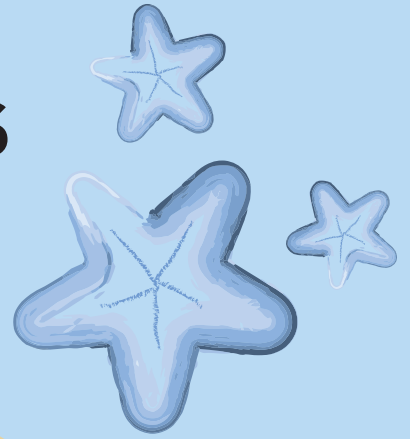


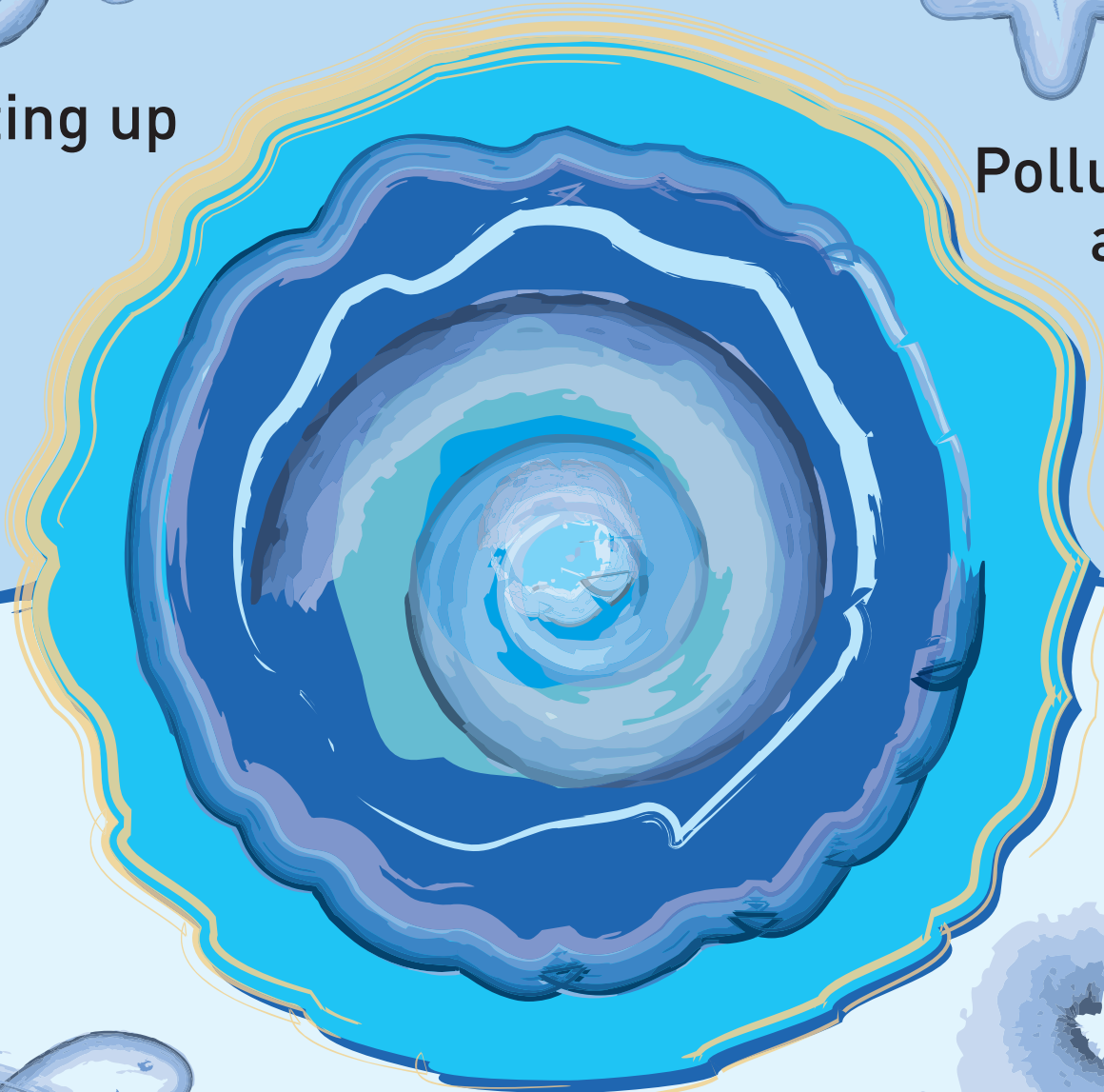
Oceans & Coasts

Deep mysteries



Heating up

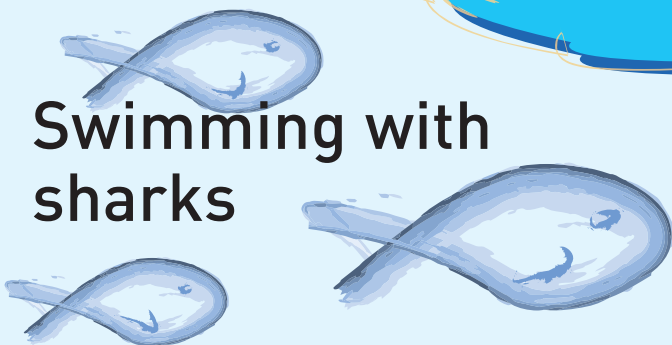
Pollution alert



Swimming with sharks

Meet Ellen MacArthur

Ocean power





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Contents

Editorial	3
Heating up	4
Deep mysteries	6
Swimming with sharks	7
TUNZA answers your questions	8
Ripple effect	9
Saving fisheries	10
Protect to prosper	11
Ocean power	12
Suffocating the sea	14
Coast-effective	15
Winning ways	16
Finding solutions	16
Total freedom, endless opportunity	17
Big responsibility	18
Raising sights	19
Meeting my minuscule match	20
The other corals	21
Home from home	21
7 Seas	22



**Partners for Youth
and the Environment**



UNEP and Bayer, the German-based international enterprise involved in health care, crop science and materials science, are working together to strengthen young people's environmental awareness and engage children and youth in environmental issues worldwide.

A partnership agreement lays down a basis for UNEP and Bayer, who have collaborated on projects in the Asia and Pacific region for nearly 10 years, to step

up current projects, transfer successful initiatives to other countries and develop new youth programmes. Projects include: TUNZA Magazine, the International Children's Painting Competition on the Environment, the Bayer Young Environmental Envoy in Partnership with UNEP, the UNEP TUNZA International Youth Conference, youth environmental networks in Asia Pacific, the Asia-Pacific Eco-Minds Forum, the Eco Forum in Poland and a photo competition, 'Ecology in Focus', in Eastern Europe.

Each of us carries in our veins a salty stream in which the elements sodium, potassium and calcium are combined in almost the same proportions as in seawater. This is our inheritance from the day, untold millions of years ago, when a remote ancestor, having progressed from the one-celled to the many-celled stage, first developed a circulatory system in which the fluid was merely the water of the sea. ʹ

Rachel Carson



UNEP/Topham

A. Pignone/UNEP/Topham



Why on Earth do we call our planet Earth? Planet Sea would be a much better name, for it is the water – and the benefits that it has brought – that really distinguishes it from the dry, barren lumps that populate the rest of the solar system. Seventy-two per cent of the Earth's surface is covered by the oceans. All life, including our own ancestors, came from the sea, and no land species could survive without the rain we get from it. And the oceans continue to regulate the climate of our lonely planet, sustaining it as an isolated oasis in the vast black desert of space.

Yet humanity has always exploited the life-giving oceans, treating them as an apparently inexhaustible source of food and a seemingly limitless dump for our wastes. For generation after generation we have managed to get away with it; the immensity of the oceans has been able to tolerate the abuse. But now, as our generation begins to assume responsibility for the health of this misnamed planet, the boundaries have been reached, or crossed. Most of the world's fisheries are at or beyond their limits. And pollution – especially from the carbon dioxide that is the main cause of global warming – now threatens the entire life of the oceans.

The problem seems to be the very thoughtless, self-centred attitude that led us to name the planet after the relatively small part of it on which we live. For it is this mindset that has led to the despoiling of the oceans, and indeed of all the world's life support systems. As a generation, we are going to have to grapple with it if we are to save our seas, and with them the planet itself. It is no easy task, but if we falter we can always look inside ourselves to find a reminder of how much we owe the oceans. For, as the great Rachel Carson – one of the founders of the environmental movement – pointed out, our very blood carries almost exactly the same composition of salts as the seawater from which our ancestors came.

RISING TIDES



The coastal nation of Bangladesh is particularly vulnerable to rising sea levels.

Photo: J. Desloîtres/MODIS RRT/NASA GSFC

Spare a thought for the people of the Carteret Islands, a scattering of atolls off Papua New Guinea in the South Pacific. They are losing their homeland to the ocean.

For the last 20 years they have been desperately trying, in vain, to stop the sea that surrounds them washing their islands off the map. They have built walls to try to keep the water out, but every year the waves have washed over their land, sweeping away homes, destroying crops and making their drinking water salty. Now the ocean threatens to drown them out altogether. And within two years they will all have gone – to the nearby, mountainous island of Bougainville.

The 2,000 people of the islands are the first trickle in what will become a flood of people around the world. For as global warming takes hold and raises temperatures, sea levels are rising worldwide.

So far this has mainly been caused by the vast bulk of the ocean expanding as it warms – as railway tracks do on a hot day. But increasingly, water from melting glaciers and ice caps is accelerating the process.

Scientists' best guess is that sea levels will rise 30 to 40 centimetres this century, but it could be a metre. It doesn't sound like much, but it would be enough to make many nations – like Maldives and Tuvalu – uninhabitable, and to inundate vast areas of low-lying countries like Bangladesh, making millions of people homeless.

And if the polar ice caps melt as global warming continues, the rise will be still more catastrophic. The melting of the Greenland ice sheet would raise sea levels by nearly 7 metres, the loss of the West Antarctic one by another 5 metres. That would swamp coastal cities and lowlands worldwide, changing the world's maps for ever, and causing unimaginable devastation.

FAILING HEALTH



Coral suffering from moderate bleaching can recover if temperatures return to normal before too long, enabling the algae on which the coral depends to recolonize its tissues.

Photo: P. Kobeh/Still Pictures



If temperatures remain high, fatal bleaching occurs. The algae that the coral needs to survive die off, and the coral itself dies. Mat-forming algae then begin to grow over the dead 'skeleton' of the coral.

Photo: Secret Sea Visions/Still Pictures

Already, global warming is causing catastrophic crashes in sea and bird life. In the summer of 2005, the tiny plankton that form the base of the food chain of the Pacific off the northwest American coast failed to appear, causing populations of fish and seabirds to fall to record lows.

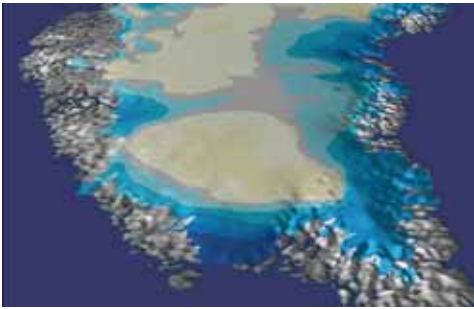
Much the same has happened around the northern coast of Britain over recent years, as warmer waters have driven plankton hundreds of kilometres further north.

Some scientists fear that these are signs that climate change is beginning to damage the health of the oceans irreparably. New research at the University of Amsterdam suggests that, as warming continues, plankton will be disrupted and destroyed worldwide.

Meanwhile, as the world's seas get warmer, coral reefs – the richest habitats of the oceans – are increasingly becoming bleached and dying.

Heating UP

GULF STREAM



A NASA image of Greenland's ice sheet shows that it is thinning around the coasts (blue areas). This could be partly due to increased melting, but is believed to be a result of glaciers carrying the ice more rapidly to the sea.

Photo: NASA GSFC SVS



Roads and railways in Labrador, Canada, are engineered to withstand extreme and prolonged low temperatures. Western European networks would quickly collapse under such conditions.

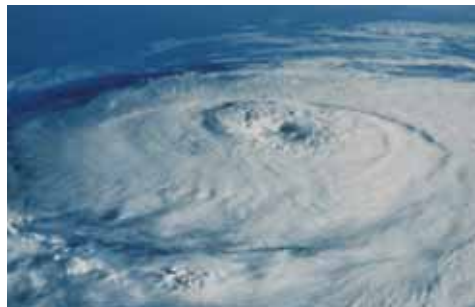
Photo: M. Lamarre/Still Pictures

Changes in the ocean currents could make some parts of the world very much colder, even as the planet heats up.

The Gulf Stream, which carries warm water across the Atlantic from the Caribbean, contributes as much heat to Western Europe in winter as the sun. Without it, one of the world's most heavily populated areas would have the same climate as frozen Labrador in Canada. Western European societies and economies could not survive.

This ocean system is driven by salty Arctic water sinking deep into the ocean, where it forms a vast current that flows south, to be replaced by the warmer surface waters flowing north. But increasing freshwater from melting northern ice is preventing the salty water from sinking, and so the current is faltering. Scientists reported in late 2005 that it had weakened by about 30 per cent.

STORM WARNING



The eye of the storm: Hurricane Elena pictured from above. The storm forced almost a million people to evacuate coastal areas between Tampa, Florida and New Orleans, Louisiana. Winds were recorded up to 195 kilometres per hour.

Photo: NASA/Still Pictures

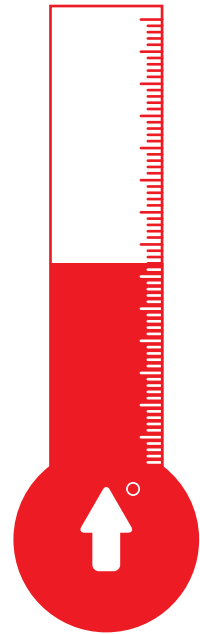


This fishing village in Honduras was destroyed by Hurricane Mitch in 1998. The Central American region is particularly prone to fierce storms.

Photo: N. Dickinson/Still Pictures

Hurricanes feed off warm seas, and as global warming has increased, both their size and number have grown. 2005 was the worst Atlantic season since records began more than 150 years ago. It started earlier, ended later and had more hurricanes and storms than ever, including three of the six fiercest ever to hit the United States. One, Katrina, flooded New Orleans, causing immense damage.

Scientists disagree on how much global warming is responsible. Recent studies suggest it has made hurricanes more intense, but it is unclear whether it has also made them more frequent. There is greater agreement that, as it continues, it will make the situation even worse.



POISON GAS



A view of the Florida Keys from outer space exposes the architectural structures formed by the calcium deposits of corals.

Photo: NASA GSFC SVS/LANDSAT



Adding carbon dioxide to the oceans is like carbonating water to make a fizzy drink or soda.

Photo: B. Mims/UNEP/Topham

And, as if all this were not enough, carbon dioxide – the main cause of global warming – is threatening to alter the chemistry of the oceans in ways unprecedented in the last 20 million years.

The oceans have absorbed half of all the gas so far emitted by humanity, and will go on doing so. This process forms dilute carbonic acid, which hinders the ability of corals, crustaceans, molluscs and certain plankton to form their hard structures or shells. As the acidity continues to rise, it is feared, coral reefs, shellfish and plankton will die off, with huge knock-on effects on the life of the oceans.

INCREDIBLE AS IT MAY SEEM, we know little about 99 per cent of the inhabitable space on Earth. For – measured by volume, rather than just surface area – that is what the seas and oceans represent. And we know virtually nothing about their depths.

Deep

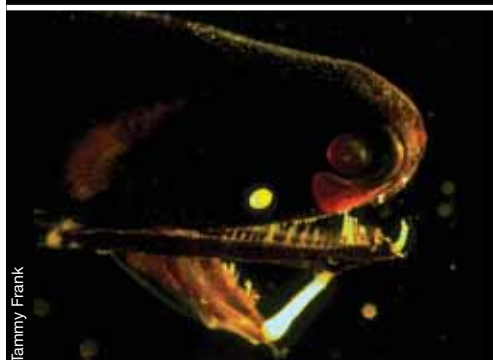
mysteries



Shaun Collin



Ron Douglas



Tammy Frank



Justin Marshall

UPPER: A midwater hatchet fish *Argyropelecus aculeatus*, whose silvery flattened body is an effective camouflaging mechanism in the deep.
LOWER: The midwater dragonfish, *Malacosteus niger*, whose light organs emit red light most other deep-sea inhabitants cannot see, giving it a 'private wavelength'.

UPPER: The lizardfish, *Bathysaurus ferox*, which lives on the ocean floor at depths of up to 4,000 metres, caught while eating.
LOWER: The deep-water pearleye, *Scopelarchus analis*, whose yellow eyes form upward pointing 'telescopes' to make best use of the dim remaining sunlight.

The world's seas, on average, are fully 4,000 metres deep (the deepest spot, as far as we know, is the Pacific's Mariana Trench, some 11,000 metres down). Everything beneath 200 metres is classified as the deep sea, and remains largely a mystery. So far we have explored just 10 square kilometres of the planet's 300 million square kilometres of ocean floor.

The little we have found is intriguing. For a start the seabed, like land, has plains and trenches, mountain ranges, volcanoes and canyons. Temperatures run to extremes: while most of the deep sea is icy cold, a few places are boiling hot. At these hydrothermal vents, scorching, poisonous water spews out of cracks in the sea floor. But despite the heat and toxic sulphides, many creatures – including giant tubeworms, clams and microorganisms – live around them.

The main obstacle to learning more about the deep sea is the difficulty of getting there, explains Ron Douglas of the University of Cambridge and City University London. Humans can barely dive down a mere 30 to 40 metres without

specialized assistance. Pressure increases 1 atmosphere for every 10 metres. And it is pitch dark: sunlight only penetrates 1,000 metres down.

Using nets is one possible solution, but getting one down 4,000 metres requires a line up to 14 kilometres long. It takes up to 12 hours to lower and raise and is difficult to control, and so risks damaging species samples. And the net is only about as big as a football goal, tiny compared to the immensity of the oceans.

Submersible craft provide an alternative, but there are only about a dozen suitable for the deep sea throughout the world, and sending one down even 2,000 metres is extremely expensive. Indeed people have only once reached the deepest part of the sea, when Jacques Piccard and Don Walsh plunged to the bottom of the Mariana Trench in 1960: the walls of their craft, *Trieste*, were 127 millimetres thick to withstand the huge pressure of 1.4 tonnes per square centimetre.

'Submersibles are very noisy and have bright lights in a quiet, dark place, and this scares specimens away,' says Douglas. 'Anything that has any sense will get out of the way, leaving scientists with only the stupid, blind and old to look at!'

Yet, despite all these difficulties, researchers are continually finding new life in the deep sea. 'The animals down there are endlessly fascinating,' says Douglas. 'They have adapted to the incredible pressure, as well as the extremes in temperature and the absence of light: few survive when they are brought to the surface.'

The density of creatures in the deep sea is low, so species have adapted to that too. Most fish have sharp teeth, big mouths and stretchy stomachs to increase their chances of catching and digesting any prey

that ventures by. And some types of male anglerfish have developed a unique way of ensuring that they take any chance to reproduce: they attach themselves to a female's back – permanently.

In that dark world, Douglas explains, creatures communicate through light produced by specialized organs on the body called photophores. These are also used to lure mates or prey – and to scare away predators.

But this is just a glimpse. As Douglas points out, it is difficult enough to grasp an idea of all the creatures down there – let alone determine each one's function within its ecosystem. He is sure that the life of the deep ocean is at least as diverse as on the land – probably very much more so – and is just as likely to provide valuable products, such as life-saving medicines.

The bid to put a man on the moon began at about the same time as Piccard and Walsh reached the Mariana Trench. Since then, 12 humans have walked on it: none has been back to the sea floor. Douglas concludes, 'The ocean frontier will likely be as exciting to future generations as space travel was to those before.'



Corbis

Swimming with sharks

Sharks have had a bad press, and they don't deserve it. Their image is of vicious, human-hating killers. But in fact, explains marine expert Jean-Michel Cousteau, fewer people are killed by sharks than by bee stings. There are about 100 shark attacks a year resulting in around 12 human deaths. In contrast, humans are responsible for killing more than 100 million sharks each year – 11,000 every hour of every day.

Their numbers are rapidly declining because they are caught for their fins – especially for shark's fin soup – and because overfishing depletes their prey. They are particularly vulnerable since they take many years to mature and give birth to few young at a time. But people have been less keen on conserving them than cuddlier creatures – such as pandas. Perhaps they are put off by sharks' predatory natures, but it is this

that makes them particularly important in maintaining the balance of life in the oceans.

Jean-Michel Cousteau – son of Jacques Cousteau, the world-renowned ocean explorer best known for popularizing marine biology – is trying to change this. He has recently been at the heart of two high-profile documentary projects about sharks – one for film and the other for television. He says: 'We hope to reach millions of people, who will see the real beauty, not the fabricated beast. Sharks have far more to fear from us than we do from them. And, unless we curb the killing of these creatures, we will irrevocably lose one of our planet's most magnificent species.'

The film – an IMAX documentary titled *Sharks 3-D*, produced in collaboration with UNEP and 3D Entertainment – is now showing around the world. Cousteau hosts this 'close

encounter with the lions and tigers of the oceans'. Spectacular footage of the world's most endangered sharks shows them to be beautiful, wild and fascinating creatures that have roamed the seas for 400 million years.

For television, Cousteau has dedicated one of his six-hour documentary series – *Jean-Michel Cousteau's Ocean Adventures* – to them. The series is a family affair: Cousteau's son Fabien and daughter Céline are members of the diving team.

Fabien Cousteau has also developed a shark-shaped submarine – named *Troy* – designed to let a diver swim with great white sharks and observe them in their natural habitat. He aims to change public perception of great whites and to contribute to shark research, and has another documentary, *Mind of a Demon*, due to be broadcast in 2006.

3D Entertainment Ltd



TUNZA

answers your

QUESTIONS

Q How important are the oceans to the health of planet Earth?

A Humanity's survival depends on the health of the oceans. More than half the world's population lives near them and they provide food and livelihoods to countless millions. They drive our climate and weather, and absorb large amounts of our waste, including half of man-made carbon dioxide.

Q Why do we need to conserve water when there is so much in the ocean?

A We can only safely drink distilled or desalinated ocean water – and our crops and livestock need freshwater too – but the time and resources needed to desalinate oceans would cost very much more than pumping freshwater out of the ground or using surface water such as streams and rivers.

Q Are offshore wind parks harmful to oceans and marine life?

A Such wind parks offer a clean source of energy and pose a low risk to the marine environment. The riskiest time is during construction and decommissioning – but even these take not more than six months. Judging from existing parks, there is no evidence to suggest that they have a detrimental impact on marine life.

Q What can people who live inland do to help keep oceans clean?

A We must recognize the life-sustaining role of oceans, even if we live thousands of kilometres inland. The United Nations has set aside 8 June as World Ocean Day – a day to organize activities to raise awareness about this. You may wish to get involved in clean-ups, painting competitions, round-table discussions – anything to demonstrate the importance of oceans to our lives and the devastating impacts of pollution on the marine environment.

Q How do oceans contribute to economic growth? How do we make sure that this growth is sustainable?

A Real economic growth is the ability to produce goods and services that improve the well-being of people and the planet. We use the oceans for sustenance, energy and mineral resources, transport and recreation. The sustainability of these life-enhancing activities depends on the care we take to protect and conserve the seas and coastal areas.

Q Is it possible to predict upcoming tsunamis and alert coastal communities?

A Yes: we already have some sensors on the seabed and the ocean surface to detect earthquakes; however, their organization and coordination needs to be improved. The United Nations is working closely with its agencies and with governments to create a global early-warning system designed to detect tsunamis and inform communities at risk.

Q Is it realistic to think of oceans as the solution to our future energy needs?

A We must ask ourselves what we will do when there is no longer enough oil, gas and coal. We know we can extract energy from the oceans, but we should be careful not to damage their health and ecosystems. With more research and development, our oceans could become a reliable, affordable and environmentally sound energy service and resource.

Do you have any QUESTIONS on environmental issues that you would like the experts at UNEP to ANSWER?

Please send them to unepub@unep.org, and we will try to answer them in future issues.

Hank Foto/UNEP/Topham

Ripple effect

Reinier A. Tinapay



N. Hicks/WWF/Still Pictures

Tree planting, recycling drives and eco-camps were all part of my life at school, but I went on itching for a deeper understanding of what it means to be an advocate for the environment. So when I heard about a new weekly radio programme called 'Environment Patrol', I immediately auditioned. I was drafted in as news anchor. Before long, we had established ourselves as an influential force in environmental advocacy. We became involved with other organizations, including the Watershed Management Youth Council, a young and vibrant group involved in water, the most precious resource in the city of Davao in the far south of the Philippines. A barrage of activities followed: now I was doing more than just planting trees.

We uncovered an illegal 6.7-hectare banana plantation inside the Mount Apo Protected Area near Davao. To make things worse, the investor was planning to construct a motorized cable car over an adjacent river, critical to the watershed. Irreparable damage seemed imminent, so we took a stand before the City Council and – together with other organizations and small farmers' cooperatives – filed a case against the plantation in December 2001.

It was a tough battle, and tensions rose high – but we fought on, and people slowly began to support us. Finally, after almost two years of hearing after hearing, we won our case. The council ordered the removal of the plantation and the forest's rehabilitation at the developer's expense.

Our success gave strength to other organizations and small farmers threatened by illegal plantations, and they too started to stand up and fight. In case after case, errant plantations were uncovered and brought to court.

Now I have had the honour of being elected to represent Asia and the Pacific as a Tunza Youth Advisor, at the recent International Youth Conference in Bangalore, India. There I met others like me – young people motivated to bring about sustainability. I shared our success story, and realized that others could be inspired by it. I went as an individual, but came home a comrade.

Truly, a single drop can make a thousand ripples. Even in our youth, we can all become catalysts of change.

Reinier A. Tinapay is a Tunza Youth Advisor for Asia and the Pacific.

WORLD ENVIRONMENT DAY • 5 JUNE 2006
DESERTS AND DESERTIFICATION



DON'T DESERT DRYLANDS!

Look out

for World Environment Day (WED) 2006 – Monday 5 June. The theme for this year is Deserts and Desertification and the slogan is 'Don't Desert Drylands!' The main celebrations will take place in Algiers, Algeria. This is the first time this United Nations day will be held in North Africa.

You can participate in commemorating this important day by organizing activities in your community or country. These should be simple but powerful environmental activities, if possible relating to the 2006 WED theme, and should engage young people in raising environmental awareness.

Previous WED activities have included painting competitions; a photo competition exhibition; tree planting; clean-ups; recycling efforts; symposiums and workshops. Sports activities could also be organized. For more ideas on how WED can be celebrated, please visit UNEP's website at www.unep.org/wed/.

Remember that whatever event or activity you select should be easy to implement, and educative and attractive to people in your community, particularly young people.

As usual, we would like to encourage you and your organizations to liaise with the UNEP office in your region to find out how you can cooperate on WED activities.

Finally, let us know what you plan to do by completing the 'Register Your Activity' form on the WED website. This information will be included in the Around the World section of the website in the 2006 global activity report.

Saving fisheries

One billion people around the world depend on fish for their main source of protein. But the harvest of the ocean – once thought to be boundless – is declining because it is being overexploited.

The seas are the last major part of the planet where ‘modern man’ still behaves as a hunter-gatherer – but pays far less attention to conserving stocks of prey for the future than supposedly ‘primitive’ hunting communities in the world’s forests and deserts.

There are two and a half times as many fishing boats plying the world’s seas and oceans as would be needed to catch the amount that they could harvest without depleting stocks. And governments subsidize them by a massive \$15 billion a year, up to a quarter of the total value of the fish caught, to keep them in business.

So it is not surprising that three quarters of the world’s fisheries are in crisis – either already overexploited or pushing their limits; only a tiny 4 per cent are underfished. As each area has been fished out, the fleets have moved on to others, depleting them in turn.

As a result – despite all the boats, subsidies and efforts of fishers – the amount of fish caught worldwide peaked at the turn of the millennium and has since been declining. As population growth has continued, the catch per person – at 14 kilograms – is at its lowest level for 40 years.

Catches of many popular fish – such as cod, flounder and hake – have been cut in half, even

though the amount of effort put in to hunt them down has tripled. Over the last half century the number of large predatory fish in the oceans – like tuna, marlin, swordfish and sharks – has dropped by a staggering 90 per cent. And over the same period the average size of a blue shark has plummeted from 52 to 22 kilograms.

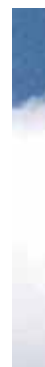
Yet huge amounts of the global catch are wasted. Every year the world’s fishing fleets throw out some 20 million tonnes of fish and shellfish as unwanted ‘by-catch’. About one in every 12 fish landed are returned, dead or dying, to the waters – because selling them is not profitable enough, or because the fishers have caught them in excess of conservation quotas.

Other wildlife is also killed as a by-product of fishing. Some 300,000 small whales, dolphins and porpoises are fatally entangled in fishing nets each year, and over 250,000 endangered loggerhead and leatherback turtles are caught on longlines set for fish like tuna and swordfish. The lines also threaten some 19 species of albatross with extinction.

At last there is some effort to promote better fishing. An independent agency, the Marine Stewardship Council (MSC), certifies sustainable fisheries so that consumers can choose to buy ethically; so far it has endorsed 12 fisheries as sustainably managed, and 263 verified products are on sale in 24 countries. And there is increasing interest in setting up protected areas where no fish can be caught, so as to allow stocks to recover.



A. Pais/NOAA



W.B. Folsom/NMFS/NOAA



V. Viyatvicha/UNEP/Topham



J. Canete/UNEP/Topham

S.B. Lacayo/UNEP/Topham



A. Heimann/UNEP/Topham

H.S. Hystek/UNEP/Topham

A. Drake/UNEP/Topham

Protect to prosper

Oceans and seas dominate our blue planet, but they are safeguarded much less than the land. Though they cover 72 per cent of the Earth's surface, less than 1 per cent of their area is set aside in protected areas, compared with 12.5 per cent of the relatively small amount of dry land. And two fifths of this 1 per cent lies in just two huge sites, the Great Barrier Reef Marine Park and the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve.

The vast majority of the world's 4,000 marine protected areas (MPAs) lie close to the coast where they are relatively easy to police, and countries are also in a position to manage their own exclusive economic zones, which run 200 nautical miles out to sea. But nearly two thirds of the oceans lie beyond these, unmanaged and unprotected.

Millan/UNEP/Topham

Protection is needed to foster biodiversity – including such critical ecosystems as coral reefs, and endangered species like turtles or monk seals – and to help maintain the oceans' productivity. When properly managed, protected areas or no-take zones can work well. To take one example, parts of the Georges Bank, off the United States' east coast, were closed to fishing after overexploitation had devastated stocks. Within five years these had recovered, and fish began to spill over to surrounding fishing areas, dramatically increasing catches.

South Africa has just created four new MPAs to protect a sub-tidal coral reef, shark species under threat, an annual migration of millions of sardines along its coast, and some endangered seabirds. And last year Ireland announced MPAs and fishing restrictions to protect cold-water corals – home to 1,300 species of invertebrates and fish – off its west coast.

But some MPAs exist only in name, and policing is always difficult. Surveillance by guards, air and sea patrols and local communities is now being tightened, and satellite tracking systems will help. Even so, there is a further need for mechanisms to strengthen international protection.



Ocean Power

The power of the oceans has always daunted humanity – whether through the sweep of its tides and currents, or the crash of its waves on the shore. Now we may be beginning to exploit it to run our homes and businesses. It is not easy, partly

because the very power that makes it so attractive also makes it hard to design and construct strong enough devices. But, wave and tidal power have staggering worldwide potential – and produce clean energy, which does not cause pollution or accelerate

climate change. Of course we already get oil and gas from under the seabed, from the Caspian to the South China Sea and the Caribbean, from the Arctic to the Bight of Benin. But these reserves are finite, and new sources of energy will be needed.

Waves and tides

Less than 0.1 per cent of the energy of waves and tides, research suggests, could supply more than five times the world's current demand for electricity. Structures to capture it are already installed on the shoreline where the waves break, and in estuaries where tides ebb and flow. In 2006, wave power devices will be placed up to 5 kilometres offshore.

Australia, China, France, India, Japan, Portugal, the Scandinavian countries and the United States are all developing ocean power technologies. The engineering is difficult as the machines – though relatively inexpensive to operate and maintain – must withstand storms and corrosion from salt. Wave devices must also be able to exploit both strong and weak waves.

Research and development for ways to harness the ocean's power may be costly. But as demands grow both for more electricity and for lower emissions of carbon dioxide – the main cause of global warming, emitted by burning fossil fuels – the attractions of clean energy from the seas are growing.



Electric snakes

Semi-submerged 'sea-snakes' are due to start generating electricity off northern Portugal in 2006. It will be the first ever commercial 'wave farm' in the world's oceans.

The snakes – strictly speaking Pelamis P-750 generators – are made up of four jointed sections, each 3.5 metres in circumference and about the length of a railway carriage. As waves move them, high-pressure oil is pumped through hydraulic motors, and these in turn drive electricity generators. The power is then carried to the shore by an underwater cable.

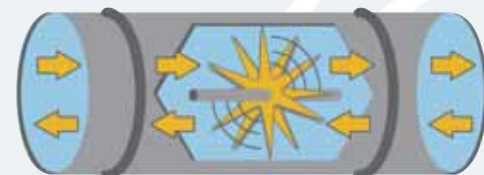
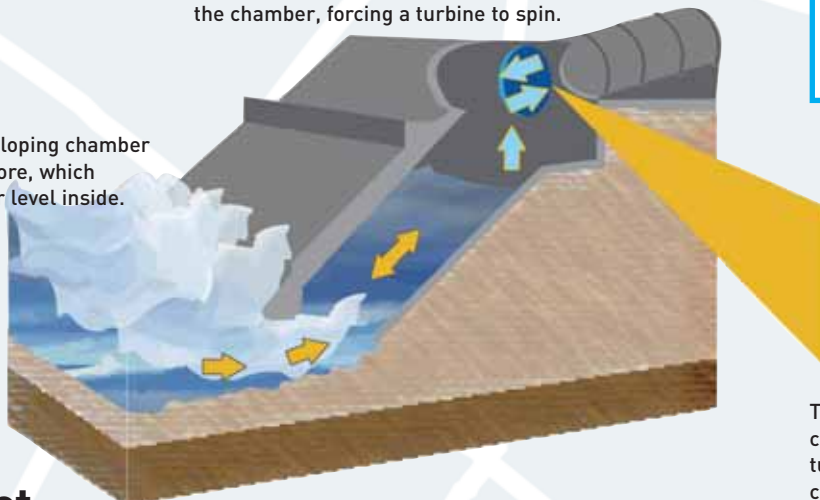
The first phase of the project, with three such generators, will produce about the same amount of electricity as a modern wind turbine – enough to meet 1,500 households' average needs, saving 6,000 tonnes of carbon dioxide emissions a year. If the \$9-million scheme – 5 kilometres off the historic city of Póvoa de Vari – goes well, 30 more sea-snakes are expected to be installed; these would generate enough electricity for more than 13,000 homes from around 70 hectares of sea.

Barrier power

The most advanced way to exploit the tides is by building barriers across estuaries. In this technology, pioneered in the 1960s, tides push water through the barriers, turning turbines to generate electricity. The largest is at La Rance, northern France. But barrages have been criticized for disturbing habitats. China is now working on an artificial lagoon scheme at the mouth of the Yalu river, harnessing the energy of the tides as the water pours out of the lagoon.

The increased water level compresses air inside the chamber, forcing a turbine to spin.

Waves enter a sloping chamber built along a shore, which raises the water level inside.



The turbine rotates both as the water enters the chamber and as it falls back into the ocean. The turbine's movement drives a generator, which creates electricity.

The Limpet

As 2006 began, the world had only one commercial wave-power generating station, on the Scottish island of Islay. The Limpet 500 (Land Installed Marine Powered Energy Transformer) produces

power for Britain's national grid. The operator, Wavegen, and the developers of the technology – researchers from Queen's University, Belfast – believe there could be enough recoverable wave power

around the United Kingdom to meet all the country's growing domestic electricity demands, and more. The same team is now developing wave power for the Faroe Islands.

Undersea riches

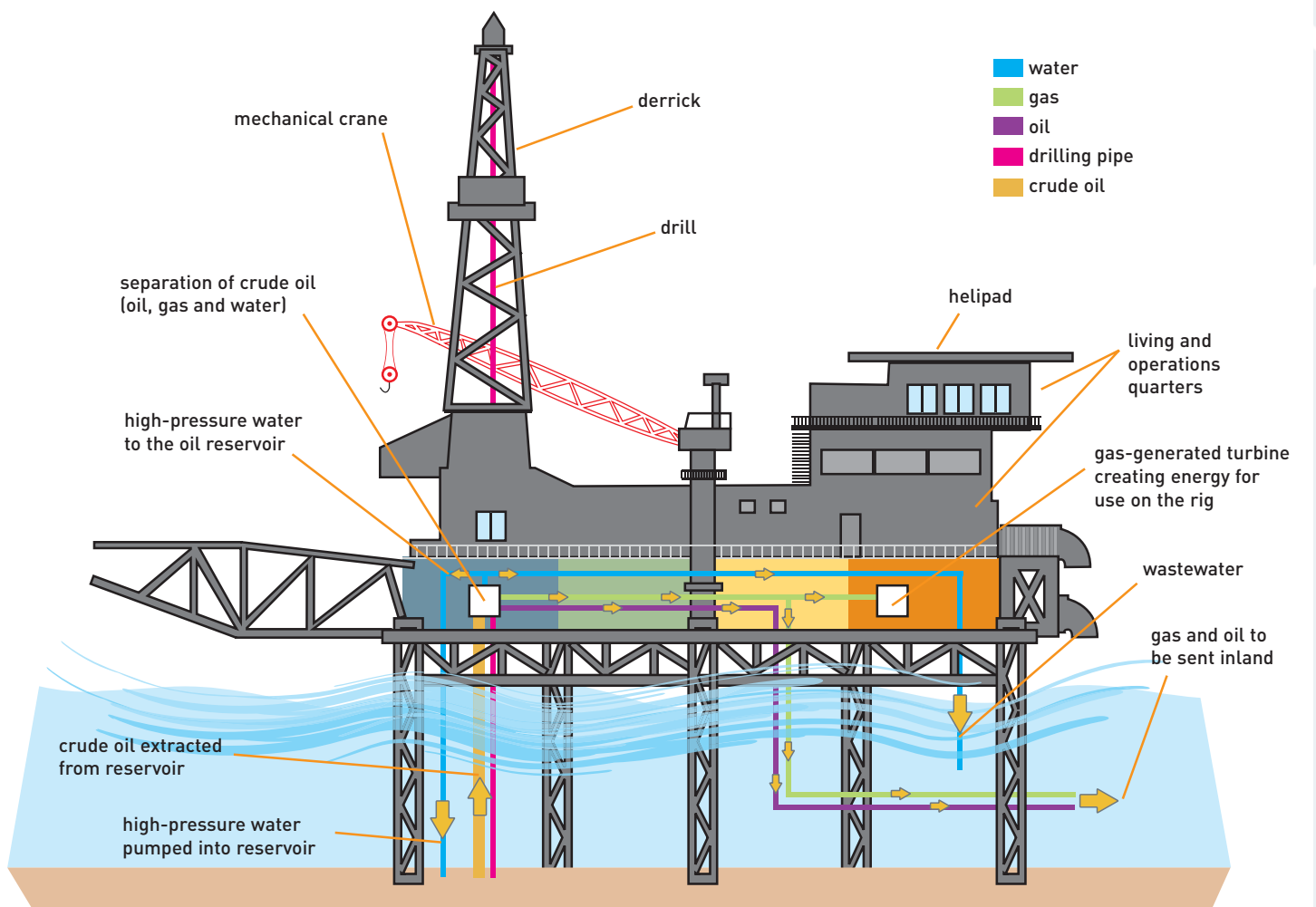
It may have been just 90 metres off the Californian coast, but when it started production in 1897 it was the world's first offshore oil well. Now around 30 per cent of our oil supplies come from offshore wells, as does about half our natural gas. They are exploited from some 8,000 platforms scattered around the world's oceans.

It is much more expensive to extract oil and gas offshore than on land. But as demand grows and reserves dwindle,

prices increase – ensuring that exploitation at sea remains attractive.

There have been surprisingly few massive spills considering the size of the industry. But it still poses threats to sea life, at least nearby. Wastes from drilling pollute the seabed and damage life, delicate habitats can be disturbed and there are concerns over disposing of the platforms, and the toxic substances they contain, after the oil fields they tap are exhausted.

When the wells run dry they may find a new planet-saving use. Technologies are being developed to capture emissions of carbon dioxide from power plants and the like, and pipe it into oil and gas wells deep under the seabed. This gives a double benefit as it can help to flush out the last oil and gas reserves: the United States is already disposing of some 32 million tonnes of carbon dioxide in this way every year.



Working rigs

Rigs have drilled in waters more than 2,000 metres deep and 300 kilometres from the shore. **Submersibles** are floated into shallow waters, then ballasted so they sit on the seabed. **Jackups** – used in waters up to 100 metres deep – are towed out to sea where their legs are lowered and their hull jacked up out of the water. **Drill ships** – anchored or kept in place by computer-controlled propellers – prospect for oil or drill in waters up to 1,500 metres deep. But **semi-submersibles** are the most

common of all; their superstructures stand on columns rising from hulls or pontoons ballasted below the water surface, providing excellent stability even in rough seas as much as 300 metres deep.

Oil platforms are industrial towns suspended above the sea, complete with all the equipment and supplies needed by their workers, from drill operators to divers, engineers to cooks. Each platform typically extracts oil and gas from a number of reservoirs at the same time.

The tall derrick hauls the drillstring in and out of the hole, cooled by fluid called drilling mud. Water is pumped into the reservoir at high pressure to force up the crude oil, a mixture of natural gas, water and oil. These are separated and the water removed, along with particles. This wastewater can be used in the drilling muds or to help extract more crude oil – or is returned to the ocean after testing for contaminants. The oil and gas are pumped ashore or loaded onto ships.

Suffocating the Sea

Think about pollution of the sea, and big spectacular oil spills spring to mind. But in fact they are a minuscule part of the problem, responsible for only 5 per cent of the oil that gets into the sea, itself just a small contribution to overall marine pollution.

Normal ship operations – such as discharges of oily ballast water from fuel tanks – pose much more of a problem. But, in fact, by far the biggest culprits are cars and other land vehicles: their used engine oil – and oily water running off roads – provides much the largest percentage of oil pollution in the ocean,



Black-footed albatross fledglings amidst broken glass and other beach detritus.
Photo: M. Rauzon/UNEP/Topham

after reaching it through drain outlets and sewers.

In all, 80 per cent of sea pollution comes from the land. The greatest load comes from untreated, or lightly treated, effluent from sewers, burdened both by human waste – with harmful bacteria and viruses – and pollution from industry and intensive agriculture.

Human sewage, agricultural fertilizers and other nutrients stimulate great blooms of algae. Sometimes these contaminate shellfish with dangerous poisons, and they always suck oxygen out of the water, often suffocating fish and

Sticking around

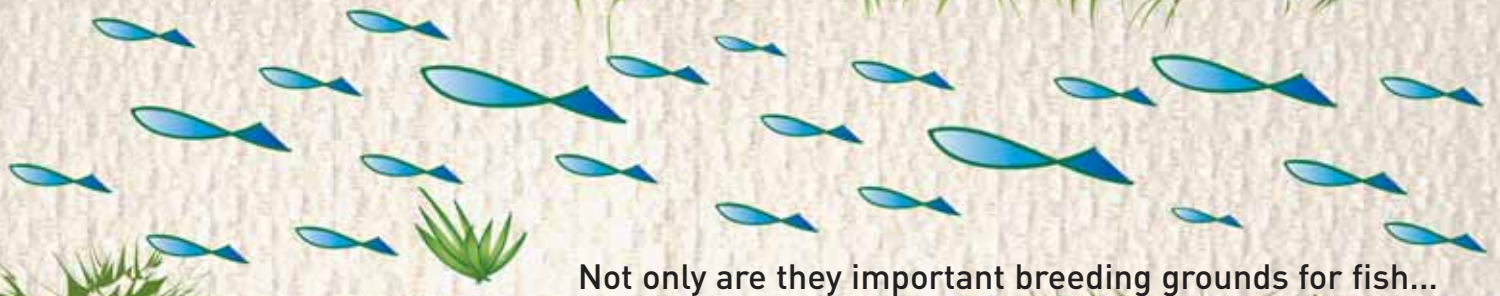
Throw a plastic bottle into the sea, or leave it on the beach after a picnic, and it will still be around in the middle of this millennium. Even a paper bus ticket will take weeks to disintegrate. Rubbish does break down at sea, but as the table shows it can take a surprisingly long time to do so.

Time taken for objects to dissolve at sea

Paper bus ticket	2-4 weeks	Cotton cloth	1-5 months	Rope	3-14 months	Woollen cloth	1 year
Painted wood	13 years	Tin can	100 years	Aluminium can	200-500 years	Plastic bottle	450 years

Source: Hellenic Marine Environment Protection Association (HELMPEPA)

Seagrasses the forgotten ocean ecosystem



Not only are they important breeding grounds for fish...

They are a valuable renewable resource providing income for local communities



www.rainkissed.com



www.karintyrefors.com



www.inspirationsfromcinnamon.com

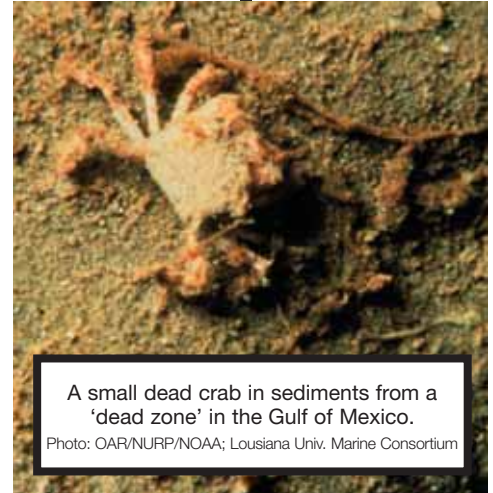
But ensure the products are harvested sustainably

All around the world's coastlines, effluent pours continuously into the sea.

Photo: D. Tapia Munoz/UNEP/Topham

other marine life. This contributes to the growth of 'dead zones' in the seas and oceans. UNEP has identified 146 of them (see map): their numbers have doubled every decade since the 1960s. Two of the biggest – at around 70,000 square kilometres – are in the Gulf of Mexico and the Baltic Sea. Meanwhile, chemicals like polychlorinated biphenyls (PCBs) accumulate in fish.

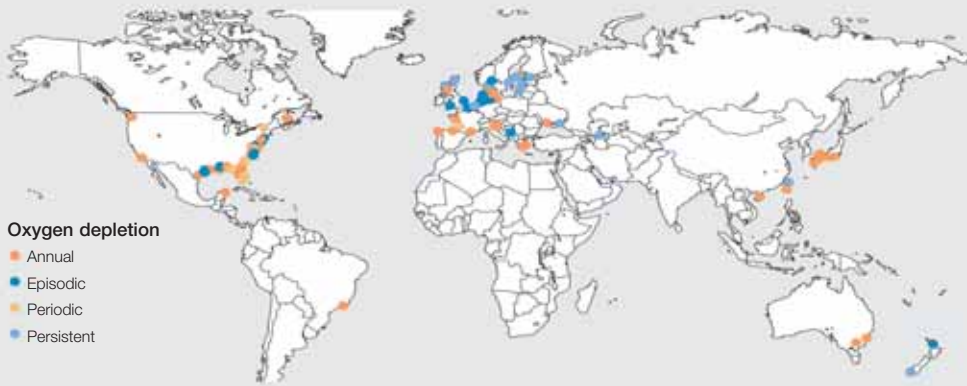
Some 95 per cent of the world's fish catch comes from the coastal waters where we dump our waste. In all, polluted coastal waters cost the world economy \$12.8 billion a year in death and disease.



A small dead crab in sediments from a 'dead zone' in the Gulf of Mexico.

Photo: OAR/NURP/NOAA; Louisiana Univ. Marine Consortium

Pollution alert: coastal zones starved of oxygen



Dead – or hypoxic – zones, caused by the bloom and subsequent decomposition of algae, can be persistent (all year round), episodic (happening once a year or less), periodic (once a year or more), or annual and associated with the seasons. The hypoxic zone off the coast of Louisiana in the Gulf of Mexico, for example, occurs during the summer months.

Source: UNEP/GEO Year Book 2003

More than half the world's entire coastline has been put under severe pressure by development. Coastal cities have expanded rapidly. Industries have flocked to the shore, especially those connected to the sea, such as oil exploration, or those needing to be near ports. And tourism – which makes huge demands on land, building materials, water and waste-disposal facilities – puts pressure on natural coastal habitats, destroying, to take just one example, turtle nesting sites.

Coastal and ocean resources can be

Take Mozambique's Guludo eco-lodge, which meets tourists' needs while providing community projects that reduce poverty and promote biological and cultural diversity. Set in the Quirimbas National Park – rich in beautiful beaches, coastal forests, corals, mangroves and seagrasses – it sets out to develop local capabilities and use local materials, and to make the minimum impact on the environment and local ways of life. Visitors stay in *bandas*, spacious tented huts with roofs thatched with *makuti* palm, built with minimal energy, and with thought as

erosion, habitat fragmentation and other problems. WWF and BioRegional's One Planet Living initiative will combine a 4,800-hectare nature reserve and native pine and oak forest restoration project with a 500-hectare tourism development of up to 25,000 beds. Its developers, Pelicano, won local and national backing, in competition with conventional mass-tourism schemes.

The \$1.2-billion project is set to be a global flagship in sustainable development and tourism. It will use sustainable building materials and has ambitious targets for



Mata de Sesimbra, Portugal.

BioRegional

Coast-effective

WWF-Canon/P.J. Stephenson



Quirimbas National Park, Mozambique.

managed sustainably, but it is difficult because responsibility for them has been fragmented and many different interests are involved. Yet recently an increasing number of small-scale tourist developments have been built on ecological and sustainable principles.

to how the buildings and materials can eventually be reused or recycled.

Then there's the Mata de Sesimbra ecotourism project in Portugal, the world's first large-scale integrated sustainable-building programme, set in an area where urban development is causing coastal

increasing energy and water efficiency and for reducing waste and carbon dioxide emissions. Visitors will pay a green tax to fund restoration, which will include reinstating ecological corridors and recovering wetlands and other important riverine and coastal habitats.



Daniel Adhatico

Australian surfer Layne Beachley, winner of six consecutive world surfing titles, originally set up her Aim for the Stars Foundation to help girls aged 12 to 18 pursue their athletic goals. However, she was so impressed by the efforts of three passionate young Australian environmentalists that she created the Beachley Environmental Award to honour them in the 2006 round of grants.

In July 2005, grant winners Sarah and Kate Charters and Millicent Burggraf joined the 600 delegates from around the world at UNEP's inaugural Children's World Summit for the Environment, which took place in Aichi prefecture, Japan. Inspired by the Summit, the three returned home and presented the Summit petition – which challenges world leaders to pay greater attention to environmental issues and commits the children to environmentally friendly actions – to Mayor Darren Ray of Port Phillip, their home town, and to Victoria's Minister for Environment and Deputy Premier, John Thwaites. They even persuaded the Mayor to sponsor their idea of making the local shopping centre plastic-bag free.

The girls plan to use the grant to attend the 2006 Children's World Summit for the Environment, to take place in Malaysia, and to continue working on behalf of the environment.

Charters/Burggraf



Finding solutions

Twenty-seven students – scientists, engineers, social scientists, economists and management experts – from nine countries gathered in Manila in October 2005 for the inaugural Eco-Minds Asia-Pacific Forum. They were challenged by the four-day programme to come up with creative and practical uses of science and technology to tackle real-world problems in sustainable development, while emphasizing a multidisciplinary, international approach. They also had to predict the social impacts of the solutions they proposed, and to test their viability: the programme encourages consideration of socio-economic and cultural factors at all stages of development, alongside its primary focus on scientific and technical innovation.



Bayer

Philippines President Gloria Macapagal-Arroyo opens the inaugural Eco-Minds Asia-Pacific Forum.

'Eco-Minds – the UNEP-Bayer partnership's latest effort to increase the environmental awareness of youth worldwide – is an important forum for scientific capacity building,' said Dr Oels, Board Member of Bayer AG, in his opening address. 'It provides the participants with a fantastic opportunity to exchange ideas from their wide range of academic disciplines, get guidance from experts, visit relevant ecological sites and work on solutions for real-world problems of sustainability.'

Lectures were given by leading experts in science and technology, environment and business – including Professor Jeffrey Sachs, Director of the United Nations Millennium Project. These offered food for thought, helping delegates to refine their ideas about development and the environment. Said Leyla Acaroglu, from Australia, 'The lectures allowed us to develop a deeper understanding of the often conflicting views, motivations and agendas that arise when attempting to find positive solutions adhering to sustainable development.'



Bayer

The group broke into teams of three – each representing different countries and areas of expertise – to work on a case study developed by Ateneo de Manila University. They were asked to help advise 'Tierra Verde', a hypothetical area in the Philippines, on a project to develop its resources while providing livelihoods for local residents: mineral water bottling, pineapple canning and shrimp farming were among the proposed industries. Each team chose a proposal to present to Tierra Verde's local government – represented by a panel of judges – on environmental protection, sustainability and social impact.



Bayer

Delegates learn jungle survival skills.

Tan Jack Young, an architectural technology graduate from the Singapore Polytechnic – and a member of the winning team – said, 'The case study was very well thought out, with every minute detail included. I initially found the environmental management aspects quite challenging. But our team members complemented each other well, with each being able to cover the respective areas of socio-economy, technology and environment.'

The third main component of the programme provided a breath of fresh air. Delegates were given jungle survival training in the pristine forests of Subic. 'It was an amazing experience that really proved that there are natural and simple ways of creating the things you need to survive,' said Leyla Acaroglu.

This was the first of a series of biennial forums that will continue to give students opportunities to synthesize ideas and broaden their knowledge of sustainable development. 'Eco-Minds is an amazing approach to getting us to realize that sustainable development requires a multidisciplinary approach,' said Philippines delegate Gerard G. Dumancas. 'It is an holistic programme where each field is given equal importance.'

Elisabeth Guilbaud-Cox, from UNEP, said, 'This Forum will help increase the momentum for creating a world in which the wishes of the founders of the United Nations are truly fulfilled.'



V. Curritcher/DPPI/Offshore Challenges



B. Stichelbaut/DPPI/Offshore Challenges

Total freedom, endless opportunity

The diminutive record-breaking young yachtswoman, **Ellen MacArthur**, has much in common with **albatrosses**, the world's biggest birds. Both are renowned for their fearlessness, and both travel huge distances around the globe on the winds.

Ellen broke the world record last year for sailing single-handedly around the world on her custom-made trimaran *B&Q/Castorama*. At just under 1.6 metres tall, she caught public imagination worldwide as she battled mountainous seas, mechanical troubles, injury and exhaustion. Her triumph was the culmination of a lifelong love of the ocean.

Out at sea, she encountered many albatrosses. The survival of 19 species of the birds is threatened by longline fishing – the practice of dragging lines of bait behind boats, on which the birds get hooked and drown.

Hailed on her return in February 2005 as Britain's greatest sailor, she demonstrated her concern for wildlife by taking time to participate in a survey of wandering albatrosses on Albatross Island – a wildlife sanctuary in South Georgia – alongside researchers working with the Royal Society for the Protection of Birds and BirdLife International.

She told TUNZA that she wanted to draw attention to their plight, as well as learn more about them. 'The current trend will lead to their extinction, so we need to give these birds the best chance we can.'

TUNZA caught up with her between her time on the island and her departure in March 2006 to establish new crewed speed records in Asian waters, when she hopes to be joined by young Chinese sailors.

Q: What first drew you to the sea and sailing?

A: I joined my aunt on a sailing trip when I was very young, and after a few days on board, I was totally hooked. My passion grew from there. I loved every element of being on the water; it felt like total freedom and endless opportunity. I also enjoyed the responsibility involved in sailing, and the preparation and care it took to look after the boat on shore.

I have a huge respect for the ocean: in this profession you need to understand what a complex and unpredictable environment it can be.

Q: Have you noticed changes to the marine environment on your voyages?

A: I did notice on my last around-the-world trip that the icebergs were far further north than they had been, and the water temperature was also marginally higher. This occurred over a four-year period, which suggests that there has been some effect due to climate change.

Q: Through the Ellen MacArthur Trust, you promote the idea that 'everyone has a goal'. Do you feel that this applies to young people, and to the environment?

A: The Trust was set up to allow children with cancer and leukemia to experience a totally new world out on the water. The transformation in some of the children who have joined us on the trips has been amazing and inspiring.

I think it is definitely important for young people to have something to work towards. It certainly helps if you aim to achieve your dreams – whether it's sailing or helping the environment – and be the best you can!

Team Ellen



Big responsibility

'It all depends on me!'

...concluded the 45 envoys at the most recent Bayer Young Environmental Envoy (BYEE) conference on environmental protection and sustainable development. The annual conference – sponsored by the UNEP and Bayer Group partnership, and taking place in mid-November 2005 at the company's headquarters in Leverkusen, Germany – supports young people in their commitment to the environment.

The envoys – aged 15 to 26, and from

agricultural science, and the control and monitoring of air and water quality.

They heard experts in biochemistry and attended workshops on Bayer's chemical and pharmaceutical work. And they learned about UNEP from Cecilia Kibare, Communication and Public Information officer, who described how its Tunza programme motivates children and young people to address environmental issues.

Yazmin Lucero Cobos Becerra, from Colombia, said she had most enjoyed visiting Bayer's wastewater and solid-

vidual projects, the best part for Oliver Goh, from Singapore, because 'it provided us with a platform to present our ideas and generate more solutions to different questions'.

Envoys were also able to build networks. Rahima Indria said one of her goals was to meet fellow Indonesians in other cities and on other islands so as to work together on common projects and aims.

But it wasn't just work. Envoys were taken on tours of nearby historic sites – including Cologne Cathedral,

E. Cooper



'This programme is a very interesting initiative; it can help improve the life of our countries.' Tatiane Guimarães, Brazil

'On returning home, I am committed to passing on my experience to other young people in my community.' Priyank Gupta, India



Bayer



E. Cooper



'Bayer has the power to spread ideas about sustainable development.' Aleksandra Tomkiewicz, Poland

14 countries in Africa, Asia, Eastern Europe and Latin America – were chosen from 800 applicants, after submitting environmental projects and essays and undergoing interviews to determine their knowledge, communication skills and leadership qualities. Bayer gave them a week-long study tour at their global headquarters.

Dr Udo Oels, a Bayer AG Board Member, told them of the important role of sustainable development in environmental protection. 'The main reason for your field trip to Germany is to find out how politics, industry and private households interact in environmental protection and sustainable development,' he said.

The envoys toured Bayer's facilities to see cutting-edge technology and learn how environmental concerns can be translated into practical applications in, for example, crop production,

waste treatment facilities, saying she had learned a lot about methods and technology to help her in her work at home.

The envoy programme began in 1995 in Thailand and has expanded to include more countries ever since. This conference was the first to include Africa, represented by two young Kenyans, Yvonne Beatrice Masilingi Maingey and George Muchina Nguri. 'It's amazing for us Africans to be here,' said Yvonne. 'It's a big responsibility but really exciting.'

Priyank Gupta, from India, added: 'This was a fantastic opportunity to meet other like-minded young people from around the world and an opportunity to learn from the Bayer Group's contribution to sustainable development and global challenges.'

The participants also discussed environmental issues and their indi-

a World Heritage Site, and the Rhine river – another chance to get to know each other.

'I have made lots of good friends. We can all learn from each other, communicate and discuss similar issues with enthusiasm,' said Ding Chen, from China.

Added Lester Louis L. López, from the Philippines, 'I hope many more people experience BYEE, because it is empowering and encouraging – and much more.'

Michael Schade, Head of Corporate Policy and Media Relations at Bayer, said he is always impressed by the envoys because they take their work seriously. The little changes they bring about, he commented, add up to big differences.

Said Rosidah Hardiani, of Indonesia: 'We came together because we want to make the Earth better.'



Bayer



Bayer

‘Environmental protection is always an investment in the future.’

Dr Udo Oels, Bayer AG Board Member



E. Cooper



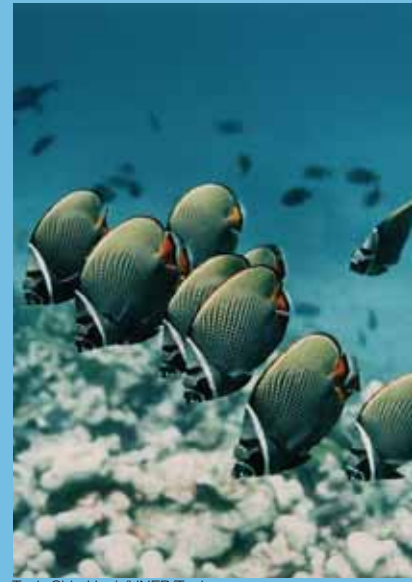
E. Cooper

‘It’s a really wonderful thing to participate on behalf of Africans. For me, this is an extraordinary opportunity to tap into environmental work.’ George Muchina Nguri, Kenya



E. Seniff

Raising sights



Teoh Chin Hock/UNEP/Topham

When Columbus reached the Cayman Islands his boats had to row through densely packed turtles in the shallow waters. Even in the 20th century, sharks were once regular company on almost every dive in the Caribbean, yet many reef divers today thrill to catch just the briefest glimpse of a fleeing shark. And everywhere, youngsters laugh as old men describe the size of the fish they used to catch.

Every generation establishes a sense of what is normal based on what they remember having seen, and we tend to set our goals for conservation in much the same way. We think we must work to keep things as they are – or, at most, hope to see a few slightly bigger creatures and a few more corals.

But we are much too low in our expectations, and thankfully there are still some places that remind us to raise our sights. On the Silver Banks north of the Dominican Republic, it’s still possible to sit in a boat surrounded by humpback whales. Divers can be followed about by enormous jewfish and continuously buzzed by sharks in southeast Cuba. There are beaches in Central America where over 10,000 turtles still come up to breed each year. Snappers gather to spawn off the coast of Belize in such numbers that whale sharks – the world’s largest fish – come in schools to feed on the eggs in the plankton.

This is the environment we should be aiming towards restoring everywhere.



Bayer



E. Cooper



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www.bayeryoungenvoy.com/

Meeting my minuscule match

Things I have seen and done when diving have taken my breath away – from swimming with reef sharks and exploring shipwrecks, to being awe-inspired time and again by the beauty and vastness of a coral reef.

The sea has always aroused my curiosity. I first entered the underwater world at the age of 10, scuba diving in the Red Sea with my family. When I got home I filled my classmates' heads with stories of my adventures in the magical world that lay just beneath the surface of the water.

In diving I found my secret garden, my secret place. Walking to the sea wearing a wetsuit and with a heavy tank on my back, I felt like an explorer, struggling against the odds. Once under the water, I was weightless, as if walking on the moon, euphoric. A decade and many dives later, the childlike fantasies that filled my head have evolved, but the euphoria and the feeling of stepping into another world have not.

A couple of years ago, in Mexico, I came across a kindred spirit: the damselfish. Colourful and about the length of my little finger, this diminutive species will defend its territory with great ferocity. As I hovered there, watching it 'farming' its patch of algae, it suddenly faced me head on, seemed to narrow its little eyes at me and charged, defiantly trying to scare me away, to show me who was boss. Something about its determination took me back to when I was a little girl, thinking that if I puffed out my chest and stared a person in the eye I could win any battle.

Being able to reach out into a mysterious and natural world is exhilarating, with its adrenaline rushes and touching quirks. The oceans are so full of life, with an immense diversity of species evolved over millions of years. As long as we respect our place as the oceans' guests, diving provides a way to explore them that is simply not possible from the world above.

Kate de Mattos

Essential tips:

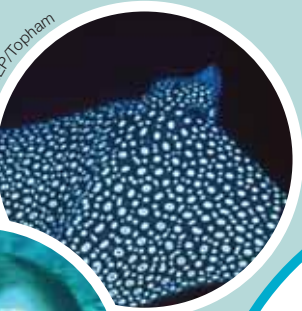
- Get the necessary training.
- Take local advice and remember that the sea is much stronger than you are.
- Tell someone where you are going.
- Go diving with a friend, never alone.
- Treat the sea and all its inhabitants with respect. (Don't chase anything!)
- Avoid touching anything, including the coral; it's an animal, not a rock!
- Leave everything as you found it.
- Enjoy it!

If you don't have the opportunity to scuba dive but find yourself near the sea, snorkelling and free diving offer a cheaper window on the underwater world.

Reef Environmental Education Foundation



A. Nachoum/UNEP/Topham



Pez Maya



S. Paitrat/UNEP/Topham



UNEP/Topham



Pez Maya



Pez Maya



The other corals

Mentioning corals conjures up the warm, shallow, turquoise waters of the tropics. But some species inhabit dark, cold, nutrient-rich waters in virtually every ocean on Earth. But as these cold-water corals are more remote than their warm-water cousins, and usually live in relatively inaccessible areas like the edges of the continental shelf and water sometimes hundreds of metres deep, it is only recently that scientists have been able to examine them more closely.

These corals form habitats just as large and complex as the more familiar warm-water corals, including reefs and forest-like gardens in otherwise rather featureless and murky surroundings. In the darker, colder waters, they cannot rely on algae for their nutrients, but live on organic matter floating by on the currents. It is the absence of algae in their tissues that makes these coral communities less colourful than the reefs of warmer environments; nevertheless they provide habitats for thousands of other species, including commercial fish.

Indeed, commercial fishing poses the greatest threat to them. Take the common practice of bottom-trawling, when a fishing boat drags along the seabed a net held open by metal trawl doors to catch bottom-dwellers such as flatfish and crustaceans. The doors, which can weigh several tonnes, smash into corals and stir up sediment, often destroying or severely disrupting the reef ecosystem.

Exploring for and producing oil and gas, laying cables and pipelines and the dumping of wastes also pose threats. And because the corals – some up to 8,000 years old – are slow growing and fragile, it may take centuries for these treasure troves of biodiversity and economic worth to recover.



A. Fritswald



A. Fritswald



A. Fritswald



A. Edwards



R. Bray/NURP/NOAA



Ove Hoegh-Guldberg



C. Webnitz

Home from home

Saltwater aquariums, with their vivid clownfish nestled among anemones, shrimps hiding under corals and other glimpses of the underwater world, are inspirational. But 99 per cent of these creatures are harvested from the wild, from coral reefs in such countries as Indonesia and the Philippines.

Conservationists say that irresponsible collection methods – including cyanide fishing, tapping on habitats to scare fish into the open, and breaking off chunks of reef to remove key species – harm delicate environments already under pressure from such stresses as climate change.

Poor handling means that fish die in transit to the United States, Europe and other places where aquarium keeping is popular. But those that survive fetch high prices, so collectors catch as many as they can to allow for these losses, often resorting to environmentally unfriendly practices.

Farming fish could be a solution. Some popular species – including anemone clownfish and certain corals – breed successfully in tanks, but the spawning cycles of most are too vulnerable for success. And unless it is done in local communities, farming can deprive small-scale collectors of their livelihoods.

Supporters of the trade argue that, with education and training, communities, exporters, importers, retailers and hobbyists could both ensure a living for local people and promote the conservation of coral reefs. The Marine Aquarium Council (MAC) – which has developed sustainable trade standards – trains and certifies collectors, wholesalers and retailers. This gives collectors sustainable livelihoods and assures buyers that they are helping to conserve coral reefs.





1. Arctic: the Narwhal

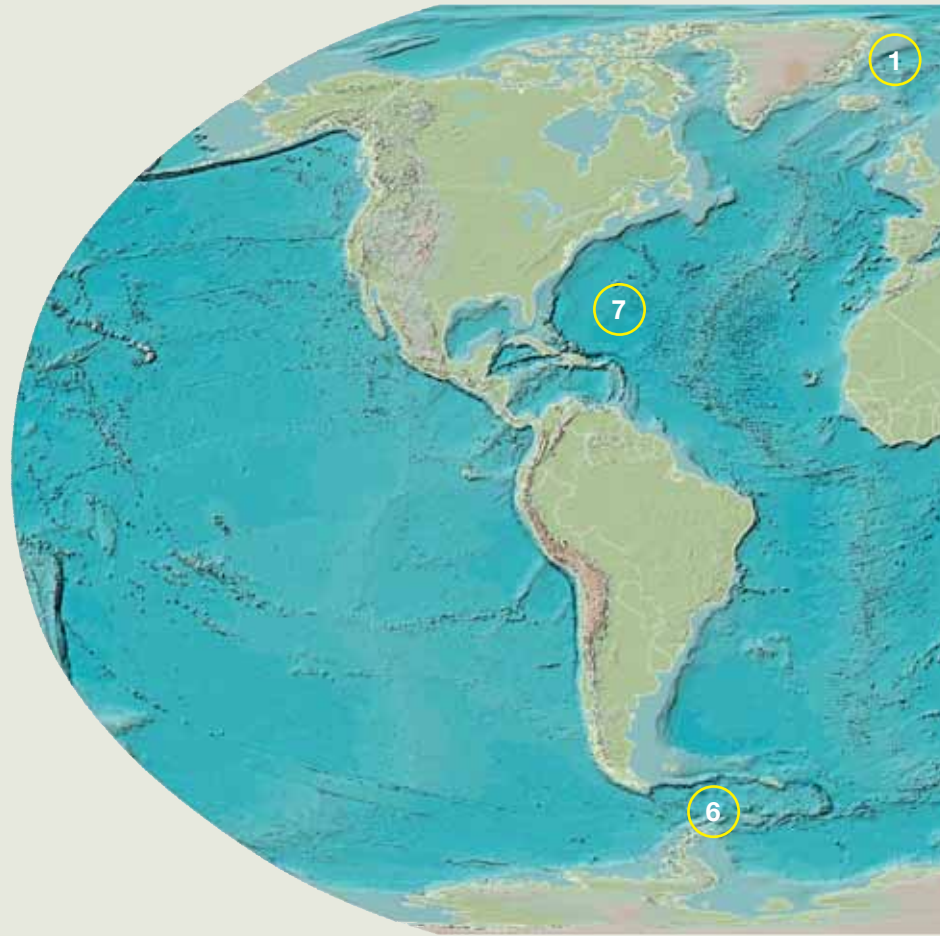
Is it a unicorn or a corpse? The narwhal whale (*Monodon monoceros*) of the Arctic – which can grow up to 5.2 metres long and weigh up to 1.8 tonnes – has been called both. Its name comes from the Old Norse words for ‘corpse whale’, though opinions differ as to why. Some say it’s because of the mottled appearance of its skin; others insist that it’s because the creature often

swims belly-up. Its more romantic appellation comes from its most distinguishing feature, the male’s usually single ivory tusk, which can grow to as much as 3 metres in length, earning it the name ‘unicorn of the sea’. Indeed the narwhal may have been the origin for the mythological animal itself.

F. Bruemmer/Still Pictures



7 Seas



7. North Atlantic: the Sargasso Sea

When Christopher Columbus bumped into masses of vegetation on his way to the New World, he thought he was about to hit land. But he was still in the middle of the Atlantic. He was in the oval-shaped Sargasso Sea – 1,100 kilometres wide and 3,200 kilometres long between the Azores and the Caribbean – which gets its name from the seaweed, *Sargassum*, that floats in huge quantities on the calm, deep blue waters. Sailors used to think their ships, slowing down in the quiet waters, were actually being held by the seaweed – giving the sea a reputation as a nautical menace. The seaweed is home to many marine species, and the sea is the breeding ground for both the American eel and the European eel.



A. Brando/Still Pictures

6. Southern Ocean: Emperor Penguins

March of the Penguins has caught the imagination of the world, making the film one of the most unexpected box office hits ever. Its heroes and heroines, the emperor penguins, are the only animals to spend the winter in the coldest place on the planet. The largest penguin species – standing almost 1.3 metres – they are insulated by a dense network of 11 feathers on every square centimetre of their bodies.

But even this cannot keep out temperatures that can plunge to minus 60 degrees centigrade. So – in a unique cooperative effort – they clump together in huge, huddled masses, taking turns to move to the inside to warm up, and then moving out to the edge again to give others their chance.



F. Lochon/UNEP/Topham

2. Black Sea: the Great Flood

Many traditions tell of a great flood early in the history of civilization. Recent research suggests that it may actually have happened, forming the present shape of the Black Sea. Geologists have found evidence that water flooded from the Mediterranean through the Bosphorus – at 200 times the rate of the flows over the Niagara Falls – around 5600 BC. Marine archaeologists have found

Topfoto/NASA/JPL/NIMA



what appear to be ancient shorelines and man-made structures, dating from about the same time, under 100 metres of water off the sea's coasts. The theory is disputed, but some believe that this could solve an old mystery: what triggered the massive spread of proto-Indo-European people throughout Europe and Asia?



3. North Pacific: the Mariana Trench

Climbing to the highest point on Earth is a doddle, compared to descending to its deepest one. Many people now scale Mount Everest each year but only two – Jacques Piccard and Don Walsh – have plunged down to the bottom of the 11-kilometre-deep Mariana Trench near Guam in the North Pacific, and that was nearly half a century ago (see page 6). Yet it contains potential treasures. In the mid-1990s, for example, Japanese scientists – using a remote-control submarine probe – discovered a bacterium, *Moritella yayanosii*. The bacterium, which contains the medically useful proteins DHA and EPA, previously found only in fish oils, has potential for treating cancer and hypertension.

4. South Pacific: Kelp Forests

Everyone knows what coral reefs look like, but kelp forests – the next most spectacular habitats in the ocean – are much less well known. Thriving in cold, nutrient-rich waters around the world – with the giant seaweed growing as tall as 30 metres from seabed to surface – the dense forests house great biodiversity, providing food and shelter for creatures from the lowly sponge to giant crabs and octopi. Many are under threat. One of the world's biggest giant kelp species (*Macrocystis pyrifera*), in the waters around Tasmania, has been declining under the impact of rising water temperatures, an increase in sea urchins and pollution.

5. Indian Ocean: the Coelacanth

They thought that the coelacanth had been extinct for millions of years, but it turned up in the catches of local fishermen. Museum curator Marjorie Courtenay-Latimer spotted the unusual-looking fish when inspecting catches near the mouth of the Chalumna River, South Africa, for interesting specimens. Up to then, the fish – whose ancestors are believed to have first appeared on Earth 350 to 400 million

years ago, and which is often described as a living dinosaur – had only been known through fossils. More of the fish were later found near the Comoros Islands, and it turned out that their people knew the fish well, but thought of it as second-rate, as it is doesn't taste very good.



N. Wu/Still Pictures



L. Rothman/Still Pictures

UNEP-WCMC/World Atlas of Biodiversity

our future oceans...



E. Cooper

if we don't fish sustainably