The UNEP Magazine for Youth

TUNZA

UNEP

for young people • by young people • about young people

Oceans & Coasts

Deep mysteries

Heating up

Pollution alert

Swimming with sharks

Meet Ellen MacArthur

Ocean power

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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.’

Rachel Carson

UNEP/Topham

A. Pignone/UNEP/Topham

Editorial

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.

B. Hatcher/A. Naseer/Dalhousie Univ.

RISING TIDES

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

Photo: J. Descloitres/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

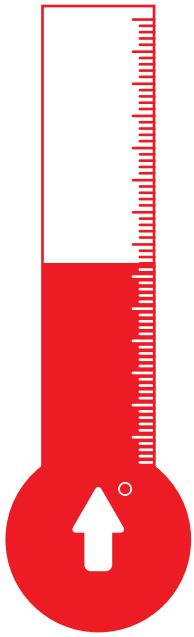
Already, global warming is causing catastrophic crashes in sea and bird life. In the summer of 2005, the tiny plankton that form the base of the food chain of the Pacific off the northwest American coast failed to appear, causing populations of fish and seabirds to fall to record lows.

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.

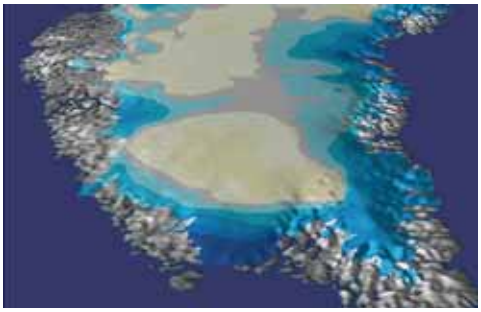
Some scientists fear that these are signs that climate change is beginning to damage the health of the oceans irreparably. New research at the University of Amsterdam suggests that, as warming continues, plankton will be disrupted and destroyed worldwide.

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.

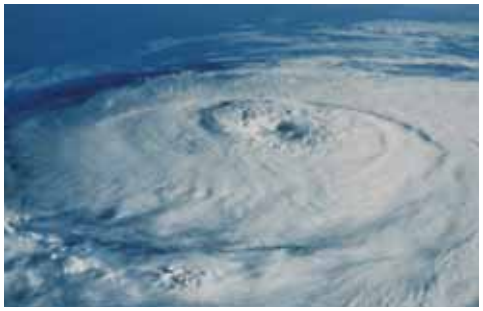
Photo: M. Lamarre/Still Pictures

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.