



Andre Hartman Shark Man



Text by Daniel Beecham
Photos by Edwin Marcow & Daniel Beecham



Nowadays, sharks are big business and many divers and scientists have made a name for themselves by making new discoveries about shark behaviour and biology. There is however one man who for many shark enthusiasts needs no introduction. A true pioneer, Andre Hartman is the original shark wrangler who, in an age of misunderstanding, has pushed the boundaries of shark diving to learn more about a species that has been misunderstood for too long.

He has made discoveries that have questioned our understanding and has made many of the most memorable shark photographs and documentaries possible by bringing the world's

"It tried to bite me! I was spear fishing at the time and carrying a lot of fish. It came in and tried to take me. I saw it coming, so I gave it the gun. It didn't like it, so it swam away"

top underwater photographers and cinematographers face to face with *Carhcarodon carcharias*, the Great White Shark.

Andre Hartman, with his thick bushy beard, his coarse South African accent and his towering physique, looks like a true sailor. He has enjoyed a long and illustrious relationship with the ocean working in the navy as a commercial salvage diver and as a Springbok champion spear fisherman.

Andre is a hero in his hometown of Gansbaai. His discoveries have earned him a reputation as one of the most respect-

ed sharks behaviourists in the world. However, his knowledge does not stem from specimens studied in a lab or facts and figures in scientific journals. It comes from spending time in the water, with no cage for protection, with one of the ocean's top predators.

Andre was born in Bellville, Cape Town, in 1953. His relationship with White Sharks started in 1977 when he first encountered them in open water.

"It tried to bite me! I was spear fishing at the time and carrying a lot of fish. It came in and tried to take me. I saw it coming, so I gave it the gun. It didn't like it, so it swam away"

Many South African spear-fishermen encounter large sharks, including Great Whites. The animals are attracted by blood and the distress of speared fish.

The diver must use his spear gun to fend off the shark. Some spear-fishermen choose to carry a *power-head*, or *bang-stick*, for extra protection, which is used in extreme circumstances.

"I was petrified of the things. I was spear fishing for South

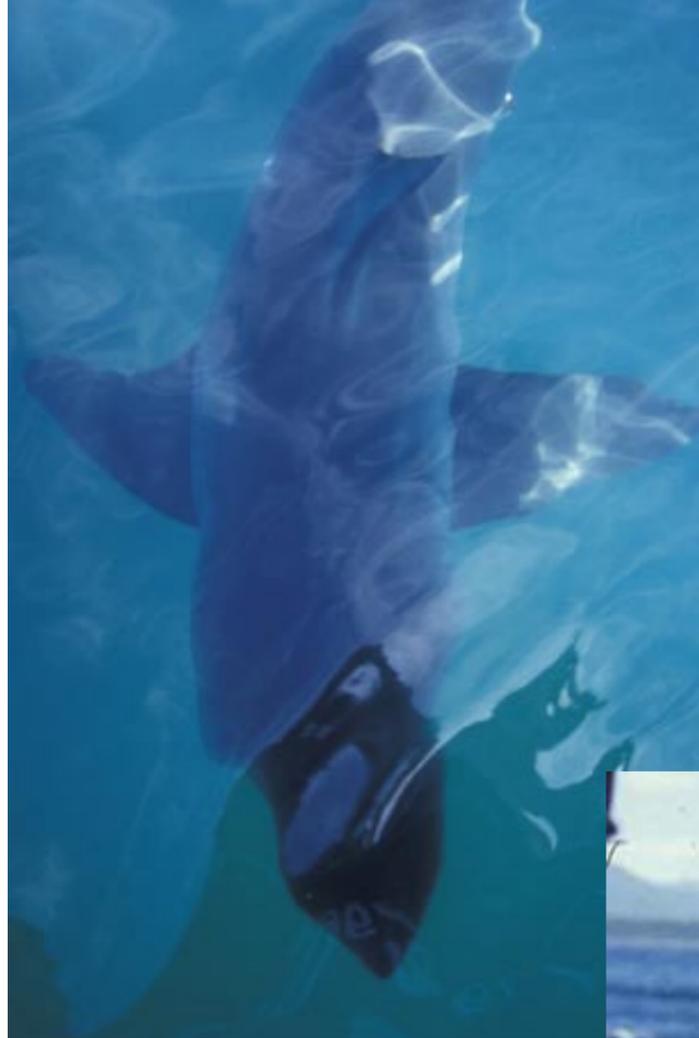
Andre Hartman

profile

Africa at this time, but before I got my Springbok colours. We used to run into these animals all the time. We needed to learn more about them, which places to avoid, how to push them off with a spear gun or how to use a power-head to scare them away. I never shot a shark with a power-head myself though."

Andre also worked as a commercial salvage diver on numerous wrecks around the Cape, playing a major role in exploring, mapping and salvaging historic shipwrecks such as the British steamer 'Joanna' and the HMS Birkenhead, famed for the tragic loss of 445 men some of which were taken by white sharks. The accident also gave birth to the phrase 'women and children first', which after the sinking, became naval protocol throughout the world.

"I have a very good memory underwater. When I see things like a school of fish in a hole, even 10 years later I can go back and find it. So, when I see something like a wreck, I first swim



above it, review its outline from above, and then I can go and map it out. With every dive, you add more detail to the map. That was basically my job. It was frightening diving on those wrecks, knowing that there were such large white sharks around and knowing so little about them."

Appreciating Great Whites

Andre continued to encounter white sharks underwater throughout his commercial diving career, often encountering

Andre Hartman - Shark Man

sharks on long decompression stops in mid water, however it was through diving and spear-fishing around Dyer Island that Andre grew to better understand and appreciate the White Sharks.

"I first came to Dyer Island in 1986. I saw the White sharks here when I was spear fishing. I again had to fend them off. I was taking the fish to the boat. There was blood in the water, and a shark investigated me assertively. But I thought: How nice they are here! "

It was in 1996 that Andre realised the commercial potential of Dyer Island where large numbers of Great Whites fre-

quent the waters year round; it's one of the few places in the world where divers can observe white sharks hunt, interact and breach.

"I decided to start up a business here because I had seen how many tourists were attracted to the sharks at Aliwal Shoal near Durban. So, my friend, Jean Pierre Botha, and I went into business."

Their company, Marine Dynamics, grew in popularity very quickly and earned a reputation for being the premier boat charter for diving the island. Many seasoned professional photographers and cinematographers, including crews from

Andre Hartman accidentally discovered an unusual trance-like behavior of the Great White Shark, *Carcharodon carcharias*, when it is touched on the nose





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Shark Man

the BBC, National Geographic and The Discovery Channel to name just a few, travelled to dive with Andre using his unique knowledge and experience to get shots that had never been seen before.

As well as working as guide to the world's top underwater image makers, Andre is himself an accomplished cameraman shooting with Sony VX1000 and VX2000 cameras. He also produces and markets his own independent productions.

Understanding Great Whites

The more time Andre spent around the sharks, the better he understood them. It was during the early years he

spent working around the island that he discovered what many consider to be one of the most amazing spectacles in the natural world.

Often, whilst diving with Great Whites, the animal would attempt to bite the out-board motors of the boat. Sharks often 'investigate' metal objects in the water, attracted by the electronic impulse emitted by the metal. Concerned about the shark damaging his motors, as well as harming itself, Andre

reached into the water from the back deck of the boat one day to push the shark away by the snout. To his amazement, it lunged out of the water with its huge jaws agape, and then swooned backwards into the water. The sharks seemed to be in a form of trance, but Andre believed that when the shark's snout was touched, it experienced sensory overload.

The Ampullae of Lorenzini, electro-receptors in the snout, are so sensitive that there is a rush of information putting the animal into temporary sensory overload. The shark is almost overwhelmed by the experience, and only comes back to its normal state after a few moments when the overload has passed.

Andre continues this exercise today. One must see to believe it.

Guiding divers

Today, Andre continues to guide divers around the island running trips for shark enthusiasts and seasoned professionals alike. Many people decide to go, meet and dive with Andre after seeing him in one of the many documentaries in which he has starred alongside various top wildlife presenters and scientists.

After meeting Andre, and diving with him, I learned more about sharks than I ever thought I could. As much as they amazed me, I couldn't help but be equally intrigued by Andre's reaction to the animals. I revelled in anticipation as the shark's fin broke the water, excitement as it lunged for the bait and wonder as it effortlessly slid back into the deep. After all these years of working with sharks, Andre is still in awe of them.

Andre Hartman

Andre is a man who has lived alongside the white sharks all his life. He is a character who will go down in history as the man who introduced the world to the true character of the Great White Shark, a man who continues to try and learn more about the most misunderstood fish in the sea.

To me, the man is a true diving legend. When I think of Great White Sharks, I can't help but think of Andre Hartman.

For more information about Andre Hartman, please visit: www.andrehartman.com ■

Disclaimer: "Don't try diving with Great White sharks without a cage on your own. These great animals are top predators in their own environment and could kill you in an instant."



OUR WORLD-UNDERWATER XXXVI

Mark your calendar for **February 24, to 26 2006** when the **36th Annual OUR WORLD-UNDERWATER Consumer Dive & Travel Exposition** will be held just minutes from Chicago's O'Hare International Airport. The **Donald E. Stephens Convention Center** will host the event featuring:

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POINT & CLICK
ON BOLD LINKS



Edited by
Andrey Bizuykin
& Peter Symes

Equipment

What's hot...what's next

Dive Xtras X-Scooter

X-Scooter Standard Body Frisco model is the Standard power motor with a standard body length.

This version uses one battery (not included) giving the diver an burntime of 1 hour.

Saltwater resistant powder coated aluminum body and tail cone. Can be Interchanged with one piece body length to Long or Xtra Long and additional battery packs www.dive-xtras.com



Cochran EMC-14

Cochran has added a new computer, the EMC-14 to their product line. Many of you familiar with the "Captain" which has been sold as a simple computer for the past many years will be pleased to see its "big brother" return in the form of the EMC-14. As with the Captain, it has user-replaceable batteries but now it can be ordered as a single-mix Nitrox computer. Please have a look because it generated a lot of excitement at the DEMA show. www.divecochran.com

Oceanic HUD mask

The HUD contains a miniature liquid crystal display (LCD) panel, multi-element optics, microprocessor, depth transducer, wireless cylinder pressure receiver, diver replaceable battery, and controlling software - all built directly into a dive mask. Oceanic's wireless transmitter module attaches to the regulator first stage and transmits the diver's cylinder pressure to the mask. While the HUD Mask will have immediate military applications, recreational divers will also benefit from this jointly created technology as Oceanic plans to release a consumer version next year. www.oceanicworldwide.com



Freedom fins

The thrust fin from Freedom Fins is attached to the lower leg; not the feet and ankles. This attachment location produces considerably more force than conventional fins because the ankles and wrists are the weakest joints in the body. With a flick of the release snap, the fins fold, facilitating seamless transition from shore or boat to water. FreedomFins are boat ladder friendly and enable good walking www.freedomfins.com



Mako fins from Aeris

There were a lot of news from Aeris. Let's start with the Mako fin. The engineered channels and side rails direct water flow off the tips of the fin without allowing water to "spill" off the sides of the blade and reduce power.

www.diveaeris.com



Report & Comment DEMAshow 2005 - Las Vegas

This year's DEMAshow was a great show. Plain and simple. And what a pleasure it was attending.

What happened? Was it because so many attendees were coming back after skipping last year's show in Houston which



was disasterously slow and boring—and obviously in the wrong location. Or is the dive industry finally back on the upbeat? Cautiously I would like to say the latter. This show was very busy, there were many new products and most of us who exhibited were bogged down by streams of customers in our booths. The overall sentiment seemed to be energetic and optimistic with a lot of thumbs up. Trends can

be fiendishly hard to interpret correctly but it seems that the world has now finally adapted mentally to a post 9/11 reality and started being outgoing again. On the travelfront most destinations seem cautiously optimistic being in positive mood but without staking too much yet on major developments. Set aside, maybe, Ocean Hunter's new

minisubmarine – which is an instant eyecatcher. Talk about a Ferrari-effect. Most boys at the show, regardless of age, must have drooled. As regards to new equipment, the industry has, for some years, seem to be struggling with their products being mature – I mean, how much can you keep on improving on a snorkel? - and to come up with true novelties. At the moment the cutting edge



Submerge Underwater Propulsion

Top rated u/w scooters with outstanding endurance different models of this make were recently used during a 14km cave dive in Mexico. The UV-18 model comes in at GBP 2500 incl. VAT and airfreight. More details at: www.silent-submersion.com

Special Ops

The Special Ops Watch is the world's first and only electromagnetic rechargeable watch with LED lighting system. It's powered by a rechargeable lithium ion cell battery. To recharge, simply place the Special Ops Watch on the included electromagnetic induction charger overnight. The Special Ops Watch is equipped with overcharge protection and low battery alert and is water resistant up to 330ft. The band links are individually connected with allen keys, making them easy to adjust www.specialopswatch.com/products.htm



Aquatek CCR



Voyager from Aquatek is a mechanical design with manual CCR setpoint control. O₂ is injected into the lid after the axial scrubber unit which comes with a clear canister. Without tanks and absorbant it weights 14 kg/31 lbs. The Voyager is CE certified to 40m with EANx and 100m with Helium. www.rebreather.it

Nemo

Mares Nemo Dive Computer & watch. A cutting-edge dive computer and an elegant watch. Now in steel with black PVD treatment with sapphire coated glass. Elegant and a complete dive computer, offering all functions for dives with or without decompression. It can also be used for Nitrox mixtures. For freediving enthusiasts, it also offers the special "free-dive" mode. www.mares.com



Apeks WTX

With the WTX series the manufacturer of the renowned regulators have announced a new selection of BCD products. Stainless steel plates, harnesses, buoyancy cells and accessories comes as modular components that can be assembled into numerous combinations from highly technical BC rigs or scaled down to make a travel friendly rig that any diver would want to use. Made out of 1000D Armorshield Cordura www.apeks.co.uk



Haskel

Now, those fine people at Haskel can say what they want but pretty it ain't, their new booster. But who cares? Haskel are known for their quality products. Their newest series of electric driven gas boosters offers contamination-free operation at lower cost and smaller size than metal diaphragm compressors. The new EDA Series eliminates oil migration in applications using all inert gases including nitrogen, helium, argon, CO₂ and air. The booster's design includes separation; therefore, only cleaning is necessary in order to use it for Oxygen service. www.haskel.com

DEMAshow 2005 (cont'd)

seem to lie in the continued application of hi-tech in dive equipment both electronics of course, like in the new Oceanic HUD mask, new computers and rebreathers but also in the application of new fabrics in suits and garments. These recent years has seen some interesting developments in, for example, thin but warm wetsuits with



X-Ray Magazine publisher Peter Symes (left) with OCEAN REALM Magazine's Ken English and publisher Richard Stewart (right)

neutral bouyancy such as the Radiotor as well as the new stretchables from Bare.

Interested in rebreathers? *Rebreather World* has a in depth going show report on these matters on their site at www.rebreatherworld.com - it is worth a visit (just click on this link). Down the same vein,

I would also like to recommend to checking out WETPIXELS report on the show and new photography equipment presented here this year. Link to www.wetpixel.com's show-report.

A good collection of videoclips from DEMA 2005 are available at [OCEAN REALMS website](http://OCEANREALMS.com)



Interview with Al Hornsby



unreal... Undersea Hunter Gets New Submarine

Have you ever wondered what lies deeper than you can go on your scuba set. Did you ever dream of sailing in a submersible? Well, now the dream is possible. The famous liveaboard Undersea Hunter now has DeepSee which is a custom built one-atmosphere submarine, capable of carrying one pilot and two passengers.

It goes down to a depth of 475m (1500 ft). It is the first deep submersible designed and developed with the ocean enthusiast and underwater explorer in mind and as a dedicated filmmaking observation vehicle. DeepSee is equipped with a High Definition video camera, and an impressive array of HID lights, that will document all the DeepSee dives. Passengers can use their own video or camera equipment

from inside the acrylic sphere that offers the viewers an unparalleled and unobstructed 360° view of the undersea world. DeepSee has a dive autonomy of 6 hours at a speed of up to 1.7 knots.

www.underseahunter.com

Note: We could only find the info using Internet Explorer, not Netscape/Firefox



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Epic**

Hoseless air-integrated technology, so small and stylish you can wear it on your wrist to dinner. AERIS "Distinguished by Design" technology enables more features to be loaded into this handsome and functional "wristwatch style" dive computer.
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With the SCUBuzz, there is no more tank banging. SCUBuzz is an underwater signaling device worn like a wristwatch. Simply, with the push of a button, your dive buddy has your attention without any annoying noises. SCUBuzz is a 2 way alert system used to alert divers from either the surface to a diver below or from diver to diver while underwater. An ultrasonic radio transmitter and receiver are built into each SCUBuzz to allow both sending and receiving an alert.

ScubBuzz



www.scubuzz.com

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The latest Scubapro bundle

S555 on MK17

A powerful all-rounder, S555 is an air balanced high performance second stage; the ideal choice for divers looking for a simple to operate second stage with superior breathing performance, coupled with a captivating design. This second stage incorporates diver adjustable Venturi Initiated Vacuum Assist (VIVA), also known as dive/pre-dive control switch. The balanced flow valve initiates effortless and instant air flow. The anti-freeze components for cold water performance make it remarkably durable and reliable in cold water.

www.scubapro-uwatec.com



Jetboots

Sounding like something coming out of a Science Fiction movie, Jetboots are a unique hands-free electric propulsion system for swimmers and divers engaged in recreational, commercial, or military dive activities. Coming in January, a new, less expensive version of Jetboots especially for the recreational diver.

www.jetboots.com



Spacy

The Neptune Space is a progression of Ocean REEF's current full face mask, the Neptune II NIRA, which was introduced in 1998. In Neptune Space the regulator has been moved closer to the visor, reducing the mask's profile and reducing the breathing effort; the inhalation effort required for the Neptune Space is 20% less than that of the Neptune II NIRA.

www.oceanreefgroup.com

Looking good for your money

Still scratching your head, not knowing what to give her for X-mas? Diving equipment or something fancy to wear? Don't despair, this fashionable hydroskin rash vest from Fourth Element may just be the answer to all your problems. Nothing quite does it like a soft package under the tree. www.fourthelement.com



AquaSketch

AquaSketch represents a leap forward in underwater communication. Not only does it simplify the task of writing and drawing underwater but it also offers unlimited paper capacity making it unnecessary to waste time erasing during a dive. Holds up to ten feet of waterproof vellum. Charts, graphs, dive logs or any technical or visual computer input can also easily be printed on the vellum. www.aquasketch.com



Pressrelease from Diversitea:

Russian Navy says Diversitea has positive effect

Diversitea Herbal Supplement Tea for Divers was recently tested at the Makarov State Maritime

Academy in St. Petersburg, Russia.

A controlled study was conducted where two groups of mice were taken to 200 meters (657 feet) in a hyperbaric chamber over a period of 20 minutes, then brought up to surface pressure in five minutes.

One group was given Diversitea for two weeks before being submerged and the control group

received plain water. Upon ascent, the mice who received Diversitea had a mortality rate of 28%, and the control group mortality rate was 84%.

This led the testers to conclude that Diversitea Herbal Supplement Tea appears to have a positive effect on the reduction of Nitrogen waste in the body, as less formal experiments had previously

indicated. Diversitea is marketed through live-aboard dive boats, dive shops, the Internet, vacation resorts and specialty retail and gift stores.

This release has not been edited or validated by X-Ray Magazine. More info about Diversitea on www.diversitea.com



Text by
Michael Arvedlund, PhD

ILLUSTRATIONS BY GUNILD AND PETER SYMES

Dolphins

A few things you probably didn't know about them

When you are on the way back to the harbor after the afternoon dive, wild dolphins often swim in front and along the dive boat. They seem to love following boats. Sometimes they then perform for us, in form of huge jumps out of the water and “tail shows”, keeping the tail up for minutes remaining still in the water.

Usually after a few minutes, the dolphins disappear again. If you enter the water, they also usually disappear. Only recently did I experience swimming together with some of these dolphins: two young dolphins were simply to curious about the noise the bunch of snorkellers and divers made, and came within a distance of less than a meter.

My biggest surprise was to see how fast these beautiful animals actually swim underwater. One of these young dolphins tried to teach me her kind of swimming, but quickly gave up on such a clumsy student. This recent first encounter made me think about how

much – or how little - do we actually know about dolphins: their biology, ecology and behavior?

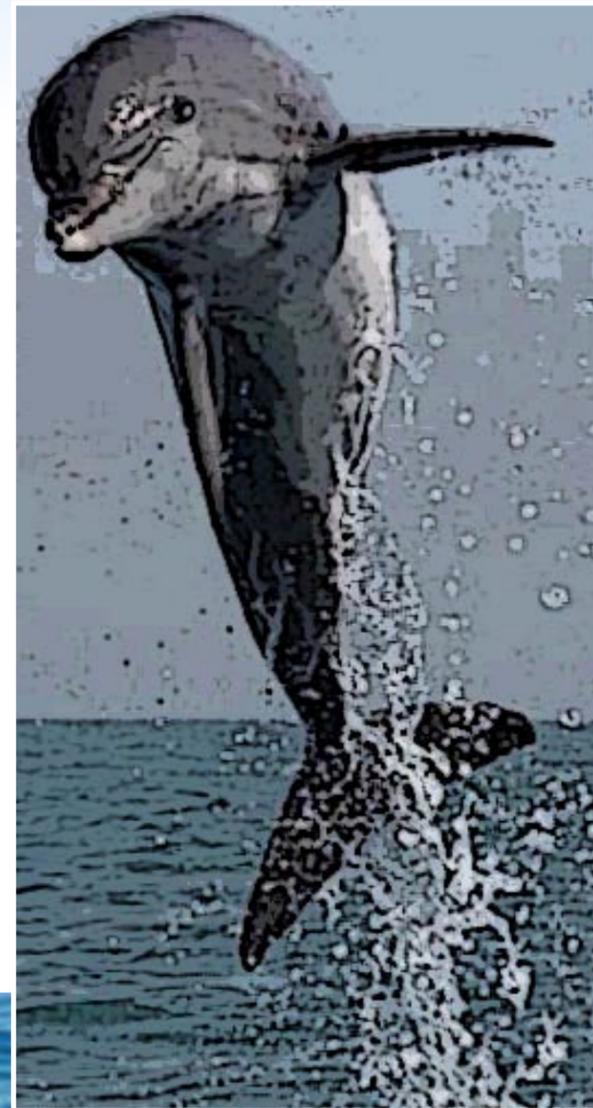
In captivity Much of what we knew was about dolphins was, until quite recently, entirely based on studies of animals in captivity and only from the species of bottlenose dolphin, i.e. “Flipper”, *Tursiops spp.*, and the orca or killer whale *Orcinus orca*.

From these studies we know they talk, i.e. they have a language and there are even different dialects among some groups of orca, that they have complicated relationships and they have a

culture. The latter is currently the subject of a lot attention and debate among scientists as it is argued that animals with a culture should have this quality included as regards to conservation issues.

Fortunately, in recent years field based studies have been on the increase which have provided us with many new insights into the fascinating lives of dolphins. We will present some of the known facts as well as some of the many newest findings.

Dolphin Sonar Dolphins contain a unique sensory organ which is used for hunting and communication: the



organ for echolocation, which also bats possess. Echolocation is also known as "dolphin sonar". By listening to the echoes of the

are capable pick up minute objects with their echolocation with outstanding accurateness. It is still not quite clear how the dol-

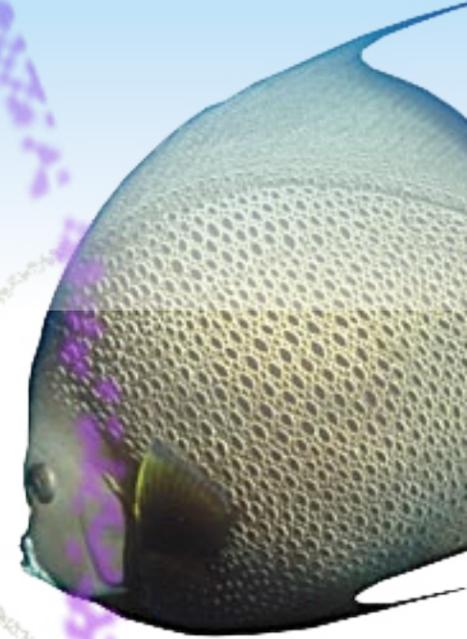
discriminate between the densities of objects. They can apparently even distinguish between different species of fish. This is of course used when they hunt: echolocation is used in the detection and tracking of prey. Some scientists think that the eco sound can stun fishes: It is thought that dolphins stun large schools of fish with the sound beams and then make the attack.

increased as a function of time. But with the dolphins, what happens is that they control their level of their emissions so that as they close in on a target, they reduce the amplitude of their signal, so that they try to keep the amplitude of the echo relatively constant."

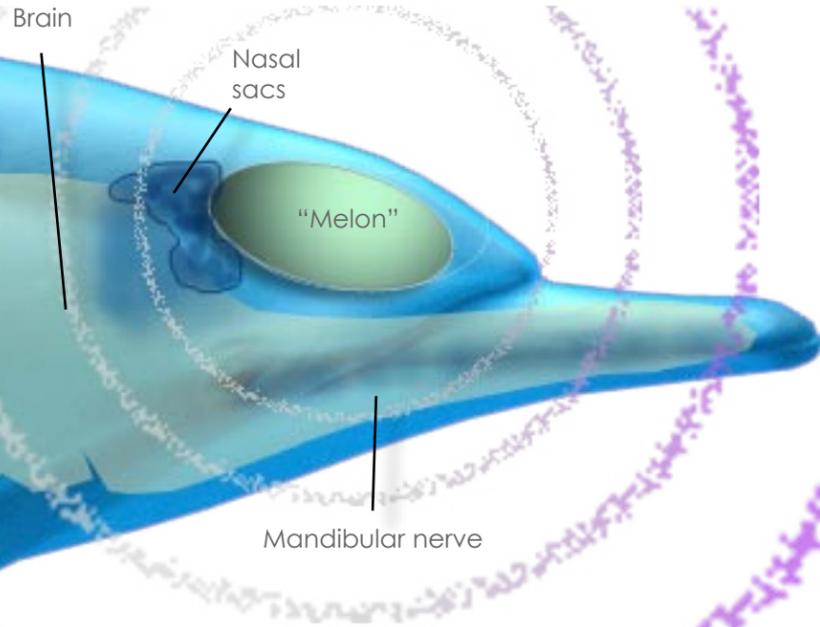
animals in coastal areas and up to hundreds in oceanic waters.

Spinner dolphins inhabit tropical and subtropical zones with herd sizes that range from 2 to 300 in coastal areas and up to thousands in oceanic waters. Spinner dolphins rest and socialize during the day, feeding at night on fish in the open ocean, whereas bottlenose dolphins rest, socialize, and feed both during the day and night. Bottlenose and spinner dolphin acoustic emissions or phonations can be classified into two general categories:

- a) tonal whistles, and
- b) pulsed sounds or clicks.



The dolphins sonar clicks reflects off fish' swimming bladders sending the echo back to dolphin



It is theorized that the sonar "clicks" are being generated in the nasal sacs and then focused through the "melon" which acts as a sort of acoustic lens. The returning echo is then probably being recieved through the lower jaw

sound they produce, dolphins can locate objects and fish with amazing achievement. A dolphin is capable of creating an acoustical image of its environment, including other animals, by using the pulses of ultrasonic sound which bounce off surrounding objects, almost like an x-ray image. Even when captive dolphins are experimentally blinded they are still able to echolocate to make their way to whatever the target is. The echolocation, sounds like a bunch of clicks or squeaking sounds, however, they are beyond the field of human hearing. Dolphins

phin sonar system works. The echolocation may be in its lower jaw. If this jaw is covered experimentally, dolphins have difficulties echo locating. Another hypothesis says that the ear canals, even though this is a reduced organ in dolphins, are where the center of echolocation is. Dolphins can learn about its surroundings by measuring how long echoes take to come back. They can

Building knowledge

Much is still poorly understood about the echolocation ability in dolphins, but progress is made every year. One of the leading researchers within the field of dolphin echolocation is Dr. Au from the University of Hawaii. In a recent interview he says the following of some of his new research results: "We recently discovered that by looking at echolocation signals from wild dolphins that they have a form of automatic gain control or a form of time varying gain. Now they do

it very different than our sonar would do it. In technological sonar, time varying gain usually occurs with the receiver, where the gain of the receiver is

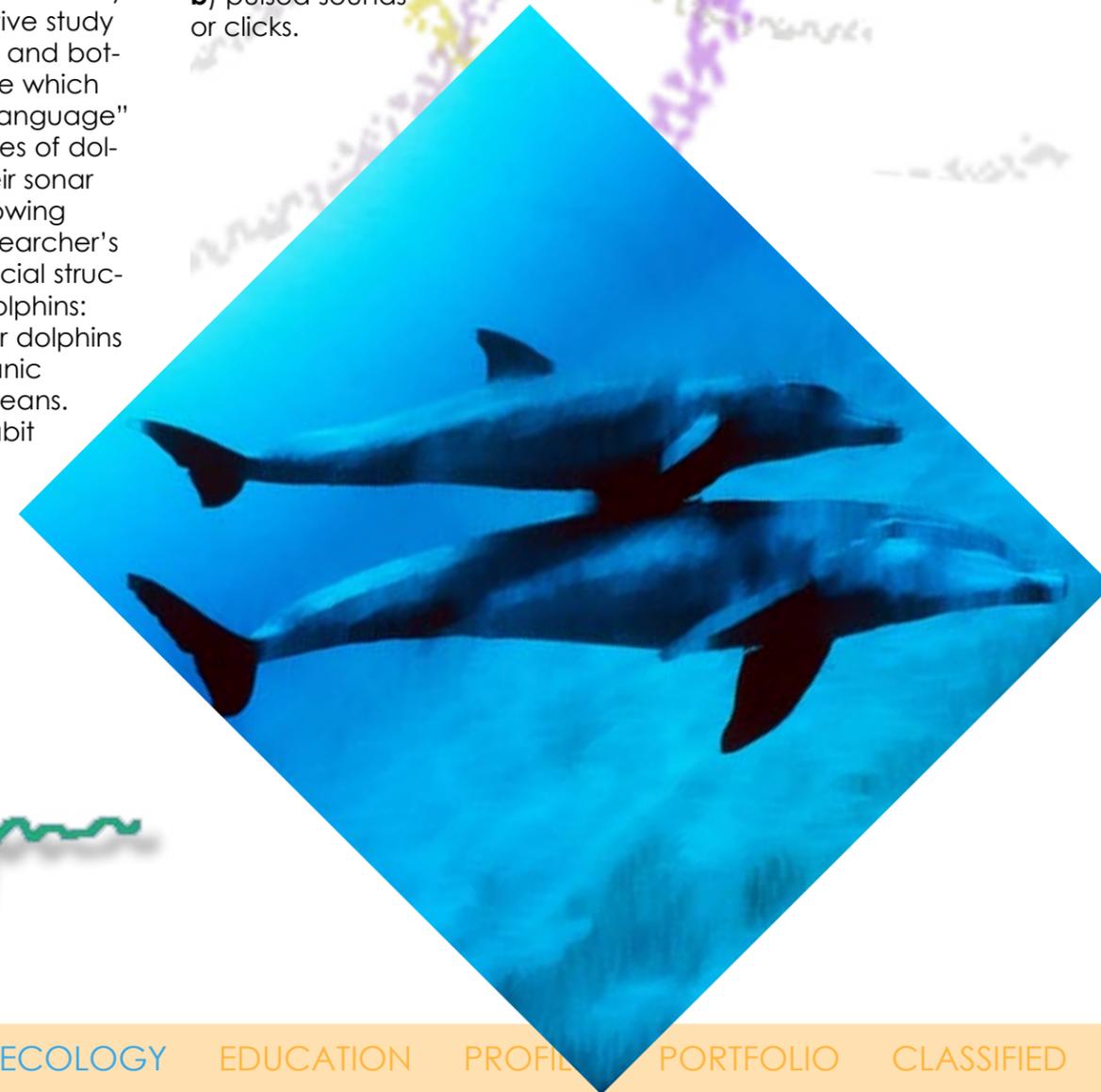
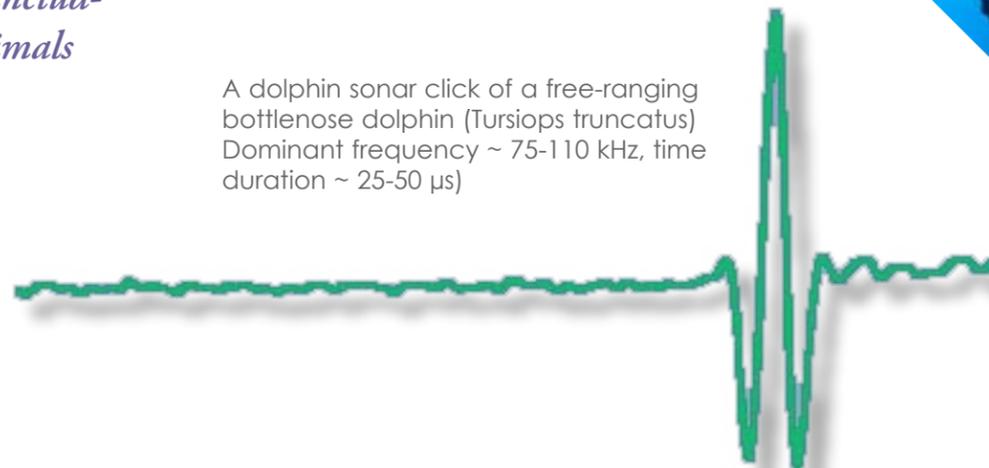
Dolphin society

Aspects of the social structure, language and learning abilities in dolphins

The Mexican dolphin researcher Dr. Carmen Bazúa-Durán recently conducted a comparative study on the ability of spinner- and bottlenose dolphin to whistle which seems to be a kind of "language" that at least some species of dolphins possess beside their sonar system. She tells the following about her and other researcher's recent findings of the social structure and language in dolphins: "Bottlenose and Spinner dolphins live in coastal and oceanic waters of the world's oceans. Bottlenose dolphins inhabit tropical and temperate zones with herd sizes that range from 1 to 30

A dolphin is capable of creating an acoustical image of its environment, including other animals

A dolphin sonar click of a free-ranging bottlenose dolphin (*Tursiops truncatus*) Dominant frequency ~ 75-110 kHz, time duration ~ 25-50 μ s)



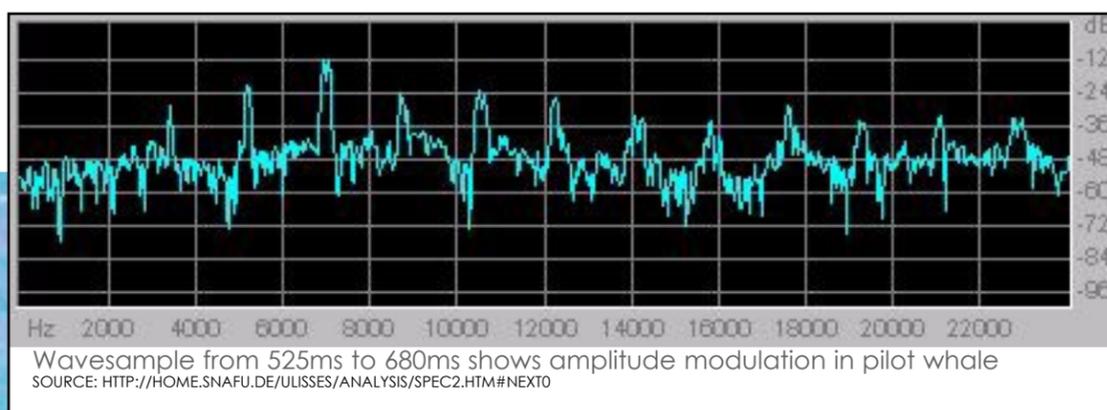
Whistle spectrogram

Dolphin whistles have typically been characterized in terms of their frequency as a function of time (spectrograms) which is also referred to as "whistle contour". Whistles are frequency modulated sounds with a fundamental frequency usually below 20 kHz and harmonics up to 100 kHz and durations between 0.05 and 3.2 s. Whistles are considered signals used to regulate group organization and function. The study of dolphin whistles has included the categorization of whistle con-

tours into classes and the extraction of acoustic parameters from each whistle contour."

The two American dolphin researchers Dr. Rachel Smolker and Dr. John W. Pepper recently documented a previously unknown whistle "union" phenomenon among adapted free-living male bottlenose dolphins. During a four year study period, three males formed an alliance, spending most of the time

together and cooperating "herding" females: small gangs of males kidnap females and keep them for a considerable time span for mating. Within the male individuals studied by Dr. Smolker and Dr. Pepper, the whistle repertoires were more variable than expected, based on previous studies, mostly performed with captive dolphins, but became less so during the time span of the study. Among the individuals,



Dolphins Parade, by Jean Lamy, oil on wood, 80 x 55cm
www.jean-lamy.com

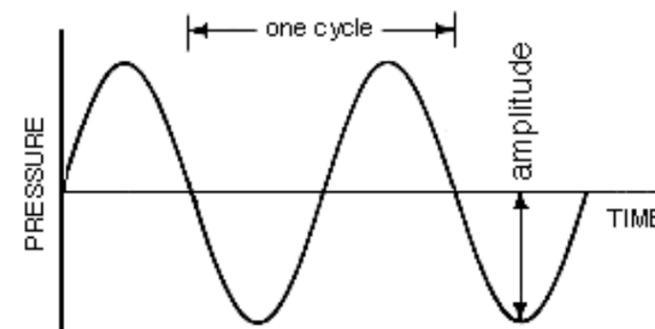
Dolphins belong to the family Delphinidae. Most species of dolphins are larger than porpoises, with the males usually being larger than the females. The family Delphinidae is the largest and most diverse family of the cetacean order. Scientists have discovered fossil records of ancient delphinids, which date back 11 million years. This family is composed of what we commonly call dolphins. There are over 30 different species in this family, the largest of which is the Orca, or killer whale. One of the smallest known dolphin is Hector's dolphin, *Cephalorhynchus hectori*, with a length of only 1.4 m. Delphinids are characterized by sharp, cone shaped teeth; most (but not all) possess a semi-circular fin on the back and a "melon", i.e. a rounded waxy mass found in the head that is thought to play a part in the focusing of sound signals. This "melon" is joined to a distinct beak. Dolphins are found in most sea of the world from the arctic to tropical regions.

the distinctiveness of individual whistling repertoires decreased such that the three males were practically indistinguishable by the end of the study. The three males had formed a

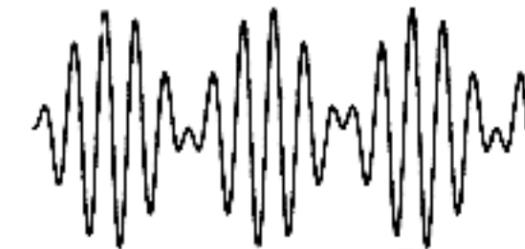
close "alliance" and had all reached the same point on one particular shared whistle form which they had only rarely produced before the forming the alliance.

Getting behind the technical terms: What is amplitude modulation really?

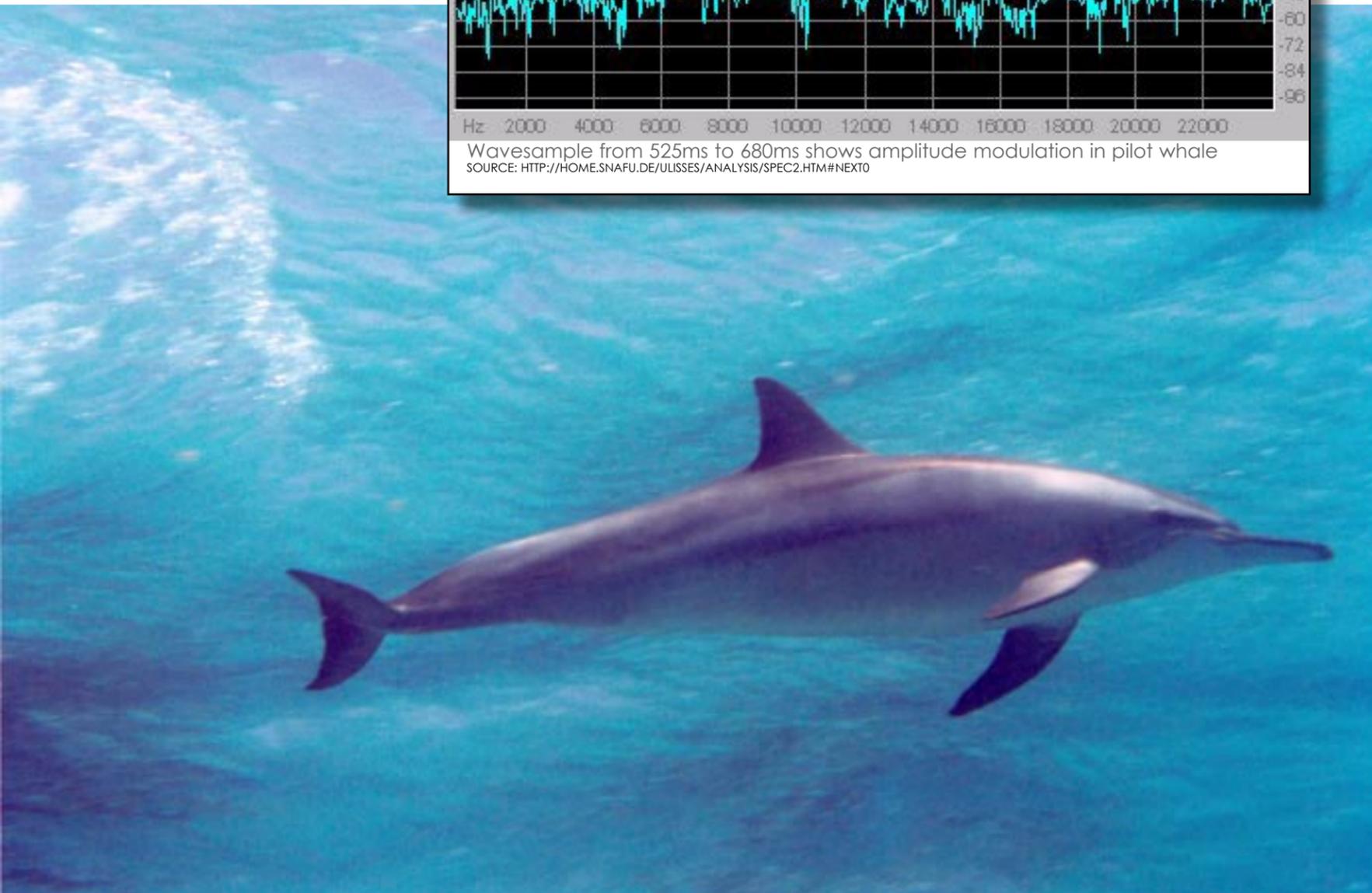
The **amplitude** of a sound wave (below) is the maximum amount by which the instantaneous sound pressure differs from the ambient pressure. One cycle corresponds to the frequency (tone)



Amplitude modulation (AM) is the process of varying the amplitude of a sound, often periodically. An example of AM is the violinist's Tremolo, where the amplitude of the vibrating string is rapidly altered by a movement of the bow.



Modulated amplitude
Click here to hear example of AM.
Requires Quicktime plugin and online connection. Example from Simon Fraser University 500 Hz carrier, 50 Hz modulator, raising the depth of modulation from 0 to 100%.



Dolphin sex

— now we got your attention, huh?

The staff at the Dolphin research center in Florida, USA (www.dolphins.org) has been breeding bottlenose dolphins for many years and has become experts within this field. They tell the following of sex and reproduction in bottlenose dolphins: dolphins have no secondary sex characteristics.

The only way to determine a dolphin's gender in the wild is to see a clear view of their genitals, or to observe an erection, act of intercourse, or a calf swimming close to an adult presumed to be a female.

Spotting the difference

Males have two slits that look similar to an exclamation point. The long anterior slit houses the genital region, while the smaller posterior slit houses the anal region. Two small pores are present on either side of the genital-anal slit, which have been considered possible vestigial nipples. Females have one continuous slit which houses both the anal and genital openings, the anus being towards the posterior.

The only way to determine a dolphin's gender in the wild is to see a clear view of their genitals, or to observe an erection, act of intercourse, or a calf swimming close to an adult presumed to be a female.

Females also have a set of slits housing the mammary glands. These slits flank either side of their genital slit. Occasionally females will have extra false sets of mammary slits. These extra slits are generally non-functional and could be a hold over from the dolphin's terrestrial ancestor.

Doing it anytime

There is no actual mating season for dolphins. They mate 365 days a year, just like humans. Ninety percent of their mating activity, however, is foreplay. Intercourse only takes seconds.

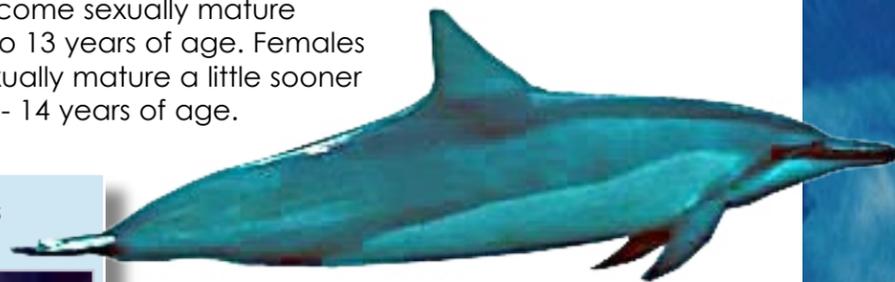
Males become sexually mature between 5 to 13 years of age. Females become sexually mature a little sooner at around 9 - 14 years of age.

Playing games

Much of the amorous activity between dolphins includes chasing each other around and raking each other with their teeth.

Dolphins have a tendency to get lazy looking eyes and lay on their sides, sinking like a log, when they are feeling amorous. This seems to be the height of erotic behavior for a dolphin.

The more dominant dolphin is usually found beneath the more passive, which is playing the "floating log".



Whenever, whoever

Dolphins are indiscriminately amorous. They have sex with the opposite gender, the same gender, and engage in masturbation with inanimate objects. Female dolphins have been observed suctioning things (like plates) to their genital region when they are feeling amorous. They also seem to enjoy buzzing on each others' slits using echolocation. What are the possible reasons for this type of behavior—as it is not just leisure? It is believed that dolphins may possibly engage in

this type of behavior to learn about sex as well as to maintain strong social bonds for many sorts of cooperative activities. Dolphins must maintain a streamlined body to move efficiently through the ocean. Therefore, male dolphins have both their penis and testicles packed inside their body. On mammals, testicles are usually found outside the body since sperm dies at body temperature. Dolphins compensate for the extra heat that their testicles must endure by utilizing a special feature of their circulatory system.

Dolphins

More than 30 species

Dolphins, whales and porpoises are placed in the scientific order Cetaceans. Cetus is Latin and is used in biological names to mean "whale". It's original meaning, "large sea animal," was more general. It comes from the Greek word ketos ("sea monster").

Cetology is the branch of marine science associated with the study of cetaceans.

Shapes and form

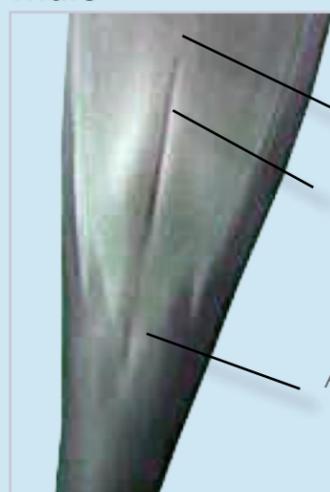
Cetaceans are the mammals most fully adapted to aquatic life. Cetaceans are nearly hairless, and are insulated by a thick layer of blubber. As mammals, cetaceans have these characteristics that are common to all mammals:

- They are warm-blooded animals.
- They breathe in air through their lungs.
- They bear their young alive and suckle them on their own milk.
- They have hair - though generally only a few 'whiskers'.

Another way of discerning a cetacean from a fish is by the shape of the tail. The tail of a fish is vertical and moves from side to side when the fish swims. The tail of a cetacean - called a "fluke" - is horizontal and moves up and down instead.

It can be difficult to tell the difference between males and females but females have mammary slits

Male



Navel
Genital slit
Mammary slits
Anus



Female

Pregnancy

Recent research indicates that bottlenose dolphin pregnancy lasts about 12 months. During this time, there is very little room in the uterus for a baby to develop. As a result, and to make birth easier, the tail fluke and dorsal are cartilaginous and are folded over in the uterus. The organs are also located beneath the developing baby, which could be the reason for a female gaining more girth during pregnancy and not developing a bulge. Mothers double their intake of food following the birth of their babies. Intervals between calves vary from about three to five years.

Calves

Calves are usually born tail first, weigh 25-40lbs, and are generally three to four feet long. We can get an approximate idea of how old a baby is by looking at the dorsal fin. It is thought that the dorsal fin stiffens within a few hours. The tail flukes seem to take a bit longer.

A calf swims in a position next to its mother called the *echelon position*. The calf swims in this position to catch mom's slipstream, allowing the calf not to work as hard in order to keep up with its mother. When calves are born they have lighter colored bands spanning their mid section. These are called fetal bands and are derived from being scrunched up

in the mother's womb. These bands will slough off after multiple weeks. Newborn dolphins are very dark in color. It is possible that this dark shading is used for camouflage as the baby travels in the mother's shadow. This coloration is also sloughed off after multiple weeks.

Learning to breathe

When calves are new to the world, they have to get used to their bodies not only swimming, but also breathing. They have to get comfortable with where their blowhole is. As a result, calves do something called chin slap breathing, which involves taking its head farther out of the water than necessary to breathe.

Echolocation is an ability that babies have to learn how to use over time. For this reason babies end up with a few cuts and scrapes within the first weeks of life.

Due to the need to look out for a clumsy calf, you sometimes see mothers "steering" their calves away from what might be considered a danger. Calves nurse an average of about

every twenty minutes or more for 24 hours a day. In the first few weeks of life this can be in more frequent intervals. They nurse, on average, a minimum of two years but have been observed to nurse up to four and a half years. Calves have many fringes along the edges of their tongue, believed to be an aid in nursing. Calves apparently roll their tongue and clasp the fringes together in order to form a watertight funnel for the milk to flow through. Mothers take the active role in nursing by squirting the milk into the baby's mouth.

Maternity pods

Groupings of females with calves are naturally occurring in the wild. The groupings are called *maternity pods*. It is important to have other females available to a mother dolphin. Female dolphins have been seen assisting in birth, and more consistently as "baby-sitters" or "aunties" helping to rear young dolphins. One of the best ways a female dolphin can learn how to care for a calf is to be around a baby and other more experienced females. Adult male dolphins generally do not appear around females unless mating. Male dolphins tend to congregate in groups of two or three and sometimes form what is known as a *pair bond*.

Bonded for life

Pair bonded males will stay together for an extended period, if not all, of their lives. Male dolphins play no role in raising their young. In fact, male dolphins have been known to be a threat to the calf.

Adolescent dolphins also congregate in separate groupings called juvenile pods. This will occur once a calf is old enough to leave its mother. Each female dolphin seems to have a unique mothering style. Some mothers are very protective parents, while others seem more relaxed with letting their calves explore. These variations have also been observed in the wild.

Dolphin Culture

– a case for better conservation?

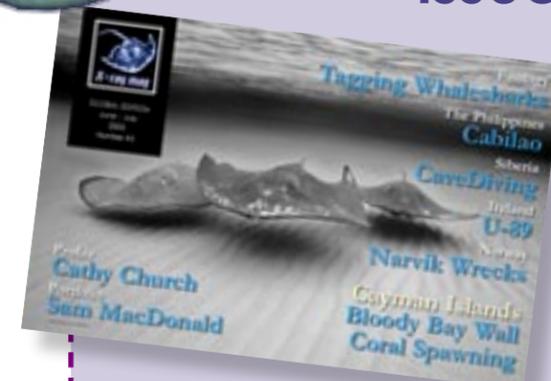
There is increasing evidence that culture is an important determinant of behavior in some non-human species including great apes and whales and dolphins.

Recently, a team of Canadian, British and American researchers lead by Dr. Hal Whitehead of Novo Scotia, Canada, has argued that at least in some cases, there may be repercussions for population biology and conservation in dolphins and whales. This may of course depend on how "culture" is defined.

Dr. Whitehead and his team follows the definition that "culture" is *information or behavior, shared by a population or subpopulation, which is acquired from conspecifics through some form of social learning*'.

A "population" could in these cases include the whole species, and "subpopulation" any subdivision of a population which contains at least a few individuals in each set. Dr. Whitehead and his team argue that culture can affect behavioral and population biology, and thus conservation issues, in ways that are importantly

FREE back issues



CAYMAN ISLANDS, Bloody Bay Wall, Freediving World Records, Coral Spawning, Innerspace, Wrecks of Narvik Norway, Siberian Cave Diving, Tagging Whalesharks, Cabilao. **Link: X-RAY #5**



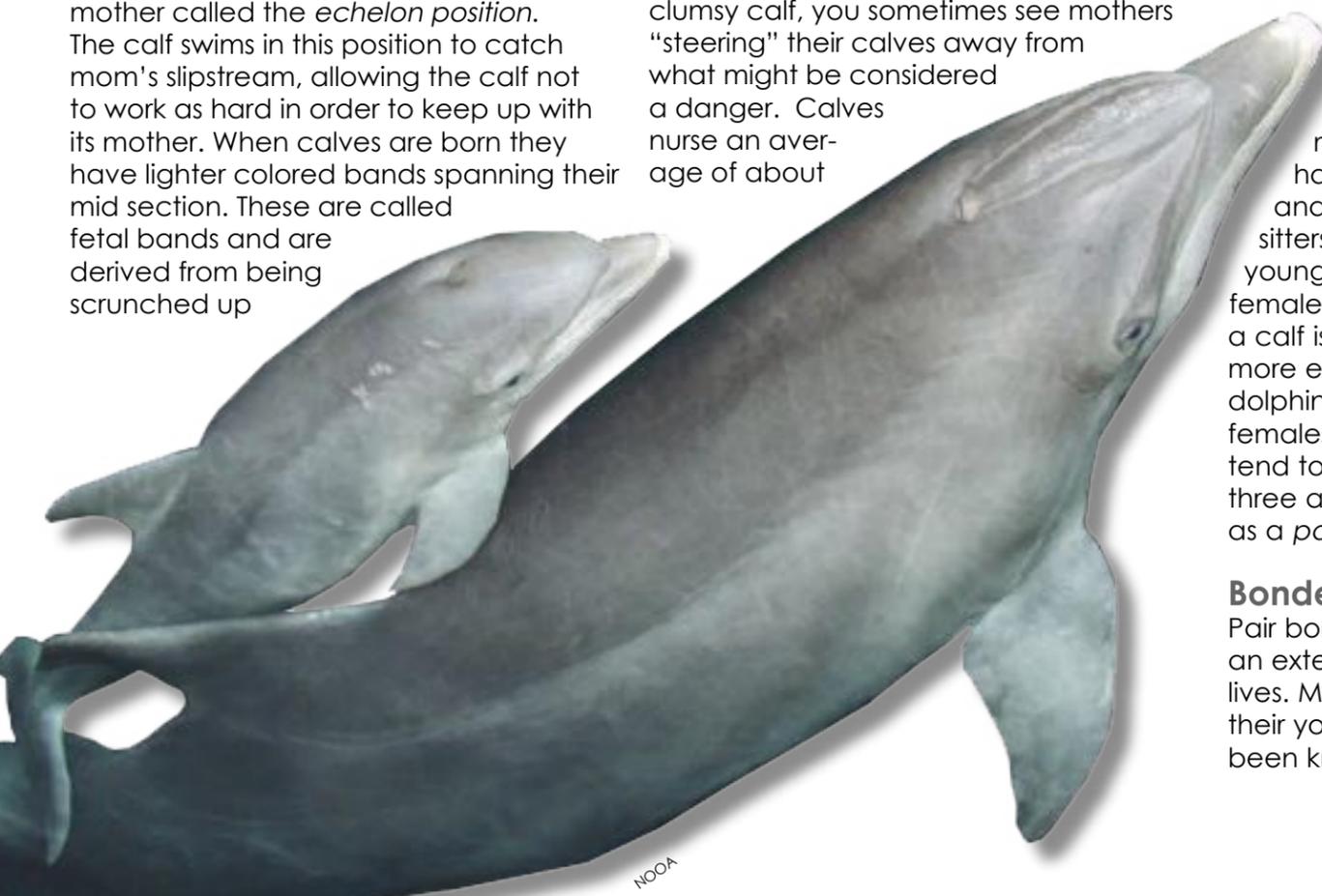
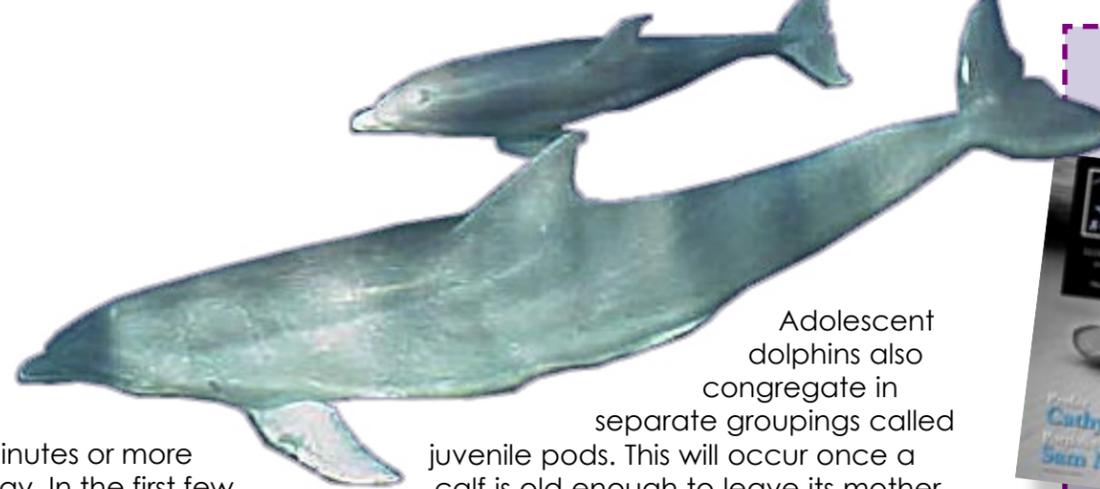
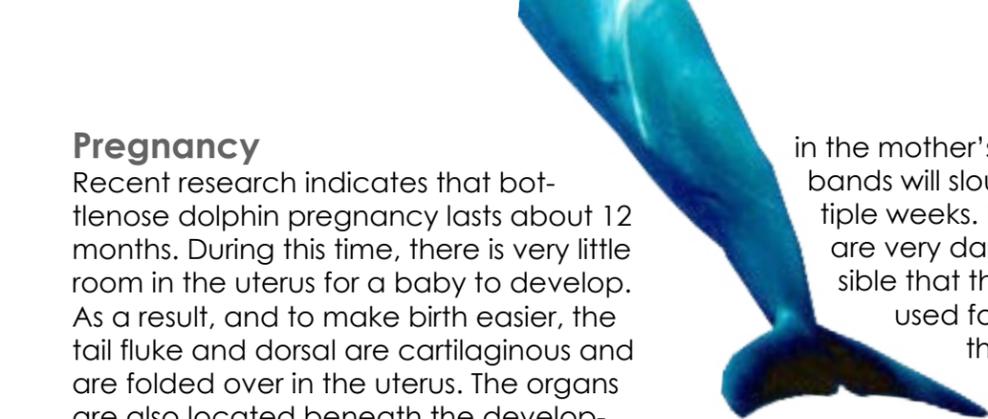
PACIFIC NORTH WEST AMERICA, Vancouver Island, Puget Sound, Neah Bay, Alaska, Honduras Sharks, Amous Nachoom, Jon Gross, Apeks, Fish Sense **Link: X-RAY #4**



MALAYSIA, Coralreefs after the Tsunami, Whale beachings, Tragedy in South Africa, Nemo's Nose: The Science of Fish Fashion, Ice Diving in Russia, Todd Essick **Link: X-RAY #3**



Diving in the Himalayas, Swimming with Orcas in Norway, El Dorado in the Philippines, Gaansbai in South Africa **Link: X-RAY#2**



NOAA

different from those traditionally expected from a model that only includes genetic inheritance. Culture is very varied, and this variation has implications for its interactions with conservation.

Horizontal or vertical culture

For instance, contrasts have often been drawn between *horizontal* cultures, where transmission is between members of the same generation, and *vertical* or *oblique* cultures where animals learn behavior from parents or other members of previous generations.

Horizontal cultural transmission can be highly effective in quickly changing population behavior in adaptive ways, an example being the rapid decrease in the use of certain chemicals by humans once they are shown to be toxic.

Conversely, vertical cultures, like some religions, can be highly conservative and can constrain adaptive responses to environmental change.

Cetacean Culture

Dr. Whitehead and his team argues that by these criteria, culture is quite common among animals, especially those that are more cognitively advanced, such as the dolphins.

However, in most of the species possessing recognized cultural capacities, only a small proportion of behavior seems to be determined by social learning, and much of this may be functionally neutral.

Despite difficulties in studying the behavior of the whales and



"Dall's Porpoise"

Carved and painted red cedar cutout wall panel. By Odin Lonning. Read more about his current works in both traditional and contemporary media about his tributes to the killer whale on his website:

www.odinlonning.com

Culture is very varied, and this variation has implications for its interactions with conservation.

dolphins, and, compared to primates and songbirds, a lack of knowledge on behavior, communication and social structure, there is strong evidence for cetacean cultures in the four best studied species, and some most interesting speculations for some of the others - for instance on spinner dolphins, *Stenella longirostris*.

Sophisticated social learning abilities exist, at least in bottlenose

dolphins and orcas.

Social learning

Of the several types of social learning which have been recognized, imitation is often singled out as being particularly significant for the propagation of culture.

The bottlenose dolphin can imitate both vocally and nonvocally and has been shown to understand the broad concept of imitation. Some consider it the most

sophisticated non-human imitator. This social learning seems to have led to culture, of various types. Among the baleen whales (suborder Mysticeti), there are several known cases of horizontally transmitted cultures.

Humpback song

The best understood horizontal culture of cetaceans is the mating song of the male humpback whale.

At any time during the winter breeding season, all the males in any ocean sing more or less the same elaborate song, but this communal song evolves over months and years. Songs in different oceans at any time are different but follow the same general syntactical and evolutionary rules.

Horizontal cultures are also found in the suborder *Odontoceti*,

the toothed whales and dolphins. An example is the *dead-salmon carrying* fad of the well-studied *southern resident*, fish-eating, orcas of the Puget Sound area of the northeast Pacific.

Of the several types of social learning which have been recognized, imitation is often singled out as being particularly significant for the propagation of culture.

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The famous K-Pod

It began with a female in K-Pod carrying around a dead salmon in 1987, spread to the other two pods in the southern resident community over a 5-6 week period and then stopped. It was noted a few times the following summer, and then never again. Probably more significant from the conservation perspective are vertically or obliquely transmitted cultures.

Populations of all the well-studied odontocetes are culturally structured

and subpopulations with distinct cultural trait groups are often sympatric. Among the bottlenose dolphins of Shark Bay, Western Australia, there are at least four distinctive foraging specializations, at least some of which are likely transmitted vertically from mother to daughter. Similar population structure by foraging specializations is found in other dolphin communities, for instance in cases of human dolphin fishing co-operatives.

Cooperation with humans

In Brazil there are at least two cases where some, but not all, bottlenose dolphins in a community have a long-standing and complex cooperative relationship with local fishers which are almost certainly vertically transmitted between generations of *both dolphins and fishermen*.

The population of orcas off the west coast of Canada is clearly structured at a number of hierarchical levels, and much of this structuring seems to be cultural. At the highest level, different types of orca ("residents" and "transients") are sympatric, but

show sufficient differences in feeding behavior, vocalizations, social systems, morphology, and genetics that they may be incipient species. It

For a range of non-human animals, culture is a vital determinant of phenotype, and so how the animals interact with humans and our cultural artifacts

has been suggested that this division was originally cultural. At lower levels, "communities", "clans" and "pods" of orcas may differ in vocalizations, foraging behavior and social behavior, but often have overlapping ranges.

Sperm whales too

The complex, stable and sympatric vocal and behavioral cultures of orca groups have no known parallel outside humans. The closest analog is with the sperm whale, whose society is also arranged into a multi-level hierarchy, at least two levels of which may support cultural differences among sympatric groups: the approximately 10-member "social units" and ocean-wide "clans" with thousands of members each.

Dr. Whitehead and his team concludes that we have heard arguments that if we are at the stage of conserving non-human cultures, then the real conservation battles have already been won. Dr. Whitehead and his team disagree. For a range of non-human animals, culture is a vital determinant of phenotype, and so how the animals interact with humans and our cultural artifacts. Thus, culture should be an integral element of the conservation biology of these species: cultural organisms behave very different than those for which culture has little significance.

At lower levels, "communities", "clans" and "pods" of orcas may differ in vocalizations, foraging behavior and social behavior, but often have overlapping ranges.

It's called

Earth Day.

That's not to say

we need to treat it

like Dirt Day.



After more than thirty years, we thought it was time that the other 72% of the planet got some attention. Which is why we're asking people to Dive In To Earth Day the week of April 18 to 24. So grab some friends and install a mooring, do a reef survey, or organize an underwater cleanup. Everybody into the water. For more information, visit www.coral.org or call (415) 834-0900.



West Marine





Opinions

Letters &
All perspectives expressed in this section are those of the individual author and do not necessarily reflect the views of X-RAY MAG or its associates

Edited by
Peter Symes

comments

Sinai: Build bridges, not barriers

I read in on X-ray magazine's website about the new "Berlin wall" around Sharem El Sheikh. As an Israeli that is familiar with the conflict from within, and as a diving instructor, photographer, journalist and most of all nature lover I would like to tell a short story.

About one month ago I was leading A group of nine Israeli divers on A diving Safari to the Ras Mohamed National Park in the south of Sinai. I went there with a Israeli group under very strong recommendations from the Israeli ministry of defence NOT to go down to Sinai during this time as there are many warnings about terrorist organization that are intending to kidnap tourists in Sinai (and especially Israelis).

After many cancellations and doubts we finally made the 3 hours drive from our border in Eilat to the harbor in Sharem El Sheikh safely. We went on board with the lovlies Egyptian crew and on the second day of the journey when we arrived to the world famous Thistleworm wreck, we received the most beautiful gift we could imagine from Nature: six wild dolphins came to play with us, and swam around us for long minutes which happens very rarely in the Thistleworm. They were so close and so lovely as you can see in the picture

I am publishing the story of this special safari trip in at least one magazine I am working for in Israel, and I hope it will help people to make the decision, to fight their fears, get out of the sofa - in front of the T.V. where they show us mostly the bad news, to go to Sinai to travel, to dive, to enjoy the beauty of nature and life, together with our neighbours from the other side of the border.

We are all sharing the same future. we all share the same beautiful Red Sea, and I believe after all we all love Dolphins. There are only a few extremists on each side, and we shouldn't give them the pleasure and bring hate or fear into our hearts. They want us to stay home scared, and to hate the other side.

We should fight them without weapons, only with our spirits and love and we will win in the end. At least that what I felt when those beautiful peaceful creatures were swimming with us right next to that huge broken war machine that lies on the ocean floor.

I don't think Sinai is anymore dangerous then anywhere else on the planet, neither does Israel. please come and visit us!!!

For me it is very important that people around the globe will know that there are many Israelis and Egyptians that are sick and tired of that war, and are searching for peace, underwater and above, and sometimes even find it...

My best to you

Yonatan Mir
Eilat, Israel

I believe our love for nature and diving can be a bridge.

Holidays behind fences? I think not

In an effort to improve security for tourists in Sharm El Sheikh, Egyptian authorities intend to build a 20km fence around Sharm

This summer three bombs exploded in Sharm, killing 88 people, including 11 Britons, wounding about 150 others. Yet this hasn't dampened our enthusiasm; Sharm is more popular than ever and this winter the tour operator Thomson will be flying 15 charters a week into Sharm, which is more than double from last year. Only this year, the tourists will encounter heightened

security, including vehicle checkpoints to get into the resort. But while the authorities are right to crack down on terrorism, and the proposed fence will be out of sight of the tourist areas, do we really want to take a holiday behind a barricade? Sharm has already turned into a tourist ghetto, where tourists and locals live separately and a wall or fence will only make this division more stark.

And if Sharm is fenced off, what's next? Terrorists may just target other nearby resorts such as Nuweiba, Dahab or Taba. We can't erect fences everywhere, nor should we. We need tourism where locals and visitors are well integrated, where

local communities are provided with both an income and a sense that tourists are guests who visit on an equal footing with locals. Creating resorts that facilitate such encounters will help to knock down any perceived divides between cultures rather than creating them in the first place is ultimately the way to overcome the "us and them" divide that is already afflicting resorts such as Sharm. Fences are for prisoners and prisoners we will not be.

Jaime
Huddersfield, England
(no surname supplied)



Enough of the hypocrisy

Japan should admit its whaling program is a total farce. They have for years maintained its scientific whaling program is about real science, while it has been glaringly obvious to just about everyone else what was really going on. Now genetic testing has confirmed that the blue whale, one of the world's most endangered species, is being sold at Japanese fish markets. Blue whale is one of the species Japan is not allowed to kill under International Whaling Commission (IWC) rules.

Charles Hook
San Diego, United States

Turtles go into soup too

Dear X-Ray Magazine,
Thank you for taking such a clear stance on the issue with Disney serving shark fin soup at their Hong Kong resort. Unfortunately sharks are not the only species threatened by culinary practices in the region. If endangered species of Indian turtles also seem to vanish, them being a delicacy in Chinese cuisine has very much to do with it. The demand for turtle meat in the Chinese market has reached such a level that it has landed these species in serious trouble. Moreover, they make a detour via Kolkhata (Calcutta) and Bangladesh to reach Chinese kitchens. A survey done in 1999 in South China had revealed that 70 per cent turtles were

imported from South East Asia. There have been some success in reducing this number through farming turtles domestically in China and in making the Chinese government and public more sensitive to the fact that these species are threatened. But the reports that turtle markets in China appear to be changing and that the Chinese seem to be taking to farmed turtles should be viewed with extremely guarded optimism. The demand in the market is still too high to be met from China's own farming which has resulted in the recent inclusion of Red Crowned Turtles (Kachuga kachuga) in the red list of IUCN.

Sonia Singhani,
Mumbai, India

Pollux or Polluce?

Your article on the Polluce - page 56 - states:

"Nigel Pickford lists it as the treasure of Pollux in his authoritative *Treasure Atlas*, so it is well known. However there has been much confusion about the names Pollux and Polluce. Pollux has to a large extent been the one that got stuck in the minds of people but wrongly so. The Pollux is a vessel that were lost in the beginning of the 1800's. One reference tells that Ferdinand IV, King of the Two Sicilies, fleeing Napoleon's advancing forces as they were invading Naples, loaded his treasures aboard an English sailing ship, and

No!



sent it northwards, towards a friendly port."

I have Pickford's book and it says POLLUCE – it does however state 1806 and talk about fleeing Napoleon's forces. Could you please clear this up for me? Could he have meant: 1841, POLLUCE and the traditional story of the 1841 Polluce?

Help! I'm so confused!!

Kathy Cunningham
(no adress supplied)

Enrico Cappeletti replies:

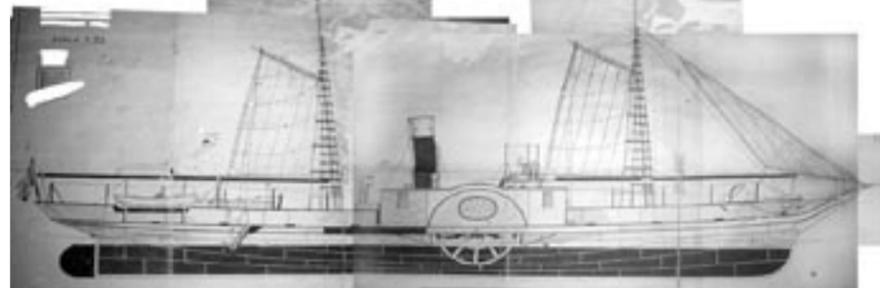
Kathy, is a good question.

Even the great Pickford made a mistake. I spoke few times with him and he learned about the mistake. He mentions the POLLUCE- the ship went down june 17, 1841 at 11.45 pm. She had on board a lot of coins in silver and gold.

If you go in our website www.hdsitalia.com you can see all the pictures I shot October 10 -31th during the salvage operation of what was left after a group of illegal english treasure hunters. Polluce was a ship of Sardinia Reign. She sailed on the Marseille-Naples route twice a week. We spent three year to understand that was the same ship that an anglo-italian team broke to pieces.

Polluce is the name in Pickford's Treasure Atlas. But the date is wrong. Pickford, as others before and after him, relayed a story that went all over the island (Elba) about a Spanish sailing ship that in 1806 carried a treasure belonging to the king of Naples. Few miles from Elba—and this was at that time when Napoleon was exiled on the island—she sunk herself in order to not fall into the hands of the French. As this story goes this ship was Pollux, or Polluce in Italian.

When we found the ship, it was made of iron and with



paddles. It wasn't a sailing ship of course but something else. It took us more than a year to find out that a ship went missing between Marseille and Naple just looking the timetable. This ship was the Polluce belonging to the Rubattino Company, Genoa, She was bought in Le Havre in 1839 and entered service on the line in April 1841.

The story that circulated on Elba was telling about a golden trolley. We found out in Marseille in an old newspaper that Della Rocca princess had onboard her trolley.

But there is more to the mystery about this ship. Why did Polluce already in 1859 come under the eyes of the treasure hunters? Why did the owner try to salvage the ship in Oct 1841? Why did English, Swiss, French and Germans come to the waters off Elba island water to give it a try? How come the greatest the treasure hunter in the world didn't touch her while someone in the United Kingdom was was able to buy the histoical information? Why aren't there any evidence of the vessel in the Italian historical database? How much was really on board? From what we can gather from the latest information it was much more than first assumed.

The four english divers went on trial in UK. They were fined for £ 2500, that's all. They smashed the only treasure ship we had in our waters and nobody can do anything about what happened. They were backed up by some Italian and one French guy and they will go on trial in January 2006.

Next summer we will go back to collect what is left. Meanwhile I have ten month to discover what else might be inside that ship.

regards
Enrico Cappeletti

Eating fish - or not

Your editorial on our consumption of tuna and it is implications for the dwindling stocks was right on. Finding substitutes or solutions will not be easy.

In the meantime there are absolutely no excuses that we don't put an immediate stop the indulgence in exotic species just on culinary reasons when the fishing practises wreck havoc with the ecosystems in the seas. Orange Rought costs about the same as smoked salmon and is served up in the smartest restaurants. But although Orange Roughy may seem a luxurious treat for the well-off, bringing it to the table comes at a horrendous price.



Orange Roughy. Illustration from New Zealand's Ministry of Fisheries

It is fished by bottom-trawling in which trawls suspended from factory-size fishing vessels are dragged violently along the seabed while their metal plates, nets and rollers ploughs everything up in their path. But the hauls bring up nothing more than a small catch of deep sea fish while breaking huge areas of tonnes of ancient coral. Like with the shark fin issue please help pressure fishmongers and restaurants not to stock these fish.

Robert Smith
United Kingdom



Deep Down the Navy Divers want the Best

Do you?



Master Jacket w/ Air II Single Tank and Basic Valve

MK18/S600

Smart Com



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After a year of intense research the Royal Danish Navy decided what suits them best

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