

The UNEP Magazine for Youth



TUNZA



for young people · by young people · about young people

“We should not be afraid to fight for what we believe is right”



AVATAR: REACHING THE HEART

TUNZA

the UNEP magazine
for youth. To view current
and past issues of this
publication online,
please visit www.unep.org



United Nations Environment Programme (UNEP)

PO Box 30552, Nairobi, Kenya
Tel (254 20) 7621 234
Fax (254 20) 7623 927
Telex 22068 UNEP KE
E-mail unepub@unep.org
www.unep.org

ISSN 1727-8902

Director of Publication Satinder Bindra

Editor Geoffrey Lean

Special Contributor Wondwosen Asnake

Youth Editors Karen Eng, Deborah Woolfson

Nairobi Coordinator Naomi Poulton

Head, UNEP's Children and Youth Unit

Theodore Oben

Circulation Manager Manyahleshal Kebede

Design Edward Cooper, Ecuador

Production Banson

Front cover photo Twentieth Century Fox

Youth Contributors Carla Basantes, Ecuador; María Fernanda Burneo, Ecuador; Francisco Chuc, Mexico; Kate de Mattos-Shiple, UK; Edgar Gegúento, Philippines; Janeicie Kantún, Mexico; Felicity Kuek, Malaysia; Abhiram Kramadhati Gopi, India; Brittany Lynn Valdez, USA; Julio Martínez, Mexico; Tribute Mboweni, South Africa; Robert Nelson, Haiti/USA; María Belén San Martín, Peru; Tan Sijie, Singapore; Maia Tanner, UK.

Other Contributors Sarah Bladen, WWF; Mark Carwardine; Fergus Drennan; Irene Hoffmann, FAO; Martin Jenkins; Tim Menke, Twentieth Century Fox; Sergiy Paskevych, www.chornobyl.un.ua; Fred Pearce; Shauna Swartz; Rosey Simonds and David Woolcombe, Peace Child International; Damon Stanwell-Smith, UNEP-WCMC; Christoph Schröter-Schlaack, TEEB; Susie Weldon, ARC.

Printed in the United Kingdom

The contents of this magazine do not necessarily reflect the views or policies of UNEP or the editors, nor are they an official record. The designations employed and the presentation do not imply the expression of any opinion whatsoever on the part of UNEP concerning the legal status of any country, territory or city or its authority, or concerning the delimitation of its frontiers or boundaries.

UNEP promotes environmentally sound practices globally and in its own activities. This magazine is printed on 100% recycled paper, using vegetable-based inks and other eco-friendly practices. Our distribution policy aims to reduce UNEP's carbon footprint.

CONTENTS

Editorial	3
Does biodiversity matter?	4
Avatar: reaching the heart	6
Taking action	8
Last chance to think	10
Where the wild things are	12
The Economics of Ecosystems and Biodiversity	14
Food choice	16
TUNZA answers your questions	18
Faith in nature	18
Closer to home	19
Measured questions	20
Fighting back	21
Seven species on the climate change hit list	22
The year of the tiger	24

Keep up with TUNZA on Facebook!

www.tinyurl.com/tunzamagfb



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.

The partnership agreement, renewed to run through 2010, lays down a basis for UNEP and Bayer to enlarge their longstanding collaboration to bring successful initiatives to countries

around the world 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/Children's Conference, youth environmental networks in Africa, Asia Pacific, Europe, Latin America, North America and West Asia, the Asia-Pacific Eco-Minds forum, and a photo competition, 'Ecology in Focus', in Eastern Europe.



MANY SPECIES • ONE PLANET • ONE FUTURE
WORLD ENVIRONMENT DAY • 5 JUNE 2010



What YOU can do

One person alone cannot save the planet's biodiversity, but each individual's effort to encourage nature's wealth must not be underestimated. Here are just four ways to do your bit to encourage biodiversity and, what's more, inspire those around you:

PLANT local species in your garden or on your balcony, or volunteer at your local nature reserve, school or botanical gardens. You will be providing nourishment for native animals and helping native plants to thrive. If you enjoy team work, why not find out about local initiatives such as planting trees with local conservation groups. Look on the web or at your local library, but if you can't find a group, you could always start your own!

PROMOTE the protection of biodiversity. Tell friends, family, teachers or the person next to you on the bus what you're doing to encourage biodiversity and why it matters. Educating your peers is one of the key solutions to raising a generation that cares about the future of all life on Earth.

PERSUADE local landowners, fishermen, farmers and businesses to do their bit to protect the species their line of work affects. These groups are the main stakeholders when it comes to protecting biodiversity, and the more they hear from the public and consumers (that's YOU), the more likely they are to choose to protect it.

PRESERVE the wildlife that already exists. That old log in your local park or garden might just be home to insects, lizards, frogs or other organisms you hadn't noticed before. Check to see what species might be there before you disturb anything.

www.cbd.int/2010/biodiversity/?tab=2
www.bbc.co.uk/breathingplaces/hour
www.snh.gov.uk/scottish/2010yearofbiodiversity04.asp
www.dublin.ie/environment/biodiversity/kids-corner.htm
www.cbcg.org.au/biodiversity/tips_for_encouraging_biodiversit.htm

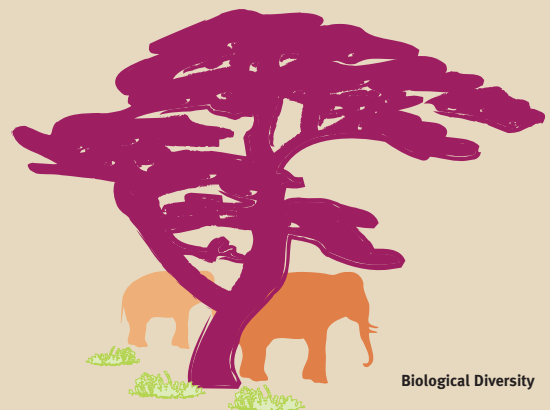
EDITORIAL

By now the world should be well on the way to defusing the greatest ever threat to life on Earth in human history. For this is the year by which the world's governments solemnly swore that they would be beating back the biodiversity crisis, which threatens to bring about the sixth mass extinction of species in the lifetime of our planet, and the first since the disappearance of the dinosaurs 65 million years ago. To be precise, world leaders pledged, early last decade, 'to achieve, by 2010, a significant reduction of the current rate of biodiversity loss at the global, regional and national level, as a contribution to poverty alleviation and to the benefit of all life on Earth.'

As the pledge indicates, the biodiversity crisis is not just about vanishing species, important though that is. It is also destroying the vital services that nature provides for humanity. We depend on soils and seas for food, for example, on forests for freshwater, on trees to reduce pollution, on wild species for many of our medicines. And yet half of the world's wetlands have been lost over the last century; 40 per cent of its forests in just the last three decades. A third of coral reefs – the most important breeding grounds for fish – have been seriously damaged. And, every year, 25 billion tonnes of topsoil is eroded away. The Millennium Ecosystem Assessment, the most comprehensive study on the issue ever undertaken, concluded that 60 per cent of the world's such 'ecosystem services' had been degraded over the last 50 years.

Poor people in developing countries are most reliant on these services, and so suffer most when they are damaged or lost. As UN Secretary-General Ban Ki-moon has pointed out, they are vital for achieving the all-important Millennium Development Goals. But everyone is affected, since the entire world economy is effectively utterly dependent on the natural environment. And yet the importance of what is happening is not recognized. As the ground-breaking project, *The Economics of Ecosystems and Biodiversity*, has pointed out: 'It is hard to think of any other asset where we would tolerate its loss without asking ourselves what we are losing and why.' No asset is more important.

2010 is the International Year of Biodiversity. It could be a year of shame, representing the world's failure to live up to its pledge to tackle the crisis. Or it could be one of promise, marking the moment when humanity decided finally to turn it around. We must do everything we can to make the second scenario a reality.



DOES BIODIVERSITY MATTER?



2010 is the International Year of Biodiversity. In October representatives of almost all the world's nations will be in Japan for a meeting of the Convention on Biological Diversity. One of the subjects they'll discuss is the 2010 biodiversity target, an agreement made eight years ago to try to stop the loss of biodiversity by 2010 – something we know we haven't achieved. But how many people, even among those meeting in Japan, really understand biodiversity? What is it? Can we measure it? Does it really matter if we lose it, or some of it? What will happen if we do?

Where is it?

Some kinds of habitat have far more species than others. Those with the most are tropical rainforests; other rich habitats include coral reefs, and scrublands in a Mediterranean-type climate, which are particularly rich in plant species. In contrast, very cold and dry places – the Arctic and Antarctic, and deserts such as the Sahara – have very few.

How much of it is there?

When it comes to living organisms we can at least have a go at counting them. We usually do this in terms of species – a kind of universal currency of biodiversity. Over a million different species have been given scientific names so far, most of them insects, especially beetles. There are also about 300,000 plant species, and about 50,000 species of vertebrate – animals with backbones – of which humans are just one. As well as the species that have been described, we know that there are many others that have not. Most of these are small animals – more beetles – and microscopic organisms living in tropical forests or hard-to-reach places such as the deep sea floor that haven't yet been well studied.

It's much harder to say how many different kinds of ecosystem or habitat there are. People can't agree on a way of classifying them, and in any case in the real world they don't fall neatly into separate units. We can divide the world into major 'biomes', like forests, deserts, grasslands and wetlands, but even then we can't really say where a forest ends and a woodland or a woody savannah begins. And it's almost impossible to say how many types of forest there are, or exactly what the difference is between a wet grassland and a wetland. And as for genes, although we've sequenced the genomes of a number of different species, including humans, we don't really have any idea how many there are in total.

What is biodiversity?

Biodiversity is really just one way of talking about life on Earth (the 'bio' bit) in all its amazing variety (the 'diversity' bit). One important part is the huge number of different kinds of living organisms that share the planet: plants, animals, fungi, bacteria and weird things like slime-moulds. Another is all the different habitats and ecosystems that make up the biosphere: tropical rainforests, woodlands, prairies, salt marshes, coral reefs, and many more. Yet another is all the different genes in each individual organism which determine what kind of organism it is.

What are we doing to it?

However we look at it, it's clear that we humans have had a huge effect on biodiversity. We've driven hundreds, probably thousands, of species to extinction, and made many more much rarer than they would be without us. We've also made a relatively small number of species commoner, and some much commoner, including domesticated animals and crops, and wild species such as dandelions or rats, which we tend to think of as weeds or pests.

We've changed habitats and ecosystems dramatically too. We've cleared huge areas of forest, ploughed up grasslands, drained wetlands and dammed rivers. We've replaced these natural systems with places suited to our immediate needs and wants: farmland for food, fibres and, more and more, fuels from plant oil; built-up areas for housing and industry; transport networks like roads, railways and airports; places to generate power; and all the paraphernalia of modern life – golf courses, ski resorts, beachfront holiday developments. And even where we haven't actually converted natural areas into something else, we've altered them by pouring our waste into rivers and lakes and dumping acid rain and other pollutants onto the land.

Changes in habitats and ecosystems can have different effects on other sorts of biodiversity – species or genes – depending on where they happen. Madagascar and France are about the same size, and there's roughly the same amount of forest in each. If we were to clear Madagascar's forests completely, the effect on biodiversity at the species level would be very great: these forests are rich in species and almost all of them occur only there, so if we cleared them, thousands or tens of thousands of species would go extinct. And for every species that goes extinct, a load of genes not found in any other species disappears. But if we were to clear France's forests completely, the effect on species biodiversity would be much less because France's forests have far fewer species and most of them are found elsewhere in Europe and northern Asia. Very few, if any, would go extinct.

How much does losing biodiversity matter?

So thinking about losing biodiversity isn't straightforward, and becomes even more complicated when we ask about its importance. There are all sorts of questions: How many species do we 'need' in the world or in any one place? How much forest? How many coral reefs? How many genes?

These questions are very difficult to answer. At a basic level, we humans are completely dependent on a host of other organisms for our survival, as it's those other forms of life that create the biosphere, without which Earth would be a sterile lump of minerals and toxic gases. Plants, algae and various kinds of bacteria produce the oxygen in the air that we breathe and, ultimately, all the food that we eat: we, in common with other animals, cannot make our own food from inorganic matter through photosynthesis. And a range of different organisms – the decomposers – break down our waste products, so without them we would be poisoned by our own effluent.

No single photosynthesizing species or decomposer can grow everywhere, and so we need a range of them just for these basic functions, so we know we need a certain level of biodiversity, but we don't really know how much.

A lot of the time we can get by with less diversity, of species at least, than there might be. Agricultural lands almost always have fewer species than the natural habitats that they replace, and in some places we've been farming pretty successfully for thousands of years. But we also know that more may sometimes be better. In ecosystems of one type, such as grasslands, those with more species tend to be more efficient at using resources – sunlight, water and minerals – to produce organic matter. They may be more resistant to some kinds of influence too, such as disease, and more adaptable to change, as there's more chance that at least some species will flourish in new conditions. Beyond that, we don't really know.

It's much the same with ecosystems, and genes for that matter: destroying all the world's forests would have a huge effect on people's well-being and on the planet generally – through changes to the climate for example. But if just the world's birch forests or mangroves disappeared, what would happen? People living in places where they occurred would be affected, but how much would anyone else notice?

Perhaps the real answer is that we're asking the wrong questions. Throughout history, we have got used to the idea that we can do what we like to nature. Modern technology means that for many of our needs and wants we can use machines, like cars, and synthesized drugs and fertilizers instead of relying on other living things. But should we feel free to destroy everything except the bare bones of the natural world we need to keep the biosphere ticking over and to feed ourselves? We still haven't actually worked out how to do that, assuming of course that we could work out exactly how much that was. And would the result really be the kind of world that you'd want to live in?

Martin Jenkins is a co-author of the UNEP-WCMC World Atlas of Biodiversity (California University Press).

PHOTOS: Earth: Apollo 17/NASA. Insects: Bugboy52.40/GNU/FDL. Leaves: The Cat/GNU/FDL. Aquarium: Diliff/GNU/FDL. Salmonella invading human cells: Rocky Mountain Laboratories/NIH/NIH.



Avatar

Reaching the heart

Photos: Twentieth Century Fox

Who'd have thought it just a few months ago? The biggest-grossing movie ever turns out to be an environmental film. Not an ecodocumentary – like *March of the Penguins*, *The Age of Stupid* or even *An Inconvenient Truth* – of course, but the Hollywood blockbuster, *Avatar*. Directed by James Cameron – of *Aliens*, *Terminator*, and *Titanic* – it combines epic storytelling, spectacular design, groundbreaking special effects, and intense action that enable audiences to take in a green message along with the popcorn.

The story opens in 2154, when Earth's natural resources have been depleted. Jake Sully, a former marine who has lost the use of his legs, goes to Pandora, a moon with a lush, Earth-like environment 4.4 light years away. Humans, led by the 'Resources Development Administration' and backed with military force, have colonized it for three decades and are mining a rare mineral (inevitably called unobtainium), needed for energy generation on Earth. The Administration wants a closer relationship with Pandora's inhabitants – tall blue warriors called the Na'vi – in order to control them and their resources.

Pandora's atmosphere is toxic to humans, so the team of scientists who aim to study its rich biosphere create 'avatars', genetically engineered Na'vi-human hybrids driven by human neurological systems. Jake has been summoned to drive one made with the DNA of his dead twin brother so that he can gather intelligence to use against the Na'vi.

But he becomes enchanted with Pandora's environment and, helped by Netyiri, a Na'vi princess, he learns to navigate the moon's landscapes and comes to respect its creatures and to understand its spiritual force – Eywa – which connects all its life. Ultimately, he switches sides, becoming a Na'vi himself and leading Pandora's defence against the encroaching humans.

Not exactly a subtle message, but Cameron did not intend it to be. 'We know what's going on with the environment but

we're in denial,' he says. 'Denial is a response based on fear of change, of the sacrifices we're going to have to make.'

'Humans think: "We're here, we're big, we've got the guns and the brains, therefore we're entitled to everything on this planet".' He goes on: 'That's not how it works. We're going to learn the hard way unless we wise up and start seeking a life that's in balance with the natural cycles of Earth.'

But rather than hit people with facts and figures, he wanted to do it with emotion. 'I wanted people to feel the environmental message, not think about it. It's the exact opposite of *An Inconvenient Truth*, which certainly offers information. But in an action film, it's more important to get these concepts viscerally.'

So Cameron made Pandora's environment as life-like as possible, taking inspiration from Earth's biodiversity. 'We had tables covered with books about animal biology and anatomy, photo books with the textures of everything from the back of a tortoise to poison dart frogs. We studied the interaction between the skin and beak of a hornbill. We used nature's resourcefulness and imagination to fuel us, which is why the creatures feel real.'

Avatar's design was also inspired by Cameron's passion for the deep sea, from the jellyfish-like seeds of the Na'vi's sacred tree to the night-time bioluminescence of its wildlife. 'Growing up in the 1960s, I was a science-fiction fanatic, and loved the idea of space exploration. I knew I would never get to go to another planet, but ocean exploration seemed like a good alternative.'

His love of diving even helped lay the technological groundwork for *Avatar*, the world's first 3D blockbuster. While working on *Titanic* – the 12-year record holder for biggest grossing film – he developed his own digital 3D



camera system to capture the experience of deep ocean exploration. He filmed two documentaries with this technology, one exploring the wreck of the *Titanic*, the other examining the creatures of mid-ocean ridges.

'There's so much we don't know,' Cameron says. 'On every dive I see something I never could have imagined. A diaphanous jellyfish 2 metres across. A pink octopus with wings on its head. Blind shrimp swarming just centimetres from water hot enough to melt lead. Nothing the artifice of Hollywood has to offer can compete with the thrill of something this exciting and 100 per cent real.'

The message seems to have hit a nerve. Teachers have approached Cameron about creating curricula around *Avatar*. Activists have used the movie's popularity to draw attention to real-life conflicts happening all over the world between indigenous peoples and corporate interests, some asking Cameron to explicitly champion individual causes.

There have even been reports of '*Avatar* depression': audience members so taken by Pandora's beauty that they find it difficult to readjust to real life. 'Pandora seemed like such a perfect place, and I became disgusted with the sight of our world, what we have done to Earth,' said Ivar Hill, a 17-year-old student from Sweden.

The profits haven't been bad either: *Avatar* has so far made more than \$2 billion at the box office, along the way winning many nominations and awards, including three Oscars for best art direction, cinematography and visual effects.

'*Avatar* asks us all to be warriors for the Earth,' says Cameron. 'It creates a sense of moral outrage, and then a sense of uplift when good conquers evil. When you put those two things together it creates a ripe emotional matrix for people to want to take action.'

What did you glean from *Avatar*?

'What really caught my attention were the futuristic style of the film and the 3D presentation. Young people love out-of-the box ideas and stories, something that will tickle our minds and take us beyond the boundaries of this world. As I watched the film, I reflected on the real-life environmental problems and challenges that we confront, caused by greed and abuse of resources. *Avatar* conveys two important messages: first, we should respect, protect and preserve our environment for future generations, and second, we should not be afraid to fight for what we believe is right.'

Edgar Geguiento, Philippines, Tunza Youth Advisor, Asia and the Pacific

'Eywa keeps the ecosystem in perfect equilibrium, and the Tree of Souls is like the keystone species of our fragile environment; remove it and the whole ecosystem will gradually collapse. The Na'vi, who understood this, fought hard to protect their own natural heritage. They are like our environmentalists, conservationists and researchers.'

Tan Sijie, Singapore

'I am a lot more eco-conscious. I don't eat meat anymore. The Na'vi aren't vegetarians, but they treat their animals with respect, while most of the meat produced in the United States is from animals that are treated cruelly. I want to move out of the city as soon as possible, become less of a consumer and produce more things for myself.'

Brittany Lynn Valdez, United States of America

Taking action

Felicity Kuek, Malaysia

The sale and consumption of turtle eggs is banned in East Malaysia, but not in the states on Peninsular Malaysia, including Terengganu, the famous nesting site of the great leatherback turtles. Although most Malaysians are aware of the plight of these turtles, many still buy and eat their eggs.



F Kuek

An active volunteer with the Sea Turtle Research Unit (SEATRU) at my university since 2007, I've witnessed first-hand how moulding young minds can positively affect conservation. In 2009, I helped organize and conduct a Turtle Camp for 11-year-olds on Redang Island, Terengganu.

The students there live near the breeding and nesting sites of the leatherbacks, and in the villages they come from, people sell and eat the eggs. Guided by volunteers and students from my university's Marine Biology and Marine Science programmes, the children were taught simple turtle biology and given the opportunity to watch turtles landing and nesting on Chagar Hutang beach. They also helped the volunteers in beach clean-ups, patrols, nest excavations and the release of hatchlings.

The children learned that sea turtles need protection, and many shared this information with their family and friends. Most also pledged not to eat turtle eggs any more. Meanwhile, those of us working with the kids learned how to share our knowledge, and gained the confidence to teach others.

Janeicie Kantún, Julio Martínez and Francisco Chuc, HUNAB, Mexico

The coastal area of the Yucatán houses one of Mexico's most important wetlands, but pollution is endangering native biodiversity.

Our towns depend on the natural resources of the area, but the limited availability of freshwater and soil for crops means food is more expensive than in the city. Our fishermen say it's more difficult to fish these days, and the economic situation means some of our brothers have had to leave school or move away from the area.

In 2005, members of our children's environmental group, HUNAB (which stands for humans and nature living in harmony), started learning about the Mayan apple snail, a forgotten species, as a way of supplementing our livelihoods. The fast-growing apple snail (*Pomacea flagellata*), native to the southeast regions of Mexico, once served as food to the Mayans who lived in Yucatán.

We rescued native biodiversity from the endangered wetlands, collecting fish, snails and aquatic plants, and set

María Fernanda Burneo, Ecuador

The Yasuní National Park in Ecuador is one of the most diverse places on Earth, and its unique location between the Andes, the Amazon and the Equator makes it one of the places least likely to be affected by climate change, so it's an important species corridor and refuge.

In 2007, Ecuador's president, Rafael Correa, proposed a carbon-credit initiative to use industrialized countries' carbon offsets to pay for protecting the Park from oil extraction, saving on carbon emissions from deforestation and the burning of oil. However, the initiative stalled early in 2009 and, in frustration, President Correa threatened to cancel the project and extract the oil, potentially seriously damaging the Park.

In response I set up a Facebook group, A DEFENDER EL YASUNI, to unite young people against this threat and encourage citizens to defend what is the property of all Ecuadorians. The group has grown to include more than 10,000 young people from all over the world. We've demonstrated twice against the possible exploitation of the Park, and plan to continue. We've created work groups to put pressure on our Government, and are circulating a petition encouraging President Correa to respect the constitution, which does not allow the exploitation of oil within protected areas: we're hoping for at least a million signatures.

www.facebook.com/group.php?v=wall&ref=search&gid=430147410600



MF Burneo

up aquaponic ponds for them to live in: artificial wetlands where the animals eat the plants, which are nourished, in turn, by the animal wastes. Each child looks after a pond at home, cultivating snails, fish and plants, which can be sold for food and pets. Using only 900 litres of water, each pond produces about 5,000 snails, 1,000 fish and 500 plants each year. The production process allows us to recycle water, which can also be drunk by animals.

The project has allowed us to earn extra money for our families. The next step is to teach other children how to do this, as well as to improve the environment by cleaning up local waterways and repopulating them with the native plants and animals we have cultivated.



HUNAB

María Belén San Martín, Peru

In Peru's rural areas, malaria is one of the commonest causes of death. The mosquitoes that transmit malaria are usually found in warm and humid areas – particularly in rice, corn, cotton, sugarcane and banana fields – divided by natural boundaries like woods, rivers, and mountains. But deforestation of the Amazon is increasing mosquito breeding grounds: when trees are felled, the temperature and water availability increase at ground level, allowing the mosquitoes to colonize new areas.



M Belén

However, Peru has a very rich tradition of using medicinal and aromatic plants. This includes knowledge of plants that work as a natural repellent to malaria by preventing contact between mosquitoes and people, or as insecticides. The best known of these aromatic plants are Peruvian pepper (*Schinus molle*), basil, rosemary, garlic, oregano and mint.

As a biology student at the Universidad Peruana Cayetano Heredia in Lima, I am identifying and measuring the repellent effects of these plants. My idea is to grow them between or around fields, creating living walls, apply plant-derived insecticides and repellents in fields and houses, and grow the plants in windowsill pots – a great solution for city dwellers as the herbs can also be used in cooking.

I hope that this will both fight malaria without the need for chemical insecticides and promote the preservation of biodiversity.

Maia Tanner, United Kingdom

In a few days, I'm leaving for Madagascar, one of the most spectacular biodiversity hotspots in the world. I will be one of six WWF youth volunteers from all over the world, working on a three-month project to conserve the forest in the dry southwest of the island. I can't wait! Not only is Madagascar top of the charts for endemic species, but I'll be immersed in its culture, dust, spiny forest, and the Malagasy language. I only know a little about Madagascar, but I do know that of all the species that live on Madagascar, 80 per cent are endemic to this island, and often to one particular climatic region within it.

I'm not entirely certain what's involved in dry, dusty 'spiny forest' ecosystem restoration. We'll plant trees, but more importantly we'll be doing it alongside local people, passing on skills and motivation to change slash-and-burn farming practices and reduce deforestation rates. We'll also do forest surveying and work with children and youth to help them understand why preserving their forest is so important, for them and for the world. I hope I can help the people – and species – I meet in some small way.

Tribute Mboweni, South Africa

Dassen Island, where I work as a field ranger, is an important breeding ground for African penguins (*Spheniscus demersus*) – the only penguin species that breeds in Africa.

Part of my job entails gathering data about the behaviour of the birds. I catch the penguins and attach tracking devices to them so that we can monitor nesting patterns, swimming depths and how far out to sea they go, amongst other things. This tells us on what kind of fish they are feeding and the information is used to amend regulations for fishery quotas.

Every five days, I do a breeding study, collecting information to monitor the breeding success of 200 nests, analysing them for abandonment rates, the health of the chicks and their development.

I often measure chicks' heads, flippers, and weight to monitor growth. And if I find an abandoned chick that's not doing well, we take it off the island to be nursed back to health.

Despite these efforts, the African penguin is, sadly, still threatened. Currently listed as 'vulnerable', it has experienced a steep decline in the last decade, and its threat status may soon be changed to 'endangered' because of the fall in populations of anchovies and sardines, the penguins' main food source, which is blamed on trawling and climate change.



T Mboweni

Robert Nelson, USA/Haiti

Since 2007, my Florida-based youth environment group Pier2Pier has been developing Haiti's first marine conservation and education facility in Petite Rivière de Nippes, a fishing village about 100 kilometres west of Port-au-Prince.

Just prior to the earthquake that hit Haiti on 12 January, 2010, Pier2Pier was working with the Haitian Government to explore ecotourism in the country, specifically whale and dolphin watching.

We had already confirmed more than one species of whale in the waters off Petite Rivière de Nippes, and we plan to visit the area again, joined by top marine mammal experts, to assess the populations of the species in Haitian waters. At the same time, we are developing a marine science curriculum, to be published in English, French and Creole, to help local young people learn about local marine life.

The project – the Haiti Ocean Project for the Environment (HOPE) – is supported by the Whale and Dolphin Conservation Society and the Haitian Government. We believe it's important for the people of Haiti to learn about these marine mammals in their natural environment, both to protect biodiversity and to provide a sustainable source of income.

In the aftermath of the earthquake, we are more committed than ever to helping Haitians protect their marine environment.



R Nelson

Last chance to think



Two decades ago MARK CARWARDINE spent a year travelling around the globe with best-selling author Douglas Adams, in search of endangered wildlife for a series of radio programmes imaginatively called *Last Chance to See*. In 2008-2009, exactly 20 years later, he retraced his footsteps with the comic and actor Stephen Fry, and found the title had proved all too prophetic: a quarter of the species they had featured had since become extinct. A zoologist himself, the outspoken conservationist talked to TUNZA about the biodiversity crisis.

It all began in 1985 when Britain's *Observer* newspaper sent Mark and Douglas, author of *The Hitch Hiker's Guide to the Galaxy*, to Madagascar in search of the aye-aye, a bizarre and endangered nocturnal lemur. This trip inspired them to spend a year seeking out weird, wonderful but endangered animals. The idea was to 'provoke a reaction'; to get conservation across to people who would never usually show an interest in the environment.

The radio series and book that emerged were witty, frank and at times hilarious, but above all a disturbing eye-opener to the plight of the world. When asked whether Mark thought their goal had been achieved, he recalled promotional book tours with Douglas, when queues were filled with 'leather-jacketed biker-type people', many of whom 'had never dreamt of reading a book about wildlife'.

When Mark teamed up with the walking library Stephen Fry to revisit many of the original places and animals, Mark frequently saw things that shocked him. 'When Douglas and I flew down

the coast of Madagascar, all you saw was thick rainforest from the sea to the mountain tops. When Stephen and I went, almost all of that was gone and there were just tiny pockets of rainforest left. It was all being destroyed for farmland, and often that farmland had turned to desert.' The uncomfortable truth was that 'despite the hundreds of millions of dollars spent and the efforts of thousands of people, a huge amount has been lost'.

Heroes of conservation

Mark was keen to point out, however, that 'without all this effort we would be a lot worse off'. The greatest cause for optimism, he thinks, is 'amazing, dedicated individuals'. In almost every place they visited, the same people were there 20 years on, 'putting themselves on the front-line between these endangered animals and extinction'. One such is Don Merton, without whom two of New Zealand's birds – the kakapo and the Chatham Island black robin – would no longer exist.

Mark himself has been 'arrested, shot at and beaten up' more times

than he can remember in the name of conservation. Even writing a column for BBC *Wildlife* magazine has resulted in death threats. But he won't compare himself – perhaps a little modestly – with those people devoting, and in many cases risking, their lives to protect an area or species.

One individual who has been doing a huge amount for conservation as a result of the *Last Chance to See* series is Sirocco the kakapo, a flightless, nocturnal species of parrot from New Zealand. Sirocco clearly fell for Mark's charm during filming, and a video on youtube of the bird trying to mate with Mark's head helped to catapult Sirocco to fame (<http://www.youtube.com/watch?v=9T1vFsHYiKY>). The bird now has 5,000 friends on Facebook, his own website with an introduction by the Prime Minister of New Zealand, and is the official 'spokesbird' for New Zealand. Mark himself clearly has a soft spot for Sirocco: 'When Sirocco saw the volunteers and rangers swimming he rushed down the jetty, leapt in and swam with them – he's a real character.'



Above: Douglas Adams meets a kakapo. Left: Twenty years later, Mark and Stephen meet another.

encourage people to think about why the label 'eco' matters so much.

He goes on: 'Politicians often want to make conservation seem painless – it's not. They love to focus on recycling, for example – which makes every-one feel good about themselves – rather than tackling the supermarket giants and the fundamental issue of over-packaging.'

Doing what you can

A talented photographer himself, Mark has been the chairman of the Wildlife Photographer of the Year competition since 2005. When asked what it was about wildlife photography that he loved, Mark's answer was: 'I'm terrible at painting and drawing but I've always loved photography. Any good picture can be very evocative – you can inspire a person with a photograph.'

So what can we do? How does a young wildlife lover get involved? 'Volunteering,' says Mark. 'Most conservation groups couldn't survive without dedicated volunteers and in return you get experience, the opportunity to demonstrate your passion and meet like-minded people. Many people I know who are now running conservation groups started that way.'

To learn more about Mark and these issues, his website www.markcarwardine.com is a great place to start.

We must empathize

The love the world has for Sirocco highlights a trait of the human personality – the need to connect and empathize – which has a profound effect on the ever-lasting battle to find resources for conservation. Of course it is not only the cute animals that need protecting, but such flagship species are 'the only realistic way of generating significant interest', explains Mark. 'In reality, if you say there is a rare mushroom in India and it needs your help, nobody's going to do anything.'

The empathy effect is even more profound when dealing with an individual animal. 'Imagine,' explains Mark, 'that there's a tiger in an awful zoo somewhere that's not being looked after. If you campaigned, say through a newspaper, you could raise the money to rescue that tiger and bring it to a sanctuary overnight. But if you campaigned in that same paper for tigers in the wild, you wouldn't raise nearly as much.'

People enjoy a story with a beginning, middle and end: find the tiger, raise the money, save the tiger. But we need to accept that there is no end to conservation. 'You can't say, "right, we've saved this species or that area", and move on to something else. As soon as you go the problems start again.'

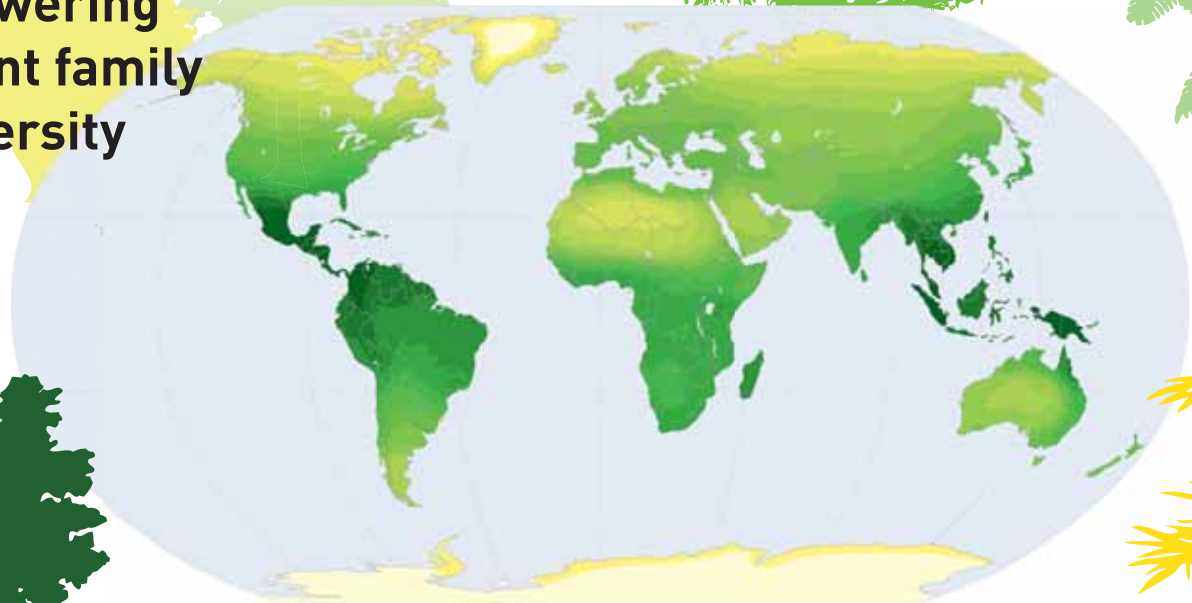
Another obstacle is that 'conservation is almost always reactive rather than proactive'. One of Mark's interests is the African lion. 'Its population is plummeting faster than the Indian tiger. Sixty years ago there were half a million and now there are 20,000, but nobody's really waking up to it. When it gets to 5,000 there'll be panic, publicity and a lot of effort, but by then it'll be much harder to do anything. That's something that needs to change.'

Over the past few decades environmental issues have become more mainstream, with many people genuinely interested in living an environmentally friendly life. Surely this can only be a positive thing? But, as Mark explained, with every movement that gains popularity, there are publicity stunts and empty promises from people who simply want to take advantage of the opportunity to make a profit.

'Take ecotourism. If it is managed well to limit disturbance and is educational, it can be a very positive thing. It brings jobs and provides people with an incentive to protect their wildlife.' However, if done inefficiently or with the wrong intentions 'it can be disastrous'. Pristine places, and the wildlife to which they are home, are at risk of being 'loved to death by well-meaning ecotourists'. This is one of the reasons why it is so important to

where the W I

Flowering plant family diversity



High diversity

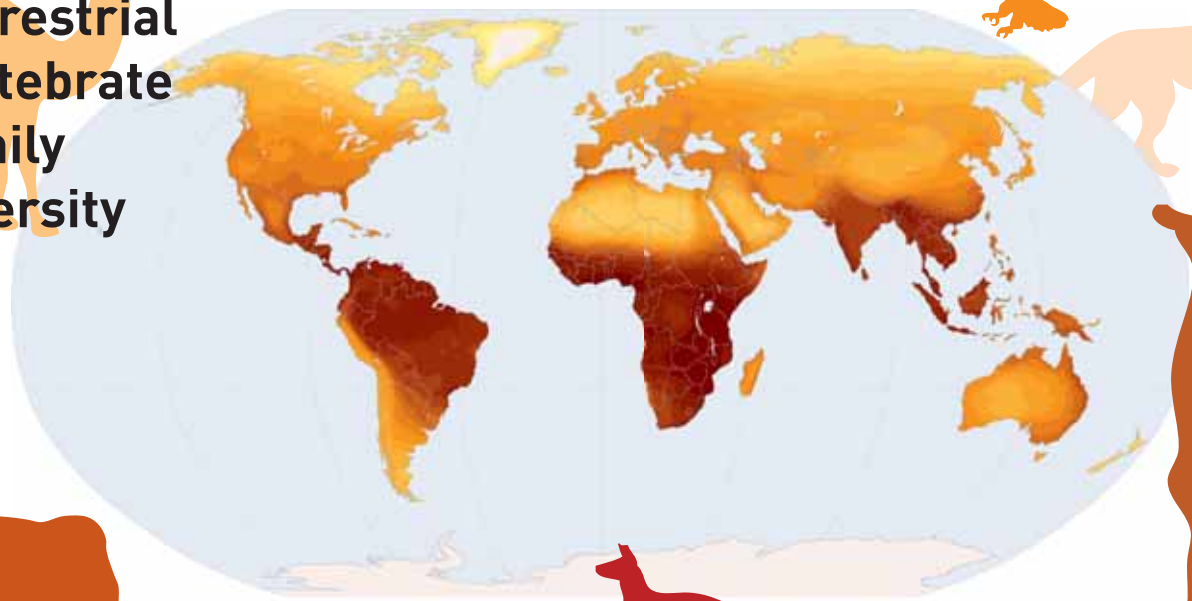
Low diversity

The maps above and below show the relative distribution of flowering plants and vertebrate animal families. While both show that species richness increases as latitude decreases towards the equator, Africa appears to be very rich in vertebrate families, particularly in the moist forest areas of the Gulf of Guinea and in the east, including in the less moist woodlands and savannahs. Flowering plants abound at the same latitudes, but of the around 90,000 families found in these regions, some 40,000 are found in Asia.

In general terms, in terrestrial environments:

- warmer environments hold more species than colder ones;
- wetter areas hold more species than dryer ones;
- areas with varied topography and climate hold more species than uniform ones;
- less seasonal areas hold more species than highly seasonal ones;
- areas at lower elevation hold more species than areas at higher elevation.

Terrestrial vertebrate family diversity

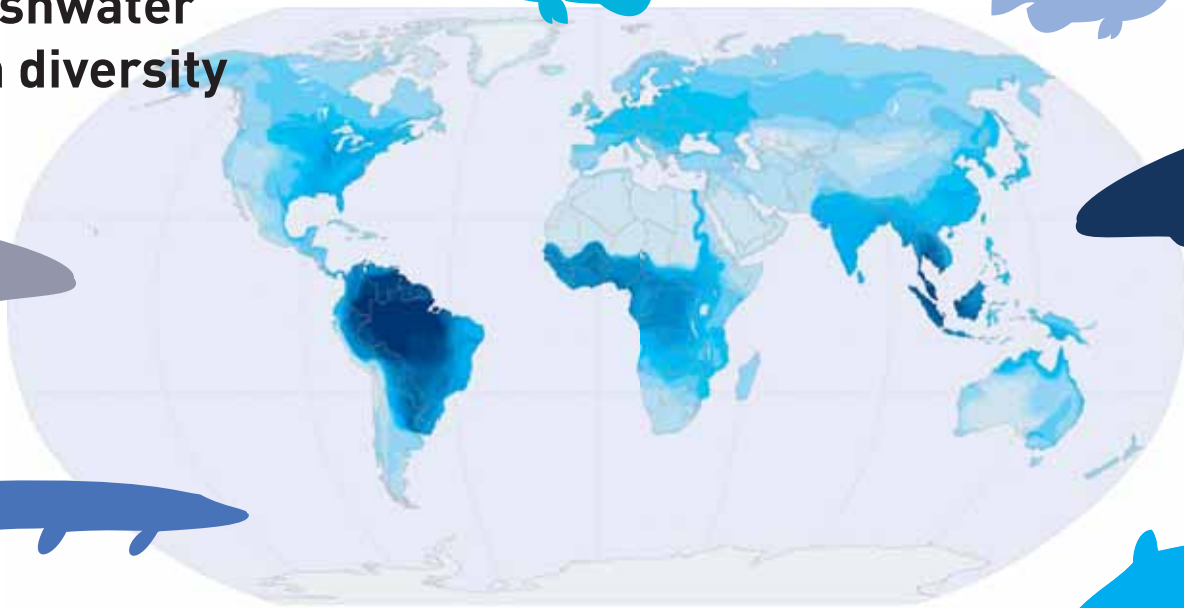


High diversity

Low diversity

LD things are

Freshwater fish diversity



High diversity

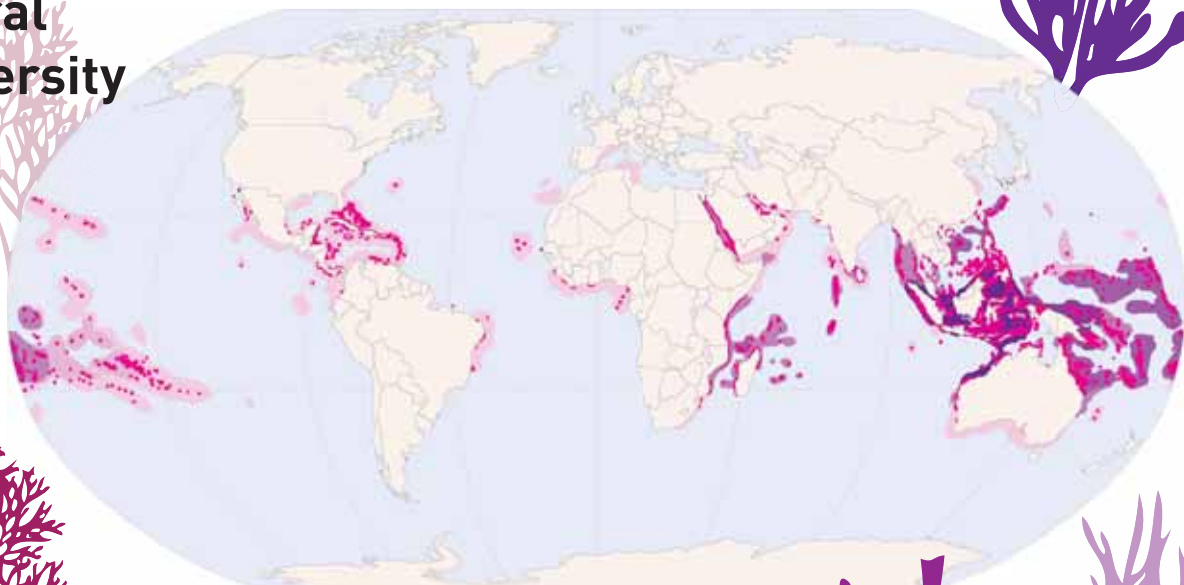
Low diversity

Inland waters make up a tiny proportion of the world's water resources, less than a hundredth of 1 per cent, yet are home to fully 40 per cent of known fish species: almost exactly 10,000 species of fishes are confined to freshwater, while a further 1,100 or so occur in freshwater but are not confined to it.

Shallow tropical coral reefs are amongst the most productive and diverse of all natural ecosystems. They are estimated to cover less than 1 per cent of the world's ocean shelves, covering an area of up to 300,000 km² around the coasts of 110 countries and territories. But just five countries (Indonesia, Australia, Philippines, Papua New Guinea and France's overseas territories) are home to more than half of them. But while warm tropical waters are the most diverse in terms of species, the colder waters of the higher latitudes are the most productive in terms of biomass, teeming with plankton, including krill, on which many other marine organisms depend.

Source: UNEP-WCMC World Atlas of Biodiversity/California University Press

Coral diversity



High diversity

Low diversity

Corals

The **E**conomics of **E**cosystems and **B**iodiversity

Just because we haven't put a value on biodiversity up to now doesn't mean it's valueless. Far from it. But biodiversity and the ecosystem services it supports used to be viewed as part of the 'global commons', something that was always there and freely available to everyone. Only it wasn't. The ever greater demands that we, people, have put on the natural world have led to the beginnings of an understanding of quite what we have been doing – bringing about, some say, the sixth great extinction of species. But does it matter? The Economics of Ecosystems and Biodiversity (TEEB) study, an initiative of the German Government and the European Commission now led by UNEP, was charged in 2007 by the world's richest nations, the G8+5, to find out what the loss of ecosystems and biodiversity was costing the world, and what the price of inaction might be. TUNZA talked to **Christoph Schröter-Schlaack** of the TEEB scientific coordination team at UFZ Helmholtz Centre for Environmental Research in Leipzig about the idea of putting a value on biodiversity.

Q: What's the difference between determining an economic value for biodiversity and ecosystems and simply working to conserve them?

A: Actually, everybody working for the environment thinks of nature as a valuable asset; an asset worth protecting. By systematically assessing the economic value of ecosystem services TEEB is just formalizing this. We are trying to provide a more comprehensive picture of the many benefits that biodiversity and healthy ecosystems provide to us all and that underpin our well-being. For example, work is taking place around the world to conserve coral reefs, one of the world's most diverse ecosystems. Reefs are valuable in many ways, not only for tourists. They are also an essential nursery for fish and of immense importance for coastal protection. And they support the livelihoods of around half a billion people.

Through systematic analysis like this, TEEB is removing the economic invisibility of many environmental benefits and the cost of 'business as usual', or should I say 'destruction as usual'. When an economic value is attributed to benefits like these, more people understand the value of what is being lost and what it might cost – if it's even possible – to repair the damage. Providing these economic arguments can help get the message across to people currently not engaged in environmental protection, such as governmental agencies for finance or economic affairs, mayors, traffic planners, businesses and consumers.

Q: Can you give us an example of how costs to the environment are and are not factored into the cost of everyday products?

A: Food prices are a good example. While conventional agriculture can provide large amounts of food for our increasing population, it often has severe effects on natural systems through highly intensive production methods involving the use of fertilizers, pesticides and antibiotics. The use of these agents can lead to a reduction in the local biodiversity, a decline in natural pollinators, an increase in pollution of waterways by fertilizers and so on. These environmental costs are not factored into the end price that

we all, as consumers, pay. Conversely, organic farming is characterized by less-intensive production and a much more careful use of fertilizers, but this often comes with lower yields and/or higher production costs. The additional costs of minimizing the ecological impacts of farming are clearly shown in the higher retail price of organic food.

Q: Many ecosystem services, such as clean air or clean water, or even the absorption of CO₂ by forests and oceans were regarded as 'global commons' freely available to everyone. Why have attitudes to this changed and how will this shift in attitude help, especially the poorest?

A: Sadly, the concept of 'global commons' has come under increasing pressure. In many cases what was there for all is now being taken by the few. 'Global commons' were often treated as infinite and abundant, but excessive demand shows this is not the case, and issues around responsibility for managing the use of these goods and services – and ensuring they remain sustainable – is coming to the fore.

It's a tragic but simple truth: the scarcer previously abundant resources become, the more their importance is felt on the ground. Often the poorest people living in developing countries are hit the hardest by environmental degradation, since, to a much greater extent, their livelihoods depend directly on nature's services. Conversely, poor people can benefit greatly from efforts to preserve biodiversity and ecosystems, thus there is a strong case for coupling development aid and funding for sustainable development.

For example, tropical forests have a vital role to play in fighting climate change. On the one hand, CO₂ emissions from deforestation are responsible for nearly 20 per cent of all anthropogenic CO₂ emissions, and on the other, forests are important carbon sinks. Thus, there will be a growing international interest, especially among developed countries, in protecting and replanting forests to mitigate further CO₂ emissions. This interest and possible investment in tropical forests may open up



Flood control: forest or dam?



Coastal erosion: mangrove or dyke?



Freshwater treatment: wetland or purification plant?



new ways to ensure livelihoods in less developed countries. Trees are far more than carbon sticks: forests offer a wide range of other services, like food, wood, shelter, medicines and water regulation.

Q: Might this valuation lead to a realization that, economically, we can live without tigers or polar bears, but not without certain fungi?

A: A systematic valuation of different ecosystems and their services might indeed lead to the conclusion that some rarely known fungi play a crucial role, for example as a basis for medical treatment or for pest control in agriculture. However, charismatic species like tigers or polar bears carry huge cultural value as they symbolize the condition of the environment that we'll pass on to our children. Hence, although not all the benefits of ecosystems or certain species can be given a monetary value, there is a strong rationale for saving species such as the polar bear because of its value as one of the great charismatic species of the world.

Q: Are ecosystem services limited, for example freshwater? In a world where resources are in ever greater demand, and the number of people is still growing, how does economic valuing do anything other than make resources less accessible for the majority?

A: Economic analysis shows the important role of ecosystem services for human well-being, a link that is currently neither well understood nor appropriately recognized in our everyday decisions. Thus, economic valuing may act as a stimulus for policy making and point to the need to stop the ongoing loss of ecosystems and biodiversity. Setting up rules and procedures for their sustainable use will ensure that ecosystem services will still be available for the generations to come. This implies that those who use ecosystem services or damage the environment, like corporations emitting air pollutants, should pay for it, while those who contribute to the provision of ecosystem services, such as organic farmers or managers of tropical forests, should be duly compensated.

Q: What is the ultimate goal of putting a monetary value on biodiversity and ecosystems? Is it about redefining public values to recognize that nature is the basis of our health, wealth and development; a financial mechanism to force us to take care of scarce resources; a way of alleviating poverty; a way of conserving biodiversity; or all of these?

A: Well, all of these. By demonstrating an economic rationale for preserving ecosystems and biodiversity, we'll contribute to the ongoing redefinition of public opinion on nature and environmental protection. In many instances we can show that it's much better to conserve ecosystems and the services they provide than let them degrade and have to provide those same services using technical solutions. Take freshwater: it can be much cheaper to preserve a watershed than build a water treatment plant. Or coastal protection: it may be much cheaper to preserve or even restore mangroves than build and maintain dykes. Adding this perspective to the well-defined arguments for environmental protection will help to get the message to a wider group in society and facilitate policy making to safeguard our natural capital.

Food choice

For the first time in history, more than a billion people are going hungry. Numbers have recently risen sharply – by 150 million – having held more or less steady between 1990 and just a few years ago. And the increase has happened at a time of good harvests. More than enough food is produced to feed everyone on Earth; it's just that the poor cannot buy what they need in the face of rising demand from the better-off. Increased use of biofuels made from crops for cars and consumption of grain-fed meat by the growing middle classes is expected to make things worse, as are population growth and climate change. Hunger is expected to rise, and so is the amount of land converted to agriculture, with the knock-on effect of reducing biodiversity.

Here, four people tell TUNZA about their approach to eating, keeping in mind the health of life on Earth. They are among the lucky who can choose what to eat.



Foraged feasts

IT BEGAN with childhood curiosity. If my tortoise, Creep, loved dandelion leaves, surely they must taste heavenly! And in my reading I'd often find references to 'country people' eating wild plants. So, good for tortoises, good for country people – good for me!

My interest in wild food grew, along with my interest in nutrition, creative cookery and sustainable living. I've now been a dedicated forager for 11 years, and from continuous research know at least 400 edible plants, 300 fungi and 80 seaweeds, and many processing techniques.

Though I'm a longtime vegetarian, I do occasionally eat foraged meat found as road-kill: wild animals that have been hit by cars but that are in fine condition for food. Foraging can be a physically intensive job, and on top of this I swim, cycle and run. Consequently, weeks eating purely wild plants can lead to exhaustion. Meat is a concentrated source of nutrients, so occasionally consuming a little counteracts any tiredness.

Foraging does have dangers, arising from insufficient knowledge or making wrong assumptions. Once, my girlfriend harvested a basketful of two similar fungi varieties, the edible horse mushroom and the poisonous yellow stainer. You can tell them apart by examining their stems, but she'd not gathered the stems of the poisonous ones, so I assumed all were the same. Vomiting and diarrhoea told a completely different story!

Eating wild is a good way to remember how intimately we are linked to Earth's biodiversity. You realize that all plants have several purposes: they provide food and medicine, and support the life cycles of countless insect species that in turn support the health of other plants and animals further up the food chain, including us. You also come to appreciate plants for their own sake. Foraging can make people intensely sensitive to the web of life right where we live, motivating us to support biodiverse habitats.

But take care. Low-impact foraging means harvesting only a small percentage of plants in a particular area, and never rare or endangered ones. I encourage foragers to germinate a few wild plant seeds from a regularly harvested area, and plant them back out.

Never forget the North American Lakota people's principle: 'Search until you find the plant you want, but do not pick it. Continue your search until you find a batch of the same plant, ensuring that it won't become extinct because of you.'

Fergus Drennan, United Kingdom

To read Fergus's foraging blog, visit www.wildmanwildfood.co.uk.

To try his favourite wild-food recipe, Sea-Buckthorn Sorbet, visit www.ourplanet.com

Varied vegetables

FOR MOST OF MY LIFE I couldn't imagine life without meat, though I believe in non-violence. Meat is an essential part of my culture, and my family has been meat-eating for generations.

Then, I travelled to the United States, where new friends from India opened my eyes to the possibilities of vegetarian cuisine. They taught me to eat lots of vegetables, prepared in different ways, surprising me with the variety of tasty recipes. They used a wide array of vegetables, many new to me.

But I didn't become a vegetarian until I developed digestive problems. My doctor suggested I give up meat for two months. I stopped eating red meat, and it was a big relief. In the meantime, vegetarian friends taught me how to have a good and complete diet. I also began learning about sustainable consumption and the environmental consequences of large-scale animal agriculture.

Today, I'm on the path to becoming a full vegetarian. It's not easy: it takes time to change habits. The most important tool is knowledge, especially of nutrition and of where food comes from. My health and that of Earth are great reasons to start.

Carla Basantes, Ecuador



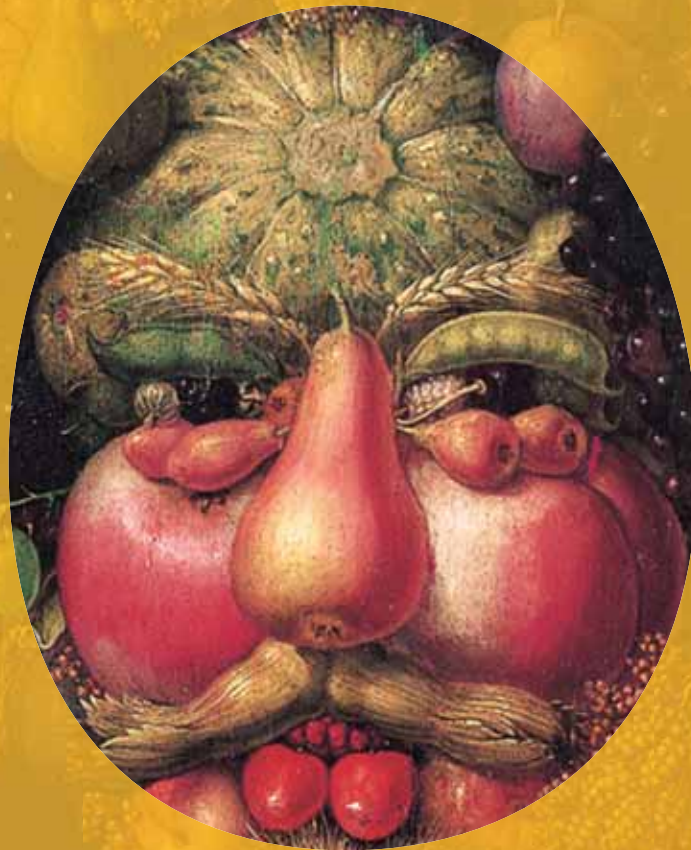
Fergus Drennan



Abhiram Gopi



Shauna Swartz



Sacred stance

IN INDIA, it is not just the beliefs of an individual, but also cultural and religious factors that decide food habits. I have been a vegetarian all my life and intend to remain so. It was my caste that decided this: it is considered a sin to eat meat. But my own belief, that killing animals is not right, has kept me on the path.

India's rich biodiversity is second to none. But most people here have hardly seen or experienced the natural splendour of their own country so, as a result of lack of awareness, have no sense of urgency to try to save vanishing resources.

The key lies in making children aware of India's natural riches, the beauty of the diversity of life. If we teach them that animals have as many rights on this planet as we do, they might come to see that taking a life of another animal for one's own recreation is a heinous crime. Until such a change happens, part of India will continue to use animals for food.

Abhiram Kramadhathi Gopi, India

Meat move

MY FAMILY adhered strictly to Jewish dietary laws, so as a child I had no illusions about where meat came from. Our butcher cut it from a skinned animal hanging from a hook – I could still make out the faint shape of a lamb. I stopped eating meat as a teenager, and for 21 years adhered to vegetarianism as a choice that is good for the environment.

But, to my shock, I have recently become an omnivore. It started with the realization that much of the vegetarian food I ate, particularly soy-based, was highly questionable. Soy is so hard to digest that it must be processed, often with petroleum, in order to make it nutritionally available. Most vegetarian meat substitutes are laden with additives. Even organic soy can be a hormone disruptor, and breast cancer is rampant in my family.

Around the same time, a girlfriend persuaded me to try fish oil pills to alleviate the depression I'd suffered for years, as Omega-3 fatty acids from fish are superior to those from vegetable sources. My mood improved, and I came off my antidepressants. I prefer getting nutrition from food rather than supplements, so I also began eating fish. I was no longer a vegetarian, and I was no longer depressed. Two life-changing experiences.

Meanwhile, I developed a deeper interest in sustainable agriculture. I began volunteering for a nonprofit market stall in Philadelphia that sells food produced by more than 80 small local farmers, and eliminated processed, non-local and unsustainably raised foods from my vegetarian diet. On visits to farms, I saw, firsthand, how they raised animals for food humanely, respecting the animals, environment, workers and, ultimately, eaters. Animals roamed and grazed on green pasture in an environment buzzing with life.

Over time, I became comfortable with the idea of meat as food. I handled and packaged it at the stall and even cooked it for my girlfriend. When I finally ate it, I found it tasted good and made me feel good.

Plant life is still the main component of my diet, but I feel my ideals have evolved and strengthened. Eating a diet that relies on more forms of life, sustainably produced, can have more of an impact against over-industrialized agriculture than simply opting out of eating animal products altogether. Yes, it costs more money and effort, but ultimately makes me feel better, and is better for the planet too.

Shauna Swartz, United States of America

Q & A

TUNZA

answers your questions

Q Surely species have always gone extinct? Why should we be worried about that happening now?

A Yes, of course, extinctions have always taken place: indeed, only about 3 per cent of all the species that have ever lived still survive. But normally this a slow process. What is happening now is that species are going extinct at 1,000-10,000 times the natural rate. If this continues, half of all species will disappear in less than 100 years, causing the greatest mass extinction since the dinosaurs died out 65 million years ago. On past performance, life on Earth would take millions of years to recover.

Q Is it climate change or other human activities that are more damaging to biodiversity?

A So far, human activities like habitat destruction, mismanagement of natural resources, pollution, and the introduction of invasive species have had the worse effect. But as global warming accelerates, climate change will predominate. Experts warn that approximately 20-30 per cent of plant and animal species are likely to be at increased risk if global average temperatures rise by 1.5-2.5°C, increasing to 40-70 per cent at 3.5°C.

Q What parts of the planet are most affected by biodiversity loss? Any particular countries?

A It is relatively difficult to say which countries are at particular risk of losing biodiversity, beyond saying that the greater the rate of change, the more diverse the area, and the poorer the current state of the environment, the greater the likelihood of a significant loss of biodiversity. Experts

have, however, drawn up a list of some 25 'biodiversity hotspots' which contain especially rich wildlife and are also particularly at risk. Many cover several countries, but most are in the developing regions of the world.

Q Are plants more at risk from the effects of climate change than animals?

A That depends from species to species. Generally speaking, animals are less vulnerable because they can move more easily. But some animals are confined by small niches, while those plants that can spread their seeds over a large area are more likely to survive.

Q Plants and animals have adapted to changes in their habitats throughout history. Why can't they adapt again to climate change?

A In part this is a question of time. Evolution works over hundreds and thousands of years, yet we are talking about major shifts in global temperatures over just 50-100 years. And it is harder than ever for species to follow a shift in habitats. Our farms, our towns and cities, our roads and railways have fragmented natural areas almost everywhere, and there are few 'corridors' of suitable habitat for the plants and animals to move along.

Q Are there any positive effects of climate change on biodiversity?

A Climate change could benefit some plant and animal species by increasing their ranges. By and large, however, pest species – which are usually very opportunistic – will do best, while rare ones confined to particular areas will do worst. And even those that do well initially may suffer as climate change continues to accelerate. At any rate, we humans won't be able to choose the winners and losers.

The world's major faiths agree we must rediscover a 'right relationship' with nature.

When we respect the environment, then nature will be good to us. When our hearts are good, then the sky will be good to us. Maha Ghosananda, Cambodian monk (Buddhism)

When God created Adam, he showed him the Garden of Eden and said: 'See my works, how lovely they are, how fine they are. All I have created, I created for you. Take care not to corrupt and destroy my universe.' Ecclesiastes, Rabbah 7 (Judaism)

FAITH IN NATURE

I have Three Treasures, which I hold fast and watch over closely: the first is kindness, the second is simple living and the third is not to presume oneself to be the chief of the whole world. Sage Laozi (Daoism)

There is no life that is inferior. All lives enjoy the same importance in the universe and all play their fixed roles. They are to function together and no link in the chain is to be lost. Faith Statement, 2003 (Hinduism)

The world is sweet and verdant green, and Allah appoints you to be His regents in it, and will see how you acquit yourselves. Sunnah of the Prophet (Islam)

We affirm that the world, as God's handiwork, has its own inherent integrity; that land, waters, air, forests, mountains and all creatures, including humanity, are 'good' in God's sight. World Council of Churches, 1990 (Christianity)

Closer to home

More than 60 breeds of cattle, goats, pigs, horses and poultry became extinct in just the first six years of the 21st century, and a fifth of the world's known livestock breeds are teetering on the brink. TUNZA talked to Irene Hoffmann of the FAO's Animal Genetic Resources Branch about what is happening and why it matters.

People started domesticating animals some 10,000 years ago, to provide food, clothing, transport, fertilizer and fuel, help them farm, herd, hunt and haul. They still do all this, and more, but things are changing. Each domesticated species did many things: cattle, for example, provided milk, meat, leather, fat for candles and lamps, and dung for fertilizer, and could also be harnessed. Now, intensive farming focuses on producing single products – say, just milk, eggs or meat – from a small set of highly specialized breeds.

Just 11 species – pigs, cattle, goats, sheep, buffalos, rabbits, chickens, turkeys, ducks, geese and guinea fowl – now provide more than 90 per cent of the world's food



Anita Eberl/PNUe

from animals. Of course, we also still rely on many more species – including asses, camels, horses, deer, guinea pigs, ostriches, and partridges – but these aren't as important for food on a global scale.

Highly productive breeds of the main species have displaced traditional ones in developed countries, and the same is now happening in developing regions undergoing rapid economic growth. Typically subject to intense genetic selection, these breeds need tightly regulated conditions, feedstocks and drugs to thrive. Small-scale farmers of traditional, local, hardy animals, finding it difficult to compete, may try these imported breeds, or cross them with their own ones. While this has been successful in increasing food production in some areas, it has also led to the decline in local breeds. In other cases, keepers have become poorer because the exotic animals are expensive to maintain and don't cope well in difficult conditions.

Hundreds of millions of the world's poorest rely on livestock to survive, and with so many hungry people it is especially important not to lose our options. The animals convert forage and crop waste, inedible to humans, into nutritionally valuable products. This is important, as about 40 per cent of the total land available in developing countries can only produce forage, and around 12 per cent of the world's human population, mostly pastoralists, depend almost entirely on livestock for their livelihoods. In addition, a diverse diet has significant advantages in addressing malnutrition: animal protein intake improves growth and cognitive development, and is particularly important for food-insecure children and mothers.

Well-managed livestock helps sustain wild biodiversity, shaping landscapes and creating mini-habitats, connecting ecosystems by transporting seeds, improving the ability of grassland to hold water by trampling and aerating the soil, fertilizing with manure, and removing excess vegetation, which reduces the risk of fire. And in well-managed grasslands, grazing animals can even help to sequester carbon in the soil.

But as breeds become extinct, the solutions they provide are lost forever. As our climate changes and our animals are exposed to shifting temperatures,



Katsuyuki Sugimoto/UNEP

droughts, diseases and parasites, or feed shortages, traditional breeds may carry traits that make them vital to our food security.



www.providencefarm-ohio.com



www.providencefarm-ohio.com

We can try to protect livestock biodiversity by keeping animals in government farms, research stations or zoos, or by freezing genetic material. But it's best to keep as many breeds as possible in use. In Europe, for example, declining breeds have recovered through the marketing of specialty products and schemes that pay farmers to keep them. The challenge now is to do this in developing countries, where small-scale farmers and pastoralists keep much of the world's livestock genetic diversity.

People involved in livestock keeping should stay well informed about genetic diversity and the characteristics of different breeds. Rare breed societies dedicated to conserving livestock diversity are open to young members. And everyone has power as a consumer. Asking about the breed, origin and environmental impact of animal products can promote diversity.

Measured questions

Everyone knows that the world's biodiversity is declining precipitously, and that this must be halted. But which species and ecosystems are under the most pressure? And on what basis could the world's leaders agree to take action?

Answers lie in indicators, says Damon Stanwell-Smith of the UNEP World Conservation Monitoring Centre. He is Project Coordinator for the 2010 Biodiversity Indicators Partnership (BIP 2010), which provides information on trends in support of the Convention on Biological Diversity (CBD), the international treaty on the issue.

He describes the indicators as 'intuitively understandable graphics drawn from available data to extrapolate useful information about the state of the environment'.

So if an indicator monitoring migrating birds shows a continuing decline in the numbers visiting a particular wetland, it may reveal an underlying problem – such as pollution or a fall in the fish that feed the birds – and make possible informed action to protect and restore the habitat.

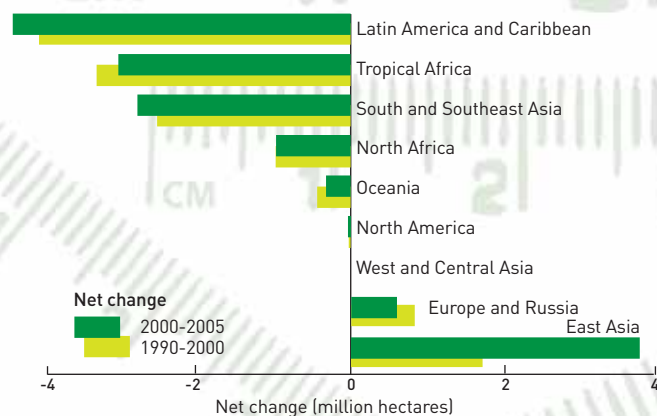
But why are specific indicators necessary? Why not just monitor everything: wetlands, birds, insects, fish, industry and so on? That is simply too great a task even for the species we know, and scientists think these make up only about 10 per cent of the Earth's biodiversity.

'Gathering data is time-consuming and very expensive, and sometimes just impossible,' says Stanwell-Smith. 'For example, we've barely even begun to come to terms with what is in the world's oceans.'

'Luckily, almost every species lives within complex ecosystem networks, so specific indicators are a reliable and efficient way to get information about the general state of ecosystems.'

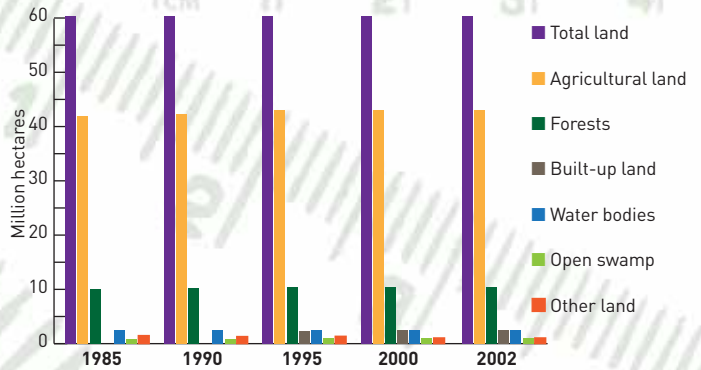
More than 190 governments are party to the CBD, which in 2002 set a target of achieving a significant reduction in the rate of biodiversity loss by 2010. In the interim, a set of 17 BIP 2010 headline indicators has been developed for assessing biodiversity and measuring progress.

Change in forest area by region



Source: UNEP-WCMC

Dynamics and distribution of land resources in Ukraine



Source: UNEP-WCMC

Some of the indicators are assessed in more than one way, making a total of 28 different measurements. They include tracking how sustainably wild species are exploited; how much of the Earth's surface is covered by protected areas; the extent of different habitats; river fragmentation; the biodiversity we use for food and medicine; trends in the spread of invasive alien species; and even the status of the world's indigenous languages, which are important because they hold deep and complex ancient knowledge of the natural world.

'Only a tiny proportion of species provide the data we need to track the status of threatened species, even though the threat of extinction is the best-known issue. We have the most complete data about birds because people are interested in them, so it is more straightforward to get volunteers to count them,' says Stanwell-Smith. 'We also like tigers because they are powerful and fascinating. But it's harder to get people interested in the monitoring of worms or fungi.'

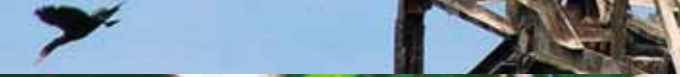
'Focusing on "charismatic" groups like birds, large cats and bears increases public awareness of the natural world,' he adds, 'but the danger is that we may spend a disproportionate amount of resources on these flagship species at the expense of less popular species like insects, marine invertebrates and microorganisms, which are critical to human survival.' Getting that story across to the public in a compelling way is one of the BIP's main goals.

Stanwell-Smith acknowledges that most of the 2010 BIP indicators point to continuing loss, and that the CBD 2010 target is not being met, but he says he is not at all pessimistic. 'The BIP is just the first step, and it's a big one. Right now it's a global undertaking; our next focus will be to encourage indicator use at the national level, because it is usually the decision makers of individual countries who take the most significant action. And of course we continue learning more about biodiversity, which will make our indicators more robust and help us make ever-more informed decisions.'

For more information about the 2010 Biodiversity Indicators Partnership, visit www.twentyten.net

Fighting back

By Fred Pearce



D Vishnevsky/www.chornobyl.in.ua

www.chornobyl.in.ua

www.chornobyl.in.ua

S Gaschak/www.chornobyl.in.ua

D Vishnevsky/www.chornobyl.in.ua

What happens to wildlife after a nuclear disaster? Does the landscape fill with two-headed mutants? Or does everything die from the radiation sickness? Well, in Chernobyl, where the world's worst nuclear accident happened 24 years ago, the answer looks very different.

Wildlife is having a field day. When humans evacuated the exclusion zone for 30 kilometres round the stricken nuclear reactor, nature moved in. Today, wolves prowl the empty streets of the ghost town of Pripjat, just down the road from the reactor. Trees grow tall in the radioactive soil. Bats roost in the rafters and roe deer run through the woodlands and abandoned farms all around.

When one of the nuclear reactors at the Chernobyl plant in northern Ukraine caught fire in April 1986, huge amounts of radioactive material escaped. Some of it spread across Europe and fell in the rain. As a result, some sheep raised on Welsh hillsides 2,000 kilometres away are still unsafe to eat. But most of the radiation fell locally, in Ukraine and across the border in Belarus.

In the months after the accident many animals died terrible deaths because of the radiation. Plants suffered too. One forest turned orange. But since then, radiation levels have fallen, and wildlife has taken advantage of the absence of humans to recolonize in a big way.

With towns emptied and the countryside stripped of farmers, hunters, loggers and all traffic, nature has the run of the place, and wildlife is taking full advantage.

Many species unknown around Chernobyl before the disaster moved in, says Sergey Gaschak from the International Radioecology Lab in Kiev, Ukraine. They included lynx, eagle owls and bears. The numbers of many other species are booming, including wolves, badgers, wild boar, deer, foxes, hares and otters. Some birds are even nesting in the burned-out remains of the reactor itself, he says.

It's not all good news, according to Tim Mousseau from the University of South Carolina. The radiation hasn't completely disappeared. He has found fewer birds in radioactive hotspots. The biggest declines seem to be among birds that feed on worms and insects living in the soil, which is still heavily contaminated.

Mousseau says birds around Chernobyl also have more genetic mutations. Most of the mutations are fairly minor, like unexpected white tufts in the plumage of barn swallows. But generally it seems that birds, and probably other species, die younger and breed less.

And some trees are growing in a strange twisted way. Scientists think their hormones are scrambled and they may literally not know which way is up.

Despite official bans on entering the exclusion zone, some humans have crept back to their old homes. But they are running big risks. And even outside the zone, people are warned not to eat animals that might have strayed inside.

But wildlife itself is ignorant of such fears. Whatever harm the radiation is doing to their bodies, plants and animals mostly revel in the sheer absence of humans. Their lives may be short, but they are happy.

You want to know what the world would look like if humans disappeared one day? Go to Chernobyl.

7 species on the climate change HIT LIST

Many forces – including habitat destruction and overfishing – are already driving species to extinction, and for some climate change is likely to prove the final straw. Last December the International Union for Conservation of Nature (IUCN) published a study of the most at risk from global warming; seven of them are described below. Yet, as Simon Stuart, Chair of IUCN's Species Survival Commission, says, 'Ordinary people are not powerless to stop these tragic losses. They can cut down on their own CO₂ emissions and voice their support for strong action by their governments to change the dire climate prognosis we are currently facing.'

Clownfish

Clownfish were made famous by the film *Finding Nemo*, but their real lives are even stranger than fiction. If the sole female in a group dies, for example, the largest male of the group changes sex to allow breeding to continue. They are also able to build immunity to a particular sea anemone's poison, live among the anemone's tentacles and lay their eggs beneath them, so that they are protected from predators. When the eggs hatch, the larvae follow chemical signals in the water to detect a suitable anemone for a new home. But as the oceans grow more acid as they absorb more and more CO₂ from the atmosphere, it is increasingly difficult for the clownfish to detect these signals.



Kike Calvo/Das Fotoarchiv/Still Pictures

Koala



Xopherlance/www.flickr.com

Koalas are fussy eaters: they will only consume the leaves of a few dozen of the more than 600 species of gum trees. Eucalyptus leaves are already poor in nutrients, and increased levels of CO₂ have been shown to reduce protein and increase levels of tannin, a chemical which makes leaf proteins highly indigestible. Eating more, to try to make up for reduced nutritional quality, would cause poorer digestion and a lower uptake of nutrients. Alternatively, koalas may become even more choosy about what gums they will eat and will have to travel further to find them, increasing the risk of being killed by dogs and cars; 4,000 a year already die like this. Increased droughts and forest fires will reduce their food supplies even further.

Leatherback turtle

As the sands in which they lay their eggs warm up, leatherback turtles will become more and more endangered. For, strangely, their temperature determines the gender of the newborn and, as global warming increases, the proportion of females to males will also grow, threatening the stability of their populations. Rising temperatures will also affect their staple food, jellyfish, which are generally found in cool, nutrient-laden, upward-flowing waters. And the more frequent and severe storms brought by global warming will erode and degrade beaches, causing turtle nests to be washed away in the short term, and reducing the number of suitable nesting areas in the long run.



Rusty Bug/www.flickr.com

Emperor penguin



Drjameslee/www.flickr.com

Emperor penguins depend on ice, both to live on as chicks before they fledge and to use as they moult. So they are particularly vulnerable to the rising thermometer. Air temperatures on the west coast of the Antarctic Peninsula, one of their main habitats, have risen by nearly 3°C over the past 50 years. If global temperatures rise by a further 2°C all their colonies north of 70° (almost 40 per cent of the total) would become unviable. Rising temperatures and thinning ice are also likely to lead to more frequent incidences of icebergs colliding with penguin colonies, as happened in 2001. And projected declines in pack ice are likely to reduce populations of the krill they feed on, and that form the base of much of the Antarctic food web.

The quiver tree – so called because San Bushmen hunters use it to make quivers for their arrows – is Namibia’s national plant. Growing in the desert, the tree’s pulpy, water-retentive wood yields drinking water and makes dead trunks suitable for hollowing out to use as natural refrigerators. Their bark can be used for building and their flowers provide nectar to feed a range of insects, birds and even baboons. While animal species can adapt to climate change by moving, plants including trees are much less mobile and rely on animals to disperse their seeds. But these are moving south, and so the northernmost trees are increasingly vulnerable and large numbers have already died.

Quiver tree



Martin Heigan

Arctic fox



Pat Meyer/Flickr

One of the first mammals to colonize Sweden and Finland following the last ice age, and now found as far west as Alaska and as far east as Russia, the arctic fox gives birth to its young in summer in complex underground dens that can host several generations. The number of young born in each litter depends on how much food is available, but many of the fox’s prey animals – including lemmings and voles which rely on the insulation provided by snow to get them through the winter – are suffering as a result of mild temperatures. Climate change is also pushing the arctic fox’s greatest competitor and predator, the red fox, to encroach upon its territory.

The 160 species of antler-shaped staghorn corals make up over 20 per cent of the world’s coral. They depend on algae – which give them their colour – for oxygen and nutrients. But as sea temperatures rise the algae produce too much oxygen, which can poison the corals. So they expel the colourful algae and become ‘bleached’, also losing the algae’s life-giving assistance. If the waters resume their normal temperature within a few weeks, there is hope that the corals will recover, but the damage caused is not totally reversible and the colonies never return to their full state of health. Already a fifth of coral reefs worldwide are damaged beyond repair.

Staghorn coral



Tersia Claasen

THE YEAR OF THE TIGER

By Sarah Bladen

“Tyger! Tyger! burning bright. In the forests of the night.” William Blake’s poem encapsulates the worldwide awe and adulation felt for the biggest of the cat species. But now there are more tigers in zoos in the United States alone than in all the forests of the globe.

A century ago, there were 100,000 tigers in the wild; now there are estimated to be just 3,200. Three of its subspecies – the Bali, Javan and Caspian tigers – are already extinct. A fourth – the Amoy tiger – has not been seen in the wild for a quarter of a century. Tigers have disappeared from 93 per cent of their former territory and most now live in isolated pockets spread across increasingly fragmented forests from India to southeastern China and from the Russian Far East to Sumatra, Indonesia.

Yet the tiger is enshrined and venerated in many cultures and faiths. It is the national animal of India and features in the Chinese zodiac and in Buddhist beliefs. Countless millions of people love and value them, even though few will have seen them in their natural habitat. And there is good reason for such respect.

Apart from anything else, as top predators, healthy tiger populations are vital to maintaining ecological balance, such as by keeping wild ungulates in check and thus conserving the vegetation upon which they feed. And as tigers need a lot of space to survive, conserving them helps protect large areas, and thus many other species.

Yet both their habitat and natural prey continue to disappear, taking a heavy toll. And they are poisoned, shot, trapped and snared – and hunted on a large scale for their body parts, mostly for use in traditional medicine. This is so serious that tigers have been wiped out in several areas set up to protect them.



Anant Vijay Singh/UNEP

If tigers are to survive into the next century, governments throughout the species’ range must show greater resolve and lasting commitment to conserving them and their habitats, and to stop all trade in products from both wild and captive-bred tigers.

2010 is the Chinese Year of the Tiger, providing a critical opportunity to mobilize action at the scale required to stop the loss of tigers and rebuild their numbers. This September a Global Tiger Summit in Vladivostok – co-hosted by Russian Prime Minister Vladimir Putin and World Bank President Robert Zoellick – will lay out an ambitious agenda for reviving populations around the world. It will include doubling wild tiger numbers by 2022, a goal enshrined in the Hua Hin declaration adopted at the first Asia Ministerial Conference on Tiger Conservation in January 2010.

WWF, the global conservation organization, has been working to conserve tigers for over four decades. Its 2010 Double or Nothing campaign aims to support the doubling of wild tiger numbers by raising emergency funds to end poaching, clamp down on the trade, support the summit and ramp up efforts to protect habitat at an unprecedented scale.

Ensuring a future for tigers in the wild is possible. The big cats are prolific breeders: given enough space, prey and protection, they can recover. And they have done so where national governments, supported by non-governmental organizations, have made a consistent and substantial commitment to conservation. Without such urgent and collective action, however, tigers will disappear from our forests, and we will lose not only an iconic symbol of power and strength, but a protector of nature.

To learn more, visit www.panda.org/tigers. Sarah Bladen is Director of Conservation Communications at WWF International.