Seven Deadly Sins
of a Rebreather Diver

Detail from Hieronymus Bosch's *The Seven Deadly Sins and the Four Last Things.* c.1450-1516

Lust: Nitrogen is like having sex. It can give us a lot of fun, but it can also impair our judgement.

Text by Cedric Verdier

Except if you spent a few years in a catholic church or a few hours enjoying the movie with Brad Pitt and Morgan Freeman, the seven deadly sins are often considered a notion of the past. In the modern world, examples of pride or envy don't seem to immediately drive the sinner to hell, and lust is all over the Internet.

Nevertheless, they should be regarded as valid for a rebreather diver using a CCR or SCR. Looking at the statistics and the accident reports, the seven deadly sins of a rebreather diver can surely help you to buy an express ticket to hell. First class. One way.

DETAIL FROM HIERONYMUS BOSCH'S *THE SEVEN DEADLY SINS AND THE FOUR LAST THINGS.* C.1450-1516

Gluttony

Our body needs food. Our body needs oxygen, too. But too much food or too much oxygen can also kill you sooner or later. A setpoint too high on an eCCR, exceeding the MOD on an SCR, or simply exceeding the physiological limits of oxygen exposure can lead a rebreather diver to oxygen toxicity and its various manifestations (acute Oxygen Toxicity poisoning on the Nervous System, whole body toxicity and its effects on the lungs, O_2-induced myopia).

- Limit your oxygen exposure.

Gluttony: Simply exceeding the physiological limits of oxygen exposure can lead a rebreather diver to oxygen toxicity...

Lust

Nitrogen is like having sex. It can give us a lot of fun, but it can also impair our judgement. Deep air divers are sometimes compared to drug-addicted people, and there is a good reason for that. An Equivalent Narcotic Depth too high is a good way for a rebreather diver to make a mistake while using his/her unit. And, for a same depth, a rebreather diver is always more prone to Nitrogen Narcosis than his fellow Open Circuit diver. Why? Because even with the most efficient scrubber, the CO_2 level in the loop will always be higher than in a second stage. And that will increase the susceptibility to inert-gas narcosis.

- Don't expose yourself to excessive Nitrogen Narcosis.

Greed

Scrubber material is cheap. So, why pushing the limits? Why try to save some money when your safety is much more important?

A diver who has invested in a rebreather and the proper training to use it, shouldn't try to extend the duration of his/her scrubber beyond the manufacturer's recommendations. CO_2 is a nasty gas, and nobody really wants to experience signs and symptoms of hypercapnia. A CO_2 hit is one of the worst things that could happen to a rebreather diver at depth.

- Change your scrubber in time.

Greed: Scrubber material is cheap... Why try to save some money when your safety is much more important?

'Avarice' print engraving from Jacob Matham's series *The Vices* c.1587

DETAIL FROM *DESIDIA* (SLOTH), 1558, BY PIETER VAN DER HEYDEN AFTER BRUEGEL

Sloth: A rebreather diver who doesn't properly take care of his/her unit is an accident waiting to happen.

Sloth

If complacency kills, laziness is one of the accomplices to the murder. A rebreather diver who doesn't properly take care of his/her unit is an accident waiting to happen. A rebreather is an expensive and delicate piece of equipment. So, a proper maintenance schedule is a must. It's a life support system, and it needs to be regularly serviced as such. A lot of its components can fail (o-rings, electronics, valves, etc) and their failure may remain unnoticed until a small problem triggers a life-threatening situation.

- Maintain and service your rebreather properly.

Wrath

Most of the time, in our daily lives, anger comes from a lack of control of events. Task loading, overexertion and stress could happen to any diver, but a rebreather diver has more things to do and to control than his/her fellow Open Circuit scuba diver. Keeping a good buoyancy control, checking the functioning of the unit and properly operating the rebreather are all parts of a normal rebreather dive. How to avoid task-loading? Take your time. Don't try to do several things simultaneously. All actions have to be done much slower with a rebreather: descending, ascending, swimming and even breathing.

- Avoid task-loading at depth.

Pride

With experience and logged dives, some rebreather divers become overconfident. After having followed a check-list for a hundred times, one may have the feeling he/she doesn't need it anymore. Or one might think that some parts of it can safely be skipped as nothing ever happened during the hundred dives before. The positive/negative pressure tests are cut short. The different components of the unit are too quickly checked. Or the rebreather diver only relies on his/her memory to follow the various steps of the check-list and simply forgets some of them. Then he/she will maybe dive on a partially inspected rebreather…

- Always use your check-list before each dive.

Envy

The desire to go deep or to explore new environments is a normal behaviour for most rebreather divers. Nevertheless, this has to be done properly and only after completing the adequate training. Diving deep with a rebreather doesn't seem very complex. Just use the appropriate helium-based mix and follow the computer! Unfortunately, nothing is that simple when it comes to proper planning or emergency procedures. In the past, a few rebreather fatalities showed that even very experienced Trimix Open Circuit divers failed to do safe mixed-gas CCR dives, as they didn't have the necessary experience and training. For Open Circuit cave divers, diving in a cave with a rebreather is more than just using a different piece of equipment. The complete dive plan has to be done differently. For experienced Rebreather divers, switching from one rebreather to a new one could ask for a new training course.

- Be trained for the equipment you use and the environment you dive in.

By using the previous rules, a diver could expect to avoid the seven deadliest sins of rebreather diving —a good way to keep your head on your shoulders and to avoid being sent to hell sooner than expected… ■

Cedric Verdier is a PADI course Director, ANDI-PSA-TDI-IANTD-DSAT Trimix Instructor Trainer, and CCR Mixed Gas Instructor Trainer. For more information, email: ***info@cedricverdier.com***

Pride: With experience and logged dives, some rebreather divers become overconfident.

Pride, from the *Seven Deadly Sins* by Jacob Matham, circa 1592

Wrath: Anger comes from a lack of control of events. Task loading, overexertion and stress could happen to any diver…

'Envy' in *The Seven Vices* by Giotto, 1306 fresco in the Cappella degli Scrovegni or the Arena Chapel in Padua, Italy

Envy: The desire to go deep or to explore new environments is a normal behaviour for most rebreather divers.

POINT & CLICK ON BOLD LINKS

Edited by Arnold Wei

A-Okay Equipment

Aeris F10

For freediving and training. Free dive mode main displays depth and elapsed dive time with access to either a pre-set countdown timer or lap timer, audible alarms with flashing led and auto-backlight illumination, user-defined surface recovery timer, repeating elapsed dive time alarm, repeating depth interval alarm, and 3 max depth alarms. Digital watch functions including alternate time, countdown timer, lap timer, and daily alarm, 99 dive log with :01 step profile, history mode, user-replaceable battery, optional pc interface with 1-second sampling rate. **www.oceanicworldwide.com**

Carbon 42

The latest regulator from Mares is the first regulator made of carbon fiber. The second stage case is thus 65 percent lighter than the same versions in metal. As carbon is also an exceptional conductor of heat it is less prone to freezing up under cold conditions. **www.mares.com**

Adventure Cart

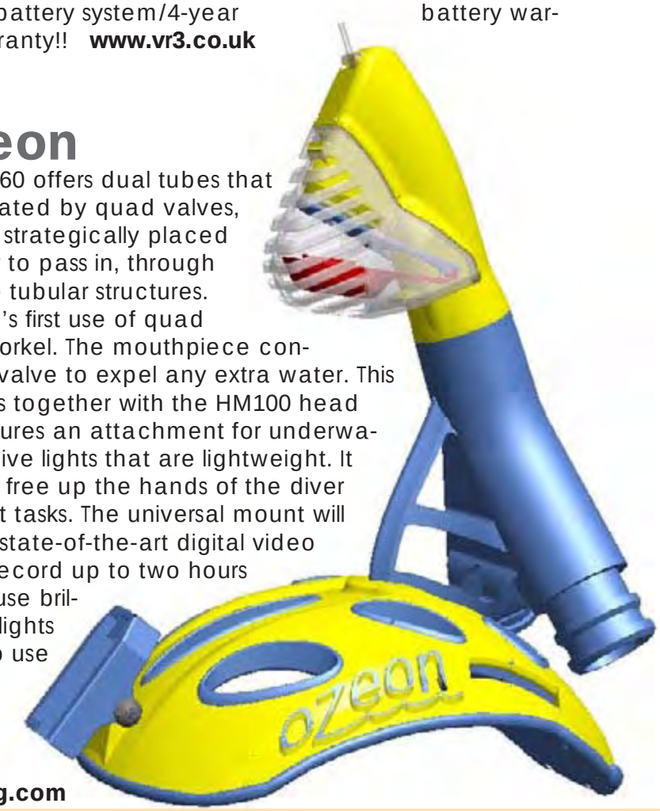
This collapsible gear carrier features a rugged front equipment platform and a first of its kind rear platform. Built tough, but still lightweight and convenient. Features: telescoping handles and optional interchangeable tires, work tables and stools. Weight: 25lbs. Load Capacity: 300lbs. Materials: Made of stainless steel, aluminum and Delrin plastic. **www.smartgearusa.com**

VRX

The new algorithm incorporates the best of Gradient factors, bubble models and Haldane dissolved gas models. For a limited period the '08 model will come fully loaded as a Closed Circuit Trimix computer (C1 to C4 PIN's supplied) with rebreather port activated. Features: built in torch, range of colours, low profile design, high resolution graphics, enhanced ergonomic functionality, Variable Gradient Model (VGM) algorithm, rebreather interfaces, 1 or 3 cell monitoring, replaceable, Lithium Ion rechargeable battery system/4-year battery warranty!! **www.vr3.co.uk**

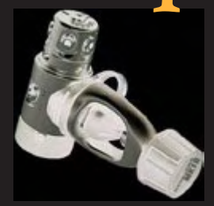
Ozeon

The QV360 offers dual tubes that are regulated by quad valves, which are strategically placed to allow air to pass in, through and out the tubular structures. It's the world's first use of quad valves in a snorkel. The mouthpiece contains a purge valve to expel any extra water. This product comes together with the HM100 head mount also features an attachment for underwater cameras or dive lights that are lightweight. It could be used to free up the hands of the diver for more important tasks. The universal mount will allow divers to use state-of-the-art digital video cameras that can record up to two hours of full rate video, or use brilliant LED underwater lights without having to use their hands.



www.ozeonsnorkeling.com

equipment



SR¹

the SR¹ is the most technologically advanced regulator Sherwood Scuba has produced in its storied 50-year history. The SR¹ utilizes a pneumatically balanced second stage, with a two-piece flow-through first stage piston for precise optimum balance and intermediate pressure control. The first stage is environmentally sealed featuring a dry-sealed spring chamber, two high pressure ports, five low pressure ports on a 360 degree swivel and is compatible with a yoke or DIN attachment. **www.sherwoodscuba.com**

Minno

Widely used by NASA, the U.S. Military, marine researchers and search and rescue organizations, the aquaSketch Minno is not a slate but a revolutionary new system that successfully brings the convenience and versatility of paper underwater. While the aquaSketch Minno surpasses the capabilities of the slate by offering unlimited writing capacity and the ability to save notes, it also opens up new possibilities for on site reference and documentation with the ability to scan dive notes into a computer after dives and print material directly on the vellum for reference during dives. **www.aquasketch.com**

OCB from APD

Ambient Pressure Diving's Open Circuit Bailout Mouthpiece, the OCB, is now available. APD's patented dual valve technology allows gas to be fed from the left or right facilitating individual configuration and is ready for use with high oxygen percentage gasses. Manufactured to a very high standard in their specialist facility, it can be fitted to existing units and will be optional on the purchase of a new unit. As with all their products full spares and back up are available. **www.apdivingdirect.com**

Infinity

The close-to-the-eyes frame design produces a mask with a low profile and an excellent view upwards and downwards. The side lens is made of an optical quality polymer and offers brighter vision and increased side light. Cardanic joint buckles rotate both up-and-down and in-and-out. **www.aqualung.com**

Surface Support Station

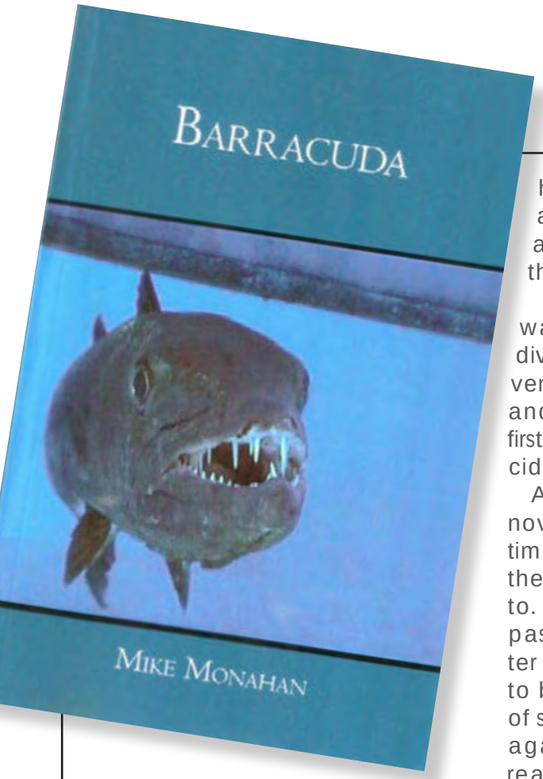
This Surface Support Station is a unique float that utilizes storage pockets, which can be removed from the float and attached to the instructor's BC for easy access. To complement the Surface Support Station, the Sand Grab Anchor was developed for anchoring floats in sandy or silty conditions. It folds in half with two handles for easy transportation and to carry equipment to and from the dive site, multiple points for attaching pockets to customize the float to individual needs, two pocket sizes designed to fit various dive equipment, pockets are designed with oversized flaps for easy opening, pockets can be removed from the float and attached to the diver's BC for extra storage during a dive. **www.atwaterconcepts.com**

reviews

Books Film DVDs CDs

Edited by Catherine GS Lim & Simon Kong

POINT & CLICK ON BOLD LINKS



Barracuda

Detective Mike O'Shaughnessy is a likeable guy. From the start, he comes across as someone whom you won't mind having a beer with. Indeed, his easy-going personality proves to be an asset as he travels to Bikini Atoll to recuperate. Along the way, he makes friends with fellow divers, resort staff and a pair of scientists as he stumbles upon some illegal activities involving the Japanese and Russian crime syndicates on the island.

Add to the mix a band of wayward (to put it lightly) renegade divers and a bad-ass (to put it very lightly) mutant barracuda, and what you get is this exciting first novel by former NYPD homicide detective Mike Monahan.

Although this self-published novel can be a tad formulaic at times, it is easy on the eye and the characters are easy to relate to. However, thanks to the writer's passion in diving (he's a divemaster with more than 1,000 dives to brag about), the descriptions of scuba diving and marine life against a fictional background is realistic enough to warrant a second or third reading.

We're definitely looking forward to the next book in the Mike O'Shaughnessy series!

Published 2008
235 pages, paperback
ISBN-10: 1419684027
ISBN-13: 978-1419684029

—Catherine GS Lim

Nadine *Labour of Love* is a picture book of underwater art by Indonesian Windiarto Tjandra with a forward by Todd Essick. It features Nadine Chandrawinata, a former Miss Universe Indonesia 2006 modelling underwater sans scuba.

Every photo is given a name that oftentimes sounds silly but nevertheless imaginative such as The queen and her coterie, Rhythm of the currents, Caught in the act, Pulse of the waves, At your beck and call. Nadine poses in all sorts of manner only a mermaid could and in very stylish outfits too. One thing that is very distracting is the amount of bubbles rising to the surface at the edges of some pictures. No doubt they are from her safety divers, but if perfection is the aim of this portfolio, then in my opinion, Windiarto Tjandra lacks an eye for detail. I'm also surprised he didn't learn anything about including marine life in the shoot from Todd Essick whose own underwater pictures feature sharks and a damsel in distress — themes that would have definitely given this book an interesting marine life angle as well.

A bed of embroidery needs special mention. It is the only picture featuring Nadine with fishes. A school of juvenile catfishes, to be exact. I suspect the inclusion of the catfishes here is by pure chance when they were swimming in the area as the shoot was taking place. The picture is interesting and nicely taken but not perfect. Nadine is seen lying on the sandy bottom behind the feeding school in a semicircle, but she had to spoil the almost perfect shot with her wayward left leg awkwardly stretched out behind her head. If it had hidden behind her wavy hair, the shot would have been the highlight of the whole book!

Title: *Nadine Labour of love*
Author: Windiarto Tjandra
Publisher: John Thet of ScubaDiver Australasia
Editor: David Espinosa
No of pages: 144
Date published: 2008
Hardcover, 250mm x 288mm
ISBN 9810801939

—Catherine GS Lim

Nudibranchs Encyclopedia

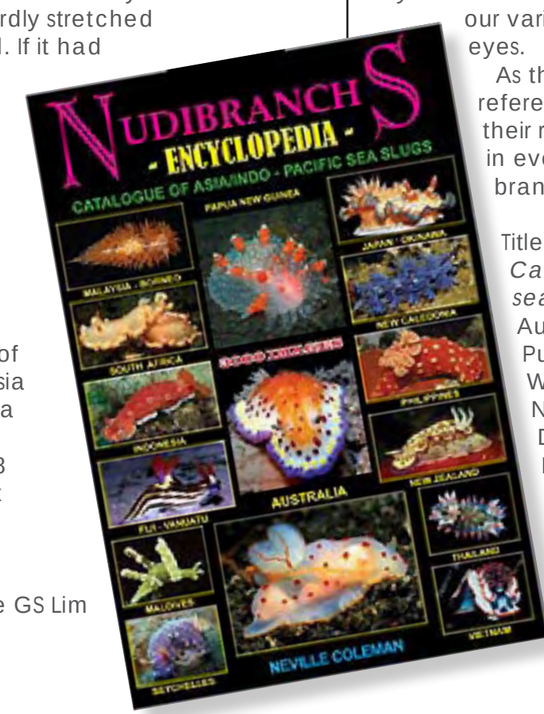
Catalogue of Asia/Indo-Pacific Sea Slugs

Neville Coleman has done a good job of updating his 1001 Nudibranchs with the eagerly awaited *Nudibranchs Encyclopedia*. Featuring his own work and those of many other renowned marine life photographers, this extensive encyclopedia is handy enough to bring with you on nudibranch expeditions. Producing the book in hard cover was a smart choice as it is able to better endure the wet hands of divers eager to reference their latest discovery just after a dive.

The amount of pictures, more than 3,000 in all, is mind-boggling. If you were to personally identify each species, it would probably take more than a lifetime. To the casual reader, thumbing through the book is a fascinating discovery in itself as page after page of unimaginable and bizarre species can be seen.

Where a species has many regional colour variations, many pictures of that variation by different photographers and at different locations are shown. This aids positive identification. An example is the species *Phyllidia ocellata,* which has extensive colour variations that look like bull's-eyes.

As the most comprehensive reference on nudibranchs and their relatives, this book should be in every dive centre and nudibranch lover's collection.



Title: *Nudibranchs Encyclopedia Catalogue of Asia/Indo-Pacific sea slugs*
Author: Neville Coleman
Publisher: Neville Coleman's World of Water
No of pages: 416
Date published: Jan 2008
Hardcover, 168mm x 242mm
ISBN 9780947325411

—Simon Kong

Shark skin adds speed like golf ball

Scientists have discovered that sharks can raise their scales to create tiny wells across the surface of their skin, just like the dimples on a golf ball, reducing drag to reach high speeds in the water.

The minute scales, which are just 200 micrometers long, are made from tough enamel, such as that found on teeth, giving the skin a rough texture like sandpaper. Lying flat, they had previously been found to reduce drag as the shark swims. Some reports had also suggested that sharks can bristle their scales, causing them to stand up on end.

Experiments have now revealed that tiny vortices or whirlpools formed within the cavities between the scales.

These vortices form a kind of "buffer layer" between the skin's surface and the fast moving fluid, preventing a turbulent wake from forming behind the shark.

Since a wake has a lower pressure than the rest of the fluid, it exerts a backwards pull on an object, decreasing its speed and making it harder to change direction.

Eliminating this wake decreases the overall drag on the shark, allowing it to travel faster and move more easily without the thick, syrupy feeling humans get as they try to move through water.

The same principle explains the dimples on golf balls, which also create mini vortices to reduce drag in this way. ■

CENTERS FOR DISEASE CONTROL AND PREVENTION

Shark Blood Help Fight Malaria and Arthritis

Shark antibodies might be used to treat a wide range of diseases from malaria through arthritis and even cancer.

Sharks have over 100 million antibodies that are amongst the smallest in the animal kingdom. They are also far more biologically stable than human ones. This means that they can also be used to develop oral treatments rather than ones that need to be injected as they can withstand the extremes of the human digestive system.

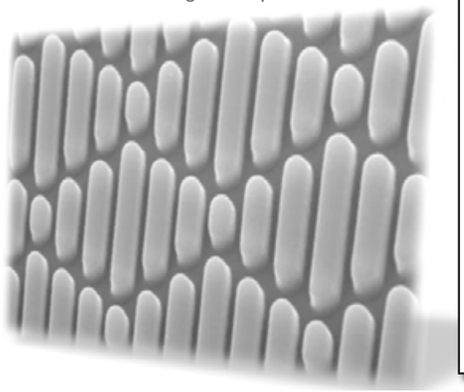
By using shark genes and putting them into a genetic vector together with random proteins, Autralian scientists Professor Mick Foley and Dr Stewart Nuttall have managed to manipulate the sharks genetic material to produce antibodies to a wide range of human ailments.

The shark antibodies produced have a finger-like loop that binds to the disease protein and stops the molecular function of the cell, and therefore, prevents it from invading the human cells. The biologists are working on ways in which they can select the relevant antibodies and then optimise it so that it binds very tightly to the protein in question. ■

Shark Skin Design Helps Hospitals Fight Infections

Dr Anthony Brennan and researchers from the University of Florida invented a surface made up of micro-scale features shaped, arranged, and spaced in a specific pattern called Sharklet™. The pattern was inspired by the skin of sharks and is a non-toxic and non-biocidial approach to enhancing the ability of a biomaterial surface to control microorganism growth. ■

Shark skin patterned surface could fight hospital infections



FINS protect the fins

Researchers in Spain are reporting that a new DNA identification method could thwart false labelling of shark species used in various seafood products, including the expensive Chinese delicacy known as shark fin soup.

Consumption of shark meat appears to be on the rise worldwide, with some seafood companies reportedly having substituted cheaper shark species for more expensive species and incorrectly labelling their products. European Union regulations now require listing the species name on shark products to avoid fraud and to help conserve certain shark species. However, a fast, reliable method for distinguishing between different species of shark remains elusive.

The scientists describe the use of a relatively new technique called forensically informative nucleotide sequencing (FINS), in which DNA isolated from unknown biologic samples is compared to a database of DNA markers from known species.

In the new study, the scientists collected DNA markers from nine different commercial seafood samples containing shark meat and compared them to known DNA markers from 23 different shark species.

The scientists found that two of the nine shark products analysed had been labelled with incorrect species names, demonstrating the effectiveness for the FINS method. ■

Europe's Most Endangered Sharks Slated for Protection

The European Commission releases bold proposals to end all fishing for spiny dogfish, porbeagle and angel sharks, expand protections for rays.

The Shark Alliance is applauding the European Commission's proposals, released today, to end fishing in 2009 for six shark and ray species classified by the International Union for the Conservation of Nature (IUCN) as Threatened with extinction in the Northeast Atlantic.

"The future of Europe's most endangered sharks and rays now lies with the European Council of Ministers"

The Commission has proposed setting total allowable catch (TAC) for spiny dogfish (or "spurdog") and porbeagle sharks at zero and prohibiting fishermen from keeping angel sharks, common skates, undulate rays or white skates.

The Commission has also proposed additional improvements to the management of fisheries for skates and rays. The European Council of Ministers will make final decisions on EU 2009 fishing limits December 17-19.

"We are impressed with the Commission's strong stance and unprecedented adherence to the scientific advice with respect to fishing limits for several of Europe's most endangered sharks and rays," said Sonja Fordham, Shark Alliance Policy Director. "These proposals demonstrate the most solid step to date toward a new, more responsible era in the management of European shark fisheries."

Earlier this year, the International Council for Exploration of the Seas (ICES) warned of severe depletion and local extinction of the bottom-dwelling angel shark and white skates and recommended that these species receive the "highest possible protection". ICES also called for an end to fishing for undulate rays and common skates. Common skate, angel sharks and white skates are listed by IUCN as Critically Endangered; undulate rays are classified as Endangered. ■

Spiny dogfish

—What is this fascination we have with poo?

BBC Reporters Breathless Over Whale Shark's Pooing in Front of Rolling Cameras

It is as thick as your arm and smells disgusting. In what is thought to be a first, a BBC film crew has filmed a whale shark pooping. It was then scooped up for research.

SCREENSHOT FROM BBCS VIDEO

The sample has helped us discover more about the giant creature's feeding habits, said biologist Mark Meekan, who called called the shark's feces sample "scientific gold."

"It does seem rather weird, someone being so excited about seeing whaleshark poo. And I'm pretty certain that this is the first time it has been filmed. But it is pretty rare—they are usually doing their business down in much deeper water."

"One way to work out what is going in one end is to look at what is coming out of the other."

He said that by getting hold of some of the shark's waste, they could use sophisticated genetic techniques to look at the DNA in the sample to find out exactly what those animals have been eating.

The whale shark had been feasting on red crab larvae, according to genetic analysis, which could be why the fish are attracted to Christmas Island, which has plenty of this food available.

The footage will be available as part of a BBC Natural World wildlife program called, "Whale Shark". ■

YouTube

Those with an obsession for this matter of whale shark bowel movements may take interest in this additional footage we found on YouTube

WWF: Ban shark fishing on GBR to save species

Conservation group WWF says the Queensland government must phase out targeted shark fishing on the Great Barrier Reef in a bid to preserve the species.

A report by the Environment Department has raised concerns over the practice in Australia's northern waters.

WWF spokeswoman Gilly Llewellyn says species like the hammerhead thresher sharks and bull sharks are at risk of becoming extinct within 30 years. ■

Nz Government Fails to Curb Shark Finning

The New Zealand government's recently released five-year national plan of action for sharks continues to allow shark finning.

Conservation advocate, Kirstie Knowles, says that while the plan was welcomed and long overdue, its failure to take the crucial step of banning finning to protect vulnerable shark populations was hugely disappointing.

Finning of sharks while they are still alive is illegal under animal welfare laws, but there is video evidence this still happens. Finning of dead sharks is still legal in New Zealand waters.

Knowles says the minister is hiding behind the live finning issue. Allowing shark fins to be landed alone makes enforcement of the Animal Welfare Act nearly impossible—unless an observer is on all vessels—and continues to allow highly vulnerable sharks to be killed. ■

Beluhas *of the White Sea*

New Sea Farm Raises White Whales in the White Sea

Text by Natalia Cherviakova
and Andrey Bizyukin
Photos by Natalia Cherviakova,
Marina Kochetova, Irina Rudenko
and Peter Slezak

Natural reserves, nurseries, marine parks, aquariums and farms that save different animals and birds are becoming more and more popular all over the world and their numbers are growing constantly. Scientists of many countries still dispute the keeping of wild animals in captivity in zoos, marine parks and circuses. Is it not inhumane to put wild animals and birds, living free and wild in nature, into cages? But on the other hand, poor, sick animals or babies lost from their parents, will die if they stay in the wild. That's why these kinds of species (not prepared for life in the wild) have come into the care of some special human beings who provide nurseries for them.

THIS PAGE: Amazing white whales from White Sea like to play and communicate with people.

White whales feel comfortable even in icy water under thin ice. They just need to have a big enough ice-hole through which they can breath air regularly

In 2006, marine biologists from St Petersburg's department of Utrishsky Dolphins' Aquarium decided to initiate a scientific project to build a natural farm, or nursery, for the breeding of white whales—or *beluhas*, as they are called in Russia—on the White Sea. One of the main aims of the project was to decrease the number of white whales caught from the wild and to exchange them with animals born in natural sea nurseries like this one.

By the way, only two countries—Japan and Russia—continue to catch white whales. It takes a lot of experience and a high level of professional skill.

The second reason for building this new natural aquarium was to make a vacation place, or a spa, for polar cetacians, to bring white whales here from big cities and provide a temporary place for rehabilitaing them in a natural environment of the White Sea waters where they could regain strength, immunity and well-being.

This new generation of natural dolphin aquariums are not built to be circuses, but to provide a new approach to direct communication between humans and sea mammals.

At the end of January 2007, two young white whale males, named Filya and Semen, came to the White Sea as the first residents of the new natural aquarium. In the move, they came back to their home waters, albeit in an open-water cage, near a local dive center called the Polar Circle.

Six years ago, these two males (then aged four years old) were caught from this same White Sea area. They were taken to an aquarium in St Petersburg and trained to give performances on tours to Moscow, Egypt and Saudi Arabia. During this time, they were in very good and constant contact with people.

It was lucky that both of these dolphins were well-adapted to the human beings in their new home, which made for good contact with scientists, biologists and divers.

The white whales, or beluhas, played very well with everyone who came to the open-water cage. With swimmers, they were happy to take each for a spin, and nibbled feet and hands in a very friendly way. But divers made the whales a bit afraid. For a long time, the beluhas preferred to take just a quick look at the bubbling persons and then stayed well out of the way.

The whales enjoy freedivers who come to the dive center. One women was free diving with a monofin. The whales became very happy, perhaps thinking

White Sea beluhas like to play with kids

FACTS ABOUT BELUHAS

Beluhas (*Delphinapterus leucas*), otherwise known as white whales, are a threatened species. Found only in the northern hemisphere, beluha whales live commonly in the coastal waters of the Arctic Ocean. They can also be found in subarctic waters. When the sea freezes over, Arctic beluhas migrate southward in large herds. Sometimes they get trapped by Arctic ice and die, becoming prey for polar bears, killer whales, and for the indigenous people of the Arctic.

Because they have been overhunted by commercial fisheries, some beluha populations, such as those in the Gulf of St. Lawrence, have nearly collapsed. They were hunted for centuries for their meat, blubber and skins used in products such as soap, lubricants, margerine, fertilizer, and shoes as well as fodder for domestic animals. Currently, 3,000 belugas are still taken each year.

Recovery has been hindered by harbor construction, river diversion and chemical pollution, which effects beluga fertility in some areas. The current estimated population is around 50,000-70,000 animals.

Characteristics

Beluha whales have an unusual color that makes them stand out from all other whales. Their calves are gray or brown when they are born, a color which fades to white when they reach five years old and become sexually mature. Before the summer molt, their skins take on a yellowish hue. Beluhas rub themselves along the sand or gravel of the seabed when their skins begin to molt.

As whales go, beluhas are small, ranging from 13 to 20 feet (4-6.1m) in length and can reach a weight of 2,000 to 3,000 pounds (907-1,361kg). Their foreheads are round, and they have no dorsal fin. They are unique among whales in that they have flexible necks, which enable them to turn their heads in all directions. The soft and flexible blubber around the head gives the white whale the ability to easily change its facial expressions.

Behavior

In general, beluhas live for 35-50 years in the wild and move together in pods, or small groups. Mothers give birth to one calf every 2-3 years with a gestation period of a year. The mothers have close relationships with their calves.

Being quite social and very vocal animals, beluhas employ a diversified language of clicks, clangs and whistles. They can also immitate a variety of other sounds. The beluha is sometimes called the Sea Canary because of its high-pitched sounds. Beluhas have an advanced echolocation system. They can produce broad-band pulses in a narrow beam, which are aimed from their melon, their bulbous foreheads.

Feeding

Cousins to the narwhale, or tusked "unicorn" whale, beluhas feed on fish (such as herring, salmon and cod), crustaceans, worms and other invertebrates such as octopus, squid, crab, and snails. It is thought that echolocation aids in their search for food and that they used a sucking motion to pull prey into their mouths aided by the flexibility of their lips, a characteristic shared only by one other creature, the Irrawaddy dolphin. A beluga whale has been observed diving underwater for 20 minutes to a depth of 647m during feeding. ■

SOURCE: MARINEBIO.ORG, WIKIPEDIA.COM, NATIONALGEOGRAPHIC.COM

that some of these intelligent beings with arms can live in the water like they do. The four-meter-long whales stayed close with this free diving woman the whole time she was in the water.

A few months later in the summer, the whales started to take interest in scuba divers. They would approach divers who were cleaning the cage and tried to take some of the cleaning tools. They seemed to have stopped worrying about the bubbles coming from the divers' air tanks.

One of the divers described the experience: "It was a sunny day in September. I was standing close to the open-water cage with the beluhas and was preparing to dive in. Just in front of me, a huge white dorsal ridge appeared and slowly went back below the surface of the water. I took a camera and went underwater. In the same moment, Semen bumped his wide forehead into me with a smile in his huge beluha mouth. And his friend, Filya, was trying to taste my strobe. Having made contact, I had become to the white whales a guest, and they started to play with me. I took pictures of the cheerful animals who looked to be really happy here in the natural dolphin aquarium on the Polar Circle of the White Sea. I used up my memory card and the air in my tank very quickly, but didn't rush out of the water because I felt so lucky to see and be so close with these friendly animals."

Special thanks to the Arctic Circle Dive Center staff for the great experience diving with white whales. ■

Pavel Rudenko and white whale after happy dive

whale tales

Edited by
Peter Symes

DNA Tests Identify New Dolphin Species in Australia

Marine mammal experts have uncovered a new species of dolphin in Australian waters, challenging existing knowledge about bottlenose dolphins and highlighting the country's marine biodiversity.

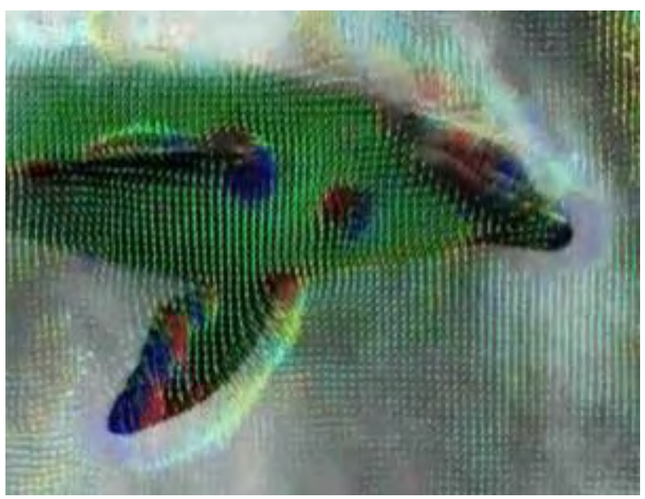
Dr Luciana Möller, of the Marine Mammal Research Group and the Molecular Ecology Lab at Macquarie University led a study that found that coastal bottlenose dolphins from southern Australia should in fact be classified as a new species rather than considered as one of the recognised bottlenose dolphin species.

There are currently two recognised species of bottlenose dolphins and both are found in Australian waters: the common bottlenose dolphin generally found in offshore waters in Australia and the Indo-Pacific bottlenose dolphin, found in coastal waters. Möller said that it is difficult to distinguish some species of bottlenose dolphins using only external body features. ■ SOURCE: WILDLIFE EXTRA

Dolphins' Speed Paradox Solved

New research using high speed videos have shown how dolphins achieve their blinding speeds.

There was something peculiar about dolphins that puzzled the prolific British zoologist Sir James Gray in 1936. He had observed the sea mammals swimming at a swift rate of more than 20 miles per hour, but his studies proposed that dolphins simply do not have the strength to swim so fast. The conundrum came to be known as "Gray's Paradox."



High speed videos have revealed how dolphins swim so fast. Click on image to see the video (It is a link to our website)

Researchers at the Rensselaer Polytechnic Institute in the US studied the movement of water around dolphins as they swim using special high speed videos cameras. With these the team tracked the stream of bubbles around a couple of retired US Navy dolphins swimming through a tank filled with millions of tiny bubbles.

The technique is called digital particle image velocimetry and works by tracking the movement of individual bubbles, determining their speed and direction, and assigning them a colour.

The more prominent the colour, the faster the water is moving. The results show that dolphins can exert as much as 400lbs of force with their tails when they do their signature "tail-walking"—a trick where they keep upright mostly above water with powerful flips of their tails

Stronger than thought

Gray had supposed they could produce less than a tenth of this amount, and imagined that something about the dolphins' skin allowed them to overcome the force of drag in the water and reach high speeds. "For the first time, I think we can safely say the puzzle is solved," said Tim Wei, the Rensselaer scientist who led the study. "The short answer is that dolphins are simply much stronger than Gray or many other people ever imagined." ■

Fishing Practices Still Have an Adverse Effect on Dolphin Populations

Despite the broad implementations of "dolphin safe" fishing practices, fishing activities have continued to restrict the growth of at least one Pacific Ocean dolphin population.

Populations of dolphins in the Eastern Pacific were expected to increase in abundance after successful regulations and agreements were enacted to reduce dolphin deaths as a result of fishing "bycatch," cases in which animals are caught unintentionally along with intended targets, a new report led by a researcher at Scripps Institution of Oceanography at UC San Diego has concluded.

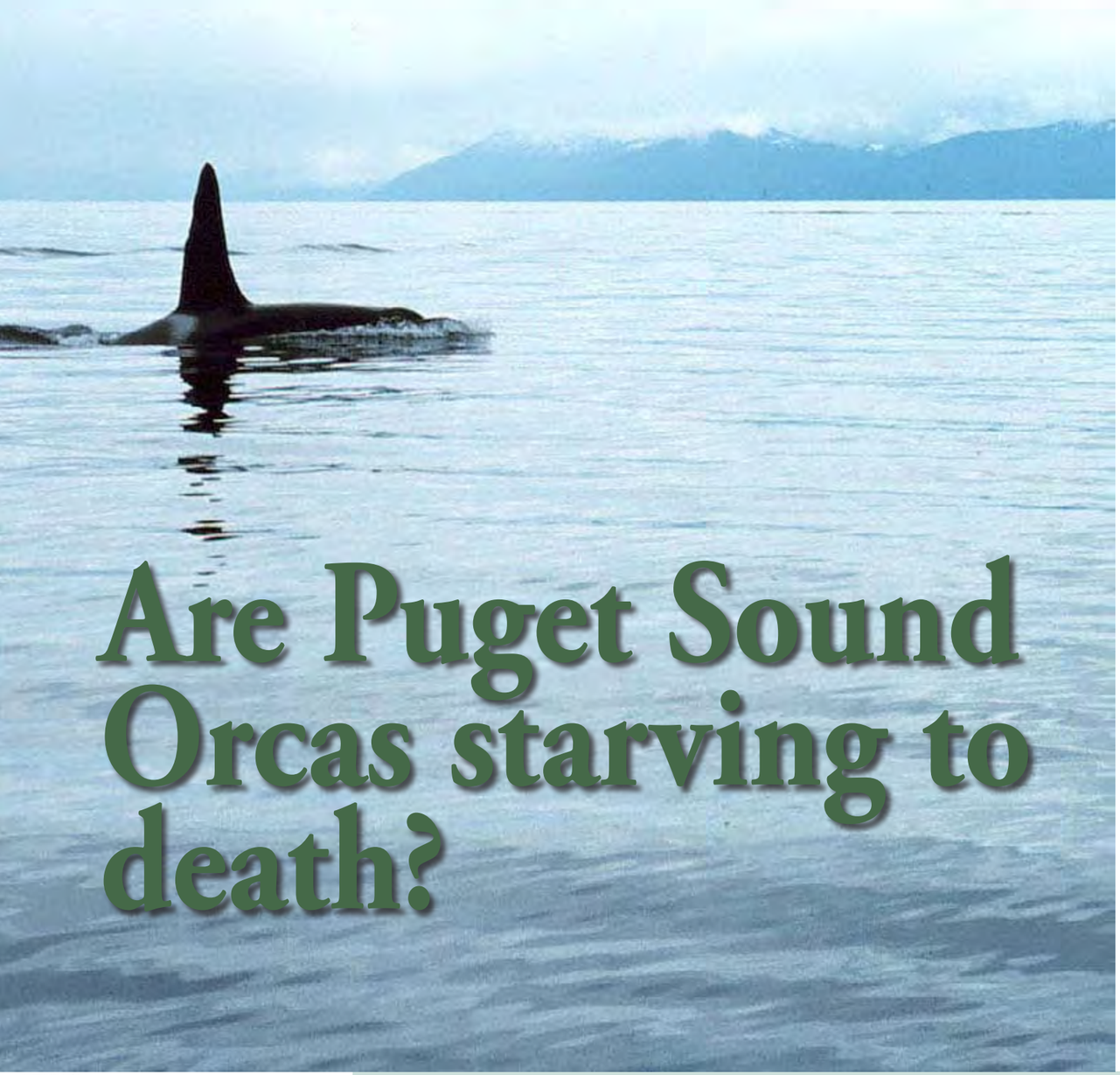
However a new study, published in the October issue of *Marine Ecology Progress Series*, reveals that negative impacts from fishing activities remain. Instead of reducing numbers through direct mortalities, the study shows that fishing activities have disrupted the reproductive output of the northeastern pantropical spotted dolphin. The researchers note that reproductive output of the eastern spinner dolphin also declined, but a direct link to fishing effort was inconclusive.

"This shows that the fisheries indeed are still having an impact."

"The results of this study clearly show that depleted dolphin populations have failed to recover in part due to a decline in reproductive output, and that fishing has had an effect on reproduction," said Cramer, a graduate student researcher in the Scripps Center for Marine Biodiversity and Conservation. "This shows that the fisheries indeed are still having an impact." ■

Edited by
Peter Symes

As salmon runs decline, killer whale numbers take their hardest hit since the 1990s. Seven Puget Sound orcas most likely died this year.



Are Puget Sound Orcas starving to death?

Two of the resident orca families from Puget sound —L and K pods—have been seen in recent years feeding off the California coast in the winter. That was unheard of before early this decade, leading scientists to speculate they are driven to swim hundreds of miles just to meet their minimum nutritional requirements.

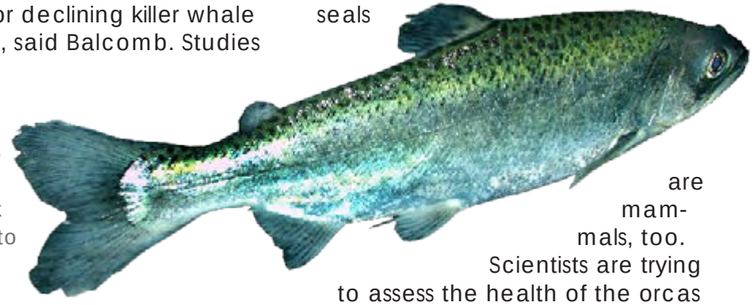
Showing signs of starvation as salmon runs faltered up and down the west coast, Puget Sound's orca population lost seven of its number over the past year, bringing the population to just 83, scientists reported. Experts believe the population of the J, K and L pods that frequent the San Juan Islands and Puget Sound probably originally numbered between 100 and 200.

"Eighty-three is low. The real number that's of concern is that we only have about a dozen reproductive females," said Ken Balcomb, founder of the Center for Whale Research on San Juan Island.

It is conceivable that one or more of the missing orcas might have wandered off on its own and is still alive. But orca scientists doubt that because it's only been documented happening two times in history. Other than that, orcas always have stayed with their families. Researchers are pretty sure all seven are dead—and it makes sense, because supplies of their favorite food were so low. Two recently deceased females showed signs characteristic of starvation—particularly a depression behind her skull where blubber should be. The condition is known as "peanut head."

Chinook salmon

The development marks the biggest reduction in the orca population since a series of bad chinook salmon seasons in the 1990s battered the killer whales' numbers. Revealing the degree to which the orcas are interrelated to a far-flung marine ecosystem, the collapse of California's Sacramento Valley chinook run seems likely to be partly to blame for declining killer whale numbers, said Balcomb. Studies have shown that orcas have a strong preference for chinook salmon, pursuing other prey only when their primary food source is scarce. That makes scientists wonder whether there is something particular about chinook salmon that the orcas need to thrive. "We know that in bad chinook years the orca population declines," Balcomb said. "It's like if you don't feed your pets—they don't survive. They start losing body fat."



Is the disappearance of Chinook salmon to blame?

Results confirmed that the orcas were under "nutritional stress" this year

Chemicals to blame?

Is direct starvation the only reason? There might be something else going on too. In recent years, scientists have noted in the orcas extremely high levels of chemicals known to interfere with reproduction, finding food and other functions. Like humans, orcas begin to burn their fat supplies in times of low food supplies. And the fat is where PCBs and other long-lived industrial chemicals are stored.

Do these chemicals, once freed, have some other effects? Studies on dolphins and Puget Sound harbor seals showed the chemicals caused reproductive problems and made the seals more likely to get sick. Dolphins and seals are mammals, too. Scientists are trying to assess the health of the orcas by collecting their waste and what's in the breath they exhale through their blowholes.

What Hormones Reveal

A team from University of Washington measured the levels of two metabolic hormones in fecal samples from Puget Sound killer whales. The results confirmed that the orcas were under "nutritional stress" this year

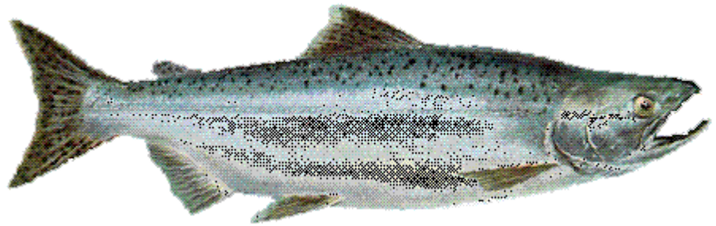
Graduate student Katherine Ayres said levels of thyroid hormone appeared to be low this year when compared with last year—a year when killer whale

deaths were low. These hormones control a mammal's metabolism and increase or decrease over time, causing less energy to be expended when food supplies are low. Consuming less food causes the thyroid to slow the metabolism and conserve fat reserves, which leads to rapid weight gain when food is restored. It appears the Puget Sound orcas went on an unintended diet this past summer, Ayres said.

Other interesting clues came from the levels of cortisone which is another hormone. Cortisol is a rapidly produced in response to mental or emotional stress. Normally cortisol levels are lowest during July and August when chinook salmon are most abundant and whales are under the least stress.

Because cortisol is produced more rapidly during stressful conditions, Ayres also investigated whether hormone "spikes" could be linked to whale-watching boat. Preliminary findings indicated that cortisol levels were higher after a weekend, when more boats are around, than during the week. "It's premature to talk about the boat effect," she said. "The bigger one we're seeing is the nutritional one."

Ayres also is working on a test to measure the levels of toxic chemicals in feces. Because a shortage of food tends to metabolize fat stores in whales, it is likely that toxic chemicals stored in fat would be released when thyroid levels are low. Toxic chemicals are believed to affect the whales' immune systems and increase their risk of disease.



Chinook salmon have a higher concentration of fat than other species of salmon and apparently killer whales like that.

Killer whales off the coasts of British Columbia and Washington State have an uncanny ability for finding chinook salmon, even in months when chinook are vastly outnumbered by other salmon species.

Bacteria or fungi?

Meanwhile other research by biologist, David Bain, and veterinarian, Pete Schroeder, studying droplets emitted from orca blow holes have found drug-resistant bacteria. Puget Sound's orcas collectively harbour more than a dozen different kinds of antibiotic-resistant bacteria—as well as other bacteria known to kill animals that are in a weakened condition. Because some bacteria show resistance to antibiotics, it is likely that they are coming from human sources, possibly stormwater or improperly treated sewage, says Schroeder.

Another concern is that a disease could get into animals on land and spread to Puget Sound. "We don't have an effective barrier to keep it out of the marine environment," Bain said. "It is possible that someone could bring a disease from another continent and expose the whales, causing a significant decline in their population."

For example, a fungus called *cryptococcus gattii* has been implicated in the deaths of dozens of harbor porpoises in the northwest, he said. That same fungus has resulted in the deaths of numerous pets and serious illness for humans. Some researchers believe the fungus was brought to British Columbia in a eucalyptus tree from Australia, where the fungus is native. Spores may have washed into stormwater flowing into the Georgia Basin, which connects with Puget Sound.

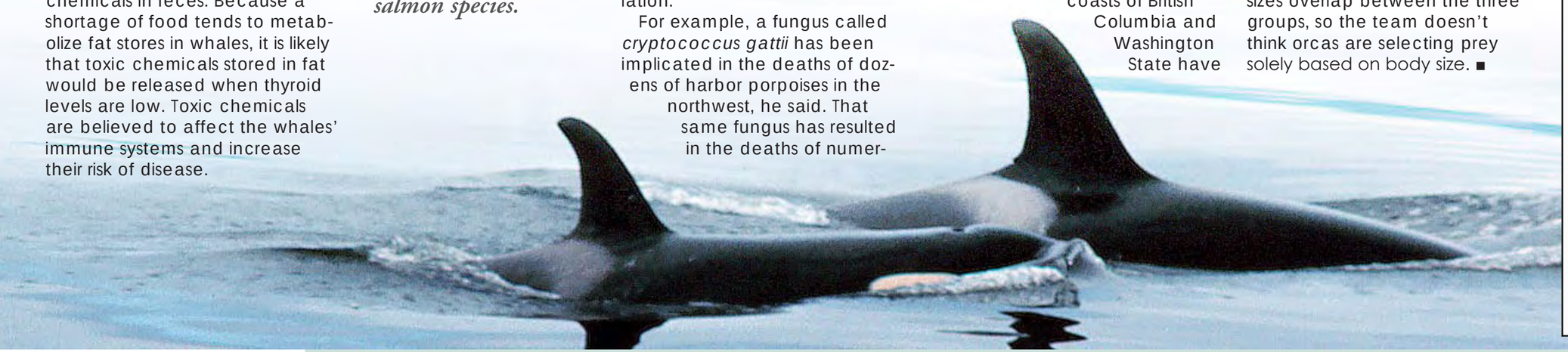
Noise perhaps?

A new study suggest that orcas use their natural sonar to find their favorite fish from a distance. Like other many other marine mammals orcas emit high-frequency clicks that are reflected back when the sound waves strike an object. The animals use sonar information to navigate, hunt, and communicate in murky waters. But orcas may have taken their use of sonar to a level of sophistication where it enables them to select specific types of prey.

Previous research had revealed that some killer whales off the coasts of British Columbia and Washington State have an uncanny ability for finding chinook salmon, even in months when chinook are vastly outnumbered by other salmon species such as coho and sockeye. "Chinook salmon have a higher concentration of fat than other species of salmon and apparently killer whales like that," said study co-author Whitlow Au, a bio-acoustician at the Hawaii Institute of Marine Biology. Au and his team simulated echolocation clicks resembling those of wild killer whales to measure the echoes produced when the sound waves bounced off the bodies of three kinds of salmon. The team found that each salmon species has a unique echo pattern based on the different sizes and shapes of their swim bladders.

The air-filled sacs show up clearly in the echo images because they have a different density than the surrounding flesh and water. The swim bladder "is responsible for at least 90 percent of the sound energy that is reflected from the fish," said study team member John Horne of the University of Washington. "Think of it as a hard wall."

Although Chinooks on average are larger than the other two salmon species, individual sizes overlap between the three groups, so the team doesn't think orcas are selecting prey solely based on body size. ■



US Navy agrees to limit underwater explosions in Puget Sound

Already facing lawsuits from two environmental groups over its use of explosives to train in sensitive areas of Puget Sound, the Navy has signed off on an agreement with the US Fish and Wildlife Service to significantly scale back such training through the end of 2009.

The Navy was sued in July by the Public Employees for Environmental Responsibility, PEER, and the Wild Fish Conservancy, arguing that the Navy was ignoring US Fish and Wildlife Service guidelines, and the Endangered Species Act, by conducting underwater demolitions training in environmentally sensitive areas of Puget Sound.

However on November 7, the Navy signed off on the current agreement to limit its training and the power of the explosives it uses, from four to one locations for the next 14 months. The environmental groups said they are confident the lawsuits will lead to a long-term settlement of the issue. The executive director of Wild Fish Conservancy, Kurt Beardslee, said while the Navy obviously needs a training program, the previous program at all four locations was not needed. Under the Navy's consultation agreement with the Fish and Wildlife Service, signed Nov. 7, the Navy's detonations will be cut from four locations to one. The only active location will be in Crescent Harbor east of Whidbey Island, adjacent to the naval air station there.

"We hope that they follow the recommendations of FWS to further reduce or even eliminate all the harm to Puget Sound that they cause," Beardslee said.

The Navy also will maintain a 500-meter zone free of marine mammals and implement a method to monitor the size of fish kills the explosions cause. ■

Meet the Whale Snot Collectors

Whales are too big to take blood samples so what do you do? Use a remote-controlled toy helicopter to get a sample of whale snot.

ZOOLOGICAL SOCIETY OF LONDON

"Scientists have always found it difficult to study diseases in whales because of their size," explains Acevedo-Whitehouse a veterinarian and conservation biologist with the Zoological Society of London to New Scientist. "Most studies on whale pathogens have focused on dead, stranded or captive animals, which are hardly representative of the normal population."

After witnessing the sheer power of whale "blows" in the Gulf of California, she realised that this would be the best way of sampling the insides of a live whale in the ocean.

For species like grey and sperm whales that do not mind the proximity of a boat, the researchers attach their Petri dishes to a long pole and hold them out over the blows. With other whales they resorted to using radio controlled model helicopters. The Petri dishes are attached beneath the metre-long choppers, which are then flown through whale blows.

"The whales definitely notice the helicopter, they turn on their sides to look at it"

"The whales definitely notice the helicopters," says Acevedo-Whitehouse, "they turn on their sides to look at it. But they don't seem bothered. We are collecting very relevant biological information without even touching them."

Each time also sampling the background ocean spray as a control. This lets them identify which bugs come from the whales, and which are present in the sea. The samples are taken back to the lab and scanned for specific DNA sequences that identify individual bacteria, fungi and viruses. As well as looking for pathogenic bugs similar to flu or TB, the researchers are trying to build a profile of what microbes a healthy whale normally carries in its lungs.

The team also hope to study how bacteria and viruses spread through whale populations. The team is still analysing its data but enough has been processed to know that different species carry different bacteria. ■

Whales lose in US Supreme court

The US Supreme Court has removed restrictions on the navy's use of sonar in training exercises near California. The ruling is a defeat for environmental groups who say the sonar can kill whales and other mammals.

The underwater cacophony caused by commercial and military ships has become so intense that it is killing whales, scientists at the World Conservation Congress told the US Supreme Court.

Sounds ranging from the hum of yacht motors to sonar blasts strong enough to destroy a whale's inner ear are wreaking havoc on the ability of these cetaceans to migrate, feed and breed. Many shipping lanes follow the coastal routes that whales have traced for millions of years as they roam the planet's seas. The result is a crescendo of beachings, strandings and collisions as whales and other sea mammals disoriented or physically damaged by noise lose their bearings.

Noise pollution

Just as air pollution reduces one's field of vision, "noise pollution in the sea reduces the zone in which whales can feed and hampers their ability to communicate," Michel Andre, director of the Laboratory of Applied Bio-Acoustics in Barcelona told AFP. "There is no place in the world's oceans that is untouched from what I call acoustic smog: the noises generated by ships."

Some forms of noise pollution are so powerful that "a whale can be killed outright by the shock," added Carl Gustav Landin, head of marine programmes for the International Union for the Conservation of Nature (IUCN). Sonars used by the military and the oil industry can exceed 230 decibels in volume, and can be deadly within a one or two-kilometer radius, Andre said. Eighty-five decibels—the unit used to measure sound pressure—can cause permanent damage to the human ear.

Acidification makes it worse

Research published in the United States last week shows that climate change is amplifying the problem. The acidification of oceans caused by rising sea temperatures reduces sound absorption in the water by up to 40 percent, meaning that noise travels much further.

"a whale can be killed outright by the shock"

Military more important

The plight of the whales ended up before the US Supreme Court. The dispute involved 14 training exercises off the California coast that began in February 2007 and are scheduled to end in January 2009. A federal judge's injunction had required the US Navy to take various precautions during submarine-hunting exercises. On November 12, the US Supreme Court fully reinstating the use of sonar and removed restrictions set by the lower court on the navy's use of sonar in training exercises near California.

In its 5-4 ruling—which is a defeat for environmental groups who say the sonar can kill whales and other mammals—the Supreme Court said the navy needed to conduct realistic training exercises to respond to potential threats and even if the sonar harms the giant sea mammals, national security would take priority. Writing for the majority, Chief Justice John Roberts said overall public interest was "strongly in favour of the navy".

"The most serious possible injury would be harm to an unknown number of the marine mammals," Chief Justice Roberts wrote. "In contrast, forcing the navy to deploy an inadequately trained anti-submarine force jeopardises the safety of the fleet."

Claudia McMurray, US assistant secretary of state for oceans, environment and science and head of the US delegation at the congress in Barcelona, acknowledged it was hard to reconcile security and environmental interests. "It is a delicate balance for us," she told AFP.

But Andre insisted solutions are available. "Technology exists that would allow military to continue their activities without putting the future of whales in peril," he said. "It is a shame this is not happening." ■

Chilean Waters Become Whale Sanctuary

Chile shows the way by turning all of its Pacific Ocean territorial waters into a whale sanctuary.

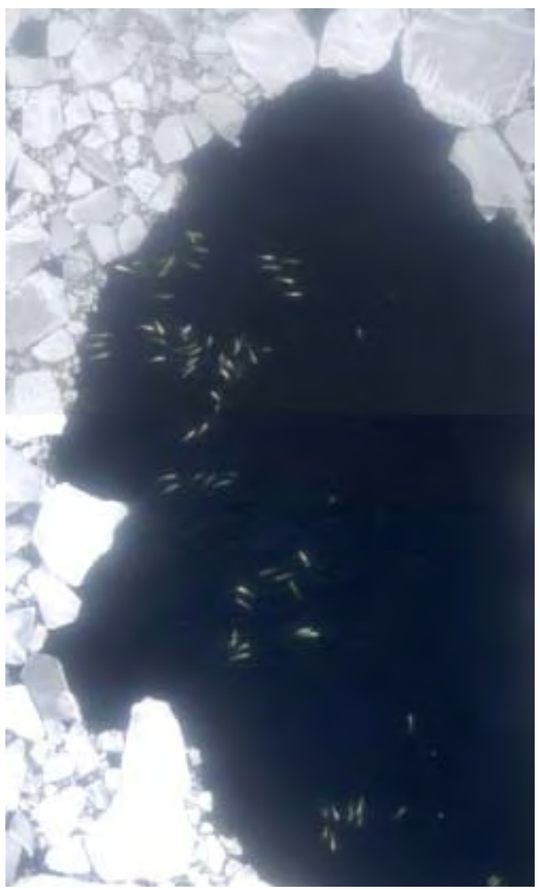
President Michelle Bachelet has signed into law a measure that bans all whale hunting off Chile's 5,500-kilometer coast. The law bans whale hunting both for commercial and scientific purposes.

Bachelet calls the law "a big step ahead in the protection of nature and a major legacy to future generartions."

Chile has not hunted whales for about three decades, but the government sought the law to emphasize its decision to protect whales in its waters. Argentina, Brazil, Costa Rica, Mexico and Panama already ban whale hunting. A whale sanctuary exists in Antarctica. ■

Alaskan Beluga Whales Gains Protected Status

The beluga whales of Alaska's Cook Inlet are endangered and require additional protection to survive, the US government declared on Oct 17, contradicting Alaska govenor Sarah Palin who has questioned whether the distinctive white whales are actually declining.



Aeriial photo of beluga whales gathering along the sea ice off Alaska

The US federal government put a portion of the whales on the endangered list, rejecting governor Sarah Palin's argument that it lacked scientific evidence to do so. The National Oceanic and Atmospheric Administration announced that the Cook Inlet beluga whale population near Anchorage is in danger of extinction, and has been listed as an endangered species. The agancy said that a decade-long recovery program had failed to ensure the whales' survival.

"In spite of protections already in place, Cook Inlet beluga population declined by 50 percent between 1994 and 1998 and is still not recovering despite restrictions on the number of whales that Alaska's native population can kill for subsistence," said James Balsiger, NOAA acting assistant administrator for NOAA's Fisheries Service. He added that recovery has been hindered by development and a range of economic and industrial activities including those related to oil and gas exploration.

Palin's objections

The decision means that before federal agencies can issue a variety of commercial permits, they must first consult with the National Marine Fisheries Service to determine if there are potential harmful effects on the whales.

That has the potential to affect major Alaska projects including an expansion of the Port of Anchorage, additional offshore oil and gas drilling, a proposed US$600 million bridge connecting Anchorage to Palin's hometown of Wasilla and a massive coal mine 45 miles south of Anchorage.

The state does have serious concerns about the low population of beluga whales in Cook Inlet and has had those concerns for many years, Palin said in a statement. "However, we believe that this endangered listing is premature," she said.

Palin in April successfully lobbied for a six-month delay in a listing decision until a count of the whales this summer could be included in deliberations. That count showed no increase over 2007 numbers—375 whales, compared with a high of 653 in 1995. Federal regulators and conservation groups said further delay would be harmful. The National Marine Fisheries Service "will identify habitat essential for the conservation of the Cook Inlet belugas in a separate rule-making within a year," the agency said.

The federal decision pleased environmentalists. ■

Governor Palin: "We believe that this endangered listing is premature."