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POINT & CLICK ON BOLD LINKS



Equipment



Edited by Rosemary 'Roz' E. Lunn

Waterproof D6

The D6 LITE ISS is a front-donning, light weight, nylon-based trilaminate drysuit primarily designed for the travelling diver. We suspect this material will easily fold down into a small bundle for packing. Waterproof really understands anatomy, and the D6 LITE ISS is designed and cut with pre-bent legs to give the diver a better fit when diving. Knowing how meticulous the folks at Waterproof are, it is no surprise that this is quite a pretty suit, with lots of attention to detail. The D6 LITE ISS comes with adjustable braces, reinforced shoulders and seat, double stitched seams, silicone neck and wrist seal system, zip cover and cordura knee pads and crotch panel. Waterproof has fitted Exlite boots that are apparently extra light, flexible and have a ridged heelstrap. www.waterproof.eu

Oceanic Omega

The unhandled Omega regulator is back! Oceanic has recently launched its ambidextrous, side-venting Omega 3 FDXi demand valve. The environmentally sealed, balanced, lightweight First Stage has four Low Pressure Ports, two High Pressure Ports, and the reg can be dived with up to 40% Enriched Air Nitrox (EANx) straight from the box. Oceanic states that it offers high performance regardless of depth or tank pressure. Apparently, the in-line design of the first stage helps to improve flow efficiency by limiting the directional changes that gases must navigate during its journey to the second stage. In other words, the fewer right angle turns, the better the flow. Available in all black, or a black and white body. oceanicworldwide.com



StingRay

The StingRay utilises a solid state switch, which has no moving parts, and therefore, no chance of flooding! The StingRay has Cree XM-L2 LEDs, which are the brightest and most efficient bulbs on the market. The torches are all double hard anodized, come with a lantern-style handle and most importantly have an anti-reflective/anti-fog coated lens. All of these improvements have resulted in the best torch I have come across to date. sealantern.com



Scubagear SG

The new SG regulator line from Subgear is equipped

with a OFD valve (Optimal Flow Design) which the manufacturer states reducing air flow resistance by directing the flow of air around rather than through the spring resulting in a higher flow rate. As there is no venturi vane in the mouthpiece area either, the air can flow directly to the mouth, without obstruction. The Venturi effect is eliminated due the angle of inflow. The SG regulator range comes in three 1st and 2nd stage combinations, SG10, SG30 and SG50 (shown). Subgear.com



DiveRite QRM

This Quick Release Mount is rather clever, and I am not surprised that there is a patent pending on this. The QRM gives you various options for mounting your Dive Rite lights. Dive Rite states it can be fitted to any of its lights and is available in two versions: a soft handmount or a Goodman handmount. I suspect that you can also fit the QRM to lights from other manufacturers, too. The QRM uses a system of rollers and bands to easily clip a light head into the mount. Once you have played with it a couple of times, it is easy to use. You can fit additional QRM receivers on your equipment, giving you the option of moving light from your handmount onto a helmet or DPV. And you can fit QRM strikers onto backup lights, giving you the option of using them with the same handmount or receiver. diverite.com



Tek-Tite 200 LED Strobe

Tek-Tite strobes are popular with recreational, technical and military divers and fire fighters worldwide. Their latest offering—the Tek-Tite 200 LED Strobe—features a 7-Watt LED strobe module. Tek-Tite states that this strobe is more durable and benefits from an improved flash rate and lamp life when it is compared to the previous Xenon version and other competing Xenon strobes. One factor will certainly appeal to divers. There are no fragile glass tubes that can easily be broken because this strobe uses a high-intensity LED strobe module. It is rated to 150 metres (500 feet) and the two C-cell alkaline batteries should burn for approximately 30 hours. The strobe itself is meant to last 10,000+ hours or 36+ million flashes. I wonder who counted them all? Tek-tite.com



Masterdry

Seac's latest neoprene offering is called the Masterdry. Perhaps it is a drier suit because of the location of the zip? The Titex zip on this 7mm semi-dry suit runs across the shoulders, with the "mastersealzipper" protected by two rows of stitched binding that meet. Suit protection doesn't stop there. Key areas such as the knees, shoulders and seat are reinforced with Supratex, whilst the back benefits from a large padded spine pad. Seac has utilised ultra-elastic Smooth Skin for their wrist and ankle seals. The suit comes with complete with a roomy zipped pocket on the leg and a separate hood. Seacsub.com



We first saw the Shearwater NERD (Near Eye Remote Display) during field trials at Divetech's Inner Space last year and were pretty impressed. The NERD ticks all the boxes for the 'kit monster' diver. It has that 'shiny toy' factor and it performs. What makes the NERD attractive to rebreather divers is the sheer amount of information it conveys in an easy to read format. Instead of a basic HUD (head up display) that shows a series of different coloured LED lights (primarily green or red) that flash or are static, you get the useful data you really want. It seems as though the data is displayed on a 32-inch TV screen a mere 12 inches away from your eye. Crucially, the display is unobtrusive, so it virtually disappears when you look straight ahead. The Shearwater NERD displays the same information as the Petrel diving computer, with key warnings displayed in a different colour.

shearwaterresearch.com

Nerd



SUB-30

SUB-30 is specifically formulated liquid detergent for use at low temperatures, hence the name (30 degrees centigrade and under). It should help eliminate sweat, bacteria and unpleasant odours from technical fabrics, and you can have the option of hand or machine washing. It is good to see that the environment and packaging has also been considered. SUB-30 not only looks after your technical garments, it is gentle because it does not contain optical bleach, phosphates, zeolites or fabric softener. Fourth Element states the 480ml bottle will do approximately 12 washes. Once empty, you can cut the shrink-wrap off and recycle the bottle. FourthElement.com



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Text and photos by Gareth Lock

In August 2012, I wrote an article which discussed *just culture* and what this meant in the context of recreational and technical scuba diving, and using this concept, how we can improve diving safety. The main thrust behind the article was that everyone makes mistakes, irrespective of who we are in the diving community, what our experience levels are or what qualifications we hold. To improve learning, we need to stop throwing rocks at those who have the courage to discuss their incident in a public forum or report it to DAN, BSAC or DISMS. Sure, many people make silly mistakes or poor decisions, which ultimately cost them their lives. But those individuals didn't get up that morning thinking, "I know, today appears to be a good day to die."

But just culture is only one part of a *safety culture*, a term which is being promoted by a number of organisations and individuals as something that needs to be developed by individual divers



to improve their safety. The funny thing is that a culture is something that is at the core of a community or group; it is 'the way things are done around here'. (Williams et al, 1994).

Whilst a culture can be developed and influenced from the bottom up, the main influence comes from the leadership, top down. Ironically, developing a safety culture means that you are improving other divers' safety as much as your own.

What is a culture?

"Shared values (what is important) and beliefs (how things work) that interact with an organisation's structure and control systems to produce behavioural norms (the way we do things around here)." Bro Uttal (1983)

"Culture is not the product of communication, as culture is affected by more than the organisation's contribution including social background, history, soci-

ety and education." (Horbury 1996)

A culture, therefore, isn't just about communicating ways of improving things, it is about demonstrating, influencing, behaving in a manner which shows that the community has the 'right way of doing things' at its core, not just talking about it. Part of the problem we have within the diving community is that there are a number of 'right ways' of doing things, and we all believe we are right!

So what is a safety culture?

A safety culture is made up a number of component parts, and over the next three issues of X-RAY MAG, I am going to expand on these concepts in a manner that allows the global diving community to address each of them, to ultimately make diving safer, and as a result, more enjoyable. These component parts were developed by Professor James Reason (of 'Swiss Cheese Model')





opinion



fame) when examining High Reliability Organisations (HRO), such as civil aviation and air traffic management. Whilst these are heavily regulated environments and many would argue we don't need that in scuba diving, the premises are the same, culture is culture, how we do things around here.

As an aside, I would violently agree that we don't need any more regulation. Whilst they provide a framework, I believe they also introduce a reduction in personal responsibility for our own actions. An area that can be developed further is that of risk perception and acceptance, but more of that in another article looking at the psychology of incidents and safety.

All divers should take personal responsibility for their actions, and not rely on someone else; you do your checks, you get in the water, you dive, you check your gas,

you end the dive ascending as per your decompression plan, all with your buddy or team mate if that was the plan.

All the agencies provide guidelines for best practice, and provide standards for their instructors to follow, but unfortunately there is evidence to show that group behaviour tends towards more risky behaviour if there isn't a strong positive influence or culture; this is known as risky shift.

I am sure you have been on a trip where, at the start of the week, all the checks are done correctly. But as time ticks on, the checks get more lax, minimum gas limits are extended, and by the end of the week, it is almost 'grab the cylinder and get in the water, it will be okay'.

Therefore, if we can improve group behaviour towards a safer outcome, then safety will be improved. Furthermore, when positive peer pressure is intro-

duced, safety can be improved by challenging poor decision making such that we feel wronged when we don't conform—e.g. buddy checks are not the norm on some commercial dive operations and we feel odd doing them when no-one else is, yet we shouldn't feel this way.

Main components

The five main components of a safety culture are outlined below:

Just Culture – a culture of 'no blame' where an atmosphere of trust is present and people are encouraged or even rewarded for providing essential safety-related information—but where there is also a clear line between acceptable and unacceptable behaviour;

Reporting Culture – a culture in which people are willing to report errors and near misses;

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Learning Culture – the willingness and the competence to draw the right conclusions from its safety information system, and the will to implement major reforms when the need is indicated;

Informed Culture – one in which those who manage and operate the system have current knowledge about the human, technical, organisational and environmental factors that determine the safety of the system as a whole;

Flexible Culture – one which can take different forms but is characterised as shifting from the conventional hierarchical mode to a flatter professional structure.

This article will cover safety culture in general, the next will discuss just and reporting cultures as they

inextricably linked, and the final article will cover learning and informed cultures.

Types of safety culture

Consider the diagram (right), which is based on Hudson's work on safety culture. Where do you think you are on this step-ladder? Where do you think your dive centre is? What about your favoured training organisation?

Just because there are quality management systems in place to ensure that instructors are teaching the correct skills, or even a safety policy at work which shows compliance with the local Health and Safety regulation, it doesn't necessarily mean we have a good safety culture as shown by the descriptors in the diagram. Whilst Hudson's work was focussed on formal organisations and their

approach to safety, clubs, groups or groups of friends are all organisations, too, albeit loosely associated organisations.

Consider two groups, one a loose group of friends who dive together, the other a dive centre in a busy location. The group of divers knows the 'rules' of best practice: they always analyse their gas and mark the results on the cylinder; they decompress together using the same computers using the same decompression model and safety factors; they practice skills and drills on most dives; they debrief and learn from events on the dive; if they have an incident, they report it to their parent organisation, or another body, so that others can learn from the error/mistake/incident.

They have a culture amongst them, which is positive towards

maintaining or improving safety. Importantly, they expect certain activities to be completed in a certain way, and when they are

SAFETY CULTURE

GENERATIVE

Safety behaviour is fully integrated into everything the organisation does. The value system associated with safety and safe working is fully internalised as beliefs, almost to the point of invisibility.

PROACTIVE

The organisation has systems in place to manage hazards and staff, and management have begun to acquire beliefs that safety is genuinely worthwhile.

CALCULATIVE

The organisation has systems in place to manage hazards, however the system is applied mechanically. Staff and management follow the procedures but do not necessarily believe those procedures are critically important to their jobs or the operation.

REACTIVE

The organisation looks for fixes to accidents and incidents after they happen.

PATHOLOGICAL

The organisation cares less about safety than about not being caught.

Types of safety culture, based on Hudson's work



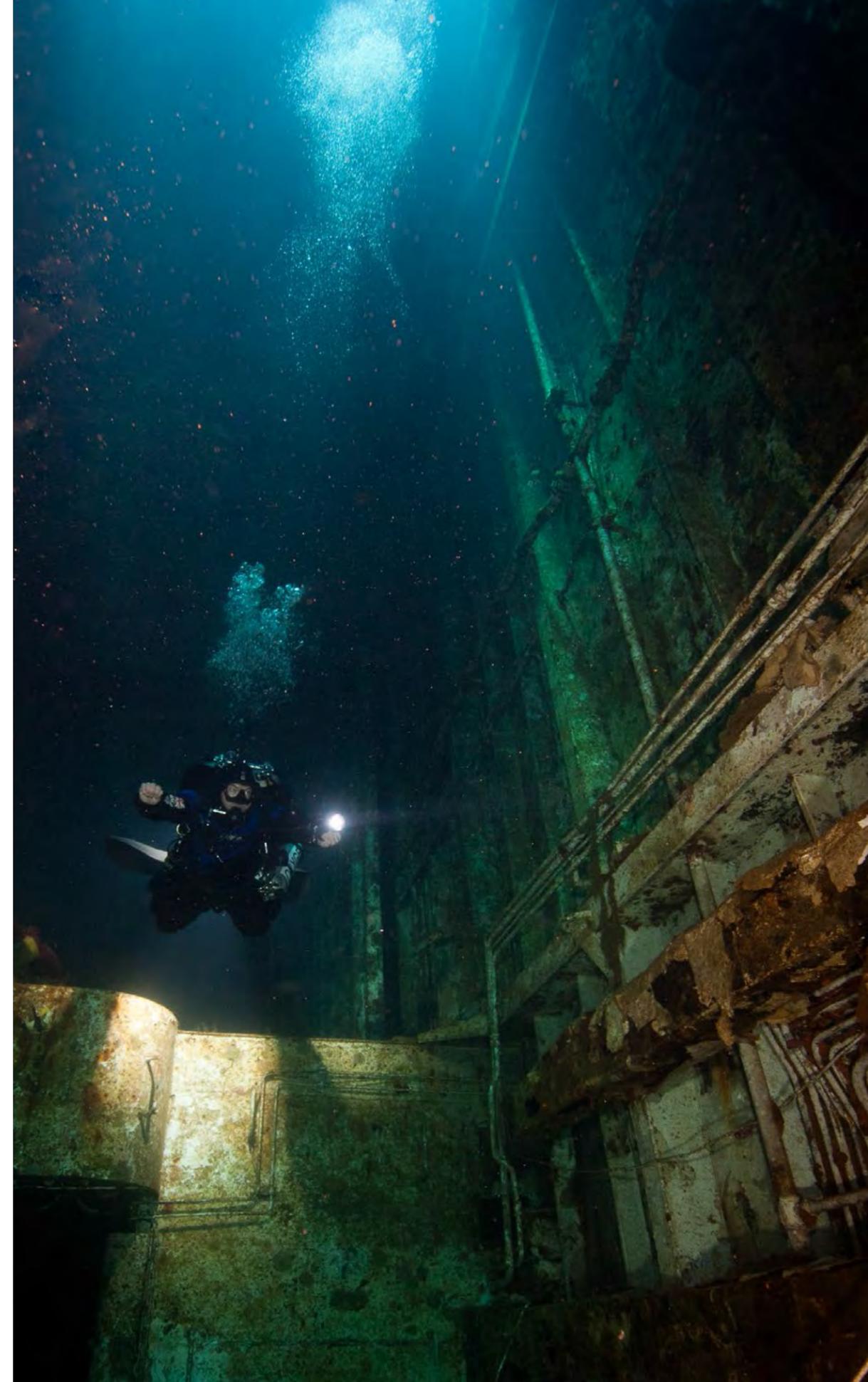
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ance harder to accept.

A dive centre where: they are very worried about profit and foot-fall; they are trying to get people through the door and certified to generate revenue; students are passed at the absolutely minimum level of standards; they do not have equipment serviced regularly because there are no local regulations requiring it; they might have a number of divers who have been injured or suffered DCS but never reported them because it is 'bad for business'—this dive centre has never had a bad QA report because all of their students loved their experience, although they are not sure that diving is for them.

Rules

'Rules' can be developed within whatever construct or environment you are diving in. A dive centre, a training organisation, an expedition, a small team or regular group of divers all have their own cultures, and if you are part of that group, you are

part of that culture. If you feel strongly enough about improving the safety culture, you need to help develop it.

If you see something which doesn't look right, stand up and be counted. If you are on a liveaboard and things aren't right, speak to the organiser or the tour operator. If enough people critique the situation, something will be done, because ultimately, clients won't come back if things don't improve. However, for safety culture to really flourish, it requires significant commitment from the senior players in the community, and organisational change is hard and takes time. That doesn't mean we shouldn't stop trying though!

In the next article, we will look at the role of a Just Culture and a Reporting Culture and show how it is so important to develop both of these in parallel. However, because these are subsets of the wider safety culture, there is need for commitment from the higher organisations for these sub-cultures to develop. □

Gareth Lock is an accomplished technical diver based in the United Kingdom. Currently serving in the Royal Air Force, Lock is undertaking a part-time PhD examining the role of human factors in scuba diving incidents. For more information, visit the Cognitas Incident Research & Management website at: Cognitasresearch.wordpress.com

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Edited by Kelly LaClaire

Japanese whaling shut down by International Court of Justice

In late March a U.N. court made a monumental ruling that the Japanese government must immediately halt its whaling activities in the Antarctic.

The International Court of Justice agreed with Australia, which brought the case in May of 2010, that the program was not for scientific research as originally claimed by Tokyo.

Australia argued that the program, known as JARPA II, was just commercial whaling in disguise, claiming that Japan had killed around 3,600 minke whales since 2005.

Japan, in turn, protested that the suit brought by Australia was an attempt to impose its cultural norms on Japan.

After much deliberation, the court declared that while JARPA II could broadly be characterized as "scientific research", the actual scientific output from the program was severely limited, and Japan had not sufficiently justified the whaling quotas it had set.

Australia delighted – Japan disappointed

Reading the court's judgment, presiding Judge Peter Tomka announced the court had decided, by a vote of 12 to 4, that Japan must withdraw all permits and licenses for whaling in the Antarctic seas and disregard any new permits already issued.

Following the ruling, former Australian Prime Minister Kevin Rudd (whose labor government originated the case) said he was "delighted by the result", while Australia's Attorney-General



George Brandis stated that relations between Australia and Japan would not suffer as a result, and current Prime Minister Tony Abbott is still planning trade talks in Japan later in April.

Conversely, Japanese spokesmen told reporters that their government was "deeply disappointed" in the verdict, and Tokyo would consider its response "after carefully examining the contents of the ruling".

Japan accepts

Foreign Minister Fumio Kishida said, "We want to accept this from a position that respects the international legal order," but Agriculture, Forestry and Fisheries Minister Yoshimasa Hayashi stated that whale meat was "an important source of food, and the government's position to use it based on scientific facts has not changed".

Japan signed a moratorium on

whaling in 1986, but continued whaling in the north and south Pacific under provisions that allowed for scientific research and by law can still continue whaling if it revises its scientific program or withdraws from the International Whaling Commission.

If Tokyo does so, they will join both Norway and Iceland, who have vocally rejected the International Whaling Commission and continue their commercial whaling

activities—mostly selling its whale meat to Japan who contends that minke whales and a number of other species are plentiful and that its whaling activities are sustainable.

As expected, anti-whaling activists Sea Shepherd were overjoyed. Their official statement said: "We've been saying for ten years that this is an illegal whale hunt and the court has proven that case." □ SOURCE: BBC NEWS



FRIITZ GELLER-GRIMM / WIKIMEDIA COMMONS

Female humpbacks stick to shallow water to avoid sexual harassment

According to a new study, female humpback whales with calves purposefully keep to shallow waters to avoid sexual harassment.

Dr Alison Craig, a marine mammal specialist from Edinburgh Napier University, led the research with colleagues Prof. Louis Herman and Dr Adam Pack from the University of Hawaii and The Dolphin Institute.

The study data, gathered around the Hawaiian Islands, showed females with a calf were often pursued by males in deeper waters, meaning the mother and calf had to increase their swimming speed by 75 percent and causing new mothers to head for shallower waters.

The scientists concluded that avoiding amorous and aggressive males assisted the females in energy conservation, helping their offspring to survive.

"Our study suggests that unwanted male attention causes females and calves to increase their swimming speed, so mothers need to supply their calves with more milk to compensate for the extra energy they've used," said Craig. "Females don't eat while they're in tropical waters, which means that they need to break down their own blubber to produce milk. Their milk is the only food source for the calves at this time, so you can see why saving energy is so important to females with a young calf. It could potentially increase the calf's chances of surviving the migration from the breeding grounds to the feeding grounds."

Previous research has shown that groups containing a calf tended to be found in shallower water, however, Craig's study is the first to specifically question whether this is due to mothers actively avoiding passionate males

rather than just avoiding common predators.

Craig said there was no definite explanation as to why humpback males were less likely to pursue new mothers into shallower waters, although a reduced number of suitable mates is the likely reason.

"There are no long-term social bonds between male and female whales, and the males approach lots of females in the hope that they will get the chance to mate," she said. "Females who don't have newborn calves are more likely to ovulate than new mothers, and these females without calves occur in deeper waters. So if males follow mothers into shallower waters they will be less likely to encounter ovulating females and so will have less chance of fathering a calf." □ SOURCE: BBC NEWS

Australian researchers track pygmy blue whales

For the first time in recorded history, scientists have tracked the route taken by pygmy blue whales during their annual migration.

Researchers from the Australian Antarctic Division tagged 11 whales in April 2009 and March 2011 and identified the previously unknown migratory route from the Australian coastline into Indonesia.

The study results, published in *PLOS ONE*, will allow scientists to assess how human activities might impact the whales during their 10,000 kilometer migration.

Dr Mike Double, Australian Antarctic Division marine scientist and lead author of the research, said the study data could be used to identify and manage various risks within the pygmy blue whale range—things like boat traffic, oil and gas platforms, as well as increased ocean noise from commercial shipping and fishing.

"This is particularly important," Double said. "Pygmy blue whales were targeted by commercial and illegal whalers prior to the moratorium on whaling, and we don't know if the population has recovered."

Curt Jenner, a study collaborator from the Centre for Whale Research in Western Australia, said the study brings to light the importance of international cooperation with ongoing conservation and management efforts in both Australian and Indonesian waters.

"When migratory animals routinely cross international borders, international cooperation is needed to implement conservation strategies that use information on habitat use and movement patterns," he said. "A combined approach by industry and managers when accounting for the movements of the pygmy blue whale utilising Australian and Indonesian waters will allow the recovery of this previously exploited species." □ SOURCE: WILDLIFE EXTRA NEWS



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Polar Diving
Antarctica

Text by Yoland Bosiger. Photos by Yoland Bosiger and Jerry Sutton
Addition photos by Erin McFadden and Chris Thrall

Iceberg palaces glimmer in the sun. PREVIOUS PAGE: Diver bubbles rise against a background of ice

On our journey north of the polar circle, my fellow adventurers and I were greeted by an astonishing spectacle. Over 20 orca were hunting an animal so rare that few people have seen them in the wild, let alone had the chance to study them. Using immense strength, agility and cunning intelligence, the orca worked as a team to hold the Arnoux's beaked whale under water to drown it. This was a story of nature at its most raw, untouched and unforgiving—a story that encapsulated wild Antarctica.

According to the Norwegian explorer Roald Amundsen, Antarctica is as desolate as no other country on our globe. In my case, Antarctica had taken me about as far away from my North Queensland, Australian home as remotely possible. Hot steaming rainforests had been replaced with ice palaces and blue green glaciers; kangaroos and cas-



YOLAND BOSIGER



YOLAND BOSIGER

The M/V Plancius at Hovegaard Island

sowaries had been substituted with penguins and seals; and my beloved shorts and singlet had been passed up for down jackets, heavy-duty waterproof overalls and beanie. About the only thing that was consistent was the intensity of the sun,

which had proceeded to turn me the color of a diner plate-sized Antarctic isopod—not a good look, I assure you.

OWUSS Rolex Scholar

Yet, despite the apparent severity of my situation, facing challenges like these was not new. I was nearing the end of a year-

long journey, which had taken me far outside my comfort zone, exposed me to new places, and taught me new skills. Antarctica was the tip of the iceberg at the end of my exciting and adventurous year as an Our World Underwater Scholarship Society Rolex Scholar.

The Our World Underwater Scholarship

Society Rolex Scholarship provides young people with the chance to explore marine fields from diving to science, engineering, medicine and media—providing these individuals with invaluable career-deciding opportunities. With the help of Expedition Leader and past British Antarctic Survey diver, Kelvin Murray, I





JERRY SUTTON

The southernmost town in the world: Ushuaia, Argentina; Mixture of Gentoo and Chinstrap Penguins at sunset (top right)

was able to experience Antarctica with Oceanwide Expeditions. My role onboard was threefold: to uncover the ins and outs of life aboard an expedition vessel, take pictures for Google Ocean and gain polar diving skills. This was an opportunity like no other.

Departing for southern seas

I made my journey from Australia to Ushuaia in Argentina—a picturesque town set at the foothills of the Martial Mountain Range and bounded at its edge by the Beagle Channel. Ushuaia and its surrounding wilderness are so beautiful that they make for an impressive tourist destination in themselves. In fact, I had been here three years previously for this very reason, hiking in the Terra Del Fuego National Park and getting my fill of empanadas (Argentinian pasties) and dulce de leche (caramel like spread).

Yet, as a result of its southern

location, Ushuaia is of course best known as the taking-off point for a large number of passenger cruise ships headed for Antarctica. The streets of this little town are chock-a-block with warm clothing outlets and camera stores for those who might have forgotten something critical.

Departure day arrived and Murray took me to see my new home for the next three weeks—the 89-meter-long, 114-passenger cruise vessel *M/V Plancius*. It didn't take long to be thrown into the thick of things, and if you have ever wondered how ten days worth of food is transported onto a large cruise vessel like this one, then you're in for a treat.

Boxes were winched onto the boat via crane and then manually transported via a long chain of crewmembers to the galley. I counted over 200 bottles of juice and got to move everything from

dry food and vegetables to entire wheels of cheese and foot-long salamis.

We then toasted the voyage and got ready for what we hoped would be a "Drake Lake", rather than a "Drake Shake". Well known for delivering giant waves and powerful winds, the Drake Passage has on occasion stymied even the most intrepid traveller. Luckily, we managed a relatively calm crossing and I spent my time attending onboard lectures and learning as much as I could about Antarctica's geology, wildlife and history.

Antarctica

Antarctica is the coldest, windiest and harshest place on our planet. In terms of size, Antarctica is the fifth largest continent (larger than Oceania and Europe) and is dominated by the Antarctic Ice Sheet. At its thickest point, the Antarctic Ice Sheet is 4.7km (2.9mi)

Antarctica



YOLAND BOSIGER



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Exploring the penguin colonies at Couvreville Island





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Antarctica

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deep, averaging a whopping 2.2km (1.4mi). An incredible 90 percent of all the world's ice and 70 percent of the entire world's freshwater is contained within this ice sheet. To put this in perspective, if the Antarctic ice sheet was to melt, world sea levels would rise by approximately 60m (197ft) everywhere.

Yet, Antarctica has not always been so heavily covered by ice. Fifty million years ago, Antarctica had a temperate climate with evergreen forests and many land animals. Nowadays, however, very little life can survive in the ice-covered Antarctic interior, except for algae and microbes.

Antarctica underwater

In contrast to life on land, Antarctica's marine environment is undoubtedly one of the most productive in the world's oceans. In summer, 24-hour sunlight combined with rich upwelling

causes phytoplankton to bloom, which in turn feeds small semi-transparent crustaceans called krill. These super-abundant and unusually large phytoplankton feeders allow Antarctica to support a great diversity of whales, seals and birds.

The waters of the Southern Ocean are also important for transporting essential nutrients all around the world. Icy cold, highly salty water known as Antarctic Bottom Water drips into the ocean from the surrounding sea ice, and in doing so, pushes warmer water upwards. This upwelling is so strong that it is responsible for driving all the oceans' currents.

Stepping onto dry land

After two days of extravagant dinners, steamy

hot chocolates and albatross photography, I seemed to be settling into my new environment quite nicely. Calm weather meant that we were able to make great time, and before long, we had crossed the Antarctic convergence and were within view of our first stunning sphinx-like icebergs. On the afternoon of our third day at sea, it was time to make landing at Aitcho, a tiny rocky island in the South Shetlands group. Eager to stretch our legs, we all made our way out onto the gangway and stared in wonder at the pink-tinged snowy mountains and pastel blue ocean.

Aicho Island is home to three different spe-

Humpback whale at Hovegaard Island (above); Antarctica at sunrise (top left); Gentoo penguin feeding chick, Aicho Island (top right); Spotting penguins at Cuverville Island (lower right)





YOLAND BOSIGER



YOLAND BOSIGER

cies of penguin: the gentoo, Adélie and chinstrap. On shore, we were greeted by a flurry of activity as both gentoo and chinstrap penguins intently went about their business not the slightest bit disturbed by our presence. At one point, I stopped to take a picture of a

gentoo penguin feeding her chick only to find that a new chick had adopted me and was sitting obediently between my legs.

Google Ocean

Penguins have got to be some of the most photogenic animals on the planet. They are also intensely curious, so much so that they often waddle too close to one's camera and cause photographs to be out of focus. My purpose behind all this camera snapping was to help Murray collect and generate content to be uploaded to the Google Ocean Layer (for which Murray is a formal contributor) in the form of photos

and videos.

Google Ocean was inspired after Dr Sylvia Earle, legendary ocean researcher and National Geographic Explorer-in-Residence, made a 'wish' for influential organisations and individuals to make a concerted effort to protect the planet's life support system—the oceans. By using Google Ocean, you can take a visual journey from shallow coral reefs to the depths of the deep sea and can learn about important research discoveries.

Reaching the Peninsula

Getting to our destination of Neko Harbour on the Antarctic Peninsula took us first through the Gerlache Strait. With my camera ready, I stood upstairs just outside the ship's bridge and tried to decide on what to photograph. Everything was so immense, so raw, and yet so delicate and magical that I decided to do the opposite—just watch and take it all in.

As we continued through the channel, huge craggy mountains rose



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Leopard seal underwater at Petermann Island; Orca hunting an Arnoux's Beaked Whale (top right)

Recovering dive tanks after a snowy night; Transferring into zodiacs for a land excursion (top left)





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THIS PAGE: Scenes from ice diving at Neko Harbour; Anemone at Vernadsky Wall (left)

comfort of the *M/V Plancius*, Antarctica seemed romantic and beautiful, but at that moment, my mind went to those early explorers who—using man-hauled sleds, with limited food supplies and primitive clothing—fought their way through this harsh and unforgiving terrain. What different opinions they must have had.

Ice diving

Although initially thought to be the exclusive dominion of documentary dive teams and specialised technical divers, Antarctica has been made accessible to recreational diving by Oceanwide Expeditions for the last 15 years. Provided conditions are favourable, divers on the *M/V Plancius* have the opportunity to

experience the majesty of ice underwater as well as a great variety of benthic marine life, penguins, fur seals and even leopard seals.

Dive sites in Antarctica vary from shallow ice diving to wall diving and even wreck diving. Diving can be from the beach or from the zodiac, and the maximum depth is 20m (60ft). Given the remoteness of Antarctica (there are no decompression chambers or hospitals) safety is of utmost concern. The diving is not for beginners, and it is crucial to be experienced with cold water diving before embarking on a trip.

The epitome of polar diving for many underwater enthusiasts is getting to dive on an iceberg. With 90 percent of their

mass underwater, it's only logical that these masses of floating ice should be explored from below.

The first time I propelled myself into the

-1°C waters, I was glad my regulator was in my mouth for a couple of reasons. The first and most obvious reason was to stop myself from swallowing water. The sec-



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abruptly out of the infinite abyss of blue and green. Icebergs in the shapes of cathedrals and castles glistened and shone under the sunrays. It was like being in paradise, yet I was aware of the irony in this statement. Certainly from the



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CLOCKWISE FROM LEFT: Pair of red starfish; Marine invertebrates just outside Vernadsky Station; Shipwreck heavily encrusted with sponges and sea urchins; Intact wooden beams of the *Gouvernøren* wreck

ond and arguably as vital purpose was to stop myself from shouting the most perverse profanities I didn't even know I was capable of. Thankfully the elaborate textures and beauty of the iceberg provided a welcoming distraction, and as my face and lips went numb, the pain eventually subsided.

from a seal's-eye-view. We could see the faint white mist hanging next to the ice and could hear the corresponding fizzing sound as trapped air bubbles escaped into the salt water. With aggressive determination I made my freezing fingers work the shutter button—my own dive bubbles making for interesting subjects against

the background of white corrugations and shades of turquoise.

At the surface, fringes of icicles hung off the edge of the berg and enclosed a gallery of emerald crystals. I was frozen, but delighted. Antarctica had just delivered one of the most awesome dives of my life.

***Gouvernøren* wreck**

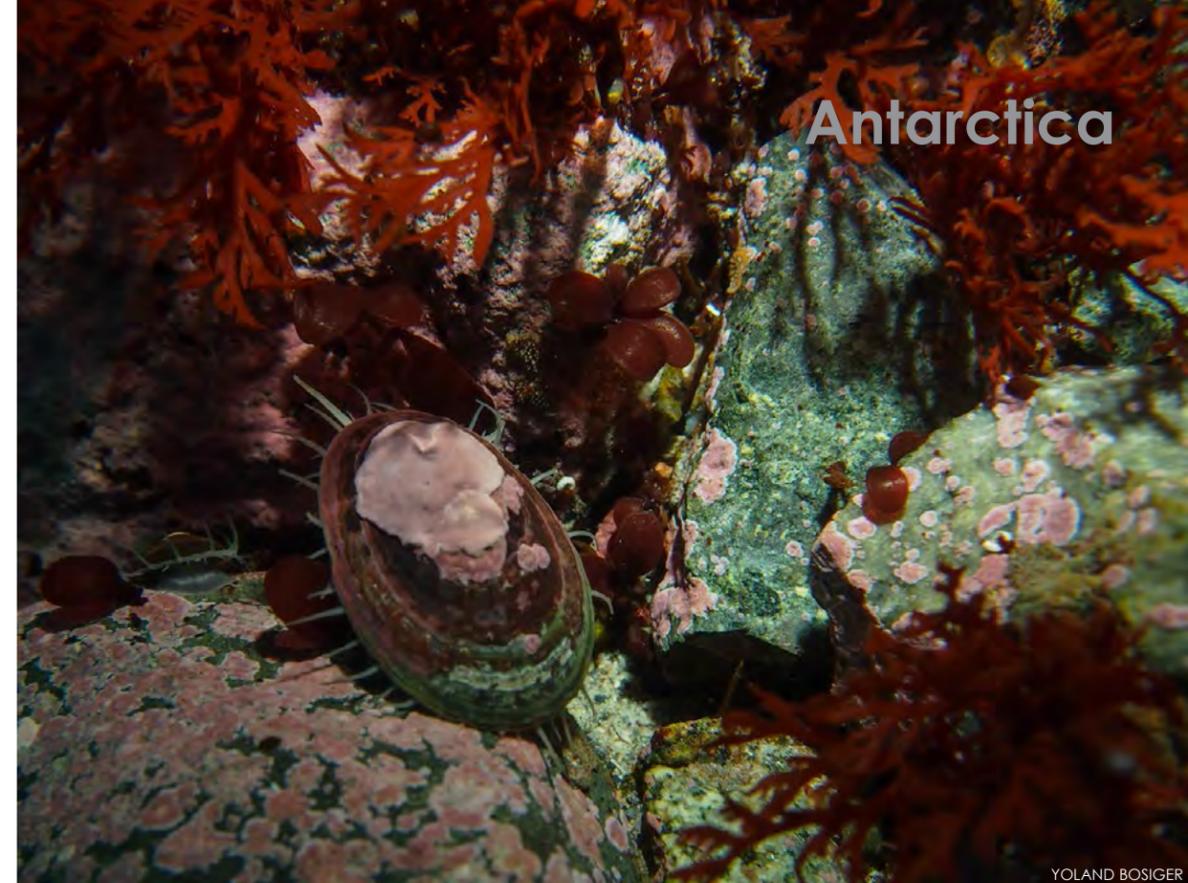
While humans have never permanently inhabited Antarctica, they have certainly left their mark here. It's thought that over a million whales were killed between 1904 and 1987 to supply human-kind's thirst for oil. Breaking the surface just ahead of us was the bow of *Gouvernøren*, a Norwegian whaling transport vessel that burned and sank



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in 1916. This was the first time any divers on our vessel (including the divemaster), had dived a wreck in Antarctica, and we were super excited about what surprises

might lie ahead. My first view of the wreck was a gigantic, slightly ominous superstructure. As the gloom began to separate, the upper



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Steel barrels (left) and main deck at entrance to the forward holds (above) on *Gouvernøren* wreck; Antarctic limpet (top right); Entering Vernadsky Station (right)

Swimming along the submerged ship revealed tell-tail signs of the ship's past life in the whaling industry, including numerous winches for hauling the whales on deck. As I adjusted my buoyancy to avoid stirring up the sediment, I couldn't help wonder what life must have been like for these early whalers and how terrifying it must have been to be stranded and sinking in this icy wasteland.

As we approached the stern of the vessel, the amount of marine life increased dramatically. Overhangs created by the hull formed ideal spaces for kelp, sponges and starfish, the intensity

of which culminated under the stern and around the rudder. It was like diving in a room full of ornate candelabras except that in place of candles were bright yellow, flinger-like sponges.

Vernadsky Station

Apart from whales, birds, seals, penguins, and the occasional tourist, Antarctica's other main resident is the "research scientist". As a result of the International Geophysical Year (IGY) and the need to defuse competing ter-



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ritorial claims, countries ratified the Antarctic Treaty in 1961, formally setting Antarctica aside for peaceful, scientific purposes.

One research outpost that we were able to visit during our journey was the Ukrainian Station of

Vernadsky, a former British Base that was sold to the Ukraine in 1996 for the bargain price of one pound! The scientists at Vernadsky conduct many experiments, most of which relate to atmospheric science. We also visited Wordie

deck became visible revealing intact wooden decking. The cold Antarctic waters had preserved

these antique timbers, and invading icebergs had kept them clean of encroaching marine life.



View of steep mountains and glacier from the safety of the *M/V Plancius*; Penguin (lower left) feeding its chick at Aitcho Island; Leopard seal (below)



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wall nowhere to be seen. Eventually, the gully led to slightly deeper water and all of a sudden the rocks dropped off to an obvious wall plunging vertically to below 20m.

Compared to the icy white surface, the rock wall presented a kaleidoscope of colour and animal life. Antarctic

isopods, colorful anemones and nudibranchs occupied the flat outcroppings and many species of urchin hid in the numerous crevices.

Predator and prey

Antarctica is one of the rare places where large predators still dominate

the ecosystem, and where both predators and prey are relatively unafraid of human beings.

Our dive at Vernadsky was followed by one of the highlights of our trip—a leopard seal hunting a penguin. Leopard seals are bold, powerful and curious animals that grow to up to 3.5m. When hunting penguins, leopard seals patrol the waters near the edges of the ice, almost completely submerged, waiting for the birds to return from hunting.

From our zodiac, we watched the gentoo penguins swim obliviously towards the leopard seal. As the seal made its surprise attack, penguin pandemonium ensued with groups of up to 20 flying in every direction, porpoising madly to escape the seal's deadly jaws.



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Leopard seal hunting a penguin just outside Vernadsky Station



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Antarctica at sunrise on the M/V Plancius; Surface interval on an iceberg at Neko Harbour (right)



CHRIS THRALL

While I certainly wouldn't say I'm a lover of gory killing scenes, observing the leopard seal was mesmerizing.

The seal grabbed the penguin by its feet and shook it violently, repeatedly beating its body against the surface of the water in an attempt to kill it. At one point the leopard seal even threw the penguin in the air

like it was playing a game of catch, triggering a crescendo of squeals and camera snaps. While leopard seals can consume a number of penguins a day in the summer, this extravaganza will not last, and many will be forced back to a diet of krill during the winter.

An unforgettable journey

My trip to Antarctica was a journey of education, exploration, adventure and discovery. I'd experienced the challenge of diving underwater, indulged in stunning, icy scenery and photographed spectacular species of wildlife

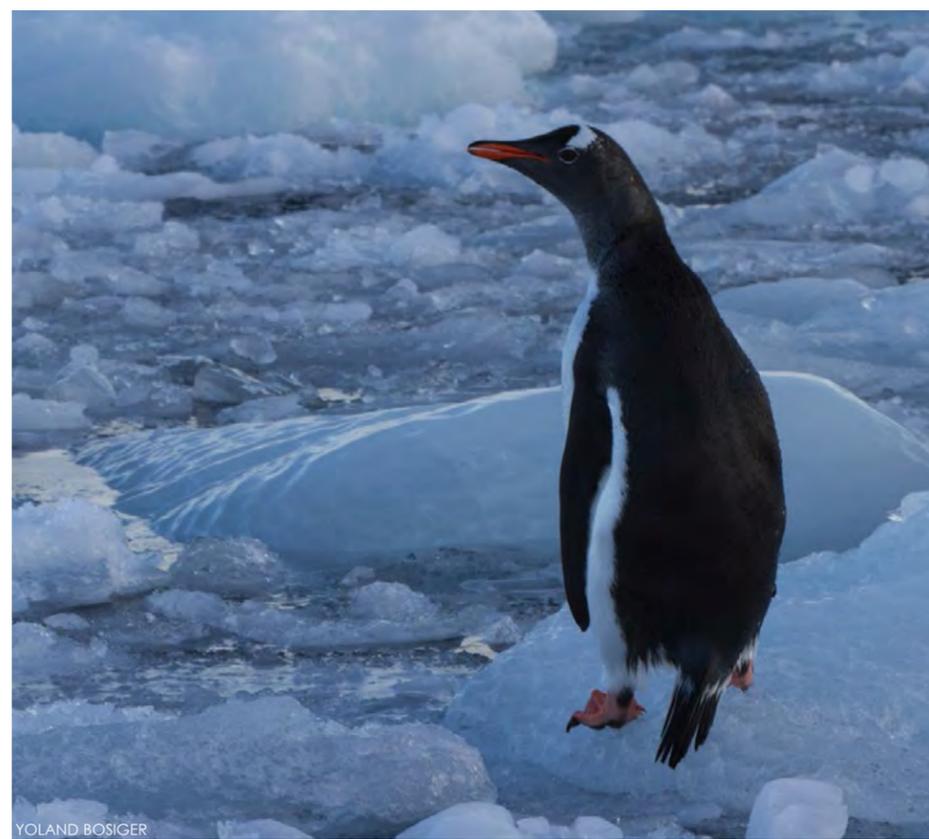
—many of which are found no where else on the planet. Perhaps most importantly though, I had begun to learn firsthand, and from passionate and dedicated Antarctic enthusiasts, about the importance of protecting this vital ecosystem.

Antarctica bursts with life, and for the most part, this is found underwater. Diving in Antarctica revealed an abundance of marine creatures in all shapes and sizes. Even from the comfort of the ship, the importance of the ocean for foraging seabirds and marine mammals, such as killer whales and

leopard seals, was clear. Hopefully with continued protection, this stunning wilderness will continue to be enjoyed by individuals who no longer want to conquer this frontier continent, but rather wish to be inspired by what it is—a truly unique and fragile ecosystem. □

Yoland Bosiger is a marine biologist and avid diver based in North Queensland, Australia. She was the 2012 Our World Underwater Scholarship Society Rolex Scholar. The author extends special thanks to Oceanwide Expeditions (Oceanwide-expeditions.com), Silvertip Expedition and Diving Management (Silvertipworld.com) and the Our World Underwater Scholarship Society (Owuscholarship.org) for making this trip possible.

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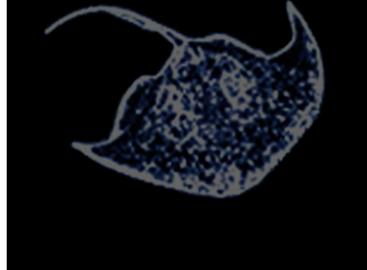


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Gentoo penguin alone on the ice; Icy wilderness at sunset (top right)



fact file



Antarctica



SOURCES: U.S. CIA WORLD FACTBOOK, NATIONAL GEOGRAPHIC ANTARCTICA EDUCATION

History Captain James Cook discovered Antarctica in 1772 when he first crossed the Antarctic convergence. Sealers were next to enter the region, and during the mid 1780s the search for virgin seal grounds drove much of the early Antarctic exploration. The Heroic Age of Exploration began in 1895 and is best known for the journeys of Robert Scott, Roald Amundsen, Ernest Shackleton and Douglas Mawson. With the onset of the 20th century, the race was on between Amundsen and Scott to secure the South Pole. The race ended in Amundsen's favour and saw the tragic loss of Scott and

his four comrades on the return journey. Whaling in the Southern Ocean was occurring as early as the 1700s, but improved technologies allowed the industry to flourish in the 20th century. Thousands of whales were slaughtered annually eventually driving whale numbers close to extinction and making the industry nonviable. With the signing of the Antarctic Treaty, Antarctica is now set aside as a place of peace and science. There are currently 42 research stations operated by 17 countries.

Population The population of research scientists varies through-

out the year. The number increases from approximately 1,000 in winter to around 5,000 in summer.

Geography Antarctica is located in the Earth's southern hemisphere and is centered asymmetrically around the South Pole. The continent of Antarctica encompasses an area of over 14 million sqm (5.5 million sqm) and is surrounded by the Southern Ocean. If ice were removed from Antarctica, it would reveal a single large landmass about the size of Australia (known as Greater Antarctica) and an archipelago of mountainous islands known as lesser Antarctica. Lesser

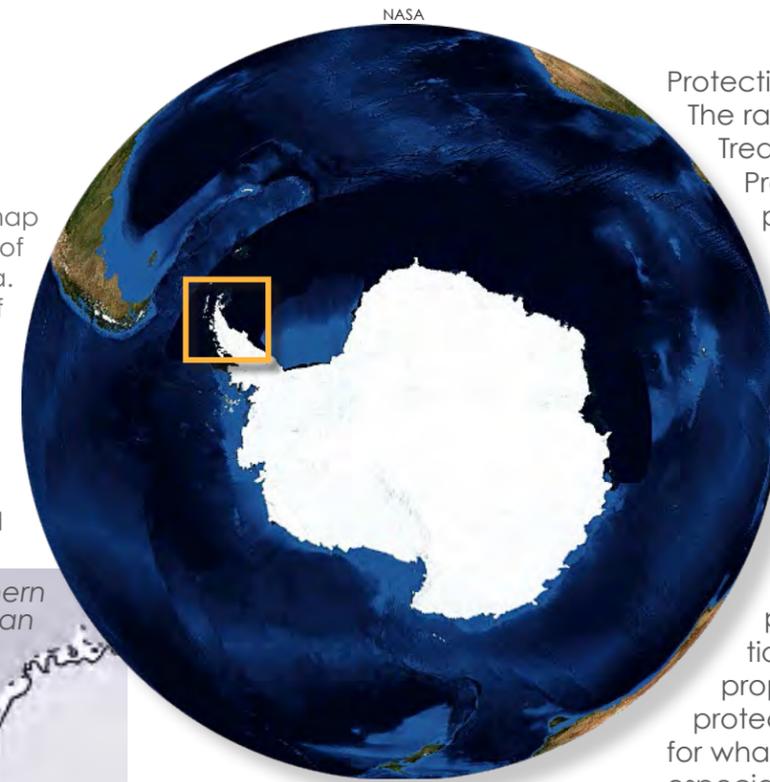
Antarctica is a tectonically active area with active volcanoes such as Mount Erebus (the southern most active volcano on earth). The highest mountain in Antarctica reaches 4,500m (14,764ft).

Climate During the summer months temperatures around the coast of Antarctica are generally close to freezing although temperatures as high as 8°C have been recorded. In 1983 the coldest naturally occurring temperature on earth was recorded

at Vostok Station of -89.2°C. Tourists do not visit Antarctica in winter.

Environmental Issues

Scientists of the British Antarctic Survey first announced the loss of ozone over Antarctica in 1985. These scientists discovered that compounds such as chlorofluorocarbons and halons take part in catalytic reactions that destroy the ozone layer. This discovery led to implementation of the Montreal Protocol, which controls the production and use of chlorofluorocarbons and other ozone depleting chemicals. The protocol is having a clear positive effect, and the amount of ozone destroying substances in the



RIGHT: Global map with location of Antarctica Peninsula. BELOW: Location of Neko Harbour on map of Antarctica Peninsula. BOTTOM RIGHT: Gentoo penguin having a scratch, Aicho Island



atmosphere is gradually declining.

Climate Change

Global warming is having a major impact in Antarctica, particularly the Antarctic Peninsula. In the last 50 years, temperatures have risen by almost 3°C—as much as five times the world average. This temperature increase has correlated with a total loss of 25,000 sqm of ice shelf from the Antarctic Peninsula. The warmer temperatures have resulted in more moisture in the atmosphere resulting in more frequent and heavier snowfalls. Scientists fear for the Adélie penguin because it needs land that is free of snow and ice to raise its young.

Fisheries

Antarctica has long been a site of exploitation for human profit. While commercial whaling and sealing has ceased for the most part, commercial fishing of the long-lived toothfish and all-important krill continues in Antarctic waters and could have devastating impacts if not controlled.

Protection

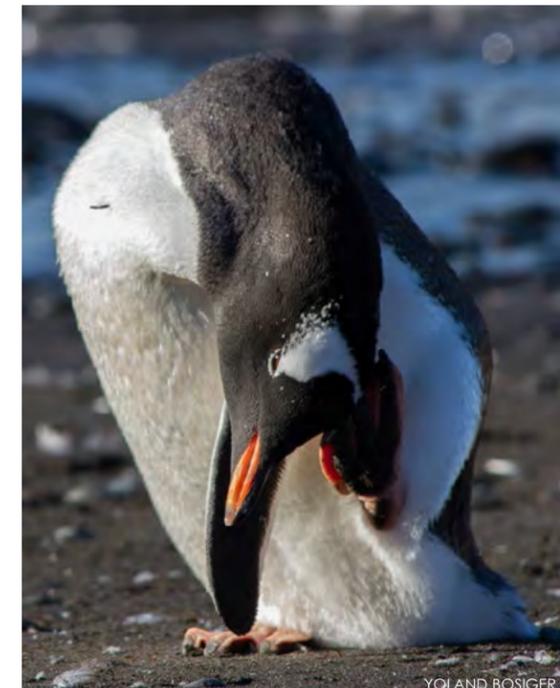
The ratification of the Antarctic Treaty and subsequent Madrid Protocol were intended to provide comprehensive protection of Antarctica. While they were certainly important for protecting Antarctica's terrestrial environment, more progress is needed to protect the Southern Ocean, which drives the cycle of life in the region. The Antarctic Ocean Alliance is supporting greater protection of Antarctic waters by proposing large scale marine protected areas—sanctuaries for whales, seals, penguins and especially fish like the Patagonian toothfish that continue to be hunted by commercial fishing fleets.

How to get there

In 2007-2008, approximately 58 vessels (including 17 yachts) travelled to Antarctica, each catering to a variety of travel needs and vacation expectations. Oceanwide Expeditions is one of the few operators to offer recreational diving in the Antarctic region.



Divers surfacing from a dive at Neko Harbour



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