AquaCorps—Managing Narcosis :: Flash Photography Underwater

X-ray mag

GLOBAL EDITION
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Number 45

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COVER PHOTO: *Jill Heinerth cave diving*
photo courtesy of Jill Heinerth

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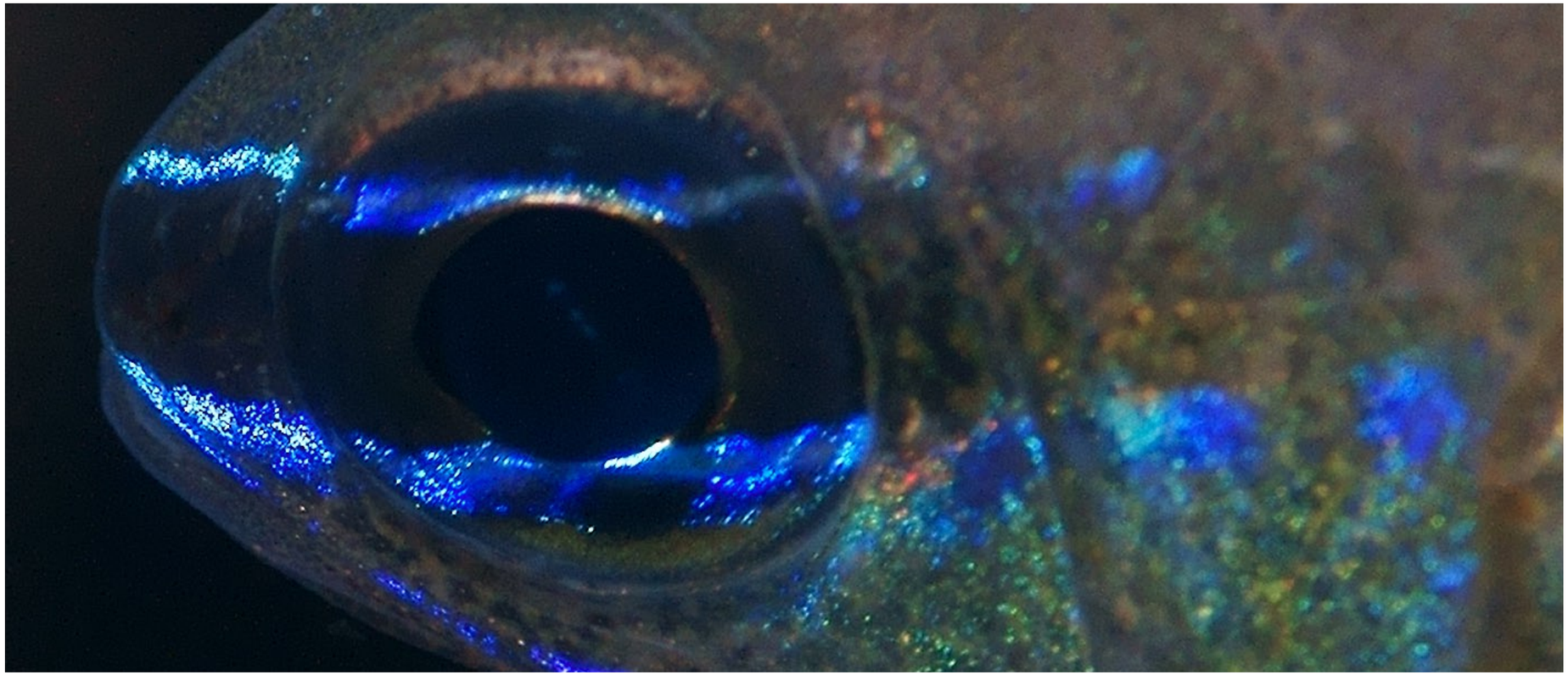
Painted Cardinalfish *Archamia fucata*, Red Sea, Taba, Egypt. Photo by Peter Symes



columns...

plus...

It matters!

A string of U.S. states have now passed legislation prohibiting shark finning and/or shark fin products.

A number of nations have either created huge shark sanctuaries or outlawed shark finning.

And the numbers are growing.

After being vilified for decades as savage sea monsters that were better off being killed, sharks are now generally appreciated and recognised as indispensable parts of a healthy ocean ecosystem—to the point that even victims of the rare shark attack now plead for the animal to be spared and not culled.

These encouraging developments are very much thanks to the relentless campaigners, grass roots movements and NGO's who swayed public opinions as well as the politicians and legislatures who took action to protect these magnificent creatures.

In other words, if you lent any support to these efforts, it is thanks to you!

If the results from various marine parks and no-take zones are anything to go by, we will also see various shark populations—alas probably not all—pulled back from the brink of extinction. In some protected zones, it has been remarkable how fast ecosystems have rebounded and re-established themselves after they were left to recover.

This does not mean it is a universal solution. With a world population that has just passed 7 billion—all of whom need to be fed—the competition for resources, including those in the ocean, it's only going to get harder to protect natural resources against unsustainable exploitation.

That is where we come in. The value of a shark, a manta or any other big creature in the ocean in terms of income from tourism is a hundred, if not, a thousand fold that of the meat value.

So, go diving and help protect the oceans.

— The X-RAY MAG Team

X-ray mag

News edited
by Peter Symes
& Catherine GS Lim

from the deep

NEWS

"The consequences of overfishing can be severe to the ecosystem and may take decades to recover."

—Dr Nick Graham of the ARC Centre of Excellence for Coral Reef Studies and James Cook University

World-first discovery may help save coral reefs

An international team of scientists has achieved breakthroughs in the understanding of fishing sustainability on coral reefs, which could play a vital role in preventing their collapse.

PETER SYMES

They published their findings in the *Proceedings of the National Academy of Sciences,* USA, describing how overfishing can generate a predictable sequence of events that lead to the collapse of reef ecosystems.

Their research offers a vital tool for managing corals reefs and tropical fisheries, providing clear targets for sustainability to help reef fisheries support the very resource they depend on.

"Our work shows that as fish biomass – the number and weight of fish living on a reef – declines due to fishing pressure, you cross a succession of thresholds, or tipping points, from which it is increasingly hard to get back," explained Dr Nick Graham of the ARC Centre of Excellence (ARC CoE) for Coral Reef Studies and James Cook University.

The study shows that in well-protected areas, there are 1,000 to 1,500 kilos of reef fish of various species per hectare of coral reef.

As the volume drops to below 1,000 kilos/ha, thresholds like increased seaweed growth and urchin activity, as well as a decline in coral cover and the reef's species richness begin to show. The actual loss of hard corals then follows; at this stage, it might be already too late to save the reef.

At 300 to 600 kilos/ha, there appears to be a window of what is known as maximum sustainable yield; but when the fish stock drops below 300 kilos/ha, that's when the reef is in trouble.

Dr Aaron MacNeil from the Australian Institute of Marine Science adds: "This information is critical to policy makers and reef managers: if fish stocks can be maintained at a certain level, the chances of retaining a sustainable fishery and a healthy reef system are greatly improved."

The effectiveness of different reef management schemes at maintaining reefs within or above this sustainability window was also evaluated.

Reef fisheries without any regulations tended to perform poorly, with some completely collapsing. No-take marine reserves where fishing was prohibited were the best performers and tended to maintain key ecosystem processes, such as predation.

"But people depend on reefs for their livelihoods, so we can't prohibit fishing everywhere," noted Dr Joshua Cinner, also from the ARC CoE. However, he added that other regulations restricting gear or the types of species that can be caught can also help maintain biomass.

"These regulations are often more palatable to fishermen than no-take closures and consequently receive higher levels of support and compliance."

The researchers pointed out their work was carried out on Indian Ocean coral reefs, and needed to be confirmed in the Pacific and Great Barrier Reef regions. However, they were confident similar relationships between the volume of fish and overall reef health exist in other ecosystems. ■

Captive breeding of saltwater species could help save coral reefs

PETER SYMES

Marine biologists are developing means to efficiently breed saltwater aquarium fish, seahorses, plankton and invertebrates in captivity so as to preserve the biologically rich ecosystems of the world's coral reefs.

A report in the Journal of the World Aquaculture Society (April 2011) highlights the concerns toward the establishment of sustainable collection, production and trading practices for marine ornamentals, as well as the urgent need to develop reliable traceability protocols to distinguish sustainably caught and/or cultured specimens from wild ones.

Unlike the freshwater ornamental market, which comprises mostly on fish raised in captivity, the saltwater ornamental market is 99.9 percent wild caught. Joan Holt, professor and associate chair of marine science at The University of Texas at Austin, says this is largely because there is less accumulated knowledge on breeding saltwater fish in captivity. Saltwater species also tend to spawn smaller, less robust larvae which are harder to rear to maturity. In addition, they feed on foods like plankton that are not readily available in bulk.

"It's the kind of thing that could transform the industry in the way that the idea of 'organic' has changed the way people grow and buy fruits and vegetables."

—Joan Holt, professor and associate chair of marine science, University of Texas, Austin

Yet all these difficulties are surmountable, Holt says.

Case in point: Holt and her colleagues have successfully bred in captivity seven species of fish, seahorses and shrimp they've caught from the Gulf of Mexico and the Caribbean, including species that other biologists had unsuccessfully tried to rear in captivity.

In time, marine biologists believe such efforts could help shift much of the $1 billion marine ornamental industry toward entrepreneurs who are working sustainably to raise fish for the aquarium trade. ■

Noisy Shrimp Rumble

Male mantis shrimp in the wild communicate in synchronised rumbles.

Watching marine animals going about their business on television, it is easy to forget that they do make sounds to attract mates or warn off predators.

Indeed, the ocean is filled with all sorts of sounds, and this is not just limited to those 'songs' emitted by dolphins and whales. Many other animals also contribute to the oceanic chatter, one of which is the benthic California mantis shrimp, *Hemisquilla californiensis*.

"Rarely are there studies of benthic acoustics (sounds from the ocean floor). There has always been suspicion that burrow-dwelling creatures like the mantis shrimp make some sort of noise, and our research is going to help us better understand life and communication on the ocean floor," said Erica Staaterman, then a staff member at the University of Massachusetts. She was part of a six-person team that sought to learn more about the sounds made by the California mantis shrimp in the wild.

The scientists had previously recorded low rumbling sounds from the male shrimp in the laboratory. The shrimp made the sound by vibrating their muscles; and used sensory hairs on their body to 'hear' rumbles made by others.

The next stage was then to study the sounds made by this 20-25cm long crustacean in the wild.

Armed with scientific instruments like a coupled audio-video system, a hydrophone array and an autonomous recording unit, the team set out for the muddy waters off the coast of Santa Catalina Island, California, in March during the early mating season.

Their research revealed the following:

Peacock Mantis Shrimp
Odontodactylus scyllarus

- Each male mantis shrimp appeared to have his own 'voice'.

- The males made rhythmic rumbles in groups of three, a technique that seemed aimed at attracting females or defending territory. "Our research team noted the 'rumbles' were so synchronised that it sounded like a chorus, similar to that of groups of birds or frogs," said Staaterman.

- Rumbles were recorded mostly during dawn and dusk, times when the shrimp were likely to be searching for food or defending their burrows. During midday and nighttime, sporadic, low-level sounds were heard as the shrimp remained inside their burrows, closing a mucus cap over the opening.

- Like in the laboratory, female mantis shrimp remained silent, so it is unclear if they could make any sounds.

"These sounds recorded in the field were different than what we recorded in tanks, so to hear these creatures communicating in the wild was very special," said Staaterman. The rumbles produced by the mantis shrimp living in the wild were more variable and occurred in rhythmic groups. ■

Oceana expedition explores Spanish and Portuguese waters


© OCEANA / CARLOS MINGUELL

Marbled electric ray, *Torpedo marmorata,* (right) glides over forest of kelp, *Laminaria ochroleuca,* at Gettysburg, Gorringe Bank, Portugal; *Oceana Ranger* departs from the harbor of Portimão, Algarve, Portugal (bottom left)

Text and photos provided by Oceana

For two months, the *Oceana Ranger* Expedition 2011 traveled through the western Mediterranean and the Atlantic to study and canyons, environments rich in biodiversity but relatively unexplored due to their depth and complex terrains.

In late June, Oceana launched its 2011 Expedition with the departure of the *Oceana Ranger* research catamaran from the port of Burriana (Spain). The two-month expedition aim was to cover various Mediterranean and Atlantic countries to study seamounts and underwater canyons. Despite their rich biodiversity, these environments remain relatively unexplored due to their depths and the complexity of their geographic structures.

© OCEANA / CARLOS MINGUELL

Exploring seamounts

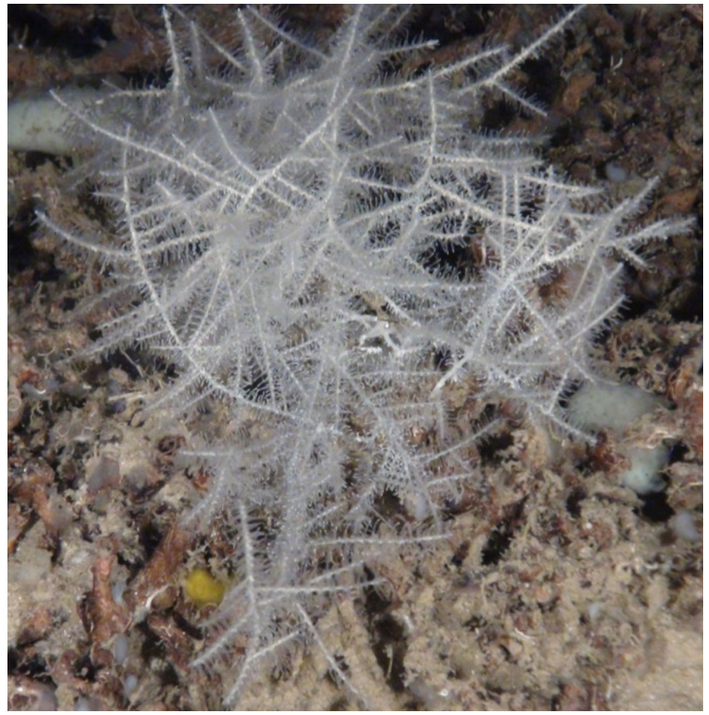
A team of marine scientists, divers and underwater robot (ROV) technicians joined the *Ranger's* crew. Oceana is backing its protection proposals with specific data about deep sea marine habitats collected with the help of an ROV. This device records video footage in high resolution and can also take photographs. During the 2011 expedition, it was used to film at 800 meters depth.

Oceana has a team of scientists specialized in the visual identification of live organisms. Once the images have been viewed and processed, the information is used to propose the creation of new marine protected areas or other conservation measures.

In this new expedition, Oceana collaborated with the Portuguese Government and the country's scientific community on the exploration of the Gorringe Bank, a little explored seamount and a veritable oasis of biodiversity southwest of Portugal. Oceana last explored these waters in 2005. Additionally, Oceana, in collaboration with Fundación Biodiversidad will continue to provide information on the Seco de los Olivos seamount as part of the European Union project, LIFE + Indemares.

"Seamounts and underwater canyons are rich in biodiversity", explains Ricardo Aguilar, Director of Research at Oceana Europe and leader of the expedition. "They provide a hard substrate on which a variety of species become attached and constitute habitats and feeding grounds for many organisms. In addition, they generate changes in oceanic currents and upwellings of nutrients that attract species of commercial interest and vulnerable species, like cetaceans. Thus, studying these structures is an important first step in designing adequate protection measures that lead to the conservation of their biodiversity and create a safe environment for the reproduction of species of interest to fisheries."

Oceana has spent the last six years documenting the Atlantic and the Mediterranean, and as in previous expeditions, scientists from various institutions collaborated to exchange knowledge. The Portuguese government and Portuguese scientists supported the project in the Gorringe Bank, a seamount that is rich in biodiversity but remains mostly unexplored. Oceana already documented the seamount in 2005 but this time worked at intermediate



Black coral, *Antipathes sp.*, (right) and soft coral, *Anthomastus cf. grandiflorus,* (bottom left) in the Alboran Sea

depths. Another seamount that was documented during the expedition was the Chella Bank, off the coast of Almeria, Spain. With support from Spanish Fundación Biodiversidad,

Oceana studied this area for the second consecutive year as a partner of the European Commission's LIFE+ INDEMARES project, aimed at documenting marine habitats for subsequent incorporation into the Natura 2000 Network.

Large coral reef in the Mediterranean discovered

The international marine conservation organization discovered a deep-sea, white coral reef in the Alboran sea (Western Mediterranean) located on the high seas at almost 400 meters depth and covers over 100,000 square meters. Oceana estimates that the reef's surface area may exceed ten hectares and covers a large part of the surface of a seamount whose peak is located between 320 and 400 meters depth. The finding proves that there are still unexplored areas in this region that may harbor many more surprises.

"We are not only talking about a large coral reef but also extensive gorgonian gardens, black coral forests and glass sponge fields, all of these important habitats for the health of the Mediterranean," explained Ricardo Aguilar, Director of Research of Oceana Europe.

The reef still maintains important live colonies growing on structures older than the dead corals, reaching a height of over one and a half meters.

Deep-sea corals area among the most vulnerable ecosystems and the United Nations has called for their protection. Most of these interesting communities have disappeared from large extensions of European waters and the Mediterranean due to bottom trawling, changes in water temperature or natural catastrophic events.

100 marine species identified on Gorringe seamount

Oceana identified over 100 different marine species on Gorringe seamount after completing a scientific expedition in the Portuguese Atlantic during recent weeks with support from the Foundation for the Third Millennium. Apart from important kelp forests, the international marine conservation organization documented deep-sea sponge fields, black coral forests, extensive oyster beds and over 100 different species including spotted dolphin, Minke whales, sea pens, slipper lobsters and fish including orange roughies, longspine snipefish,

Videographer at safety stop, Recifes artificiais, Algarve, Portugal

Crew members (above) lower the ROV into the water from the deck of the *Oceana Ranger*; Mediterranean rainbow wrasses, *Coris julis*, (top left) hover over forest of kelp, *Laminaria ochroleuca*, on rocky seabed at Gettysburg, Gorringe Bank; Wall decorated with jewel anemones, *Corynactis viridis*, (bottom right) at Ormonde, Gorringe Bank, heading towards Seamounts

information about unexplored areas. This information can be used to identify these as areas of special interest because of the species and habitats they harbor. Furthermore, these areas must be protected in order to comply with European legislation and the different international commitments Portugal has acquired.

Despite the fact that the Habitats Directive was approved 19 years ago, currently only 0.10 percent of Portuguese marine areas are part of the Natura 2000 Network, making Portugal the E.U. country with the least percentage of areas designated to form part of this network. Various international conventions, like the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), and the scientific community in general, consider seamounts to be priority areas due to the biodiversity they harbor. Within the European Union, Portugal is the country with the largest marine area and the one with the most number of seamounts in its territory; its responsibility to protect these ecosystems is unquestionable.

morays and conger eels.

The findings reflect the area's high levels of marine biodiversity and richness and, in Oceana's opinion, justify the inclusion of this seamount in the Natura 2000 Network, Europe's most important eco-network. "Gorringe bank is an impressive place. The base of the mountain lies on the sea bed at 5,000 meters depth, but its peaks rise up to 30 meters. This means kelp can develop down to 80 meters depth, something that doesn't occur in other areas and would explain this area's high productivity," explained Ricardo Aguilar, Director of Research at Oceana Europe.

Collaboration to protect

By disseminating these preliminary results, Oceana hopes to collaborate with the Portuguese government by providing new scientific

International cooperation

For the development of this expedition, Oceana received support from scientists from the University of the Algarve and the Portuguese interministerial agency Estrutura de Missão para os Assuntos do Mar (EMAM) that provided advising for the design of the expedition in Portuguese waters and collaborated in the identification of species and data collection.

According to Ana de la Torriente, Oceana's marine scientist, "Collaboration between scientists from both countries has been very enriching and played a key role in the expedition. From the moment we embarked, we maintained constant contact, working together to analyze data, and this will allow us to make specific protection proposals based on scientific data. This is our way of collaborating to reverse the current situation in Portuguese waters and make advances in marine conservation."

Oceana documented

Portuguese sea beds for the first time in 2005 when the organization explored beds around the Azores, specifically around Faial Island and Joao de Castro bank, apart from one of Gorringe's peaks known as Gettysburg. To complement the data obtained in Portuguese waters, the international organization also completed various dives off the coast of the Algarve, in southern Portugal. ■

Why big claws are cool

The first thing you would notice about male fiddler crabs are their enlarged major claw. This claw is extremely obvious, and is often large enough to cover the crab's entire body. Only the males have them; all female fiddler crabs have normal-sized claws.

And yes, the large claw is as cumbersome as it looks.

University of Texas researcher Dr Zachary Darnell describes the problems posed by the enlarged claw: "The large claw is metabolically costly, it hinders feeding because it is cumbersome for this task, and it reduces endurance capacity when crawling on the sand. Male crabs are both heat-stressed and hungry while on the surface, foraging and performing the claw-waving display."

Since it is so bothersome, why did nature evolve it?

Well, it turns out that there are several reasons for the big claw's existence.

For one thing, it allows the crab to stay cool. Darnell discovered this when he and colleague Assistant Professor Pablo Munguia shone lamps on Gulf coast fiddler crabs (*Uca panacea*) with an intact major claw and on crabs that were missing theirs. The crabs' temperatures were measured every ten minutes. The researchers discovered that the crabs lacking the large claw took much longer to cool down.

"The major claw likely functions like a heat sink, with heat being transferred from the body to the claw and dissipated into the surrounding air through convective heat transfer. With the large claw acting as a heat sink male fiddler crabs can remain on the surface longer, foraging and performing the waving display," concluded Darnell.

So, while the size of the large claw limits the crabs' ability to remain on the surface, the disadvantage is balanced by the claw's function of dissipating heat, thus prolonging its ability to remain above land longer to forage for food and attract females.

The ability of the claw to attract females is another important feature, especially since the female fiddler crab is known to be fussy when choosing a mate, according to Dr Catherine deRivera of the University of California, USA.

And not without good reason. It seems that the size of the burrow affects the development time of the larvae. "A burrow of just the right size allows larvae to hatch at the safest time, the peak outward night time flow of the bi-weekly tidal cycle," explained Dr deRivera.

Based on her research at the Sweetwater River estuary in Chula Vista, south of San Diego, USA, male fiddler crabs would stand in front of their burrows and wave their major claws. As the female fiddler crab walked through the colony, she might stop and size up one of them. Then, if he passed this first test, she would inspect his burrow, and he would follow her in.

If it was up to her standards, the male would plug up the hole. Otherwise, the female would leave, and continue her search.

On average, the female would visit 23 burrows before deciding on the right one.

Hence, the enlarged claw does play an important role in mate selection, allowing its owner to be spotted in possibly a 'sea' of competing male crabs excitedly waving their enlarged claws, all eager to catch the female's attention. ■

More to the Coral Sea than meets the eye

It seems that the Coral Sea is a pretty happening place, according to a report commissioned by Pew Environment Group-Australia.

Far from containing just corals (as its name might suggest), it-together with the Great Barrier Reef—hosts the world's only known spawning aggregation of black marlin.

It is also regarded as a global 'biodiversity hotspot' for large predatory sharks, tuna and marlin, with at least 28 species of whales and dolphins having been recorded there. There was also evidence of oceanic and reef sharks, as well as 52 species of deep-water sharks and rays, 18 of which are known to only exist there.

These findings (and more) were unveiled in the report *Australia's Coral Sea: A Biophysical Profile*, released in August 2011 and written by marine biologist, Daniela Ceccarelli.

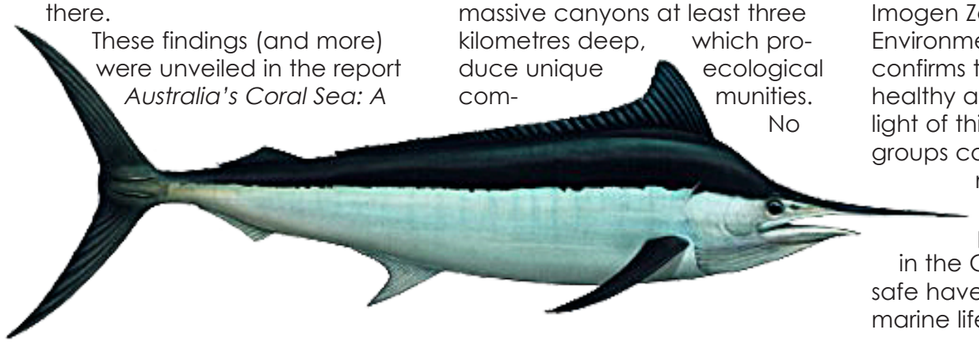
In it, she describes the Coral Sea as "a valuable scientific reference site, as it is close to the global centre of coral reef biodiversity—the Coral Triangle".

As for coral reefs, the Coral Sea has 18 isolated reef systems that include 49 small islands and cays and multiple small reefs. According to Dr Cecarelli, early studies had revealed a great diversity of habitats, including massive canyons at least three kilometres deep, which produce unique ecological communities.

No wonder then that Professor Hugh Possingham, director of the Ecology Centre at the University of Queensland, described the report as an important contribution to understanding the Coral Sea ecosystem.

He added that "the Coral Sea may be the only part of the world's tropical ocean where a permanent marine park of the scale of the interim Conservation Zone could be established and effectively managed with a relatively small impact on users".

This point was reiterated by Imogen Zethoven of the Pew Environment Group: "The report confirms that the Coral Sea is healthy and relatively intact. In light of this report, conservation groups call on the federal government to establish a very large, world-class, highly protected marine park in the Coral Sea to provide a safe haven for its spectacular marine life." ■

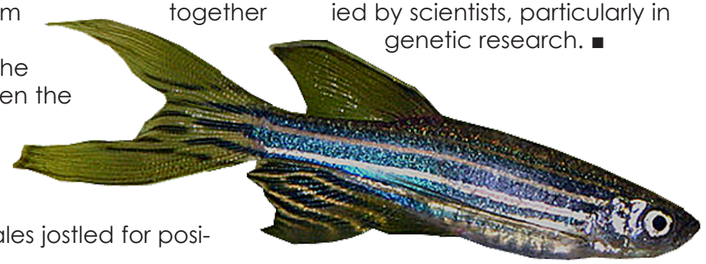


Male zebrafish adopt devious tactics to woo females

Scientists from the University of Sheffield have discovered that during spawning, smaller male zebrafish were able to get between a female that had just laid eggs and larger, rival males. Their smaller size gave them first access to the eggs in order to fertilize them.

A single female was placed into a tank with two males, one a dominant male and the other a subordinate. The female was contained in a plastic cylinder covered in fine mesh, enabling her to smell the males but not make contact with them.

After 24 hours, the scientists released the female, allowing the fish to spawn. Males and females then released masses of eggs and sperm together at the base of the tank. When the female was ready to lay eggs, males jostled for position close to her. It was found that dominant males had fathered more offspring than subordinate animals. Surprisingly, the subordinates that had the best chance of fathering offspring were the smallest. Zebrafish are widely studied by scientists, particularly in genetic research. ■



Edited by
Peter Symes

SSI announces rebreather partnership with Poseidon

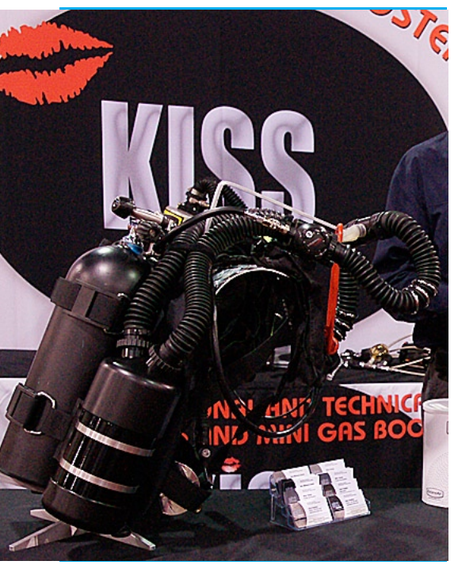
Scuba Schools International (SSI) has announced a new partnership with Poseidon for an entry level rebreather course using the Poseidon Discovery Rebreather. ■

PADI's 20 Millionth Certification

— via Press release

The PADI countdown to 20 million diver certifications is over and new PADI Open Water Diver, Alexandra Swanson, is the recipient of a dream dive trip to Australia's Great Barrier Reef. PADI Americas processed Swanson's winning 20 millionth certification on 4 September 2011.

Additionally, Swanson's instructor, PADI Master Scuba Diver Trainer, Timmothy Aguon, and PADI Five Star Instructor Development Center, Micronesian Divers Association in Guam, also win trips to the Great Barrier Reef. Both the instructor and dive center were aware of the campaign prior to certifying Swanson and worked diligently towards the goal. "We were happy to hear of the 20 millionth diver certification campaign. The contest encouraged customers to earn their open water diver course certification or continue their dive education and enroll in a specialty course. Plus, we jumped at the chance to win a trip to Queensland and experience the *MV Spirit of Freedom* live-aboard," said Micronesian Divers Association president and owner, Lee Webber. ■



TDI announces Gem Level One diver course

— via Press release

Technical Diving International (TDI) has released the course standards for the TDI Gem Level One diver course. TDI worked closely with KISS Rebreathers to get these completed. Kim Mikusch of KISS Rebreathers stated, "We are very pleased to have worked with the professionals at TDI in the developing of the KISS GEM training course."

"For years there has been a void in the rebreather market for a semi-closed system," stated Sean Harrison, Vice President of Training and Membership Services. He went on to say, "I think the new GEM will meet the needs of divers looking for a way to extend their diving times and reduce the noise without going the fully closed circuit route."

The TDI KISS GEM Level 1 Semi-Closed Circuit Rebreather (SCR) course is the ideal course for photographers, cold water divers or anybody wishing to enjoy a quieter dive and closer interaction with marine life. The course is unit and level specific covering the GEM Level 1 skills and academics. The GEM is an SCR that can be attached to any size cylinder within minutes and ready to go for a 2-4 hour dive (times water temperature dependent). eager to get started with their programs. ■

Poseidon Announces Rebreather Technical Upgrades Program

Program for technical upgrades of the Discovery MK VI rebreather.

The program will deliver three key upgrades: 40M Deco, 45M Tri-Mix and 60M Tri-Mix. All current owners of Discovery MK VI's will be able to use these upgrades as they become available, Poseidon writes in a press release.

Poseidon's tech upgrade program has been designed with two key objectives in mind:

1. To allow all existing and future Discovery MK VI owners to expand the performance range of their MK VI's beyond the recreational envelope, should they wish to do so.
2. To enable Dive Instructors to teach both recreational and technical courses on the MK VI.

40M Deco: Firmware upgrade, using air as diluent.
45M Tri-Mix: Firmware upgrade, using Normoxic Tri-Mix as diluent, with a choice of helium fractions.
60M Tri-Mix: Firmware and hardware upgrade, allowing for manual addition.

Upgrade pricing and availability will be announced at DEMA in November, along with certification levels required for each upgrade. All current and future Discovery MK VI owners will be able to use these upgrades.

For further information, please visit: www.poseidon.com or contact james.roberton@poseidon.com

Promotional photo from Poseidon Industries


YURI ROMERO © ARQUEONAUTAS WORLDWIDE – ARQUEOLOGIA SUBAQUÁTICA S.A.

Close-up of porcelain motif. According to archaeologist and COO Alejandro Mirabal, identified ceramic artifacts point to the Wanli period of the late Ming dynasty, and originate from kiln sites in the provinces of Jiangxi, Guangdong and Fujian

明

Illuminated Treasure

Text by Carol Tedesco
Photos by Yuri Romero, Alejandro Raul Mirabal, Manel Gomes da Costa and Simon Lim

When translated, the Chinese word Ming expresses brightness, luminosity, and illumination. Approximately four centuries ago, a merchant ship sank in more than 50 meters of water off of the Indonesian coast. Her cargo: thousands upon thousands of precious Chinese Ming Dynasty porcelain wares, crafted during the reign of the Wanli emperor, who ruled from 1572-1620 AD.

Chinese porcelain's have been treasured for many hundreds of years. Louise Levathes, author of *When China Ruled the Seas, The Treasure Fleet of the Dragon Throne 1405 – 1433* (Simon & Schuster), wrote that China produced the world's first "true" porcelains. She reports that in the seventh century, Arabs desired the ceramics not only for their beauty and their brilliantly reflective hard, translucent glazes—they believed that they would reveal the presence of poisons.

The ocean wastes no time in concealing her sacrifices. The lost merchant ship lay undiscovered until 2009, when it was happened upon and reported by some area fishermen. Eventually, its plight was brought to the attention of the Portugal-based professional shipwreck exploration company, Arqueonautas Worldwide – Arqueologia Subaquática S.A. (AWW).

I previously had an opportunity to work with this outstanding company in my capacity as a Spanish Colonial period coin expert on their Mozambique-based São José shipwreck project.

Arqueonautas is led by founder and CEO Count Nikolaus Carl Max Emanuel Graf von und zu Sandizell. (Can it possibly get any more romantic—an explorer who is also a Count? The multilingual Graf Sandizell—whose friends call him Niki—concluded a career in international trade in 1995 with the objective of founding a marine archaeological company that would embrace an amalgamated approach: 1) to recover cargos from endangered historical shipwrecks in a scientifically responsible manner, following established marine archaeological protocols and methodologies; 2) in a commercially viable manner; 3) whilst dedicating activities to the protection of world maritime heritage.

AWW's second in command is Graf Sandizell's long time friend and colleague, COO/marine archaeologist Alejandro Mirabal. Mirabal is an extensively published scientist with a staggeringly impressive curriculum vitae, having been directly involved in the exploration and/or recovery of more than 61 shipwrecks throughout the world.

The Mission

In June, in cooperation with the Indonesian government and in partnership with the company RM Discovery, Inc., Graf Sandizell and Mirabal led a team to the site of the "Wanli" shipwreck for a 15-day reconnaissance mission. Their objectives were:

- To sketch the general area of the sites debris field of cultural material and its horizontal limits.

wreck rap

TOP TO BOTTOM: Ming porcelain bowls in situ; Count Nikolaus Graf Sandizell, founder and CEO of Arqueonautas Worldwide – Arqueologia Subaquática S.A.; A Chinese language map of the Far East made in the year 1602 by the Italian Jesuit Matteo Ricci


ALEJANDRO RAUL MIRABAL © ARQUEONAUTAS WORLDWIDE – ARQUEOLOGIA SUBAQUÁTICA S.A.

- To understand the extent and nature of the cargo within the debris field and the characteristics of the overburden.
- To find out the possible penetration of artefacts into the seabed and the depth and thickness of the cultural layer (vertical limits).
- To identify the density of artefacts in different sectors of the debris field.
- To get information on the amount and condition of the fragile porcelain artefacts presently in-situ (in place).
- To identify whether or not there are still coherent remains of the ships wood structure that might allow for its study.
- To evaluate whether the wreck site is viable for subsequent archaeological excavation based on the amount of remaining cultural material.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MANEL GOMES DA COSTA © ARQUEONAUTAS WORLDWIDE – ARQUEOLOGIA SUBAQUÁTICA S.A.

renowned British marine archaeologist Dr Margaret Rule, of Mary Rose fame, to develop AWW's working protocol, which encompasses the obligatory individual dive-log, the artefact sheet, daily OPS reports, and a sophisticated data-base correlating all of the collected information as a base for research and future publications.

The Dive Plan

Mirabal explained that with a dive team totaling four, working at a depth of approximately 54 meters, careful planning was essential to achieve maximum efficiency and safety with a short bottom time.

To that effect, the team of four was divided in two groups making two dives each per day: two dives in the morning with a 20 minute bottom time, and two in the afternoon with a 15 minute bottom time. This dive plan guaranteed a total dive time of 9.13 hours per day (2.28 hrs/diver/day) with an effective net bottom time of 2.33 hours per day (35 min/diver/day) accumulating a CNS O_2 (Central Nervous System Oxygen toxicity) of 14 percent after the afternoon dive. "A CNS O_2 of 14 percent is considered quite safe for the divers," Mirabal said, "and after the 16 hours of interval between the afternoon dive and the next morning's dive it would drop to under one percent."

The Details

I had so many questions about the project that it eventually made sense to proceed with a Q and A format:

CT: Did the dive team use compressed air or mixed gas?

AM: We did the recon phase with compressed air, no mix.

CT: How much time was devoted to decompression stops?

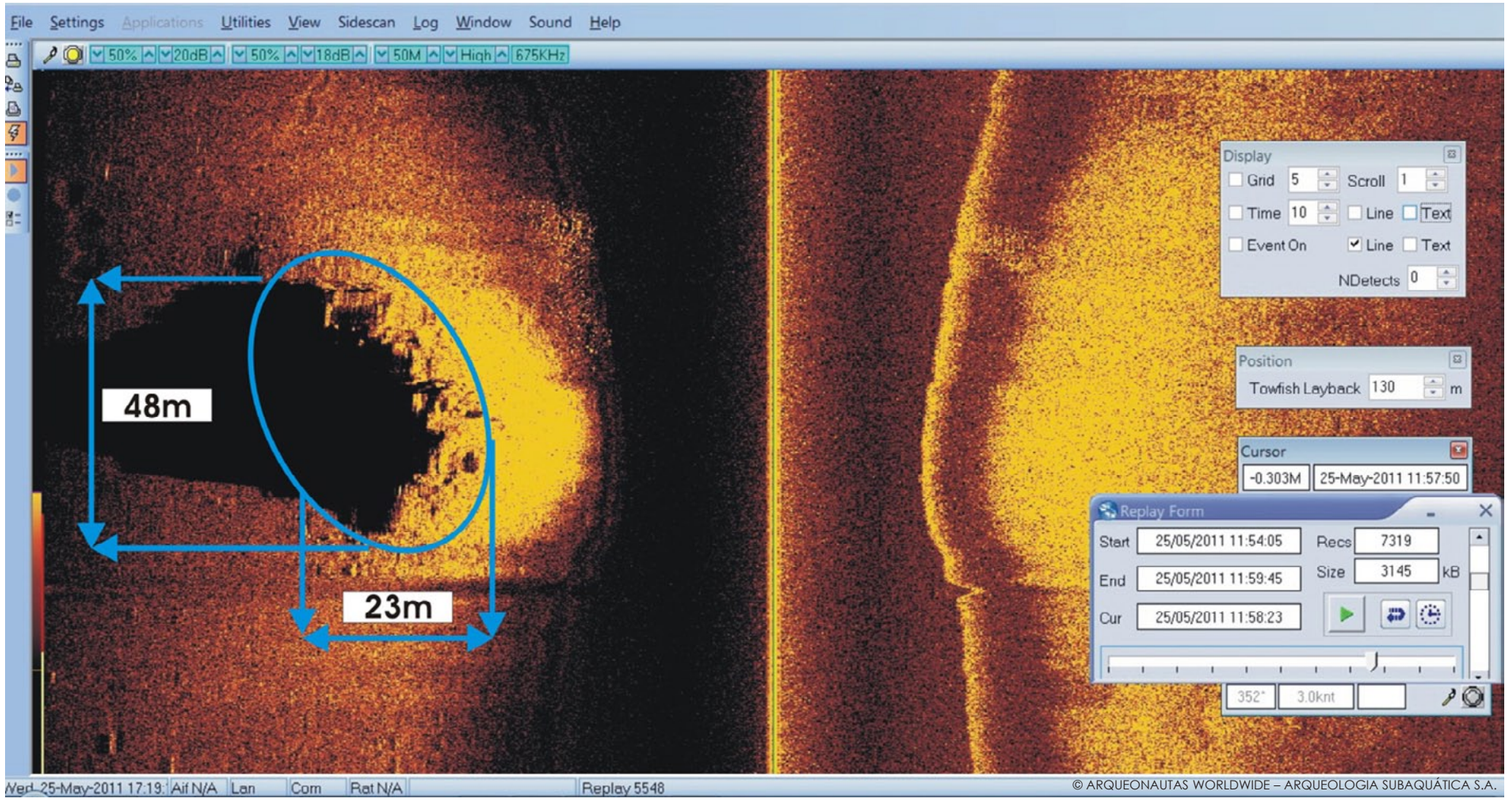
AM: In total we did about 80 minutes of deco in the morning dives and around 100 or 120 minutes in the afternoon dives.

CT: You mentioned working in currents. Are the currents in this area predictable?

AM: During the duration of the expedition, we experienced currents always to the West, stronger at the surface, and almost imperceptible at the seabed.

CT: Can you give us an idea of current strength in terms of knots?

AM: Normally the current ran at



about 1 to 2 knots. The strongest we experienced was about 4 knots.

CT: Did you use a down-line from boat to bottom?

AM: Yes, we had two down-lines from the boat to the wreck site, one for the divers and one for the crate/lifting bag.

CT: What was the water temperature in June?

AM: The temperature is around 28°C to 31°C during the entire year (incredible!).

CT: So, your informal description of the diving conditions as a whole?

AM: It went very good. Just one afternoon we were surprised by an absolute zero visibility and the work we had planned (measurements and photos) was not possible. Weather was quite adverse during the second week (swell, strong wind and low vis) but being on a three point mooring on top of the wreck and diving at 50+m deep, it really didn't affect our work.

CT: You mentioned that you believe the ship is unusually large for this time period. Any idea of the actual dimensions?

AM: The amount of porcelain and the size of the debris field (little dispersion and very compact) suggest a ship of 40 to 50m long, or bigger. However, because no structural timbers are exposed we don't have the actual dimensions; that we will only know after completing the excavation.

CT: Do you think that any shipwreck structure might actually still remain?

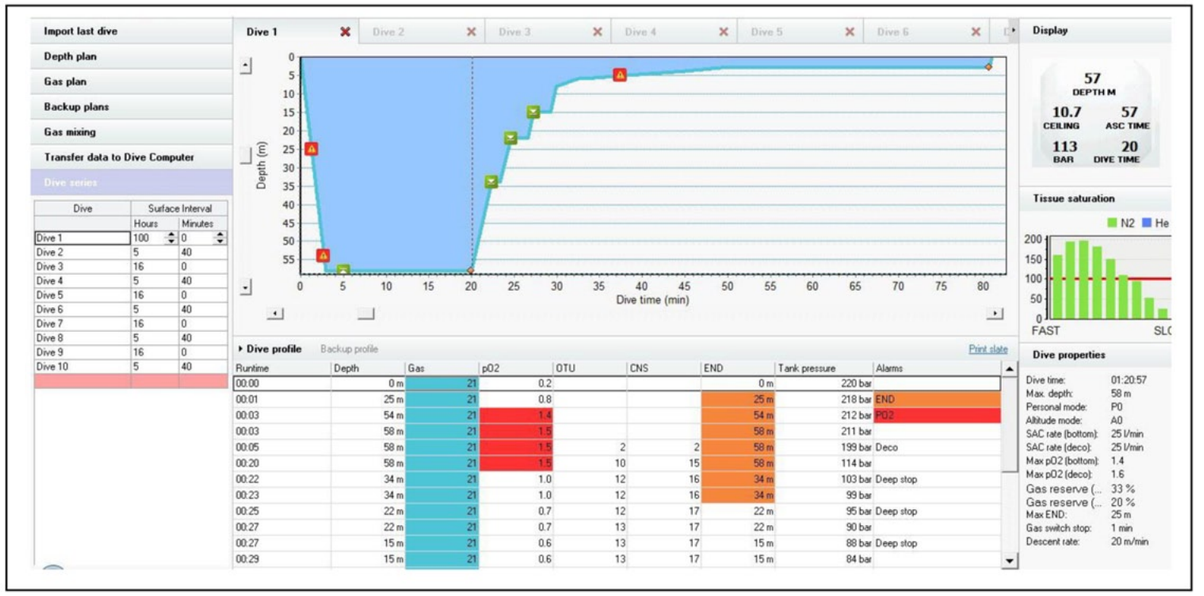
AM: It is very possible that an important part of the wood structure of the ship is buried under meters of sediment and probably in fair condition.

CT: AWW has stated that the wreck dates to approximately 1590 AD. Is the circa of the porcelain how you came to this approximate date? What exactly did you recover?

AM: We recovered Chinese ceramic wares dating to the Wanli period of the late Ming dynasty. The period of the ceramics has been verified by various ceramics experts and also by my own research. The cargo consists of porcelain and stoneware objects from kiln sites in the provinces of Jiangxi, Guangdong and Fujian. The majority are blue-and-white porcelain objects from Jingdezhen (Jiangxi)—primarily bowls but also plates, boxes, jars, ewers and vases. Furthermore, in smaller numbers there are blue-and-white decorated porcelain jars from Guangdong and stoneware storage jars (so called 'Martaban') from Fujian. Some blue-and-white plates belong to the 'Swatow type' from Fujian province. In terms of its destination, the wares can be generally classified as Chinese Trade ceramics for the Southeast Asian markets.

CT: Do you have an estimate of what the cargo may be worth today?

LEFT TO RIGHT: Gentle hand fanning by archaeologist/COO Alejandro Mirabal reveals delicate bowls lying in orderly stacks, as they were stowed more than four centuries ago; A sidescan sonar image of the wreck's position on the seafloor; Morning dive plan tables (below)



wreck rap

Yuri Romero, Arqueonautas Operations Manager, Indonesia, with a recovered ceramic bowl. Only a thin film of calcareous concretion suggests the centuries this Ming Dynasty porcelain artifact spent lost and submerged in the Java Sea

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Archaeologist/COO Alejandro Mirabal passing time on the deco line

NS: According to experts, the cargo—which numbers roughly 700,00 pieces—may be worth in the neighborhood of US $70 million.

CT: That is a very valuable cargo! Where are the pieces that you recovered now—in a safety deposit box?

NS: The artefacts were only temporarily recovered so that we could collect sampling data. After the data was collected, the artefacts were returned to their original positions on the site.

CT: Why is that?


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Team members prepare a crate of artefacts to be returned to their original position on the site.

AM: One of the main objectives of this expedition was to collect enough data to be able to roughly estimate the amount of porcelain artefacts, depth of the cultural layer, and typologies and proportion between broken and intact pieces. This information will allow for better planning of the subsequent excavation methodology, tools to be used, conservation facilities needed, size and composition of the team and related budget.

CT: What happens next?

NS: Now AWW's executive board will work with interested investors, with the intention of being fully funded by late summer so full scale recovery operations can begin.

CT: I noticed that there were not any women on the recon team. What do you say? Are you ready to balance out your team?

AM: Well Carol, our crew members take turns in the galley, and we've heard stories about you dishing up Tofu to divers and jettisoning strange looking culinary experiments overboard when you think no-one is looking. What can we say? We'll be in touch?

CT: Word does travel in this industry, doesn't it?

NS: It certainly does.

Sixteen years after founding

Arqueonautas Worldwide, Graf Sandizell is one of the few in the historic shipwreck exploration industry who can say that he has achieved and exceeded his original goals. He credits his company's success to its adherence to sound business principals, its commitment to upholding the highest scientific methodologies, and to the excellence of its personnel.

As a leading commercially oriented marine-archaeological search and recovery organization specializing in shipwrecks in depths to below 60m sea level, AWW reports that the company has to date "located over three hundred shipwrecks in Africa, Asia and South America under government licenses by the Republic of Cabo Verde, Mozambique, Indonesia, Vietnam and Brazil. Over 100,000 coins and more than 10,000 culturally significant artefacts have been recovered, recorded and published from a total number of 15 excavated shipwrecks, most of them represented in the national museums of the nations in which territorial waters these shipwrecks were rescued."

To stay abreast of Wanli Cargo news, or to learn how to get involved yourself, visit www.wanlicargo.com. For more information about Arqueonautas Worldwide—Arqueologia Subaquática, S.A., visit www.arq.de or www.arq-publications.com ■


SIMON LIM © ARQUEONAUTAS WORLDWIDE – ARQUEOLOGIA SUBAQUÁTICA S.A.

The expedition vessels and team, left to right: Manny Abalon Dujali, Alexander Capote, Nemesio Calunod Magsayo, Amos Timbunan, Alejandro Raul Mirabal, Alejandro Mirabal, Bobby Effendi, Yuri Romero, Yusuf Luminto, Deni Syaputra, Saripudin, Eduardo de los Reyes

Odyssea Marine finds not one, but two treasure ships in the Atlantic

Discovery of *SS Gairsoppa* confirmed

Odyssey Marine Exploration, Inc., announced that they have found the wreck intact. They estimate its cargo at up to 240 tons of silver—a trove worth more than US$200 million. They plan to recover it this spring.

SS Gairsoppa has been located nearly 4,700 meters below the surface of the North Atlantic, approximately 300 miles off the coast of Ireland in international waters.

The *SS Gairsoppa* was a British steam merchant ship that saw service during the Second World War. She sailed with several convoys, before joining Convoy SL 64. Whilst heading to Galway, Ireland, to refuel, she was torpedoed and sunk by a German u-boat. Contemporary research and official documents indicate that the ship was carrying GB£600,000 (1941 value) or seven million total ounces of silver.

In 2010, the U.K. Department for Transport awarded Odyssey, through a competitive tender process, the exclusive salvage contract for the cargo of the *SS Gairsoppa*. Under the salvage agreement Odyssey will retain 80 percent of the net salved value of the silver bullion recovered under the contract.

The Odyssey team recently conducted ROV (Remotely Operated Vehicle) operations from the *RV Odyssey Explorer* to inspect the site. The video and photographs acquired during the exploration of the shipwreck were reviewed and analyzed at length to confirm the identity of the shipwreck as that of the *SS Gairsoppa*. The expedition and resulting data was also used to evaluate the condition of the shipwreck and to begin planning for recovery operations.

By analyzing the known configuration and research about the *Gairsoppa* and her final voyage and painstakingly exploring the shipwreck site to record each element and item, the Odyssey team of experts was able to positively identify the site as the *Gairsoppa*.

The recovery, if successful, would be history's deepest and largest retrieval of a precious cargo lost at sea. ■

See video about the *SS Gairsoppa* here >>> **www.xray-mag.com/content/ss-gairsoppa-shipwreck**

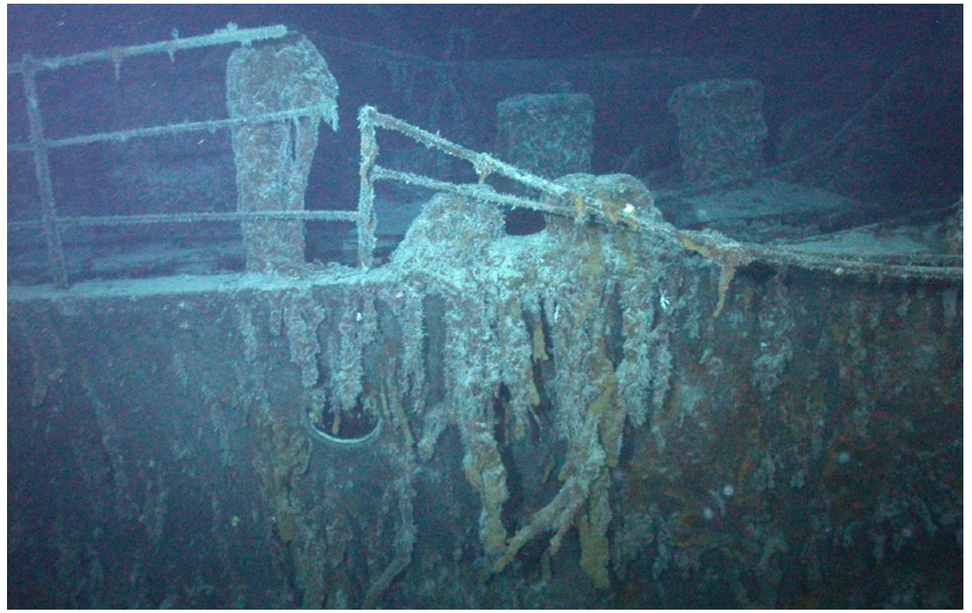
We were fortunate to find the shipwreck sitting upright, with the holds open and easily accessible. This should enable us to unload cargo through the hatches, as would happen with a ship alongside a cargo terminal.

— Greg Stemm, chief executive of Odyssey

In 1941, a German u-boat sank the British merchant ship *SS Gairsoppa,* which was carrying a fortune in silver to England from India.

Find of another treasure wreck, *SS Mantola*, also confirmed

Odyssey Marine Exploration has discovered a shipwreck that was torpedoed during the World War I while carrying a shipment of silver.



Odyssey's visual inspections conducted by ROV at a depth of approximately 2,500 meters revealed the forecastle deck in the background from the port side of the *SS Mantola*

The *SS Mantola* sank on 9 February 1917, after being torpedoed by German submarine *U-81*. Odyssey discovered the shipwreck approximately 2,500 meters beneath the surface of the North Atlantic Ocean, approximately 100 miles from the *SS Gairsoppa* shipwreck.

"The Mantola project is located at a depth range that we have a lot of experience in. We have information on the location of the cargo that should make this a great target for testing some new technology that will be useful for a number of new deep-ocean projects we have planned. As we push deeper and deeper, a lot of new and interesting opportunities are presenting themselves," said Greg Stemm, Odyssey's CEO.

"This find shows the value of our research team and our extensive database of shipwrecks, which allow us to build backup projects that can be added to our surveys in the event of a quick find. The discovery and verification of the Mantola marks the second verification of a valuable deep-ocean site and contract with the United Kingdom this year."

Odyssey has begun the process of assembling the tools and equipment for the salvage expedition for the *Gairsoppa* and *Mantola*, and anticipates that operations will begin in spring 2012 as soon as the weather window begins to open up in the North Atlantic. The system being mobilized for modern salvage recovery can also be used on other projects, several of which are in various stages of search or confirmation at this time. ■

travel news

Edited by
Scott Bennett

Airlines' cheap ticket offers to be investigated

Airlines, train firms and rail websites criticized for controversial 'add-on' charges. Growing concern that airlines exploit passengers by expanding additional charges.

The European commission has launched an inquiry into airlines' controversial "add-on" charges, allowing them to offer low prices bearing little resemblance to the actual final price. European commission vice-president Siim Kallas said he was concerned by the increasing practice of airlines offering attractive" headline prices" for flights that are then subject to a slew of additional costs including baggage charges, credit and debit card fees and airport check-in fees.

Roundly criticized by U.K. consumer groups, the practice has been under scrutiny for being used by not only budget airlines but also scheduled carriers, train firms and rail websites. Amid growing concern that airlines exploit passengers by expanding the list of additional charges, Kallas revealed that the commission admitted spiralling consumer complaints were difficult to address within current laws. The situation has been compounded by the ease of online ticket purchases, where people may decline to cancel a transaction at a late stage as the extra charges kick in. Consumers must agree with carriers' terms and conditions to proceed with the transaction.

According to Monique Goyens, director general of the European Consumers' Organisation, "It's high time the commission looks into this issue. More and more airlines charge their clients unnecessary high costs for paying by credit or debit card, inflating the price tag of flights advertised as low cost. Accepting card payments to buy a ticket is not a service delivered by a company. Passengers should not be charged for exaggerated and unjustifiable card fees."

Commercial practice has, little by little, segregated specific services that may be avoidable (check-in at the counter, excess baggage weight, checked baggage), but which up to now have formed part of the basic fare. Results of the report will be released in the autumn with legislative action expected next year.

On a similar front, airlines Swiss and Lufthansa are to start charging customers for using debit and credit cards, just weeks after the Office of Fair Trading (OFT) backed the consumer rights group Which? in calling for an end to the fees. As of 2 November 2011, a charge of GB£4.50 will be added on all payment card bookings, a little over a month after the OFT responded to a complaint from Which?, stating that surcharges were misleading and detrimental to consumers.

"It's unbelievable that two airlines have introduced these card fees just weeks after the OFT agreed with us that they are unfair and misleading," said Richard Lloyd, executive director of Which?.

"Just one simple change to the Payment Services Directive would put an end to debit card surcharges for good. The Treasury must act quickly to do this before other airlines and businesses jump on the bandwagon and start charging these excessive fees," he added. ■

The *Economist* wrote that Ryanair's "cavalier treatment of passengers" had given Ryanair "a deserved reputation for nastiness" and that the airline" has become a byword for appalling customer service

Changes to Egyptian tourism visa regulations suspended

No travelling in Egypt without passing numerous checkpoint. This one is in Sinai desert along the Red Sea coast

Mixed messages over Egypt visa requirements

The Egyptian government reverses a decision that would have required tourists to get their visas ahead of time instead of buying them upon arrival at the airport, as has been the case for a number of years.

Red Sea dive operators are undoubtedly breathing a sigh of relief. In an abrupt flip-flop from a previously announced move, Egypt will suspend a controversial decision requiring tourists to get visas in advance. Assistant Minister of Tourism, Hisham Zazou announced that Minister of Tourism, Mounir Fakhry Abdel Nour, has agreed with the Council of Ministers to suspend the recent decision that would necessitate tourists to obtain a visa in advance from Egyptian embassies abroad. Tourism companies and offices were quickly notified of the decision's suspension. Previously, tourists from Europe, the United States and other select countries could simply purchase a one-month visa upon arrival at the airport. The decision was met by public outcry and accusations that it would deal a major blow to Egypt's already fragile tourism industry, which has seen a 30 percent decrease in business since the events that toppled Hosni Mubarak from power earlier this year. ■

travel news

Number of visitors to Mabul to be limited

View from one resort to another on Mabul Island

The Tourism, Culture and Environmental Ministry of the Malaysian State of Sabah is considering limiting the number of visitors to Mabul Island, a popular diving resort near the famous Sipadan.

The move was pertinent to avoid overcrowding and to preserve the island, Assistant Minister Datuk Bolkiah Ismail told reporters after launching a workshop on the management plan for Sabah's islands. The government would seek the views of stakeholders including tourism operators before introducing the new guidelines.

Earlier introduced guidelines restricted the number of visitors to Pulau Sipadan, which is among the most popular scuba diving centres in the world.

On the development of islands as tourism centres including those owned by individuals, he said the ministry would conduct a study to identify them. ■

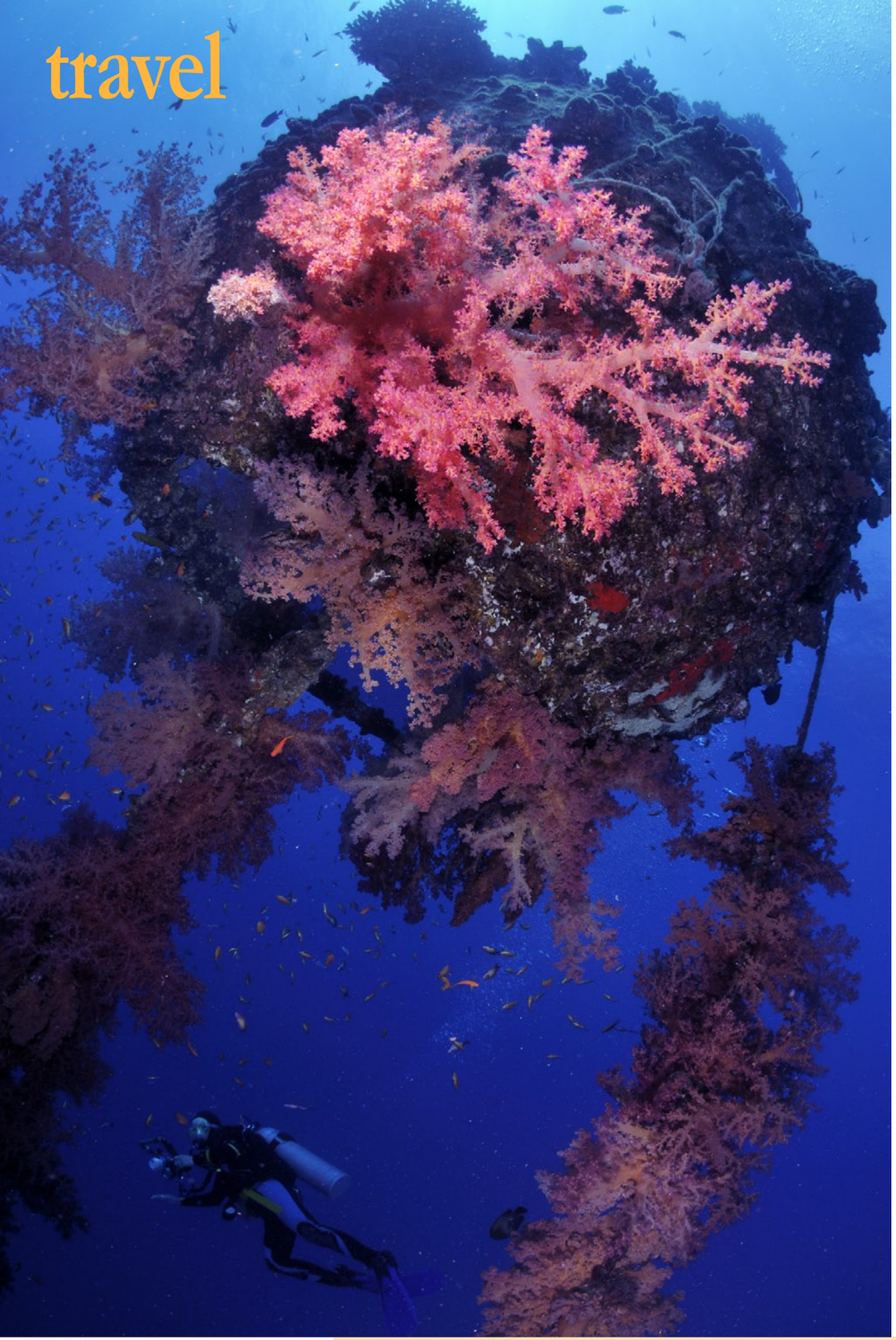
The number of visitors is increasing every year. If the situation is not controlled, it could adversely impact marine life as well as the environment at Pulau Mabul Park and the surrounding islands in the long run.

—Assistant Minister Datuk Bolkiah Ismail

Egypt's Red Sea

Nuweiba

Text and photos by Charles Stirling



The Sinkers mooring buoy Nuweiba (left); It can be very relaxing sitting on the beach in Nuweiba (above); Yellowtail tang fish (below) PREVIOUS PAGE: Polyps of soft coral, *Dendronephthya sp.*

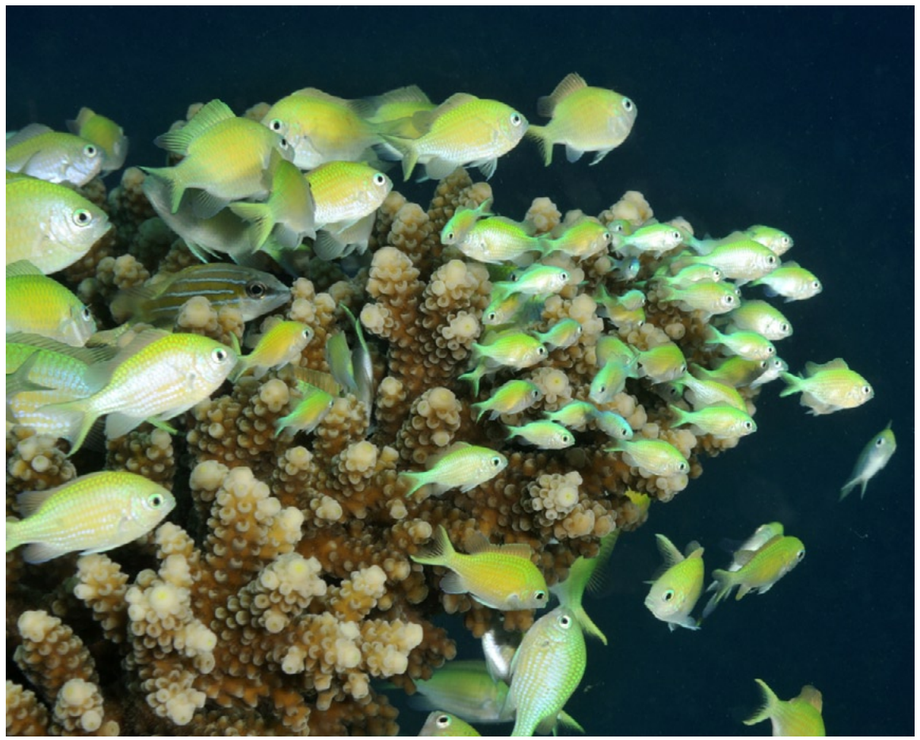
The Red Sea is a fabulous area for diving, so it naturally attracts rather a lot of divers, and under normal circumstances, let's say, "It's busy". Popular locations may have 10, 15, 20 or more dive boats each with 20 or more divers aboard. I've dived pinnacles with maybe a hundred others all circling around in a confused layered fashion. More secluded sites with maybe just those from your own boat often means a liveaboard and lots of cruising. To find seclusion, special locations need to be found. One of these is Nuweiba, up in the Northern Sinai Gulf of Aqaba beyond Sharm el-Sheikh between Dahab and Taba.

Nuweiba is a natural oasis, it spreads over about 40km of gently sloping flood plane surrounded by the majestic Sinai mountains inland and the Gulf. It isn't primarily a tourist centre but has grown due to its ferry port with connections to Jordan. Much of its coastline has fringing coral barrier reefs with coral gardens, reef walls and pinnacles.

On my visit, the town had three dive centres, each having their own distinct ambiance but all were relaxed, friendly, well run, professional and held safety highly. Diving predominantly starts from a sandy beach over a gently sloping seabed to the area of interest. One centre, Scuba-College Nuweiba, also runs a dive boat to reasonably near sites. All offer nitrox.

So, what diver would chose this

Pipefish, in sea grass (above); Reef, this one at Sha'Ab Elaria, Nuweiba (right)



Bluegreen chromis fish, *Chromis viridis*, on *Acropora lamarcki* coral (above); Gray moray eels, *Gymnothorax griseus*, were reasonably common (top left)

location over the many other good options in the Red Sea?

- Beginners. With little or no current and easy beach entries, it's an excellent training location. The training can start at entry level right through to technical with shallow sites to some at 100-metre depths nearby.
- Underwater photographers like the wide range of critters and possibility of re-diving sites they can get to know well.
- Divers with non-diving families like it, as swimming and snorkelling are excellent with good beaches, and it has easy access to desert attractions.
- Any diver wanting independent buddy dives in place of guided groups.

It's not the location for extensive nightclubbing, or heavy duty shopping trips, nor the wreck junky.

Heavy metal

No ship wrecks here—instead, The Sinkers and Pipeline sites offer some rusty metal for those who must have it. These two structures, left after the Israeli occupation in the 1970's both have good marine life associated and are well worth a visit even if they are not in the world's "must do" list.

The Sinkers site is a large, totally submerged mooring buoy, held down by a pair of big heavy growth-covered chains populated by hard and soft corals, shrimps, sponges, anemones and of lots of fish circling.

The Pipeline site has a pair of desalination plant discharge pipes not used in over 30 years, so they are covered in soft and hard corals with numerous species of fish calling the area home. It was a great place to find many tiny pipefish and the occasional torpedo ray on the sand around the pipes with scorpion fish, antheas, fairy basslets, batfish up on the pipes. The end areas of the pipes are used as cleaning stations, so large jacks and snappers visit for the attention of cleaner shrimp and wrasse.

Light metal

For those metal junkies wanting man-made artefacts, just off the Scuba-College beach at 6m, is a jeep. Not thought of as anything special by anyone there, but really quite fun. It has a pair of undulated morays under a wheel, hawkfish swimming over, lionfish in front and numerous other critters. It makes an especially good night dive. The piers at the Hilton and Nuweiba Town also give good

backdrops. The Hilton pier showed off lots of needlefish hunting in swarms of smaller fish.

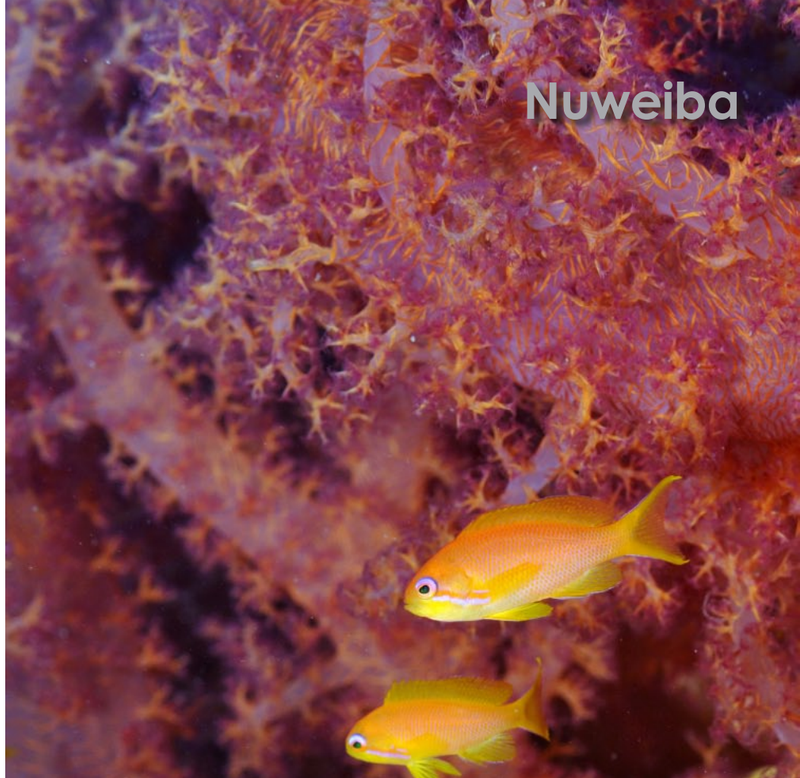
Corals sea beds and sand

What attracts the dedicated diver to Nuweiba is, of course, the abundant marine life associated with reefs. The

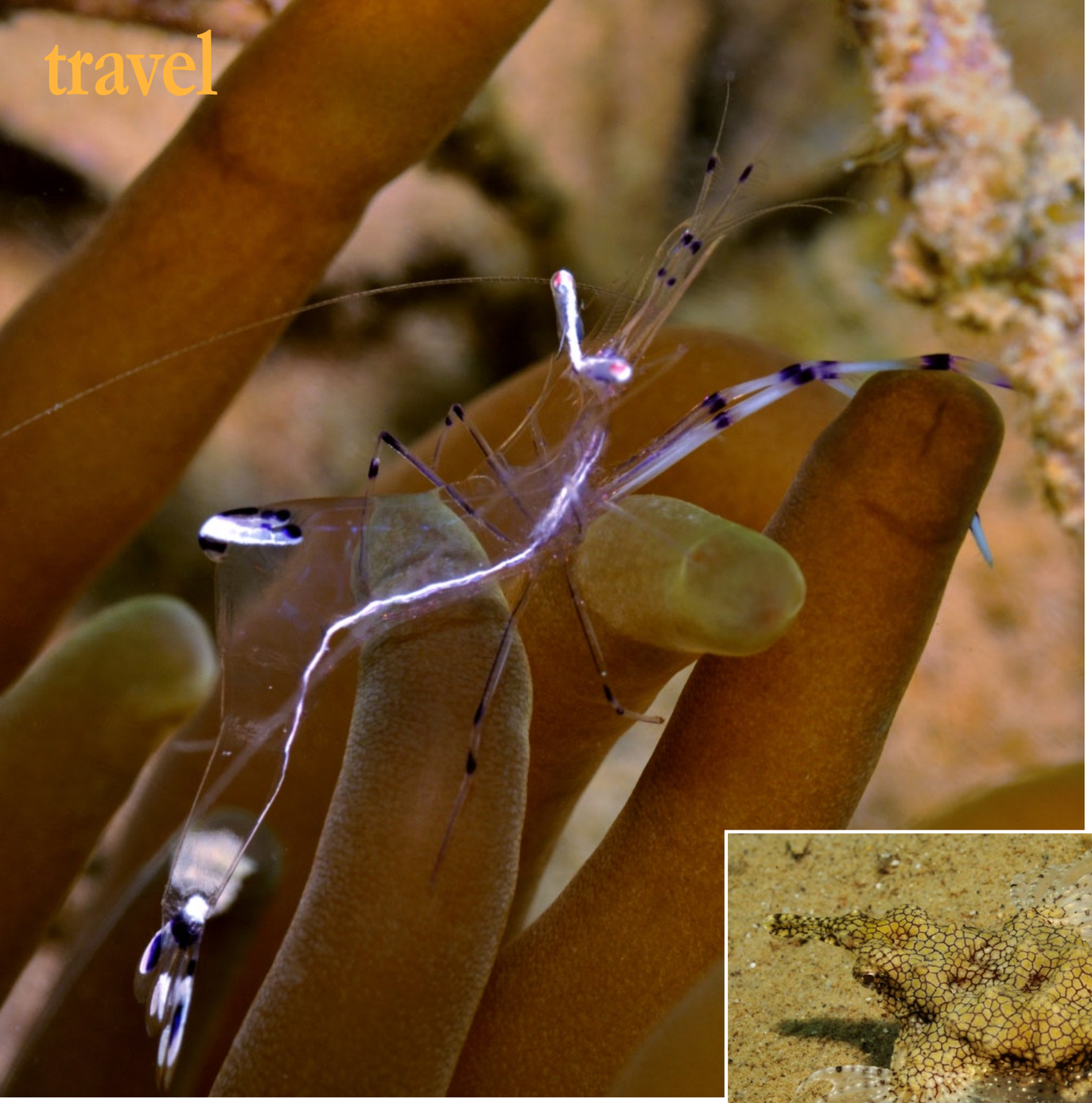
Broad-banded pipefish on hard encrusting coral; The Jeep (above)

hard and soft corals are in good condition with all the species generally found in the Red Sea. The wide mix of coral gardens, valleys, pinnacles, ergs and tables with areas of sea grass, rocks and sand, probably gives more diversity than nearly any other single location.

The Scuba-College southern house reef starting at the waters edge and dropping to 40m or more is an example. Up at the shore in less than a metre just the variety of stonefish is phenomenal, red, green, blue. Down at the deeper end various pinnacles intersperse with walls to give great topography. At the Hilton house reef of Abu Lou Lou the whole reef acts as a series of cleaning stations and attracts underwater photographers for multiple trips a year, year after year as the photos from it win so many contests.



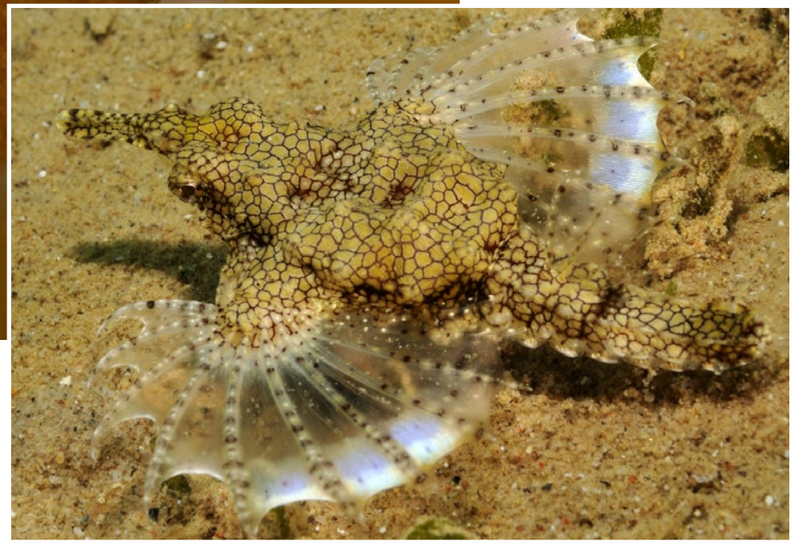
Scalefin anthias (above) on Dendronephthya soft coral; Stargazer fish (left) buried in sand; Stonefish (far left)



LEFT TO RIGHT: Long-arm cleaner shrimp on sea anemone. Excellent macro life here; Diver and anthias on coral head; Thorny seahorse

With a sandy beach as the normal entry in Nuweiba, it's worth looking at that sand while swimming out to 'the site'. It can be surprising what might show itself. The thornback cowfish hunting for morsels, the elusive sea moth, flounder, stargazer, sand dollars, rays, even the mimic octopus, which isn't supposed to be in the Red Sea, may be found. Often next to the sand will be sea grass beds where you might see ghost pipefish, sea horses and a multitude of other fish and invertebrates.

Dives can be *very* local, i.e. just a 100-metre walk. House reef diving is good to great, and can easily occupy a few weeks. Other sites are a few minutes drive, and all three dive centres have this as part of their itinerary along with longer drives down to Ras Mumlah, which is part of the Ras Abu Galum National Protectorate. Ras Mumlah is maybe better known from the long coastal camel trek from Dahab, but it's on the correct side of the mountains for an easier 4X4 journey from Nuweiba. Sites here offer stunning wall dives, beautiful soft and hard corals and technical diving depths.



Sea moth, or little dragonfish, on sandy seabed

A difference in ambiance

Sarah, from African Divers Nuweiba, with her well-trained eyes, was invaluable in pointing out frog fish, the sea moths and other unusual critters. This is the advantage of guided dives with a dive master showing what to see. With Emperor Divers, based out of the Coral Hilton, guided dives are the norm, but independent buddy

Male "Panther flounder" on sandy seabed (left)

Nuweiba

which made prepping equipment a pleasure. It also attracts couples with the extra space, along with families, but won't have the range of facilities of the much larger Hilton. Middle priced. The beach in front gently

dives on the house reef may be permitted for experienced divers. With Scuba-College based out of the Nuweiba Village Resort, the emphasis really is on buddy diving even from the boat, but guided dives can be arranged. Their popular night dives are also guided. Here, Petra and Mike both emphasize that what they want to see are divers who trained up to be confident and self sufficient. The above starts to point out those different ambiances offered by dive operators while other aspects come from the associated hotels.

All of the centres will collect divers from any of the local hotels, but it's often easier being at the associated hotel.

LEFT TO RIGHT: Yellow boxfish; Gray moray eel and undulated moray; Porcupinefish—yellow spotted burrfish; Loading the boat for a dive at Scuba College

African Divers is located adjacent to the Swisscare Nuweiba Resort Hotel, though it also uses other accommodations. The Swisscare rooms were all doubles, and for photographers, the setup was one of the best with desks, lights, chairs

slopes seaward, and for a long way, which makes the swimming excellent but pushes divers to use transport for the drive to their house reef. This in turn emphasizes group diving, but they have free unguided house reef diving with dive packages. The

COUNTER-CLOCKWISE: Shore diving; Wall dive; The Sinkers mooring buoy Nuweiba; Technical diving is possible from Nuweiba, this on trip to Ras Abu Gallum

Nuweiba

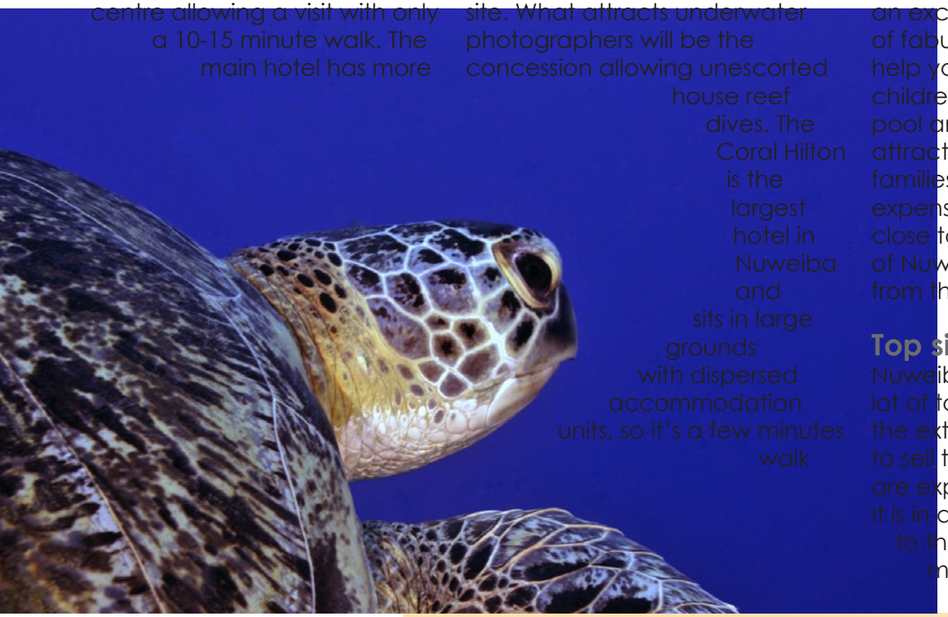
Swisscare hotel is located on a beach side local road with other smaller hotels midway between the port and town centre, so it's a long walk to either.

Scuba-College is located on the beach of the Nuweiba Village Resort in amongst their beach huts, billed as Diving Camp. The huts are more primitive than hotel rooms and adequate if you are primarily interested in the diving, but couples often decamped to the hotel proper. Inexpensive. For divers it was a

CLOCKWISE: Main restaurant food at Coral Hilton ; Bedouin guide at entrance to Abu Hamata Canyon; Very narrow gorge of Abu Hamata Canyon; Hawksbill Turtle, *Eretmochelys imbricata*

supremely easy walk the few yards to the dive centre to pick up cylinders, kit up and walk the few metres to start a dive whenever you chose. The camp is close to what exists of the town centre allowing a visit with only a 10-15 minute walk. The main hotel has more facilities than the camp.

Emperor Divers are probably the largest centre here and do the more usual approach of two dives a day organized around a drive to a shore entry site. What attracts underwater photographers will be the concession allowing unescorted house reef dives. The Coral Hilton is the largest hotel in Nuweiba and sits in large grounds with dispersed accommodation units, so it's a few minutes walk to the dive centre in the main complex, then a cart to transport gear to the beach. The hotel can offer an all inclusive deal with an excellent range of fabulous food in help yourself fashion, children's play areas, pool and particularly attracts couples and families. It's the most expensive. It's located close to the port area of Nuweiba and some distance from the town centre.



Top side excursions

Nuweiba itself doesn't have a lot of tourist attraction, even to the extent of no taxis, no hustling to sell trinkets, and local shops are expecting to sell to locals. It is in a good position relative to the mountains to offer many Bedouin run desert excursions in the Sinai or day trips to Jordan or Israel. Popular sites to visit are Mount Saint Catherine and Mount Moses with Saint Catherine Monastery a must do for many. For me, I liked the desert landscape and took off on a 4x4 trip out to more remote areas with fabulous canyons and sleeping on sand dunes under the stars.

The desert trips start on paved main roads but soon move onto unpaved dirt tracks then cross country using dry river valleys, flood planes, sand dunes, whatever it takes. For larger groups, it may be a few 4x4's travelling together. For mine, it was two of us plus the Bedouin driver and the Bedouin guide with stops to say 'hi' to their families or friends camped out. Then, it was on to Ein Khudra

Swisscare Nuweiba Resort Hotel (above) with the Sinai mountains as backdrop; Through the desert, Wadi Meghesa (above right)

Oasis, which acts as a hub. This was organized by Sulman Atwa, a local Bedouin friend of Sarah and Daniel of African Divers. Each dive centre and hotel has Bedouin friends to organize trips.

From Ein Khudra Oasis, you could go off on camel treks or eat, sit, relax before going on. I avoided the camel treks—they are hard on the bottom and I've done camels before—so I went on to find a secluded valley for the night after walking a bit of the White Canyon.

Early next morning, after breakfast and breaking camp, it was off to walk through the little known Abu Hamata canyon with its very tight canyon walls before heading back to Sulman's camp in Tarabeen at the northern end of Nuweiba. A few cups of tea, a good meal and chatting gave a relaxing break in my visit. If you are really adventurous, the guide teaches camel care and riding for that real trip.

Nuweiba is great; it's just not for everyone. Avoid it, if you are the type who wants lots of discos, shopping and crowds. For any diver interested in marine life, I would put it high on my list. For others, it can be a good place to relax and unwind.

Charles Stirling is a dive writer and underwater photographer based in the United Kingdom. ■

LEFT TO RIGHT: Shops in the centre of town; In Nuweiba, it's possible just to relax with your feet up; African Divers Nuweiba dive centre on the beach; A few shops cater for tourists, this one sells carpets (above left); Camping out (above right)

Tranquillity in Taba

Text and photos by Peter Symes

Taba

FAR LEFT: Anthias dart in and out of the thriving reef

LEFT: Enjoying snacks in the twilight on the terrace of the Marriott after a good day's diving

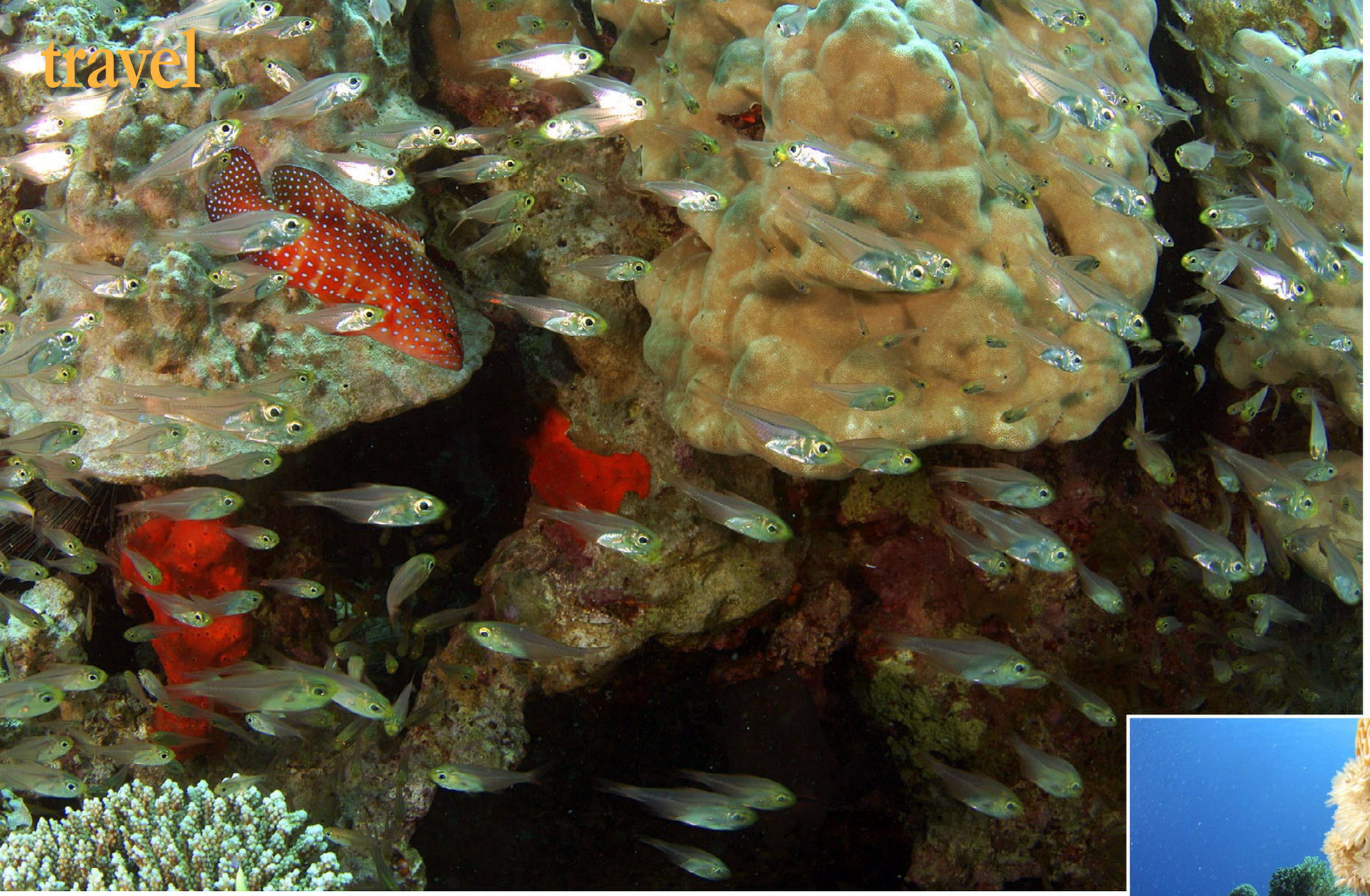
BELOW: 'Big Brother is watching you'—what is presumably a grouper gives the onlooker and ominously stare from behind a geometric moray, *Gymnothorax griseus*

The northern end of the Gulf of Aqaba in the Red Sea is full of new opportunities and fresh dive sites Find something new and interesting to report on at the Red Sea was the assignment I gave myself. Right. Easier said than done. It is one of the most popular and visited dive destinations on the planet and countless articles have already been written about the underwater wonders of its spectacular underwater world. I found myself with a challenge on my hand.

It probably dates me a bit, but I remember when Sharm el Sheikh was a small, sleepy village at the tip of the barren Sinai peninsula, which was reached by overnight coach from Cairo. Domestic flights from Cairo's international airport, which was the common place of entry to Sharm's airstrip, were available but came at a substantial price. This was about 20 years ago, and I still recall how the sensation of remoteness filled me with joy and excitement—it was an adventure. The waters were amazing, and I think they still are. But they are not quite as accessible anymore, and in places, have become somewhat crowded. Sharm has turned into a bustling resort town with over 150,000 hotel beds, or so I have heard, and a busy international airport, and the once barren, rugged and dramatically beautiful coastline has been extensively developed and clad with resorts, which now extend in an unbroken chain far into the mist on the horizon. Granted, a lot of these hotels are very nice, and there are few other places on the planet where you get so much standard for your buck.

However, I was yearning for the original Red Sea experience and for at place where I could go diving off the coast at my leisure, without being compelled to get up in the wee morning to catch a bus to a day boat in the next bay. This is now what you have to do in Sharm. I don't want to get up early, and I do not want commute on a holiday.

While the "Deep South" area south of Marsa Alam on the western coast of the



The life inside the reef structures is quite vibrant. TOP RIGHT: A marble snake eel, *Callechelys marmorata,* pokes its head out of the sand. Approach slowly and you may be able to get up quite close. BOTTOM RIGHT: Huge lionfish are omnipresent

Red Sea possibly could offer all this in plenty, my attention was drawn to the northern end of the Gulf of Aqaba and the area of Taba just south of the border with Israel. The macro life was said to be really good there with a healthy population of frogfish. "Is that so?," I thought. A decision was made, and off to Taba I went.

Fast forward to arrival in Sharm el Sheikh airport. I was amazed and impressed how fast I was whisked through customs and immigration by the guides from our travel company. It only took a few minutes from the time I stepped out of the plane until I sat in the minibus on the outside still gasping and panting from the massive and almost burning wall of hot air that greeted me upon disembarkation. That is Sinai in early August for you. Thank goodness for air conditioning.

Taba Heights is a small resort town built around a golf course and a cluster of four international hotels which takes about 2.5 hours to reach from Sharm el Sheikh. Whether the drive through Sinai's rugged landscape is considered an experience in its own right and part of the whole adventure or just a tedious

CLOCKWISE FROM TOP LEFT: Many of the dive sites are very conveniently located just below the resort; Many of the dive sites are at moderate depth. There are no dramatic drop-offs with lush gorgonians, but there are lots of small critters; Blacktip grouper, *Epinephelus fasciatus;* Sargeant major fish (inset)

and unwanted stage just to get over with the sooner the better depends, I suppose, on your personal inclinations in that respect. I kind of like it, and it helps resetting my frame of reference, as I stare out on the vast and empty expanses of the desert.

I could not help studying the landscape that passed pondering on all the biblical stuff that took place on this peninsula. It's mind-boggling in a way—all the strife that has taken place in this region—and at the same time, I wondered what all the fuss was really about and why people were here in the first place.

There is no water here, no growth, no green pastures nor food for that matter—just dust, sand, gravel, rocks and scorching temperatures. It seems as fertile as Mars. I am passing through in transit to undertake some great diving on colourful corals and sip cocktails or cold beers by the pool side in the evenings—that is my good excuse for being here. But it eludes me as to why anyone would like to hang around in this beautiful but forsaken place before diving was invented and dragged along its masses of tourists with their cash and credit cards.

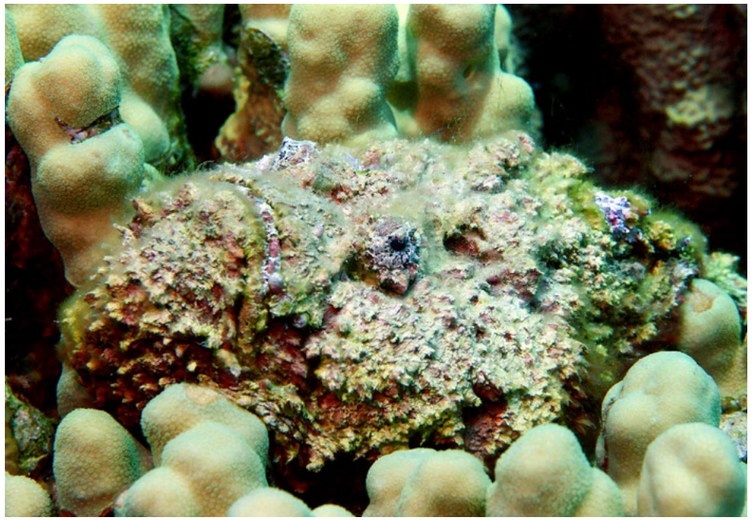
Underwater Sinai is a completely different world, and breaking the surface is like going through a portal to another universe that is colourful, vibrant and alive.

But before one descends, one cannot help taking a look around at the peaks draped in an amazing spectrum of soft pastel colours ranging from sandy yellows to dusty pinks, which only get softer, hazier and redder as the day progresses.

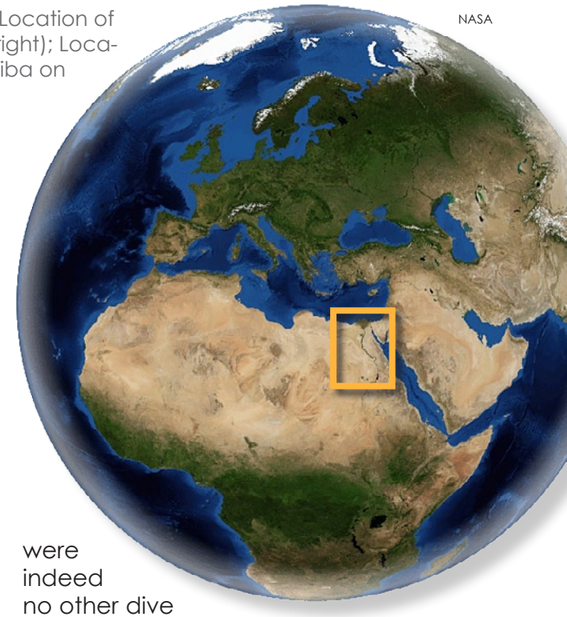
And once one gets water over one's head and immerses oneself in the blue realm, the whole tonal range completely changes, and one is greeted with the full palette of strong colours coming to life in the form of orange anthias and damselfish darting in and out of coral structures, yellow butterfly fish, blue surgeonfish, and the almost phychedelic juvenile emperor angelfish to name a few.

Zen moment

The tranquillity down below was soothing, and I slowly descended to the bottom about 15m below me. I was on the house reef just outside the resorts. From the boat deck, I just stepped off, and I could see my hotel room. It was that close and



Stonefish on reef (left); Location of Egypt on global map (right); Location of Taba and Nuweiba on map of Egypt (below)



NASA

that easy to get to. As I gently touched down like a humanoid lunar lander on a sandy patch and started adjusting my belts and buckles, fidgeting with my camera gear—all my everyday worries had already left me. Ah, peace!

The diving in these parts was everything but dramatic. The bottom was a flat sandy plateau scattered with lots of coral heads and table corals under which all sorts of critters were playing hide and seek. I came to think of a garden with bushes and plantations. There were several big table corals under which groupers, morals and lionfish huddled, pushing shoulders and shoving each other out of the best spot.

I don't recall ever seeing so many moray eels in one location, both in terms of specimens and different species. The maximum depth of 18m also made this dive relaxed in terms of ample margin to no-deco limits and remaining airtime.

Being a photographer I was, obviously, not keen on going with groups. Having to swim from A to B and keep up with a group of divers, some of which invariably have questionable skills in buoyancy control and limited situational awareness, is not very conducive for working properly with a camera. But, much to my relief, in this case A to B turned out to be a short and sedate semi-circular course, so I was fortunately able to mind my own business while staying within eyesight of the group, or rather the dive guides. I believe I even hummed a few tunes as I went about taking my pictures.

I didn't see any other divers in the water. I believed we were the only group on this whole stretch of reef, and once out of the water almost an hour later, there were indeed no other dive boats in sight.

It was a beautiful day, and the surface of the sea was flat and smooth as glass. I got out of my gear and headed for a strong cup of tea and some fresh baked cake before we went on our next dive a little further down the reef. There was no rush.

The moon rises over the gulf of Aqaba. On the other side is the Jordan and Saudi Arabia.

According to Wikipedia the name of the sea may signify the seasonal blooms of the red-coloured Trichodesmium erythraeum near the water's surface.

But what about the special hue the surface takes in the twilight?

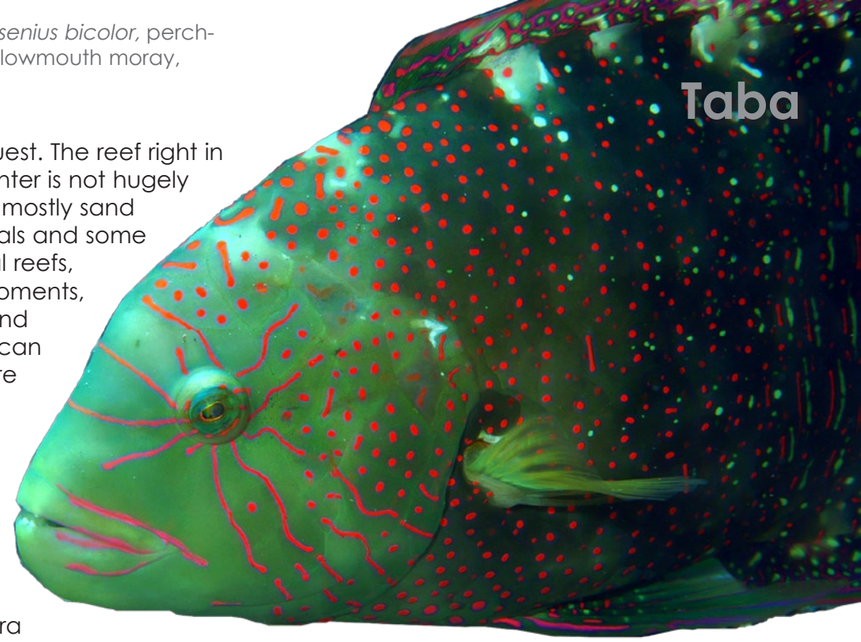
Stellar moments

That evening I had my first of several good dinners with a magnificent view over the opposite coastline. Jordan is on the left, and Saudi Arabia is on the right.

As the daylight dimmed and turned into twilight, the moon rose across the gulf, reflected by the still waters that had taken on a rosy tone. This was the Red Sea all right. I understood that it got its name from this very phenomenon where the local circumstances combined in a way that made the sea appear reddish.

While I watch in silence how the twilight

COUNTER-CLOCKWISE FROM LEFT: A tint bicolor bleny, *Ecsenius bicolor,* perches on a coral head; Nose-spotted, *Synodus binotatus*; Yellowmouth moray, *Gymnothorax nudivomer;* Spotted wrasse (right)



Taba

but it is close enough. The Red Sea Waterworld dive center lies adjacent to the hotel complex and is reached in only a few minutes by the complimentary shuttle bus that stops by the hotel twice every hour for most of the day. Equally important, if you are an occasional lazy bum like yours truly who wants to sleep in now and then and decide to give the morning dive a pass, you can jump in later.

There are three boat dives a day—one in the morning, one at 11 and one after noon. In addition, there is unlimited beach diving from either the house reef in front of the dive center, aka the aptly named "Confined Training Area", or in the nearby Marina Bay area to which you get driven in a 4WD on request. The reef right in front of the center is not hugely exciting being mostly sand with a few corals and some smaller artificial reefs, but it has its moments, as seahorses and pipe ghostfish can be spotted here and, as the name implies, it is an excellent training area. Also, it is good for getting kit adjusted and the camera configured if you have not been in the water for a good while.

I went out several times during the week, just because it was so easy to just grab another tank and walk straight out. I never saw any seahorses but, somewhat ironically, lots of other exciting stuff.

Fjord

No, we have not washed up in Norway. Fjord is the name of a site some 25 minutes sailing time from the marina where there is a freshwater well on the bottom. The well itself appears to be a cylindrical depression in the reef some 15 meters in diameter. The rim starts around 15 meters, so even OWD divers can come along but cannot go to the bottom of the well, which lies at 27m. Also, because freshwater seeps from the bottom of the

Rounding off a day of diving with a glass of cold Stella—a reasonably good Egyptian beer

slowly transformed itself into a velvety blue night, I enjoyed a cool Stella—an Egyptian beer. It did not quite meet the standard of the Belgian or Czech pilsners—but then again, what is—and I found it actually pretty good. I can't help thinking, is there any better way of wrapping up a very nice but warm day full of great diving than with a cool beer while looking out of over the sea. That night I slept like a baby.

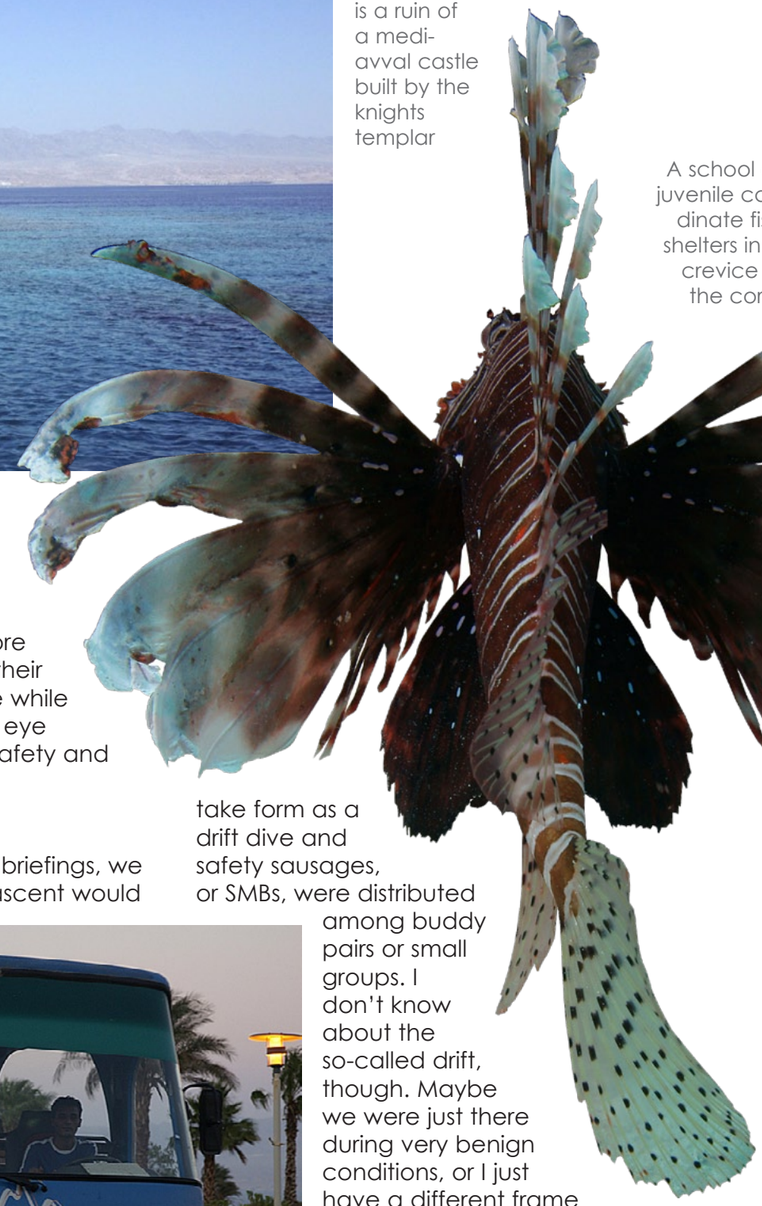
The elusive frogfish

Ideally, I wanted to stay at a resort with a house reef I could have direct access to at my leisure. It is not quite possible here,

On Pharao's Island near the Israeli border there is a ruin of a medi-avval castle built by the knights templar

Taba

Red Sea racoon butterflyfish, *Chaetodon fasciatus* (left)



A school of juvenile cardinate fish shelters in a crevice in the coral

people around but letting people explore the surroundings in their own time and pace while keeping a watchful eye out for everyone's safety and minor needs.

Drift diving

During many of the briefings, we were told that the ascent would take form as a drift dive and safety sausages, or SMBs, were distributed among buddy pairs or small groups. I don't know about the so-called drift, though. Maybe we were just there during very benign conditions, or I just have a different frame of reference on currents, having learnt to dive in Scandinavian waters, but I did not feel much of a current. I think it only makes sense to talk about drift dives when it is a) impossible or at least prohibitively strenuous to swim against the current, or b) when the current is used for sweeping you effortlessly along on a joy ride along the well, divers will experience a loss of buoyancy, which needs to be countered as one descends into the well.

There seems to be little need, however, to explore the bottom, which appears to largely consist of coarse gravel and is a waste good breathing gas.

It is mostly what lives on the walls that seems interesting, including a bright pink anemone zealously guarded by clownfish. The well is a curiosity and a good excuse for an excursion, but once you have seen it, you have seen it, and what goes on in the surrounding reef is more interesting.

Once again, we have the place to ourselves, and there is no hurry. In general, I have to give the dive guides much credit for not herding

Day octopus, *Octopus cyanea,* about to blend in with the reef; The shuttle bus is free and runs every 30 minutes (left)

Taba

CLOCKWISE FROM FAR LEFT: Tube worm blenny, *Plagiotremus rhinorhynchos*, peeks out of its hole; Steinitz's shrimp goby, *Amblyeleotris steinitzi*, usually shares its burrow with a shrimp that keeps the burrow tidy in return for protection and food scraps; Two-banded anemone fish, *Amphiprion bicinctus*; Pyjamas nudibranch, *Chromodoris quadricolor*; Juvenile emperor angelfish, *Pomacanthus imperator*

reef. This dive had neither, but we got a good excuse for some very good practise in deploying the buoys, ascending along their lines and performing a safety stop suspended under these sausages. You never know when you will really be dependent on such skills. In any case, it is my firm belief that a surface marker buoy should be part of any diver's safety kit.

Other dive sites

The local dive sites lies pretty much like pearls on a string along side the resort and a bit to north. And none of them are very far from the marina. Most of the sites are dominated by relatively flat or gently sloping areas with a mix of sandy patches and coral heads. This physical structure combined with the fact that there is plenty of macro life makes it a very good area for photographers, because there always seems to be ample room to kneel down on sand and mess around without damaging the sensitive coral by accidental physical contact. The dive guides also seem to have a keen eye for spotting elusive or camouflaged creatures, which is very helpful for photographers.

One dive site, Farun Island (aka Pharaoh's Island) lies close to the border with Israel, around 45 minutes sailing time from Taba Heights marina. On the island, the most prominent landmark is the old fort.

In the 12th century, Crusaders defending the route between Cairo and Damascus controlled by the nearby city of Aqaba, in Jordan, built the first fortification on the island. In December 1170, Saladin conquered the island and reconstructed the citadel. In 2003, the citadel on Pharaoh's Island was added to the UNESCO World Heritage Tentative List.

History aside, it is also a popular dive site, with lush coral reefs making it a popular sightseeing attraction among tourists based in Taba, Eilat and Aqaba. From Taba Heights, this is a full day weekly excursion with lunch served on the boat.

TOP TO BOTTOM: Wandering feather star traverses the sea grass meadow; Painted cardinalfish, *Archamia fucata*; Schultz's pipefish, *Corythoichthys schultzi*

Dense schools of glass fish (above) congregate over the reef structures; A pipefish of indeterminate species (right) hides in the sea grass bed

Sea grass and glass fish

The lush meadows of sea grasses constitutes a different habitat than the coral reef. At a glance, there doesn't seem to be much life there, but look again and look closely, because a lot of the species there are very well camouflaged. Hiding behind the sea grass, you can find seahorses and pipefish, some of which are fiendishly well camouflaged. Or you might come across a grazing sea turtle.

It was on of one of these shallow nearby sites where I had one of my most enjoyable dives for many years. The name of the site is Muqabila and lies few minutes south of the marina. We started the dive among table corals and pillars on the sandy bottom, and as usual, the amount of life taking shelter among the corals was a spectacle one could keep watching forever.

A school of juvenile The pickhandle barracuda *Sphyraena jello*

Seaside view of Taba Heights (right)

Typical reefscape below the resorts (bottom right)

Two-banded anemonefish in pink bubble coral, *Physogyra sp.* (below)

All kinds of damselfish, more species than I could recognise, were darting in and out. Moray eels were tucked away in crevices at the bottom, and huge lionfish gave me the grumpy look.

On top of one the coral heads, the guide spotted and pointed out a stone fish, which I would never have seen on my own. What an ugly fellah. But some 45 minutes into this already pleasant dive, we came to a big coral head that sat just where the beds of sea grasses started.

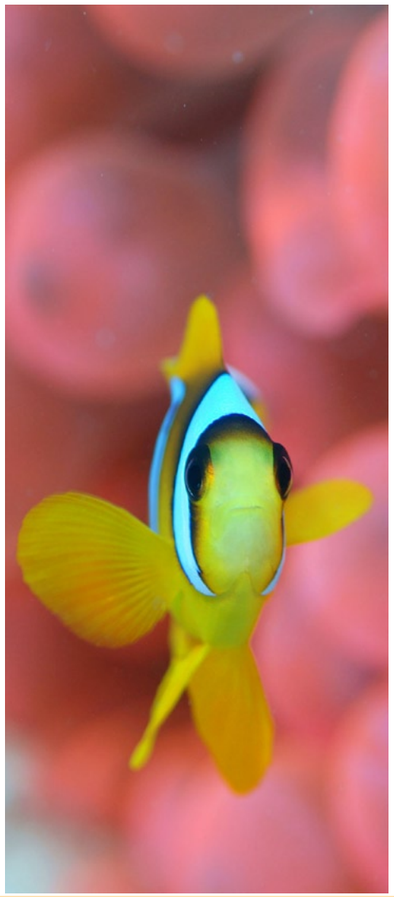
The sun was coming from behind the underwater scenery, as I watched a school of large glassfish moving and swaying in and out of the reef. Suddenly, they passed over the reef and came in between me and the sun, which backlit the whole lot like a glass mosaic in a cathedral, and every little fibre in their translucent bodies stood out.

Slowly moving away from the coral, we then went over the bed of sea grass.

First, I came across a wandering brittlestar, then a bright red pipefish—of a species I have not yet been able to establish with any degree of convincing certainty—some small wrasses, and then, a majestic sea turtle calmly grazing.

Security

Due to the proximity to the borders with Israel, Jordan and Saudi Arabia guests are required to bring their passports on all boat dives, but this is not a major hassle. Every morning, when divers got picked up outside the hotel by the dive center shuttle, the dive guide collected the passports for safekeeping. Security is in place everywhere. During the transfer from the airport in Sharm, we passed through a number of checkpoints where we were waved straight through by soldiers who looked utterly bored out of their skulls, as they cooked in the heat and fly-infested manholes for I don't know how long. Around the perim-



On the road from Sharm el Sheihk to Taba, you never know what you are going to meet

eter of the Taba Height urbanisation was another set of check-points, so if one had no legitimate business here, one was not able to get very far. Nonetheless, busses and transfer vehicles were not able to pull up all the way to any of the hotels being prevented to do so by barriers, which are probably there to stop car bombers from entering the premises.

It is probably all just healthy paranoia stemming from Egypt's critical dependency on the revenue from tourism, as it's better to be safe than sorry. But sometimes, it just got a bit silly and inconsequential. Everyday guests had to pass through a metal detector and empty their pockets to enter the hotel through the lobby, while nothing prevented guests from going straight to their rooms via the sidewalk or by entering the hotel from the beach.

The dive center

Red Sea Waterworld gave me the impression of being organised and efficient in the way they dealt with the many groups of divers, snorkellers and other watersport guests. Operations were timely but never rushed or chaotic. The place appeared neat and orderly, and the rental equipment looked fairly new and in good shape. But perhaps most importantly, I noticed how the staff interacted among themselves, and the mood seemed relaxed and light hearted. If things are in a mess back stage, it will show.

The center has a café where one can have a light lunch or snack between dives or just enjoy a coffee, juice or smoothie.

Accommodation

The standard is good, as is often the case in Egypt, and relatively upscale with attention to detail without being uncomfortably posh for divers in t-shirts and flip-flops. I stayed at the Marriott but poked into the other nearby hotels, which seemed to be of an equally good four star standard. That aside, I cannot pass any judgement on these hotels as I did not stay there.

At Marriott, I enjoyed having the all-inclusive board, which meant that all meals were included as long as I dined in the main restaurant. There were a number of other tempting restaurants in the hotel which I, however, did not get to try.

Amazingly, all-inclusive also meant alcoholic beverages—of which something was supposed to be excluded, but I never found out what it was. I presumed that it must have been the expensive liquors.

The hotel had some excellent big pools, a good fitness center

Marriott in Taba Heights (above)

Dinner restaurant at Marriott (above); View of Taba Heights (top left)

with a spa and a tennis court, which I cannot believe a person could actually use in that searing heat without suffering a heat stroke within minutes. My main gripe was that Internet connection was shockingly pricey at €15 per hour, which deterred me from getting much work done while on location—a feature that might well assist guests in avoiding the temptation to work, or get bogged down checking emails, while on vacation.

Sights

Castle Zaman is a restaurant in a castle with a spectacular view about 15km down the coast. It specialises in slowly stewed dishes served still sizzling in huge ceramic pots. It is not cheap but well worth the visit if you fancy a change from the hotel's restaurant.

St. Catherine Monastery lies in the heart of Sinai and is a full day trip, so are most of the other excursions on offer such as the Colored Canyon, Aqaba, Eilat, Jerusalem and, my personal favourite, the magnificent Petra.

Boats leave from the Taba Heights marina to Jordan, but during my visit, operations were put on hold pending some bureaucratic issues with permissions. Until this gets sorted out, trips to Jordan take place by going by coach to the Israeli border, which is crossed on foot. Then, another vehicle takes guests the short distance to the Jordanian border, which is then crossed on foot. And finally, some van or minibus takes guests to the sights they want to see. Petra is worth it, though.

Recommendations

As it has probably already been made clear, this is a place for macro photographers and holiday makers who are looking for a more tranquil location than what big resort towns elsewhere can offer. Of course, the trade-off is less shopping options and less night-life though there are bars enough in the hotels or the little 'uptown area' on the other side of the central golf course. You will not find the wild and dramatic diving here—go to Brothers or Elphinstone for that—nor did I spot many of the lush soft corals I have seen further south, but this area's got so many other things to offer. It is a good place to relax and seems like a good place for a family holiday unless one craves a lot of excursions and sights of which there are not so many.

Oh... and I never got to see my frogfish. I guess, I'll just have go again. ■

Edited by
Rosemary 'Roz' Lunn
& Arnold Weisz

POINT & CLICK ON BOLD LINKS

totally cool Equipment

Xeo

The Liquivision Xeo is a wrist-mounted air, nitrox, and OC/CCR trimix computer that can serve divers of all levels. The Xeo is compact and light weight, and its bright full-colour LED display is easy to read. It is operated with a tap-interface and is designed for ease of use with both bare hands and thick gloves. The computer is shaped to fit the wrist and the screen is angled to optimized readability. The battery is user-replaceable. **Liquivision.com**

Hollis Ride

Ride is a technical BC that has been made specifically with travel in mind weighing in at just 5lbs but packed with technical features. It includes a simple yet strong nylon one size harness, that fits most and is easily adjustable. The wing is a rugged one-piece 1000 denier cordura and with stainless steel two-inch D-rings on the shoulders and hips, padded crotch strap, back pad and lower storage pouch. The wing comes in two sizes with 23 and 37lbs of lift respectively and, depending on the size, can be used with single or twin tanks. **hollisgear.com**

Smartfind beacon

The Smartfind S10 AIS Beacon is a manually activated personal safety device that incorporates both AIS (Automatic Identification System) and GPS technology. When activated the Smartfind S10 transmits a unique alert signal to the vessel the individual has come from and to all AIS enabled equipment within a typical four-mile range, signalling that help is required in a man overboard or lost diver situation. Smartfind S10 is fully submersible to 60 meters, buoyant and compact, intended for carriage by divers, crew and anyone who works on or carries out leisure activities on the water. **mcmurdo.co.uk**

iQ

This sturdy iQ jacket with adjustable hood is water repellent and wind resistant, yet breathable. Other features include zippered arm pocket, zippered side pockets, water repellent hood, fleecy lining and embroidery on the shoulders and chest. **iq-company.com**

Tusa Voyager

The BCJ-1800 Voyager is TUSA's bid for a lightweight and compact BC for warm water divers or the constant traveller, weighing only 4.4lbs/2kg. The Voyager can be rolled for travel and features a unique console sleeve, on the left side, for streamlined routing of your gauge or computer console. It features the integrated weight loading system (W.L.S.), which permits easy weight loading and release and the Independent Harness System that was developed to significantly reduce weight and structure. **tusa.com**

Aeris light

The AT600 ION LT over-balanced diaphragm first stage is brand new and weighs less than a pound. The AT600 ION ION LT is non-environmental but comes with the option to add an environmental conversion kit.
diveaeris.com

rEvo CO_2 monitor

We were recently shown rEvo's carbon dioxide monitor that works in conjunction with Shearwater's Predator dive computer. The sensor itself doesn't look like much—a bit like a stick of metal, or an antennae, in the center of the radial scrubber canister where it measures the warmth given off by the active zone on the scrubber. Keep an eye out for the specs once it gets posted online. **revo-rebreathers.com** and **shearwaterresearch.com**

HDS Pro-elite

The HDS Pro-elite is a new lightweight and flexible, yet very durable trilaminate from the English drysuit specialist, Hammond. Produced from a special fabric called Rhombus Weave Terrazza with single-stiched and double-taped seams, this suit is built to last. It comes with valves from Apex, latex wrist seals, neoprene neck seal and zips with protective flaps.
hammond-drysuits.co.uk

Aqualung Axiom

This high-end, jacket-style BC incorporates Aqua Lung's i3 technology, a streamlined integrated inflation and deflation system that makes buoyancy control easier. The new patent-pending Wrapture™ Harness System completely supports the weight of the tank with an innovative wrap-around backpack, Aqua Lung writes. This keeps the cylinder closely secured to a diver's center of gravity—the back—and efficiently distributes its weight to provide superior stability. The Wrapture system works in conjunction with Aqua Lung's patented shoulder swivel buckles to prevent the BC from riding up while making the tank feel lighter. **aqualung.com**

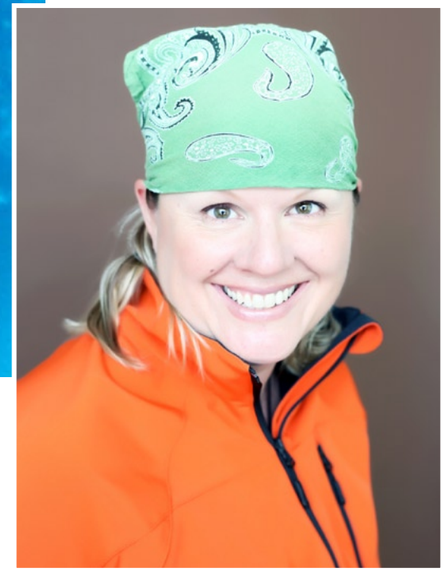
Green Force HID50 LED

Should you be so unfortunate as to drop and damage your precious Green Force lamp, despair not. With this new HIF 50 LED upgrade, the user can now easily replace the lamp, as all the connections of the battery packs and the light heads are identical (Green Force TOS connection*), all the components are interchangeable and one has the choice between eight battery packs and 20 light heads, which vary from halogen over LED to HID and are all compatible and modular.
green-force.com

Jill Heinerth

Text by Bonnie Harris McKenna
Photos courtesy of Jill Heinerth

Jill Heinerth, whose first job was a newspaper route in her home town of Toronto, Canada, is today a pioneer technical diver and instructor, a renowned explorer of underwater caves who owns a record for the deepest and longest cave dive, and a record for the longest dive into an Antarctic iceberg. She is also a respected filmmaker, author and photographer. She has been honored by the diving community by being an inaugural inductee into the Women Divers Hall of Fame, and this year, she will receive the Nogi award in recognition of her continued work in the dive industry.

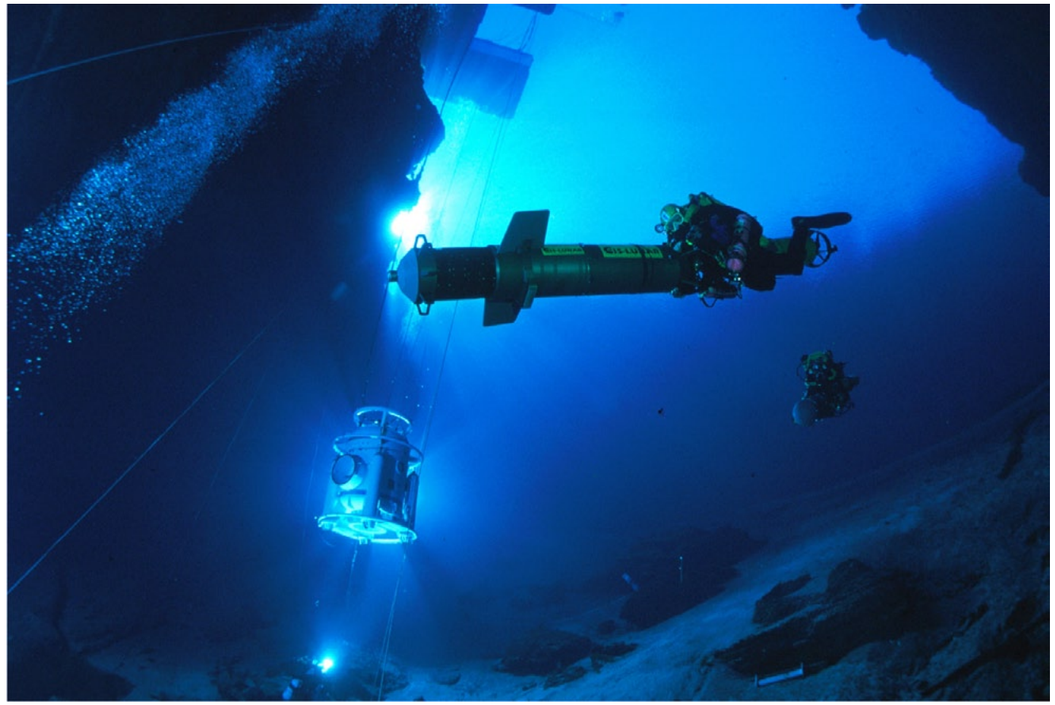


Heinerth currently resides in High Springs, Florida, with her husband, Robert McCellan, who is not only her life partner but her business partner, too. He has a background in concert promotion, as a studio engineer and a Navy SeaBee combat photojournalist—all critical tools at Heinerth Productions.

Heinerth earned a Bachelor of Fine Arts in Visual Communications Design from York University. "It is a highly specialized and competitive four-year degree that puts out creative professionals. My advanced education is in curiosity," she commented.

BHM: When and where did you become interested in SCUBA diving?

JH: I was a volunteer swim instructor and lifeguard at a local swimming pool when, at age 16, I got a chance to try scuba. I was hooked. I finally got certified in university. I had been wanting to do it all my life, but I had to earn the cash to take the



Heinerth

classes. My early years in diving were in Tobermory, Canada, in the wreck capital of the Great Lakes.

BHM: Did you have a hero when you were growing up that influenced your desire to dive and explore?

JH: This may sound obvious, but I loved Jacques Cousteau's Undersea Adventures. It was on on Sunday night, and we were permitted to have our dinner in the living room to watch the show. That was a real treat. I also thought the astronauts were pretty cool.

BHM: Diving, writing, filmmaking, photojournalism – which came first, how did you connect them and why?

JH: I had a small advertising and graphics company in Toronto and taught diving at night. The ad agency was the money. The diving was the relaxing bit. I knew I needed to find a way to bridge my two loves, so I sold the business, packed up and moved to the Cayman Islands for almost three years working as a dive instructor, guide and managing the marketing for the resort. In terms of photography, I think I have always been the person to document life and share it.

BHM: If you could switch professions, what would it be?

JH: That's tough, because I am living my dream.

BHM: What do you do when you are not working?

JH: My husband and I have a really weird yard. We grow as much of our food as possible and built an outdoor shower, a yurt and a geodesic greenhouse. We love working on our mini-farm and yard art. We are also avid cyclists and paddlers.

BHM: What is the one thing about you that your colleagues may not know?

JH: That one thing is actually two. I am a painter and love to watch "Dancing with the Stars". My husband loves watching, too. We watch very little TV; we don't even have cable or satellite; we have to rely on what we can get with our antenna.

BHM: What are the greatest challenges you have faced in your career?

JH: I've faced numerous challenges being a woman in a man's world. Whether it is in the field of technical diving or filmmaking, that said, the older I get, the more our world seems to embrace talent in either gender.

BHM: What are the most important attributes of a person who wants to get involved in the work you do?

JH: I think humility is the key… perhaps in all aspects of life. Tenacity is critical, too. If you have a dream, you can accomplish anything you set your sights on, but it will take tenacity and really hard work to succeed.

BHM: How do you prepare for the demands of tech-diving?

JH: In diving, fitness is ideally important and that includes physical and mental fitness. I manage to put in hundreds of dives every year, but I still focus on rehearsal and currency. I have a lot of diving toys and have to remain fresh and current before taking those toys out on a job. Then, Practice, Practice, Practice and always accept new learning opportunities.

BHM: What kind of person do you want diving on the same team as you?

JH: Open minded. Comfortable in their own skin. Versatile, creative thinkers and hard workers.

Heinerth

BHM: I believe you own a record for your cave diving expertise.

JH: Yes, it was at Wakulla Springs for five hours at 300 feet.

BHM: What drives you to push the envelope?

JH: Life is a puzzle, and I believe that almost anything can be solved with the right tools, patience and imagination. Exploration often leads me to push the limits of human endeavor, but it is always secondary to finding the answers for questions that drew me in the first place.

BHM: How do you see the future?

JH: It is an interesting time of change in our world. There is a great shaking up of old ways and old institutions that don't serve the population. Everything about how I work has changed. I have to work leaner, broader and smarter in every aspect of my business. I embrace that change as exciting, and I feel very positive about the world that will arise from the change we are experiencing today.

BHM: Are there any caves you will not dive?

JH: Definitely not!!!

BHM: What are your best and worst experiences?

JH: Antarctica and Antarctica. It was like going to another planet, but there were many physical and mental challenges.

BHM: When preparing for an expedition what are you looking for in team members?

JH: On expeditions, I might be looking for a particular talent beyond diving, such as an audio recordist or mechanic. I cannot afford a huge crew, so I need fewer people to cover more bases.

BHM: You are known as an expert in the use of closed circuit rebreathers. Recently, PADI's magazine, Undersea Journal*, had an article discussing the launch of their Rebreather Diver and Advanced Rebreather Diver courses that address recreational divers diving with Type R rebreathers. The courses are scheduled for announcement in the third quarter of this year. What are your thoughts and do you think it might be the wave of the future in diving?*

JH: The industry is simplifying the Type R rebreathers so that they are automated and easier to use. I do not know if they are the wave of the future, but if the marketplace is up to it and willing to grow with it, it might be. There is nothing like diving with no bubbles, you can get really close to observe the animals.

BHM: What influences your selection of rebreathers?

JH: I have owned a lot of rebreathers, but that is because I am always willing to look for the next greatest innovation. It is life support, and you should own the best thing you can afford. I have to be able to look my husband in the eye (he barely dives) and tell him that I am using the safest thing available to me.

BHM: Much of the work you are known for involves cave diving. Were you exposed to exploring dry caves before you started cave diving?

JH: I was exposed to dry caves first. I always loved small spaces, but they feel even more comfortable to me when I am underwater.

BHM: What is your fascination with caves/overhead environments?

JH: Cave diving is like swimming in the veins of Mother Earth. It feels primordial. When I cave dive and follow the flow of water, I feel like I am seeing things that nobody has witnessed before…and many times, I am. I love the allure of exploration, and caves are perhaps the greatest source of the unknown.

I was also one of the closest calls I ever had.

BHM: Can you tell me about it?

JH: First, let me clarify. My worst experience was getting bent. Antarctica was another experience altogether. It was my first ever cave dive in an iceberg, and my two partners did not have experience with icebergs either. We were on a National Geographic assignment in 2001 to intercept and dive B-15, the world's largest recorded iceberg. [B-15 calved from the Ross Ice Shelf in March 2000 was larger, in area, than the island of Jamaica and estimated to weigh around three billion tonnes. Despite breaking up several times, after a decade parts of B-15 still have not melted.]

On the last dive, we were pinned inside the iceberg cave by the current. We were at 130 feet racking up deco, literally crawling on the bottom as the current kept sucking us back into the iceberg. Later, in the evening, while back on board the ship, we heard a loud explosion; the iceberg exploded into a square mile of ice cubes. It also spawned an enormous wave. Diving the iceberg was an incredible and unique experience.

BHM: How did you get started in filmmaking?

JH: I did some TV work before I started filmmaking. In fact, the first story I wrote for film was the Antarctic film in 2001, and I have done a number of independent films since that time.

BHM: If the whole world were listening, what would you tell them?

JH: My biggest passion is working toward water literacy, teaching people gently how they are intertwined with their drinking water resources and how they can be good stewards and protect those precious resources for the future. That means I talk to a lot of students, Rotary Clubs, organizations, etc. People must know where their drinking water comes from and understand that their actions on the surface of the Earth affect the quality of the water beneath their feet. We will be fighting wars over water… not oil.

When I swim in underwater caves, I am acutely aware that I am swimming through the life blood of our planet. I get to swim through the very veins of Mother Earth. As I chase freshwater beneath the surface of the earth, I realize everything that we do on the surface of our porous planet will be returned to us to drink. I've seen the changes in the quality of water. I've noted the diminished flow that sometimes allows a cave system to choke and stop like a clogged artery in a heart attack.

There is a small infinite amount of clean fresh water on our planet, and I get to explore the limits of one of the largest windows on the underground on Earth.

I think Florida is a microcosm of what is happening elsewhere. We are pumping more water out of the ground everyday than is replenished by rain. We are the largest water hogs east of the Mississippi using a gluttonous amount [of water] to create ridiculous golf course lawns that we cover with pesticides, herbicides and fertilizers that soak into the ground, flow through the landscape and pollute springs, rivers and lakes. All that eventually pours out in the nurseries we find in estuaries, and it causes horrible filamentous algae to explode on our coral reefs.

Don't get me wrong, it is not just lawns; there are many other sources of nitrate pollution, but it serves as a good example of how we, perhaps unknowingly, cause catastrophic events downstream from normal everyday actions in our homes.

I don't [think] anyone really wants to pollute or [they] would connect their lawns with our oceans, but I think my biggest and most important job in life is to help people make these connections and make better choices in their lives whether at work or at home. With education and a lot of small changes, we can make a difference.

If we can increase water literacy and recognize clean water as a basic human right, the world will be a more peaceful place.

"When you do push the envelope and your experience fear, it is like there's a new boundary for what is possible."
—Jill Heinerth.

BHM: Are you currently working on any new films?

JH: Yes, two works are in progress: *Ben's Vortex*, which is about a diver who disappeared in vortex Springs and has never been found. The other production is *We Are Water*, which is about fresh water resources on our planet—our most precious resource. ■

RECORDS:
Women Divers Hall of Fame
- Longest dive into an iceberg—2001: Three hours using Cis Lunar MK-5P rebreather. Water temperature -1.9°C (28.6°F).
- Longest deep cave penetration—1999 (Women): 3,050 meters (10,000 feet) cave penetration at a depth of 91 meters (300 feet) for five hours during a science and mapping dive at Wakulla Springs.

BOOKS:
Essentials of cave diving (2010)
Cave diving: Articles and opinions (2008)
Digital underwater photography (2010)
Side mount profile (2010)

PUBLISHED IN:
National Geographic
Smithsonian
Deep (China)
Diver (China)
Wired
All recognized dive publications and countless newspapers and Web sites

FEATURED IN:
Sports Illustrated for Women
National Geographic
National Geographic Adventure
Undersea Journal
Sport Diver

Contributor to numerous Tech Diving publications

FILM AND TELEVISION:
Credits for more than 30 various productions including the PBS production of *Water's Journey* a documentary series that takes viewers on a journey through the world's greatest water systems.

For more information on Jill Heinerth, visit her web sites:
www.IntoThePlanet.com
www.RebreatherPro.com

Have Rebreather, Will Travel

'Building a strong pillar to support the new rebreather revolution?

Text by and photos courtesy
of Jorge Antonio Mahauad

As the word, *rebreather,* gains readership in diving magazines, brings novelty to shows and fills the mouths of renowned instructors many industry professionals are thinking of "rebreatherizing" themselves. This is predictable, as the rebreather has been hailed as the "greatest diving innovation since the regulator".

The fact is that in the advent of a new wave of recreational rebreather divers and the industry trend of making rebreather diving more available, many manufacturers are envisioning their own consumer rebreathers in the short and mid-term. At the same time, several recreational diving instructors wait for the "approved" units to come out while others are "taking the plunge" on units like the Poseidon MKIV. It is reasonable to think that a greater number

of dive centers will be willing to analyze the option of providing support services to rebreather divers in the near future. In this regard, it is highly likely that offering a wider range of services will become a source of competitive advantage as the recreational rebreather market expands.

It is reasonable to think that a greater number of dive centers will be willing to analyze the option of providing support services to rebreather divers in the near future.

In the last decade, technological advancements have allowed this futuristic technology to include automated mechanisms that will override and prevent reasonable user error. In addition, training to reduce the so called "human factors" is being designed, and it is expected that the application of multi-level sensory learning systems of proven educational value will help develop simple response mechanisms for quick bailout procedures to virtually eliminate fatalities. Nonetheless, many challenges lay ahead as the travel and leisure component is still undeveloped and underestimated as one of the pillars of this so called "new revolution".

So far, the additional business or the competitive advantage created by having a recreational (meaning no decompression, maximum 30 meters diving) rebreather operation have not overcome the extra work, expenses and potential liability that come with it, and some changes from manufacturers and training agencies are still needed in order to effectively develop the recreational rebreather travel sector.

In this article, I will try to list, expose and explain the components of rebreather travel and the general challenges the dive travel and leisure model faces. Hopefully, this will be of interest to manufacturers and training agencies that are willing to listen to others as part of their product development process. I think that this article can also be of value for the travel professionals thinking about getting into the rebreather market and to the people making decisions that will make such "evolution" happen.

Investment

Let's start from the beginning. Investment in developing, marketing and distributing rebreathers has increased in the last few years. It is foreseeable that this increased expense will create a greater number of opportunities and that diving instructors will provide training for many new entry level or "recreational" rebreather divers. If the equipment sales model is maintained, many of the new divers will eventually buy a rebreather.

Some changes from manufacturers and training agencies are still needed in order to effectively develop the recreational rebreather travel sector.

As the recreational rebreather diver spends money on a rebreather and develops skill, a new market for the rebreather traveler will develop. This new market will probably combine the well publicized destinations for recreational diving and the more specialized attention required to support a number of traveling rebreather divers.

Eventually, as recreational rebreather diving becomes an interesting product line for dive operators, a considerable amount of extra expense will be needed for diving service providers in the sector in order to cope with the base line for rebreather support and increased volumes of divers. As a result, additional investment in infrastructure, equipment and education will be required from the service provider intending to provide high standard facilities for rebreather divers.

Rebreather-friendly

Obviously, this investment will have to be offset by the benefits that serving rebreather divers will bring to the dive operator. But what are those benefits? What is worth the hassle and extra workload that rebreather divers create? Let's take a look at the current rebreather travel model and work it from there.

A place where rebreather divers are welcome is often called a "rebreather-friendly" facility. So far, these facilities have served the needs of technical divers in general, and some sort of community standard has emerged from the needs and expectations of this niche market.

In order to facilitate the modern closed circuit rebreather diver to a sport diving level, a "rebreather friendly" facility has to provide at least high pressure (200 bar) fills of medical grade oxygen and a reliable supply of oil free (tested), high pressure air. In order to make use of the gases provided, the dive operator will have to stock a range of rebreather tanks and valves, along with a choice of rigged bailout cylinders and regulators, and a stock of soft and trim weights in small increments. In order to comply with what the community now calls "basic support", the rebreather facility will also have to provide a range of CO_2 absorbent mechanisms such as grain or cartridges.

In addition to these basic features, a rebreather minded operation needs to provide certain infrastructure that includes a safe, somewhat private, well ventilated, cool, clean and grease free area for assembling and storing rebreathers. In addition, a dedicated space and water hose for rebreather rinsing is important; this area does not need to be exclusive, but it cannot be the same

A "rebreather friendly" facility has to provide at least high pressure (200 bar) fills of medical grade oxygen and a reliable supply of oil free (tested), high pressure air

Supervision is not easy with a group of bubble-less divers who are able to stay down for a long time

Procedures for entering the water will often require flexibility

used for rinsing wetsuits, BCD's, etc. There is nothing such as a rebreather "rinse tank".

Special care

Areas with changing currents, big waves, strong winds, open ocean locations, bad visibility or any other conditions that could be considered potentially (and reasonably) dangerous will have to provide special care if the rebreather-friendly operation offers boat (or supervised) dives.

Positioning

In my opinion, the rebreather operation should be able to estimate with reasonable accuracy the position of rebreather divers underwater depending on the currents, runtime and bottom topography for a standardized dive plan at any given time. On the other hand, a high tech solution to perform this task would be ideal and have great sales potential.

The challenges of providing the diver with underwater GPS, EPIRB and surface communications are well known and technology will eventually develop and provide this in a single, pocket sized, standalone and affordable device that is user-friendly and available on the consumer market. With time, such a device will become standard "support technology" for rebreather diving and traditional devices (DSMB's, audible surface aids, etc) will be carried as manual backup mechanisms.

There is nothing such as a rebreather "rinse tank".

Special needs

Aside from the "non-rebreather" technological needs of the travel professionals to serve rebreather divers, the staff of a CCR-friendly operation also needs to fully understand the principles of rebreather divers, be knowledgeable about a variety of units and be able to fulfill the customer's unique needs. This is easier said than done, and many so-called travel specialists often do not understand that rebreather divers do most things differently.

Consistency

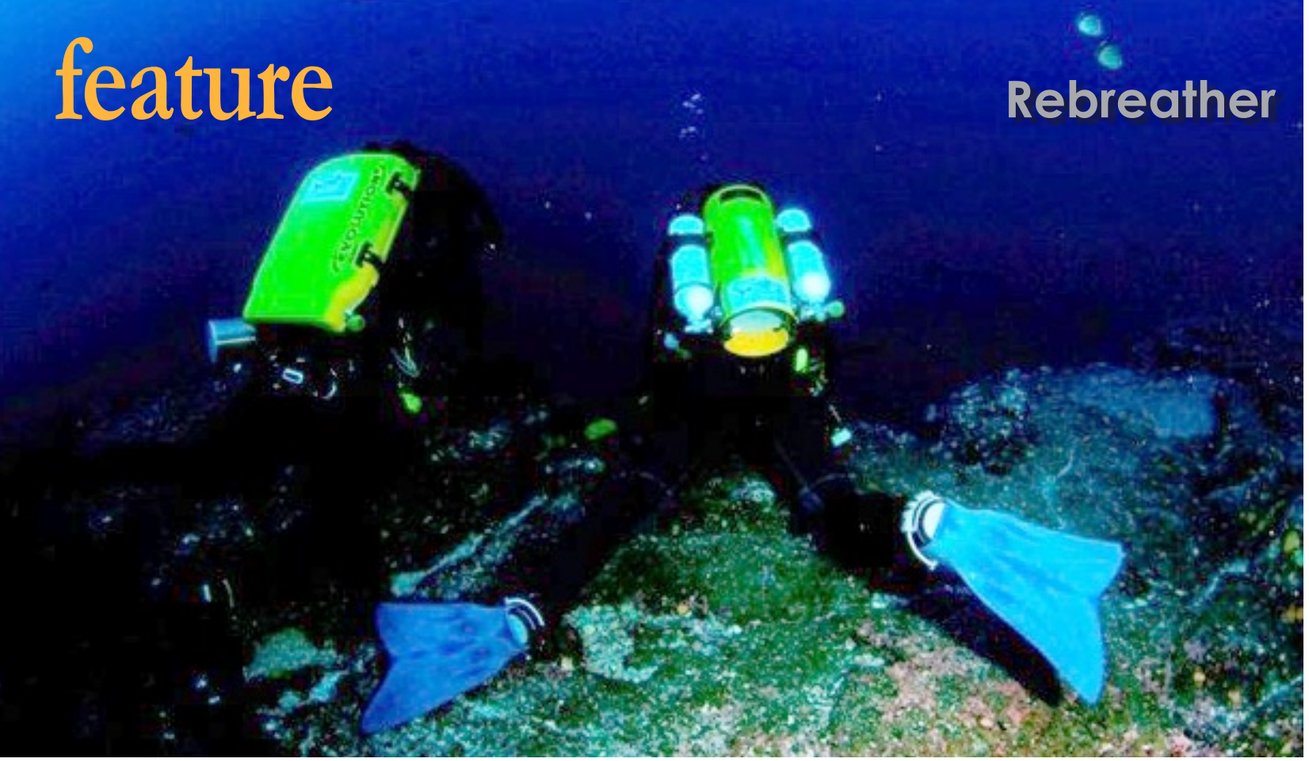
Dive operations offering guided dives will need to ensure that their guides are diving rebreathers consistently, that they are appropriately trained to assist on a rebreather emergency, and that they have top of the line understanding of physiology, equipment, underwater techniques, dive planning, etc. Guides will also need to understand that individual attention is essential; CCR divers cannot be rushed to get in the water, cut short on runtimes or be casually mixed with open circuit divers.

Procedures

The dive center that aspires to be a rebreather friendly operation also needs to revise monitoring and in-water procedures. For example, procedures for entering the water will often require flexibility. Locations where the practice is for "everyone to back-roll into the water at the same time" will have to implement a different approach. Supervision is not easy with a group of bubble-less divers who are able to stay down for a long time; therefore, pre-dive briefings, dive plans and surface support coordination will prove their often forgotten importance in the recreational open circuit diving field. Upon surfacing, tenders should provide a line to clip bail-out or stage tanks to and a long, strong and comfortable ladder with good hand-holds and safe steps for exiting the water while still wearing the unit.

Many so-called travel specialists often do not understand that rebreather divers do most things differently.

The rebreather facility also needs to offer a basic toolkit to allow servicing and a dedicated retail area offering a range of consumables available for sale that would include as a minimum, disinfectant, fresh cells, O_2 lube, batteries and reasonable support with some spare parts for the major rebreather models



and reasonable support with some spare parts for the major rebreather models.

Travelling

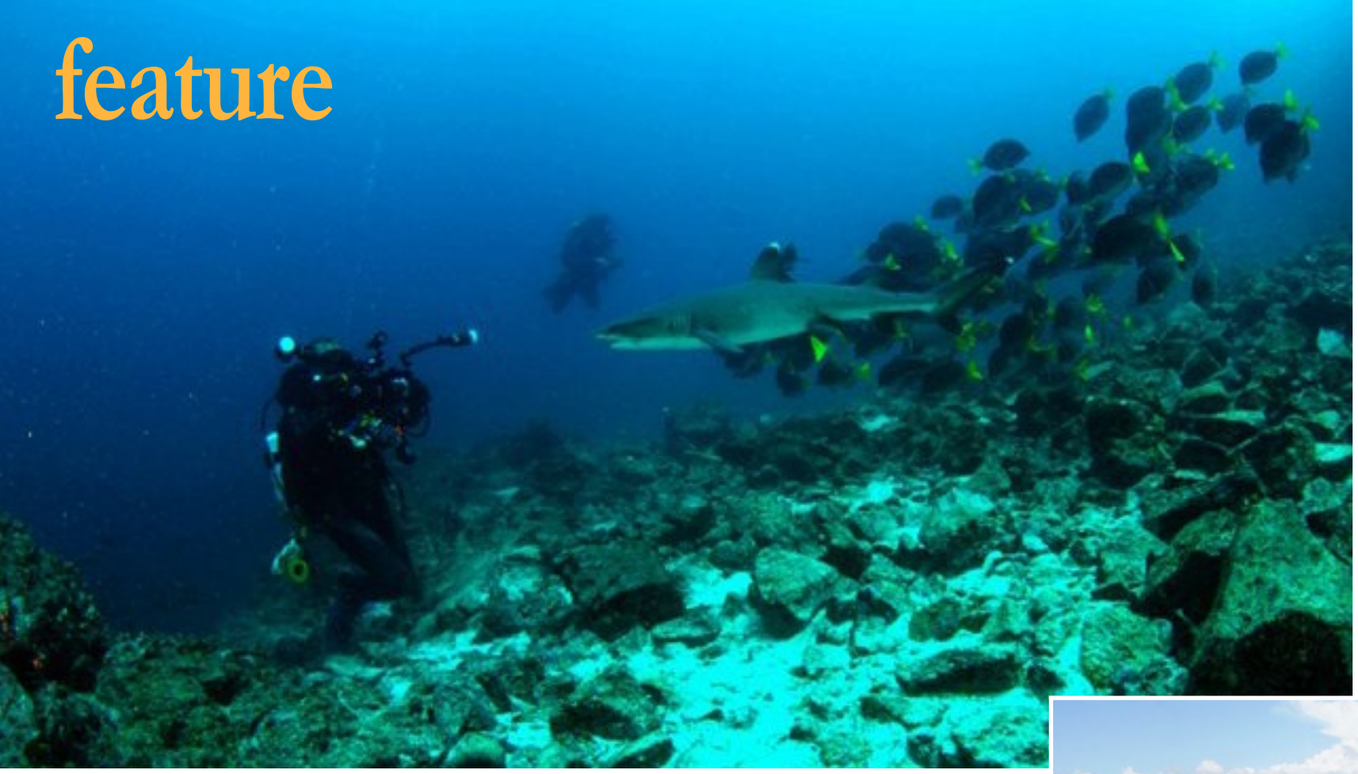
At this point I think it is important to make one clarification. The "requisites" above are not something I have personally authored. They are more of a potpourri of knowledge gathered from reading on line, meeting other divers and supporting some rebreather people. It is my experience that, although the process is often painful and full of uncertainty, if rebreather divers find some of those optimal features in a dive operation at an area with something worth diving for, they will slowly start to show up.

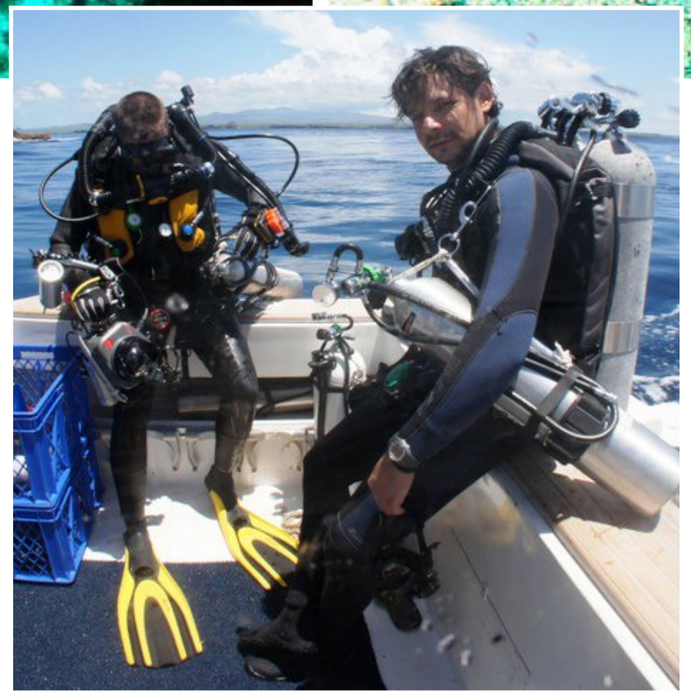
Getting there

But for the traveling rebreather diver, the hassle is not over by locating a "rebreather-friendly" dive provider in a nice destination abroad. First, they have to get there, and for such purpose packing, flying and entering a new country is often a tricky first step.

For some time rebreather manufacturers have been doing their best to develop a unit whose weight is approximately the same as a standard single cylinder scuba rig. Unfortunately, that is not enough anymore as weight restrictions have become tighter with more additional luggage fees being charged.

As a result, the rebreather traveler often has to resign him or herself to the use of hard boxes and other protective measures recom-





The expensive and heavy camera equipment that makes owning a rebreather worthwhile will also have to be added to the mix and the average 23 kilo baggage allowance will be quickly doubled or worse.

mended by the manufacturers. This practice reduces the overall extra expense in overweighed luggage but can also jeopardize the integrity of a very sensitive life support device. In any case, the expensive and heavy camera equipment that makes owning a rebreather worthwhile will also have to be added to the mix and the average 23 kilo baggage allowance will be quickly doubled or worse.

Weight restrictions have become tighter with more additional luggage fees being charged.

Security

A second factor that complicates rebreather travel is airport security. As the world's flights become "safer" every day, the list of restricted and suspicious items grows longer. Depending on where you travel from or to the terms rebreather, oxygen, gas cylinder, cell or solenoid can be very attractive to security officers. In addition, many components of a rebreather are not meant to be disassembled manually or require special tools and procedures for such purpose.

Even though short warning labels should be enough to keep the hands of the curious recreational rebreather owner away from something potentially dangerous, the special tooling or signs will not prevent the security screeners from using whatever is at hand to pull apart and examine a unit. Just Google "rebreather tsa", and you will find the most amazing stories of wings being punctured or sliced, items being removed from checked luggage and even whole pieces of luggage being confiscated for further investigation.

Try to explain...

When talking about traveling abroad one last challenge is still to be handled. Overweight luggage that has an "inspected" tag on it and that will look specialized and expensive in an X-ray scan will draw attention from the average customs officer. Trying to explain what this machine does, how much all the gear is worth or what you will do with all this is something that often complicates things a bit further.

All the challenges listed above are common to the individual that travels with scuba equipment but are often more complicated with a rebreather. The reason is simple; a rebreather is a more complex mechanism. In any case, this article is not about the downsides of rebreather travel but about the real challenges that the traveling rebreather diver has to face and how we, as travel professionals in the rebreather diving market, need to provide solutions for our customers.

Many conventional scuba equipment manufacturers have developed travel oriented gear

Tips

If we benchmark the regular scuba travel business a few tips are available. First, the traveler usually has real time access to information that allows "smarter packing"; in addition, many conventional scuba equipment manufacturers have developed travel oriented gear that is extremely light and compact. In the travel sector, some dive operators have created rental programs that provide to the experienced diver traveling light and to the entry level student different equipment lines. With this reasoning, maybe the best direction for the rebreather travel market would be to develop and offer lighter rebreathers and to standardize rebreather rental pro-

grams that could be provided by the so called rebreather friendly facilities. Again, this is easier said than done.

A rental scuba regulator will always work in the same way and there is no special training required to use a particular model; moreover, if the diver's brand of choice is not available for any reason, there is always the option to grab anything working "fairly okay" and still make a couple of dives. On the other hand, rebreathers require unit specific training and dedicated top of the range servicing in order to be in a condition to conduct safe dives consistently.

High investment

If a rebreather facility wants to provide rental units and serve all the potential combinations of rebreather models, the investment needed is very high. On the other hand, if a particular rental rebreather is not available, or if the unit is not supported at a destination, this will personally affect a diver who committed a considerable amount of money in a brand of choice. This situation is never good for the brand and will hurt the relationship with the costumer in the long run because the customer will have to either change brands or choose a different destination. If the customer still wants to dive that destination and the required rental units are definitely not available, then we are back to the original travel, safety and weight issues.

Maybe the best direction for the rebreather travel market would be to develop and offer lighter rebreathers and to standardize rebreather rental programs that could be provided by the so called rebreather friendly facilities

Despite the increased expense in product development and marketing of rebreather related subjects in the last few years, this important issue remains mainly unaddressed. The "bubble-less dream" of a manufacturing industry providing technology and training without the travel pillar in place somehow resembles what happened back in the mid 1990's with a "first wave" of semi-closed rebreathers that did not succeed completely in the market. I think that the rebreather travel market strongly developed back then and that the industry professionals making the "new" revolution happen need to take this into account now.

Program development

In my opinion, if the rebreather revolution is to be successful this time, rebreather manufacturers need to approach travel specialists all over the world in order to develop a rebreather rental program very quickly. This program will have to provide options and support to the dive operators who want to include their units as part of the "menu" on offer. I know of at least one company that has something in this fashion but a common effort is needed to make it a trade standard in the rebreather market. Another step towards the development of this third pillar of the recreational rebreather model is standardization.

Simple things like the scrubber mechanisms have variations in size, duration, specification, and packing from one rebreather to the next. Cylinders and valves are other examples. Usually when diving open circuit, a DIN to Yoke adapter or valve

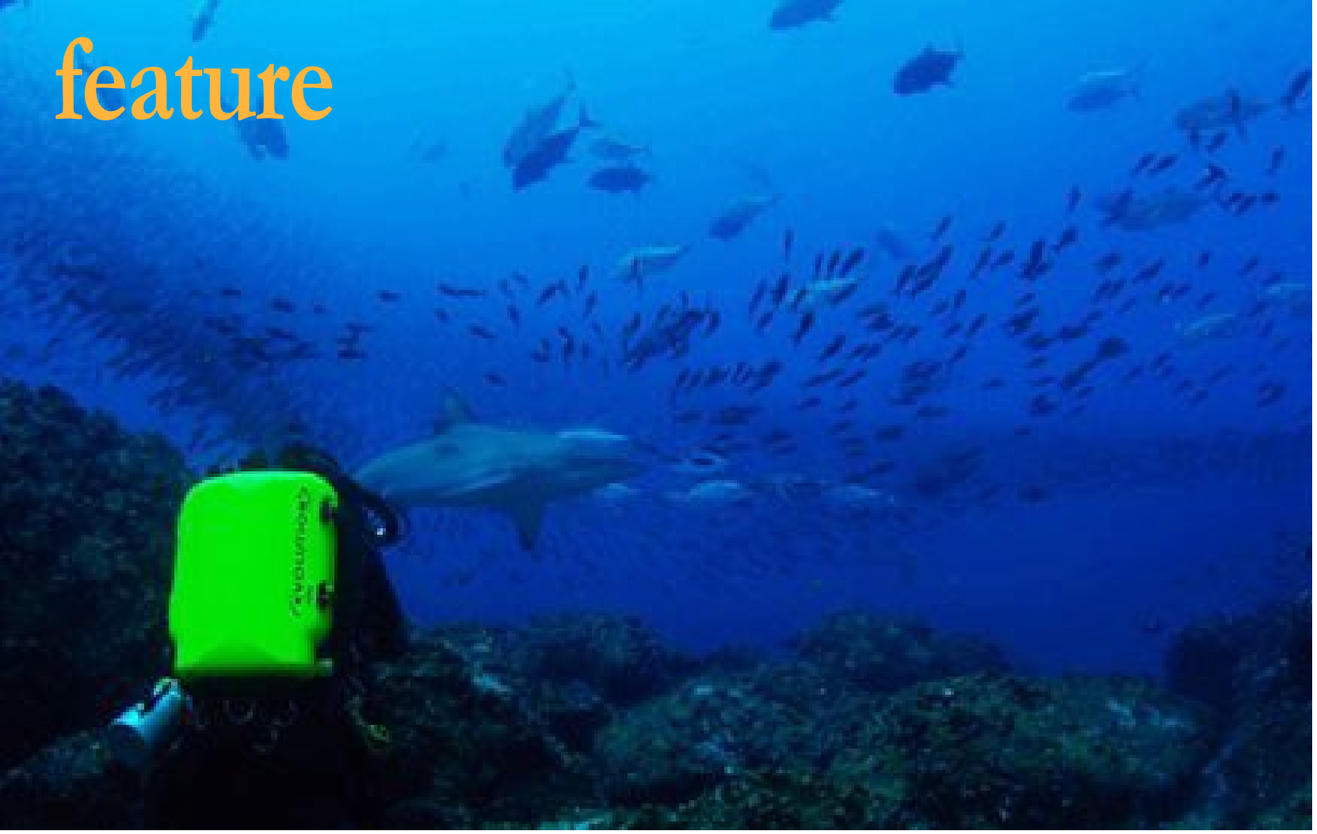
Many rebreathers require a specific size of cylinder and type of valve to fit properly.

Rebreather

insert will be everything a diver will need to fit a regulator in a cylinder. Rebreathers don't work that way. Many rebreathers require a specific size of cylinder and type of valve to fit properly. Modifying such configuration will usually alter the learned response to potential problems, invalidate certifications or simply make diving impossible. Even small consumables such as batteries, oxygen cells, tools, "o" rings, mushroom valves and fittings will not work from one unit to another proving the task of providing "reasonable support with some extra spare parts for major rebreathers" more complicated than initially thought.

Benefits

Aside from the technicalities of rebreather travel one last aspect remains.



How much more revenue can a rebreather diver create (over the more conventional open circuit diver) in order to make this profitable to the dive operator at a travel destination? Is the investment in training, infrastructure, consumables, rental rebreathers, gasses and logistics worth the rewards?

Can the manufacturing and training sectors of the industry support travel professionals to make it worthwhile? I know profitability depends on the particularities of every region and business model, but I think we can talk about potential trends.

Initially, the benefits of supporting rebreather divers will probably be collected by charging a "premium fee" and by gaining reputation and competitive advantage over the other dive shops, just like what happened with the premium fees and "specialized" equipment sales that the use of Nitrox produced back in the late 1990's and early 2000's.

But as the market matures these extra margins will eventually decrease and being rebreather-friendly will probably become mainstream product component, just like what made nitrox a "free gas" in many dive operations today.

At this stage, questions about economical sustainability of this could come to mind. Aren't we deliberately reducing the price competitiveness of the "scuba diving industry" by making "diving" more complex and by including extras to a sector with already low average profitability?

Things are changing very quickly in the rebreather world these days. Maybe by the time this text is published, half of the information here will be obsolete or inaccurate. On the other hand, as the rebreather travel market expands, the challenges and complications will increase and an unhappy scenario for manufacturers and training agencies could result if the travel component is not there to provide what they promise.

I think that if we are going to make this rebreather revolution happen, more cooperation and communication with the travel destinations as a sector will be needed. Maybe the upcoming rebreather forum 3.0, RESA, and other industry initiatives will address and proactively advance this exciting new frontier in diving. ■

Jorge Antonio Mahauad is a PADI/DSAT Master Instructor, Trimix Instructor and Evolution rebreather diver based in the Galapagos Islands.

Increased fin whale sightings encourage scientists in England

The massive yet illusive fin whale is classified as an endangered species, but marine research by the Sea Trust showed they be making a slight comeback as pods of the gentle giants are swimming into waters off Pembrokeshire (southwest Wales) each year in larger numbers than ever before.

Scientists are very excited as sighting such as these, while obviously important for research, are a truly unique experience. Adult fin whales can weigh anywhere between 30 and 80 tons, grow to more than 90ft (27m) and are the second largest animal on the planet. Their tongues alone can weigh more than an African elephant.

"It's one of the planet's most spectacular wildlife events," said Sea Trust coordinator, Cliff Benson. "In the past, we had seen one or two, and back in 2005, a group of four, but they now seem to be arriving in much greater numbers. In 2009, we came across at least 20 with massive blows appearing all around us as far as the eye could see, along with animals feeding around the boat."

Despite heavy seas, volunteers from the trust were recently sent out on a fact-finding mission and captured footage of a school of at least 12 whales feeding on massive shoals of fish about 30 miles off shore near the Pembrokeshire islands.

"We had at least 12 feeding all around us, and one passed so close in front of us [we] had to slam the engines into reverse to avoid collision," said Benson.

Records of the sightings will be passed to the European Defense Agency as part of a protection of marine mammals project.

Benson added, "The project aims to protect marine mammals against the impact of active sonar deployed by European navies. This could save the lives of many of the whales and dolphins that inhabit our waters.

"We are keen to work closely with the military to prevent incidents such as the one off Cornwall which killed more than 20 common dolphins which stranded on the coast after a naval exercise a couple of years ago."

Man-made ocean noise, from shipping, oil and gas excavation and naval sonar, is thought to make it ever harder for whales to navigate, communicate, find food or mates and avoid prey. ■ Source: BBC News

Scientists concerned over inbreeding among orca pods

New data published in the Journal of Heredity, National Oceanic and Atmospheric Administration (NOAA) researchers and others, using DNA testing of killer whales have discovered that some of the juveniles they studied were the result of mating within the same pods that are part of the overall population.

The study focused on an endangered population of orcas known as the Southern Resident killer whales whose range includes British Colombia, the Puget Sound and parts of the Oregon and California coasts. They number only about 85 individuals and live in three distinct groups called J, K and L pods. (It helps to think of an orca population as a very small town and a specific pod as a large extended family within that town).

It was long thought by scientists that these orcas did not mate with members of their own pod but instead only mated with whales from the other two pods in the population, but new DNA research is now bringing to light occasional inbreeding practices among inter-pod males and females.

One concern and possible implication of this breeding behavior is a significant reduction in the genetic diversity of what is already a perilously small population of animals.

Inter-pod mating has never been detected in previous studies of Northern Resident killer whales, a separate population of killer whales which range from Washington to southern Alaska, and until now researchers assumed that Southern Residents exhibited similar mating patterns. The two populations are distinct and do not socialize or mate with each other.

The study entitled, *Inferred paternity and male reproductive success in a killer whale (*Orcinus orca*) population*, involved researchers from NOAA's Fisheries Service, the University of Washington, Cascadia Research Collective and the Center for Whale Research.

"We were surprised that, in many cases, the father was from the same pod as the mother," said Dr Michael Ford, lead author of the study and a scientist with NOAA's Northwest Fisheries Science Center in Seattle. "Based on earlier studies, we didn't think killer whales mated within their own pod. This behavior may be unique to the Southern Resident population, perhaps related to the population's small size."

The researchers analyzed 78 individuals for 26 different genetic markers, or DNA fingerprints, and determined the paternity for 15 mother-calf pairs. The study found no evidence that Southern Residents mate outside their population, but clear evidence that they do sometimes mate with members of their own pod.

"Even though some of the fathers were in the same pod as the mothers, none of them were really closely related to each other. Our results suggest that Southern Residents avoid mating with their siblings or parents, but we aren't really sure of the social process that results in this avoidance," Ford said.

Another surprising finding was that a multitude of males within the Southern Resident community are responsible for offspring production in the population rather than just one or two. This contrasts with some other marine mammals like elephant seals, where very few males completely dominate the breeding in a large group. Researchers think this may reflect the difficulty male killer whales have in controlling other males' access to females during mating season.

However, the study also showed that the older and larger males appeared to be responsible for most of the successful mating indicating that females may choose to mate only with older males, or possibly that older males may somehow be preventing the younger males from breeding.

Ford said he and his colleagues are particularly worried about the Southern Resident group's lack of genetic diversity, which he characterized as a kind of bottleneck. "Since this population remains isolated from other killer whale populations, mating within pods puts Southern Residents at risk of genetically deteriorating further from a potential increase in inbreeding or harmful mutations," he said. ■

SOURCE: NOAA

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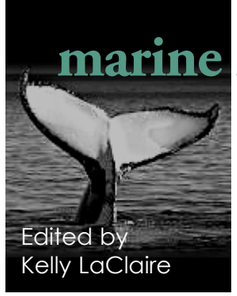


Whale washes ashore: Necropsy reveals gunshot

On September 24, a ten-foot-long, short-finned pilot whale was found washed ashore and stranded on a community beach in Allenhurst, New Jersey, USA.

According to officials at the National Oceanic Atmospheric Administration the necropsy, performed at the University of Pennsylvania, revealed a bullet from a high-powered rifle or handgun lodged in the whale's jaw. Examiners say the slug shattered the 700-pound whale's jaw and fractured several more bones in its skull.

The necropsy also determined the whale—believed to be a juvenile—died a lingering death brought on by a massive infection that made it impossible to eat. "The whale literally died of starvation," said Bob Schoelkopf, director of the Marine Mammal Stranding Center who originally found the animal. "It probably traveled quite a distance before it became so weak that it washed ashore." Schoelkopf added that the whale was still alive when it washed up in Allenhurst, but died a short time later.

Officials at the Office of Law Enforcement for the National Oceanic and Atmospheric Administration (NOAA), who are now investigating the matter, say it's still not clear when, where or why the shooting occurred but did say the bullet was sent for ballistics testing at a federal lab in Seattle. Scott Doyle, an assistant special agent for NOAA, said they generally investigates "two or three" shootings of dolphins and seals each year, but this is the first time he can remember a whale being shot in his 25 years on the job.

Whales and other marine mammals such as seals and dolphins are protected under the 1972 Marine Mammal Protection Act, which prohibits them from being "harassed, hunted, captured, killed or collected". Violations can result in penalties of up to US$100,000 and imprisonment for up to a year.

NOAA is hoping that "someone with a conscience" who witnessed the shooting from a boat will come forward with information about the incident, Doyle said. Officials also have no idea if the shooter was on a commercial vessel or a recreational boat, but they said there is likely a witness because there is usually more than one person on these vessels. ■ SOURCE: ASBURY PARK PRESS, TIMES UNION

Whale sighting a first in the United Kingdom

A marine research charity has confirmed a small whale found beached near Penzance (a small port town in the county of Cornwall in Southwest England) was in fact a dwarf sperm whale. The small whale, barely larger than a common porpoise, recently swam into Mounts Bay and somehow became beached.

Luckily, the tiny whale was soon sighted by residents on the sand and quickly reported to the coastguard and the Cornwall Wildlife Trust.

A very brave and heroic townsperson managed to get the small whale back into the sea before it died and residents watched it swim away.

Dr Peter Evans, Director of Sea Watch, said the species had never previously been recorded off the U.K. coast. This confirmation means that 29 species of cetaceans have now been recorded in U.K. and Irish waters.

Extremely rare, almost nothing is known about these animals, so any new findings are exciting. "Pictures of the Penzance whale show it to be a dwarf sperm whale, its fin being large and almost triangular," said Evans.

"This species has been recorded on only a handful of occasions in Europe, including Spain and France, and never in Britain or Ireland.

"It is just one of the increasing number of records of warm water species to be turning up around the British Isles in recent years." ■ SOURCE: BBC NATURE


WIKIMEDIA COMMONS

U.S. Navy halts underwater explosives training after dolphin deaths

The United States Navy said it has temporarily halted use of time-delay underwater bombs for training in the waters off San Diego, California, after an incident that killed three long-beaked dolphins.

According to official Navy reports, an explosive disposal unit arrived at a training location known as the Silver Strand off the Southern California coast and set a charge with a 15-minute time delay on the ocean floor. After ten minutes, safety observers from the training vessel spotted a pod of dolphins entering the blast area.

With only five minutes remaining before the explosives detonated, the disposal unit felt they did not have enough time to safely enter the water and retrieve the bomb and as a last resort tried to maneuver a dive boat between the detonation area and the dolphins in attempt to chase them away.

Unfortunately, their efforts were unsuccessful. Three common dolphins were killed by the blast.

According to Cmdr. Greg Hicks, a spokesman for the Navy, underwater explosives are important for clearing obstacles out of harbors so ships can enter. When the Navy practices with them offshore, Hicks said observers look for dolphins, seals, whales and similar creatures that might swim into the danger zone.

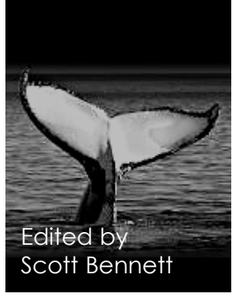
The National Marine Fisheries Agency, who is conducting an official investigation alongside the U.S. Navy, said they will take another look at the United States' pending request to disturb marine mammals off San Diego, in what the Navy calls "a realistic venue for amphibious training and special warfare tactical training in the coastal environment".

The existing application, however, doesn't anticipate dolphin deaths related to training however.

The fisheries service also raised the question whether the Navy violated the Marine Mammal Protection Act of 1972, designed by Congress to protect dolphins, whales and other marine life.

"We have an excellent track record in our training and have exacting standards that we apply to try to prevent these types of incidents," Hicks said. "We do our best to protect marine life while conducting essential training."

Environmentalists and fisheries experts could not recall a similar incident in Southern California but are calling for the Navy to take more protective measures during training. ■ SOURCE: SAN DIEGO UNION TRIBUNE



"This is an incredibly fascinating discovery as there have only been three new dolphin species formally described and recognized since the late 1800s."

Tursiops australis, commonly known as the Burrunan dolphin

New dolphin species discovered in Australia

Researchers determine that dolphins found in southeastern Australia represent a previously unknown species.

Newly described species differs greatly from other dolphins worldwide.

Researchers at Melbourne's Monash University have determined that dolphins residing along the South Australian coast are in fact a new species. The discovery was made by Kate Charlton-Robb, a PhD researcher at the School of Biological Sciences at the university. The remarkable discovery, published in the latest *PLoS ONE Journal,* reveals that coastal dolphins in southern Australia differed greatly from other dolphin species worldwide. Until now, approximately 150 of the dolphins living around the Melbourne area had been assumed to be bottlenose dolphins.

The new species has been, formally named *Tursiops australis*, with the common name of Burrunan dolphin, derived from the Aboriginal Australian meaning "large sea fish of the porpoise kind". The recognition of *T. australis* is significant, as the new species is confined to a small geographic region of southern and southeastern Australia where only two small resident populations reside.

This research relied heavily on the analysis of dolphin skulls collected and maintained by museums over the last century, including Museum Victoria in Melbourne. Detailed DNA analysis revealed that the dolphins differed from that of known bottlenose species *Tursiops truncatus* and *Tursiops aduncus*.

"This is an incredibly fascinating discovery as there have only been three new dolphin species formally described and recognized since the late 1800s," Charlton-Robb stated. "What makes this even more exciting is this dolphin species has been living right under our noses, with only two known resident populations living in Port Phillip Bay and the Gippsland Lakes in Victoria state. In fact, now that it is recognized as a separate species it may immediately qualify under Australia's criteria for endangered animals," she added.

Charlton-Robb said it is important this study continues in order to conserve and protect the Burrunan dolphin for future generations. More research is required to determine if there are other resident populations of this species in Australia. "The formal recognition of this new species is of great importance to correctly manage and protect this species, and has significant bearing on the prioritization of conservation efforts," the authors wrote. "This is especially crucial given its endemism to a small region of the world, with only two small known resident populations." ■

Canary Island's Lanzarote

Text and photos by Charles Stirling

A small, warm, sub-tropical Atlantic Ocean island with enough tourist visitors to make access easy and facilities plentiful, diving not mainstream but both good and also dependable—this is Lanzarote.

It is the most easterly, most northerly and fourth largest island of the volcanic chain of the seven main Canary Islands, which are part of Spain but located just off the African coast. Lazarote is only 37 miles (60km) long and 12 miles (20km) wide, with 130 miles (213km) of shoreline. The whole island has Unesco World Biosphere Reserve status and an ecological style of tourism without mass high rise developments.

Lanzarote attracts something around a million visitors a year with its good weather, low rainfall, clean streets, towns and beaches, lack of hassle, low crime and generally informal, friendly atmosphere. About 15,000 of those visitors go diving. In the past, it had a reputation as a 'get-drunk-and-party' destination, particularly for British youth, but that reputation has long ago faded with a much more diverse range of visitors now.

The divers range in experience from those doing their first ever dives through to the very experienced. Many divers, having found Lanzarote, treat it as an alternative to the more heavily promoted locations and return time after time.

In some respects, the island offers "a holiday with diving" while some of the many repeat dive visitors seem to think of it as a diving destination first with a smidgen of holiday thrown in. The good mild weather is attractive not just for holidays, which means diving is year round with few days lost due to inclement weather—it's dependable.

The island is volcanic in origin, as evidenced by underwater escarpments of lava walls, tunnels, caverns and sink holes along with the sandy areas. Marine life is a mixture of tropical and temperate, with reefs volcanic not coral. It's said there are about 500 species of fish and 1,200 of invertebrates here. Water temperatures run from 19°C in winter to 23°C in late summer. With little rainfall, no rivers and unpolluted waters, visibility

varies from 15m to 30m.

Lanzarote is one of the seven main islands in the Canaries archipelago, which forms a chain about 500km long off the African coast. All of the volcanic islands started to form some 20 million years ago, with the movement of the African tectonic plate and the submergence of the Atlantic plate. Lanzarote itself started forming about 11 million years ago in three phases with the oldest regions in the north and south of the island followed by later infill between these regions in the second phase four to seven million years ago.

The third phase and latest volcanic activity was in the 17th and 18th centuries and can now by seen in the Timanfaya region. These near-continuous volcanic eruptions in 1730-1736 were devastating, destroying the best farmland along with some 26 villages and hamlets covering a quarter of the island in lava. Smaller eruptions lasting for three months in 1824 produced three more volcanic cones. The results of these eruptions are well preserved, with little erosion due to the limited rainfall. The exact geological mechanisms are not fully understood. The common theory of a mantle plume, or hot spot, in the mantle giving rise to the volcanoes is contested by some.

The shelf around the island drops away to very deep water a mile or more offshore, which may have limited the numbers of naturally occurring wrecks (they end up too deep) and means most diving is near shore. There are a few

CLOCKWISE FROM TOP LEFT: Cuttlefish (*Sepia officinalis*) swimming; Playa del Reducto Beach and Arrecife skyline; Tube-dwelling anemone on sandy seabed

PREVIOUS PAGE: Town of El Golfo

Lanzarote

Sea hare, *Aplisia dactylomela*, grazing on marine algae (above); Divers with school of grunts at Playa Chica (left)

moved on to look at its exterior. I would happily have spent all my time on the wreck, but my buddy wanted to check out the adjacent volcanic landscape, so we continued on a slow swim examining nooks and crannies, fish and invertebrates before surfacing after an hour's dive for the boat pick-up. It was a very enjoyable dive. Several divers back on the boat gushed with excitement and considering it one of their best dives. Our boatload of

Cuttlefish

"natural" wrecks and more wrecks that have been purposely sunk, but it is as much for the landscape and marine life that divers keep returning to the island. For the technical diver, deeper valleys and lava tubes and channels with faster drifts exist.

The islands highest point, 670m, isn't enough to induce rain producing cloud formations from sea winds, just clouds. This has limited the vegetation with more species diversity on the older, more weathered regions. Relatively few native land animals are found, predominately birds (40 nesting species); six mammal species are known and only three species of reptiles. The underwater world is much richer.

Wreck diving

After the briefing, a short boat ride of about five minutes on calm seas, a quick final buddy check and a giant stride into blue waters, a few moments passed on the surface before a gentle free descent commenced. Within a few metres of depth, the outlines of a wreck started to appear.

The wreck was listing on its side but looked like a ship. Its bow, stern, decking and holds were intact with enough ravages from the sea to feel real.

We were diving one of the "Harbour Wrecks" of the Los Erizos Wreck Park. It was an easy dive. I swam inside its open structure, exploring it without sediment exploding up to block visibility, and

Divers and angelshark buried in sand

nine divers included a few with dive numbers approaching or well over the 1,000 figure in number, and these divers rated it as a great dive.

Another wreck park and a marine conservation zone is just west of Puerto del Carmen. Off Punta Tinosa are the "New Wrecks". Three fishing boats were prepared and sunk in 2004 in shallow water, but with more currents here and the ravages of an occasional winter storm, they have moved from their initial resting places to slightly deeper water, nothing above 17m. One is only part of a shell now; the other two are more intact. It is still possible to dive all three in a single dive, but doing two or just one is probably a more interesting option. Going slow, you see more.

I dived two of these, and again, penetration was safe and easy. The exteriors were interesting with lots of fish. None of these wrecks pretend to be world class; they are simple good holiday dives.

Dive centres

There are many dive centres scattered mainly along the east cost of Lanzarote mostly located in resort areas—Playa Blanca, Arrieta, Mala, etc—but with the overwhelming majority in Puerto del Carmen. The Atlantic-facing west coast has diving, although limited, due to prevailing winds and is more the preserve of the surfer or kitesurfer.

In Puerto del Carmen most diving starts at the small protected beach of Playa Chica. A perfect location inside a natural protected horseshoe-shaped cove with stone outcrops extending on both sides providing shelter to the gently sloping sandy beach—ideal for divers, snorkelling or swimming with the family. The local dive centres from around the island visit this site.

The reefs formed by these outcrops and the area just beyond offer most of the marine life that can also be seen in other parts of the island. Depending on the season, angel sharks, octopus, cuttlefish, sea horses, yellow striped nudibranchs, arrow crabs, scorpionfish, wrasse, flatfish, bream and more can be seen.

The underwater volcanic arch of the Blue Hole, The Cathedral, Red Coral site, volcanic walls, small caverns are all right here at Playa Chica. Its protected beach entry

THIS PAGE: Scuba divers on and inside one of the "New Wrecks" off Puerto del Carmen

LEFT TO RIGHT: Diver on one of the "New Wrecks"; Easy entry on one of the "New Wrecks"; Bow of one of the "New Wrecks"

Lanzarote

makes it ideal for training, and the marine life makes it interesting for underwater photographers.

Within the cove, the bottom is coarse salt and pepper sand, which settles relatively quickly when kicked up by someone else's fins—never your own, of course—with many flounder, lizardfish and garden eels present, and at night, tube anemones, which hide by day buried below the surface.

Depths of up to 10m are found inside the cove, which is protected by walls, lava boulders and overhangs in steps to 30 or more meters. It was the shallower rocky outcrops and sand right at the bottom of these steps that seemed to hold the greatest number of creatures.

Some of the divers reported seeing the rather shy angel sharks on nearly every dive and sea horses at specific locations. Garden eels seemed to be at the right of the cove or around its outer corner, and schools of jacks were found near shore. The site is the ideal place to just go exploring.

Most of the dive centres in Puerto del Carmen, and those outside town, seem to offer both shore and boat dives with boats varying from fast RIBs (Rigid-hulled Inflatable Boats, or Zodiacs) to small hard boats. Some have only guided group dives while others have both buddy and guided trips. Some have fixed times for dives, others are more flexible and, at least for shore dives, you can chose your own times.

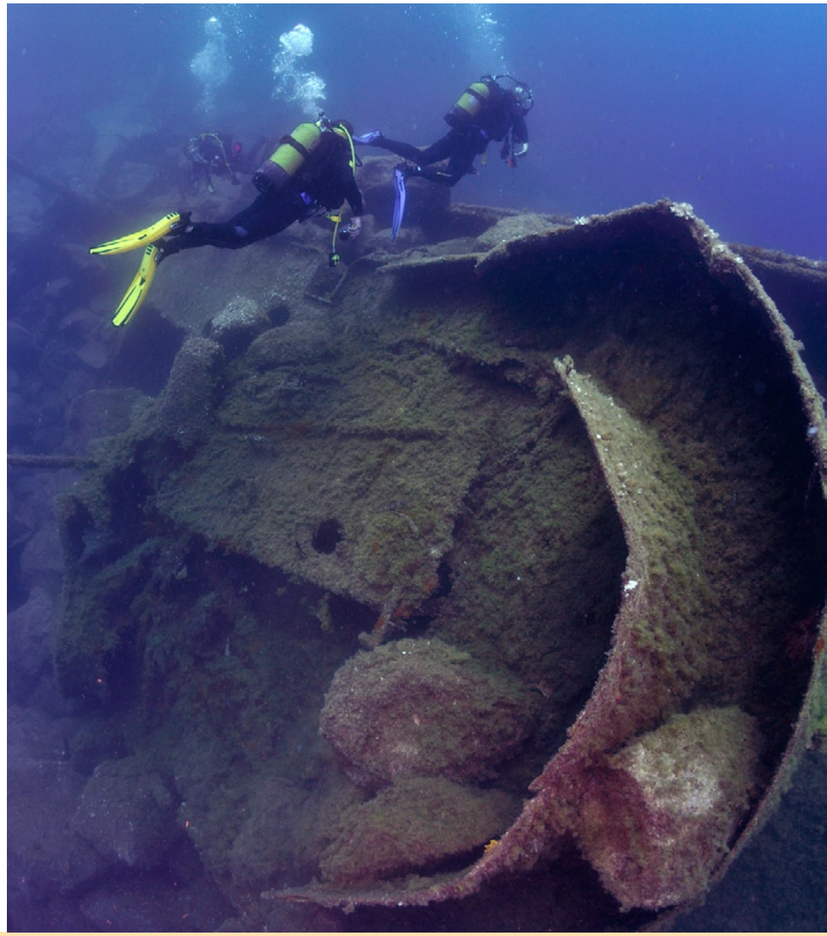
Many training agencies are represented including PADI, BSAC, CMAS, IANTD, BARAKUDA and more, so with the right choice, you can add qualifications that suit. They all offer holiday style dives with a single tank and air; many have nitrox; and a few offer technical diving, mix gas, rebreather dives and training.

Reviews and comments suggest that most operators are appreciated for what they offer, have rental equipment in good condition and are well run. So, pick your operator with your intentions in mind.

Spanish diving law is different from many destinations and changed substantially a few years ago. Now, one thing to watch for is that the operator you dive with is legally registered as a dive operator. Not all are, as it's expensive, and operators did not need to register in the past. It could void your insurance coverage if you do not use a registered centre. All the registered operations are listed at: www.turismolanzarote.com/en/buceo.jsp.

Do bring both your medical certificate and dive insurance card with you, as it's required by law in Spain. However, insurance can be arranged locally, if needed.

I dived with Safari Diving,



which is owned and operated by the British couple, Steve and Wendy Hicks, who offer both guided shore and boat dives and the possibility for simple unguided buddy diving—if you are a solo diver, they find you a buddy—as well as training. Using them as an example, one can note the questions to ask of any potential centre one might chose.

Safari Diving is exceptionally well placed right on Playa Chica beach where all their shore diving is conducted, with the boat diving jetty almost adjacent. Due to the location, the centre is relatively small, without the dry changing areas, locker rooms, hot showers, dry camera set-up areas, etc., which larger centres can offer, but it has wet storage for your kit, hire kits in good condition, rinse tanks and hose to wash down, and the water's edge is right there.

Safari Diving is a very popular centre with many visitors, so hired kit is not kept just for you but turned in and taken out for each day/dive. They do not bus you around to other locations, as there is no need since it is already at the prime location, so you save time but don't see other locations. Their hard boat is comfortable but goes to relatively local sites only. They can offer nitrox, but it's not routine, and they don't do technical dives.

They use a nearby hotel with a pool when needed for teaching, but also go though some teaching more informally over coffee in a café.

The guides know the area well and point out the unusual, so they are worth using. I totally missed the small wreck just beyond the bay entrance by not using a guide. Instead, I joined a buddy group, and we turned to the right instead of the left at the wrong point. On another occasion, I missed sea

CLOCKWISE: Arrow crab; Bastard grunt fish in shallows at Playa Chica; Yellow striped nudibranch, *Hypselodoris picta*, also known as *H. edenticulata*

CLOCKWISE FROM TOP LEFT: Golden barrel cactus at Cactus Garden (Jardín de Cactus); Viewing cliffs, sea and black volcanic beach of El Golfo; Playa Chica; Camel ride at Parque National de Timanfaya; Tourists watching volcanic heat set fire to dry lichen in Timanfaya park

horses for a similar reason.

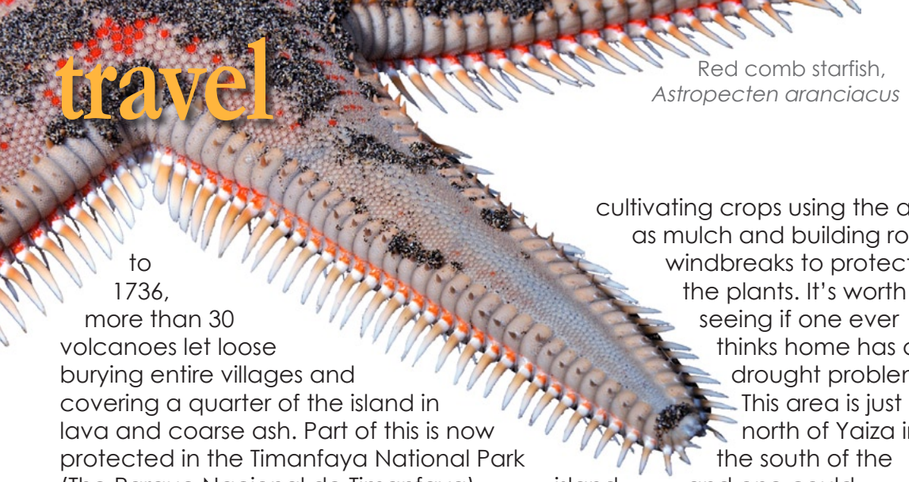
Night dives are a regular item in the Playa Chica cove, staying relatively shallow at eight to 12 metres around the stone outcrops and off the boat jetty, which seems to offer the best observations. Again, I went with a buddy pair who went deeper than needed, so I missed some of what could have been seen.

Most dive centres anywhere on the island offer Playa Chica with the adjacent attractions, or just the cove itself, and use the jetty for the popular wreck dives. They drive to the parking lot near the beach where divers change in the vans and carry their kits the short distance to the entry point at either the beach or the jetty. Other beach entry points along the Puerto del Carmen seafront, or around the island, also have good diving—so, just take your pick.

Holiday destination

Year round sun, minimal rainfall and many good "blue flag" beaches are enough to attract many holiday makers. If you want a bit more than lying on a beach, the natural environment plus a few of man's interventions are well worth a visit. Car rental and fuel are reasonably priced. The roads are good and not crowded outside of major towns, so driving is the most productive way to tour, but lots of coach tours exist as well.

During the volcanic eruptions of 1730



Red comb starfish,
Astropecten aranciacus

Lanzarote

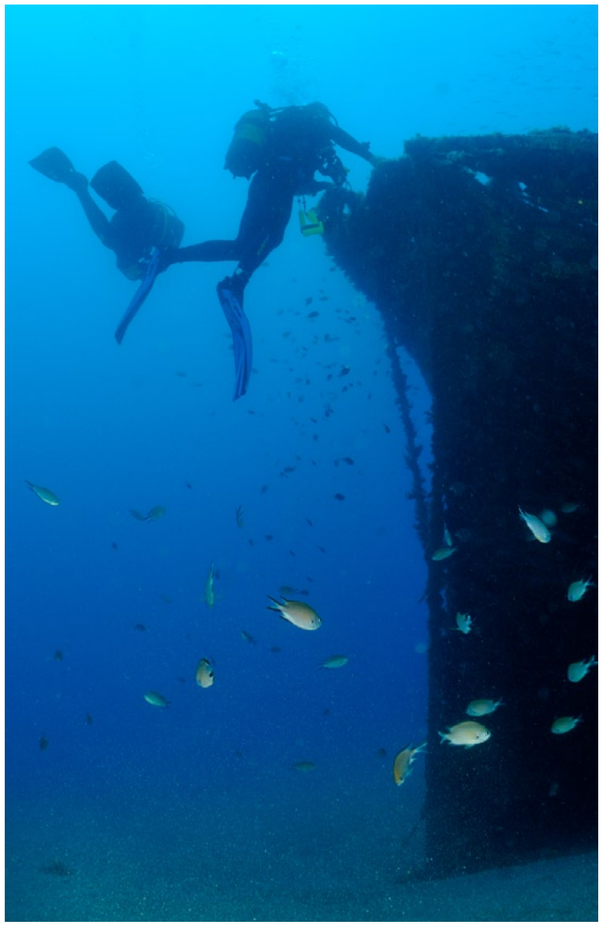
to 1736, more than 30 volcanoes let loose burying entire villages and covering a quarter of the island in lava and coarse ash. Part of this is now protected in the Timanfaya National Park (The Parque Nacional de Timanfaya), which is one of the visitor must-see locations. Parts of it, the badlands, really are still barren of nearly any plant or animal life. Outside the park, farmers are cultivating crops using the ash as mulch and building rock windbreaks to protect the plants. It's worth seeing if one ever thinks home has a drought problem. This area is just north of Yaiza in the south of the island, and one could include El Golfo with its volcanic lake and the flats producing sea salt in one slightly hurried outing.

To the north of the island, César Manrique's Cactus Garden (Jardin de Cactus) built in a volcano crater is much more interesting for its design than might be imagined and worth a visit. Surrounding this garden are plantations of prickly pear, host to the cochineal beetle. Not far away are the Los Jameos del Agua, the lava tube made into an underground entertainment venue with a lake that is home to blind albino crabs. The Green's Cave (Cueva de los Verdes) is also part of the lava tube. On the very northern most point of the garden, are views over to Isla Graciosa and Chinijo Archipelago with a park at Mirador del Río, which I missed, as it closes at 6:00pm—the all too often normal closing time for attractions. Six o'clock is too early if one is trying to fit in a lot of siteseeing after a morning dive. The island simply has too much to see and do on a short visit—yet, another reason to revisit.

Being a holiday destination has its advantages with bars, restaurants and cafes plentiful and nearly any nationality of cuisine on offer. For really local food, try a dining spot outside the main tourist areas. Shopping in both the small independent shops or larger malls plus various markets should be able to fill most desires, but avoid the majority of independent camera and electrical stores, as they have a reputation of carrying too many fraudulent deals. The streets are not full of hucksters, so you miss the fun of constantly saying you're not interested. Accommodation is plentiful and varied—maybe it's best to let the chosen dive centre organize it, but deals can be found independently. There are good museums, gallerias, festivals and things to do with the family.

The diving was good, relaxed holiday fare with lots of marine life to see. It would suit families, anyone wanting to learn to dive, anyone just wanting easy diving on a holiday as well as the underwater photographer interested in sub-tropical marine life. The possibility of deeper or technical diving including rebreathers is a possibility. ■

Biosfera shopping mall at night in "Old Town" Puerto del Carmen
Bleak landscape of Parque National de Timanfaya (center)



Bow of one the "New Wrecks" (above); Seaside board walk in "Old Town" Puerto del Carmen (top right)

fact file

Canary Islands, Spain

SOURCE: CIA.GOV WORLD FACTBOOK

History The earliest settlers were African about 1000 to 500BC probably from central Algeria. Some of the place names such as Yaiza, Teguise, Tinajo, and Timanfaya stem from those early settlers. Those settlers found the island with more substantial vegetation, and it is thought that the introduction of pastoral animals and cereal farming by early settlers destroyed much of this. These early settlers knew nothing of metal, of sea navigation, lived in caves or semi-buried huts when Europeans first arrived in 1312. By the latter half of the 14th century, marauding pirates had reduced the original population down to near 300 individuals. Norman privateers conquered the island protecting it from the pirates and slavers in 1402. Over the next 70 years, various battles, power struggles and issue of sovereignty finally ended with the treaty of Alcacovas granting the islands to Spain and governed by nobility under a feudal system.

To repopulate the island under Spanish feudalism, slaves were brought in from Africa, but Moorish and other pirate slavers also continued to raid the island. It was these slaves brought in who dug the hillside terraces with the help of camels introduced at the same time. This was a dangerous and difficult place to live in those times, and many fled to other islands or to South America. Feudalism and numerous conflicts continued until 1812 when the Canaries became a province of Spain.

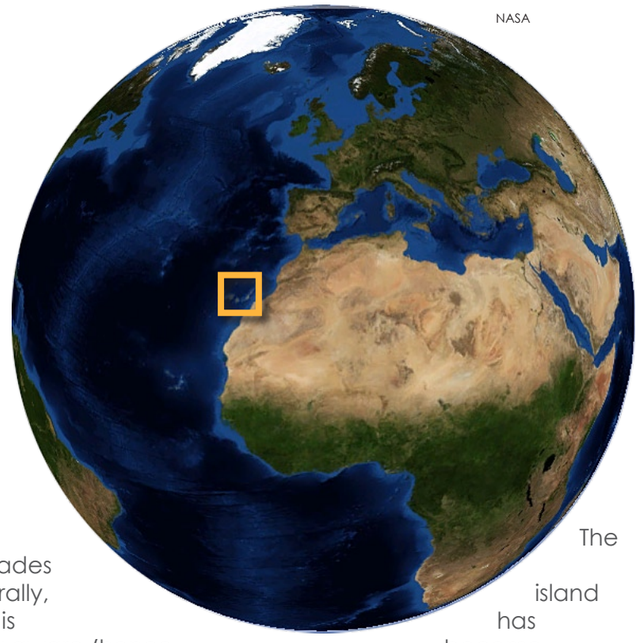
It is now a Spanish autonomous community as Spain has decentralized after Franco's dictatorship ended, and it is an "outermost region of the European Union". In 1852, the law of free ports granted the islands immunity from customs and excise duties—which sort of still applies as duty is low so prices are low—but limits on what can be brought back into EU countries applies, as they are outside the European Union Value Added Tax Area.

Principally due to the growth in tourism and EU membership, but also the high birth rate, the islands population has grown dramatically in recent times, ten times the growth in Spain. With 65,503 in 1988 to 139,506 or more in 2008. It's a young population with over half between the ages of 25 and 39. Over a quarter are non-Spanish in origin.

Climate Warm and dry, pleasant year round with average temperature of 24°C and 3,000 hours of annual sunshine. Fuerteventura and Lanzarote have the sunniest weather of the Canaries, rainfall 5.9 inches (150 mm) annually. Moderate north-easterly trade winds come April through to October; at other times, winds can come from any direction. For diving, by moving around the island, a lee side can always be found. Water temperatures can go down to 18°C in winter, up to 23°C late summer, cooler at depth.

Environmental Issues
A UNESCO World Biosphere Reserve, the island endeavours to have environmental friendly development such as no tall buildings, no billboard advertising, and houses must be painted white with woodwork either of two shades of green. Generally, the community is environmentally aware (hence little litter—it's clean). There is limited rainfall, so water is desalinated. It doesn't taste great, and drinking water is bottled. Most energy production does come from oil, but wind farms have been developed. Commercial fishing was a major industry, but is now much reduced probably helping the marine life.

NASA



Economy Up to the 1980's, agriculture and fishing were the major economic activities. With its good climate, tourism was inevitable, and large amounts of European investment money poured in during the 1970's and 1980's buying up prime coastal land to eventually develop into the resort centres of Puerto del Carmen, Costa Teguise and Playa Blanca. Infrastructure was greatly improved, various natural attractions were opened to visitors. The first desalination plant was inaugurated, and the airport was expanded with the first international flights in 1970. In 1974, the Island had 2,000 tourist beds on offer. By 2001, it was 50,000 rooms and 72,000 by 2006. The island has become very dependent on tourism, predominantly from Britain with Germany next in numbers. Scandinavia and the Benelux countries and even the USA add to this. The current recession saw visitor numbers fall in 2008-9 with some shifts in demographics but greatly recovering by 2011.

Agriculture seems an improbable activity in this dry environment, but onions and ,to a lesser extent, potatoes and a range of green vegetables are exported. Ploughing used to be done with camels. Now, it's cheaper to buy a tractor even though this degrades the volcanic chippings called picon or lapilli, which helps to hold moisture in the soil. The onions, which have a delicious sweet flavour, mainly go to Spain but also do reach much of the rest of Europe. Another product is the cochineal beetle, used to make a dye extracted from the crushed beetles raised on cactus leaves. The cochineal dye gives the red to the drink Campari and is also used in lipstick, sweets and toothpaste.

It's interesting to see the physical remains of former economic activities. Salt production by evaporating sea water in large holding ponds used to be a major export industry, which has since collapsed. The salt was particularly used in preserving fish on the fishing boats around the world just after catch before refrigeration/freezing became common. All around the island are now deserted salt pans. These pans once employed hundreds of workers. Now, the salt pan at Janubio has become a tourist attraction and produces more than 15,000 tons per year but this is less than half of its production 40 years ago.

Sea salt concentrating pans, Salinas de Janabio

Currency Euro

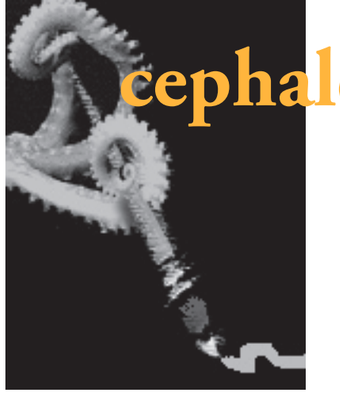
Time zone GMT, the same as London

Electrical 220 volt, uses standard European round pin sockets

Language Spanish (similar to South American dialect). Many other languages, particularly in tourist areas with English common.

Hyperbaric Chambers
Arrecife Recompression Chamber with five spaces. Hospital Insular Arrecife; Tel.: 0034 928 810 000; 928 810 500

Websites
Tourist board
www.canarias.es
Tourist board
www.turismolanzarote.com/en



PETER SYMES

Think fast - like a squid!

Text by Naiha Balal Khiljee

Squids, octopus and cuttlefish (who all belong to the phylum of molluscs) are among the most intelligent animals in the sea, and definitely the most intelligent marine invertebrates. We should in fact ask ourselves if the human mind is capable of thinking as fast as these creatures do.

We applaud our nervous system, but interestingly, squids have unusually large neurons, which makes them a lot faster than us. These gigantic neurons are much easier to study than the normal minute neurons found in animals and humans. This has assisted scientists in gaining further basic knowledge and understanding about the functioning of the rather complex nervous systems in animals as well as humans.

Neurons consist of a somatic cell body containing the nucleus with DNA, and several cell organelles in the cytoplasma surrounding the nucleus (see Figure 1). The somatic part has many dendritic ends who receive signals from many other neurons. A long axon runs from the somatic part of the neuron, where the electric nerve signal travels with an astonishing speed of about 360km per hour. This electrical signal finalizes its axonal journey into many synaptic ends, where it manages to trigger synaptic secretions of chemicals (neurotransmitters: e.g. certain hormones like oxytonin) which travel into the intercellular space and reaches specific receptors attached to the surface of adjacent neurons.

In squids, axons carry information to the muscles of a squid's mantle when it is startled, causing them to contract and jet to safety. It is the axonal part of the neuron in squids which is rather large (considering that typical axons in humans are only a few micrometers in diameter)—up to 1mm in diameter. The squid giant axon is several hundred times larger than the typical human axon. Such neurons are obviously much easier to see in microscopes than the typical smaller neurons. This helps researchers to comprehend how the mind functions.

The mind

The mind is an intriguing part of the body. It is like an abstract work of art, which we have not come to fully comprehend yet. The nervous system is complex and consists of two departments: The CNS—which is the central nervous system—and the PNS, which is the peripheral nervous system. The CNS consists of the brain and spinal cord, while the PNS consists of two kinds of nervous cells: sensory nervous cells and motor nervous cells. The motor nervous cells carry electrical impulses sent from the CNS to organs, muscles and glands.

The motor nervous system is divided into the autonomic nervous system and the somatic nervous system. The autonomic nervous system controls involuntary muscles (smooth and cardiac muscles), which explains why our heart beats even though we are not conscious about it. The autonomic nervous system can be divided into two additional nervous systems, which illustrates the complexity of the nervous system.

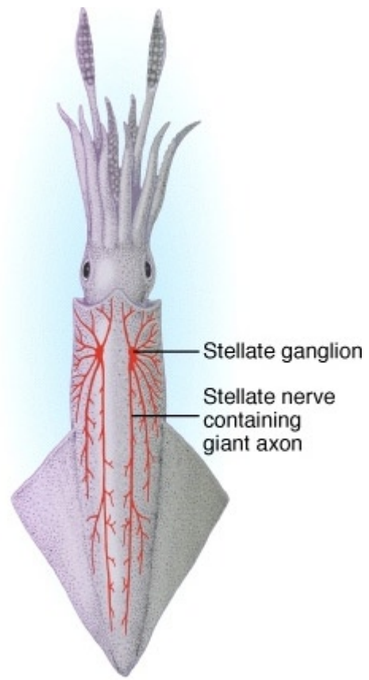


Figure 1

The somatic nervous system controls skeletal muscles as well as external sensory organs such as the skin—this nervous system is unlike the autonomic nervous system "conscious" while we control it consciously (with the small exception of reflex reactions).

Cells of the sensory nervous system send information to the CNS from internal organs or from external stimuli. So basically, the CNS, which consists of loads of neurons, is the "masterkey" of the entire nervous system.

When looking closely at these neurons, it is inevitable that the most essential part of a neuron is the axons, because the axons carry the electrical impulses, which allow one part of the nervous system to communicate with another.

We have doctors and specialists examining these axons, and we are all very fascinated by our nervous system, but rarely is it acknowledged that squids actually have much bigger axons, which means that information runs far more rapidly through their nervous system, making their reactions much faster than those of human beings. So, the next time you are diving in the wondrous ocean—know that you will not be able to reach a squid! ■

Squid Behaving Badly

Text by Catherine GS Lim

CHUN & VALDIVIA, DIE CEPHALOPODEN, 1910 / WIKIPEDIA PUBLIC DOMAIN

When it comes to mating, it seems that the deep-sea squid isn't too picky. New research has shown that the 12-centimetre cephalopod would mate with any deep-sea squid it came into contact with, be it female—or male.

However, despite the potentially sensational nature of this observation, this behaviour may just be a case of mistaken identity in the blinding depths of the deep ocean.

Prior to this discovery, it was believed that male deep-sea squid mated by depositing their spermatophores (packages containing millions of sperm) onto the female's body. The sperm are then absorbed into her tissues. Evidence of the interaction would be in the form of the sperm sac left on the female's body.

A straightforward concept, except that when researchers reviewed video footage taken over 20 years in the Monterey Submarine Canyon, off the Californian coast, USA, sperm sacs were found on both female and male squid.

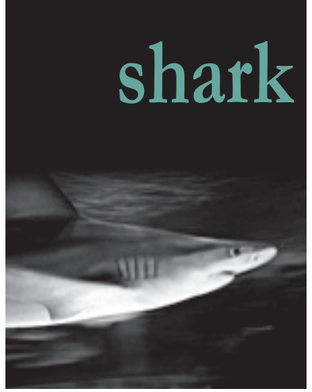
Writing about it in the Royal Society journal, *Biology Letters*, lead author Henk-Jan Hoving, from the Monterey Bay Aquarium Research Institute, explained that as "the locations of sperm packages were similar in both sexes, we concluded that males mate with males and females".

It seems that this behaviour is rooted in practicality. Living at dark depths of 400 to 800 metres, the solitary deep-sea squid often find it hard to bump into one of its own species.

And even when it does bump into someone, determining its gender may prove difficult in the dark.

So, instead of letting an opportunity slip away, it would simply initiate the mating process, and hope that its partner was indeed a prospective female.

Explaining this behaviour as a reproductive strategy, Hoving said, "Squid, including deep-sea species, only reproduce once and they have to find mates in time in an environment where encounters between individuals of the same species are few and far between." ■



Tiger shark going after chum

Do's & Don't's Responsible Shark Diving

Text and photos by Andy Murch

Maybe the concept of 'responsible shark diving' sounds a little oxymoronic, but there are many things that you can do to protect yourself and the sharks during your interaction.

First and foremost, I can't stress enough the need to gain as much knowledge as possible about the animals and their environment. To go into the water without at least a basic idea of how the sharks are likely to react is foolhardy to say the least. If you are participating in an organized "shark diving experience", you may feel that the operator's knowledge is sufficient and that you can sit back and watch the show.

It's important to remember that every shark interaction is different. Just because countless people have watched the parade of sharks at a particular site passively swim by does not mean that you will have the same experience.

Following are some guidelines for minimising the dangers associated with interacting in the wild with sharks and rays. Whilst the advice hopefully is useful, it should be regarded as a vague guideline only.

Your experiences will differ greatly from mine, and the sharks and rays you encounter may react in a completely different way. As such, I take no responsibility for the outcome of any encounters that you may have or for the validity of any information stated below.

Get educated!

Ask local divers and fishers what species of sharks you are likely to see. Knowing if an area is frequented by nurse sharks or tigers may make a big difference to how alert you feel you need to be on the dive. Learn the stats on different sharks. The shark attack file is a good place to start to find out which sharks have been responsible for attacks in the past.

Find out how the sharks in the area normally respond to divers. Most free swimming sharks will disappear the minute they see a noisy, bubble blowing diver heading their way, but some sharks are more curious. Occasionally sharks like to wander up to divers and give them a closer look. Being buzzed or even brushed by a shark does not necessarily mean that you are about to become lunch.

Are the sharks in the area regularly fed by divers? It can be disconcerting to drop down onto an area of reef where shark feeding normally take place and immediately find yourself surrounded by expectant sharks.

Ask if bait will be used or if any member of the dive group is planning to spear fish. Aggressive behaviour is significantly increased in the presence of struggling fish or when blood and other juices are in the water.

Find out if the sharks in the area are territorial. Sharks may respond to divers as threats to territory and defensively attack.

Dress appropriately

There are differing points of view on the subject of what colors are most likely to attract a shark's attention. Every conceivable color combination has been tried at one time or another in an effort

shark tales

THIS PAGE: Lemon sharks and divers interact

to deter sharks from attacking. Even broad black and white stripes have been tried in an effort to replicate the appearance of a banded sea snake, which is an animal avoided by the majority of shark species.

As a rule of thumb, tropical sharks are mainly fish eaters and as such are attracted to bright and shiny objects. Therefore, it would seem logical that a neon yellow wetsuit would attract the attention of sharks looking for a meal. In shark diving circles, neon yellow has actually been given the nickname of "yum yum yellow". Other bright colours may also have the same effect, so if you're planning on regularly putting yourself in the presence of tropical fish eating sharks, it may be a good idea to tone down your fashion statement and choose a more muted color or black. Bear in mind that thousands of divers swim with tropical sharks every day wearing all manner of clothing from bikinis to camouflaged full body dive skins, and the incidence of attack is extremely low.

If you have bright metal objects such as reels or dive knifes attached to the outside of your BC, try to stash them out of sight in a pocket or replace them with darker coloured alternatives. Even a shark diver's first stage can look good to a hungry reef shark, as I found out in the Bahamas.

Wear dark gloves. From a shark's point of view, there's nothing more tempting than seeing two small lily white "fish" flapping around in front of them. If you don't have any gloves, try to keep your arms folded across your chest. Using your hands to swim with is asking for trouble. Full suits are better than shorty wetsuits. This is the same principle as exposing your hands. Try not to expose distinct areas of skin that a shark can focus on or mistake for a fish. Even if you have dark skin, it's a good idea to cover up. A lot of injury can occur from the brush of a shark's sandpaper-like skin.

Some sharks in temperate seas feed on seals and sea lions. The chances are that you will never see a white shark underwater. I have a friend that lives on Catalina Island who has seen a couple, but he considers himself very lucky indeed to have done so. Many divers prefer the tough guy black commando look, and this is reflected by the choices of suits that manufacturers offer. Personally, I think that mimicking a seal doesn't seem like such a good idea.

Keep in mind again that there are plenty of fish eaters in temperate seas as well, including smaller white sharks, so flashing bright colours and shiny objects may also be unwise. I own a nice neutral blue dry suit that hopefully differentiates me from both pinnipeds and schools of fish.

Lastly, fins tend to be prime targets for bites. This is more likely to do with their movements and exposed position rather than colour but white, silver, or bright fins should probably be avoided.

Avoid erratic movements

Sharks are able to pick up on disturbances in their environment. They are looking for the tell-tale signature of a wounded fish or other animal. Once they find one, they carry out their civic duty and remove the wounded creature from the gene pool.

Thrashing around in the water may mimic the vibrations sent out by a wounded fish and/or may replicate the movements of a feeding shark. Either way, slow, rhythmic fin strokes are more likely to be ignored. Good buoyancy is also important. Crashing into the reef or struggling to stay down could generate interest or may work in reverse and drive away sharks, which you were hoping would stay around.

Look but don't touch

The best way to get bitten by a shark is to grab it by the tail or any other part of its anatomy. You wouldn't think this needs putting into print, but a surprising amount of shark bites are the direct result of divers trying to manhandle otherwise docile creatures.

Joe shark diver sees a nurse shark's tail protruding from under the reef and thinks that if he gives it a little poke or tug, the nurse shark will shift into a position where Joe can get a better look at its head. He grabs the shark's tail, and before he has

shark tales

Lemon shark

time to register exactly what has happened, he looks down to find a nurse shark jaw wrapped around his wrist.

Contrary to popular belief, nurse sharks do have rows of sharp little teeth, and once Joe is finally released (which sometimes doesn't happen until he is literally dragged out of the water) Joe gets to spend the rest of his holiday, at the very least, with a bandaged arm.

Don't be Joe Shark Diver. Sharks are extremely flexible and explosively fast.

Rays usually remain very docile if you approach them slowly until their personal space is encroached upon, and then they finally either bolt or slowly lift off the bottom and relocate a few meters away. The best way to get near them is to move in close to the sea bed. Rays feel more threatened when approached from above.

In rays, the two defence mechanisms that a diver needs to be aware of are: the stingray's tail barb and the electric ray's ability to shock.

Waders (often fishing) have been wounded and even killed where medical attention was not available, as the result of stingray barbs entering the abdomen or other vital organs. The barbs often carry toxins, which compound the medical problem and create immense pain. Luckily divers are rarely faced with stingrays using this defence mechanism, as it is only employed as a last resort when the animal is pinned down. Stingrays are more than happy to move away if they are too closely approached by a diver.

I am not aware of a single diver that has been stabbed whilst on a dive. This is not to say that you won't step on one with painful results whilst attempting a shore entry. If this occurs, wash the wound in fresh water and apply as much heat to the area as possible. This will help to break down the toxins and relieve some of the pain. Seek medical attention as soon as possible. Stingray barbs often break up upon entry, and the wound may need to be cut open and cleaned to avoid infection.

The electric organs of some rays are potentially dangerous, but again, in the majority of cases, the ray is far more likely to move away than to shock. However, torpedo rays are known to have a bad temper, and there have been a few cases of these animals chasing divers and repeatedly shocking them. Some torpedo rays have been shown to be able to emit in excess of 200 volts! Usually, if the animal is not harassed, it will leave divers alone.

Stay away from the chum

Sharks that come to a shark feed are not there to socialise. They want food, and if you're between them and dinner, you're in the wrong place at the wrong time. Keep your distance from any hanging bait that has been placed in the water, and if the current is moving a chum slick away from the area, make sure that you are positioned off to the side or up stream.

Having watched the shark's behaviour for some time, you may feel confident about moving in for better pictures or a better look. Remember that if the current is running and you are down stream, any sharks that are swimming up to the bait may think that those delicious odours are emanating from you. Now you're stuck in a position where a shark is coming toward you, and you are drifting into it. As it's very hard to swim against even a mild current, you probably now have to turn around to make headway against it to get back up stream, which puts you with your back to the approaching shark. A better course of action is to swim sideways until clear of the chum slick, at which point, you can kick up current without looking like a fleeing wounded animal.

Get underwater

Floating at the surface in the presence of sharks sends the wrong message. You want to descend as soon as you can for a few reasons:

Firstly, a body floating at the surface is high on the list of desirable objects for a shark to explore. In the ocean, dead things float. Oily chum tends to create a slick on the surface that you may be covering yourself in while you remain there.

Secondly, if your head is above water, you are effectively blind to the movements of any sharks underwater.

Thirdly, a positively buoyant diver's actions are far more limited. It takes time to become negative and descend out of trouble, and swimming at the surface in dive gear looks an awful lot like a thrashing animal.

Read the sharks

It's important to pay attention to the behaviour of the sharks participating in a shark feed. Although sharks become agitated as soon as they know food is available, they will usually continue to cruise around calmly waiting for the opportunity to strike at the bait. In a well-organized feed, access to the bait is often restricted to keep the sharks interested but not overexcited.

shark tales

THIS PAGE: Photographer encounters oceanic whitetip shark (right) and silky sharks (left)

If too much bait ends up in the water, the sharks may become very aggressive. They may chase each other tearing at the food, and in their single-mindedness, any divers that get in the way stand a chance of getting hit. To understand the significance of being thumped by a shark underwater, it's necessary to look at the medium the sharks are moving through. If an adrenalin-filled dog were to hit you at 20 miles an hour, it would bowl you down. Now replay this scenario in a medium 800 times denser than air, and you don't get bowled over anymore because you're supported by the water. However, the object hitting you is still travelling at the same speed resulting in a tremendous impact. Even a leisurely swimming shark can hurt a diver, but sharks rarely collide with anything unless they are panicked. Pay attention to the dynamics of the feed.

Beyond a critical level of excitement, sharks may become too aggressive for divers to safely remain in the water, and it is difficult to judge when this point is approaching. If many sharks are in attendance and ploughing into the food, seemingly indifferent to anything else around them, they may become excited enough to bite randomly at whatever is close to them. Often the surprising thing is how fast the pace can change.

Some sharks regardless of food stimulus may become aggressive towards divers. Any type of posturing is a bad sign. The threat display of grey reef sharks has been well documented. This consists of exaggerated swimming motions, back arching, raising of the snout, lowering of the pectoral fins and head swinging. Not all sharks will give you these visual cues, but you may see some small modified behaviour. The message is a clear one: BACK OFF!

Hopefully the diver will notice the posturing and move away before the shark takes its next defensive strategy, which is often to attack. The most common scenario in which this situation occurs is when a shark is cornered. Try to always give sharks an escape route.

It may be tempting to want to photograph posturing behaviour, but this has proven to be the downfall of numerous divers in the past. A camera flash is often the catalyst that brings on the final attack. Even bringing a camera up to eye level may be enough to push a shark over the edge, and it's important to remember that no matter how ready you think you are, if a shark attacks at speed, you are unlikely to be able to block the attack in time.

Be a responsible participant

We have come a long way since the early days of Jacques Cousteau pitting himself against the monsters of the sea. The survival of the sharks that cruise today's oceans hangs in the balance. There is no excuse for harming any shark or even interrupting important behaviours such as mating or birthing. If you feel that a shark diving situation may require the use of a power head or other weapon for protection, then the dive should not take place.

It is also important to protect the fragile environment that sharks and rays inhabit. "Getting the shot" is secondary to protecting the reef regardless of what the subject is. Always practice good buoyancy skills, and if the situation calls for you to crouch inconspicuously on the sea floor, find a barren spot that will not damage any corals or other marine creatures. That group of orange sponges may make for a better photo location but not at the expense of the surrounding corals.

If baiting sharks into an area is enough to create a worthwhile experience, then actual feeding is not necessary. The consensus is that it is far more harmful and behaviour changing to actually feed sharks than to just lure them into the area.

Try to avoid creating a repetitive feeding area where resident sharks wait for a handout. Whilst this may be a convenient way to re-attract sharks, it provides an easy target for unscrupulous shark fishers.

Diving with sharks can be a fun and highly rewarding activity, but this becomes hollow and selfish enjoyment if you in any way harm the animals that you have come to see. ■

Dogfish shark chemical stops human viruses

Researchers report that squalamine—an antibiotic isolated from dogfish sharks—is also active against a broad spectrum of human viral pathogens

The spiny dogfish shark (Squalus acanthias) is the most common shark and travels in schools. They are called dogfish because they travel and hunt in packs. They are found in the Atlantic, Pacific, and Indian oceans, from tropical equatorial climates to the Arctic and Antarctic

Animal studies showed that squalamine controlled infections of yellow fever, Eastern equine encephalitis virus, and murine cytomegalovirus. In some cases, the animals were cured.

Squalamine appears to protect against viruses that attack the liver and blood tissues, and other similar compounds that we know exist in the shark likely protect against respiratory viral infections, and so on.

We may be able to harness the shark's novel immune system to turn all of these antiviral compounds into agents that protect humans against a wide variety of viruses. That would be revolutionary, lead researcher Prof Michael Zasloff said:

Because squalamine can be readily synthesized and has a known safety profile in man, the researchers believe its potential as a broad-spectrum human antiviral agent should be explored. ■

Marshall Islands now a safe haven for sharks

If you're a shark, head for the Marshall Islands. That's because in early October, its government declared the world's largest shark sanctuary within their home waters.

Comprising an area eight times larger than the United Kingdom, sharks within the 1,990,530 sq km area are now safe from being fished. Anyone who accidentally catches a shark has to release them alive.

In addition, trade in shark and shark products is prohibited. There would also be a ban on wire leaders, a longline fishing gear that has proved deadly for sharks.

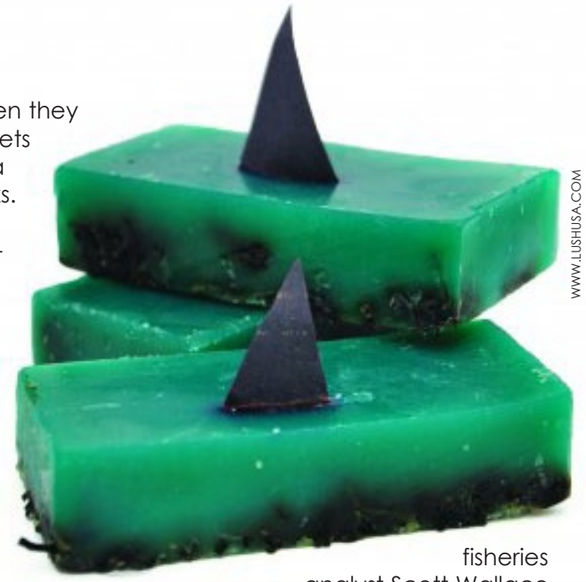
In the run-up to the bill, the Marshall Islands government had collaborated with the US-based Pew Environment Group, which has been instrumental in establishing shark sanctuaries worldwide.

"In passing this [shark protection] bill, there is no greater statement we can make about the importance of sharks to our culture, environment and economy," said Senator Tony deBrum, who co-sponsored the bill through the parliament.

"Ours may be a small island nation, but our waters are now the biggest place where sharks are protected," he added. ■

Lush Shark Fin Soap

This is perhaps the one time that shark-phobics won't panic when they see a shark fin popping out of the water. Lush's shark fin soap gets you squeaky clean with its blend of softening seaweed, fine sea salt and lime oil, while letting you do your part to save the sharks. You see, all proceeds from the sale of this limited edition soap goes to Shark Savers, the organisation dedicated to the protection and conversation of sharks. Now that's the perfect combination to make you feel good both on the inside and out! ■



WWW.LUSHUSA.COM

Spiny dogfish makes history as world's first 'sustainable' shark fishery

British Columbia's spiny dogfish has become the world's first shark fishery to be deemed sustainable, offering a glimmer of hope for globally overfished shark populations. The London, England-based Marine Stewardship Council (MSC) has concluded that B.C.'s commercial hook-and-line dogfish fishery is sustainable, following an independent scientific assessment by accredited certification body Moody Marine Ltd.

The council concluded that the dogfish met the "global standard for sustainable fisheries, which includes healthy fish stocks, minimal ecosystem impacts, an effective fisheries-management system," and is "managed within the precautionary framework" of the federal fisheries department.

"We're really excited," stated Michael Renwick, executive director of the B.C. Dogfish Hook and Line Industry Association. "We're hoping MSC certification will result in new interest for dogfish products. It's a small nugget of hope that environmental groups will open their eyes to this first initiative to ensure sustainability by a very rigorous process."

In an opinion letter in the journal Nature in 2010, scientists such as Jennifer Jacquet and Daniel Pauly of the University of B.C. Fisheries Centre said the MSC's credibility was at risk unless it "creates more stringent standards, cracks down on arguably loose interpretation of its rules, and alters its process to avoid a potential financial incentive to certify large fisheries."

However, the MSC's dogfish certification is supported by the David Suzuki Foundation (DSF) and World Wildlife Fund, which co-founded the MSC but is no longer involved in its operation. Despite ongoing questions about stock assessments, DSF fisheries analyst Scott Wallace said the fishery was worth supporting as all vessels utilise electronic monitoring, there is limited bycatch of dogfish in other fisheries and the total allowable catch is conservatively set. "This is an exception in the world of shark fisheries," he said.

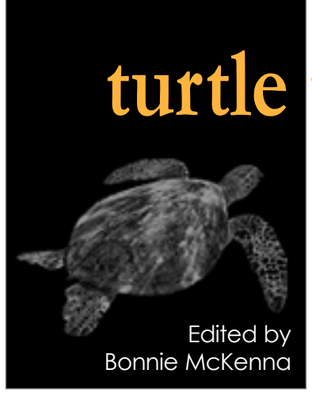
The dogfish is the most common of B.C.'s 15 shark species and its most widely utilised fish. Its meat is sold as 'rock salmon' for fish and chips in England, the belly flaps smoked and sold in Germany, the fins for Asian shark-fin soup, cartilage for health pills (of dubious value), and the reminder for organic fertiliser. Among the other B.C. fisheries already MSC-certified as sustainable are hake, halibut and Fraser sockeye (the latter species being particularly disputed by some environmental groups). ■

The Fin Trail

The Fin Trail is a film about shark fin. From breath-taking images of sharks swimming free in the ocean, to graphic sequences of how the ingredients of the shark fin soup are harvested. Director Steve Bowles and his team intends to take the viewers on a worldwide journey to places where the shark finning is legal, and where it is not. They will reveal how the harvested fins make it to the consumer and how the dollars and cents of the trade add up for the suppliers of the business - and what it means for the rest of the world.

In short, The Fin Trail is the inside story told from both sides of the trade: from the businessmen, gangsters and politicians eager to fuel the demand, to the conservationists and activists fighting to stop the slaughter.

In conjunction with the filming, an online petition (http://www.thepetitionsite.com/1/the-fin-trail/) is underway, urging governments to ban shark finning and to outlaw the trade in shark fins except for those sourced from sustainable fisheries. ■



Accidental sea turtle deaths drop by 90 percent in U.S. fisheries

According to a new study by Duke University Project GloBAL and Conservation International, the number of sea turtles accidentally caught and killed in fishing gear in the United States has declined by an estimated 90 percent. The report credits the drop to measures that have been put in place to reduce bycatch.

Before measures were put in place to reduce bycatch, it is estimated that sea turtle takes surpassed 300,000 annually. Of those, 70,000 turtles were killed.

The study collected data from 1990 to 2007 to determine the bycatch rates from more than 20 fisheries operating in Atlantic waters from the Gulf of Mexico to the Canadian border and in the Pacific Ocean along the west coast and around Hawaii. Shrimp trawls in the Gulf of Mexico and southwestern United States accounted for up to 98 percent of all bycatch takes and deaths during the study period.

Reducing bycatch

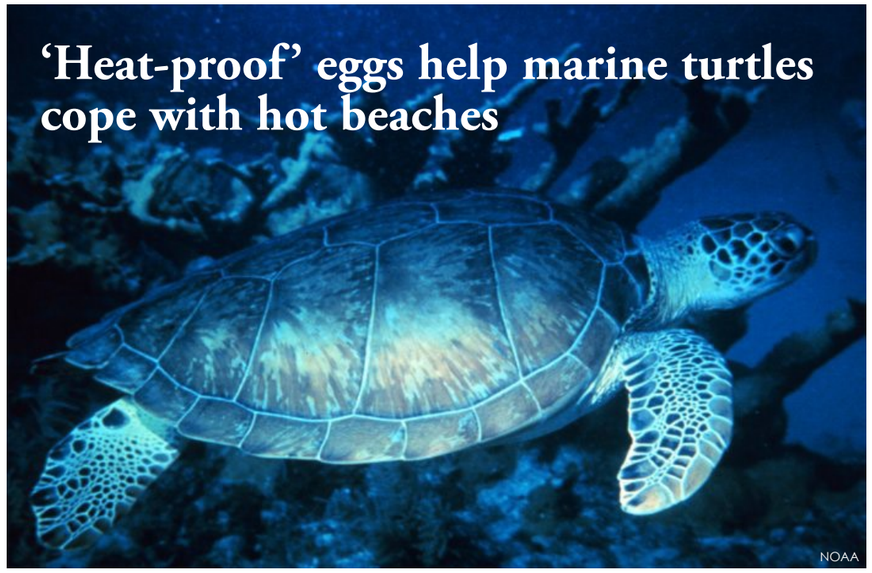
Bycatch is an acute threat to marine turtle populations worldwide. High bycatch rates can indicate unsustainable fishing practices that negatively impact the health of the marine ecosystem. Mitigation strategies that have helped reduce bycatch are: the use of circle hooks and dehooking equipment, the use of Turtle Excluder Devices (TEDs) in shrimp trawl nets, and the implementation of time-area closures to restrict fishing when turtles are most likely to be present.

Fragmented approach

Piecemeal regulation remains a problem. The fragmented approach of allowing a fishery-by-fishery to set bycatch limits does not account for the overall impact of all takes and leads to total allowed takes to exceed what the sea turtle populations can sustain.

The researchers note that the actual bycatch rates are likely higher than reported because in many fisheries, particularly the shrimp trawl fishery, the number of on-board observers is low relative to the amount of fishing that occurs. ■

'Heat-proof' eggs help marine turtles cope with hot beaches



Research led by the University of Exeter shows that some turtles are naturally heat-tolerant.

The study focused on green turtles on Ascension Island. They found that eggs laid by turtles on a naturally hot beach withstand temperatures better than eggs found on cooler beaches just a few kilometers away.

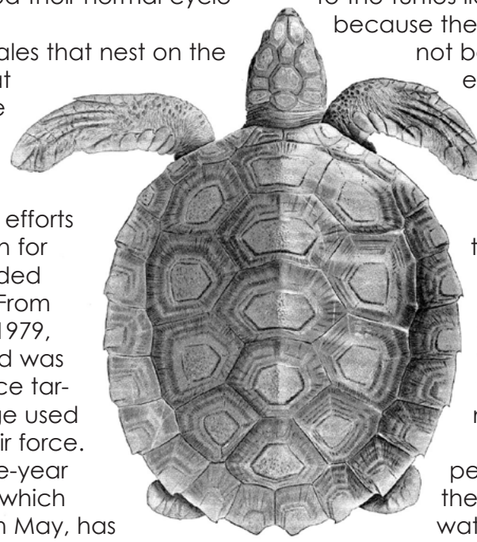
The warmer beach had dark sand and the cooler beach had white sand. Since most female turtles nest on the beaches where they were hatched, it was concluded that the turtles became adapted to specific nesting locations.

Adaptaition to heat

The researchers placed some eggs from each beach into incubators at either 32.5°C or 29°C and monitored the progress. They found the eggs from the warmer beach were better able to survive in the hot incubator than those from the cooler beach. Researchers believe that this is the first time that adaptation to local environmental conditions has been demonstrated in marine turtles.

Dr Sam Weber, who lead the study said, "Such adaptations probably evolve over many generations, so whether turtle evolution can keep pace with the rapid climate change that scientists have predicted remains to be seen. However, occasional movements of heat-adapted turtles to other nesting sites could help to spread favorable genes." ■

Turtles and unexploded bombs



Flatback turtles that nest on Bare Island, a deserted patch of sand dunes off the coast of Darwin, Australia, have continued their normal cycle of life.

The females that nest on the beach at night are oblivious to the daytime efforts to search for unexploded bombs. From 1945 to 1979, the island was a practice target range used by the air force. The three-year project, which began in May, has already unearthed a number of large bombs as well as an abundance of empty cartridges and projectiles.

Resting in peace

While the island's violent past would seem an unlikely place for the nesting turtles; the opposite is true due to the lack of predators on the barren island, which has resulted in a very high successful number of hatchlings making it to the sea. Despite the nesting successes, threats to the turtles lie offshore because the area will not be protected by a network of marine reserves proposed by the government for the northwest and north of the continent.

Only three percent of the northern waters would be protected by the draft plan. Sea turtles in that nest on Bare Island will be left vulnerable to oil spills, seabed mining and commercial and recreational fishing. The Australian Marine Conservation Society is disappointed that this important breeding ground for the flatback would not be protected by the network of proposed marine preserves. ■

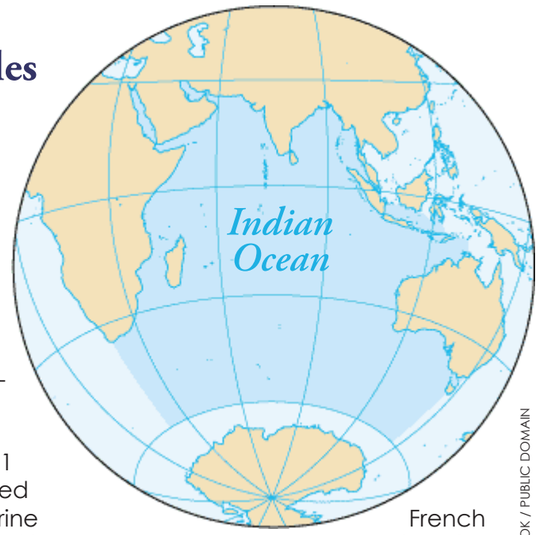
Ingestion of plastic and latex by sea turtles is studied

Small pieces of latex and plastic were fed to sea turtles on different occasions. The turtles feeding behavior, as well as the time taken for the turtles to pass the ingested material were noted. The physiological and clinical status of the turtles was monitored constantly. Green and loggerhead turtles were observed actively seeking the offered material; some color preference was noted. The amount consumed depended on appetite. The studies noted no effects of plastic ingestion on gut function, metabolic rate, blood chemistry, liver function or salt balance. However, blood glucose declined for nine days following ingestion, indicating a possible interference with energy metabolism to gut function. Passing of the ingested material ranged from a few days to four months. Some turtles passed multiple pieces bound together although they had eaten the latex pieces at different times. It appears that some of the latex pieces are being held in the intestines, and those pieces that had been held in the gut the longest showed evidence of deterioration.

To read the full report, go to ***http://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-154_P719.PDF*** ■

Almost half of the world's threatened turtles are found in the northern Indian Ocean

Top experts recently discovered that 45 percent of the world's threatened turtles are found in the northern Indian Ocean. The study also determined that the most significant threats across all threatened marine sea turtles are fisheries bycatch, accidental catches and the direct harvest of turtles, their eggs or their shells for commercial use.



CIA WORLD FACTBOOK / PUBLIC DOMAIN

The report, produced by the IUCN, Marine Turtle Specialist Group and supported by CI and the National Fish and Wildlife Foundation, is the first comprehensive status report of all marine turtles globally. The study is designed to provide a blueprint for conservation and research. The assessment system will provide a baseline status for all marine turtles from which conservationists can gauge their progress on recovering these threatened populations.

Sea turtles everywhere are conservation-dependent, but this framework will help us effectively target our conservations efforts around the world.

Five of the 11 most threatened species of marine turtles are found in the northern Indian Ocean. Other areas that proved to be most dangerous to marine turtles were the East Pacific Ocean (from the USA to South America) and the East Atlantic Ocean (off the coast of Western Africa).

The study also highlighted the 12 healthiest marine turtle populations in the world. The thriving habitats which include nesting sites and feeding areas are Australia, Mexico, Brazil, the Southwest Indian Ocean, Micronesia, and French Polynesia.

Dr Bryan Wallace, director of science for the Marine Flagship Species Program at CI said, "Before we conducted this study, the best we could say about sea turtles was that six of the seven sea turtle species are threatened with extinction globally, but this wasn't very helpful for conservation because it didn't help us set priorities for different populations in different regions. Sea turtles everywhere are conservation-dependent, but this framework will help us effectively target our conservations efforts around the world." ■

U.S. adds loggerhead sea turtles to the endangered list

After four years of lobbying, the U.S. National Marine Fisheries Service moved the loggerhead population in the North Pacific from threatened to endangered under the Endangered Species Act.

NOAA

The loggerhead populations have declined by at least 80 percent over the past decade, according to marine biologists.

According to the Sea Turtle Restoration Project, deadly high-seas longline fisheries, illegal poaching and radioactive debris offshore of loggerhead nesting areas in Japan jeopardize these sea turtles.

Swordfish boats from Hawaii often hook and drown loggerhead turtles on their longline hooks, but the real threats come from the Taiwanese, Chinese and Japanese longline fleets that are not subject to U.S. fishing regulations.

It is hoped that by adding the loggerhead to the endangered list it will allow pressure to be brought on the United Nations and other foreign nations to subject their fishing fleets to more stringent regulations regarding their longline fishing practices. ■

Managing Narcosis

Under the influence: A performance guide to managing narcosis
—from aquaCORPS *# 3, DEEP, JAN91*

Text by Barry Fowler, Ph.D.
Illustrations by Andrew Bell
Creaturesinmyhead.com

Breathing hyperbaric air causes a syndrome of behavioral and subjective effects called nitrogen narcosis, which limits the work efficiency of divers and is ultimately life-threatening.

squishy...
i feel squishy

Table 1(right) presents the classic view of the progressive effects of nitrogen narcosis based on descriptions in a number of current textbooks (Bennett, 1981; Miller, 1979; Edmonds et al., 1983). This view emphasizes the growing helplessness of the diver to combat narcosis until eventually stupification sets in at 295 fsw.

The image of helplessness is reinforced by Cousteau's well-known description of narcosis as "raptures of the deep" and his accompanying warnings about a loss of self control, which is exemplified by the urge a diver might have to give his mouthpiece to a passing fish.

Given the assumption of helplessness, it is not surprising that the usual advice to divers is to avoid narcosis by not descending too deep, or to ascend immediately when symptoms are encountered. This is excellent advice: narcosis should be avoided if possible. On the other hand, this advice is not helpful to those divers who must work while narcotic.

The purpose of this paper is twofold. First, to highlight recent advances in behavioral research on narcosis, which suggest that it might be possible to develop training procedures to improve the work effectiveness and safety of divers exposed to narcosis. The second purpose is to propose some principles that could serve as a guide for he development of these procedures. For more detail on the experiments mentioned in this paper, the reader is referred to a recent review covering the last 15 years of behavioral research on narcosis (Fowler, et al., 1985).

Narcosis as a slowing of responding

Recently, a theory called, the slowed processing model, has been proposed, which suggests that, prior to unconsciousness, the primary effect of narcosis on performance arises from a single fundamental deficit in the central nervous system. This deficit is thought to be a decrease in arousal which slows responding but does not cause perceptual distortions of either vision or audition.

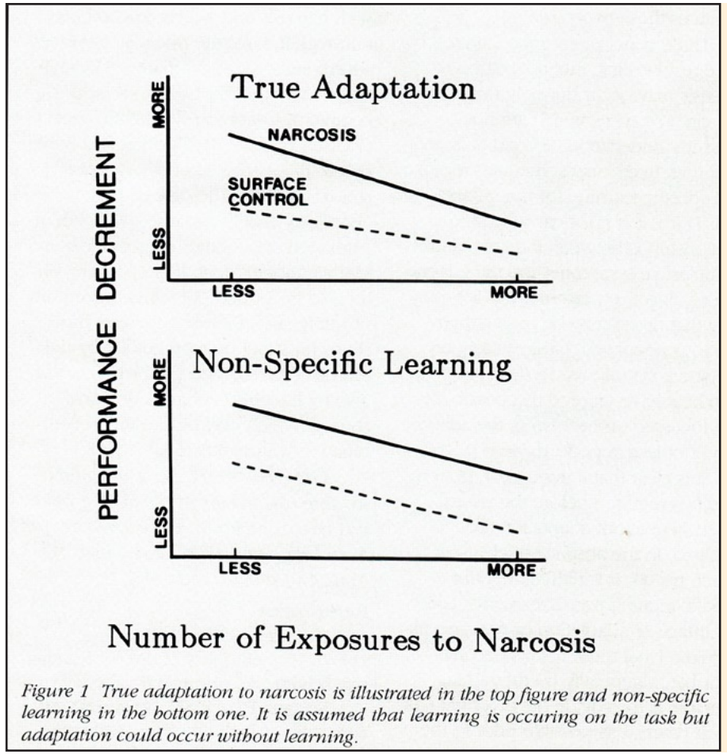


Figure 1 True adaptation to narcosis is illustrated in the top figure and non-specific learning in the bottom one. It is assumed that learning is occuring on the task but adaptation could occur without learning.

Adaptation to narcosis: Number of Exposures to Narcosis, Figure 1. True adaptation to narcosis is illustrated in the top figure and non-specific learning in the bottom one. It is assumed that learning is occurring on the task but adaptation could occur without learning

TABLE 1: A summary of the classic view of the progressive effects of nitrogen narcosis.

4ATA (98 fsw)
Mild euphoria, delayed responses

6ATA (164 fsw)
Sleepiness, hallucinations, impaired judgement; laughter and loquacity may be overcome by self control.

8ATA (230 fsw)
Convivial group atmosphere, severe impairment of intellectual performance, uncontrolled laughter or terror reaction in some.

10ATA (299 fsw)
Stupifecation, mental abnormalities, euphoria, almost total loss of intellectual faculties.

The claim that narcosis does not cause perceptual distortions is counter-intuitive, because narcosis typically decreases the accuracy of responding as well as increasing response time on a variety of cognitive, perceptual-motor and manual dexterity tasks.

To explain how the slowed processing model accounts for these decreases in accuracy, it is useful to consider an example of the research that is being conducted on narcosis with the hyperbaric facilities at the Defense and Civil Institute of Environmental Medicine in Toronto, Canada. One of the tasks used to study narcosis is called the Serial Choice Reaction Timer. It consists of a set of push buttons arranged so that a finger can rest comfortably on each one.

Adjacent to each button is a light-emitting diode. The task is to extinguish

a lighted diode as quickly as possible by pressing the appropriate button. This lights another diode randomly which must then be extinguished and so on for a specified period of time—usually 90 seconds. A computer controls this sequence of events and also records reaction time and the number of times an unlit button is pressed—this is defined as an error and reflects the level of accuracy.

Subjects performing this task in a hyperbaric chamber at the equivalent of 295 fsw show an increase in reaction time and in the number of errors committed, but they are not stupefied as the classic view would suggest. Moreover, it turns out that these errors can be eliminated by training the subjects to slow down. In other words, the loss in accuracy can be controlled at the expense of speed.

Generally speaking, it appears that this is true for many tasks where a loss of accuracy is not necessarily part of the performance breakdown due to narcosis. To summarize, the slowed processing model holds that decreased accuracy on many tasks is due to untrained individuals working too quickly and being willing to take more risks than usual.

Two training principles are suggested by this research. First, disorganized behavior is not necessarily part of narcosis and can be overcome by training. Second, errors can be avoided by slowing down. Conversely, when time is at a premium and the diver is hurrying, an increase in errors will be unavoidable. The potential costs of these errors in terms of work efficiency and safety must be weighed against the possible gains.

For example, it might be acceptable to hurry and make an assembling a piece of apparatus. It would not be acceptable to hurry and make an incorrect decision resulting in loss of orientation with respect to an anchor or guideline.

FOWLER ON NARCOSIS
- Disorganized behavior is not a necessary part of narcosis and can be overcome by training. Errors can be avoided by slowing down.
- Divers should rely on memory as little as possible. When memory must be relied on, the material should be highly overlearned and memory cues used to minimize forgetting.
- Divers must become familiar and comfortable with the sensations of narcosis, and learn to allocate attention between the task and the symptoms in a manner appropriate to the situation. Divers can learn to use the intensity and type of symptoms to estimate performance capability.
- Divers should practice as much as possible prior to the dive on the tasks to be performed underwater. ■

Effects of narcosis on memory

Tasks involving long-term memory and learning are one area where slowed processing model is unsuccessful in explaining decreases in accuracy by a failure to slow down. Narcosis causes forgetting, which can be so severe that it was evident to early observers.

Even before World War II, it was noticed that, after surfacing, divers were unable to recall all the events that had taken place under water. More recently, research has demonstrated another effect. During a dive, Material learned beforehand may not be recalled.

Quite clearly, these forms of amnesia raise a number of potential problems. During the dive, there is the possibility of forgetting previously learned instructions and the learning of new material will be impaired. This latter effect will contribute to difficulty in solving new problems. After surfacing, events during the dive may not be recalled.

Two training principles could be employed to counter these amnesic effects. First, the diver should rely on memory as little as possible. Second, when memory must be relied on, the material should be highly overlearned and memory cues used to minimize forgetting.

Examples of procedures relating to the first principle include preparing and using a check-off list, which details every stage of the dive and recording all interesting observations during the dive. With respect to the second principle, divers must overlearn any emergency procedure, which is to be executed quickly in a precise sequence. In addition, an obtrusive alarm system should serve as a cue for critical items, such as bottom departure time.

Subjective symptoms of narcosis

—and their relationship to performance

The term "raptures of the deep" was coined to highlight a striking

…i thought i could handle it.

Narcosis

characteristic of narcosis—the subjective sensations of euphoria which may induce rash behavior. However, the point was made earlier that divers can be trained to act rationally under narcosis. One may feel euphoric without necessarily acting these feelings.

The emphasis on euphoria has obscured the fact that there are other subjective sensations induced by narcosis. These have been documented by asking experienced divers to identify adjectives describing their feelings. In all, four clusters of adjectives have been identified. These relate to euphoria (e.g. more carefree and cheerful), consciousness (e.g. more fuzzy and hazy), work capability (e.g. less effective and efficient) and inhibitory state (e.g. less cautious and self-controlled).

this is the last time I do this for you…

For training purposes, it is important to note that, apart from inducing rash behavior, subjective symptoms have the potential to influence performance in two ways. First, performance may be disrupted because the diver pays attention to the internal sensations of narcosis at the expense of maintaining concentrations on the environment and the task.

This is because a fairly strong relationship has been demonstrated between subjective ratings of the severity of narcosis and the degree of performance impairment. It should be noted that this study was performed under ideal conditions in a dry hyperbaric chamber and possibly these results could not be replicated under water. This is because a variety of other factors, e.g. cold, anxiety and fatigue, could all produce sensations which might mask narcosis.

The potential influence of the subjective symptoms of narcosis on performance suggests three training principles. First, the diver must become familiar and comfortable with the sensations of narcosis. Second, the diver must learn to allocate attention between the task and the symptoms of a manner appropriate to the situation.

The object here is to prevent a performance deficit due to inattention, but at the same time, not to ignore the symptoms entirely. The reason for not ignoring symptoms becomes apparent in the third principle. This states that a diver should be taught to use the intensity and type of symptoms to estimate performance capability. For example, in the event of inadvertently exceeding the depth limit during an excursion dive, subjective symptoms could be the first warning if the development of a life-threatening situation.

Adaptation to narcosis

It is generally agreed by divers that frequent exposure to narcosis leads to adaptation. The problem is that research on this question has not clarified what kind of adaptation is taking place (Fowler, et al., 1985).

There is some evidence of adaptation that is specific to narcosis. This means that, over successive exposures, performance under narcosis improves at a greater rate than a surface control—this is true adaptation.

On the other hand, this kind of adaptation has not been found in some experiments where the improvement in performance is identical for narcosis and the surface control. This is a case of non-specific learning, but it is important to note that there is still an improvement in performance under narcosis. Figure 1 illustrates these two cases.

Three conclusions are suggested by these results. First, true adaptation to narcosis may occur but only under certain circumstances which are not presently understood. Second, it is possible that divers may sometimes mistake non-specific learning for true adaptation. Third, it is not clear what the relationship is between the adaptation of subjective symptoms and the adaptation of objective performance. It is possible that divers may be basing their opinions about adaptation largely on subjective symptoms. To date, researchers have ignored this possibility and focused on measuring the adaptation of objective performance.

It is clear that a good deal more research is required before the issues raised here about adaptation are resolved. In the absence of clear-cut research results, it is difficult to offer specific training principles which take advantage of adaptation or non-specific learning.

Until these results become available, a generally useful training principle is to provide the diver with as much practice as possible prior to the dive on the tasks to be performed under water. If these tasks can be practiced under narcosis prior to the dive, so much the better. There are some techniques that might be useful for this purpose, but it is beyond the scope of this paper to discuss them.

Some final caveats

The eight training principles that have been proposed are aimed at controlling and possibly ameliorating the effects of narcosis

when it cannot be avoided. Underlying these principles is a view of narcosis, expressed in terms of the slowed processing model, which differs from that presented in current textbooks. However, it must be emphasized that these principles are only tentative and must be tested by controlled research. There is definitely no suggestion that current maximum depth guidelines for sports divers should be violated.

Finally, for the purposes of this paper, the whole question of predicting performance in the underwater environment has been over-simplified. There are a variety of other stressors, which coexist with narcosis and which, in combination with it, have the potential to place severe limits on performance.

These include hypercapnia, cold, anxiety, perceptual disorders and weightlessness (Fowler, et al. 1983; Godden and Baddeley, 1979). This has been demonstrated clearly in the case of anxiety (Baddeley and Fleming, 1967), but information about other combinations is virtually non-existant. If deep diving on air is to be carried out with a maximum of safety and efficiency, training procedures must not only be guided by the effects of narcosis on performance, but also by the effects of any additional stressor that may be present in combination with narcosis.

Barry Fowler, Ph.D., is one of the leading researchers in the field of inert gas narcosis. He can be reached at York University, 4700 Keele Street, New York, Ontario, M3J 1P3, Canada. ■

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The Insidious Threat of Hypoxic Blackout in Rebreather Diving

Why rebreather divers, even more so than open circuit divers, need to be in control and focused when they ascend.

Text by Simon Pridmore

Rebreathers allow divers to enter a realm of undreamed-of opportunity. However, while they provide a solution to many of the drawbacks of open circuit scuba diving, such as limited gas supply, noise and short no–decompression limits, rebreathers also expose divers to a number of new concerns, which is why proper training and lots of practice in emergency procedures are essential.

Not only free divers

One of these concerns is a widely misunderstood phenomenon most frequently referred to as shallow water or hypoxic blackout, something that hitherto has typically been a problem encountered mainly by free divers.

One of these concerns is a widely misunderstood phenomenon most frequently referred to as shallow water or hypoxic blackout, something that hitherto has typically been a problem encountered mainly by free divers.

A technique many free divers practice to extend their time underwater is hyperventilation. They breathe in and out aggressively to reduce their carbon dioxide levels as much as possible. This causes the breathing reflex and onset of anxiety to be delayed while they are underwater. Then they dive. As they swim their bodies metabolize the oxygen and convert it into carbon dioxide and the longer they are down the more oxygen is metabolized.

Maintaining conciousness

Human beings can function normally at oxygen partial pressures of between 0.16 and 0.5. At partial pressures greater than 0.5 we are at risk from oxygen toxicity: at partial pressures below 0.16 the oxygen level is insufficient for us to maintain consciousness.

At the surface, the oxygen partial pressure in the air the free diver breathes is 0.21. When he arrives at 10m (33ft), generally speaking, the percentage of oxygen in the air in his lungs is still 21 percent, but as he is now at an ambient pressure of two atmospheres and as the pressure of the air in his lungs has now doubled, the partial pressure of the oxygen in his lungs is 0.42.

Dropping pO_2

This partial pressure then starts to drop and continues to fall as the oxygen is metabolized. If the diver stays at depth until the partial pressure drops to 0.28, he is fine, but this equates to a partial pressure of only 0.14 at the surface. So, as he ascends and his oxygen partial pressure drops with the reduction in ambient pressure, somewhere at a point close to the surface it will fall below 0.16, the diver will black out abruptly and, if he is not positively buoyant, will sink back down to the depths.

It may well be this phenomenon lies behind a number of unexplained rebreather fatalities in recent years.

Rebreather divers can encounter similar issues as they ascend. On most electronic CCRs, the oxygen level in the diver's breathing supply is maintained at a preset level. As the diver ascends, the ambient pressure drops as does the partial pressure of oxygen in the diver's breathing loop.

Lag effect

When the rebreather's electronics detect that this is happening they direct a solenoid to allow a fresh injection of oxygen into the loop to maintain the partial pressure at the desired level. If the diver's ascent is too rapid, however, the electronics may not have time to pick up and compensate for the oxygen shortfall. Furthermore, if the oxygen cylinder is empty or if corrosion or other debris is blocking the injector then no oxygen can be added, no matter how controlled the ascent. If the diver does not monitor his oxygen partial pressure and act to manually sustain a breathable oxygen level by, for instance manually injecting fresh diluent gas into his breathing loop, he will black out before he reaches the surface.

There are no warning signs or symptoms

It may well be that this phenomenon lies behind a number of unexplained rebreather fatalities in recent years. With very few exceptions, we all begin our diving lives on open circuit scuba and acquire open circuit habits. It is common in standard no decompression sport diving for divers to relax their vigilance once they begin their ascent. The dive is over and their attention starts to wander. It is also natural for a diver who encounters a problem or feels uncomfortable to quickly seek sanctuary in the shallows. After all, this makes good sense in open circuit terms because the shallower you are, the less air you use and the more time you have to solve any problem.

Resist the tendency

Due to the dangers of hypoxic blackout rebreather divers have to be trained to resist such tendencies, and it can require intensive practice for them to achieve the instinctive level of concentration and discipline required. The ability to conduct a controlled and considered ascent is a widely underestimated tool in any diver's skill set. For a rebreather diver, it is an essential survival technique. ■

Simon Pridmore is the author of Scuba Confidential: An Insider's Guide to Becoming a Better Diver, *which will be available from Best Publishing Company in late 2011. See www.scubaconfidential.com for an advance preview.*

Flash Photography

Subject: Clown Anemonefish (*Amphiprion ocellatus*), Lembeh Straits, Indonesia. 105mm lens, ISO 200, Sea & Sea YS110 flash, 1/125th second at F22

Text and photos by Lawson Wood

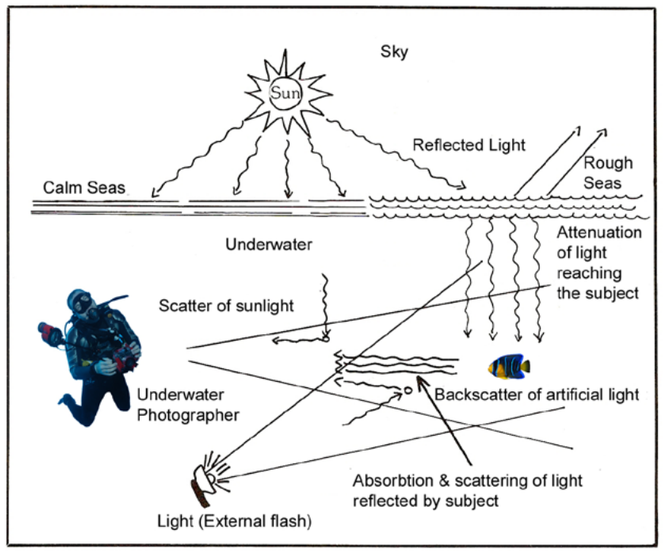
We already know that as you go underwater light refracts and changes colour with the density of the water. You lose the colour red in less than two metres (6.5ft) and that colour gradually loses intensity the deeper we go underwater. To compensate for this loss of light and colour, we either add a flash to illuminate the subject, a filter to alter the colour spectrum being 'seen' by the camera, change the white balance accordingly at the beginning of the dive or by a quick fix on Photoshop. This loss of colour is the underwater photographer's ultimate challenge; our goal is to bring back as much of the real and natural colour as possible, allowing the viewer to truly appreciate the splendour of our underwater world.

By far, the simplest (yet costly) way forward is to use flash. Most compact cameras have fairly adequate internal flash to illuminate close-up subjects, but this small flash is not strong enough to illuminate larger subjects or subjects at a distance of over 1metre (3.25ft). Those compact camera owners are recommended to purchase an additional external flash unit that actually fires as a 'slave' to the camera's own internal flash by the use of a fibre optic cable, allowing for a greater spread of light to illuminate a larger subject area. White balance settings ultimately always help, but the addition of external flash is better still.

Light underwater—*The way light is affected once we go underwater*

As you can see, light and its absorption causes all sorts of problems once it starts to penetrate the underwater realm.

The principal problem which underwater photographers face is the fact that *we are underwater,* and it is the water that gets in the way of the picture, or more accurately, it is the particles in suspension in the water, (which reduces the visibility) which get in the way of a clearly lit photograph. In low visibility, these particulate—be they planktonic debris, bits of rusty particles knocked off an old wreck, small marine critters dislodged by a diver's exhaust air bubbles, the bubbles themselves or sedimentation—any and all of the above can and normally will produce an effect called 'backscatter'. This occurs when the burst of light produced by your electronic flash bounces off and reflects back to the camera's lens before it has reached the subject to be illuminated.



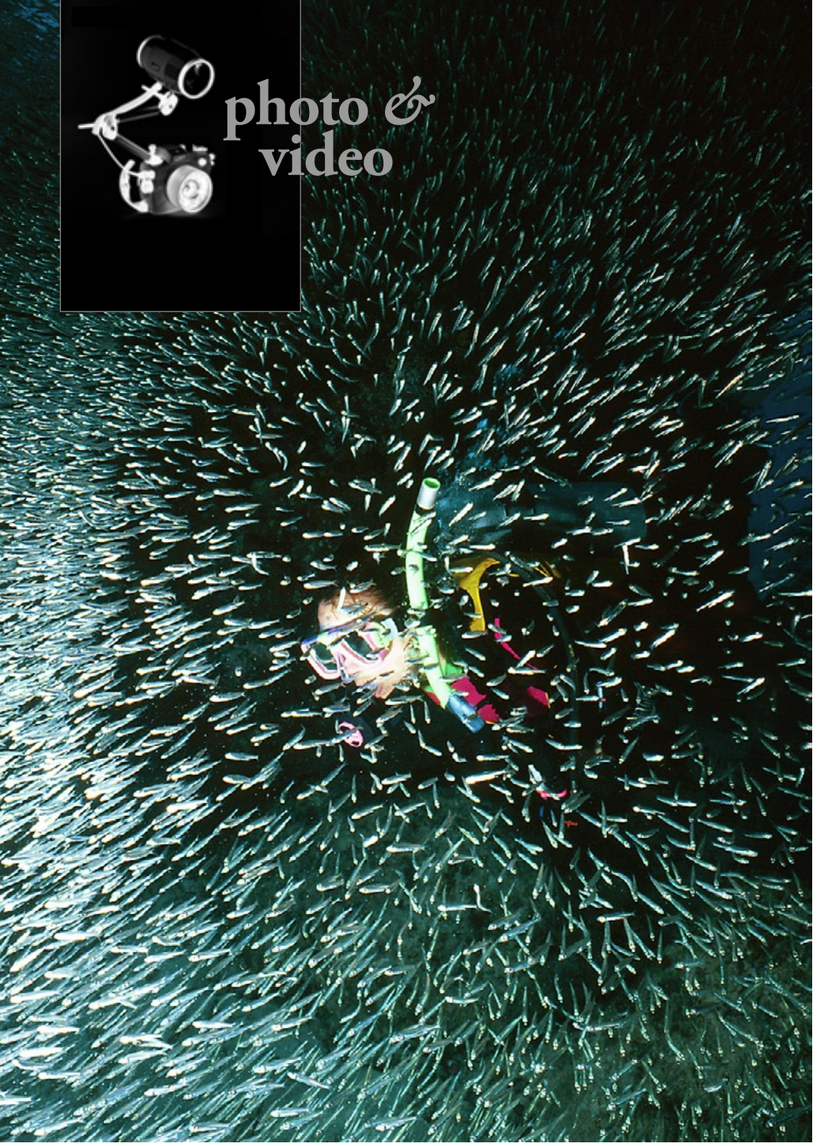
When using flash to take a photograph of the subject, not only do we have to cope with the attenuation of light reaching the subject, we also have to deal with various sea conditions: sunny or cloudy overcast days, highly reflective subjects such as silverside minnows or even a diver's bald head!

(Assuming that the water is crystal clear) the calmer the water the more light is able to penetrate into the depths and allow for natural light illumination of your subject. This obviously does not happen in poor visibility areas, and these dives should almost be treated as potential night dives.

The rougher the water, the more a higher percentage of the sun's rays are deflected back up into the atmosphere. Light does filter down from above to the subject, but due to the refractive index of light absorption, you lose the colour red in approximately 2m (6.5ft) of water. There is of course a scattering of light in the water column as well as the subject matter actually absorbing and reflecting light particles as you take the photograph. A white sandy seabed will help the overall illumination, but black sand will absorb the light.

Reflective surfaces such as the sides of these silverside minnows have to be treated with caution, as too much flash will produce flare that will bounce back and overexpose the photograph.

By concentrating the flash directly



Subject: Kelly and school of Silverside Minnows, Little Cayman Island. 15mm lens, Fuji Velvia (scanned), ISO 50, Sea & Sea YS200 flash, 1/125th second at F16

Subject: Stareye Hermit Crab (*Dardanus venosus*), Dominica. Canon Powershot S95, Auto settings

into the centre of the subject area, I was able to illuminate all of the fish, and the extreme wide angle of the lens gave the impression of vignetting with the outside of the frame fading to dark. Undoubtedly, flash always enhances a highly colourful subject, but it is also extremely effective in illuminating fairly monochrome subjects such as the silvery fish.

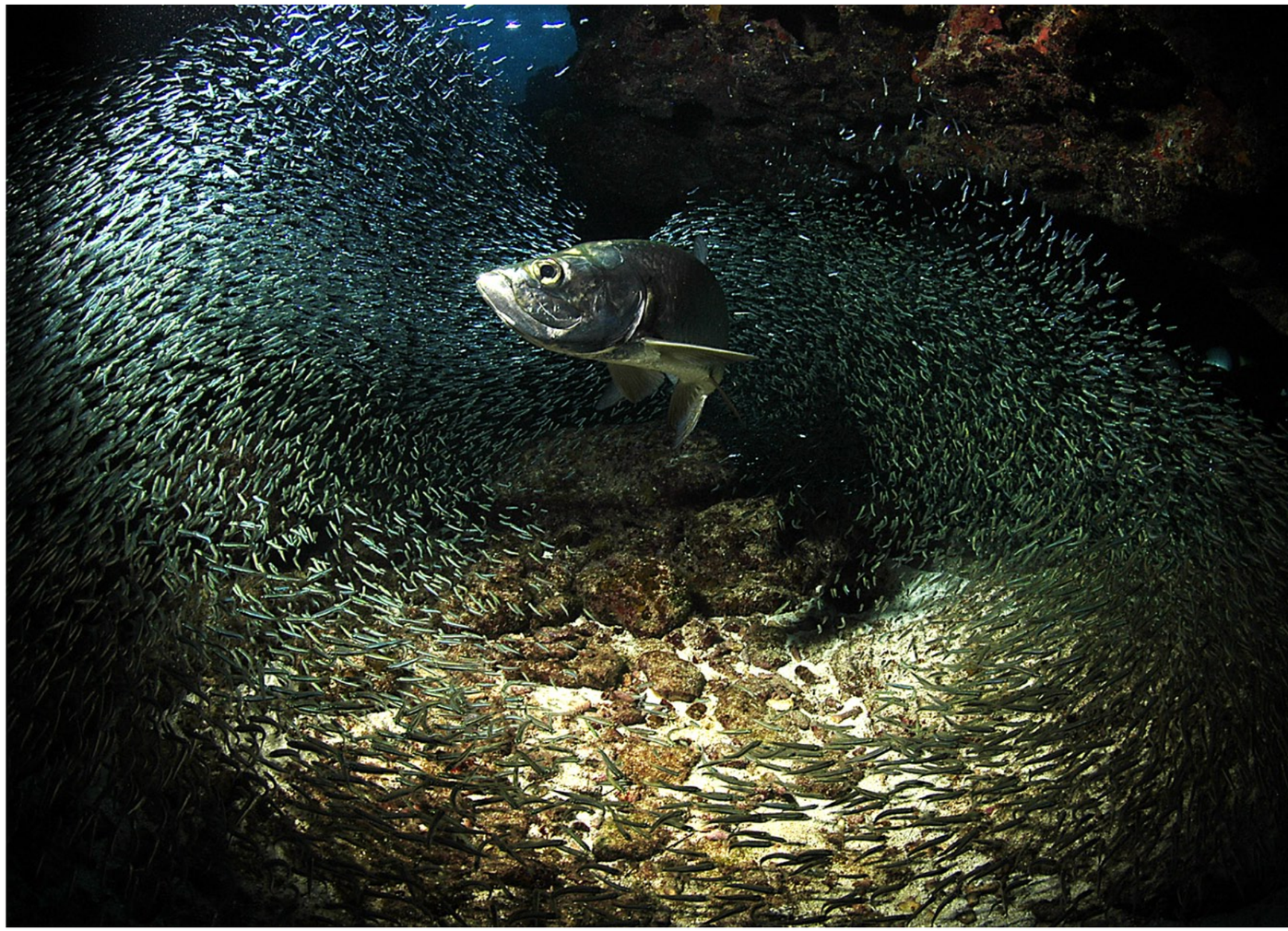
On a compact camera, the use of the camera's internal flash (whilst it is powerful enough to illuminate the subject) it is incorrectly positioned due to the housing's manufacture, and this will always create a shadow in the lower right hand side of the photograph, particularly when using the macro setting on the camera. The way to get around this anomaly is to keep the camera setting on macro, with the flash on, move further back and away from the subject (this also eases the stress on you and the critter) and use the camera's internal zoom lens to get closer once more and allow you to compose the subject with full illumination, no stress and no shadows.

As you can see, clearly illustrated in the images (top right) is the problem with the Canon compact camera's housing creating a shadow when working in close to the subject, yet it is cured by staying further back and using the zoom instead.

The use of 'fill-in' flash is perhaps the most rewarding as our camera's automatic settings do like to give their sensor's rendition of the colour of the background water, whether it be the green of Scottish waters or the brilliant cobalt blue of the Red Sea, Pacific or Caribbean waters. By using just enough flash to 'fill in' the colours of the subject in the foreground, yet still take the photograph at the same aperture (of the natural light available), we are able to give colour and depth to the subject and the scene overall.

Challenges

The use of flash underwater in inevitably challenging. Take for instance the two wreck photographs (next page) taken recently at Scapa Flow in the Orkney Islands off the northern shores of Scotland. Both are in very similar con-



Subject: Tarpon and school of Silverside Minnows, East End, Grand Cayman Island
10.5mm lens, ISO 100, Twin Sea & Sea YS100 flash, 1.80th second at F8

Subject: Technical Diver Nat from Divetech on Grand Cayman Island. 10.5mm lens, ISO 100, Twin Sea & Sea YS110 flash, 1/80h second at F:11

Subject: Stern gun on the German Batlecruiser *Kronprinz Wilhelm*, Scapa Flow, Scotland. 10.5mm lens, ISO 400, Twin Sea & Sea YS110 flash, 1/80h second at F:5.6

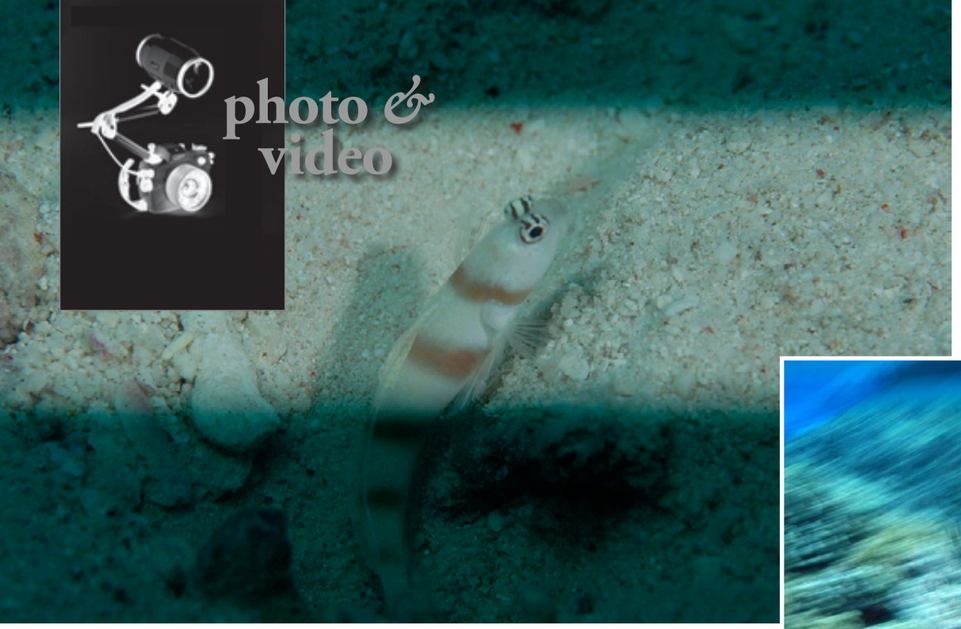
Subject: Stern gun on the German Light Cruiser *Karlsruhe*, Scapa Flow, Scotland. 10.5mm lens, ISO 200, Twin Sea & Sea YS110 flash, 1/80h second at F:5.6

ditions, but the first photograph on the *Kronprinz Wilhelm* is taken in 46m (150ft), and we are actually underneath the ship. The muddy seabed is getting stirred up; there is no natural light due to the deep shadow created by the looming shipwreck overhead, and I have to completely illuminate all of the subject area. The second photograph on the *Karlsruhe* is taken in 26m (90ft). The underwater visibility is the same, but there is now enough ambient light to illuminate the subject area, but I still need 'fill-in' flash to highlight the divers and the wreckage of the gun in the foreground. The divers/models are using their dive lights and these also give the impression that it is the divers who are illuminating the gun, and not my camera's flash—pretty near perfect, as far as I am concerned!

Problems to avoid

By not taking care in the use of the camera's command dial (image next page), I reversed the settings that I was aiming for and subsequently lowered the aperture and increased the speed of the shutter. Sadly, my flash did not synchronize to the 1000th of a second shutter speed and failed to fully illuminate the subject. Care must always be taken when adjusting the camera speed and shutter control. Try not to be in a rush as obvious mistakes like this one should be easily avoided and photographers of my experience should no better!

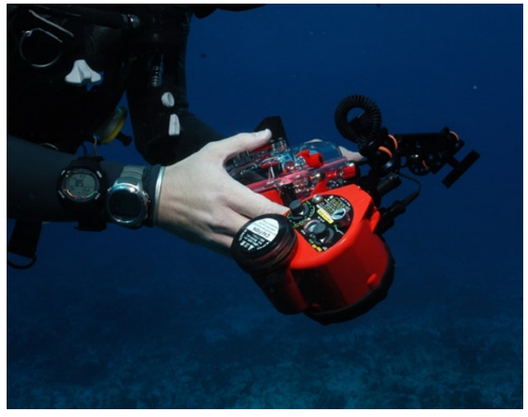
A similar problem, but at the opposite end of the spectrum happens when the camera is set on automatic and trusting that the flash will recharge in time to be able to synchronize with the shutter speed. Sadly, the flash has not recharged in time to be able to fire,



Subject: Banded Shrimpgoby (*Neoturris pileata*), Red Sea. 60mm lens, ISO 100, Sea & Sea YS180 flash, 1/1000th second at F3.4

Subject: Green Turtle (*Chelonia mydas*) Sipadan Island, Malaysia. 20mm lens, ISO 100, Sea & Sea (misfired) YS180 flash, 1/8th second at F3.4

A Compact Camera with attached external flash



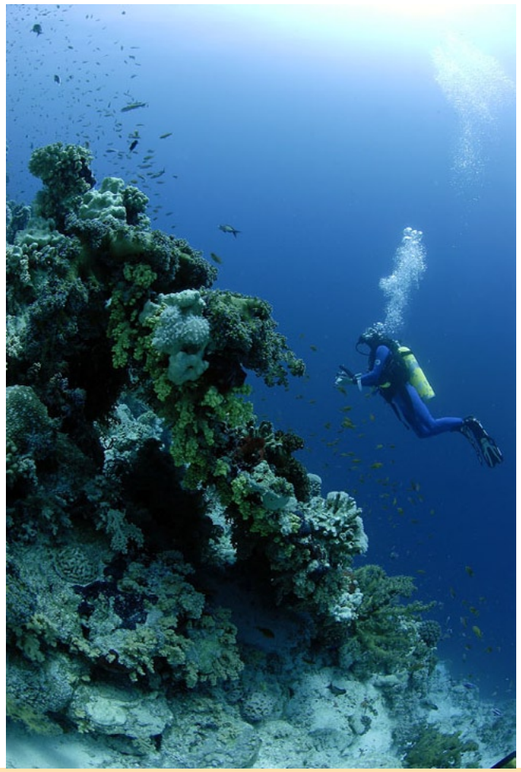
and the automatic setting on the camera has reduced the shutter speed so low that the subject is not only moving, it is out of focus too. (Nevertheless, it is still a pleasing photograph!)

The sequence of two photographs (bottom right) that I am using to illustrate this example were actually taken with the flash (full colour) photograph on the right first, followed instantaneously by the second photograph before the flash had time to recycle and fire again. The subjects are virtually identical, excepting that one can clearly see the effects of using or not using flash underwater to illuminate a subject area. The flash has clearly illuminated the brilliant colours of the soft corals, yet have failed in power to reach my dive partner, Reeta, in the background, exactly the effect that I was wanting to achieve. By reversing these images in a dissolve style audio-visual presentation, you have the effect of a rather drab colourless photograph virtually coming to light before your eyes.

Undoubtedly, the use of flash underwater is absolutely essential to bring to light (please excuse the pun) the actual true and brilliant colours which the eye and the camera lens rarely see in all of their glory, except in extremely shallow water. Only with flash, set to the correct colour temperature as that of daylight (approximately 6,500K) that you are able to obtain truly stunning colour renditions of a rather drab and usually colourless underwater world.

Flash photography, of course, is always used on night dives, as rarely do divers carry sufficient continuous and powerful lights to completely illuminate the seabed to allow your camera to use a natural light setting, even at night. Sorry, but I have actually witnessed this! For the rest of us, the use of a camera and flash either internal or external on a compact camera and externally on a housed Dslr are dérigueur for all of us underwater photographers.

The use of a spotting light (often located inside the flash) such as some of the Sea & Sea flash, Ikelite



Subject: Reeta Tunney along a wall of soft corals in the northern Red Sea. 10.5mm lens, ISO 100, Twin Sea & Sea YS110 flash, 1/125th second at 8.

Subject: Golden Cup Coral (*Tubastrea aurea*) northern Red Sea. 105mm lens with +2 dioptre, ISO 100, Twin Sea & Sea YS110 flash, 1/80h second at F:8

Subject: Snowy, Jackson Reef, northern Red Sea, 10.5mm lens, ISO 100, twin Sea & Sea YS110 flash, 1/125th second at F8

Subject: Salmon (*Salmo salar*), Deep Sea World Aquarium, North Queensferry, Scotland,15mm lens, Fuji Velvia (scanned), ISO 50, Sea & Sea YS120 flash, 1/125th second at F:11

and Inon models is an absolute must not only to aid composition, but for also finding immediately which brilliant colours are on display by many of the marine critters that are often only seen out at night.

No matter what type of camera you are carrying underwater, buoyancy control has to be second nature in approaching your subject matter.

No matter what type of

underwater camera system you opt for, immediately you will note the distinct difference in size. They say size doesn't matter—well apparently it does! With more and more weight restrictions being levied on international airline travelers, the underwater photographer undoubtedly feels the brunt of these rules as invariably there will be additional costs levied onto your holiday travel cost.

With this in mind, many divers opt for the simpler (yet still very versatile) compact camera, or ICL, as it can be carried in hand luggage and rarely raises an eyebrow as it passes through X-ray machines. For those of us lumbered with large Dslr's, plus housing; plus perhaps two external flash; extendable arms; batteries; recharging units; numerous lenses; numerous ports for the housing to suit the lenses and inevitably we will also be trying to smuggle on board a laptop computer; external hard drives; memory cards and even DVD's. Can you imagine the apoplexy that the security guards have at airports when they see all that hardware in one case that can hardly be called hand baggage, as it weighs more than your hold luggage with all of your diving gear; torch lights; diving computer; clothes and wee home from home snacks to make your overseas dive trip more bearable, just in case you do not like the food!

Who on Earth said that this was fun! But, when those little critters start to perform for you, or when that whaleshark just arrives at the same time as you, or when you find your first hairy squat lobster without the use of a dive guide, and you correctly illuminate a golden cup coral on a night dive, then all the effort is worth it.

As we have discussed,

Subject: Dahlia Anemone (*Urticina eques*) St.Abbs, Scotland.15mm lens, Fuji Velvia (scanned), ISO 50, Sea & Sea YS200 flash, 1/60th second at F16

Subject: Ornate Ghost Pipefish (*Solenostomus paradoxus*) Gangga sland, North Sulawesi, Indonesia. 60mm lens, ISO 100, Sea & Sea YS120 flash, 1/125th second at F:11

Subject: Ornate Ghost Pipefish (*Solenostomus paradoxus*) Gangga sland, North Sulawesi, Indonesia. 60mm lens, ISO 100, Sea & Sea YS120 flash, 1/125th second at F:11

the main problem that underwater photographers have is the fact that the water gets in the way of the picture, or more accurately, it is the particles in suspension in the water, which get in the way of a clearly lit photograph. In low visibility, these particles in suspension, be they planktonic debris or sedimentation, will produce an effect called 'back-scatter'. This occurs when the burst of light produced by your electronic flash bounces off and reflects back to the camera's lens, before it has reached the subject to be illuminated.

To counteract this effect, there is a combination of steps that you can take:

1. Get as close to your subject as possible; in effect, remove the water element by using a wide angle lens.
2. Hand hold or repostion the flash to cut across the sedimentation and so limit the backscatter.
3. Only use a flash to subject distance of one fifth of the underwater visibility. (ie. if the viz' is only 5m, the maximum distance your flash to subject distance should be only 1m)
4. Better still, only take photographs in clear, clean warm water.

Sometimes backscatter can be used to your advantage. Undoubtedly, some of these photographs illustrated work because of the backscatter. It gives a very real sense of being underwater and highlights the fact that not all of our diving is in crystal clear water in exotic locations. Most of us dive much closer to home, and invariably, our home waters are generally not as clear as we would like them to be. With the Salmon (previous page), we are faced with lots of highly reflective air bubbles from the underside of a waterfall plunging into a fresh water pool, and the other is quite simply taken in extremely bad visibility where backscatter is expected—it is accepted, and it is then used to create the photograph required.

Sometimes however, no matter how skillful you are in underwater photography and Photoshop techniques, some photographs are just not worth rescuing. In this instance (top image), not only am I too close to the subjects, the visibility is just too poor; I have got my lighting wrong, and generally, this should be consigned to the digital bin. Such a shame because I just love Ornate Ghost Pipefish.

This is what happens when you get it right (above) with the same subject, same time, just differing compensation for the flash and ambient light and its effect on backscatter.

Buying a flash is easy. Choosing the correct flash for your photography is more difficult, and I suggest that you consult any of the larger retailers such as Ocean Optics, Cameras Underwater or Ocean Leisure Underwater Cameras who will give you independent and informed advice on a large number of flash from different manufacturers. ■

photo & video

News edited by Don Silcock

Canon EOS 1D X

Canon has announced the release of the new EOS 1D X professional camera body. The new camera will replace the EOS-1Ds Mark III and EOS-1D Mark IV in the Canon range and features a new 18 megapixel full frame CMOS sensor, dual LOGIK 5+ image processors, 14 bit data conversion and a frame rate of 12 fps continuous shooting. The new sensor gives an ISO range up to 51,200, with up to 204,800 available in H2 mode, a new 61 point AF within six AF point selection modes, together with a new "intelligent tracking and recognition" option and an exclusive DIGIC 4 processor for metering. The camera features two new HD video formats and 1080 video at 24p (23.976), 25p, or 30p (29.97). **usa.canon.com**

Nikon mirrorless "1 System"

Nikon has announced the release of the 1 system EVIL camera range. Two new cameras, the J1 and V1, four new lenses and a speedlight make a new range within the Nikon family. Specifications on the new camera include a CX-format, 10.1 megapixel High-Speed AF CMOS, ISO range from 100-3200, a new EXPEED 3 image processing engine and HD movies at 1080p with frame rate control (30, 60, 400 and 1200fps). The new autofocus system in the cameras has 73 focus points and is claimed to be the world's fastest. The J1 is being aimed at a more general consumer who "who use a camera as part of their connected lifestyle". The V1 has a magnesium alloy body, mechanical shutter and an enhanced EVF screen. The new lenses announced today include a 10-30mm f3.5-5.6 zoom, a 10mm f2.8 pancake, a 20-110mm f3.8 zoom and a power zoom; the 10-100mm f4.5. The new products will be available from 20 October. The J1 will retail at US$649.95 with the 10-30mm, the V1 at $899.95 with the same lens. **www.nikonusa.com**

Subal housings for Panasonic GF2 and GF2 EVIL cameras

Subal has announced the release of two new housings for the Panasonic GF2 and GF2 EVIL cameras. Both housings feature the standard Subal manufacture techniques and surface coatings, as well as the QuickLock closure system. The SGF2 and SGF3 also feature access to all camera controls (including flash raise/lower), are backwards compatible with all bayonet fitting Subal ports and have a fiber optic port for strobe triggering. **Subal.com**

Watershot video lights

Watershot has announced new and upgraded STRYKR LED lighting products. The new models feature dive and video lights heads that range from 900 to 3000 Lumens. The STRYKR video light heads now come in three varieties: 900, 1800 and 3000 Lumen. They use a separate battery pack, and Watershot offers a variety of these packs allowing the option of one or two light heads to be powered per battery pack. **www.watershot.com**

Amphibico new Genesis video housing

Canadian company Amphibico have announced the release of their Genesis line of compact Prosumer HD housings. The initial release is for the Sony FS100U HXCAM HD camcorder. The new housing is machined from aluminum, and features full access to camcorder controls, a top mounted 3.5" window to view the camera's LCD, a bayonet lens port mounting system that accepts existing Aquatica ports and an option to mount an Atomos Ninja HD recorder using an optional accessory. **www.amphibico.com**

Black Jack's tail-plane and Archie the divemaster from Tufi Dive

Text and photos by Don Silcock
www.indopacificimages.com

B17 Black Jack Wreck

Lying undisturbed in the deep water just off the fringing reef from the remote village of Boga Boga on the tip of Cape Vogel, is what many consider to be the best aircraft wreck in Papua New Guinea and possibly the world.

The wreck is the B-17F "Black Jack", serial number 41-24521, and one of the first Flying Fortress bombers built at the Boeing factory in Seattle during WWII.

History

The completed plane was delivered to the U.S. Army in July 1942 at a cost of US$314,109 and subsequently flown to Australia, from where it joined the war in the Pacific in early September with the 43rd Bombardment Group, 63rd Bombardment Squadron in Port Moresby.

The plane was assigned to Captain Kenneth McCullar and his crew of nine, and served with distinction over the next few months. It was McCullar, an avid gambler, who gave Black Jack its moniker from the last two digits of its serial number—a jack and an ace is a "blackjack hand" of 21 in the card game of Pontoon.

Captain McCullar was quite a pilot and one who was highly regarded and decorated for his bravery, but who was unfortunately killed in April 1943 when another B17 he was commanding crashed during take-off from Port Moresby. In his obituary, the commander of the 5th U.S. Air Force commented on McCullar's bravery and leadership skills and said "he was a master at the art of sinking Japanese ships".

It was McCullar at the controls of Black Jack that developed the potentially dangerous, but devastating technique of "skip bombing" that is credited in his sinking of the Japanese Kagero Class destroyer Hayashio on the night of the 24th November 1942, in the Huon Gulf.

That attack left Black Jack so badly damaged that it was out of action for two months and when it returned to service it was under the control of McCullar's co-pilot, Lt. Harry Staley who had took over from McCullar when he was promoted to Squadron Commander in January 1943.

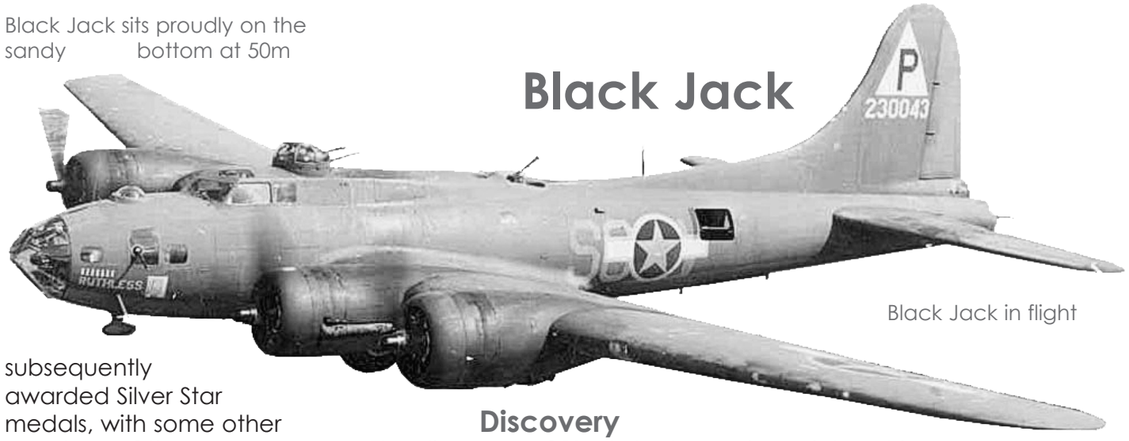
Black Jack performed equally well under Staley until he completed his tour of duty and handed the plane over to it's next, and final, pilot—Lt. Ralph De Loach.

The Final Flight

Black Jack's final flight was on 10 July 1943 when it left 7-Mile Airdrome in Port Moresby just before midnight on a mission to bomb the heavily fortified Japanese airfields at Rabaul in

Black Jack sits proudly on the sandy bottom at 50m

Black Jack



Black Jack in flight

New Britain.

The plane's course took it southeast down the coast before it turned northeast over the Owen Stanley Range and Dyke Ackland Bay to the Solomon Sea and on to New Britain. On reaching Kimbe Bay on the north coast, it changed course again and headed east to Rabaul.

The flight was a troubled one, with both right wing engines developing problems during the flight to New Britain. However, De Loach, together with his crew of nine, managed to reach Rabaul and successfully deliver their bombs on target.

De Loach turned the plane round to return to Port Moresby, but on the way back ran into a violent storm on approach to the coast of New Guinea to the northwest of Cape Nelson, a situation he later described the situation as "the blackest of black nights…the worst flying weather I'd ever seen in my life".

With two engines badly malfunctioning, it was impossible to hold the plane on course for Port Moresby and cross the Owen Stanley's, and so Black Jack was turned southeast down the coast towards Milne Bay. They made it as far as Cape Vogel where, with virtually no fuel left, the decision was taken to ditch the plane on the shallow reef that runs parallel to the white sand beach at Boga Boga.

Never having ditched a bomber before, De Loach handed the controls over to his co-pilot, Joseph Moore, who managed to put the plane down but over-shot the reef flat. It ended up over the deep water, where the plane floated briefly before sinking down to the sandy sea bed some 50m below.

There was just enough time for the ten man crew, three of whom had been injured in the landing, to get out before Black Jack sank, and they managed to get to shore with the aid of local villagers who had seen the plane come down.

An Australian Coastwatcher named Eric Foster also saw the crash landing and informed air-sea rescue to dispatch an RAAF seaplane to evacuate the wounded. The rest of the crew were rescued two days later when a PT boat arrived to take them to Goodenough Island, where they were flown back to Port Moresby, and then given two weeks leave in Sydney before returning to full combat duty.

The pilot De Loach, and co-pilot Moore were subsequently awarded Silver Star medals, with some other members of the crew receiving the Bronze Star or Oak Leaf Cluster for their parts in the overall mission and getting the plane down.

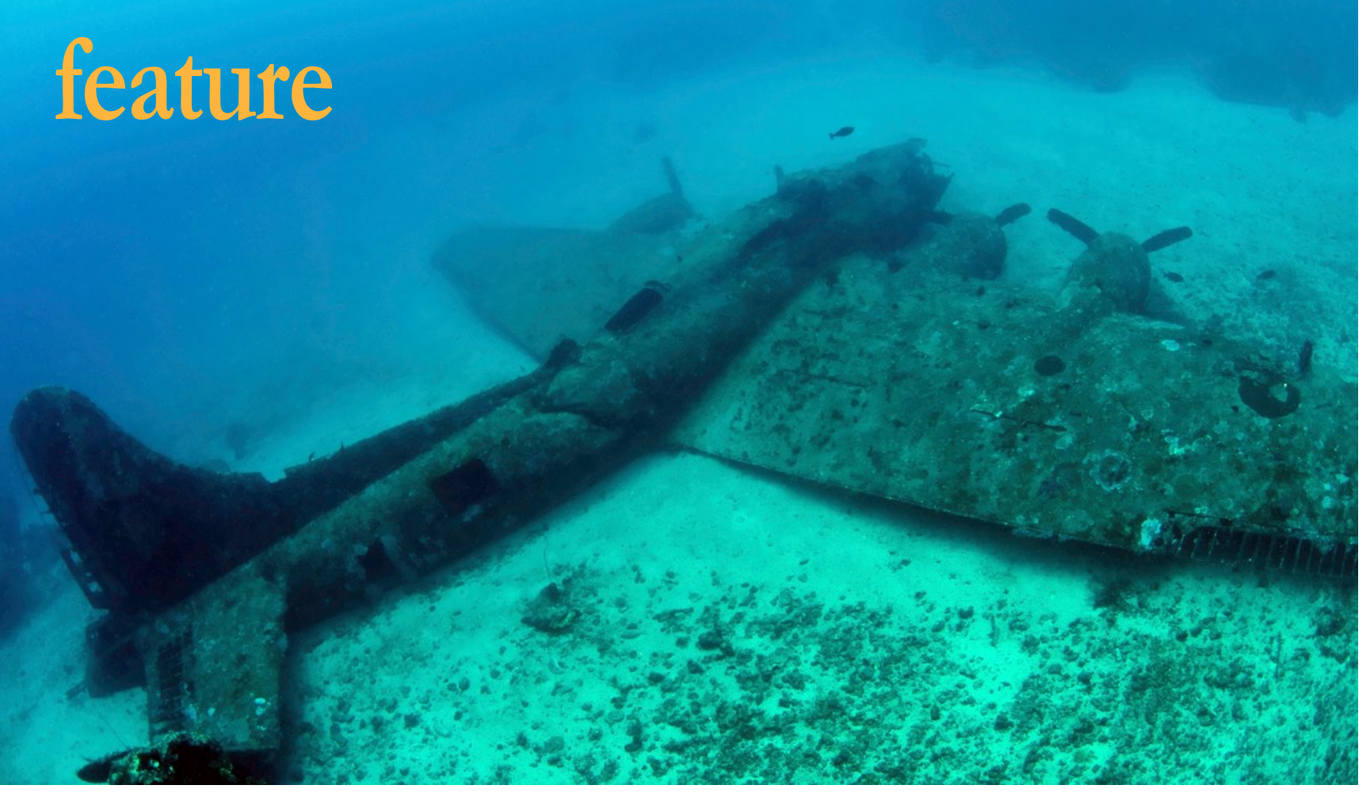
Black Jack on the other hand lay largely forgotten on the sea floor and remained undisturbed there for another 43 years.

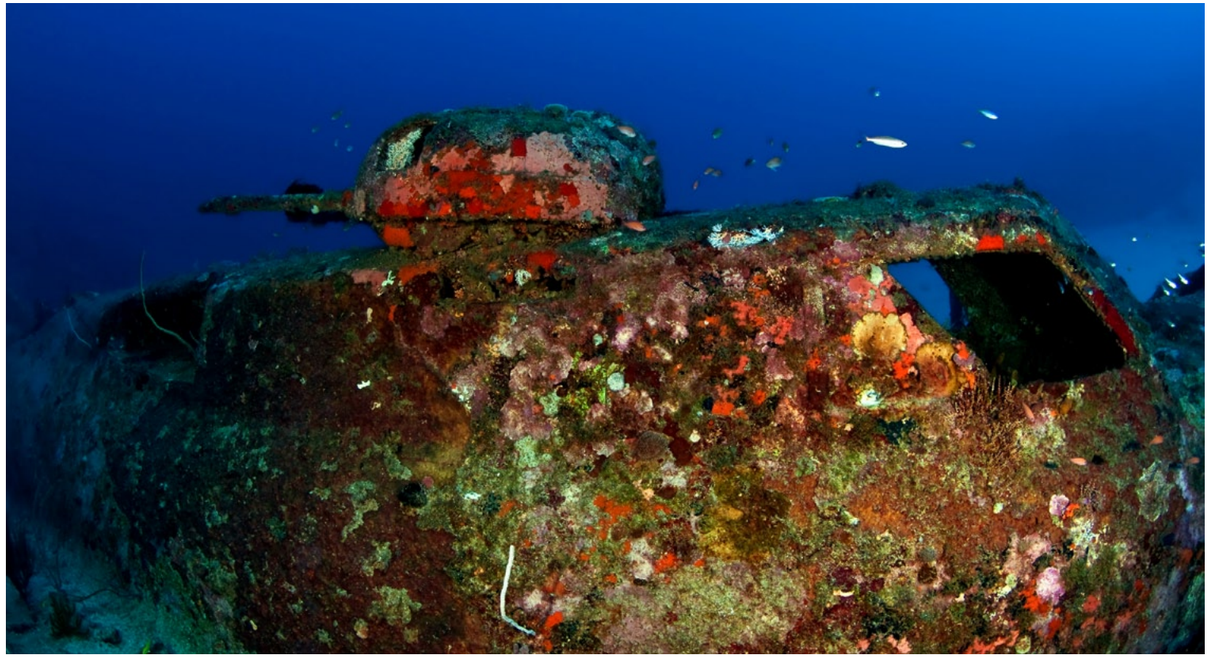
Discovery

The discovery of Black Jack reads like something out of an adventure novel, with three Australians—Rod Pierce, Bruce Johnson and David Pennefather—stumbling on the wreck almost by accident in late December 1986.

Pennefather, an ex-Kiap who spent most of his adult life in PNG and developed a strong interest in WWII wrecks, had visited the Cape Vogel area earlier in 1986 where he heard from the villagers of Bogo Boga that a plane had crashed near their reef in WWII. He subsequently organized a Christmas dive trip with Rod Pierce and Bruce Johnson to try and find what they

The nose and front of Black Jack shows the full force of the plane's ditching in the sea





CLOCKWISE FROM TOP LEFT: Black Jack is remarkably intact sitting in 50m off Boga Boga village on Cap Vogel; View of fuselage and tail plane; Cockpit and rear gun

believed to be was an Australian Beaufort A9.

Rod Pierce is the owner of the *MV Barbarian*, a small liveaboard dive boat that is synonymous with wreck diving in Papua New Guinea, and Bruce Johnson was a commercial pilot.

The villagers of Boga Boga guided the three divers to the general location where the plane had gone down, and when they entered the water, the game plan was to spread out and cover as much area as possible to try and find it.

It was Rod Pearce who found the wreck first, spotting the large tail-plane as he conducted his search. One can only imagine the sheer exhilaration he must have felt when he first saw the B17 Flying Fortress sitting there on the sand in almost perfect condition!

For someone who has dedicated his life to wreck diving, it must have been like finding the Holy Grail.

Over the next few days, they dived the wreck as much as its depth of nearly 50m would allow, entering the inside of the plane and finding the Radio Call Plate with the 24521 serial number on it, which later allowed them to positively identify it as the famous Black Jack.

Bruce Johnson also managed to satisfy his intense desire to reach the cockpit, which meant finding his way through the dark bomb bay and many dangling control cables, to become the first person in over 40 years to sit in the pilot's chair.

Black Jack documentary

So unique was the discovery of Black Jack that it led to a documentary being made the following year by a team of nine Australian divers and underwater cameramen together with Rod Pierce, Bruce Johnson and David Pennefather.

Making a documentary about a plane wreck in a remote location in 50m of water is a significant undertaking and required eight months of detailed planning, major logistic support from Rod Pearce on *MV Barbarian* and two teams of divers for eight days to get the footage.

Australian aviation writer, Steve Birdsall, provided a very interesting aspect to the film, when he managed to locate Ralph De Loach in Marina del Rey, California, USA. De Loach had completed his service at the end of WWII and returned to civilian life where he went on to become one of the famous Marlboro Men—the advertising icons created by the tobacco company Phillip Morris to sell their Marlboro cigarettes.

Birdsall arranged for the 69-year-old De Loach to return to Cape Vogel where he was reunited with some of the villagers who had helped get him and his crew safely to shore when Black Jack was ditched in 1943.

The completed film, *Black Jack's Last Mission*, was very successful and was shown on television around the world and is still available on DVD.

Diving the Black Jack

The really special thing about the Black

CLOCWISE FROM LEFT: Boga Boga villagers selling wares; Fisherman from Boga Boga village; Boga Boga village and its fringing reef; Tufi Dive's dive boat on the beach at Boga Boga village

Jack is the fact that the plane is so intact and sitting as she is, on a sandy seabed in clear blue waters with visibility that can easily reach 40+, it's almost like diving a set from a Hollywood movie.

The nose is badly crumpled from the impact of the crash landing and the propellers on the four engines are somewhat twisted, but the rest of the plane is basically all there, which is quite remarkable after over 66 years underwater.

Apparently the plane sank within 45 seconds of coming to a halt, and the crew only just had time to scramble out with the three wounded members. This meant that, apart from two waist guns and the radio transmitters which were jettisoned prior to ditching, Black Jack took all its contents with it to the sea floor.

Pierce, Johnson and Pennefather found machine guns still in their turrets with hundreds of rounds of ammunition in the tracks to the guns and the twin tail guns could still be moved freely in their mounts.

The other very significant thing about the Black Jack is that at nearly 50m depth, she is at the very limits of recreational diving, and although it's a straightforward dive in as much as the water is clear and there are no major hazards or obstructions outside of the plane, decompression and bottom time are critical to a safe overall experience.

Two divers are reported to have lost their lives diving Black Jack since it was discovered in 1986, so it has to be said that this is a dive only for the experienced and competent.

There is a permanent guideline from the shallow reef, which leads divers down the slope, and at around 15m, divers will be able to see the wreck below. There is usually a fairly strong current that sweeps along the slope, so the line is good for guiding divers and providing a reference point—particularly so on the way back.

The line goes all the way down quite close to the huge tail of the wreck, and from there, one should head to the front of the plane to take in its full size. Entry into the plane is possible, but given the depth of the wreck, the extreme likelihood of nitrogen narcosis and all the potential hazards inside, only the most foolish would even consider doing that—just don't go there.

A much safer option is to look inside the cockpit, as the windows are open.

The current is usually strongest out in front of the plane and swimming against it will increase one's air consumption even more, so take great caution with air supply and retain half a tank for the ascent and inevitable deco stop on the rope.

Operators

- Tufi Dive Resort (www.tufidive.com): It is a about a two-hour trip across Collingwood Bay from Cape Nelson to Boga Boga, and one will need good weather to do it, but Tufi Dive does the Black Jack regularly on special request. I dived Black Jack with Tufi Dive, and both Glenn and Archie, the dive leaders at the resort, know the wreck well and how to dive it safely.
- Rod Pearce (www.niuginidiving.com) includes Black Jack on his wreck diving specials on his boat *MV Barbarian,* so divers can combine diving the wreck with meeting one of the men who discovered it!
- Craig de Wit on *Golden Dawn* (www.mvgoldendawn.com) includes Black Jack as part of the Milne Bay itinerary, which the boat does at certain times of the year. I first dove Black Jack from *Golden Dawn* back in about 2001, and de Wit also knows the wreck well and how to dive it safely. ■

Don Silcock is a dive writer and underwater photographer from north west England now based in Sydney, Australia. For more information and images, visit: ***indopacificimages.com***