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X-ray mag

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Canary Islands
Lanzarote

Tech
Rebreather Travel

Shark Diving
Do's & Don't's

Profile
Jill Heinerth

Wrecks
Wanli Treasure

Papua New Guinea
B17 Black Jack

EGYPT'S TABA & NUWEIBA
The Red Sea

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

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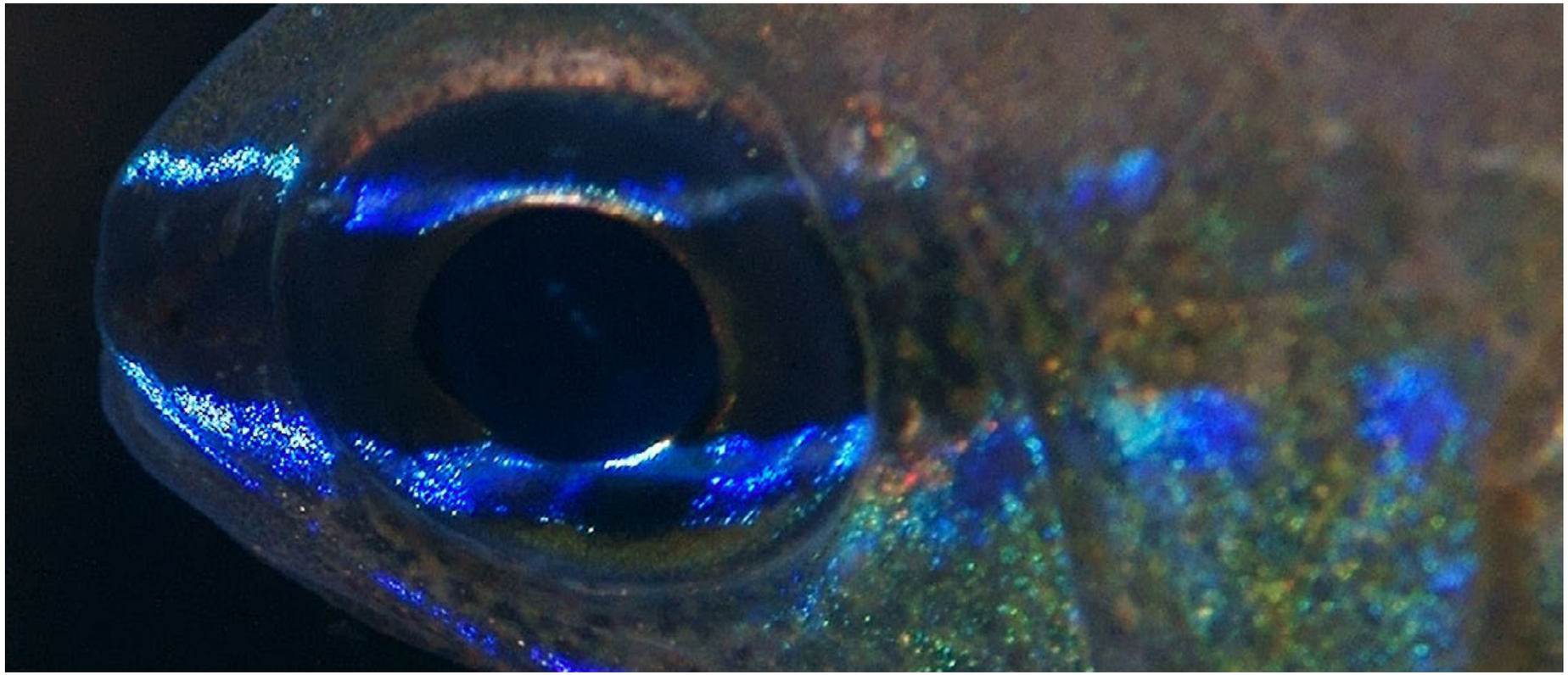

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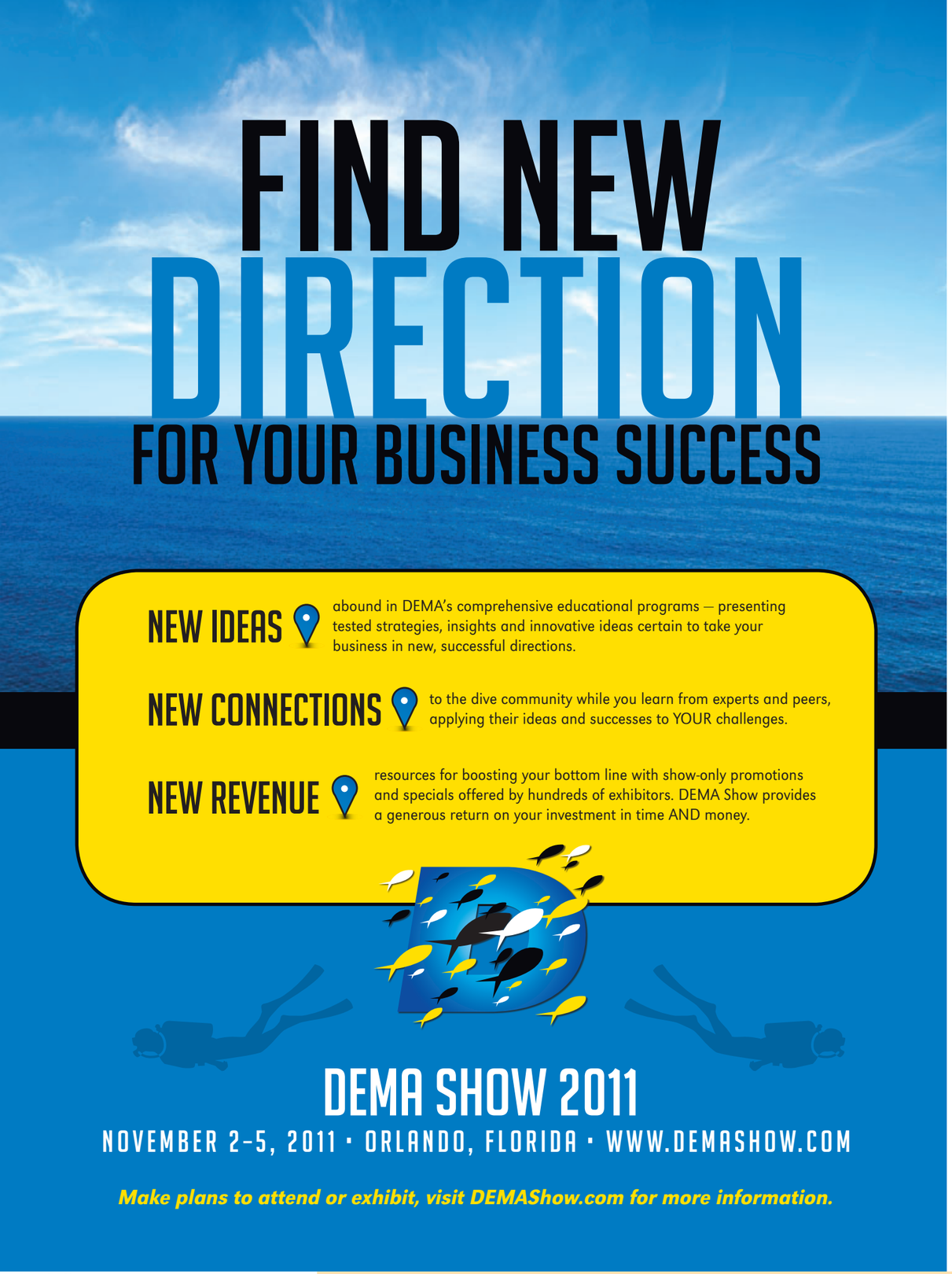

It matters!

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:

ANDREA FERRARI

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

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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.

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Exploring seamounts

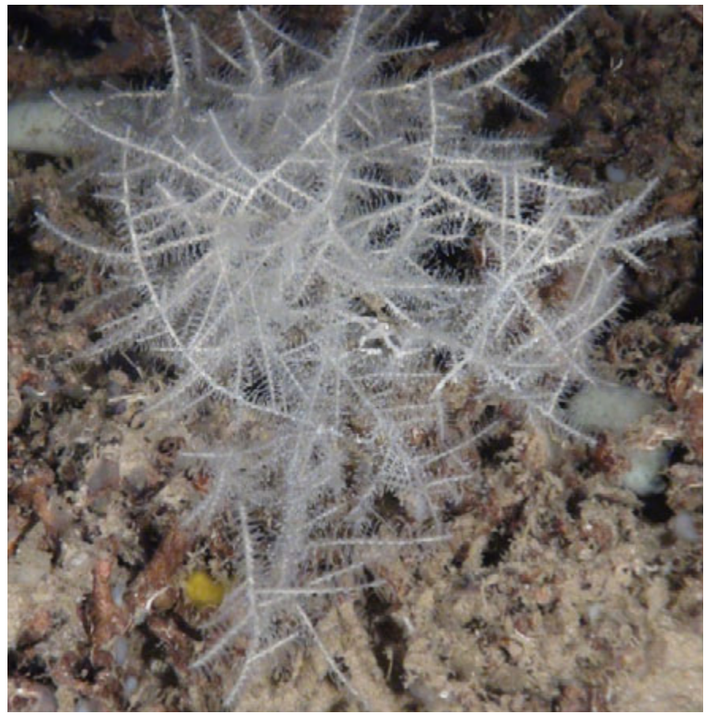
A team of marine scientists, divers and underwater robot (ROV) technicians joined the *Ranger's* crew. Oceana is backing its protection proposals with specific data about deep sea marine habitats collected with the help of an ROV. This device records video footage in high resolution and can also take 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,

© OCEANA / CARLOS MINGUELL

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.

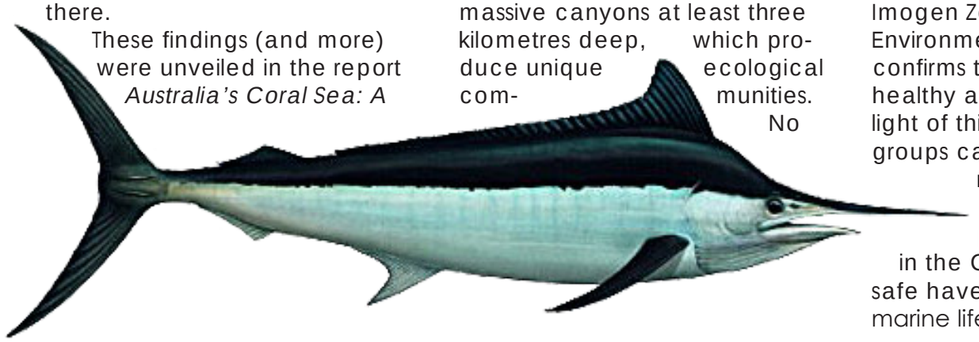
In it, she describes the Coral Sea as "a valuable scientific reference site, as it is close to the global centre of coral reef biodiversity—the Coral Triangle".

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." ■

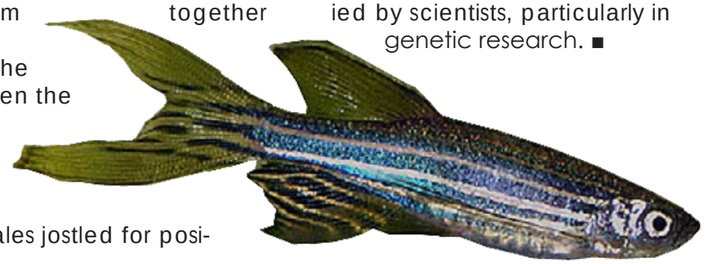


Male zebrafish adopt devious tactics to woo females

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. ■



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Training Bulletin

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

wreck rap

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

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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).

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

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.

WIKIPEDIA COMMONS / PUBLIC DOMAIN

Incidentally, Mirabal worked with the 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.

MANEL GOMES DA COSTA © ARQUEONAUTAS WORLDWIDE – ARQUEOLOGIA SUBAQUÁTICA S.A.

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

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

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.

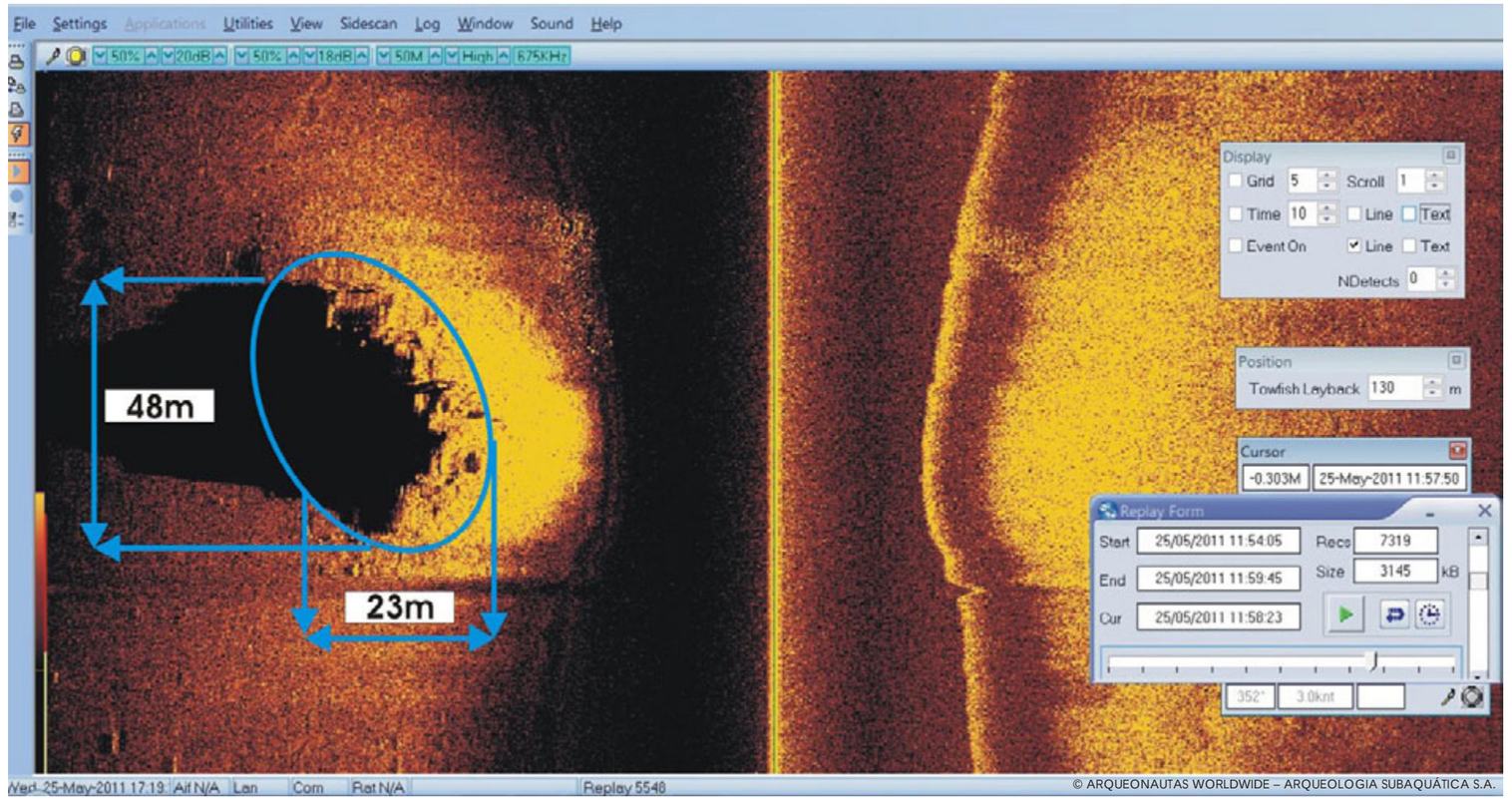
CT: Do you think that any shipwreck structure might actually still remain?

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.

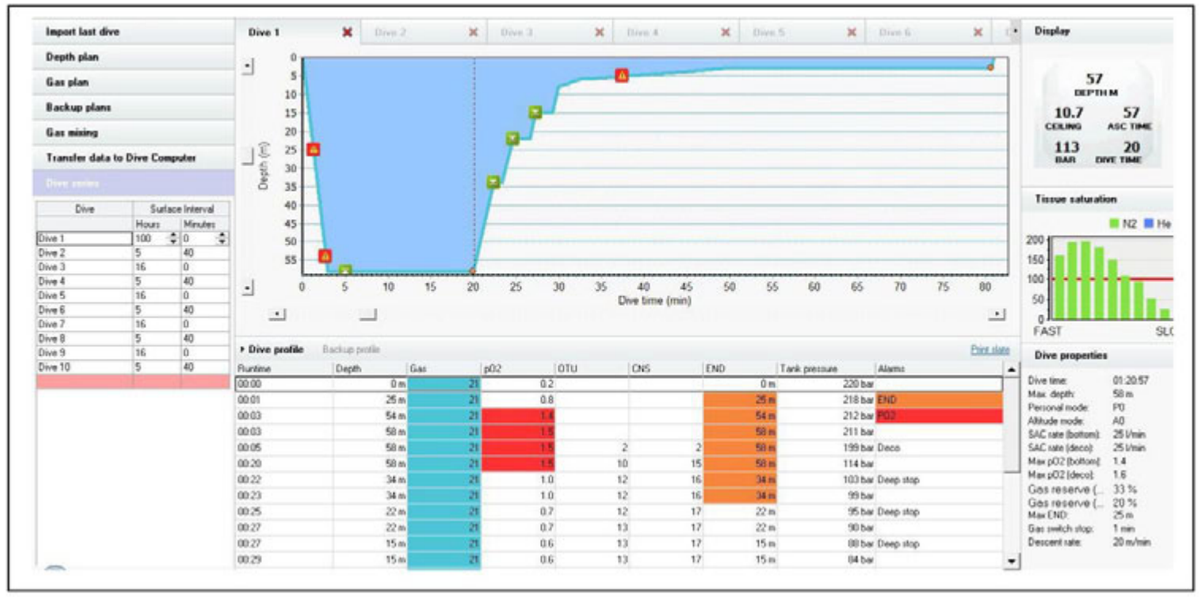
CT: AWW has stated that the wreck dates to approximately 1590 AD. Is the circa of the porcelain how you came to this approximate date? What exactly did you recover?

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)



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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

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

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

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?

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

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

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?

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

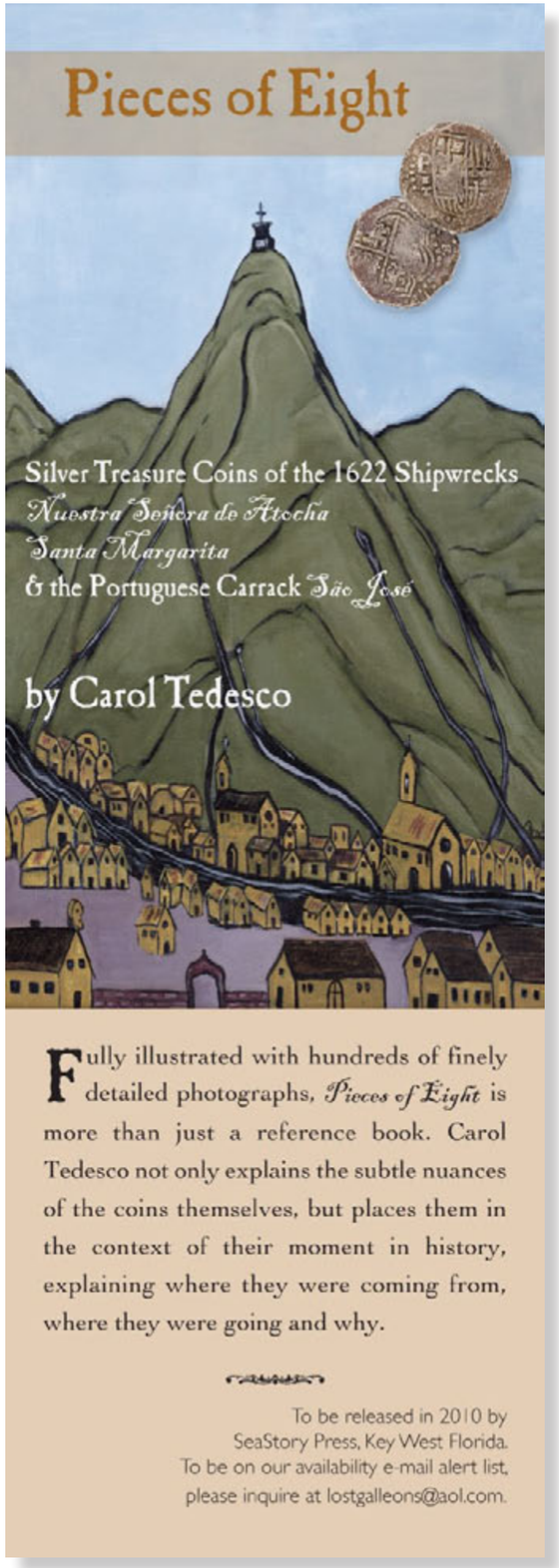
Arqueonautas Worldwide, Graf Sandizell is one of the few in the historic shipwreck exploration industry who can say that he has achieved and exceeded his original goals. He credits his company's success to its adherence to sound business principals, its commitment to upholding the highest scientific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



Fully illustrated with hundreds of finely detailed photographs, *Pieces of Eight* is more than just a reference book. Carol Tedesco not only explains the subtle nuances of the coins themselves, but places them in the context of their moment in history, explaining where they were coming from, where they were going and why.

To be released in 2010 by SeaStory Press, Key West Florida.
To be on our availability e-mail alert list, please inquire at lostgalleons@aol.com.

wreck rap

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**

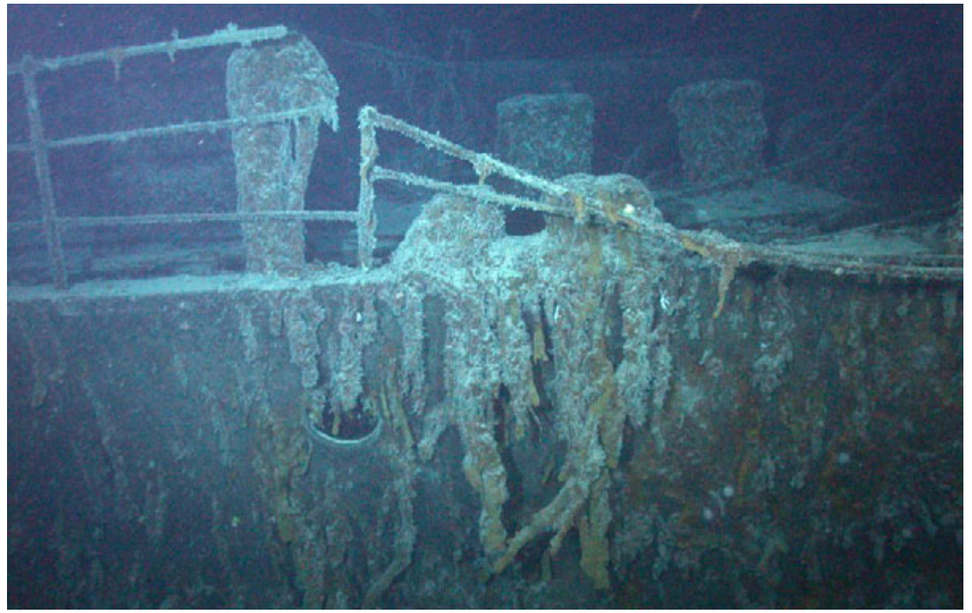
We were fortunate to find the shipwreck sitting upright, with the holds open and easily accessible. This should enable us to unload cargo through the hatches, as would happen with a ship alongside a cargo terminal.

— 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. ■

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