your white balance, so that you can quickly set it and get shooting!

## Technique

Because filters work by removing light, you may be forced to use slower shutter speeds than you normally would. So, remember to



Without filters or strobes



With filters, and still without strobes

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# Photo & Videography

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Filter and URPRO discs



concentrate on keeping your camera steady to get sharp images. If you find your shutter speed is dropping too low, you may need to up your ISO. Many digital cameras perform excellently at 200 or 400 ISO. Get to know your camera and the quality of the images at different ISO settings, so you can get to know how far you can push the ISO without losing quality.

Like shooting underwater video, it's also important to shoot WITH the light when using filters. So, have the sun to your back. It's also important to try and keep a downward angle, which will give you even lighting.

## Post-processing

It's possible to shoot images that you will be able to use straight out of your camera, but sometimes it may be worth performing slight adjustments to get the best out of your images. It's also worth bearing in mind that you can perform RAW conversions using software such as Photoshop to play with settings including white balance. As a general rule, it best to try and get your white balance set during the dive. But when this is not possible—if you're in a rush to capture a subject—bear in mind that you will be able to set it later.

## The Limitations

It's important to keep in mind the limitations of filter photography; bright sunny conditions are always required. So, obviously, filters won't work at night! Also, the effectiveness of filters is very dependent on your depth. Any filter will have an optimum working depth. So, be sure the subject you're planning to photograph will fit within this depth. If not, you may need to re-think your subject or your photographic approach!

The development of new technologies continues to revolutionize the way we shoot our underwater images, and the cost of underwater camera systems has made underwater photography available to everyone. With the development and refinement of techniques for filter photography, it's easier than ever to get images you can be proud of. ■

Raw image file adjustment on the computer



Camera housing with twin strobes

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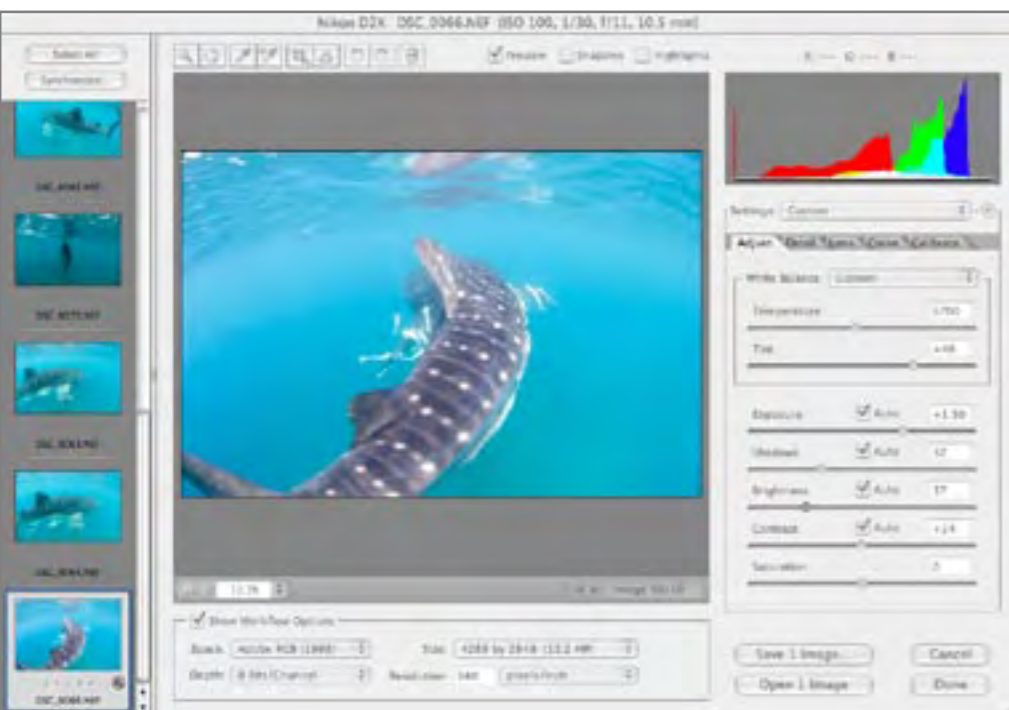
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**Cleaning?** Delkin Devices, Inc., makers of high quality digital photography products and accessories, announced their SensorScope™ System for cleaning digital SLR image sensors. The SensorScope's use of magnification and focused, high intensity light, enables camera owners to inspect their camera's sensor to see if it needs cleaning. Why risk damaging your camera—don't clean your sensor if it doesn't need it! [www.delkin.com](http://www.delkin.com)



## Corel upgrade

Corel has released a free update to Paint Shop Pro Photo XI, which extends Corel's support for camera raw formats, including a significant improvement in the quality of imported raw images, enhanced support for IPTC metadata, and support for additional camera models (Nikon D200, Sony DSC-F828, and Sony DSC-V3). Corel will continue to add support for new models in future updates of Paint Shop Pro

Photo XI. This update also features enhanced performance in many areas of the program, especially in the organizer and thumbnail generation features. Many issues have been fixed including saving 16-bit images as TIFF files, support



for transparency when saving PNG files, retention of EXIF data when files are duplicated, and problems moving floating text. This free update is recommended for all current users. It is available for download at [www.corel.com/support](http://www.corel.com/support)

## Photoshop CS3 - Beta

Adobe has released a beta version of Adobe Photoshop CS3. Probably the most significant point in this release is the fact that it is a universal binary version allowing it to run on Mac computers with the new Intel chip, while at the same time—not to forget their Windows customers—supporting XP and Vista. Adobe says this is to allow a smoother transition to newer hardware platforms—namely, the Mac. The free beta can be downloaded at Adobe's website by any user with a valid Creative Suite 2 or Photoshop CS2 serial number. [labs.adobe.com](http://labs.adobe.com)

## Three new houses for Canon 400D



### SEALUX CC400

The most important part of a housing is the viewfinder, according to Sealux. Chose between the

inexpensive LD viewfinder that gives a good overview over image and camera data, or Sealux' special brilliant GD (grand) view finder that offers a spectacular viewfinder image. [www.sealux.de](http://www.sealux.de)

### Hugyfot's HFC 400D

is very ergonomic, allowing for one hand photography, and is depth rated down to 100 meters. The housings are CNC milled out of solid blocks of aluminium. [www.hugyfot.com](http://www.hugyfot.com)




### Sea&Sea's DX-400D

underwater housing for the Canon EOS 400D/Digital Rebel XT is made from a combination of corrosion resistant aluminum alloy and polycarbonate. Depth-rated to 180 feet, the housing also includes a 3 pin N-type connector (for attaching a YS-series strobe); a A TTL converter; a leak sensor; and a 0.66x viewfinder. [www.seaandsea.com](http://www.seaandsea.com)



### Inon House for Canon

Inon's new X-2 series DSLR housings for Canon EOS20D and 30D cameras comes with three user interchangeable viewfinder options, including the 45 degree Viewfinder. Each housing is equipped with two fiber optic sync connectors supporting four directly connected strobes, each capable of S-TTL operation. The housing is supported with a multi-coated optical glass port system with Magnetic Rotary System (MRS) manual focusing possible on some models. [www.inonamerica.com](http://www.inonamerica.com)




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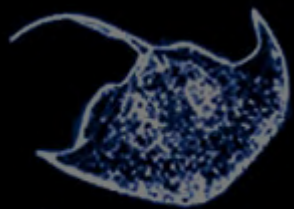
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Dive Operators EUROPE

Dive Academy Gran Canary Island Europe's most southern dive center www.diveacademy-grancanaria.com Diving World, Netherlands Dive travel specialists www.divingworld.nl Dykkercenter Langeland, Denmark Cabins & Wreck diving in Denmark www.dykkercenterlangeland.dk Eden Roc Amigos Del Mar Costa Brava Irish owned, reef, wrecks, caves, Clubs & individuals welcome www.eden-roc-dive.com Media-Sub, Erstein, France —Underwater video and photography equipment and service www.mediasub.com Profondo Blu, Ustica An underwater paradise in the Med www.ustica-diving.it Scuba.Lu, Luxemburg —Diving Luxembourg-Worldwide expeditions www.scuba.lu Timuna Sea, London, UK Premier diving specialist in East London www.timunasea.com West Wales Diving Center, UK Longest serving dive center in Wales www.westwalesdivers.co.uk Zapp Divers, Denmark Dive tours around Jutland www.zappdivers.dk

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Emperor Divers, Sharm El Sheikh, Egypt Your Red Sea dive specialists www.emperordivers.com Nemo Divers, Eliat, Israel Red Sea's best little dive center www.nemodivers.co.il

Dive Operators AFRICA

Dive Solutions, South Africa —Diving Mozambique, tech & rec dive educ www.divesolutions.co.za

Dive Operators ASIA

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Dive Operators AUSTRALIA

Abyss Scuba Diving, Sydney Australia Scuba diving in Australia is worldclass www.abyss.com.au Aquapro Dive Services Australia Your first choice for instructor training www.aquaprodiver.com Deep Sea Divers Den, Australia Diving Great Barrier Reef & Queensland www.diversden.com.au Eagle Hawk Dive Center, Tasmania Tasmanian Peninsula dive specialists www.eaglehawkdive.com.au

New Zealand Dive Experiences Expand your diving and underwater photography horizons in Kiwi country www.nzdivexperiences.com Ningaloo Reef Dive, Western Australia Preferred operators on the West Coast www.ningalooreefdiver.com.au Perth Diving, Australia —Western Australia's premier diving organisation www.perthdiving.com.au

Liveboards

Nautilus Explorer Liveboard, USA Diving Mantas to Icebergs www.nautilusexplorer.com Ocean Rover —Cruises in Thailand, Myanmar, Indonesia and Malaysia www.oceanrover.com SMY Ondina —Dive Indonesia www.smyondina.com www.thebestdivingintheworld.co Star Dancer Liveboard, Australia Peter Hugues Diving Adventures www.peterhughes.com

SCUBA & UWP Clubs

Aalesunds Sportsdykkerclub, Norway På Voldsdalsberga ved Borgundfjorden www.aasdk.no Ajax Scuba Club, Ontario, Canada Serving Durham Ontario since 1975 www.ajaxscubaclub.on.ca Alberta Underwater Council, Canada Underwater sports & eco-awareness www.albertaunderwatercouncil.com Barnacle Busters Scuba Club, USA Los Angeles/Long Beach (Gay/Lesbian) www.barnaclebusters.org

Bottom Bunch Dive Club, San Diego, US Promoting safe diving and having fun www.bottombunchdiveclub.com British Sub Aqua Club (BSAC), UK Where sport diving began... www.bsac.co.uk Dansk Sportsdykker Forbund, Denmark 7500 members in 152 clubs in Denmark www.sportsdykning.dk Los Angeles Underwater Photographic Society, USA www.laups.org Northumbria Sub Aqua Club, UK Dive training and trips www.divenorthumbria.co.uk Saddleworth Sub-Aqua Club, UK Based in the Pannine hills of Lancashire www.saddleworth-subaqua.co.uk Southern Division Diving Club Netherlands: Dive with us, you can't sink lower! www.sd-diving.nl Tufts University Scuba Club, MA, USA New adventures, new buddies www.ase.tufts.edu/scuba Underwater BC Photography Society Vancouver, British Columbia, Canada www.ubcps.bc.ca

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Dive Travel Agents

AquaTours UK Aquatours specialise in Scuba Diving holidays world-wide. Aquatours.com Blue o Two Operating since 2001, blue o two offers tailor-made diving holiday packages to THAILAND, RED SEA, USVI and MALTA. www.blueotwo.com Dive Discovery, Houston, TX, USA Complete dive & adventure travel www.divediscovery.com US Dive Travel Network, USA Not just a vacation, an adventure! www.usdivetravel.com



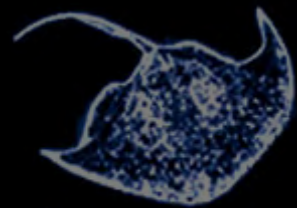
Bao Xishun and friend

World's Tallest Man Saves Dolphins in China

At the Royal Jidi Ocean World Aquarium in China, veterinarians found two of the dolphins ill after they ingested some plastic found near their pool. While attempting surgery, the vets were forced to stop because their instruments were going to lacerate the stomachs of the dolphins. A sudden brainstorm brought an urgent call to Bao Xishun, a herdsman from Inner Mongolia. At 7 feet, 9 inches, he is the world's tallest man. Xishun came to the aquarium and stretched his 41. inch long arms into the dolphins' mouths to physically remove the plastic from their stomachs. While a few small pieces remained, the vets said the dolphins soon digested and passed the leftover bits. SOURCE: Newsvine.com

Wet & Weird News edited by Gunild Symes





X-ray mag

## Business Directory

### Publishers

#### Best Publishing Co, Flagstaff, AZ, USA

Scuba diving & hyperbaric medicine  
[www.bestpub.com](http://www.bestpub.com)

#### Oceans Enterprises

Diving and Underwater Books  
[www.oceans.com.au](http://www.oceans.com.au)

#### Pine Belt Publishing

Online Book Distributors  
[www.pinebeltpublishing.com](http://www.pinebeltpublishing.com)

### Dive Manufacturers

#### Cochran

Undersea Technology  
[www.divecochran.com](http://www.divecochran.com)

**Dive Junkie, Singapore** —Fun, fashionable and expressive scuba dive t-shirts  
[www.divejunkie.com.sg](http://www.divejunkie.com.sg)

**Diving Unlimited International, USA**  
Unlimited comfort, performance, quality  
[dui-online.com](http://dui-online.com)

**Fourth Element, UK** —High tech, high quality dive clothing and design  
[www.fourthelement.com](http://www.fourthelement.com)

**Nocturnal Lights, CA, USA** —Advanced lighting systems for diving, UWP, video  
[www.nocturnallights.com](http://www.nocturnallights.com)

#### Reefling Clothing

Divewear that inspires diving  
[www.reefling.com](http://www.reefling.com)

#### Silent Diving Systems, USA

Closed circuit rebreather distribution  
[www.silentdiving.com](http://www.silentdiving.com)

### Non-Profit Organisations

**International Association of Handicapped Divers (IAHD Foundation)**  
[www.iahd.org](http://www.iahd.org)

**Coral Reef Alliance** —Working together to keep coral reefs dive  
[www.coralreef.org](http://www.coralreef.org)

#### The Manta Network

Help Save the Mantas  
[www.save-the-mantas.org](http://www.save-the-mantas.org)

### Online Dive Resources

#### Cairns Scuba Diving Australia

Dive training & travel holidays  
[www.divedirectory.com.au](http://www.divedirectory.com.au)

#### DiveGuru, Deerfield, FL, USA

When you want answers...  
[www.diveguru.net](http://www.diveguru.net)

**DiveIndex.com** —All links diving related  
Newest, top-rated, most popular  
[www.diveindex.com](http://www.diveindex.com)

**DivePhotoGuide** —The essential resource for UWPs & Videographers  
[www.divephotoguide.com](http://www.divephotoguide.com)

**Diverlink** —A comprehensive resource for divers and dive businesses  
[www.diverlink.com](http://www.diverlink.com)

#### Divester

Weblong's premier diveblog  
[www.divester.com](http://www.divester.com)

#### Dykcentralen, Sweden

Swedish divelink index  
[www.dykcentralen.se](http://www.dykcentralen.se)

**Lines & Shadows** —Home of the best source of UWP, travel & adventure  
[www.linesandshadows.com](http://www.linesandshadows.com)

**NauticFriend.com** —The Ultimate Worldwide Watersports Directory  
[www.nauticfriend.com](http://www.nauticfriend.com)

#### Onderwaterfoto, Netherlands

Digital UWP Forum  
[www.underwaterfoto.net](http://www.underwaterfoto.net)

**One Ocean** —Earn frequent diver points toward equipment & travel  
[www.oneocean.com](http://www.oneocean.com)

#### Patrick Musimu, Freediving Champion

Accept No Limits  
[www.patrickmusimu.com](http://www.patrickmusimu.com)

**Scuba Duba** —Online diving resource for news, equipment, buddies & travel  
[www.scubaduba.com](http://www.scubaduba.com)

**Scuba Spots** —The World's Oldest, Largest Scuba Directory  
[www.scubaspots.com](http://www.scubaspots.com)

**Scuba.start4all.com** —Diving directory in cooperation with Diving World  
[www.scuba.start4all.com](http://www.scuba.start4all.com)

#### ScubaDiveSites.com, Australia

Listing Dive Sites Worldwide  
[www.scubadivesites.com](http://www.scubadivesites.com)

#### UK Diving

—UK Scuba Diving Resource & Network  
[www.ukdivers.com](http://www.ukdivers.com)

**Underwater Australasia** —Australia & Asia Pacific's most popular dive portal  
[www.underwater.com.au](http://www.underwater.com.au)

**UnderwaterTimes** —A daily journal of life in and around water  
[www.underwatertimes.com](http://www.underwatertimes.com)

#### University of Michigan, OSEH

Dive links by Larry "Harris" Taylor, PhD  
[www-personal.umich.edu](http://www-personal.umich.edu)

#### WetPixel, USA

Digital imaging for divers  
[www.wetpixel.com](http://www.wetpixel.com)

#### World-Newspapers.com

Scuba Diving Magazines Online  
[www.world-newspapers.com/scuba](http://www.world-newspapers.com/scuba)

### UWP Competitions

#### National Wildlife Photography Awards

Deadline: July 15th, 2006  
[www.nwf.org](http://www.nwf.org)

#### Santa Barbara Ocean Film Festival

Deadline: August 30, 2006  
[www.ocean.com](http://www.ocean.com)

#### XARIFA Unterwasser Foto & Film Festival

14-15 October 2006, Germany  
[www.uwfv.de/xarifa](http://www.uwfv.de/xarifa)

#### World Festival of Underwater Pictures

25-29 October 2006, Antibes, France  
[www.underwater-festival.com](http://www.underwater-festival.com)

### UW Photo, Video, Film

#### Alex Mustard, PhD, UK

UWP and Marine Biologist  
[www.amustard.com](http://www.amustard.com)

#### Amos Nachoum Big Animals

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

#### Bill Becher Outdoor & Adventure

Writing & Photography —CA, USA  
[www.becher.com](http://www.becher.com)

#### Cathy Church, Cayman Islands

UWP Center, Classes, Trips, Services  
[www.cathychurch.com](http://www.cathychurch.com)

#### City Seahorse, Dallas, TX, USA

UWP & Raja Ampat stock & tours  
[www.cityseahorse.com](http://www.cityseahorse.com)

#### Edwin Marcow, UK

Marine & Wildlife Photographer  
[www.edwinmarcow.com](http://www.edwinmarcow.com)

#### Jack Connick, WA, USA

UWP & Graphic Design  
[www.opticalocean.com](http://www.opticalocean.com)

#### John Collins Photography, Kinsale, UK

Cool Waters-Emeral Seas  
[www.johncollinskinsale.com](http://www.johncollinskinsale.com)

#### Jon Gross & Keith Clements, WA, USA

Marine Life Index  
[www.seaotter.com](http://www.seaotter.com)

#### Michael Portelly, UK

Director and Cinematographer  
[www.portelly.com](http://www.portelly.com)

#### Nonoy Tan, Metro Manila, Philippines

Underwater images of the Philippines  
[nonoytan@yahoo.com](mailto:nonoytan@yahoo.com)

#### Poppe Images, Philippines

Marine Iconography of the Philippines  
[www.poppe-images.com](http://www.poppe-images.com)

#### Thomas Peschak, South Africa

Africa's Oceans and Coasts  
[www.currentsofcontrast.com](http://www.currentsofcontrast.com)

#### Tony White, UK

Underwater imagery at its best!  
[www.seaofdreams.co.uk](http://www.seaofdreams.co.uk)

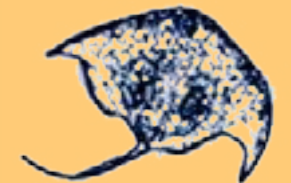
#### UV Foto, Norway

Underwater photos of Stein Johnsen  
[www.uvfoto.no](http://www.uvfoto.no)

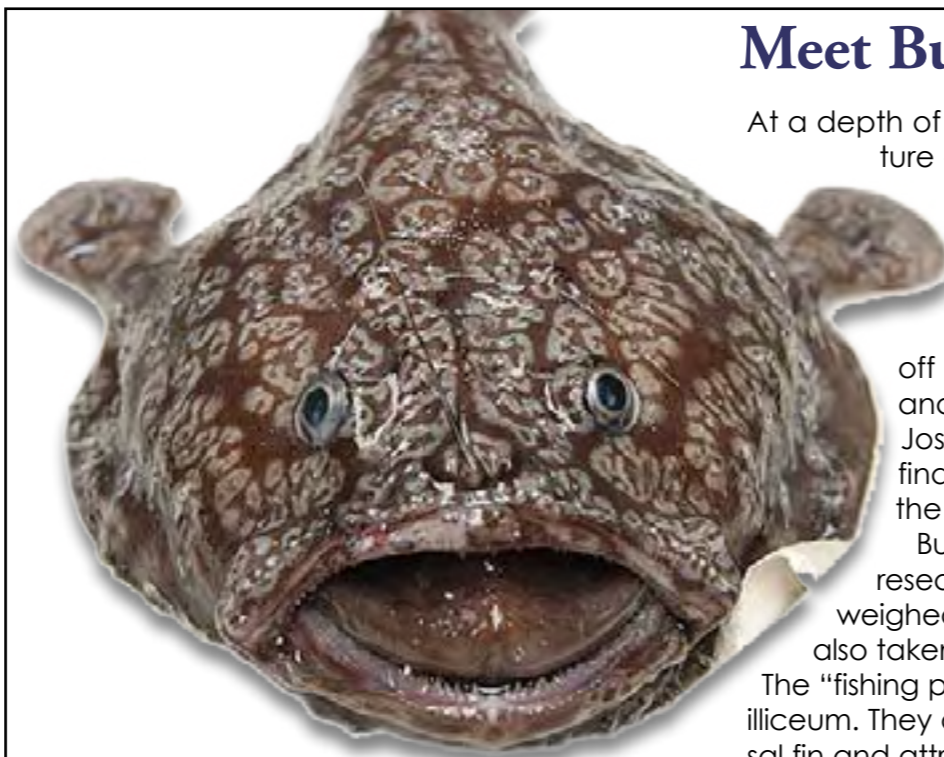
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Travel, diving and culinary images  
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### Wet & Weird



News edited by  
Gunild Symes



This specimen is one of only three Shaefer's anglerfish ever seen in the world

## Meet Bubba the Fish...

At a depth of 2,977 feet, a water temperature of 10.3°C and salinity of 35.3, researchers found one of only three Shaefer's anglerfish, or *Sladenia shaeferi*, to be seen in the world. The other two specimens were found off the coast of Columbia in 1976 and Aruba later. Research diver, Josh Loefer, was credited with finding the specimen and gave it the unique identifying name, Bubba.

Bubba (left) was taken aboard the research vessel where he was measured, weighed, studied and preserved. Bacteria was also taken from Bubba for antimicrobial study.

The "fishing poles" sticking out of Bubba's head are illicium. They are the first and second spines of his dorsal fin and attract prey swimming just above his huge mouth. He then sucks them in for a tasty meal. SOURCE: NOAA ■



## Stuck in the Toilet?

Love fish so much you can't be without them for even a minute? Well, now you can enjoy your fishy friends in the WC with this cool little number (left). It's called a

Fish'n'Flush and touted as "a whimsical potty that turns your toilet into a nautical wonderland" by its creators at Aqua One Technologies located where else but in that innovative state of California, USA. They also say on their website that the funky flusher will maximize space, provide entertainment and excitement... Got to have one? See [www.fishnflush.com](http://www.fishnflush.com) ■



# Sue Duda



Edited by Gunild Pak Symes  
All images are original batik on silk by Sue Duda

**Blending her love of the sea and its cherished creatures with the ancient art of Batik, a die and wax technique on silk, Sue Duda has created an ocean of art work to delight the most hardy sea lover.**

Sue Duda received her education in art at the University of Wisconsin-Stevens Point in the U.S. where she earned a Bachelor's Degree in Art in 1976. She spent the next 22 years working as a studio potter. Experiences in scuba diving and snorkeling led Duda to incorporate the ocean's wonderful colors and intricate patterns on silk, using the wax-resist method of batik.

On silk, vibrant colors harmoniously blend creating bright, eye-catching designs. Duda says that foregrounds of the batik paintings are uniquely enhanced by the cracked backgrounds. The



textural effect emulates the look of sunrays streaming through water, which enhances the allure of Duda's underwater pieces. Through her batik work, Duda hopes to share her love for the rich environment of the underwater world, its color and life. By drawing attention to the ocean with her images, she wants to positively influence human-kind's awareness of the ocean's fragile ecosystem.

Bringing the splendors of the underwater world to the surface, Duda

COUNTERCLOCKWISE FROM TOP LEFT: *Beaked Butterflyfish*; *Quilfin Blenny*, 22 x 27 inches; *Ascent*, 30 x 24 inches; *Clown Triggerfish*; *Red Banded Wrasse*, 24 x 28 inches





creates cheerful art for others to enjoy and ocean art enthusiasts can enjoy building distinctive collections.

Duda recommends framing your original batiks on silk between two layers of glass in order to allow light to pass through the batik. It creates a spectacular conversation piece when placed near a window in your home, office or on your yacht. Originals can also be framed in conventional styles as well.

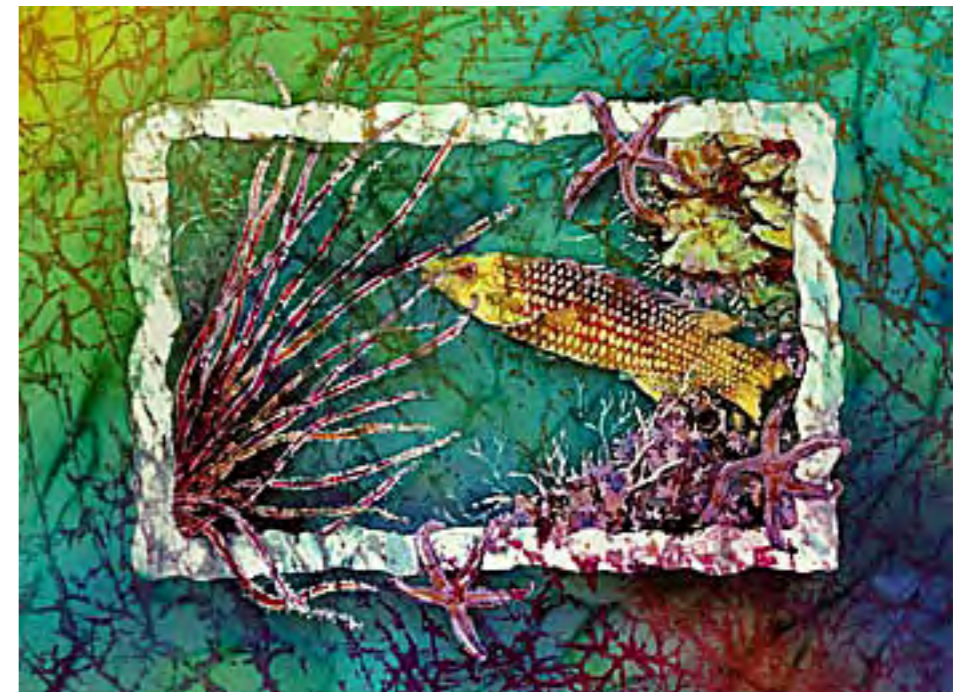
The artist has won several local and regional awards for her art work. Several of her pieces have been published by Sundance Graphics and Ocean Arts Gallery. Duda focuses on sea life but also creates freshwater fish, nature, and music batiks.



See her work at the following websites:  
[Ocean Dudes by Duda](http://OceanDudesbyDuda.com)  
 Original batiks, greeting cards and prints  
[www.oceandudes.com](http://www.oceandudes.com)

CLOCKWISE FROM TOP LEFT: *Mandarinfish*, 23 x 28 inches;  
*Lookdowns*, 24 x 28 inches; *Queen of the Sea*, 28 x 24 inches;  
*Trunkfish*; *Bluestripped Grunt Quints*, 25 x 19.5 inches;  
*Cardinalfish*, 22.5 x 28 inches





Ocean Arts Gallery  
Fine art giclée prints of batiks  
[www.oceanartsgallery.com](http://www.oceanartsgallery.com)

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CLOCKWISE FROM TOP LEFT: Head Green Border; Head Red Border, Tail Blue Border; Spottfin Butterflyfish and Juveniles; King Angelfish; Spotted Hogfish



# portfolio



◀ Sue Duda shows off her original batik on silk of *Two Moorish Idols*, framed with primavera wood between two layers of glass

Sue Duda

## IN OUR NEXT ISSUE

The Red Sea  
Saudi Arabia  
New Zealand



BARB ROY



BARB ROY



PETER SYMES



Sue C. Duda ©



CLOCKWISE FROM TOP: *Dive Flag*, 20 x 24 inches. The artist created this brand new batik especially for X-RAY MAG. It might very well be the only batik dive flag design available; *Moorish Idol*; *Banded Butterflyfish*, 30 x 24 inches

A percentage of all sales from The X-RAY MAG Store and Ocean Arts goes to ocean conservation!

Masterpiece Giclees can be ordered in 3 different sizes on the customer's choice of canvas or watercolor paper. The color on these giclees is fabulous! Inquiries about purchasing original batiks can be sent to Sue Duda at: tel. 715-356-4526, e-mail: [sue@oceandudes.com](mailto:sue@oceandudes.com). Prices of some of the originals can be viewed on Sue's website: [www.oceandudes.com](http://www.oceandudes.com) ■

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