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DIRECTORY

X-RAY MAG is published by AquaScope Media ApS
Frederiksberg, Denmark
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PUBLISHER
& EDITOR-IN-CHIEF
Peter Symes
Editor@xray-mag.com

PUBLISHER / EDITOR
& CREATIVE DIRECTOR
Gunild Symes
Gunild@xray-mag.com

ASSOCIATE EDITORS
& REPRESENTATIVES:
Americas:
Arnold Weisz
Arnold@xray-mag.com

Russia Editors & Reps:
Andrey Bizyukin PhD, Moscow
Andrey@xray-mag.com

Svetlana Murashkina PhD, Moscow
Svetlana@xray-mag.com

South East Asia Editor & Rep:
Catherine GS Lim, Singapore
Cat@xray-mag.com

ASSISTANT EDITORS
& REPRESENTATIVES:
Malaysia Editor & Rep:
Simon Kong, Kuala Lumpur
Simon@xray-mag.com

Canada/PNW Editor & Rep:
Barb Roy, Vancouver
Barb@xray-mag.com

GirlDiver Editor & PNW Rep:
Cindy Ross, Tacoma, USA
Cindy@xray-mag.com

ADVERTISING
International sales rep:
Arnold Weisz
Sales@xray-mag.com

Asia-Pacific rep:
Simon Kong (Malaysia)
Simon@xray-mag.com

French speaking territories:
Mathias Carvalho
Mathias@xray-mag.com

Canada
Wendy Jankovic
Wendy@xray-mag.com

SENIOR EDITOR
Michael Symes
science@xray-mag.com

SECTION EDITORS
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CORRESPONDENTS
Robert Aston - CA, USA
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Nonoy Tan - The Philippines

CONTRIBUTORS THIS ISSUE
Kurt Amsler
Michael Aw
Scott Bennett
Andrey Bizyukin, PhD
JP Bresser
Natalia Cherviakova
Steve Jones
Dennis Kaandorp
Catherine GS Lim
Rob Rondeau
Frank Russell
Yann Saint-Yves
Gunild Symes
Peter Symes
Cedric Verdier
Arnold Weisz

MARKETING MANAGER:
Yann Saint-Yves
marketing@xray-mag.com

SOCIAL MARKETING:
Ken English
Ken@xray-mag.com

Further information:
contacts page
at www. xray-mag.com

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COVER PHOTO: *Dances with Giants*, Madi Varu, South Ari Atoll, Maldives, by Steve Jones

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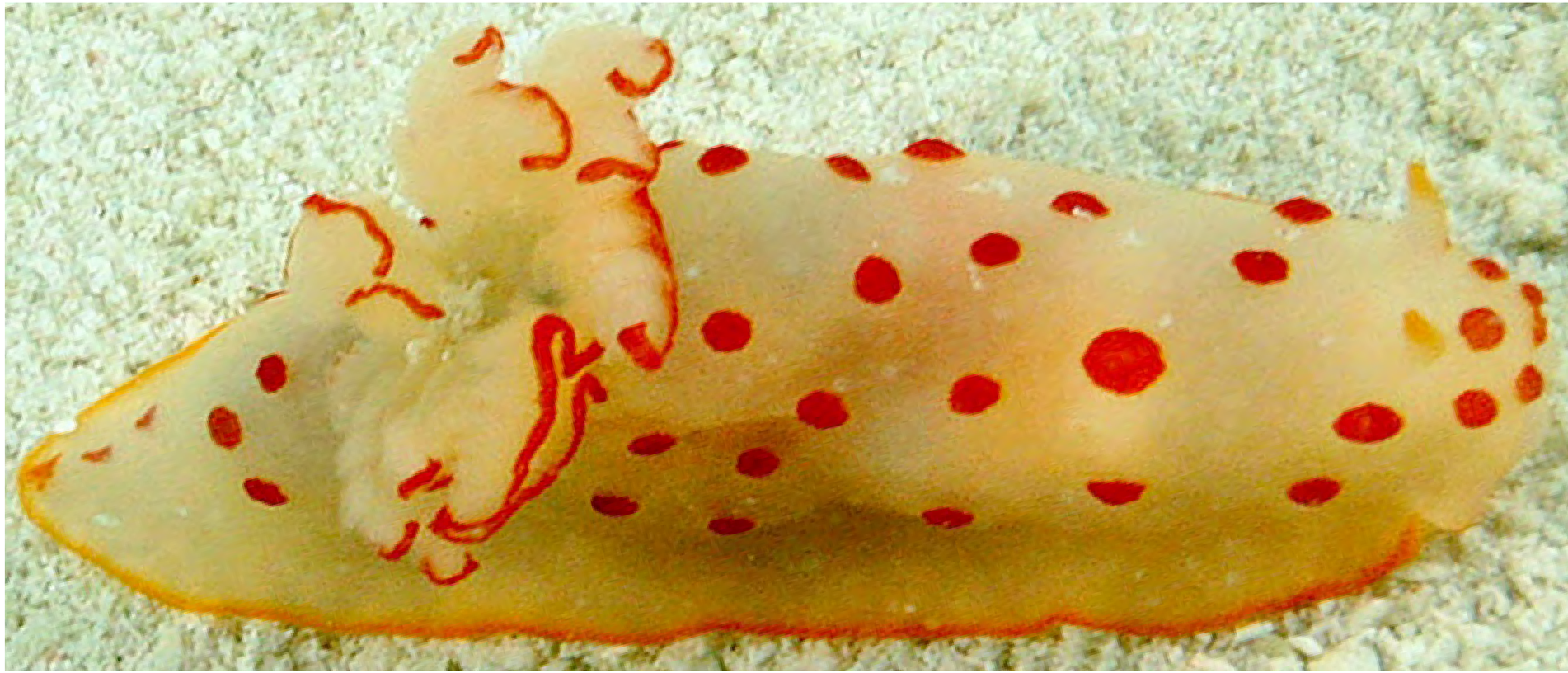
Nudibranch. Photo by Yann Saint Yves



plus...

columns...

Getting the Priorities right

In this issue, we have dedicated several pages to the controversial topic of manipulating oceanic plankton as a method of removing CO2 from the atmosphere. It's a risky attempt to off-setting the anthropogenic contributions of carbon.

An Indo-German oceanographic expedition recently embarked on an 'ocean-engineering' experiment in the water around Antarctica that could have an extremely negative impact. LOHAFEX, as the experiment in known, calls for the addition of nutrients to large swathes of ocean to boost the production of plankton, one of nature's best remedies for excessive CO2.

While I don't stand entirely with critics opposed to the experiment – I think some valuable lessons were learned – I am in general agreement with those who believe this is very dangerous project. Mankind can not fix global warming by tinkering with complex ecological systems. Because they are complex, the result of this nutrient rich soup is unpredictable. What if something really goes wrong? We can't extract the nutrients and start over, can we? And, of course, we don't have another planet to perform another experiment on. Secondly, the underlying concept of tampering with a natural, and supposedly healthy, eco-system in order to fix problems elsewhere is flawed. This ocean experiment is a bad way of prioritizing limited resources.

There are easier, and more ecologically sound remedies.

Let begin with stopping the destruction of the forests and wetlands. Don't you think planting trees and cleaning the water will help? The burning of rainforests and other woodland areas add huge amounts of carbon dioxide to the atmosphere, far more than traffic. Every tree we cut down diminishes nature's ability to absorb carbon dioxide. Natural sinks are capable of absorbing nearly 5 billion tons of CO2 each year, or about 55% of all anthropogenic carbon emissions. Obviously, we have to close that gap.

Natural sinks are worth three quarter trillion dollars annually to the global economy, if an equivalent sink had to be created using other climate mitigation options. With global economy sagging, isn't it worth making the most of our limited finances?

As far as I am concerned I'd rather buy rainforest certificates, than get a replacement for my dated hi-fi and cathode ray TV. I need the ocean more than I need gadgets. How about you?

As consumers, and advocates, we have power and leverage. We can change things, as we have done in the past. As divers, we may think less often of the jungle, than the ocean, but without a healthy landside environment, there will be no healthy ocean. We need to stretch the eco-buck, not pass it. We need a healthy planet, which means clean air, clean water and an abundance of trees. We need a 'Blue-Green Philosophy.'

Let me conclude on a positive note by congratulating those who have helped with campaigns to stop shark-finning, over-fishing of whales, the killing of seals and leatherback turtles.

With regard to shark-finning, Alibaba.com finally gave in after sustained pressure and removed shark fin products from their portals, as have many others.

Some of the turtle campaigns are now seeing a decline in the once flourishing illegal turtle trade on Bali.

To a large degree, progress is because of the support from readers of this magazine and other those of our partner organizations.

I was in Chicago for the 39th edition of Our World Underwater. Jason Heller of DivePhotoGuide and Wetpixel coordinated the Underwater Film Festival. One of the categories had an environmental theme. It showed images of the senseless slaughter of marine life that most of the audience had never seen. It had impact. That's what I'm talking about – making an impact on the way we see things.

Thank you for be a reader of Xray-mag.com. As we enter our 6th year of publishing, we are excited about the way the internet is evolving. We're adding more video. We'll be posting internet radio programs. We're on Facebook and Twitter too. In fact, why don't you follow us: **www.Twitter.com/XRAY_Magazine**

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X-ray mag

News edited
by Peter Symes
& Arnold Weisz

NEWS

Scientific sub makes deep-sea discoveries

Bizarre carnivorous sea squirts, large spider-like creatures and an ancient coral reef have been discovered by scientists during a four-week expedition to explore the deep ocean southwest of Tasmania, Australia, revealed that the area was home to several species of deep sea animals previously unknown to science.

Images courtesy of Advanced Imaging and Visualization Laboratory WHOI

A bright red, undescribed species of shell-less coral, called an anthomastid or gorgons-head coral, at 1700 metres deep at the Cascade Plateau, off south-east Tasmania

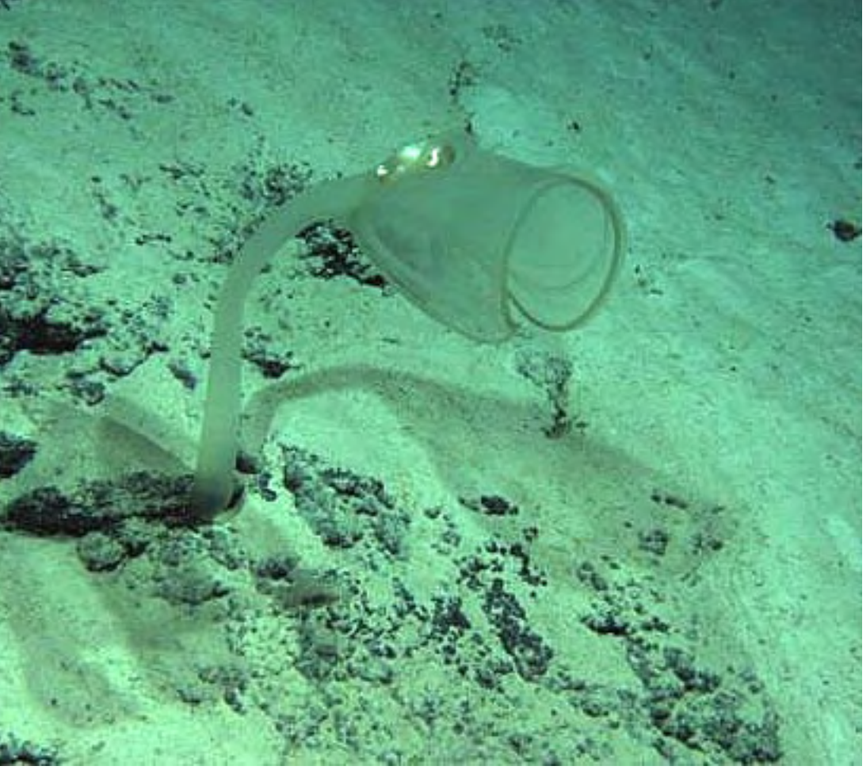
"We set out to search for life deeper than any previous voyage in Australian waters. We also gathered data to assess the threat posed by ocean acidification and climate change on Australia's unique deep-water coral reefs," said Dr Ron Thresher from CSIRO.

The expedition used a remote-controlled submarine to explore the hidden depths of a near-vertical slice of the Earth's crust southwest of Tasmania. Known as the Tasman Fracture Zone, it drops below 4000m. Among the new species was a funnel-shaped carnivorous sea squirt half-a-metre high, and a waffle-like cone-shaped giant sponge. At up to 3000m were thousands of sea spiders, about 30cm in diameter that look like land spiders but are unrelated. And at 3500m were millions of round, purple-spotted sea anemones. All of these new species are located more than 2000 metres below the surface.

"The entire bottom was covered in these things as far as you can see, and it was just completely unexpected to see this huge dominant community down there," said Thresher.

+10,000 years old

The researchers on the joint US-Australian exploration identified vast fields of fossilized corals more than 10,000 years old located below 1400m as well as a modern reef system.



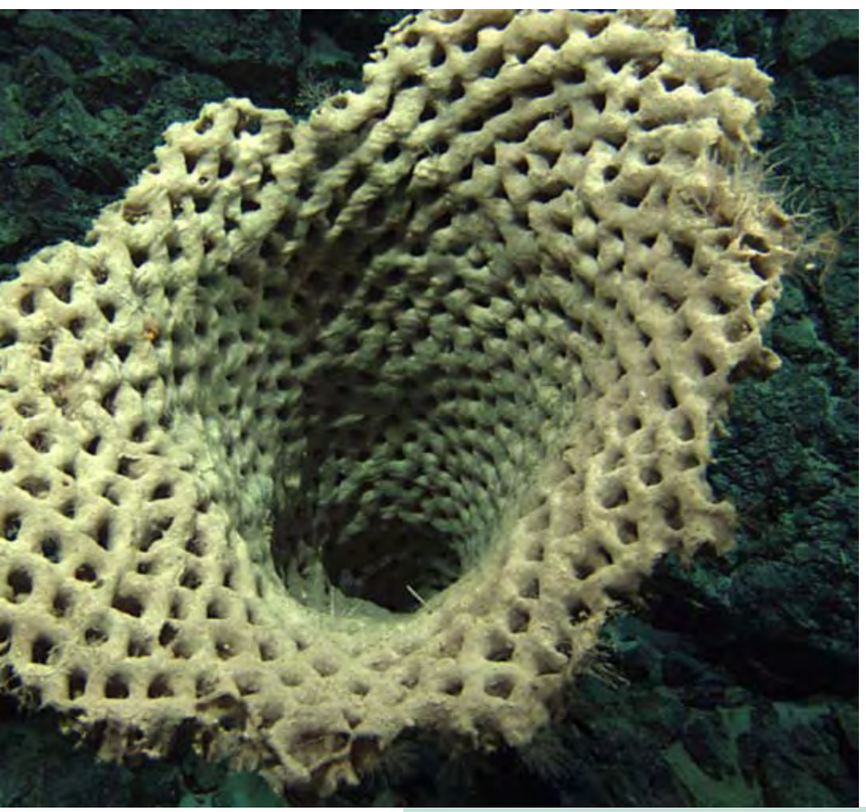
One of Australia's deepest residents—a bizarre carnivorous sea squirt, or ascidian, standing half a meter tall on the seafloor on the Tasman Fracture Zone at a depth of 4006 metres. The animal feeds opportunistically, triggered when a fish or any other swimming organism touches it. The animal is then trapped by the funnel-like front section, which collapses around the prey item

However, Thresher said images taken by the submarine provided evidence that the modern reef system was dying. Most reef-forming coral deeper than 1300m had recently died, and ocean warming and increasing ocean acidity may be the cause.

"We need to closely analyse the samples and measurements we collected before we can determine what's caused this," Thresher said. It could be the result of several factors, such as ocean warming, disease or increasing ocean acidity.

The exploration was funded by the US National Science Foundation, which spent A$2 million to bring the research vessel *RV Thompson* to Australia, as well as the remote-controlled submarine *Jason*.

The collaborative voyage of US and Australian researchers was led by chief scientists Dr Jess Adkins from the California Institute of Technology and Dr Ron Thresher from CSIRO's Climate Adaptation and Wealth from Oceans Flagships. ■



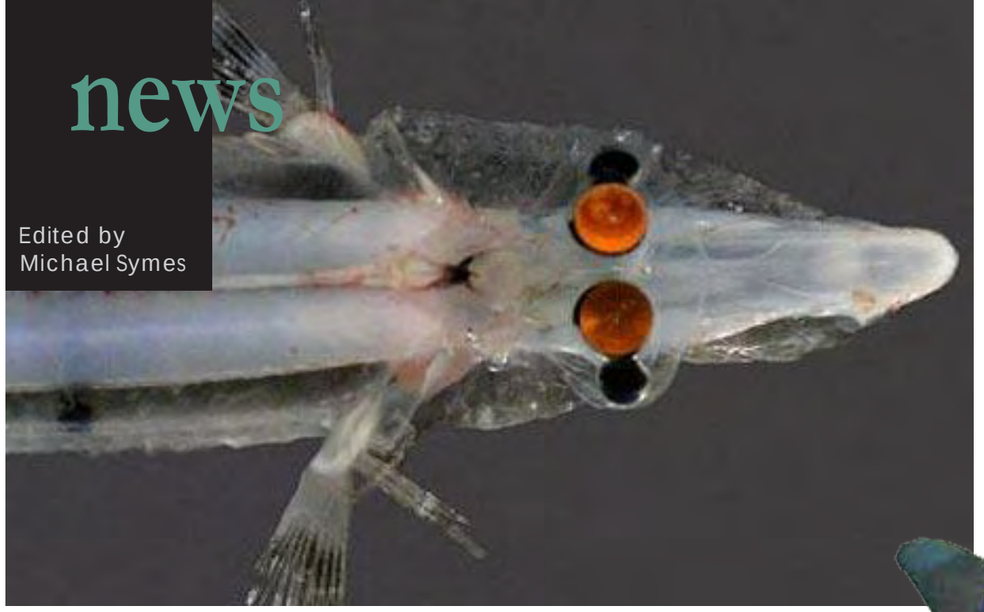
The half-metre-wide mouth of a 2-metre high "waffle-cone" sponge, found at a depth of 2197 metres in the Tasman Fracture Zone

Deepwater shrimp, small gorgonian fan (also known as sea whip or sea fan), small sea star in approximately 2400 metres of water

In 2007, Google launched an advisory group ('Google Oceans Advisory Council' with 18 elite members, consisting mainly of oceanographers) to discuss creating a 3D map of the oceans. They thought that this could be an underwater version of "Google Earth", which could stimulate a lot of new interest in oceanography for showing sea behaviours, changing temperatures, weather patterns, etc.

The newest version of Google Earth (5) recently released takes previous technology it applied on land and uses it to map the ocean and all its wonders. The data comes courtesy of the US Navy and a number of partners, including the BBC and National Geographic, and offers information on global fishing statistics, footage of shipwrecks, dive sites, movements of Arctic sea ice and marine animal tracking. When you spot an icon of a sea lion, whale or sea turtle, click on it and you can follow the path of a sea lion that was radio tagged by a scientist with Global Tagging of Pelagic Predators. Some of the links and other information you find on "Ocean" is still a bit "beta" but as users and Google's partners insert more information, it will get better. ■

Edited by Michael Symes



Spookfish has mirrors for eyes

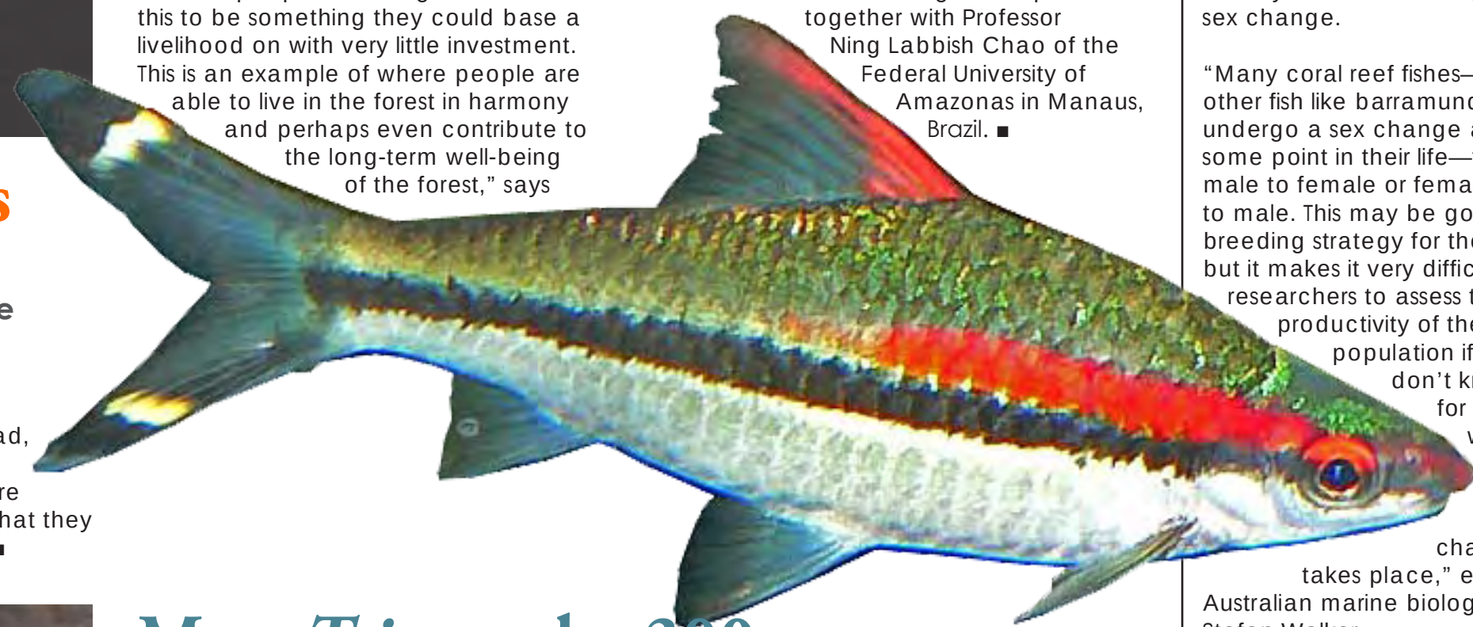
The mirrors give the fish the edge over its predators because they allow it to detect flashes of light made by creatures in the deep in more detail than eyes with lenses can.

Diverticular eyes. While the spook fish looks like it has four eyes, in fact, it only has two, each of which is split into two connected parts. One half points upwards, giving the spookfish a view of the ocean—and potential food—above. The other half, which looks like a bump on the side of the fish's head, points downwards into the abyss below. These 'diverticular' eyes are unique among all vertebrates in that they use a mirror to make the image. ■

"Buy a fish, save a tree"

The Cardinal Tetra has for the past 50 years defied easy breeding in captivity, and its wild harvest has been supporting a vibrant community of caboclos living along the tributaries to the Amazon River, notably the Rio Negro and Orinoco Rivers in Brazil. Nearly 40 million cardinals are being sustainably caught and exported every year.

"Rural people in this region found this to be something they could base a livelihood on with very little investment. This is an example of where people are able to live in the forest in harmony and perhaps even contribute to the long-term well-being of the forest," says Scott Dowd in a recent article published in *Americas* by the Organization of American States. Without a source of income from aquarium fishes, local people might be forced to turn to agriculture, cutting trees and mining, according to local observers. The 'Buy a fish, save a tree' campaign was originally set up by Dowd who works for the New England Aquarium together with Professor Ning Labbish Chao of the Federal University of Amazonas in Manaus, Brazil. ■



Coral reef fishes experts at changing sex

The researchers from the ARC Centre of Excellence for Coral Reef Studies and James Cook University have solved one of the major problems confronting fisheries biologists in determining the sustainability of fish populations—not knowing exactly when fish undergo a sex change.

"Many coral reef fishes—and other fish like barramundi—undergo a sex change at some point in their life—from male to female or female to male. This may be good breeding strategy for them, but it makes it very difficult for researchers to assess the productivity of the fish population if we don't know for sure when the sex change takes place," explains Australian marine biologist Stefan Walker.

With almost a third of world fisheries rated as having collapsed and many more under threat, and with coral reefs facing climate and other human-caused stresses, it is vital to assess the productivity of fish populations in order to know how much fishing pressure it can withstand and whether or not it can bounce back. This includes having an understanding of the gender ratios and the age at maturity for females and males. ■

Meet *Triops*, the 300 million year-old living fossil

This humble tadpole shrimp has outlived mammoths, dinosaurs and trilobites. Notostracans, or tadpole shrimps, have survived at least three such devastating extinctions maintaining a remarkably stable body shape and way of life. Fossils from *Triops*, a type of Notostracan from over 300 million years ago, are identical to living species today, so they are considered one of the oldest 'living fossils'. Despite its survival throughout the geological ages, *Triops cancriformis* is an endangered species mainly because of habitat loss and pollution.

The dozen or so Notostracan species live in seasonal, freshwater ponds, in temperate regions, deserts and even the Arctic, and they are commonly found in large numbers. The most immediate feature that appears to help Notostracans' survival is that they produce eggs that are extremely resistant to hostile conditions. These resistant eggs withstand desiccation; extremely high temperatures, right up to boiling point; freezing; and even digestive enzymes—this lets eggs survive when the adults that carry them are eaten by birds. ■

A new giant Antarctic amphipod crustacean nearly 100 mm long, belonging to the genus Eusirus, sampled by baited traps off the Antarctic Peninsula

BRITISH ANTARCTIC SURVEY

'Diving in Antarctica is absolutely remarkable, just so full of life,' reports Dr David Barnes from the British Antarctic Survey

Antarctic seas richer in life than Galapagos Islands

Researchers in North and South startled to find Polar oceans share 235 species. Changes in species distribution documented as warmer oceans spur migration. United by high-speed current, Antarctic benthos revealed as single bioregion. Smaller species replacing larger ones in some Arctic waters.

A British Antarctic Survey study has revealed over 1,200 marine species around the South Orkney islands

GAUTHIER CHAPELLE

A giant Antarctic barnacle, a cirriped crustacean sampled at the tip of the Antarctic Peninsula

Seas surrounding an archipelago near the tip of the Antarctic peninsula are richer in animal life than the Galapagos Islands, challenging the notion that warm seas in tropical zones are higher in biodiversity, say scientists from British Antarctic Survey on scientific expedition to the South Orkney islands.

Sea fans are closely related to corals. Although these ones, photographed in the waters of Larsen B, "choose" a large drop stone as a habitat, sea fans can also live on soft substrate.

Much less is known about the South Orkney islands than the tropical islands that helped to shape Charles Darwin's thoughts about natural selection on his Beagle voyage. But according to a new study just published in the *Journal of Biogeography*, the sea around them is teeming with a huge variety of life. The survey disproves the notion that the waters in chilly polar regions have a much poorer variety of fauna.

The survey recorded 1,224 species in 50 different biological classes. The team discovered five new species and one genus—the biological category that is higher than species—that was new to science. The new species are all sea mosses (bryozoans) or isopods (wood-louse-like animals) but they have not been given names yet.

RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS, CENSUS OF MARINE LIFE

Sand-fleas such as *Hyperoche capucinus*, are common predators swimming in polar waters. This specimen, about the width of a finger, was photographed during the CEAMARC 2008 expedition aboard the Umitaka Maru to the Antarctic, part of a joint CAML/ArcOD/CMarZ effort

SHAWN HARPER, UNIVERSITY OF ALASKA FAIRBANKS.

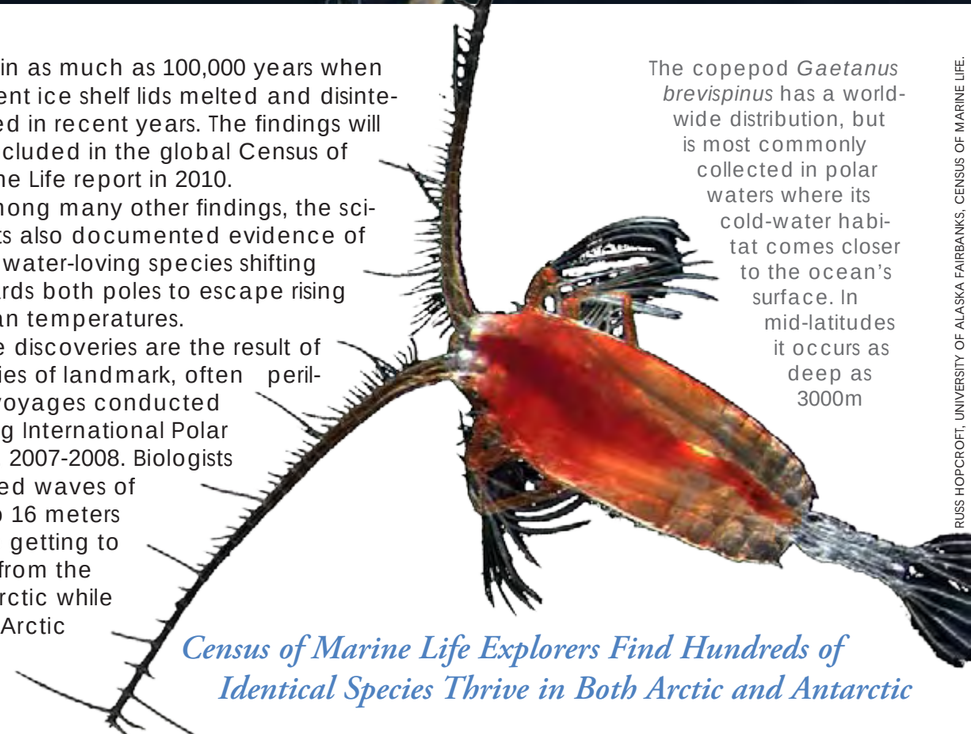
Sand fleas (amphipod crustaceans) under nearshore ice in the Beaufort Sea. Ice-associated amphipods are a major food source for Arctic cod, in turn the main prey for ice seals

Living at both poles

At least 235 species are thriving in both the Arctic and Antarctic polar seas, according to the Census of Marine Life. Scientists found that species such as grey whales, birds, worms, crustaceans, and angelic snail-like pteropods exist at both poles. Dozens of species were separated by nearly 7,000 miles, they said. The census involved 500 researchers from more than 25 nations, and took place during International Polar Year (from March 2007 to March 2009). The survey recorded 1,224 species in 50 different biological classes. They took data from nearly one million locations. Those places include seafloors exposed to light for the first time in as much as 100,000 years when ancient ice shelf lids melted and disintegrated in recent years. The findings will be included in the global Census of Marine Life report in 2010.

Among many other findings, the scientists also documented evidence of cold water-loving species shifting towards both poles to escape rising ocean temperatures.

The discoveries are the result of a series of landmark, often perilous voyages conducted during International Polar Year, 2007-2008. Biologists braved waves of up to 16 meters while getting to and from the Antarctic while their Arctic col-



RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS, CENSUS OF MARINE LIFE.

The copepod *Gaetanus brevispinus* has a worldwide distribution, but is most commonly collected in polar waters where its cold-water habitat comes closer to the ocean's surface. In mid-latitudes it occurs as deep as 3000m

Census of Marine Life Explorers Find Hundreds of Identical Species Thrive in Both Arctic and Antarctic

"Humanity is only starting to understand the nature of these regions."

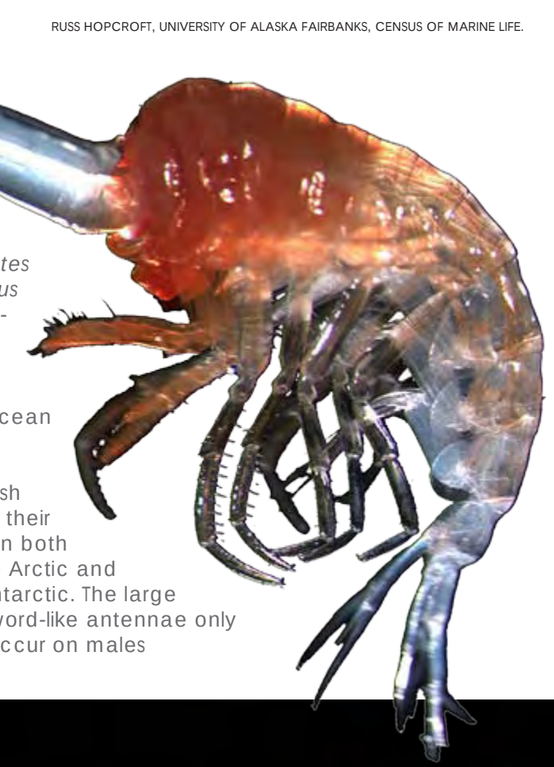
A remotely operated vehicle equipped with a video camera was used to record life in the Southern Ocean during an expedition aboard the Aurora Australis. Shown here is scientist Rob Beaman removing the camera from its waterproof case

RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS, CENSUS OF MARINE LIFE.

This marble-sized jellyfish, *Calycopsis borchgrevinki*, is one of the more common hydromedusae encountered in Antarctic waters

Arctic krill, *Thysanoessa raschii*, was found in high densities under sea ice in the Arctic and its marginal seas, where they feed seasonally on algae associated with the sea ice, similar to the behavior of the Antarctic Krill

RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS, CENSUS OF MARINE LIFE



Mimonectes sphaericus is a commensial amphipod crustacean living upon jellyfish and their kin in both the Arctic and Antarctic. The large sword-like antennae only occur on males

leagues often worked under the watchful eye of an armed lookout to protect them from polar bears.

"The polar seas, far from being biological deserts, teem with an amazing quantity and variety of life," says Dr Ian Poiner, Chair of the Census Scientific Steering Committee. "Only through the co-operation of 500 people from more than 25 countries could the daunting environmental challenges be overcome to produce research of such unprecedented scale and importance. And humanity is only starting to understand the nature of these regions."

A cold incubator for new species

Previously thought to be low in species diversity and abundance, the researchers have amassed biological data from nearly one million locations. Those places include seafloors exposed to light for the first time in as much as 100,000 years when ancient ice shelf lids melted and disintegrated in recent years.

Research in the 1970s suggested separate bioregions around Antarctica. CAML's efforts, however, reveal life on the seafloor encircling Antarctica forms a

RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS, CENSUS OF MARINE LIFE

This 3cm long ghost-like sea-angel *Platybrachium antarcticum*, flies through the deep Antarctic waters hunting the shelled pteropods (another type of snail) on which it feeds

A midwater Medusa from the Celebes sea

The bean-sized swimming snail, *Limacina helicinia*, occurs in both Arctic and Antarctic waters. It spins a mucus-net off its paddle-like foot-wings to trap algae and other small particles on which it feeds

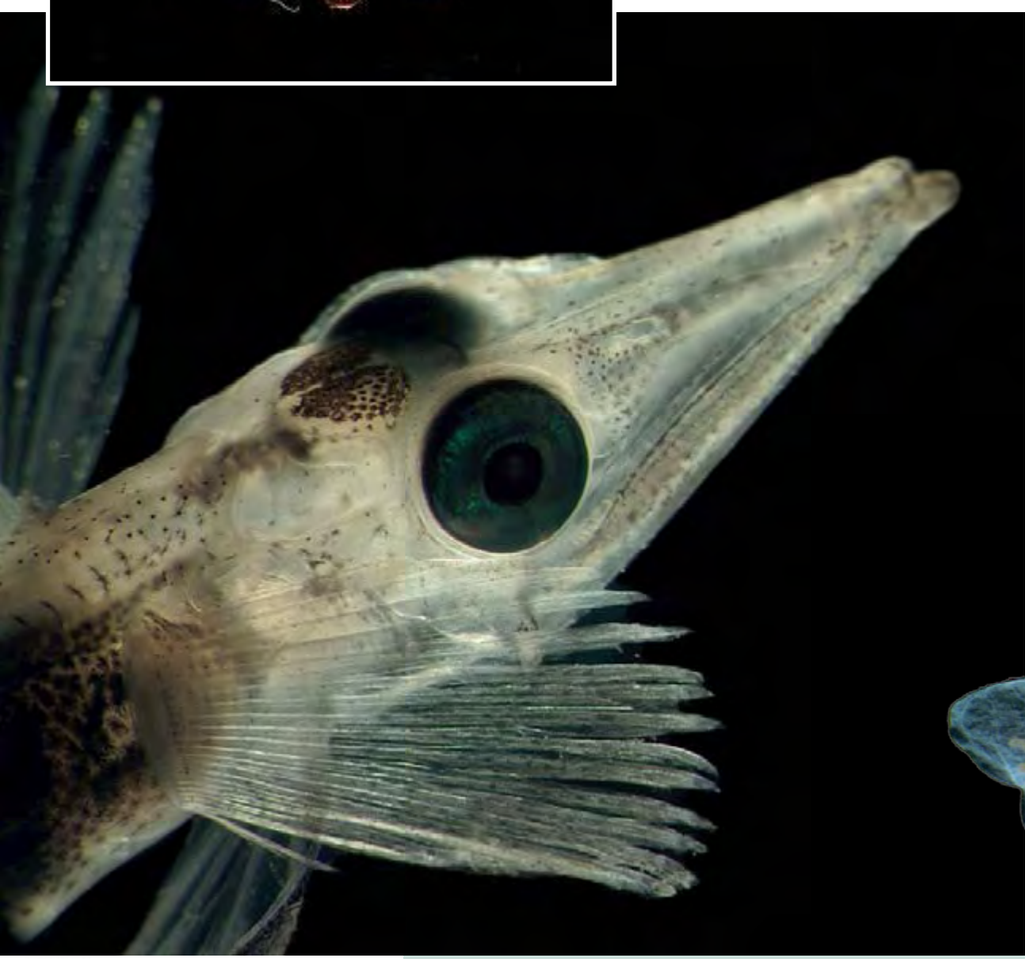
RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS, CENSUS OF MARINE LIFE.

single biological province, even though 8,500km of ocean separates opposite sides of the continent. Scientists are now analyzing hundreds of open ocean (pelagic) samples from all compass points around Antarctica to establish whether, as suspected, marine life distribution has been evened by the churn of the Antarctic Circumpolar Current. That swift-flowing current circles the polar continent twice as fast as the Gulf Stream flows from the Gulf of Mexico towards Europe.

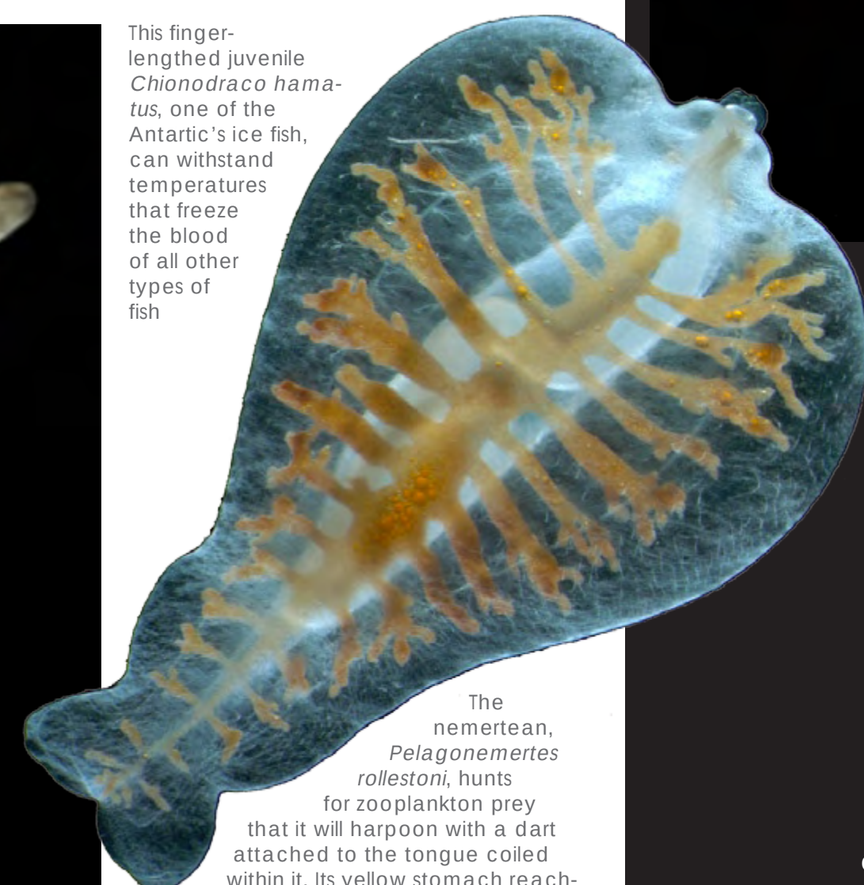
MIgrations

And they report species of cold-water snail (pteropods) migrating southward as ocean temperatures rise further north. Meanwhile, the polar marine explorers were startled when molecular techniques revealed that glacial cycles over millions of years made the Antarctic the cold incubator of many species residing today in more northern waters.

Census researchers last year established that several octopus types have repeatedly colonized the deep sea, each migration coinciding with retreating Antarctic ice over 30 million years.



This finger-lengthed juvenile *Chionodraco hamatus*, one of the Antartic's ice fish, can withstand temperatures that freeze the blood of all other types of fish



The nemertean, *Pelagonemertes rollestoni*, hunts for zooplankton prey that it will harpoon with a dart attached to the tongue coiled within it. Its yellow stomach reaches out to feed all parts of the body —about 3cm long

RUSS HOPCROFT, UNIVERSITY OF ALASKA FAIRBANKS, CENSUS OF MARINE LIFE

SHAWN HARPER, UNIVERSITY OF ALASKA FAIRBANKS

Elizabeth Siddon dives below the ice in the Canada Basin, tethered to a tender for her safety

A brightly coloured comb jelly swimming in the Artcic seas off the Canada Basin

Today they theorize that the Antarctic also regularly refreshes the world's oceans with new varieties of sea spiders, isopods (crustaceans related to shrimp and crabs), and others as well. They believe the new species evolve when expansions of ice cloister Antarctica; when the ice retreats, they radiate northward along the same pathways followed by the octopuses.

The abundance of Antarctic marine biodiversity is recorded in the SCAR-MarBIN database, which today contains close to one million marine life observations below the Antarctic Circle. About half of Antarctic species are found nowhere else on Earth.

Says Victoria Wadley: "One hundred years ago, Antarctic explorers like Scott and Shackleton saw mostly ice. In 2009, we see life everywhere." ■

J. ZIEGLER, CENSUS OF ANTARCTIC MARINE LIFE.

The *RV Polarstern* breaks a path through the Southern Ocean. Operated by the Alfred V. Wegener Institute, the *Polarstern* provides an excellent platform for exploring below the Antarctic ice

Sponges crucial to reefs' health

Although sponges inside the cavities of coral reefs take up a lot of dissolved organic material, they scarcely grow. However, they do discard a lot of cells that in turn provide food for the organisms on the reef.

Caves in coral reefs are the largest and least well known part of the reef. Until now, it had been assumed that sponges populating these caves could only eat by filtering the non-dissolved particles from the seawater. However, a Dutch scientist Jasper de Goeij's research demonstrated, the caves contain far more dissolved material than non-dissolved material.

The filter inside the reef

Cave sponges take up enormous quantities of dissolved organic material from seawater. The question was, do they also process it? De Goeij was able to reveal that the sponges process 40 percent of the material and take up 60 percent. This should lead to a doubling of the sponges' biomass every two to three days. However, cave sponges scarcely grow. The caves are so densely populated that there isn't much space to grow.

Rapid rejuvenation

Instead of growing, the cave sponges rapidly rejuvenate their filtration cells and discard their old cells. This short cell cycle is unique for multicellular organisms, and to date, was only known to occur in unicellular organisms. The production and breakdown process of the sponge cells mirrors that in the human intestinal tract.

JASPER DE GOEIJ / THE ROYAL NETHERLANDS INSTITUTE FOR SEA RESEARCH.

Dutch researcher, Jasper de Goeij, investigated how caves in the coral reef ensure the reef's continued existence

Eat and be eaten

Coal reef regenerates itself in a remarkable manner. The algae and corals on the reef produce dissolved organic material. Before this material enters the open ocean, it is taken up by sponges that filter enormous quantities of water and convert the ingested dissolved material into particles. These particles are in turn consumed by the algae and corals on the reef. In this manner, the various inhabitants of the reef facilitate each other's survival. ■

SOURCE: THE NETHERLANDS ORGANISATION FOR SCIENTIFIC RESEARCH

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Porites lobata at Neva Shoals, Lisianski Island, Northwestern Hawaiian Islands

Coral reef growth is slowest ever

Coral growth in Australia's Great Barrier Reef has slowed to its most sluggish rate in the past 400 years. The decline endangers the species the reef supports, say researchers from the Australi Institute of Marine Science.

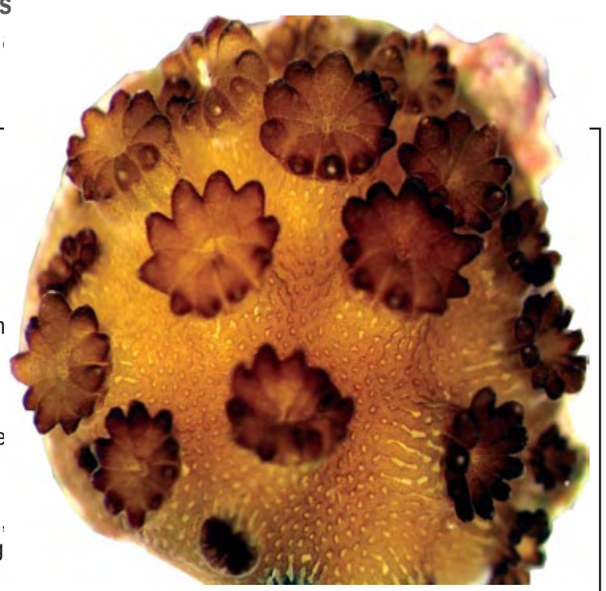
Dr Glenn De'ath and colleagues investigated 328 colonies of massive *Porites corals*, from 69 locations. They studied massive porites corals, which are several hundred years old, and found that calcification has declined by 13.3 percent since 1990. Such a decline is unprecedented in at least the past 400 years, they write in *Science* journal.

The researchers warn that changes in biodiversity are imminent, both at the Great Barrier Reef and at other reef systems throughout the world's oceans. The Great Barrier Reef is the largest in the world, composed of over 2,900 individual reefs and 900 islands. The largest corals are centuries old - growing at a rate of just 1.5cm per year. ■

Coral disease works like cholera

The complexities of coral disease are starting to be unravelled with the key revelation that a similar mechanism that causes cholera in humans may be causing White Syndrome (WS) in coral. A bacterial enzyme carries out a two-pronged attack, first causing whitening of coral tissue as symbiotic algae are targeted, and subsequently causing coral tissue lesions. This two-stage process leads to the distinctive appearance of bands of white coral skeleton typical of the disease.

The enzyme disturbs the ability of the symbiotic algae living in coral to carry out photosynthesis and breaks down the symbiosis between the coral and the algae, leading to death of the coral. The bleaching caused by WS is distinct from that caused by thermal stress. Unlike bleached corals that can recover from short-term temperature stress, WS causes the infected coral to die, though lesions may stop progressing if the coral can mount an immune response. ■ SOURCE: PLOS ONE. 2009; 4(2): E4511.



SUSSMAN ET AL.

NOAA

Yellow band disease is spreading

Researchers at the Woods Hole Oceanographic Institution (WHOI) and colleagues have found that Yellow Band Disease seems to be getting worse with global warming and announced that they've identified the bacteria responsible for the disease.

This is the first demonstration that the same bacterial culprits are to blame for the disease throughout the Caribbean as well as half way around the world in Indonesia. ■

Lotte and Hans Hass being interviewed on the main stage at BOOT in Düsseldorf. Hans Hass just celebrated his 90th birthday

Impressions from BOOT 2009

Europe's biggest dive expo held in the shadow of the credit crunch

As dive show's go, Germany's annual BOOT Expo is the behemoth that stands head and shoulders above everything else on the continent, and probably the planet too. It's size and nine day duration put it into it's own category.

I always have pitied those exhibitors who have to allocate the better part of two weeks when preparations, build-up and moving out is taken into account. But for many international exhibitors, it has become the chosen venue.

Located in Dusseldorf in Germany's industrial heartland, it can be reached in a day by car by the 100 odd million that have German as either their native language or first foreign langauge. And many come from other countries thanks to Germany's efficient traffic infrastructure.

Looming crisis

Germany is one of the European countries hit hardest by the state of the global economy, and that was reflected in the attendance that was reported 15 percent down from last year when a whopping 267,379 attendees went through the tillers. A rough calculation makes that some 55,000-60,000 visiting the dive section this year—still a very respectable number.

BOOT is not really the place where a lot of new products get displayed first. That honour still falls to DEMA in the US, which, however is not open to the general public. But the newest gizmos will be on dispay here, too. What sets BOOT apart from other expos is its sheer size, long duration (a total of nine days) and the many destinations and resorts present here. There are many booths from the Mediterranean destinations, and needless to say, many of those overseas destinations favoured by the Germans—the Philippines and Indonesia. Also notable are the many central European manufacturers—predominantly in the areas of photograpy and lamps—that are rarely seen outside Europe, which is a shame really as many of these products are really nice. ■

Europe's biggest dive show attracts a lot of dignitaries. Dr Phil Nuytten from Canada (left) with NAUI Europe's CEO Dick Lucas

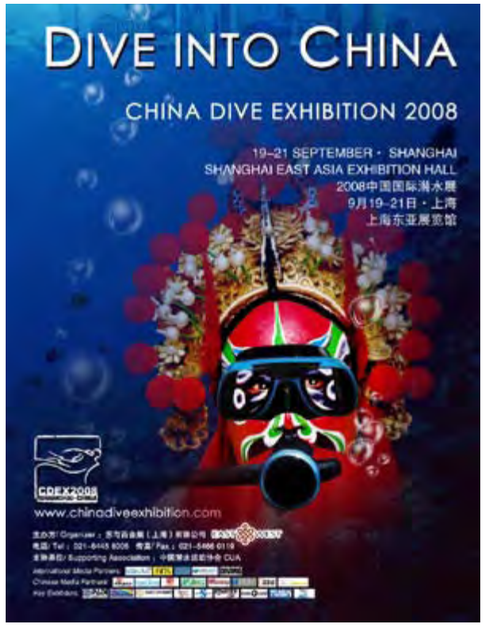
ADEX moves to a new venue and new dates

In view of the current economic climate, TMX Show Productions would like to announce that Asia Dive Expo 2009 (ADEX) will be held in conjunction with Boat Asia 2009. Both events will be held from 23 to 26 April 2009 at the world-class Marina at Keppel Bay.

The overall direction of ADEX 2009 and Boat Asia 2009 will remain unchanged. With the synergy of these two events, ADEX believes that the increase in visitor traffic and media buzz will greatly benefit the exhibitors, partners and sponsors. The combination of both events will also serve to increase business opportunities for exhibitors, and visitors can look forward to more exciting activities that the combined events will offer. ■

Our World Underwater Chicago, Feb 20-22.

This exciting expo in the US Midwest was held just as this issue went to press but do see our extensive online reports on our website. There are video interviews, still images and internet radio. Visit **www.xray-mag.com/OWU**



China Dive Exhibition (CDEX) has closed

East West MICE (Shanghai) Co Ltd have hosted China Dive Exhibition since 2005, which has been an ongoing annual event and opportunity for the international dive community to enter and understand the China dive market. In 2007, it was further reinforced as a platform for the community to share and exchange ideas between the international and local dive sectors to build up the market.

It is with regret that East West MICE announced the official closure of CDEX operations due to the company's strategic refocus into other areas. East West MICE (Shanghai) Co Ltd would like to thank all exhibitors, partners and supporters who have made this a successful and meaningful platform over the past four years and wish you the best in your future endeavors in the China dive market.

Furthermore, if any exhibitors, partners and supporters have already signed any legally binding agreements for CDEX 2009 and made payment in accordance with the agreements, these will be refunded—any prepaid amount—within one month upon issuance of this announcement subject to the terms and conditions of the agreements made between the relevant parties. Please contact them for refunds on such prepaid amounts. For all enquiries, please contact Rebecca Lim at rebeccalim@eastwestmice.com. ■

Britons claim the underwater ironing record

UK divers break world record for the most number of divers ironing underwater at the same time in aid of the Royal National Lifeboat Institution.

A total of 128 scuba divers braved the freezing winter temperatures on 10 January 2009 to attempt to break the world record, currently held by the Australians, for the most number of divers ironing at the same time underwater. The previous record was 72, but the British divers managed to get 86 ironing within a ten minute period and this also included six freedivers. Water temperatures were in the region of 5ºC and air temperatures as low as -2ºC. Divers covered the full range from technical diving with trimix to 55m to the shallow end at six meters.

The event took place at the National Diving and Activity Centre (NDAC) near Chepstow, Gloucestershire, and was organised by Gareth Lock, Morag Ward and John Turnock of the Yorkshire Divers internet forum (www.yorkshire-divers.com). In addition to breaking the world record, the aim was to raise money for the RNLI, the charity of choice for the forum for 2008-2009. At the time of going to press, nearly GB£6000 had been raised from this event through application fees, sponsorship and a charity raffle. ■

Diver ironing at 53m as part of the Extreme Ironing record attempt

Protect the Living Reef of Pulau Redang 2008

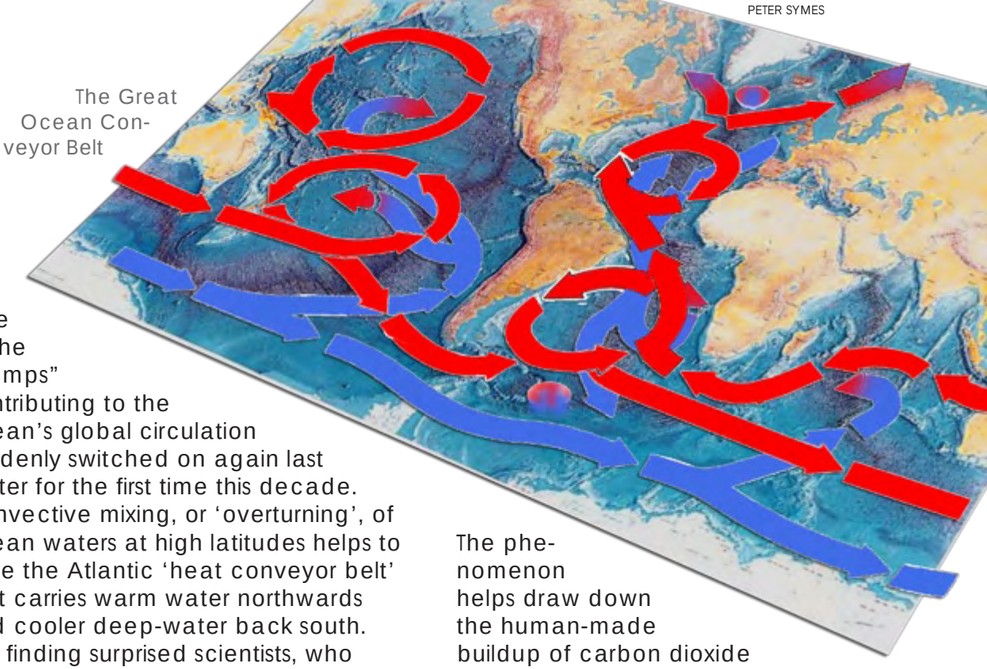
As part of the International Cleanup Day, Dragonet Diving and Coral Redang Island Resort organized Protect the Living Reef of Pulau Redang 2008 at Redang Island, Malaysia. An annual Project AWARE program, more than 40 participants consisting of divers and snorkelers did their bit by doing a beach and underwater clean up. "We have a good mix of environmental conservation, education and fun," says Vincent Chong of Dragonet Diving. Divers were given the Coral Health Chart, which contained a series of colours representing different stages of coral bleaching. The colour of the corals were compared to the Coral Health Chart, and the data was recorded and submitted to the University of Queensland Australia to be analyzed. Participants also visited a marine turtle research and conservation station on the island to learn more about the threatened hawksbill and green turtles. For more info, visit www.dragonet.com.my. ■

The Royal National Lifeboat Institution is a registered charity that saves lives at sea. It provides the 24-hour on-call service to cover search and rescue requirements out to 100 nautical miles from the coast of the United Kingdom and Republic of Ireland and a seasonal lifeguard service on appropriate beaches in the south and south west of England. The RNLI is independent from government and continues to rely on voluntary contributions and legacies for its income. ■

Scientists have determined that due to a dramatic loss of sea-ice in the Arctic during the summer of 2007, convective mixing in the North Atlantic Ocean, a mechanism that helps to remove carbon dioxide (CO_2) from the atmosphere, has returned after a decade of near stagnation.

CO_2 removing mechanism resumes in North Atlantic

NASA



PETER SYMES

The Great Ocean Conveyor Belt

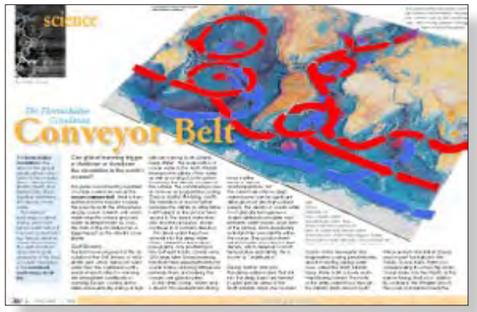
One of the "pumps" contributing to the ocean's global circulation suddenly switched on again last winter for the first time this decade. Convective mixing, or 'overturning', of ocean waters at high latitudes helps to drive the Atlantic 'heat conveyor belt' that carries warm water northwards and cooler deep-water back south. The finding surprised scientists, who had been wondering if global warming was inhibiting the pump, which, in turn, would cause other far-reaching climate change.

The "pump" in question is the sinking of cold, dense water in the North Atlantic Ocean in the winter. It drives water down into the lower limb of what is often described as the Great Ocean Conveyor. To replace that down-flowing water, warm surface waters from the tropics are pulled northward along the Conveyor's upper limb. The pump is driven by the contrast between frigid, dry winter air and warm water, which draws heat from the ocean into the atmosphere. That leaves the water denser, and it consequently sinks.

The phenomenon helps draw down the human-made buildup of carbon dioxide from air to surface waters and eventually into the depths, where the greenhouse gas can be stored for centuries and offset global warming. It also transports warm tropical waters northward, where the ocean transfers heat to the air and keeps winter climate in the North Atlantic region much warmer than it would be otherwise.

There's been very little convection in the North Atlantic over the past decade, prompting concerns that the impact of global warming was already being felt. Now, according to a report in Nature News, two teams of scientists have independently found evidence that overturning has resumed in the North Atlantic. As air temperatures have generally warmed over the last two decades, the sinking of cold water in these northern

Get the background info in one of X-RAY MAG's older articles: "Ocean conveyor belt—the thermohaline circulation" X-RAY MAG Issue 12 **Download link**



North Atlantic Oscillation Linked to Climate Warming

Using a 218-year-long temperature record from a Bermuda brain coral, researchers at the Woods Hole Oceanographic Institution (WHOI) have created the first marine-based reconstruction showing the long-term behavior of one of the most important drivers of climate fluctuations in the North Atlantic.

By analyzing the strontium to calcium ratio in the Bermuda brain coral, WHOI scientists were able to reconstruct monthly changes in ocean temperatures and evaluate variability of the North Atlantic Ocillation (NAO) during both cold and warm periods from the Little Ice Age (1800–1850) to modern day.

The research team found the variability of the NAO decade-to-decade has been larger, swinging more wildly, during the late 20th century than in the early 1800s, suggesting that variability is linked to the mean temperature of the Northern Hemisphere. This confirms variability previously reported in past terrestrial reconstructions.

"When the Industrial Revolution begins and atmospheric temperature becomes warmer, the NAO takes on a much stronger pattern in longer-term behavior," said Goodkin. "That was suspected before in the instrumental records, but this is the first time it has been documented in records from both the ocean and the atmosphere." ■

seas has been either shallow or absent. But new data from a fleet of robotic floats showed that in the winter of 2007-2008, cold water sank significantly beyond 1,000 meters deep in northern seas for the first time in eight years and for only the second time since the mid-1990s. Beyond that depth, waters can be swept into lower limb of the Conveyor and carried around the world.

The lack of substantial sinking throughout the decade meant that there was no "preconditioning"—that is, colder waters could not build up from previous winters to a point where they are easily pushed over a density threshold and sink the following year, the research team said. That made the sudden reappearance of sinking in 2007-2008 all the more surprising.

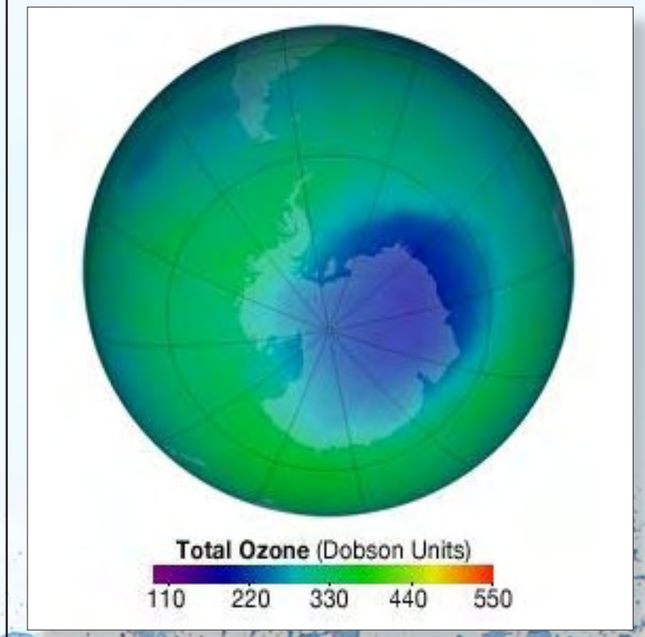
Analyzing satellite and in-situ ocean data, the researchers said a large amount pack ice and fresh water was exported into the northwest Labrador Sea in the summer of 2007. This froze the following winter, significantly extending the ice edge farther offshore. As a consequence, cold air from the North American continent traveled farther over ice, instead of warmer ocean waters, remaining cold until it hit warmer open water in the middle of Labrador Sea. The resulting temperature contrast helped trigger the sinking process.

The scientists noted "that the increased liquid and frozen freshwater flux into the Labrador Sea was probably tied to the large export of sea ice from the Arctic Ocean that contributed to the record minimum in sea-ice extent observed in the summer of 2007. Ironically, this disappearance of Arctic sea ice, which has been linked to global warming, may have helped trigger the return of deep wintertime [water sinking] to the North Atlantic." ■

Ozone hole weakens oceanic carbon sink

A new model links stratospheric ozone depletion to ocean acidification.

The hole in the ozone layer over Antarctica may be impairing the Southern Ocean's ability to mop up carbon dioxide from Earth's atmosphere. Earth's oceans are the largest sink of carbon dioxide, with the Southern Ocean accounting for more than 40 percent of the annual oceanic uptake of the greenhouse gas, says Andrew Lenton, a marine biochemist at the Pierre and Marie Curie University in Paris. In theory, seas should soak up more carbon dioxide as levels of the gas in the atmosphere rise. ■



It's tempting to speculate that these tiny plankton, by taking carbon dioxide out of the air, might have helped trigger the most severe global cooling event in the past 100 million years."

Scientists urge caution in CO_2 capture schemes

This winter the Indo-German Lohafex ocean fertilization experiment created a lot controversy. Engineering the vast icy oceans surrounding Antarctica to soak up carbon dioxide to mop up mankind's excess CO_2 to fight global warming may seem attractive to some, but to many scientists and many nations the whole concept of using nature to is fraught with risk and uncertainty.

Fast growing animals, as these ascidians, were found at Larsen A. This can be an indication of a first step towards a biodiversity change

An analysis by a leading Australian research body has urged caution and says more research is crucial before commercial ventures are allowed to fertilize oceans on a large scale and over many years to capture CO_2.

Sprinkling the ocean surface with trace amounts of iron or releasing other nutrients over many thousands of square kilometres promotes blooms of tiny phytoplankton, which soak up carbon dioxide. When the phytoplankton die, they sink to the seabed, along with the carbon locked inside their cells where it is potentially stored for decades or centuries in sediments on the ocean floor. Much of the Southern Ocean is depleted of iron and experiments have shown even small amounts of the nutrient can trigger phytoplankton blooms that can last for up to two months.

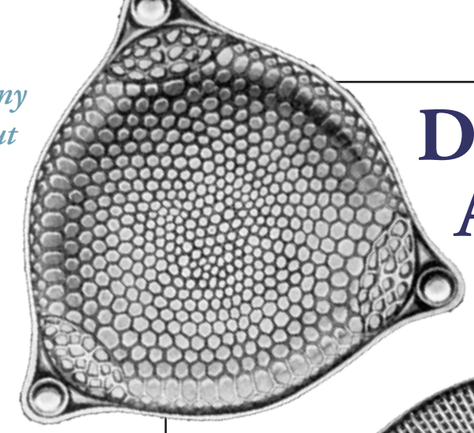
Risking profound changes

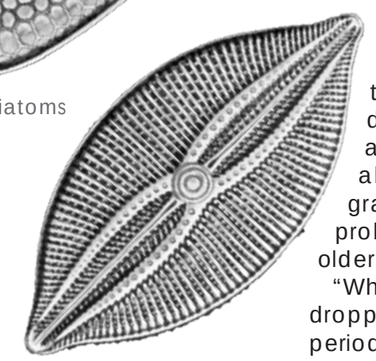
The problem is no one knows exactly how much carbon can be captured and stored in this way, for how long, or the risks to ocean ecosystems from such large-scale geo-engineering. Some scientists fear such schemes could change species composition in the oceans, increase acidity or cause oxygen depletion in some areas, even promote the release of another powerful greenhouse gas, nitrous oxide. Furthermore, the potential for negative impacts is also expected to increase with the scale and duration of fertilization. There are doubts that any damaging effects could be detected in time.

"Ocean fertilization may cause changes in marine ecosystem structure and biodiversity, and may have other undesirable effects. While controlled iron fertilization experiments have shown an increase in phytoplankton growth, and a temporary increase in drawdown of atmospheric CO_2, it is uncertain whether this would increase carbon transfer into the deep ocean over the longer-term," said one of the report's authors, Tom Trull, Ocean Control of Carbon Dioxide program leader at the Antarctic Climate and Ecosystems Cooperative Research Centre in Hobart.

"I don't think the scientific community has even sat down and made a list of the things we need to check before we feel comfortable that this would be a low-risk endeavour. We never even designed measurement programs to look at ecological change and the risks."

"It is very important to recognise that if deleterious effects increase with scale and duration of fertilization, detection of these cumulative effects may not be possible until the damage is already done," said John Cullen, professor of oceanography at Dalhousie University. "It is extremely important to look at the ecological risks of this kind of activity." ■



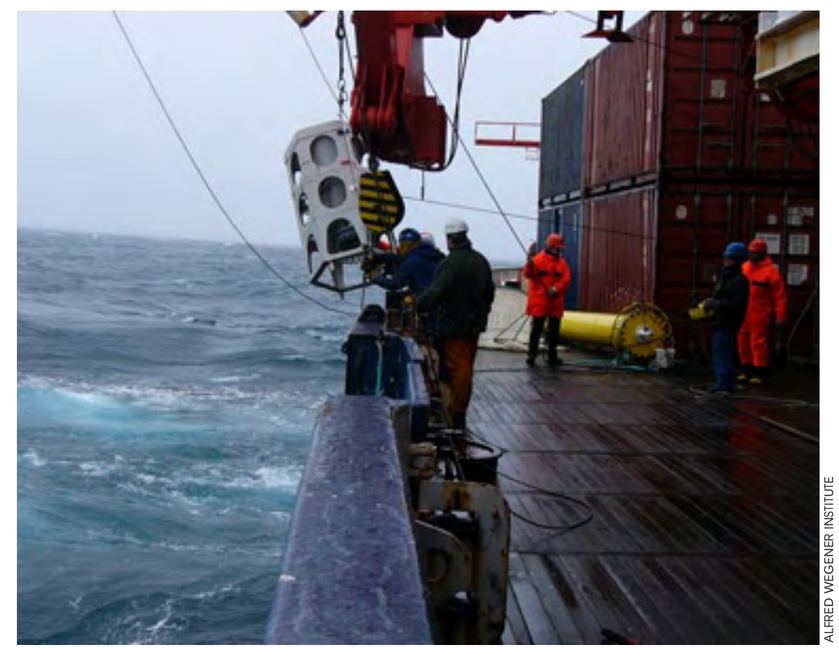


Diatoms

Did Plankton trigger Ancient Global Cooling?

The evolutionary history of diatoms—abundant oceanic plankton that remove billions of tons of carbon dioxide from the air each year—needs to be rewritten, according to a new Cornell study. The findings suggest that after a sudden rise in species numbers, diatoms abruptly declined about 33 million years ago—trends that coincided with severe global cooling. The research casts doubt on the long-held theory that diatoms' success was tied to an influx of nutrients into the oceans from the rise of grasslands about 18 million years ago. New evidence from a study led by graduate student Dan Rabosky takes into account a widespread problem in paleontology: that younger fossils are easier to find than older ones.

"Why diatom diversity peaked for four to five million years and then dropped is a big mystery," Rabosky said. "But it corresponds with a period when the global climate swung from hothouse to icehouse. It's tempting to speculate that these tiny plankton, by taking carbon dioxide out of the air, might have helped trigger the most severe global cooling event in the past 100 million years." ■



ALFRED WEGENER INSTITUTE

Sinking algae are sampled by means of a sediment trap

Scientists to restore Japan's largest reef

Japanese scientists embark on an ambitious project to restore the country's biggest coral reef by planting thousands of baby corals growing on tiny ceramic beds. Thousands of corals are to be planted in the Sekisei Lagoon, Okinawa, which has suffered major bleaching due to rising sea temperatures.

Corals in Sekisei Lagoon stretching between the Okinawan islands of Ishigaki and Iriomote have plunged by 80 percent over the past two decades due to rising water temperatures and damage by crown-of-thorn starfish. In a joint project with Japan's environment ministry, scientists will plant some 6,000 baby corals in the seabed over a 600m² area. The corals are 18 months old and grow on round ceramic beds that measure four centimetres in diameter. Researchers working on the joint project first implant fertilized coral eggs into ceramic beads. Once the eggs have grown into larvae one to two centimeters in diameter, they take the ceramic beds to the lagoon and attach them to rocks in the seabed.

TOKYO UNIVERSITY OF MARINE SCIENCE AND TECHNOLOGY

Near the southern island of Okinawa, a baby coral grows on an artificial ceramic bead. Mineo Okamoto and his team are in an unprecedented project to restore Japan's largest coral reef by planting thousands of baby corals

A first

"No projects in the world have ever restored a coral reef artificially," said Mineo Okamoto, associate professor at the Tokyo University of Marine Science and Technology. Most projects are instead focused on attempting to improve conditions, or transplanting corals to a new location.

It follows the implantation of 5,300 baby corals in 2006. Only one-third of them have survived, with many dying off or damaged by dead and collapsed corals stirred up in the sea by typhoons.

"We have learned lessons from the previous planting regarding what are the best places to plant and other conditions for survival. We'll make a fresh try," said Okamoto.

Ten year plan

The project aims to "restore the lagoon in some ten years". If successful, the team hopes that the method can be replicated elsewhere, with preparations already underway for a similar project in Indonesia.

"No projects in the world have ever restored a whole coral reef artificially"

NASA

The Sekisei Lagoon, which extends between Ishigakijima and Iriomotejima islands, is located about 450 kilometers west of the prefecture's main Okinawa island and is the country's largest coral reef. The lagoon area also includes the smaller islands of Taketomijima and Kuroshima.

Since the project began in fiscal 2004, about 7,500 baby coral have been transplanted. In some areas, scientists have found staghorn coral of about ten centimeters in height where they planted baby coral last year. ■

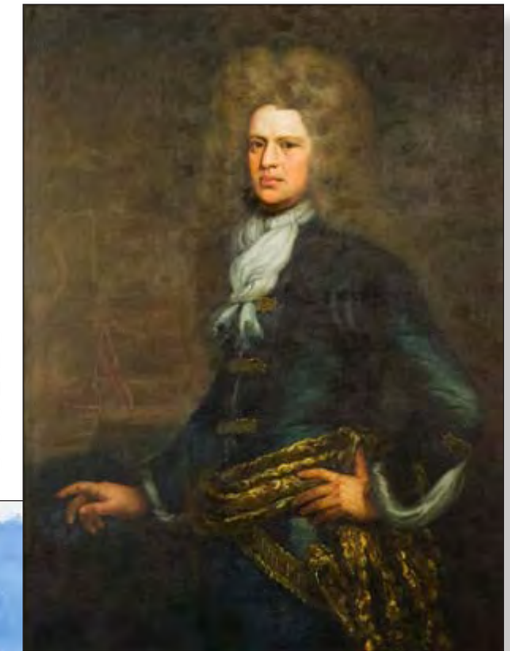
SOURCE: JAPAN'S ENVIRONMENT MINISTRY

Recent mass generation of Acanthaster starfish and coral bleaching in the area have caused catastrophic damage to the lagoon. Because of the damage, the reef has diminished to about 20 percent of its largest recorded size

wreck rap

Edited by Mathias Carvalho

The telltale bronze canons lying visible on the sandy ocean floor



Admiral Balchin was blamed for wrecking the ship on the Casquets due to faulty navigation

HMS Victory found

Text by Arnold Weisz
Illustrations courtesy of Odyssey Marine

In the beginning of February, media around the world reported that the ship which inspired Nelson's Victory, *HMS Victory* lost in 1744, was found. The wreck was found by the Florida based Odyssey Marine Exploration.

HMS Victory was located already in 2008, by Odyssey Marine Exploration, a company that specializes in deep sea exploration and recovery. Odyssey went on investigating the underwater remains in secrecy. The identity of the find was confirmed through a close examination of 41 bronze cannons visible on the sandy ocean. The company lifted two of the cannons and gave them to the British Ministry of Defence, and is now negotiating with British authorities on the disposition of the artefacts and treasure before it attempts further recoveries.

"Finding this shipwreck has solved one of the greatest shipwreck mysteries in history. Having discovered it in deep water far from where history says it was lost has served to exonerate Admiral Balchin and his officers from the accusation of having let the ship run aground on the Casquets due to faulty navigation," said Greg Stemm, Odyssey's Chief Executive Officer.

Controversy

Odyssey Marine Exploration has sparking huge controversy from marine archaeologists, with several wreck finds behind them already, who are concerned that Odyssey may put their commercial interests ahead of a thorough and responsible salvage operation. Odyssey salvaged the Civil War era shipwreck of the *SS Republic* in 2003 and recovered over 50,000 coins and 14,000 artifacts from the site nearly 1,700 feet deep. Odyssey has several shipwreck projects in various stages of development around the world, including the code-named Black Swan Project. Spain has launched legal action over this wreck, which has been described, speculatively, as a 17th century vessel found off the coast of England. Odyssey's co-founder, Greg Stemm, has denied any wrongdoing. ■

Peru also puts Odyssey through the legal wringer

A public decree issued by Peru's Foreign Ministry orders Lima's ambassador in Washington to hire attorneys to try to recover 17 tons of coins.

Peru claimed the treasure in U.S. District Court in Florida last year, arguing that the coins were made from Peruvian silver and minted in Lima.

Spain's government is also suing Tampa-based Odyssey Marine Exploration for the loot, which was found off Portugal in 2007.

Peru was a Spanish colony at the time the ship sank. ■

Calls for preservation

"Rather than staying frozen in time beneath the waves, this unique shipwreck is fading fast," warns marine archaeologist Dr Sean Kingsley, director of Wreck Watch International said in a statement released by Odyssey.

The Victory lies in an area of intensive trawling, and her hull and contents are being ploughed away by these bulldozers of the deep day in, day out. Leaving the *Victory's* rich archaeology so vulnerable to the ravages of man is like allowing a motorway to smash straight through a historic site on land without excavating it. The archaeological recovery of the artefacts from the site should begin as soon as possible or the story of England's most important lost man-of-war may not survive to be told.

UNESCO has called for measures to preserve the *HMS Victory*. UNESCO stressed the need to safeguard such a historically significant find, in light of its Convention on the Protection of the Underwater Cultural Heritage, which entered into force this January.

"I am delighted that such an exceptional example of underwater heritage has been located. The cultural and scientific value of this artefact is considerable," declared Koïchiro Matsuura, Director-General of UNESCO.

Unsolved mystery

The finding of the *HMS Victory* is solving one of the greatest mysteries in naval history. Odyssey discovered the wreck west of the Casquets, a group of rocky islets near Alderney, the most northerly of the Channel Islands. The site is nearly 100 km from where the ship was historically believed to have been wrecked on a reef near the Channel Islands.

HMS Victory was launched in 1737 and became the flagship of the Channel Fleet under Sir John Norris in 1741. She was the last British First Rate to be armed entirely with bronze cannon. She was wrecked with the loss of her entire crew while returning to England as the flagship of Admiral Sir John Balchen after relieving Sir Charles Hardy, who had been blockaded in the Tagus estuary by the French Brest fleet. As the fleet reached the English Channel on 3 October 1744, it was scattered by a large storm. The screaming winds, the stinging rain and the towering storm-waves were remorseless: every one of the 1,100 officers and men on board drowned. ■

Dutch set to return shipwreck relics to Australia

The Dutch government has offered to hand over artefacts from the *Batavia* (1629), *Vergulde Draeck* (1656), *Zuytdorp* (1712) and the *Zeewyk* (1727) The artefacts, including a cannon, elephant tusk, amber, German stoneware, lead ingots, coins and porcelain from the 17th and 18th centuries as well as rare objects owned by crew and passengers such as navigational instruments and ornaments are currently stored in the Netherlands. The 1326 artefacts and 633 coins will be relocated as close as possible to the West Australian shipwrecks —the *Batavia*, the *Vergulde Draeck*, the *Zuytdorp* and the *Zeewyk*. Previously, pieces of the wrecks have been located in both countries, under a 1972 agreement with some of items placed in the care of the Western Australian Museum. ■

Why a Ship is a "She!"

While other languages, such as French, Spanish and German, assign masculine and feminine articles, the English language only assigns gender to humans and animals. So, why is a ship a *she*?

There's a couple of reasons, says historian Silvia Rodgers. "Two images predominate—the all-powerful mother who nurtures and offers womb-like protection and the enchantress of whom a man can never be certain."

It's also about the reality of the sea, Rodgers explains. It's a hostile environment where sailors are vulnerable. It's this vulnerability that could account for the partnership of an all-male crew with a feminine ship, she writes.

HERVÉ COZANET / WIKIPEDIA (CREATIVE COMMONS)

The figurehead of schooner *Recouvrance* in Brest

ANDREA MALZ

Figurehead of the sailing vessel *Christian Radich*

But, the association between women and the mystical isn't anything new! The feminine has always been held to be supernatural—as demonstrated in the archaeological record. The ancient Romans, Greeks and their predecessors all carved or painted feminine symbols on their vessels.

From the Middles Ages onward, superstition amongst sailors held that a ship's figurehead had eyes to find her way through the seas and that her bare breast would shame a stormy sea into submission.

Towards the end of the 18th century, English ship owners took to commissioning figureheads after wives or daughters and naming the vessels in their honor. Another superstition holds that it's bad luck to have a woman aboard ship. No sailor wants to risk the jealous wrath of his first love!

When the question was put to the late, great US admiral Chester Nimitz he replied, "A ship is always a 'she' because it costs so much to keep one in paint and powder."

But, time has caught up with tradition. As of 2002, Lloyds no longer refers to ships in the feminine. The registry now refers to all ships as 'it'!

— Rob Rondeau
Marine Archaeologist
www.procomdiving.com

wreck rap

HM Colonial Schooner *Mermaid* Archeological Site Protected

Archaeologists from Australia's National Maritime Museum have found the site of an historic shipwreck on the Great Barrier Reef. Based on metallic objects, including heavy copper sheathing, as well as other clues found at the site, they concluded it was indeed the government schooner *Mermaid*, which was used to map large areas of the north Australian coast in the late 1820s, captained by Lieutenant Phillip Parker King.

The ship sank in 1829, south of Cairns, while attempting to deliver a dispatch to disband the fledgling Port Raffles community in what is now Australia's Northern Territory.

Her skipper, at the time, was a man by the name of Captain Nolbrow who, according to specialists, made the decision to sail too close to the reef, acting against the wishes of his junior officers and against the direction of the colonial government, and was later accused of being drunk and irrational.

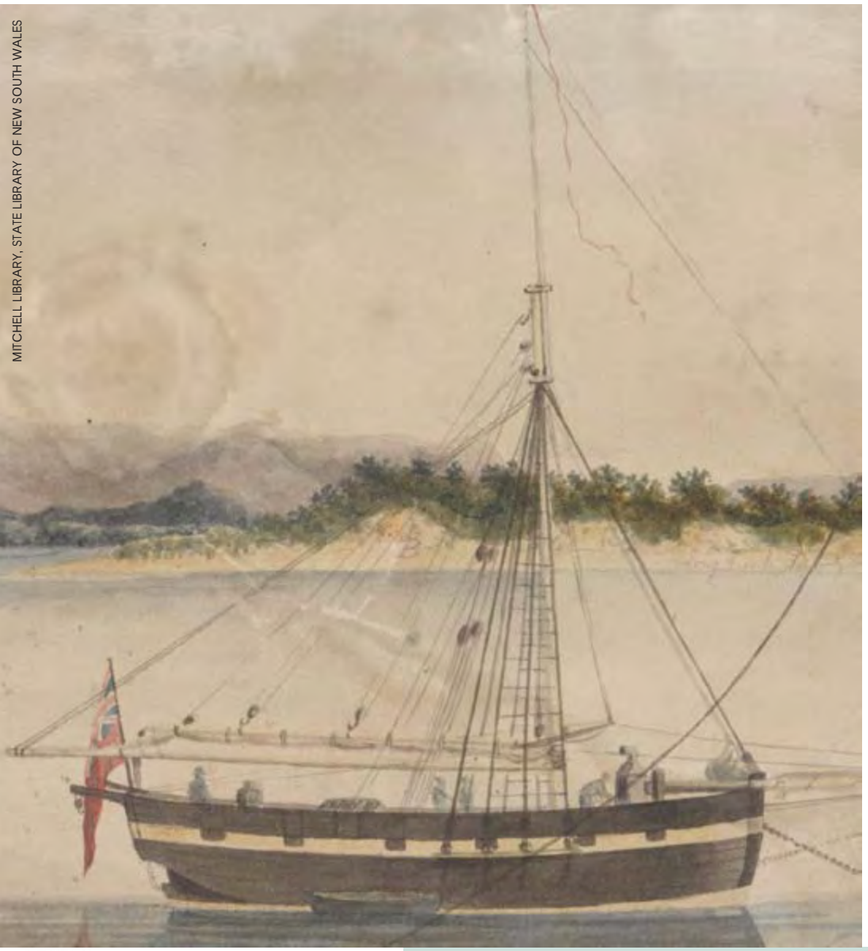
The archeological team has also identified clues as to the crew's effort to salvage the ship.

According to Kieran Hosty, Curator of the Australian National Maritime Museum, the crew tried to get the vessel off the reef, by deploying a kedge anchor and trying to drag the vessel off over the site. Hosty says the ship's location in the reef explains why it has taken so long to find it.

Protection

Environment and Heritage Minister Peter Garrett announced that the site will be protected:

"Although much of the small survey ship has long disintegrated into the ocean floor, a small kedging anchor, anchor chain, compass components and iron barrel rings continue to mark the presence of this great ship. The protected zone put in place under the Australian Government's Historic Shipwrecks Act 1976, will control access at this site, so that it can continue to be a part of Australia's heritage." ■



MITCHELL LIBRARY, STATE LIBRARY OF NEW SOUTH WALES

Mermaid at anchor, Endeavour River 1819, by Phillip Parker King

Trajan was a stately 125-foot bark

Lime Bark *The Trajan* Found 141 Years After Sinking

New England, USA. Modern divers will not make much of the barnacle, seaweed and anemone riddled pile of timber, starting at ten meters in Newport Harbor and strewn all the way down to the bottom at 25 meters. It is, however, no ordinary pile of scuttled material.

Thanks to two wreck divers and a handful of maritime historians, it was established that this pile of underwater junk is, in fact, the remains of the long-lost *Trajan*, a 125-foot wind-sailed bark, loaded with lime, that went down on 17 August 1867. The find was the rightful reward of years of research, hard work, and a trifle more than their due share of luck.

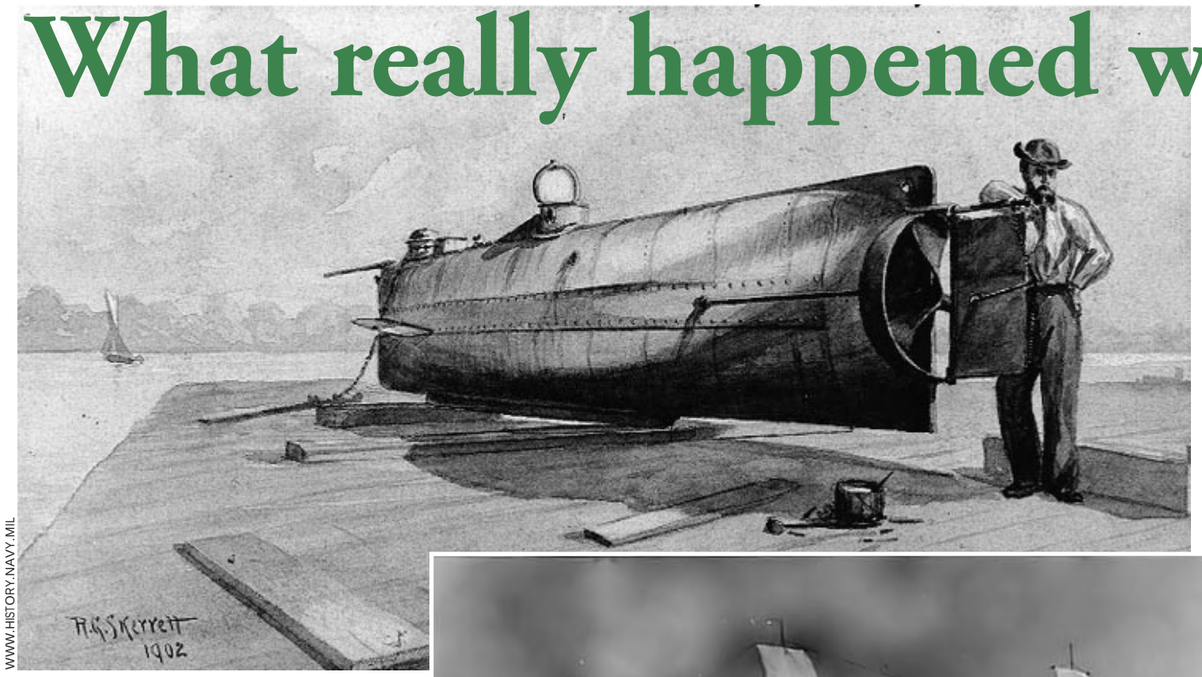
Illustrious but forgotten

one of many vessels that transported freight along the East Coast, Cuba, New Orleans and beyond, the fate of the *Trajan* is part of an important, yet less popular then part of Rhode Island maritime history and it's importance to the local—and New England's—economy at the time. Revolutionary times' vessels are far more extensively researched than commercial ones, although the latter played a significant role on the Revolutionary Wars.

The *Trajan* was named after the Roman emperor, built in 1856 by the H. Merrian shipyard builders in Rockland, Maine. When she was lost, the *Trajan* was carrying barrels of lime from Rockland to New Orleans, which was extensively used in plaster and mortar, consisting of a dangerous cargo. When wet, it may catch on fire. Water won't put it out, so lime captains' only hope of saving their vessels was to snuff the flames by closing the hatches and killing the oxygen supply. That's exactly what happened as the *Trajan's* cargo began to ignite. An account written in 1871 by Thomas Higginson, author of the local history *Oldport Days*, its crew steered the vessel into Newport Harbor and waged a fruitless battle to save her. "In the coming years, the vessel's hulk would be dynamited, partially salvaged and, ultimately, forgotten," he later wrote.

According to Rhode Island law, the divers won't salvage anything from the wreck. They videotaped the dive, instead, studied it, and now hope to share their information with fellow Rhode Island maritime heritage enthusiasts and scholars, including the Rhode Island Marine Archaeology Project (RIMAP) and the Rhode Island Historical Preservation and Heritage Commission. ■

What really happened when *Hunley* sank?



WWW.HISTORY.NAVY.MIL

Confederate submarine *Hunley* was a first of its kind. Drawing based on a Photograph taken in 1863 by George S. Cook

In February 1864, during the Civil War, the hand-cranked confederate sub *Hunley* became the first military underwater vessel to sink a ship in battle—in this case, when it rammed a black powder-loaded spar into the Union blockade warship *Housatonic*.

The sub then disappeared and wasn't located until 1995. In 2000, the wreck of the sub was finally raised from the ocean floor. It became a 136-year-old time capsule holding the remains of the fated crew, as well as answers to very old questions.

Investigation

Since its recovery, a team of experts has strived to determine the identity of the eight members of the crew and why they volunteered for such a dangerous mission, from which there was no return. The project drew expertise from a number of scientific fields, such as forensic anthropology, underwater archaeology, forensic artistry and genealogy. Since then, questions began to emerge. The actual hull design was different from what scientists expected, and there were only eight crewmen, instead of the documented nine.

The first conservation phase consisted of documenting and studying the hull's outside. Several iron hull plates were then removed, allowing scientists to enter the crew compartment to remove sediment, human remains and artifacts.

The next phase consists of cleaning the outside of the hull and putting the sub into a chemical vat, thus removing encrusted salt deposits. When the procedure is completed, the *Hunley* will eventually be displayed in a new North Charleston museum.

The USS Housatonic: The First Ship Sunk by a Submarine

Underwater crime scene

From the position of the crew's bodies, found at their duty stations, scientists believe that there was no emergency when the sub sunk, so an attack or a fire accident seemed to be unlikely. And the controls on the bilge pump were not set to pump water, suggesting there were no considerable leakages.

But what actually caused the sub to never surface again? Several theories were presented since her recovery.

Hypothezising

One speculates that, after the attack, the *USS Canandaigua* rushed to the aide of the *Housatonic,* and it might have grazed the *Hunley*, disabling her. Another hypothesis is that, as the *Hunley* needed to wait for the incoming tide to return to shore, it is possible that the crew waiting down miscalculated their air supply and blacked out. A grappling hook, believed to serve as her anchor, was found near the wreck. The hull may produce evidence of a rope, indicating the sub was indeed anchored and waiting for the tide to change.

Several other theories will be tested against hard evidence to be found in the coming months. It is hoped that clues to solving the mystery will soon be found. But the archeological crime scene has some conflicting evidence that might keep scientists busy for quite a while. ■

U.S. ARMY ENGINEER INSTITUTE FOR WATER RESOURCES (IWR)

Hunley suspended in a supportive cradle following its recovery from Charleston Harbor in 2000.

Unknown 200 year-old schooner discovered in Lake Ontario

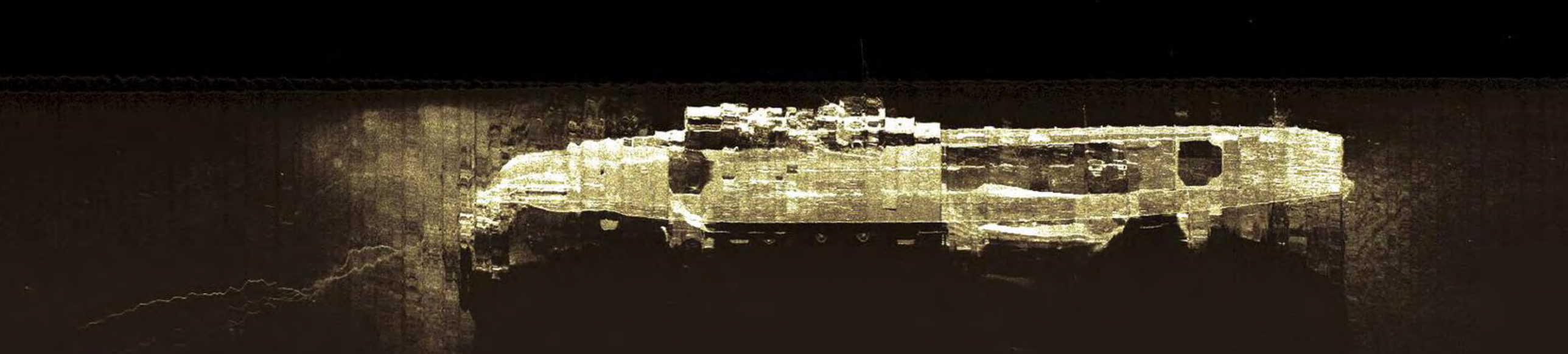
Two local shipwreck enthusiasts discovered a 200-year-old dagger-board schooner in Lake Ontario, about ten miles offshore of Oak Orchard, Orleans County.

Jim Kennard and Dan Scoville found it on early September 2008, while conducting a deep water sonar survey using an ROV designed and built by Scoville. The shipwreck was found upright and in remarkable condition, considering that it rests at a depth of over 500 feet (152 meters).

The ship's origin or name remains unknown, but the amateur explorers have been in contact with the Great Lakes Historical Society and various maritime sources about their find.

Sailing vessels of that type were in use during a brief period of time in the very early 1800s. This ship is the only dagger-board schooner known to have been found in the area.

The schooner might not have been scuttled—as it has apparently been stripped of its upper deck structure long before it sank. It may either have broken loose from moorings, or it might have been under tow when it broke away and sank. ■



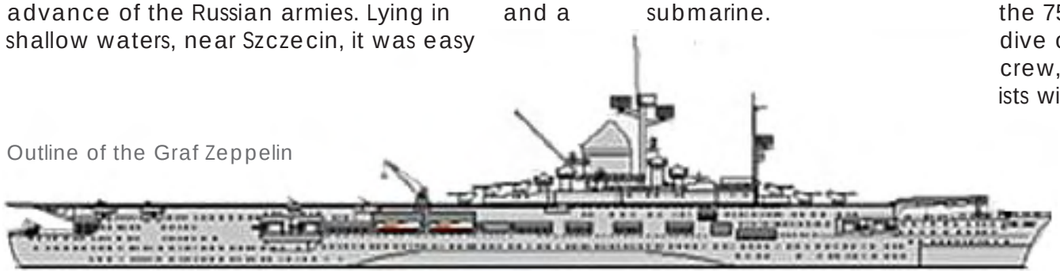
Diving *Graf Zeppelin* — Hitler's Aircraft Carrier

The wreck of the *Graf Zeppelin* will soon be visited by a team of German divers. Kept secret by Soviet authorities, Nazi Germany's only aircraft carrier, the *Graf Zeppelin*, was only located in July 2006, 49 years after being sunk the Baltic Sea, near the Bay of Gdansk.

Standing at a mighty 262 meters long and 30 meters wide, the *Graf Zeppelin* had a range of 8,000 nautical miles, equalling the best of the Allied carriers of the time. As the tides of war had already changed when she was launched, the *Zeppelin* never made it into active service, and was scuttled in April 1945 by German troops fleeing the relentless advance of the Russian armies. Lying in shallow waters, near Szczecin, it was easy for the Red Navy to recover her after capturing the Polish port. In the 1960s, the Russians repaired the ship and then used it for target practice at Leba, by Soviet dive bombers simulating attacks on US aircraft carriers. The wreckage was located by the Polish Navy in 2006 resting at roughly 87m (250 ft). She starts at 55 meters making technical training a requirement to dive the wreck.

Documentary

On 21 March 2009, Deep Wreck Project embarks on an expedition to explore the *Graf Zeppelin*—the only German aircraft carrier ever built. One of the main purposes will be the production of a documentary, *Flugzeugträger, Graf Zeppelin—Hitler's Traumschiff* ('Dreamvessel'—ed.) Divers will explore the wreck down to a depth of 80 meters supported by ROVs and a submarine.



Outline of the Graf Zeppelin

Unique wreck

What is so special about this wreck? First of all, its whole existence has been shrouded in mystery both during the war and afterwards. Secondly, her technical construction is extraordinary. In her time, she was viewed as the most sophisticated aircraft carrier. Yet, the whole concept was strangely incoherent. There were no support vessels planned nor aircraft designed for used on aircraft carriers. Hitler's dream of a huge indestuctable aircraft carrier was never completed.

The expedition aims to answer two general questions: First of all, is the wreck in Baltic sea really the *Graf Zeppelin*? And secondly, would she have been able to affect the outcome of the war had she entered active service? The Polish vessel *IMOR* will be used for research, while the 75m *Cdt Fourcault* will be used for all dive operations. During the daytime film crew, scientists, historians and journalists will be aboard the *IMOR* from which ROVs and other scientific equipment will be lowered down to the *Graf Zeppelin*. Accommodation will be on the *Cdt Fourcault* from which all diving will take place. Working depth will be between 80 and 50 m. There will be no salvage of any part of the wreck. The documentation and research will be non-destructive.

About "Deep Wreck Project"

The company was founded in 2008 by Dr Andreas M. Stolpe, Bernd Očić M.A. and Christian Schramm. The combined competences from diverse business fields such as public relations, marketing, offshore-technology as well as underwater search technique-development optimises the chances for a positive growth of the company.

Stolpe has conducted several dive expeditions in general in cooperation with the Maritime Museum in Danzig. He is member of the German Society for Underwater Archaeology (DEGUWA) and a NAS-certified tutor for underwater

Bernd Očić at the recent BOOT expo in Germany

Divers will be accommodated aboard the *Cdt Fourcault* in one- and two-person cabins

archaeology. Očić is a marine geologist, researcher and specialist in underwater-documentation of off-shore sites and an ROV-operator.

Schramm is a developer and manufacturer of underwater technology, in particular underwater, lighting-systems. His qualifications include underwater archaeological techniques, and he is member of the DEGUWA, too.

Purpose

The main goal of Deep Wreck Project is to describe the history of a sunken ship and show the audience what a "time capsule" she is. People must appreciate the value of their cultural heritage and understand the necessity of protecting their wrecks. Beside the formal professional qualifications, this team is specialised in working at greater depths. This is necessary if one wants to have good visibility during film productions.

The wrecks resting at greater depths are often in a better condition due to environmental conditions at depth and the absence of scuba divers. Since the team aims at the deeper wrecks, they get many opportunities to document the culturally and historically important shipwrecks. In the past, wrecks in greater depths have not been filmed easily by divers.

The documentary about *Graf Zeppelin* is not the team's only film project. Several other projects are already in progress.

The aim of their work is not only to produce a documentary, but also to send a message to scuba divers and audiences that the wrecks are immensely valuable as part of our cultural heritage. Undisturbed wreck sites can provide scientists with invaluable information. But as soon as a wreck site is disturbed, the information may possibly be lost forever.

Documentary

The main priority of the expedition is to produce the documentary about the *Graf Zeppelin*. But diving the wreck has a second priority. As this story goes to press, several TV channels have become involved: ARTE, ARD/MDR and National Geographic, with a number of others showing interest. The documentary will probably be broadcast internationally by National Geographic America and BBC.

Diving

The vessel's hull rests on the seabed at 80m. The upper parts of the ship reach 50 meters. The superstructure, such as the bridge and other significant parts of the wreck, will be illuminated. Parts of the wreck are covered by fishing nets, which pose a danger for divers, submarines and ROVs.

While divers are in the water, RIBs will be on standby. There is a decompression chamber aboard the vessel and an emergency chain established to Europe's most sophisticated and modern decompression chamber. In parallel, a large scientific study will take place to compare micro bubbles in mixed gas divers using closed versus open circuits.

Crew

The crew consists of dive instructors, diver, underwater archaeologists, camera teams, an historian, ship crew, a technician, ROV-operators, an operator for submarine and people from the press.

Schedule

The scientific part of the expedition starts on the March 21 from Gdynia, Poland, and ends on April 7. Guest divers will board April 1.

Approximately two weeks will be spent for the expedition per i.e. departure to the *Graf Zeppelin* and search, exploration, boarding the guest diver and

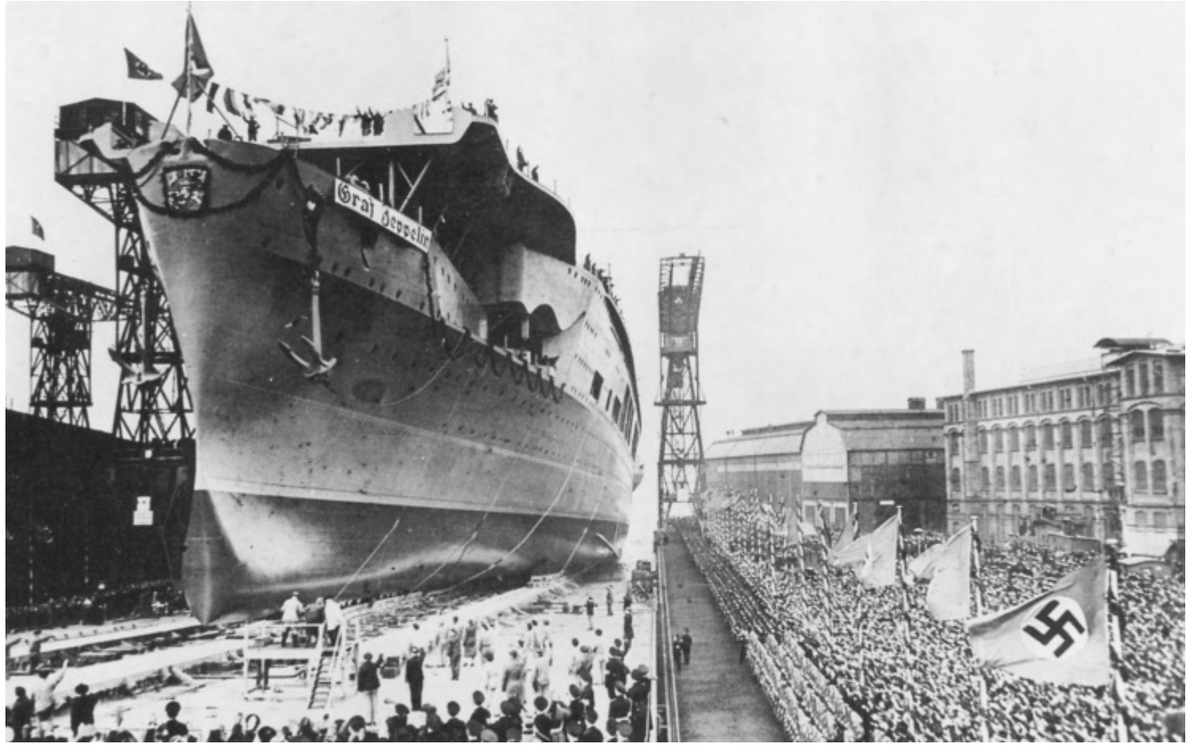
heading back to Gdynia. Due to the fact that the expedition is dependent on weather conditions, four days reserve has been planned.

Accommodation

Accommodation and food is included. Diver and personel will be on the *Cdt Fourcault* in one and two-person cabins. Gas fills have to be paid separately. Sofnolime will be free.

More information

www.deepwreck.de ■



The launch of *Graf Zeppelin*

The research vessel *IMOR*

travel news

Edited by
Scott Bennett

2009 outlook for the travel industry

The slow down in advanced economies, which are facing a contraction in gross domestic product for the first time since World War II, is already spreading to major emerging markets such as China, India and Brazil.

The World Tourism Organization (UNWTO) expects 2009 international tourism to be in the range of zero percent to a two percent decline. Along with the Americas, Europe will be the most affected region in terms of overall tourism results, as most of its source markets are already in, or entering into, recession.

In Asia and the Pacific, results are expected to be positive, although growth will continue to be much slower compared with the region's performance in recent years; the same applies to Africa and the Middle East.

Notwithstanding this assessment, UNWTO highlights the fact that the softening of international tourism growth follows four historically strong years:

- Plus seven percent a year on average between 2004 and 2007, or well above the four percent long-term trend;

- 2008, with an increase of two percent based on a strong first half performance. ■ SOURCE: UNWTO

Grenada's undersea sculpture park replaces devastation

Jason de Caires Taylor has created a sculpture garden with a difference.

Internationally renowned sculptor, Jason de Caires Taylor, who was featured in X-RAY MAG #18 has crafted a stunning and unique underwater sculpture park in the shallow waters of Grenada.

The result is a series of beautiful seascapes that have formed a series of artificial reefs, drawing new life into areas of this Caribean island, which have been damaged by both the forces of man and nature. Positioned in clear, shallow waters, the sculptures are easily accessable by divers and snorkellers. Those not wanting to get wet can perouse his creations in glass-bottom boats.

The work is continually in progress, as living coral builds layers onto its surface and marine creatures take up residence in its tiny nooks and crannies. The direction and strengths of currents ensure that some sections of the work become covered or lost. At other times, figures emerge and are fully visible.

There are currently a total of 65 stunning installations in place. Most are in Grenada, with additional projects in the UK and Europe. Contracts have been agreed for the first phase of a new underwater project in Mexico, placed within the National Marine Park of Cancun, Isla Mujeres and Nisuc. Taylor works out of his studio in London. ■

His love of the underwater realm coupled with the desire to create striking and meaningful art forms has led Taylor to explore the intricate relationships between art and the environment

WHALE QUEST KAPALUA

Whale Quest Kapalua Invites Guests to Dive into the World of the Humpback

Each year, Maui's balmy climate draws a multitude of tourists from around the world eager to escape the winter cold. However, the island's most famous and longtime visitors are humpback whales, which make their annual pilgrimage to Maui's waters each winter.

Celebrating their arrival is the fourth annual Whale Quest Kapalua to be held at the Kapalua Resort. Running at The Ritz-Carlton, Kapalua, the three-day symposium will grant thousands of Hawaii residents and visitors the chance to get up close and personal with these exceptional creatures. "Kapalua Resort believes in the importance of preserving and sharing our island's unique environment and wildlife with our guests," said Nancy Cross, Kapalua Resort's vice president of events management.

Festivities commence on Friday, February 13, with a special welcome ceremony by Charles "Flip" Nicklin, whose underwater photography of marine mammals has graced numerous articles in National Geographic. This will be followed by a 45-minute seminar by Jason Sturgis from Whale Trust on humpback whale underwater cinematography.

Speakers will include Bruce Mate from Oregon State University; Hugh Pearson from the BBC; award-winning National Geographic photographer Brian Skerry; wildlife filmmaker Adam Ravetch; and Dr James Darling, a specialist in Humpback whale behavior.

Attendees will also have an opportunity to observe these gentle giants in their natural habitat by signing up for a two-hour whale watch excursion. Guided by a representative Whale Quest Kapalua, the trips will present a wealth of interesting facts and knowledge about the whales. Excursions will run daily at 7 am and admission is US$40 plus tax.

For additional information, visit kapalua.com ■

Enhanced security hampers Indian diving

Grande Island, with its rich marine biodiversity, has turned into a dive site, but divers and operators say that the local dive industry, already suffering from neglect, has been further affected by security hassles.

Following the recent Mumbai attacks, patrolling along the coast by the Indian Navy, coast guard and marine police is common. They also routinely check tourists and scuba diving enthusiasts taken to the island by operators. "Often, they are stopped and subjected to checks en route three times a day by all three," sources from the Association of Dive Centres of India tells Times of India.

Conceding that the exercise is inevitable in view of grave security concerns, the sources said it should not be such that it is construed by tourists as harassment. "These knee jerk reactions and sometimes rude treatment of tourists is affecting tourism badly," the sources added.

Water sports operators refrain from making an issue out of it fearing victimization. "Initially, during December, the authorities often made the boats turn back, and even if operators refunded their money, tourists were unhappy about wasting a whole day," a water sports operator said. ■

SOURCE: TIMES OF INDIA

Edited by
Scott Bennett

Flower Power?

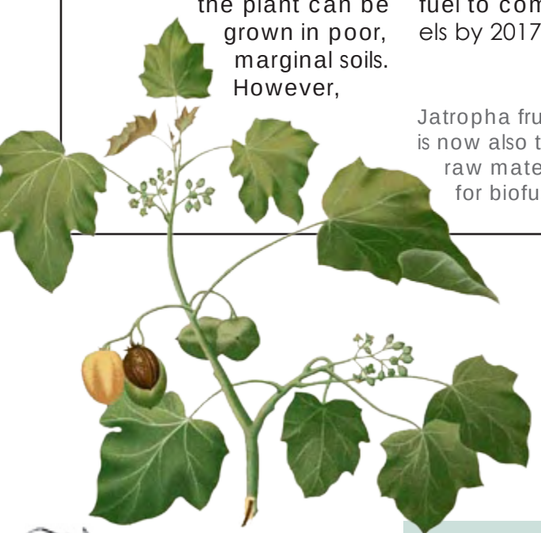
Air New Zealand completes two-hour test flight partly powered by fuel derived from a tropical fruit.

Air New Zealand hailed the flight as a "milestone" in the development of sustainable fuels that could be instrumental in the reduction of airplane emissions

One engine of the Boeing 747-400 was powered by a 50-50 mixture of jatropha plant oil and standard A1 jet fuel. According to Air New Zealand chief pilot David Morgan, oil from the plum-sized jatropha fruit performed "well through both the fuel system and engine".

The fuit from jatropha trees is toxic to humans and the plant can be grown in poor, marginal soils. However, questions have been raised about the plants' suitability as a biofuel. Harvesting the fruit is labour intensive, and the yield quality can be inconsistent. Critics argue against turning over arable land to the cultivation of biofuels at the expense of growing food.

Although this was the first time the fuel had been used partly to powering an aircraft, Asia has been powering cars and trains with biodiesel for a number of years. The International Air Transport Association would like tenth of aviation fuel to come from biofuels by 2017. ■



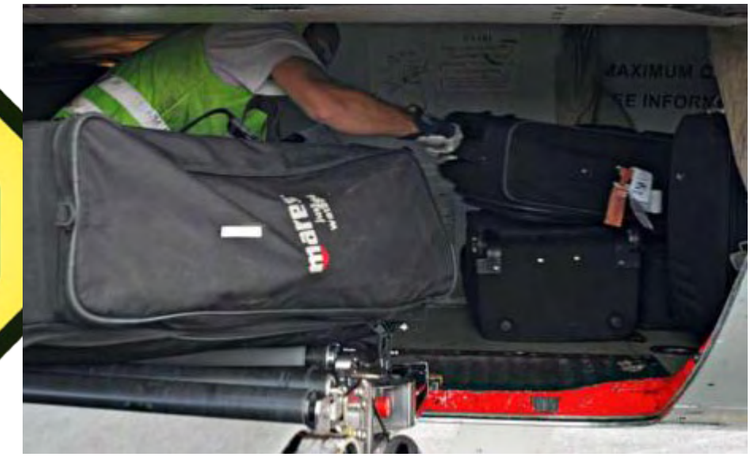
Jatropha fruit is now also the raw material for biofuel

Pack Less
— and help save fuel and CO_2

Copenhagen Airport launches initiative to make you pack lighter to save fuel and to prevent back injuries among the luggage handlers.

- Leave your alarm clock at home. Your cell phone has one built in.
- Sun lotion, mosquito repellent, Frisbees and beach towels can be bought on location
- Bring your literature in the carry-on. This way you also have access to entertainment during the trip. Use a light rucksack instead of a handbag.
- Even compact washing powder is heavy—a standard pack weighs 900gram (2 pounds). Pack only the amount you expect to use in plastic bags.
- A little liquor may be good, but leave it at home. Trying out the local brands is part of the adventure.
- Buy shampoo, toothpaste and shaving foam in small sizes for travel, or pour them into smaller containers.
- Bring only clothes for the number of travelling days and only light garments. It weighs less, dries faster and can easily be washed.

If the luggage is still too heavy, then distribute it in two smaller bags. ■



That looks like a mighty heavy **dive bag** being loaded

Luggange handlers say that bags weighing 15-20 kgs are rarely a problem, but bags over 25 kgs put them at risk for back injuries

Bahamas shark diving still under review

The Bahamas government says it is still considering what steps it will take, if any, to regulate shark-diving after a tourist was killed in 2008. The fatal attack occurred along a reef where the crew of a Florida-based dive boat chummed the water with bloody fish to attract sharks. Divers entered the water without the protection of a shark cage.

Since the incident occurred, cage-free dives continue despite calls for a ban.

The Bahamas Ministry of Tourism has yet to issue any regulations."I can assure you this is still under review," said ministry spokeswoman Anita Patty. "What you're talking about is changing policy. We will definitely stay on top of it."

The subject of shark feeding has always been a topic of controversy. Environmentalists and shark experts disagree about the wisdom of the dives. Proponents claim they help further education about sharks, while critics claim they are nothing more than a cash cow for the Bahamian tourism industry. ■

Lemon sharks were hit hard by contruction work according to Professor Gruber and four colleagues who published a scientific paper last year showing that dredging in the North Sound for the resort construction in March 2001 had cut the first-year survival rates of juvenile lemon sharks there by more than 23 percent

Bahamas create new marine sanctuary in North Bimini

The Bahamas government has created a marine reserve off the island of North Bimini, preserving critical mangrove habitat and a shark nursery that had come under threat from a resort there.

The reserve, which will be protected from most fishing and other "extractive activities," is home to endangered species such as the Nassau grouper and the Bimini boa, as well as a vibrant nursery for lemon sharks.

The decision which was approved by the Bahamas cabinet on Dec. 29 is a setback for the Bimini Bay Resort and Marina, which has been clearing some of the island's mangroves to build a hotel, a golf course, a casino and two marinas, some of which have already been constructed.

Backed by the PM

Prime Minister Hubert Ingraham had initially considered establishing the reserve in the late 1990s, but his party lost power in 2002, and the development proceeded. Ingraham's party won back control in 2007.

Philip Weech, director of the Bahamas Environment, Science and Technology Commission, said the government concluded that the mangroves on North Bimini's North Sound contribute to the nation's fisheries as well as tourism.

"It is vital for the fisheries in the area to retain the ecosystem in that area," Weech said, adding that the reserve "helps us also to deal with the issue of climate change, flooding, storm surge and the biodiversity that's there." ■