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POINT & CLICK ON BOLD LINKS



Equipment *in the news*

Edited by Peter Symes & Rosemary 'Roz' Lunn



Mares Matrix

The new sleek metal housed wrist computer from Mares features a full-dot matrix high resolution display, tilt-compensated digital compass with bearing function, graphic profile during the dive and multi-gas algorithm. The watch offers the choice of digital or analog time of day display, second time zone and a precision stopwatch. The 35-hour logbook features dive profile graphs at 5s sampling rate. The battery is rechargeable, which means years of maintenance-free use. The charging cradle doubles up as PC (or Mac) interface for downloading dives and for firmware upgrades. Mares.com

TUSA M-211_HR

TUSA has gone back to the drawing board to redesign the humble mask and are quite excited by the result. The TUSA designer and engineering teams spent time analysing mask fit, facial bone structure and mouth movement, hence the Freedom mask has three specific design features—a dimpled skirt, varied silicone thickness and stability ridges. TUSA said that this will reduce leakage in key areas (temple, forehead and around the cheek bone), enhance comfort and fit, and minimise compression whilst maintaining ideal skin surface contact. Other features include a Quick-Adjust Buckle System, 3-D Anatomic Strap and Crystalview lenses with an anti-reflective coating. Naturally the skirts are available in clear and solid black silicone. Tusa.com



Poseidon Ballistic bag

Poseidon's Ballistic dry bags are waterproof, made in ballistic nylon and designed to withstand the toughest environments and challenges. The bags, which come in 20-, 52- and 110-liter sizes are fitted with an additional outside pocket, inside lining with pockets and padded shoulder strap. Only available in black.

Poseidon.com

Light & Motion Sola 2000

Light & Motion's Sola™ 2000 Video lights can be used with multiple camera systems from L&M's housings through to DSLR rigs or action cameras like the GoPro™. It benefits from a regulated output, accurate lumen ratings and a visual dashboard that clearly indicates the power output, battery status and charge status. Light & Motion state this Sola™ light needs zero maintenance, has a flood-free design, an intuitive user friendly ergonomic switch, and is very bright compared to its size—283 grams with mount, up to 2,000 Lumens, 240 burn time at 500 Lumens. uwimaging.com



Oceanic USA line

A number of manufacturers have adopted a philanthropic ethos of 'paying it forward'. (Breast Cancer research recently received a financial boost with a rash of pink equipment). Now it's the turn of Oceanic with a more patriotic flavour. This product line is slated to hit the shelves this summer, and we believe it will sell like hot cakes. Appropriately coloured red, white and blue, seven percent of Oceanic's sales from this line will be annually committed to their programme to support injured qualified military personnel. It's hoped that this program will provide US\$250 to each of 300-350 qualified veterans to help them purchase diving equipment. Oceanicworldwide.com





Mares Instinct

The hydrodynamic design of this second stage has several advantages. The side exhaust deflects the exhaled bubbles away from the diver's view, and the angled diaphragm combined with the VAD system ensures high performance in any orientation. Openings have been put in the back to minimize the likelihood of freeflows in strong current. The 12S first stage, which is a balanced diaphragm type, features DFC system for consistent flow and comes with two HP and four LP ports.

Mares.com



Aeris Atmos

Due for release shortly, the Atmos from Aeris has seen a revamp resulting in a more competitively priced, lighter weight, good all-around BCD. Aeris said that the combination of the wrap-around air lobes, which snuggle the diver's torso with the rear inflated hybrid air cell, gives the diver a better upright position at the surface. As you would expect to come from the Aeris stable, the Atmos comes with all the usual goodies: depth compensating cummerbund, padded backplate, seven stainless steel D-rings and an integrated weight system. Divers also have an option of a pocket knife mount, large zipped pockets and grommets for retractor mounting.

diveaeris.com

Halcyon Defender



The new Halcyon Defender Pro series of guideline devices expands upon the time-tested utility of Halcyon Defender spools by providing enhanced flexibility and unique operational advantages. The solid center that reduces spool size makes it small and light, enhancing portability, ease of operation and eliminates any risk of catching a finger. The Easy Grip adaptor provides a good grip even with gloves. Available in 30m, 45m, 60m (100ft, 150ft, 200ft) sizes with #24 line.

www.halcyon.net

Scubapro Meridian

The Meridian is a stylish multi-function wrist watch with Scuba, Apnea and Gauge mode. Displays are visually clear and easy to navigate. An intuitive +/- push of a button leads you to more advanced information and data. In Scuba mode, The Predictive Multi-Gas algorithm lets you enjoy the full benefits of carrying high oxygen concentration mixes (21%-100% O₂ compatibility) in addition to your main breathing gas. Meridian's ZH-L8 ADT MB algorithm calculates the decompression schedule for all possible gas combinations and in case you don't switch to the new mix, it adapts the calculation accordingly. The unique integrated Heart Rate Monitor senses your effort, incorporates it into the workload calculation and then adapts the decompression algorithm. The result is safer diving, because each diver is unique, because each dive location and situation is different. Scubapro.com



Lavacore

Thermal protection has vastly improved from the white polyester cotton Long Johns of yesteryear. Today, its amazing looks equally match superlative performance,, and Australia-originated Lavacore is a perfect example of this. The Lavacore range was developed, designed and trialed by a large team of water-sports enthusiasts, and it shows. For instance, a full gusset has been incorporated into the under-arm to offer exceptional arm movement and stretch, whilst an anti-bacterial inner fleece minimizes odour and eliminates bacteria growth. Thought has also gone into the problem of 'riding up', and the rear of the shirt benefits from an extended panel. Both male- and female-specific cuts are available in this adaptable range, offering the diver thermal protection either as a stand-alone garment or as part of a layering system. The four-way stretch high performance material is wind-proof, fast drying and has SPF 30+ protection. Small wonder that thermal protection has hotted up. www.lavacoreinternational.com



Nuytten rolls out the new Exosuit

The EXOSUIT, the next huge leap forward in the world of the undersea exploration, was unveiled at North America's largest diving show, Beneath the Sea, by Dr Phil Nuytten, designer and manufacturer of the revolutionary submersible.

Developed and built in North Vancouver by Nuytco Research Ltd, this hard metal dive suit allows divers to operate safely down to a depth of 1,000 feet and yet still have exceptional dexterity and flexibility to perform delicate work. The amazing technology of the EXOSUIT atmospheric diving system (ADS) maintains a cabin pressure of the surface and still allows the suit to bend due to a unique rotary joint invented by Nuytten.

The EXOSUIT, looking more like a spacesuit than a diving suit, incorporates an advanced design with operational capabilities far exceeding existing present day undersea technologies. The suit is a fully-certified submarine in the shape of a human being. It has its own life

support, which is capable of sustaining an operator for up to 50 hours. There is a fibre-optic tether supplying full network capability between the EXOSUIT operator and the surface. This allows suit telemetry (the monitoring of life-support systems, sonar management and communications), and high definition video to be sent to the surface. The EXOSUIT "flight pack" has thrusters that are more powerful and yet more sensitive to the operator's inputs than previous one atmosphere hard suits, allowing the pilot of the submersible to fly effortlessly through our oceans.

The EXOSUIT is a natural successor to Nuytco Research's original Newtsuit. Like its predecessor, the EXOSUIT will become an invaluable tool for research scientists around the globe, as well as commercial dive companies, military organizations and explorers.

Nuytten, 2012 recipient of the William Beebe Award (given to an individual who has made exceptional contributions to

underwater exploration) from the Explorers' Club, has been involved in undersea construction, technology and exploration for over 40 years. He invented and is the patentee for the "Remora" submarine rescue system (which set the standard for the U.S. Navy mobile submarine rescue system) and a series of deep diving submersibles, the DeepWorker and the Dual DeepWorker. He has also contributed to many Hollywood movies, including James Cameron's *The Abyss* and *Titanic* and formed part of an advisory committee, set up by Cameron, to tackle the Deepwater Horizon oil spill.

In a time when ocean exploration is very much a hot topic, Nuytco's latest creation, the EXOSUIT, is the next generation of undersea technology and will aid mankind in exploring the ocean depths, proving Canada helps lead the way in exploration technology. ■

"Take me to your leader"

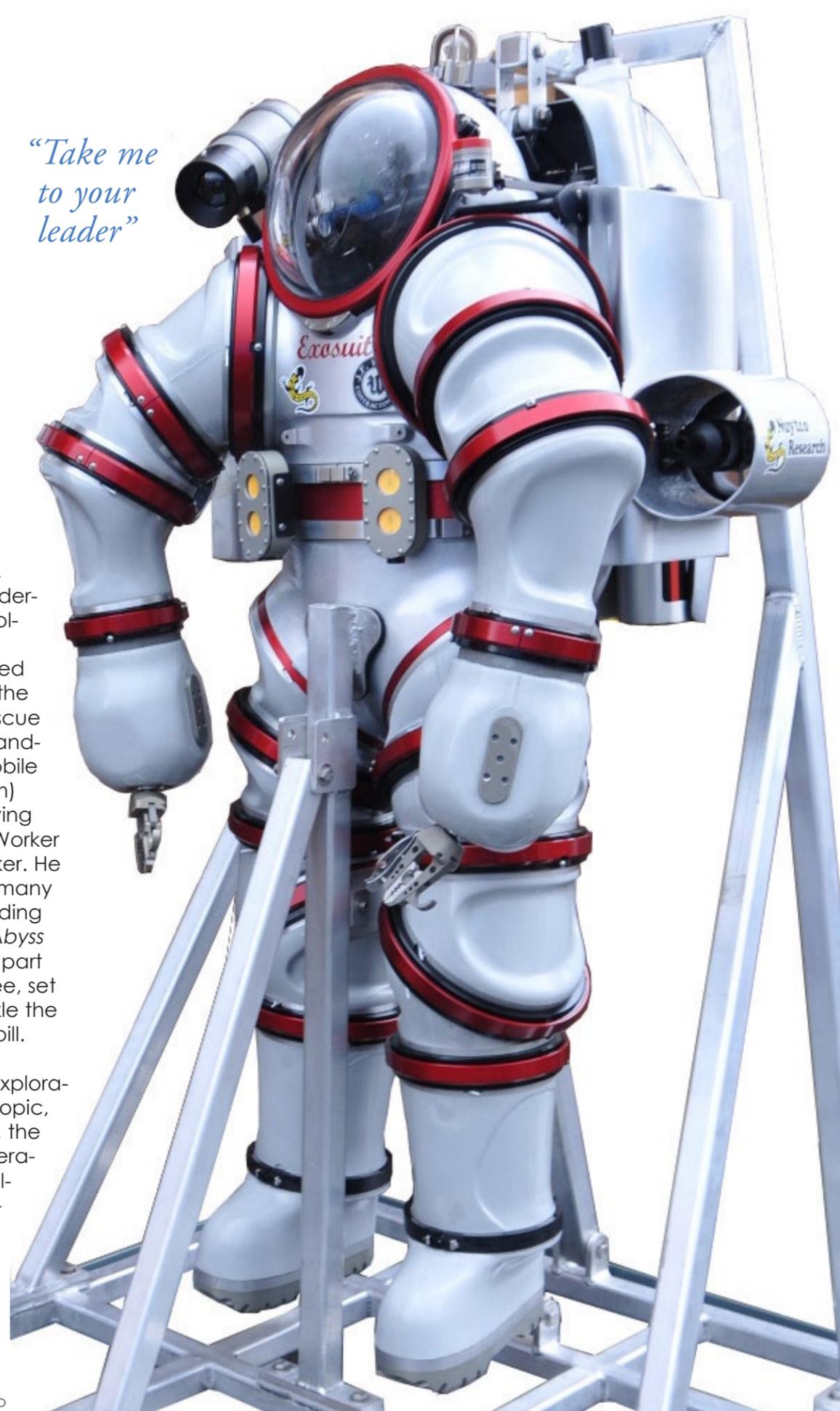
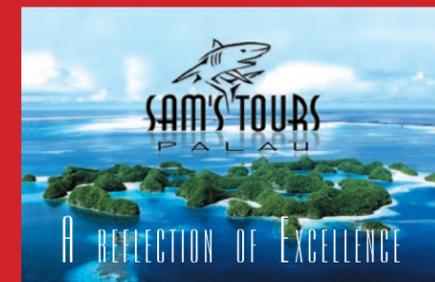


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The Oceanic Archipelago of

Madeira

Text and photos by Nuno Sá





Large anemone and diver at Baixa do Lobo

The oceanic archipelago of Madeira lies approximately 1,000km southwest of Lisbon, right in the middle of the Atlantic Ocean. Located between latitude 30° and 33°N, quite close to the Strait of Gibraltar almost the same as Casablanca (Morocco). Seven islands form the archipelago but only the biggest two, Madeira and Porto Santo, are inhabited and have a harbor and airport. The remaining islands and islets are divided in two small groups, the Desertas and the Selvagens, and are natural reserve parks due to their immense biological wealth.

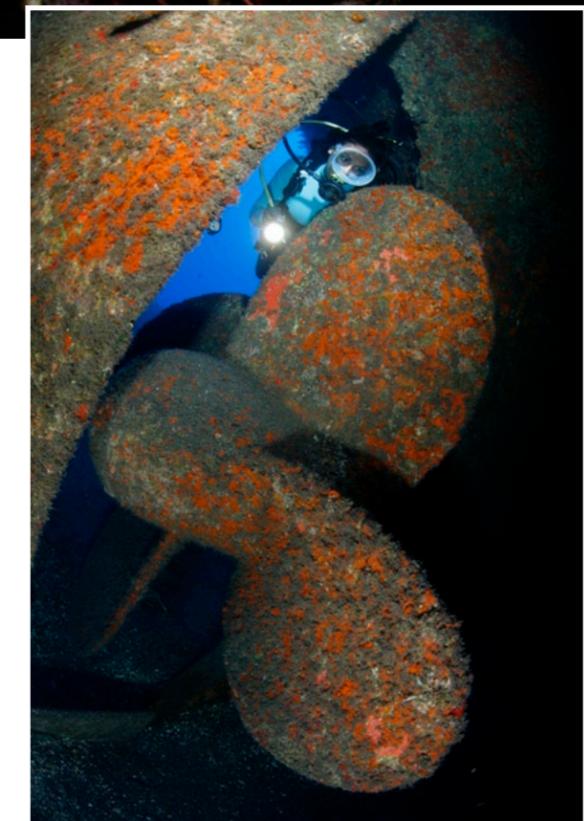
Geographically, located in a subtropical region and conditioned by the southern branches of the Gulf Stream, the archipelago has moderate climate all year round, with no great yearly thermal amplitudes. Average air temperatures range from a maximum of 23°C to a minimum of 15°C, and water temperature hovers around 22°C in summer, gradually lowering to 18°C at the end of the winter.

As in most oceanic archipelagos, the sea topography lacks a continental shelf, reaching high depths at relatively short distances from the shores. These characteristics allow the sighting of ocean specimens such as large pelagic fish, manta ray, turtles and marine mammals in diving spots close to the shore.

The archipelago of Madeira has deep blue waters, with excellent visibility (20 to 35m on a typical summer dive) and



Hikers enjoy the rugged Madeira landscape (above); Diver explores the wreck of *Bowbelle* (left)
PREVIOUS PAGE: Huge school of blue-striped snapper with diver at Garajau Natural Reserve





is home to some 360 marine vegetable species, together with 550 marine fish, 21 marine mammals and an enormous amount of invertebrates. The biodiversity of species that co-inhabit the waters of Madeira is unique worldwide. Being an oceanic archipelago, Madeira has not only Atlantic varieties of species, such as large pelagic fish, but also a wide-range of species from the North Sea to the Mediterranean, as well as some tropical species that have Madeira Island as their northernmost distribution limit.

Diving
Madeira Island offers a wide range

of diving sites, including several wrecks, cave dives and coastal dives. However the top dives on this island are concentrated in a small area called Garajau Natural Reserve. This protected area was the first exclusively marine reserve created in Portugal 23 years ago. Since then, the area has become populated by a wealth of flora and fauna.

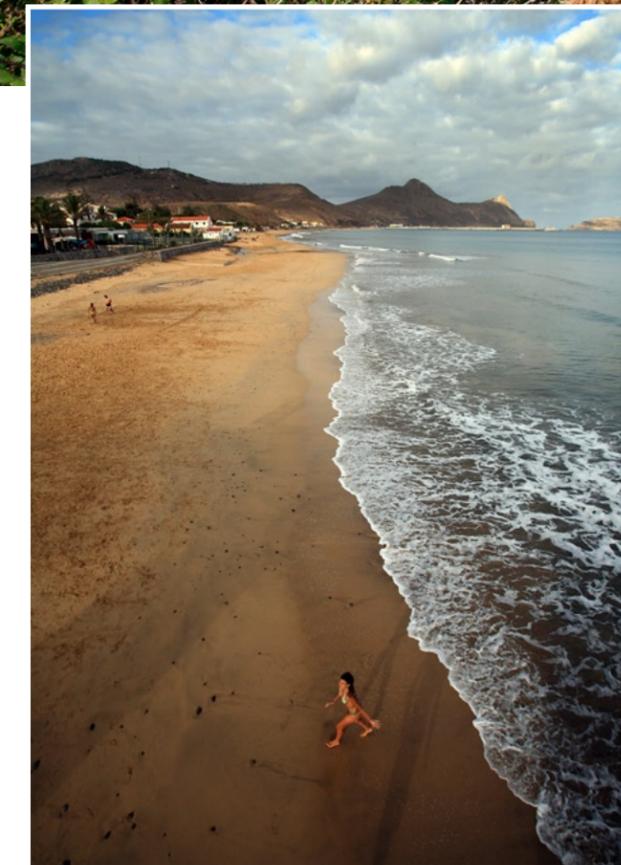
This 376-ha (929-acre) natural reserve is located on the south coast of Madeira, not too far from Madeira's capital, Funchal, and has several diving sites marked by yellow marker buoys. Some of these dives can be made directly from the coast, with some diving



CLOCKWISE FROM TOP LEFT: Diver explores cave at Roca Mar; Seahorse at Reis Magos; Dusty grouper and diver at Garajau; Diver and sabre squirrelfish at Garajau



The beautiful Madeira coastline; Diver and school of blue-striped snapper at Garajau (right)



Beach at Porto Santo

centers offering direct access to the dive sites from the bathing areas of hotels.

Dives in the reserve include several cave dives, including a 35m-long cave (gruta da ponta da Oliveira) with a large air pocket inside where divers can reach the surface. It is often visited by the world's most endangered sea mammal—the monk seal (*Monachus monachus*).

However, the Garajau dive site is by far the most visited of them all, and definitely the top dive site on the island. Depth starts at about 15m but quickly descends to about 30m. During the summer time, the reserve comes alive with shoals of pelagic fish, which pass through the archipelago with the Gulf Stream, such as white trevally or guelly jack, yellowmouth barracuda, almaco

jack and greater amberjack and bastard grunt. Also towards the end of the summer, the graceful and elegant mobula rays can sometimes be seen slowly gliding over the divers.

Here you can also encounter large specimens of barred hogfish and comb grouper apart from all other species that are abundantly present at any dive such as several species of moray eels and colorful anemones. However, a particular species captures the special attention of most divers—the dusky grouper, considered the symbol of the Garajau Reserve.

Dusky groupers at Garajau are very large—they can weigh up to 60kg—but extremely playful and curios, usually following the divers along the whole dive. Due to their longevity—they live up to 50 years—and hospitality, regular visi-



tors can recognize particular individuals year after year, such as Malhado (Spotty)—Garajau's oldest, largest and most famous grouper. Three or four dusky groupers can be seen on a typical dive at this site, many times competing for the divers' attentions and usually swimming beside the dive masters that have know them for several years.

Also fun to observe are the large colonies of brown garden eels that in some places cover the sand bottom looking at the divers and quickly vanishing in the sand as they approach.



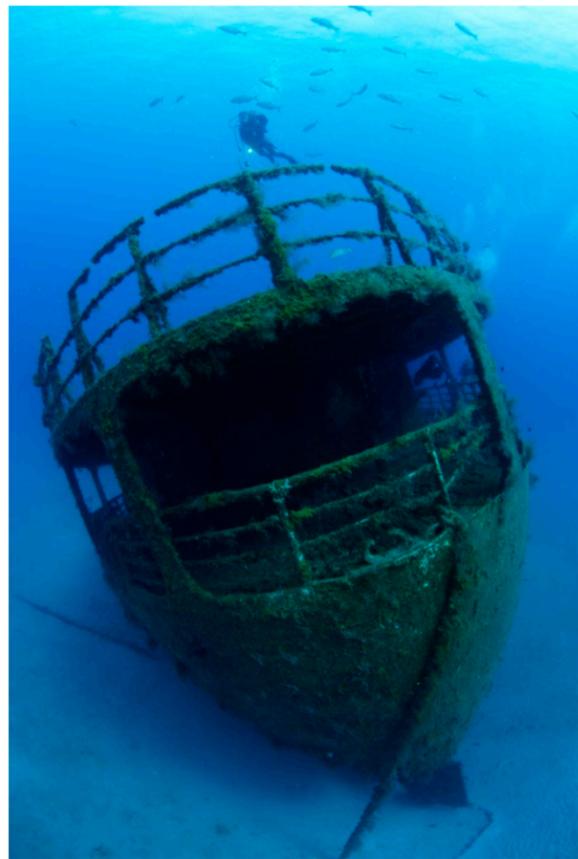
Porto Santo

Just 27 miles off the high rocky cliffs of Madeira, lies the small island of Porto Santo. Although close together these island's landscapes could not be more different, as Porto Santo is a small island with a large coastal plane bathed by five miles of golden sandy beaches.

Less touristic than Madeira Island, it has a calm and easygoing trend to it and is also home to some of the archipelago's

best dives and most pristine waters. With daily three- to four-hour-long boat rides and flight connections, visiting both islands for a one-week dive trip is certainly possible and recommended. Porto Santo also has a large marine protected area, with several dive sites in its borders. Distances to dive sites are, however, larger, and a short boat trip to the main dive sites is necessary.

Porto Santo is home to a huge biodiversity of marine species, which ranges from



CLOCKWISE FROM TOP LEFT: : Diver at *Pronto* wreck; Diver at Desertas Pedregal; The *Madeirense* wreck at Porto Santo; Cleaner shrimp services moray eel at Roco Mar; Fangtooth moray eel at Roco Mar



Madeira

CLOCKWISE: Rugged coastline of Madeira; Map of Madeira archipelago; Diver and big red seastar; Diver on *Bowbelle* wreck

dusky grouper, comb grouper, moray eels to large-sized common and round stingray, shoals of yellowmouth barracuda swimming in circles, white trevally, almaco jack and skipjack tuna.

The best and most well-known dive site in Porto Santo is without a doubt the *Madeirense* shipwreck. This dive alone makes a trip to this island worthwhile. The ship *Madeirense*—a ship that was used for decades to connect Madeira to Porto Santo—was sunk on purpose for diving in the year 2000.

Nowadays, it is filled with a panoply of diverse species from resident dusky groupers to large shoals of other fish. As in Garajau

Reserve, these groupers are very playful and enjoy the company of divers. As soon as divers start the decent to the wreck that lays verti-

cally on the 34m-deep sandy bottom, large schools of fish can be sighted and Big Lips—the wreck's most curious grouper—usually leaves the wreck to meet the divers as they descend.

When approaching the top of the ship, we can usually sight large shoals of almaco jack, white trevally and yellowmouth barracuda all concentrating on the capture of small bogue (*Boops boops*) that wander in their thousands around the wreck. Exploring the inner areas of the ship's bow, we may find other less curious dusky groupers and comb groupers always keeping an eye on the sandy bottom, where resting common stingray and spiny butterfly ray are usually sighted.



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CLOCKWISE FROM LEFT: Squat or sexy anemone shrimp, *Thor amboinensis*, at Roca Mar; Diver spies large triggerfish at Mamas; Nudibranch at Roca Mar

Desertas and Selvagens Islands

Desertas Islands are a group of three major islets located 22 nautical miles away from Funchal and have been a natural reserve since 1995. Visiting these islands is possible with some dive centers and is a three-hour trip from Madeira Island.

The protection of the Desertas Islands and the launching of the natural reserve was mainly caused by the need to create conservation measures for the monk seal, whose population was in danger of extinction in Madeira. This species, classified as threatened (in critical danger) by IUCN, is the rarest seal in the world but can still be sighted on these islands. Its population in the archipelago of Madeira seems to be recovering now. It is currently estimated at around 25–35 specimens. Increase in population tends to increase the distribution area, which now includes some

spots in Madeira island.

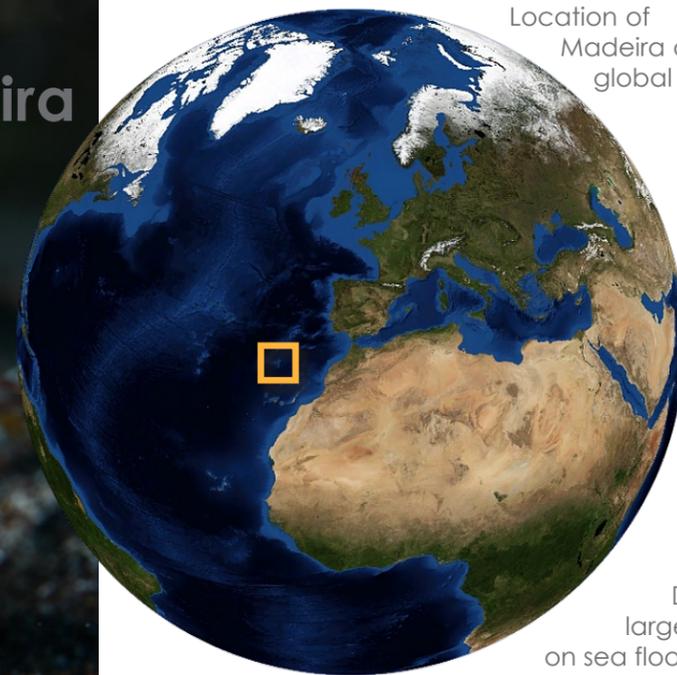
Only half of the reserve can be visited by divers, as the area most visited by monk seals is completely forbidden to navigation, bathing or diving.

The coastal area of Desertas is mostly characterized by steep cliffs only accessible through some rolled gravel beaches in some coastal spots. Its landscape is sculptured by constant sea and wind erosion, extending below the sea level where the rocky formations are true works of art from Mother Nature.

Diving in Desertas can mean a chance to witness large shoals of yellowmouth barracuda, white trevally, almaco jack and great lumberjack, and manta ray. In addition, it is also possible to encounter a sea wolf!

The Selvagens Islands, on the other hand, are located 163 miles south of Madeira and also have three major

Madeira



Location of Madeira on global map

Lizardfish (left)
Diver with large stingray on sea floor (below)

islands. However, diving activities are subject to permission issued by the Madeira Natural Park, and its distance from the other islands in the archipelago is enormous, which vastly limits the ecotourism activities in these islands.

All together, this group of islands has a bit to offer to every diver, from beautiful wrecks, cave dives, pristine waters, a healthy sea life, very reasonable weather year round and just a two- to three-hour flight from many European capitals.

Together with beautiful landscapes, hundreds of kilometers of walking trails, excellent bathing areas and the opportunity to see several species of whales and dolphins on a whale watching trip, Madeira is definitely a destination for keeping in touch with nature.

Nuno Sá is an underwater photographer and author based on the Azores. Visit: www.photonunosa.com

HYPERBARIC CHAMBER: There is one hyperbaric chamber available for the whole archipelago located on the island of Madeira.

DESERTAS: 22 nautical miles from Funchal.

PORTO SANTO: 42 nautical miles from Funchal.

GETTING THERE: SATA and TAP are the Portuguese airlines with daily connections to Madeira. Lufthansa, Spanair, Transavia, Continental, Easy Jet and several European airlines have regular direct flights to Madeira and Porto Santo.

GETTING AROUND: Connections from Madeira to Porto Santo: By boat – Porto Santo Line www.portosantoline.pt By plane – SATA www.sata

Madeira Tourism
www.visitmadeira.pt



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DONG ENERGY A/S

A primer on

Island Biogeography

— *And the common features of decommissioned oil rigs, windfarms, wrecks and artificial reefs*



As most anglers and many divers know by first hand experience, man-made structures on the seabed, whether put there deliberately, such as an artificial reef, or by accident (e.g. a shipwreck) can become a home to numerous species of fish and other wildlife. So, why are these structures sometimes a help to wildlife?

What matters is the physical presence of substantial objects on an otherwise featureless seabed. Granted, many man-made structures that end up on the seabed may also pollute—such as ships going under carrying large quantities of fuel or constructed with materials that may be toxic to marine life—hence, the need to thoroughly clean and strip down decommissioned vessels destined to become artificial reefs. But that side of the matter we'll leave for another discussion.

A structure on the seabed such as a shipwreck does not only provide shelter for fish and other marine life but in many cases also constitutes a physical substrate upon which sessile organisms, such as corals and seaweeds, can attach themselves. In this manner, the structure may become a habitat in its own right, and as such perhaps even an important one. Consider the scenario where we have two comparable shipwrecks, one of which is positioned in a diverse area with plenty of

Text by Peter Symes





corals or other natural structures, while the other is placed on a barren sandy or muddy seabed. In the latter case, this artificial structure may become a habitat for a range of creatures, which would not survive on the plain bottom. Such a wreck constitutes a virtual island in the middle of a barren expanse. And this is where the concept of *Island Biogeography* comes in.

The focal point of this scientific discipline is the species richness of isolated natural communities. Originally, this field of research

was developed to study the biodiversity on actual islands, but the theoretical framework was soon extended to the concept of islands in a more generalised sense—such as an oasis in the middle of a desert, patches of bogs in the middle of farmland or expanses of grassland surrounded by highways or urbanisation. In other words, in terms of biogeography an “island” is any area of suitable habitat surrounded by an expanse of unsuitable habitat—a

definition that also clearly fits a shipwreck laying in sandy area. Henceforth and within the scope of this article, the term, *island*, will refer to this wider theoretical concept rather than only actual islands.

Connectivity and pathways

In addition to their significance as habitats for residing species, islands may also play an important role in facilitating migration by providing the proverbial pit-stop or stepping stones for

Where islands are placed close enough together they may constitute what is termed a habitat corridor, which is a pathway or network along which species can migrate across expanses that would be otherwise impossible or prohibitively difficult to cross.

creatures on the move. These could either be dedicated migratory species where the individuals move due to their own locomotion—e.g. trekking birds—or sessile species that propagate through dispersion of egg, larvae, pollen, seed, etc. Where islands are placed close enough together they may constitute what is termed a habitat corridor, which is a pathway

or network along which species can migrate across expanses that would be otherwise impossible or prohibitively difficult to cross. Such immigration is obvi-

In terms of island biogeography, shipwrecks may constitute an island.

Notice how the propeller and the rudder of this shipwreck in the Danish straits have become a substrate for soft corals such as dead man's fingers (*Alcyonium digitatum*) as plumose anemone (*Metridium senile*). *M. senile* adheres to rocks, boulders, man-made structures, pebbles and shells.

It favours places where the current is strong, where it can catch small organisms floating past. Smaller forms inhabit the lower shore where they are found under stones, beneath overhangs and in shaded places

ously largely dependent on the distance of an island from the source of colonising creatures. Islands that are more isolated are less likely to receive immigrants than islands that are less isolated, and thus also likely to harbour less species. This is known as the *distance effect*.

Number of species

How many species can live on an island? This depends on a number of factors related to both isolation and island size. Among other things, it hinges on the relative balance between immigration and extinction. All other factors being equal larger islands tend to maintain a higher number of species and individuals. Species may actively target larger islands for their greater number of resources and available niches and larger islands may accumulate more species by chance merely by virtue of being larger. Larger habitat size also reduces the probability of extinction due to chance events.

Smaller islands, on the other hand, are more susceptible to fluctuations and disturbances in their environment. For example, epidemic diseases may easier wipe out an entire population on a small island. Populations on less isolated islands are less likely to go extinct because individuals from the source population





DONGENERGY.DL

At Horns Rev, the Danish Energy company Elsam (now DONG Energy) built the first offshore wind farm in the North Sea. A total of 80 Vestas V80-2.0 MW units, capable of producing 160 MW, were installed

and other islands can immigrate and replenish the island population before it becomes locally extinct. This is known as the *rescue effect*.

The literature in species-area relationship is not unanimous but most plots of this relationship clearly demonstrates an equilibrational mechanism that regulates the number of species present on islands.

Recolonisation and species composition

In stable communities, population numbers of component species are generally in rough balance, maintained by density-dependent feedback effects as illustrated by the curves (right), but what happens if this equilibrium is perturbed? Does the system just bounce back to where it was? In a now classic study, the insect fauna on a small mangrove island in the Florida Keys was

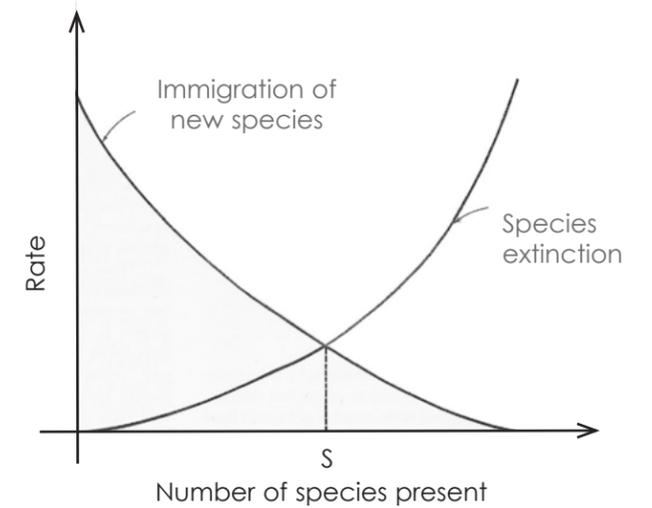
censused. All animal life was removed by putting a cover over the islet and pumping in some toxic substance which killed off all the animal life while leaving plants unharmed. Thereafter, the islands were observed to see how fast they were re-colonised. Once a steady state was achieved, the island had roughly the same number of species present as before they were poisoned. Interestingly, the composition of species was different. Evidently, conditions on the island did not specify which particular species shall live there but determined roughly the number of species that could live there.

Continued censuring also demonstrated that while the number of species living on the island remained the same, the composition changed continually as new species arrived and old ones became locally extinct. As

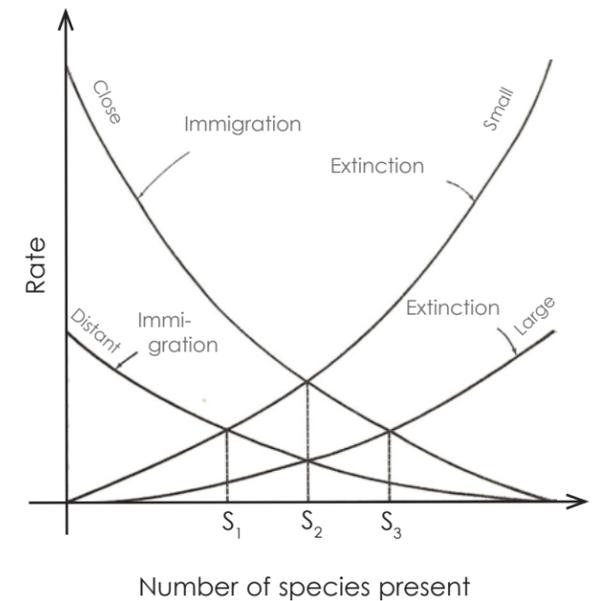
“Horns Rev is situated in an extremely tough environment with strong wave action, which means, for example, that seaweed forests, together with the small fish that live in them, cannot establish themselves. We would therefore expect the positive reef effects to be even greater still in a park located for example in the more sheltered Kattegat.”

—Claus Stenberg, Biologist

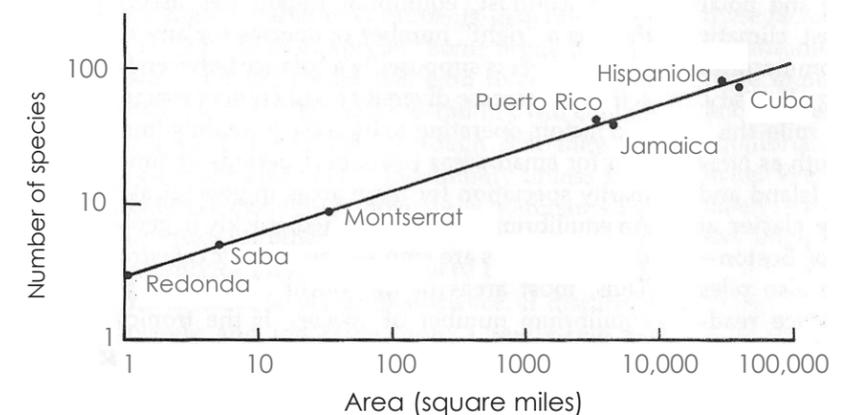
The equilibrium theory of diversity on islands. The immigration rate declines as more species reach the island from a mainland source because fewer migrants will belong to new species. But extinction rate rises as immigration rate declines because as the island becomes more crowded with species, intensity of competition increases and less ecological space remains for new species. The *equilibrium number* (S) lies at the crossing of the curves.



Predictable change of equilibrium number of species with changing size of island and distance to continental source of immigrants. Immigration rates will be higher on close islands, thus raising the immigration curve and pushing equilibrium number to the right (S_3). Equilibrium number will also rise on large islands, but for different reason: the extinction curve is lowered because the island can hold more species. Immigration rates are low to distant islands. The immigration curve is thus depressed and the equilibrium shift to the left (S_1). Equilibrium value also falls for small islands because space is more limited and extinction rates are higher.



Number of species of reptiles and amphibians plotted against island area on logarithmic scales for West Indian islands. The close fit to the straight line with a slope of about 0.25 means that numbers of species increases about one-fourth as fast as island area. Equilibrium theories of diversity predict that number of species should increase in regular way with island area, other things being equal.



REPRODUCES FROM "A VIEW OF LIFE", BY LURIA, GOULD AND SINGER, 1981

REPRODUCES FROM "A VIEW OF LIFE", BY LURIA, GOULD AND SINGER, 1981



the equilibrium was approached, new species had increasing difficulty to gain foothold as successful colonists usurped space and resources, preventing others from settling in. At equilibrium, no new species could be added unless old ones disappeared.

Artificial reefs are not a replacement for natural ones

Recent studies of various shipwrecks in the United Kingdom and the Red Sea have shown that these artificial reefs often create new and different types of habitat than natural reefs. In 2004 the

former Royal Navy frigate *HMS Scylla* was scuttled off the coast of Cornwall, UK, to become an artificial reef. From the beginning, the wreck was closely monitored by scientists observing how the marine life interacted with it.

According to Dr Keith Hiscock, an associate fellow at the Marine Biological Association in Plymouth, who carried out the majority of the colonisation research, the researchers were in for a few surprises. The first two years saw a massive colonisation of sea urchins—a species which are normally found under boulders close to shore. Then wrasse arrived and



Scylla Reef was created when the former Royal Navy frigate *HMS Scylla* was placed on the seabed in Whitsand Bay, southeast Cornwall, after a series of controlled explosions, on 27 March 2004. Since placement, the reef has established itself as a centre for scientific research, a habitat increasingly rich in marine life and a unique destination for recreational divers

ate the sea urchins. A coral on a nearby natural reef only 30 meters from the wreck took three years, but once established on the wreck, they spread prodigiously and unexpectedly quickly.

Pink seafans on the wreck were also growing surprisingly fast, Hiscock told BBC News. They were thought to grow about one centimetre a year, but some had grown 40cm in just a few years, he explained.

Windmill parks

About ten years ago, the first large scale off-shore wind farm in the world with 80 turbines was erected on Horns Rev (also known as Horns Reef), which is a shallow area in the eastern North Sea, about 15km (10 miles) off the western-most point of Denmark.

In this area, which is mostly less than 20 meters deep, the number of fish species has increased since the erection of the windmill park, according to a study published in 2012 by DTU Aqua, the Danish National Institute of Aquatic Resources. The turbines at Horns Rev rest on foundations that are driven deep

Shipwrecks as 'islands' on the seabed, providing habitat and constituting a network of habitat corridors through which species can propagate. Isolated islands are less likely to receive immigrants and few islands may become critical links in tying together a network

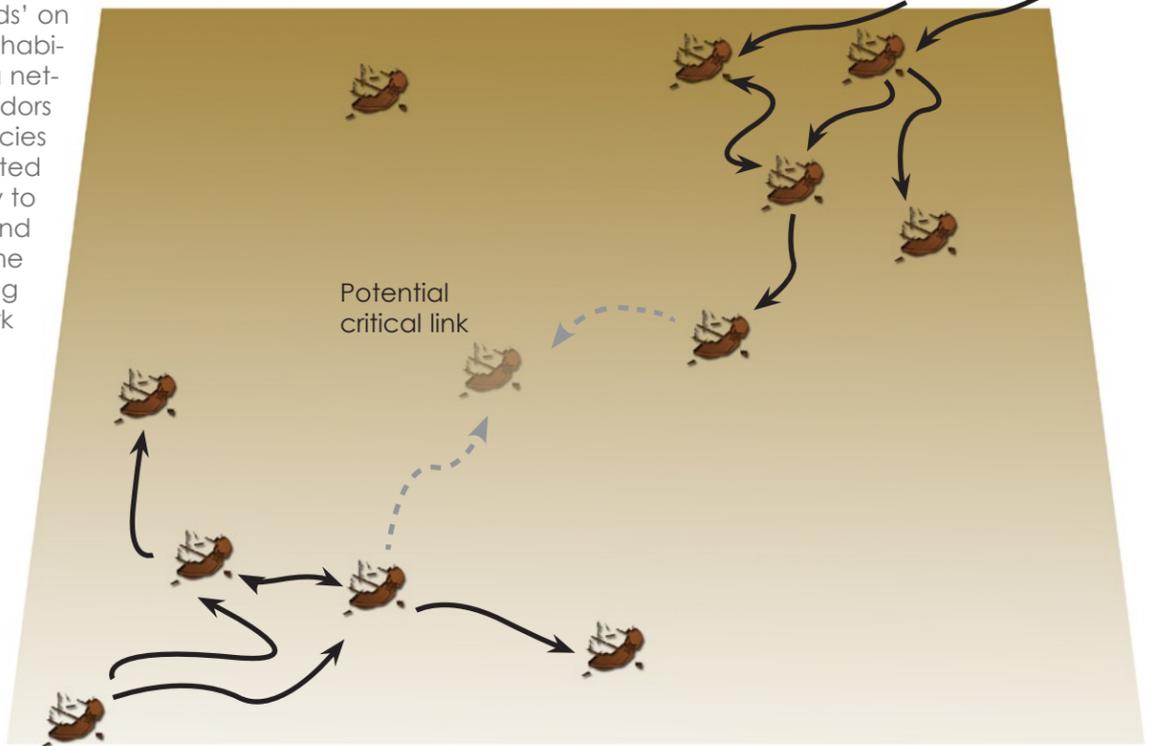
into the seabed and are protected by a rim of surrounding boulders, which prevent currents from eroding the base. The study suggests that these stone structures also act as artificial reefs, providing enhanced conditions for fish, with an abundant supply of food and shelter from the current, and

attract fish like a rocky sea bottom. As such, the turbines have created habitats for a number of new species in the area. "Species such as the goldsinny-wrasse, eelpout and lumpfish, which like reef environments, have established themselves on the new reefs in the area—the closer we came to each

turbine foundation, the more species we found," biologist Claus Stenberg stated in a DTU newsletter.

Oil rigs

When gas or oil rigs outlive their original purpose, they have to be removed. This process is called



platform decommissioning and can be accomplished in four different ways: total removal, partial removal, toppling and leaving-in-place. Removing the rigs could be devastating to resident and nearby marine life and create a number of pollution problems in the process, so leaving part or all of abandoned platform structures in place has become an increasingly popular alternative.

By shearing off the top of the rig and leaving the tall steel jacket and support struts, it maintains what in many cases has already become a thriving habitat for marine life and at the same time

saves oil companies money on their decommissioning obligations.

This process has become known under the popular name "Rigs-to-Reefs". It should also be noted that as oil platforms contain toxic materials and are often surrounded by contaminated debris, their complete removal is warranted in some cases. Research suggests that fish populations around the platforms are healthy, stable and



Size matters. On Rockall, a small and isolated island in the North Atlantic, small populations of sea birds seem to barely be clinging on for their dear life. Yet, it constitutes a habitat. Also beneath the surface

"Scylla does not emulate rock reefs. You can't say, 'Oh heck, we've put so many scallop dredges through the rock reefs that we've wrecked them; let's put down another frigate as a replacement.' No, it's a different sort of habitat."

—Dr Keith Hiscock, Marine Biological Association in Plymouth

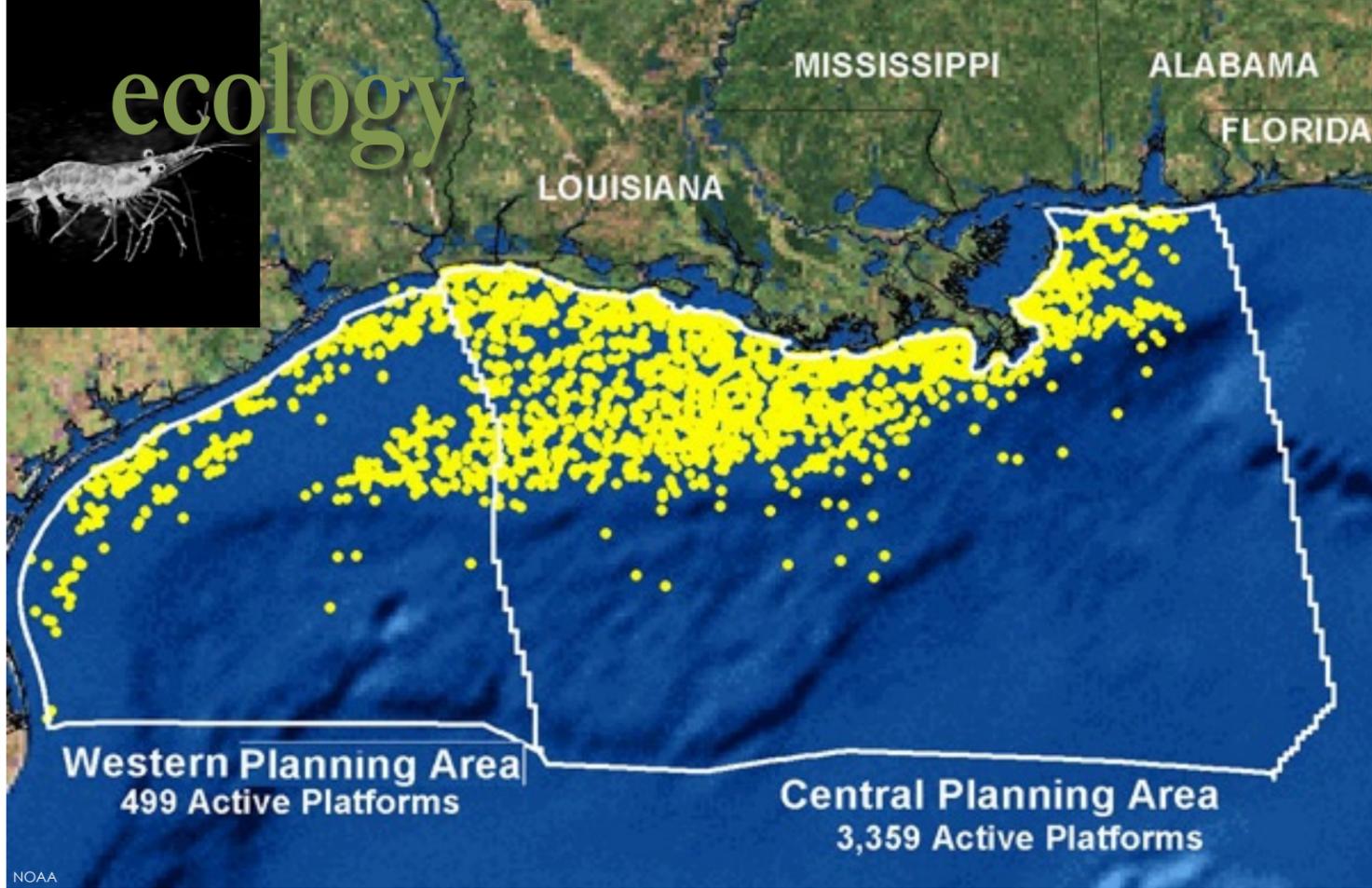


Chart of U.S. Gulf Coast platforms (above); Constructing artificial reef using concrete blocks (below)

reproducing well.

In their 2011 report, *Rigs-to-reefs: Will the deep sea benefit from artificial habitat?* authors Peter I Macreadie et al pointed out that "... decommissioned rigs could enhance biological productivity, improve ecological connectivity, and facilitate conservation/restoration of deep-sea benthos (e.g. cold-water corals) by restricting access to fishing trawlers".

Preliminary evidence indicates that decommissioned rigs in shallower waters can also help rebuild declining fish stocks. Conversely, potential negative impacts include physical damage to existing benthic habitats within the "drop zone", undesired changes in marine food webs, facilitation of the spread of invasive species, and release of contaminants as rigs corrode.

The combined ecological and economic benefits of maintain-

ing parts of the decommission rigs in situ has spurred many states, in particular in the United States, to legislate the matter. In Texas, the Artificial Reef Act of 1989 directed the Texas Parks and Wildlife Department to promote



and enhance the artificial reef potential off Texas. To fulfill this purpose, the Department developed the Texas Artificial Reef Plan, which was adopted by the Parks and Wildlife Commission in 1990. In California, a similar law was signed into effect by the then-governor, Arnold Schwarzenegger.

Natural islands

These theories and models also have wide applications in management of wildlife resources, including Marine Protected Areas and national parks. For these reserves to become successful, the same principles apply. Protected areas need to be both big enough to sustain diverse populations and a sufficient number of species, and to be placed where they can serve as a reservoir for migration. ■



A structure on the seabed such as a shipwreck does not only provide shelter for fish and other marine life, but in many cases also constitutes a physical substrate upon which sessile organisms, such as corals and seaweeds, can attach themselves

Patagonia's Killer Whales Orcas of Valdes

Valdes orca stalks seals at water's edge by using a unique hunting strategy

Text and photos by Frank Wirth
Translated from German
by Dr Ingrid Visser

The Valdes Peninsula is located in the north east of the Argentinian province of Chubut on the Atlantic coast. Approximately 3625 km² in size, it is an important nature reserve and was classified a World Heritage Site by UNESCO in 1999. The Peninsula consists mainly of barren landscapes with small salt lakes scattered throughout. It is of particular importance because of the marine mammals (sea lions, elephant seals and fur seals) that inhabit the coastline. Southern right whales can be found in Golfo Nuevo and Golfo San José, protected bodies of water located between the peninsula and the Patagonian mainland. Peninsula Valdes however, has become renowned for the Orcas and the spectacular hunting technique they use to catch sea lion and seal pups off the beach, something so called an 'intentional stranding' by researchers.

The Orcas of Valdes

Orcas have been observed hunting around the Cape of Punta Norte since 1976. Two male orcas, named Bernardo and Mel, taught the whole population how to successfully catch sea lion pups off the beach, a technique that is now transferred from generation to generation. Nowadays, up to 13 resident orcas

showcase their sophisticated hunting skills as they pursue young sea lion pups playing on the beaches. If you have ever seen footage of such an attack, it was without doubt filmed at Punta Norte, on a 50 meter wide so-called 'attack channel'. This area is not accessible for tourists. Only photographers or filmmakers with a special government permit are allowed

to enter this area.

There is a second hunting area on private property ground of Estancia La Ernestina, where the Punta Norte Orca Research Project (PNOR), founded in 2004, is based. These beaches are also prohibited for the public, yet a small group of guests of the Estancia is permitted to enter the beach area, guided by

Juan Capello, the owner of the Estancia and one of the principal scientists of the Orca Project. Photographs taken by participants of our expeditions are evaluated and given to the PNOR for identification purposes.

The Hunt

The beaches of Peninsula Valdes are sur-

rounded by shallow reefs that emerge at low tide. Between these reef formations channels are formed, which still allow water flow at low tide. These channels are used by the orcas while they hunt, hence the name, 'attack channels'.

The orcas are only able to hunt for the sea lion pups on the beaches when tide, wind and weather conditions allow the





THIS PAGE: Orcas teach their young how to intentionally strand to catch seals

picture of their surroundings. The animals also possess the ability to determine whether the prey is an adult animal or a juvenile. Instead of wasting energy on chasing experienced, fast seals, the orcas rather concentrate on the less challenging and less heavy, young pups. The chances of capturing an adult sea lion are less than 20 percent,

whereas catching younger animals offer a chance of more than 50 percent. In addition, it is possible that the soft, tender meat of the young pups tastes better to the orcas.

The orcas are also known to display inventive tactics that trick the sea lions. A part of the group of orcas will swim fast and noisily towards their prey, which in turn



flees in the opposite direction where another orca is waiting to catch the pup. The attack is fast. When the timing is right, the orca rides a wave right up onto the beach, snatches up a sea lion pup, and then rolls back out into the water with the next wave.

Apart from the sea lion pups, the orcas also hunt for young ele-

phant seals. In March 2011, at the attack channel of Punta Norte, we were able to witness, and get footage of an extraordinary attack by a female orca named, Marga, catching a young elephant seal weighing around 500 kg!

animals to get close to the shore. Typically, the orca can start hunting from three hours before high tide to three hours after high tide.

When the tide is rising, the orcas have the opportunity to manoeuvre closer to the beach where the sea lions frolic, the main prey of the orcas of Valdes.

Southern sea lions (*Otaria flavescens*) at Peninsula Valdes give birth in January. Each year between February and April, the small 'nurseries' of sea lions pups start exploring their surround-

ings and play in the shallow surf close to the beach. With their first attempts at learning how to swim and unaware of danger, the pups are most vulnerable in these first few weeks and become an easier target for the orcas to prey upon. Even their mothers are slow to warn and protect them, as the orcas begin the approach.

Very often we can watch the orcas patrolling the beach. With their echolocation skills, the orcas continuously scan the shallow water and receive a detailed





Training the young
Often the orcas spend time training their young in the attack channel. Learning these sophisticated hunting skills, something referred to by researchers as an "intentional stranding", can be a dangerous undertaking. Therefore, in order to prepare their young for the real hunt, the orcas will simulate attacks to allow their young to learn how to get close to the beach without stranding themselves perma-

nently. Observation of the orcas shows clearly that the young animals are being taught to apply specific timing to their attacks. While the successful capture of a sea lion pup has many elements, the most crucial skill required is calculating how to utilize the waves to reach their desired prey and more importantly catching the next wave back to the safety of the ocean.

The orcas also engage in a "cat and mouse" training technique in open water. After a sea lion pup has been snatched off the beach by one of the experienced hunters it is not killed and eaten straight away, but offered to a young orca and used as a tool to teach how to attack and kill a sea lion in open water. The orcas will 'play' with it. They slap it around with their tails like a game of tennis before sharing it as a meal. What appears to the casual onlooker as brutal is for the orcas nothing more than learning a hunting technique vital to the survival of the next generation of orcas of the

Peninsula Valdes.

The hunting season of 2011 turned out to be excellent at the attack channel in Punta Norte. Researchers were able to clearly determine that two young orcas named, Llen and Pao, from the so-called Maga group, used the hunting technique successfully for the first time. The four- and eight-year-old siblings performed a spectacle beyond compare and didn't even seem to get enough of it.

What do orcas eat?

Orcas are the greatest predator of the seas. They feed on several fish species, sharks, rays, an extensive list of marine mammals and occasionally seabirds and turtles. Their diet is variable and often geographic, or population specific, and they have developed various different hunting techniques in order to sustain themselves. Within certain areas, orcas have developed

preferences for certain prey species. However, they are also known to travel vast distances to get their favorite food. There are reports of orcas that migrate from the high Arctic to the mid-Atlantic to feed on tuna.

The orcas of Valdes have only a limited amount of weeks to hunt the sea lion pups, correlating directly with the pupping season. March and April are the two main months to hunt for Southern sea lions, whereas in September and October, they have a chance to hunt for elephant seals. The rest of the year, the orcas must sustain themselves by feeding on other prey. The rich biodiversity of the Patagonian coast allows for their diet to vary most likely between rays, various fish species



COUNTER-CLOCKWISE FROM RIGHT: This series of images captures the frame by frame action of a killer whale tossing a seal pup with its tail fin. Nicknamed, pup tennis, it looks to be a cruel treatment of prey to the outsider, but like cats play with mice before eating them, the orcas let their juveniles play with their food to learn valuable hunting skills important for survival



and whales and dolphins.

Importance of research

Observation and data collection is important, since the orcas of Patagonia are one of two groups of orcas in the world that use the dangerous and unique hunting strategy of intentional stranding.

The Punta Norte orca popula-

tion currently consists of only 23 animals of which 13 demonstrably hunt on the beaches. Photo identification is the most important tool to identify the individuals and keep track of the size of the pod. The ID database must be updated annually. Various orcas have been split into groups for identification and research purposes, such

as the Maga Group, the Jazmin Group, the JC Group and the Mel group.

Mel is one of the two male orcas who taught the whole population how to successfully catch sea lion pups off the beach. He was last seen on 16 March 2011 when he only briefly showed up in the attack channel. Mel

is approximately 50 years old, which is beyond the average life span of 30 years for a male orca. However, Mel has surprised us before by disappearing for a longer period of time, after which he returned to the attack channel in 2009 and 2010 where he hunted successfully for weeks on end.

Since April 2012, Mel's female

THIS PAGE: Orcas display their ingenious hunting strategy of intentional stranding in order to capture seals at the water's edge





partner has been observed regularly with a young male. This animal is an unknown individual and has yet to be identified as offspring from the Punta Norte orca pod. On 14 April 2012, the young animal was observed hunting in the attack channel for the first time.

There are only a few people in the world that can positively identify the orcas of Punta Norte, including orca scientist Dr Ingrid Visser and Juan Capello from the Punta Norte Orca Project, wildlife warden Roberto Bubas and Hector Casin.

Casin is a conservationist and is responsible for photographers and film crew that have a special government permit to enter the area of the attack channel. Every year, he is stationed right at the attack channel for six to eight weeks. He collects data and communicates with the research team of PNOR. All the data collected enable

them to get a better picture of the lives of these killer whales. The photos and film footage from participants of the expedition groups is a helpful tool in gathering more information, since it's often small details that make an ID possible.

Orca expeditions

Every year, orca expeditions are organized in a two-week Orca Camp in Patagonia for nature and wildlife enthusiasts, students and amateur photographers. In close collaboration with scientists at the Punta Norte Orca Research (PNOR) station and under guidance of New Zealand orca scientist, Dr Ingrid Visser, and experienced marine biologists, participants visit the orcas of Punta Norte for eight days. In addition to viewing the orcas as they demonstrate their predatory techniques, participants will help with

the collection of research data, which includes conducting photo and video ID for the Punta Norte Orca researchers. Snorkeling with sea lions, kayaking and cycling around the peninsula is also part of the program.

The second portion of the trip involves the exploration of Patagonia's remote coastal and steppe-like areas and its magnificent wildlife further south. Participants have the chance to encounter numerous penguin colonies with Magellanic and rockhopper penguins, Commerson's and Peale's dolphins, various seabirds and the animals from the Pampas, such as the Darwin ostrich, guanacos, maras and foxes.

In addition to the Orca Camp, professional photographers and film crews can also elect to go on customized expeditions. The attack channel—the zone that the orcas use most to patrol and hunt—is a narrow band of beach

Orcas wave their tail fins at the moon over Patagonia; Location of Patagonia on global map (right)

only 50 meters wide between two underwater reefs. It is not open to the public, but is limited exclusively to photographers and film makers with a special permit issued by the Argentinian government. At times, the orca may only be 20 meters away from the photographers.



The relatively high cost of the permit and the difficulty obtaining the permit limits the size of the group. Per time period and on set dates, there are only six spaces for photographers available. ■

For more information on the various orca expeditions or professional film and TV productions, please visit www.patagoniaproject.com or email Frank Wirth at whales@gmx.net.

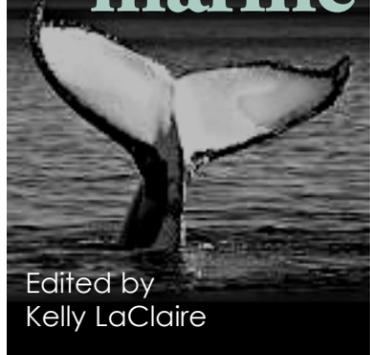
Frank Wirth has worked in the marine mammal tourism industry worldwide for more than 20 years. Having travelled to the Valdes Peninsula since 1993, he guides the orca expeditions and coordinates film productions. Considered to be one of the more experienced guides in the area—knowing everything there is to know about the orcas and their behavior—Wirth organizes the daily schedules for photographer teams and nature enthusiasts.

Dr Ingrid Visser is New Zealand's only scientist specializing in orcas and one of the lead scientists and co-founders of PNOR. She works in cooperation with Wirth during the orca expeditions. Additional professionals of Punta Norte include Juan Capello and Hector Casin.



Location of Patagonia on map of Argentina





Edited by
Kelly LaClaire



NOAA

Dolphin Gangs?

Maybe I just haven't been paying attention, maybe it's common knowledge, but when I learned that a disoriented and stressed dolphin was stranded in a wetlands in Southern California, USA, because a gang of hostile males had chased him—in fact, intimidated him—into those shallow waters, I was more

than just a little surprised.

Did dolphins really form gangs? I wondered.

Well, it turns out they do, and it's not all that uncommon.

In March of this year, scientists from the University of Massachusetts, Dartmouth, released the results of a five-year study of more than 120 adult dolphins in Shark Bay, Western Australia. Their findings specifically stated that male bottlenose dolphins formed gangs to protect their females and drive off other males who may be potential suitors.

Richard Connor, a co-author of the study and a biology professor who has studied dolphins for more than 20 years, said that male dolphins' social lives can be very passionate and severe. "They do get in fights," he said. "They are in these incredible gangs—we call them 'alliances.' There are big fights between groups over their females. Just like people, they have squabbles. Relationships are complicated."

This is the exact scenario playing out in the Bolsa

Chica Wetlands just south of Los Angeles. For a little more than a week now, "Freddy", a seven-foot, black-and-white common dolphin has been hiding out and swimming in circles only a few feet from the shoreline, apparently afraid to leave.

Trying to get Freddy back into the sea, Peter Wallerstein, director of El Segundo-based Marine Animal Rescue and five wildlife officials each climbed onto paddle boards in an attempt to slowly push the dolphin back into the harbor and thus, get him on his way back out to open waters.

But as he was moving into the harbor, four male dolphins appeared and proceeded to hound and attack the lone Freddy, harassing him back into the relative safety of the wetlands.

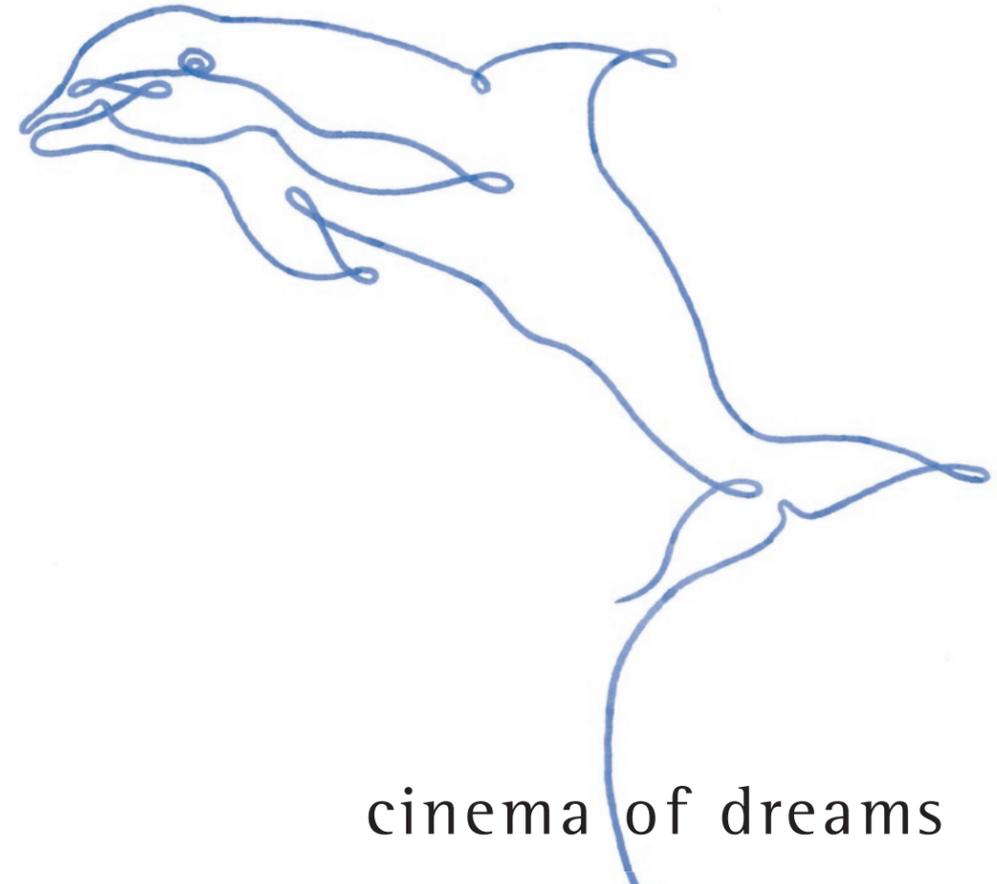
"He was scared. He was intimidated," Wallerstein stated. "Dolphins can be very aggressive toward each other. They do have a dark side."

For now, wildlife officials have decided to leave Freddy alone and hope he returns to the open ocean when he is ready and the "gangs" aren't watching. We'll keep you posted.

You can see video of Freddy and the rescue attempt at abcnews.com. ■ SOURCE: ABC NEWS



NOAA



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Edited by
Kelly LaClaire

North Sea Bottlenose holding fast

The east coast of Scotland boasts the majestic and expansive Firth of Forth as well as a resident population of bottlenose dolphins who call those waters home. For more than two decades, the University of Aberdeen has been carrying out consistent monitoring of the pod in an effort to discern the health and stability of the only known resident pod in the entire North Sea. As of May, the researchers commissioned by Scottish Natural Heritage (SNH) that the group of nearly 200 dolphins is healthy, stable and may even be increasing in size.

This is very good news for the man-

agers of the Moray Firth SAC (Special Area of Conservation), a group that monitors the conservation efforts of the waters spanning 500 miles of coastline of the Northeastern Scotland coast. The dolphins use this entire stretch year round as their food supply migrates, and the entire area is protected under EU laws.

"We can say with some confidence that the population of bottlenose dolphins on the east coast of Scotland is stable or increasing. And the number of dolphins using the Moray Firth SAC between 1990 and 2010 appears to be stable," said Morven Carruthers, SNH

policy and advice officer.

"However, this population is considered vulnerable due to being small and isolated from other populations. The east coast bottlenose dolphins are a special part of Scotland's nature and wildlife and a major tourist attraction, and it is encouraging to see that the population is currently stable. Monitoring will continue to observe the dolphins and help ensure that they do well."

Since 1989, this specific population of dolphins has been the focus of research programs led by the University of Aberdeen in coordination with the University of St. Andrews and supports the work carried out under the Dolphin Space Program (DSP), whose goal is to promote sustainable and educational dolphin-watching opportunities in the Moray Firth.

The resident pod remains one of the most recognizable wildlife species in all of Scotland and along with the beauty and scenery of the Firth of Forth, draws many, many tourists (and needed revenue) to the eastern coast. ■

SOURCE: WILDLIFE EXTRA, SCOTTISH NATURAL HERITAGE



Bottlenose dolphin

Norwegian controversial whale hunt underway



Minke whale breaching

The first three whales of this year's Norwegian hunt have been harpooned off the Arctic Lofoten archipelago, a month after the official whale season began in that country.

Currently, Norway, Iceland and Japan are the only countries in the world who still openly defy the 1986 international moratorium on commercial whaling despite nearly planet-wide opposition and resentment.

Japan uses a loophole in the law that allows killing cetaceans for "lethal research" while Norway justifies its yearly

harvest with claims that Minke whale stocks are large enough to sustain controlled hunts.

Norway has set their 2012 season quota at 1,286 minke whales. This is the same number they aimed for in 2011 even though they only killed 533 whales and public demand for commercial minke meat has diminished drastically.

"There is really no problem pulling up the quota," said a Norwegian whaling representative. "We hope that the sales will go better this year and that Norwegians will consume more whale meat."

Norway's whale harvest season began on April 1 and will run until August 31, but weather conditions have been poor and boats have been unable to hunt. According to weather services, however, these conditions will steadily improve, making the controversial killings easier. ■



Minke whale



Edited by
Kelly LaClaire

THIS PAGE: Iceberg, the white orca, with his pod caught on film by Russian scientists studying whales and dolphins in the seas around the Commander Islands

Researchers find what may be the world's only adult white orca

Scientists from Russia studying acoustic and social interactions among whales and dolphins off the Commander Islands believe they have discovered the first ever adult white orca.

The researcher, a group from the Far East Russia Orca Project (FEROP) led by Erich Hoyt, a senior fellow with the Whale and Dolphin Conservation Society, first spotted the whale when a pod of orcas swam near their vessel and out of the waves emerged an all-white, seven-meter (22-foot) killer whale.

"It has the full two-meter-high dorsal fin of a mature male, which means it's at least 16 years old," said Hoyt. "In fact, the fin is somewhat ragged, so it might be a bit older."

Orcas normally mature at around the age of 15 (males can live up to 50 or 60) and "Iceberg"—as he has been

named—seems to be perfectly happy and healthy and well on his way to living a long, full life.

Other species of white whales have occasionally been seen around the world but the only known white orcas have been young and have not survived into adulthood.

"We've seen another two white orcas in Russia, but they've been young, whereas this is the first time we've seen a mature adult," Hoyt stated. "Iceberg seems to be fully socialized. We know that these fish-eating orcas stay with their mothers for life, and as far as we can see, he's right behind his mother with presumably his brothers next to him."

It is possible that Iceberg is not a true albino whale, since he has color on his saddle (the area behind his dorsal fin) and the cause of his unusual pigmentation is not known. One way

to find out for sure would be to see if Iceberg's eyes are pink—positive proof of albinism, but this will take a very close encounter indeed, which isn't always easy.

Although this is the first news we are hearing of Iceberg, he may actually be the same whale that was spotted by different researchers in Alaska in 2000 and again in 2008. Iceberg and the previously seen whales look very similar, and it wouldn't be odd for Iceberg to have made the Russia-to-Alaska crossing with his pod; fish-eating North Pacific killer whales are known to migrate more than a 1,000 miles following food sources.

Whatever the case, Hoyt and the folks at FEROP were elated, "We can see that he is a healthy-looking male, a handsome, robust member of his fish-eating pod, so we can presume that his coloration doesn't affect

him in a negative way. Finding a beautiful animal like Iceberg shows us that there are still great surprises to be found in the least visited parts of the ocean."

"I would hope," Hoyt added, "That Iceberg would help motivate people not only to save whales but to save their habitat, their homes in the sea." ■

SOURCE: BBC NEWS
NATIONAL GEOGRAPHIC



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