WWF *for a living planet*®

2010 AND BEYOND

Rising to the biodiversity challenge

ZSL LIVING CONSERVATION

Global Footprint Network

WWF
(also known as World Wildlife Fund in the USA and Canada) is one of the world's largest and most experienced independent conservation organizations, with almost 5 million supporters and a global network active in over 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

ZOOLOGICAL SOCIETY OF LONDON
Founded in 1826, the Zoological Society of London (ZSL) is an international scientific, conservation and educational charity: its key role is the conservation of animals and their habitats. ZSL runs ZSL London Zoo and ZSL Whipsnade Zoo, carries out scientific research in the Institute of Zoology and is actively involved in field conservation in over 30 countries worldwide. www.zsl.org

GLOBAL FOOTPRINT NETWORK
promotes a sustainable economy by advancing the Ecological Footprint, a tool that makes sustainability measurable. Together with its partners, the network coordinates research, develops methodological standards, and provides decision makers with robust resource accounts to help the human economy operate within the Earth's ecological limits.

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Living Planet Index
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PHOTOS

Front cover (left to right): WWF-Canon/Michel Terrettaz; WWF-Canon/Homo ambiens/R. Isotti-A. Cambone; WWF-Canon/Sebastian Rich; WWF/Catherine Holloway; WWF-Canon/Roger Le Guen. Page 7 (left to right, top to bottom): WWF-Canon/Jason Rubens; WWF-Canon/Homo ambiens/R. Isotti-A. Cambone; WWF-Canon/Jo Benn; WWF-Canon/Roger Le Guen; WWF-Canon/Michel Gunther; WWF/Catherine Holloway; WWF-Canon/Homo ambiens/R. Isotti-A. Cambone; WWF-Canon/Vladimir Filonov; WWF-Canon/Michel Terrettaz; WWF/Chinese Academy of Science; WWF-Canon/Hal Whitehead; WWF/James W. Latourette.

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INTRODUCTION

At the start of the millennium the United Nations set a clear, measurable objective for biodiversity conservation. We are now only two years away from reporting on the target agreed by the Parties to the Convention on Biological Diversity (CBD) in 2002: to achieve by 2010 a significant reduction of the current rate of biodiversity loss at global, regional and national levels as a contribution to poverty alleviation and to the benefit of all life on Earth. The EU countries also agreed in 2002 to a more ambitious target – to halt biodiversity loss by 2010.

These targets mean that the public can hold the world's governments collectively responsible for ensuring that global biodiversity is conserved, or at least that the rate of its loss is reduced. Regrettably, in 2008, it does not look as if sufficient effort has been made to stem the loss of biodiversity, and it appears unlikely that the global 2010 target will be achieved. WWF uses two indicators to measure trends in the state of global biodiversity and the human demands on the biosphere. These indicators have also been adopted by the CBD, among a suite of indicators to assess progress towards the global 2010 target.

The first of the two, the Living Planet Index (LPI), developed in partnership with the Zoological Society of London, uses population trends in species from around the world to assess the state of global biodiversity. Over the past two years the coverage of the dataset has been expanded, methodological improvements made and better standards for LPI data implemented. The index tracks nearly 4,000 populations of 241 fish, 83 amphibian, 40 reptile, 811 bird and 302 mammal species. Indices for marine, terrestrial and freshwater species are calculated separately and then averaged to create an aggregated index. Between 1970 and 2005 the LPI declined by 27 per cent overall. Although the decline appears to have flattened out in the last few years, an analysis of switch points shows no significant change in the direction of the index since 1976, meaning that the 2010 target is very unlikely to be met.

The second is the Ecological Footprint, which measures human demands on the biosphere to produce resources and absorb carbon dioxide. Over the past three years, Global Footprint Network and its partner organizations have developed new methods and standards for calculating the Ecological Footprint (www.footprintstandards.org). They have also been working with countries to refine the data and methods used to evaluate national footprints. These collaborations have improved the analysis presented in this report. In 2003, the most recent year for which there are data, humanity's total footprint exceeded the productive capacity of the biosphere by 25 per cent, and its rate of growth showed no sign of diminishing. This means that the fundamental drivers of biodiversity loss – the appropriation of the biosphere for the production of natural resources, and the disposal of associated waste products – are still increasing.

Figure 1: Global Living Planet Index. The average of three indices which measure overall trends in populations of terrestrial, marine and freshwater vertebrate species. The index declined by 27 per cent from 1970 to 2005.

Figure 2: Global Ecological Footprint. A measure of the productive capacity of the biosphere used to provide natural resources and absorb wastes. Humanity's footprint was equivalent to about half of the Earth's biologically productive capacity in 1961, but grew to a level 25 per cent above it in 2003.

Fig. 1: **GLOBAL LIVING PLANET INDEX,** 1970–2005

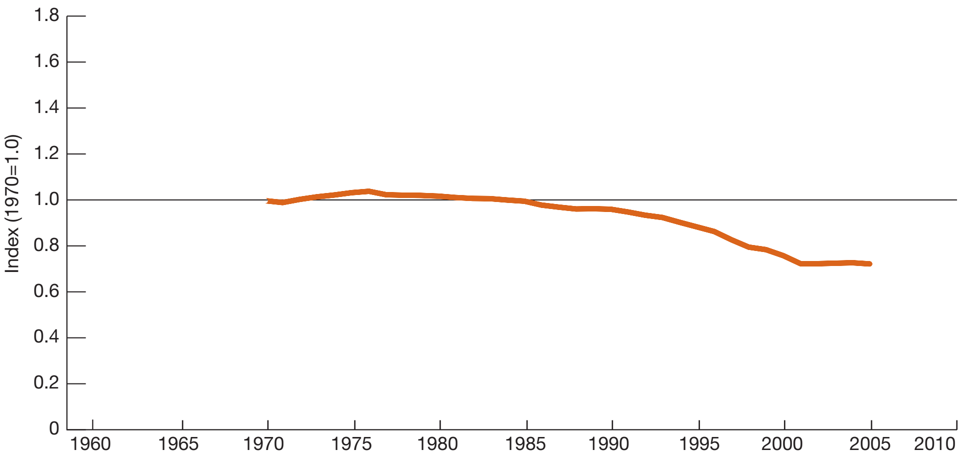
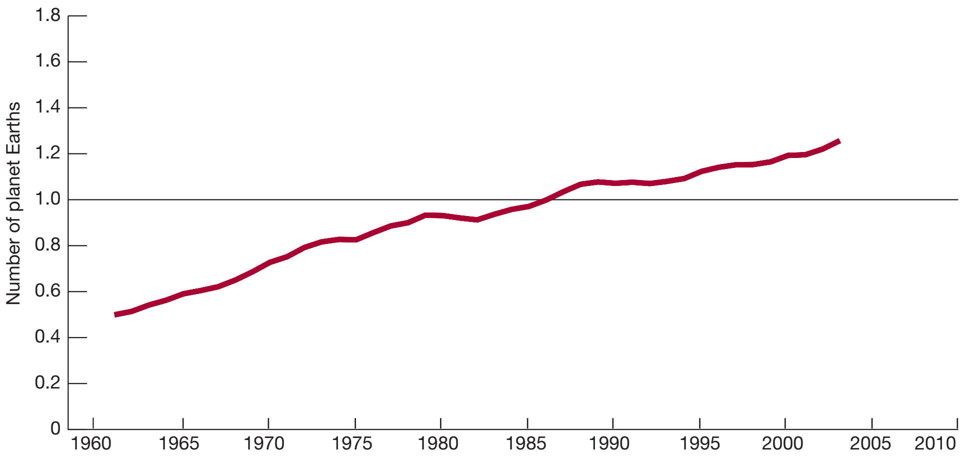


Fig. 2: **GLOBAL ECOLOGICAL FOOTPRINT,** 1961–2003



BIODIVERSITY LOSS AND THE HUMAN FOOTPRINT

The Living Planet Index shows that wild species and natural ecosystems are under pressure to a greater or lesser degree across all biomes and regions of the world. The direct, anthropogenic threats to biodiversity are often grouped under five headings:

- habitat loss, fragmentation or change, especially due to agriculture
- overexploitation of species, especially due to fishing
- pollution
- the spread of invasive species or genes
- climate change.

All five of these threats stem ultimately from human demands on the biosphere – the production and consumption of natural resources for food and drink, energy or materials, and the disposal of associated waste products – or the displacement of natural ecosystems by towns, cities and infrastructure. Further, the massive flows of goods and people around the world have become a vector for the spread of alien species and diseases (see Figure 3).

Natural habitat, especially in terrestrial ecosystems, is lost, altered or fragmented through its conversion for cultivation, grazing, aquaculture, industrial or urban use. River systems are dammed and altered for irrigation, hydropower or flow regulation, and even marine ecosystems, particularly the seabed, are physically degraded by trawling, construction and extractive industries.

Overexploitation of wild species populations is the result of harvesting or killing animals or plants, for food, materials or medicine, over and above the reproductive capacity of the population to replace itself. It has been the dominant threat to marine biodiversity, and overfishing has devastated many commercial fish stocks, but overexploitation is also a serious threat to many terrestrial species, particularly among tropical forest mammals hunted for meat. Overharvesting of timber and fuelwood has also led to loss of forests and their associated plant and animal populations.

Invasive species, which have been introduced either deliberately or inadvertently from one part of the world to another and become competitors, predators or parasites of indigenous species, are responsible for declines in many native species populations. This is especially important on islands and in freshwater ecosystems, where they are thought to be the main cause of extinction among endemic species.

Pollution is another important cause of biodiversity loss, particularly in aquatic ecosystems. Excess nutrient loading is a result of the increasing use of nitrogen and phosphorous fertilizers in agriculture, which causes eutrophication and oxygen depletion. Toxic chemical pollution often arises from pesticide use in farming or aquaculture, from industry or mining wastes. One result of increasing carbon dioxide concentrations in the atmosphere is the acidification of the oceans, which is likely to have widespread effects on marine species, particularly shell- and reef-building organisms.

Less significant in the past, but with the potential to become the greatest threat to biodiversity over the course of the next few decades, is climate change. Already, impacts of climate change have been measured in arctic and alpine as well as coastal and marine ecosystems, such as coral reefs. The global extent of climate change will mean that no ecosystem on the surface of the Earth will be immune from rising air or sea temperatures or changing weather patterns.

It is clear that all of these direct threats or pressures are the effect, in turn, of more distant, indirect drivers of biodiversity loss which relate to the consumption of resources and pollution arising from their waste products. The ultimate drivers of threats to biodiversity are the human demands for food, water, energy and materials. These can be considered, sector by sector, in terms of the production and consumption of agricultural crops, meat and dairy products, fish and seafood, timber and paper, water, energy, transport, and land for towns, cities and infrastructure. As the human population and global economy grow, so do the pressures on biodiversity. The Ecological Footprint is a measure of the aggregate demands that the consumption of these resources places on natural ecosystems and species. Understanding the linkages and interactions between biodiversity, the drivers of biodiversity loss and the human footprint is fundamental to slowing, halting and reversing the ongoing declines in natural ecosystems and populations of wild species.

BEYOND 2010

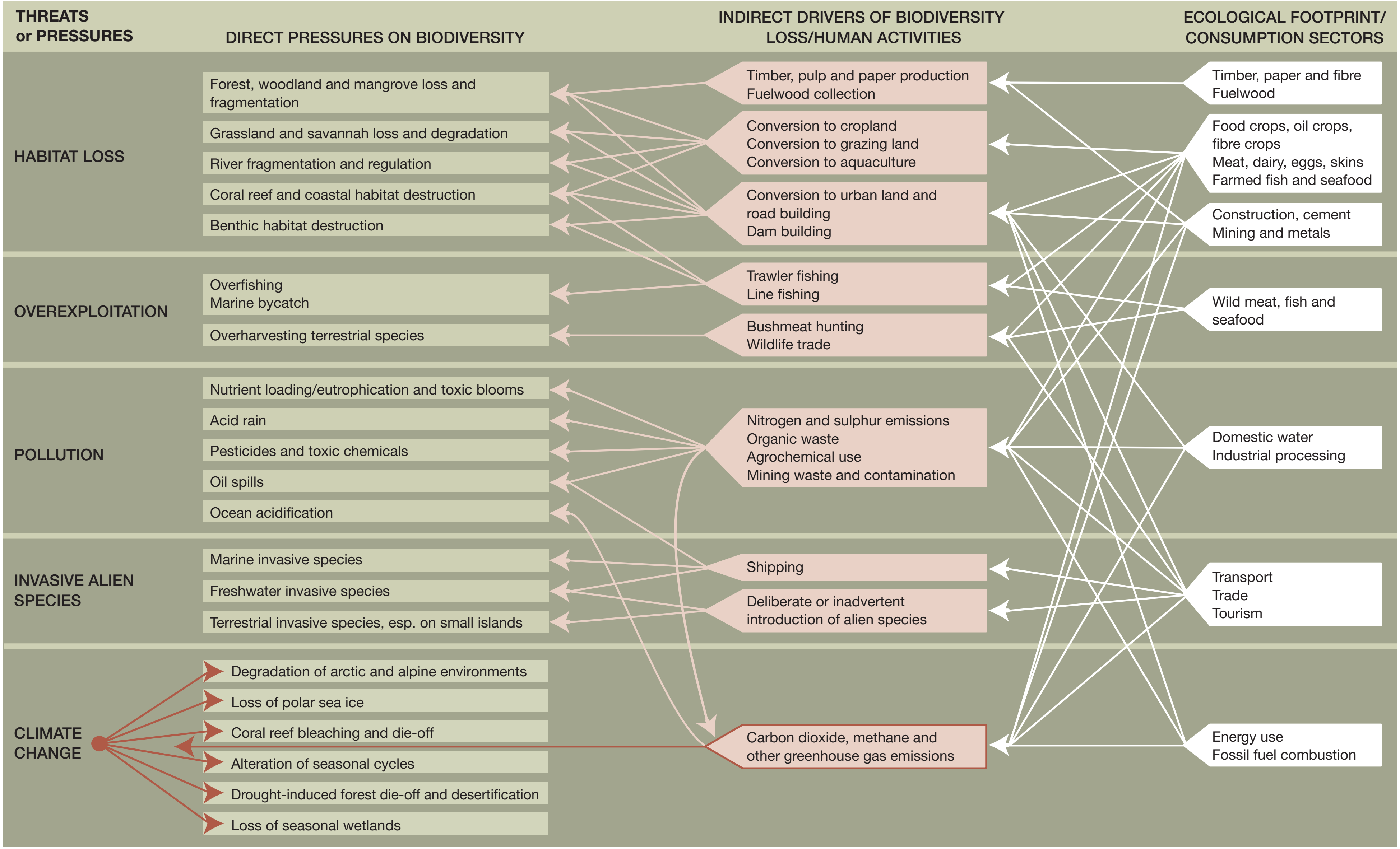
By opting for a target to reduce the *rate* of biodiversity loss, the signatory nations conceded that halting the decline by 2010 is probably unachievable. With only two years to go, unless immediate action is taken to reduce the growing pressures on natural ecosystems, the loss of global biodiversity is set to continue unabated.

Whether or not we are on track to achieve the 2010 target, it is not too soon to start thinking about subsequent targets. Any future goals must be measured using indicators of the state of global biodiversity, the drivers and pressures causing its decline, and the societal impacts and responses to biodiversity loss. Indicators must be relevant, cost-effective and easily communicated, and any new targets should be measurable using those indicators.

Only a tiny fraction of all biomes, ecoregions and species are being monitored. The range of biodiversity that is covered by the existing indicators is far from complete, and we are particularly ignorant concerning tropical ecoregions, marine and freshwater biomes, and invertebrates. Addressing these knowledge gaps is essential.

Only by monitoring the state of global biodiversity, the drivers that affect it, and the impact of interventions designed to protect it, will we be able to identify and implement the most cost-effective and efficient responses to biodiversity loss.

Fig 3: **BIODIVERSITY LOSS, HUMAN PRESSURE AND THE ECOLOGICAL FOOTPRINT**



THE GLOBAL LIVING PLANET INDEX

The Living Planet Index (LPI) is a measure of the state of the world's biodiversity based on trends from 1970 to 2005 in nearly 4,000 populations of 1,477 vertebrate species. It is calculated as the average of three separate indices that measure trends in populations of 813 terrestrial species, 320 marine species and 344 freshwater species.

The index shows an overall decline over the 35-year period, as do each of the terrestrial, marine and freshwater indices individually (Figures 4, 5 and 6). The global LPI shows an overall decline from 1970 to 2005 of 27 per cent (Figure 1).

No attempt is made to select species on the basis of geography, ecology or taxonomy, so the LPI dataset contains more population trends from well-researched regions, biomes and species. In compensation, temperate and tropical regions are given equal weight within the terrestrial and freshwater indices, as are the four ocean basins within the marine LPI, with equal weight being given to each species within each region or ocean basin. An assumption is made that the available population time series data are representative of vertebrate species in the selected ecosystems or regions, and that vertebrates are a good indicator of overall biodiversity trends.

The terrestrial LPI is the average of two indices which measure trends in temperate and tropical species respectively, and shows an overall decline of 25 per cent between 1970 and 2005 (Figure 4). The marine LPI shows a decline of 28 per cent between 1970 and 2005, with a dramatic decline between 1995 and 2005 (Figure 5). Many marine ecosystems are changing rapidly under human influence, and one recent study estimates that more than 40 per cent of the world's ocean area is strongly affected by human activities while few areas remain untouched (Halpern et al., 2008). Freshwater ecosystems provide water, food and other ecological services essential to human well-being. In spite of only covering about 1 per cent of the total land surface of the Earth, inland waters are home to an enormous diversity of over 40,000 vertebrate species. The overall freshwater LPI fell by 29 per cent between 1970 and 2003 (Figure 6).

Figure 4: Terrestrial Living Planet Index. The terrestrial LPI represents average trends in 813 species (1,820 populations) and shows an overall decline of 25 per cent from 1970 to 2005. Two indices, for tropical and temperate regions, are aggregated with equal weighting to produce the terrestrial LPI.

Figure 5: Marine Living Planet Index. The marine LPI represents overall trends in 320 species (1,180 populations) and falls rapidly over the last ten years of the period. Four ocean basin indices are aggregated to produce the marine LPI.

Figure 6: Freshwater Living Planet Index. The freshwater LPI represents trends in 344 species (988 populations) and shows an overall decline of 29 per cent. Tropical and temperate regional indices are aggregated with equal weighting to produce the freshwater LPI.

Fig. 4: **TERRESTRIAL LIVING PLANET INDEX,** 1970–2005

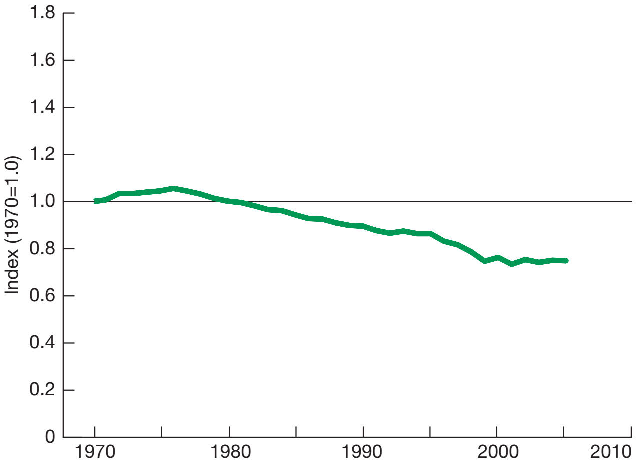


Fig. 5: **MARINE LIVING PLANET INDEX,** 1970–2005

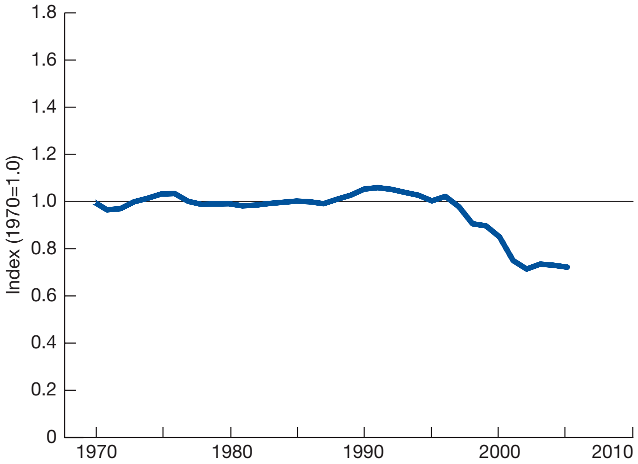
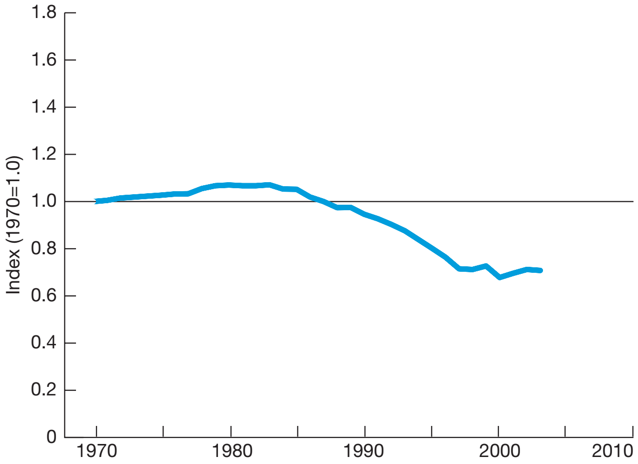


Fig. 6: **FRESHWATER LIVING PLANET INDEX,** 1970–2003



Terrestrial and freshwater Living Planet Indices

Each region of the world shows varying trends in species populations, reflecting the differing anthropogenic and environmental pressures on biodiversity. The terrestrial LPI reveals a marked difference in trends between tropical and temperate species (Figure 7). Tropical terrestrial species populations appear to have declined by 46 per cent on average between 1970 and 2005, while temperate species showed little overall change. Because of insufficient data on freshwater species populations, especially from the present decade, the freshwater indices have been calculated only to 2003 for temperate regions and to 2000 for tropical regions. The freshwater index for temperate regions declined by 26 per cent between 1970 and 2003, while the index for tropical regions fell by 35 per cent between 1970 and 2000 (Figure 8). These results do not necessarily imply that biodiversity in temperate regions is in a better state than it is in tropical regions: many declines among temperate species occurred before 1970 and so these trends are not reflected in this index. The rapid decline in tropical species is paralleled by a loss of natural habitat, particularly within tropical forest biomes.

Terrestrial and freshwater species were combined to give an indication of biodiversity trends within Europe, North America and Asia-Pacific – the regions with the most data available. Unfortunately, species population data from Latin America and Africa were insufficient to show overall trends for those continents as a whole with confidence, but data availability is improving and it is expected that it will be possible to make indices for these regions by 2010.

The European[1] index shows an initial positive trend and then a decline since 1990, but there has been little absolute change since 1970 (Figure 9). The North American[2] index shows no overall trend from 1970 to 2005. The Asia-Pacific[3] region has undergone the greatest industrial and economic change over the last 20 years, and the index for this region displays the greatest decline in species population trends since the late 1980s.

Figure 7: Temperate and tropical terrestrial indices. The temperate terrestrial index shows no overall change in the abundance of 591 species while the tropical terrestrial index shows a decline of 46 per cent on average in 237 species from 1970 to 2005.

Figure 8: Temperate and tropical freshwater indices. The temperate freshwater index, showing the average change in abundance of 293 species, fell by 26 per cent over the period 1970–2003, while the tropical freshwater index shows a decline of 35 per cent in 57 species from 1970 to 2000.

Figure 9: Regional terrestrial/freshwater indices. These three regional indices (Europe[1], North America[2] and Asia-Pacific[3]) show very different average trends in terrestrial and freshwater species populations. The indices are based on data for 276 species, 576 species and 165 species respectively.

1 Includes continental Europe as far as the Ural Mountains, plus Greenland, Iceland, Svalbard, Turkey, Georgia, Armenia and Azerbaijan.
2 Includes Canada and USA.
3 Includes continental Asia east of the Ural Mountains, the Middle East, South and Southeast Asia, and Australasia.

Fig. 7: **TEMPERATE AND TROPICAL TERRESTRIAL INDICES,** 1970–2005

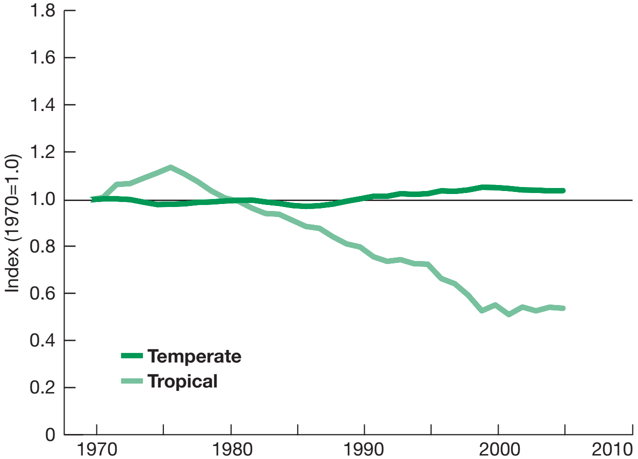


Fig. 8: **TEMPERATE AND TROPICAL FRESHWATER INDICES,** 1970–2003

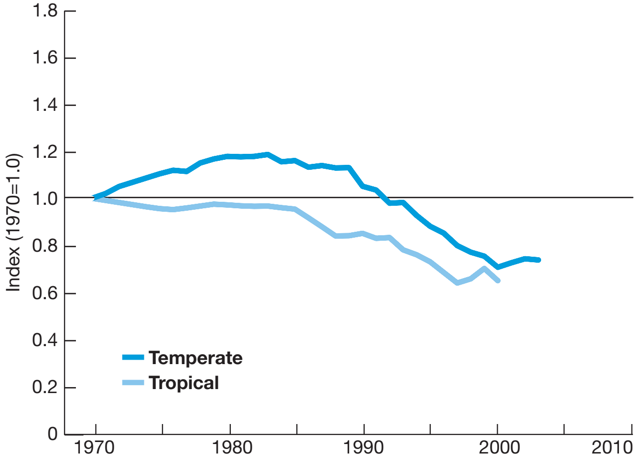
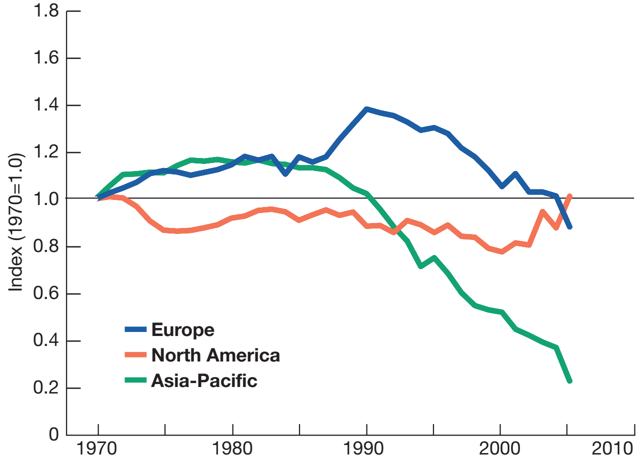


Fig. 9: **REGIONAL TERRESTRIAL/FRESHWATER INDICES,** 1970–2005



Marine Living Planet Indices

The global marine LPI is the average of four ocean basin indices (Figures 10 and 11), all of which show some decline in recent years to a greater or lesser extent. It is also possible to disaggregate global trends by species group as well as by region, and this has been done for marine fish and birds (Figure 12).

Species populations in the North Pacific and North Atlantic/Arctic Oceans show little or no absolute change from 1970 to 2005, although both ocean basin indices show a downward trend from about 1990 onwards (Figure 10). The indices of the southern hemisphere oceans are based on a smaller dataset than those of the northern hemisphere oceans. They reveal a long-term decline in the South Atlantic/Southern Ocean and a dramatic decline in the South Pacific/Indian Ocean since the mid-1990s (Figure 11), although with lower confidence than for the northern hemisphere. According to a recent assessment of pressures on marine ecosystems (Halpern et al., 2008), the North Sea, the East and South China Seas, the Bering Sea and much of the coastal waters of Europe, North America, the Caribbean, China and Southeast Asia are heavily impacted by fishing, invasive species, pollution and greenhouse gas emissions.

The marine fish index remained fairly level until about 1990 but subsequently dropped, indicating an overall fall in abundance of 21 per cent during the 35-year period (Figure 12).

The index for marine birds shows a positive trend from 1970 to the mid-1990s, but a rapid decline of about 30 per cent since the mid-1990s (Figure 12). This fall in bird populations may be the result of multiple threats, including bycatch from long-line fishing, pollution and the decline in abundance of marine fish as indicated by the marine fish index.

Figure 10: Northern marine indices. These two indices show little or no overall change in abundance over the period 1970–2005, although both show a downward trend since the mid-1990s. The indices are based on populations of 185 and 84 species from the North Atlantic/Arctic Ocean and North Pacific Ocean respectively.

Figure 11: Southern marine indices. These two indices represent trends in 48 and 52 marine species from the South Atlantic/Southern Ocean and the South Pacific/Indian Ocean respectively. Both show severe declines over the three decades from 1970 to 2002.

Figure 12: Marine fish and bird indices. The marine fish index shows an average decline in abundance of 21 per cent across 145 species of marine fish between 1970 and 2005, whereas the trend in 120 species of marine birds shows an overall fall of 14 per cent over the same period, but with a steeper drop since the mid-1990s.

Fig. 10: **NORTHERN MARINE INDICES,** 1970–2005

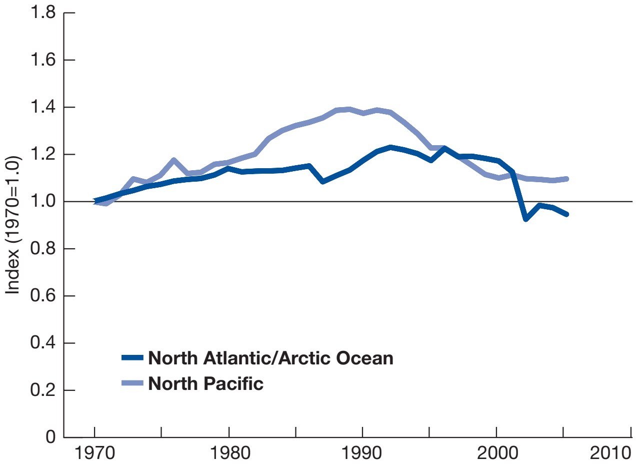


Fig. 11: **SOUTHERN MARINE INDICES,** 1970–2002

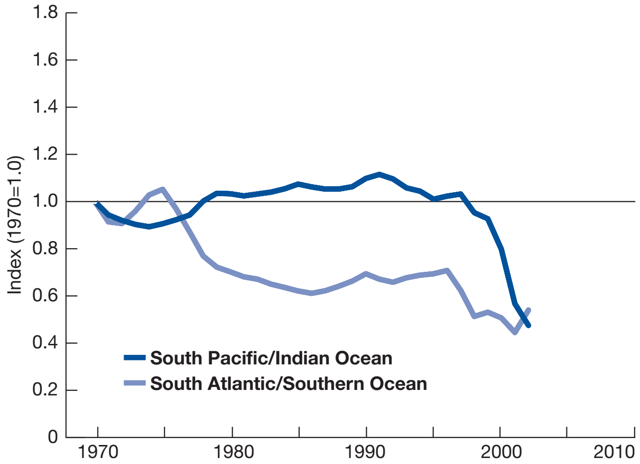
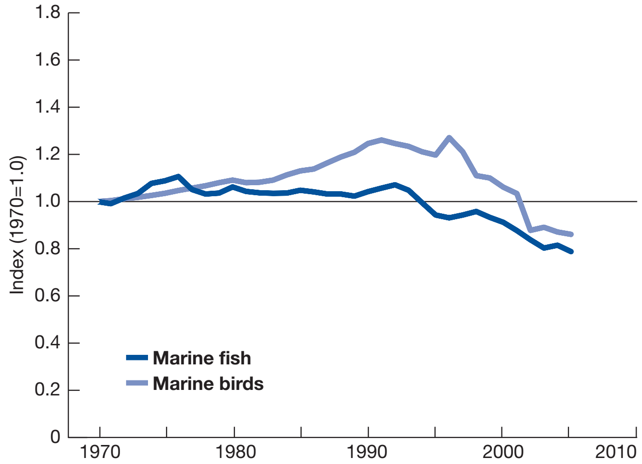
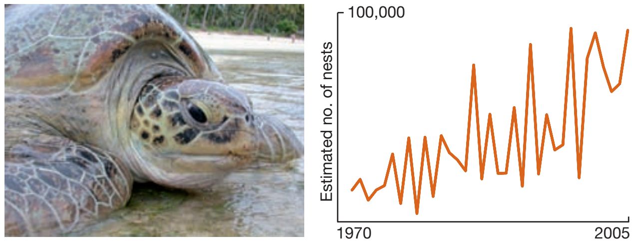


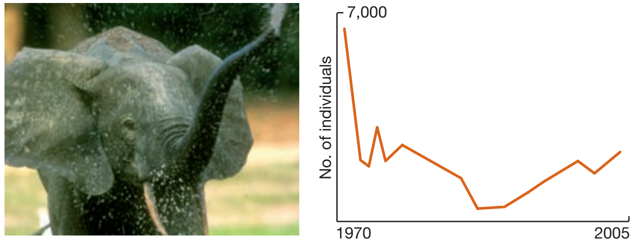
Fig. 12: **MARINE FISH AND BIRD INDICES,** 1970–2005



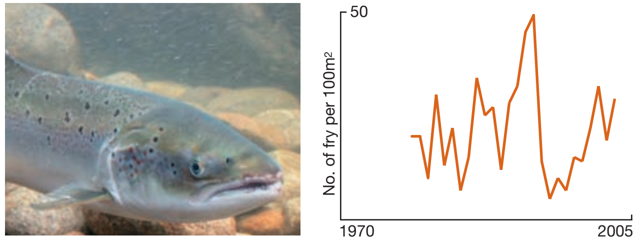
Trends in sample populations of selected species



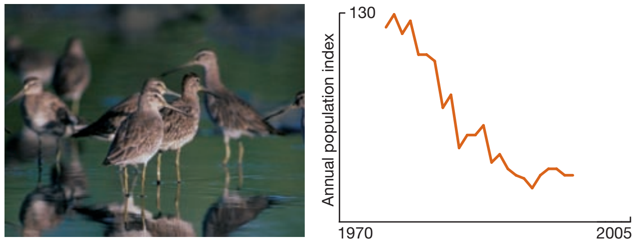
Green turtle (*Chelonia mydas*), Costa Rica



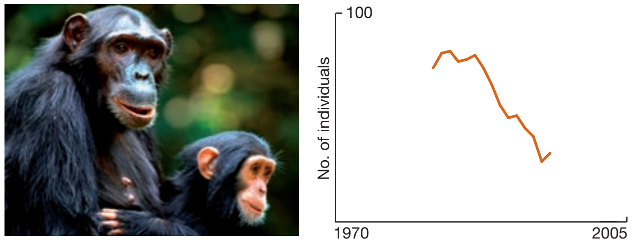
African elephant (*Loxodonta africana*), Tanzania



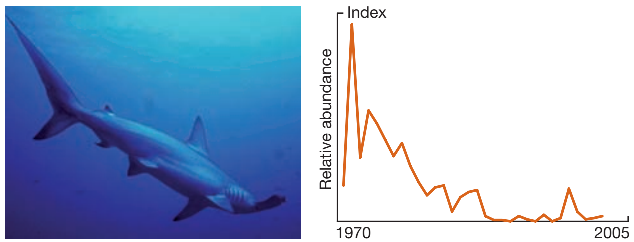
Atlantic salmon (*Salmo salar*), Norway



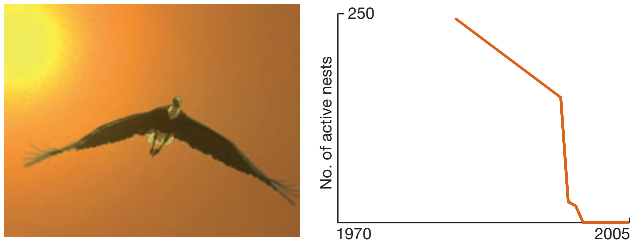
Common snipe (*Gallinago gallinago*), Sweden



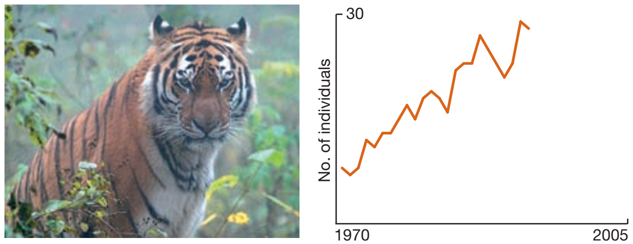
Chimpanzee (*Pan troglodytes*), Côte d'Ivoire



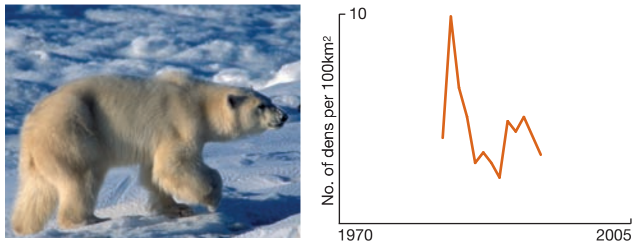
Scalloped hammerhead (*Sphyrna lewini*), United States of America



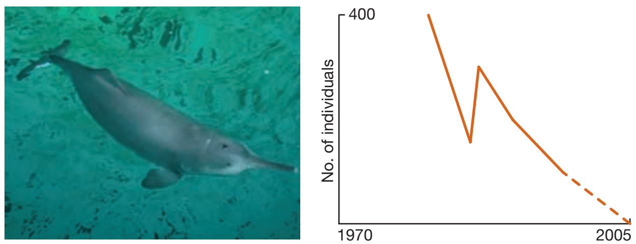
White-rumped vulture (*Gyps bengalensis*), India



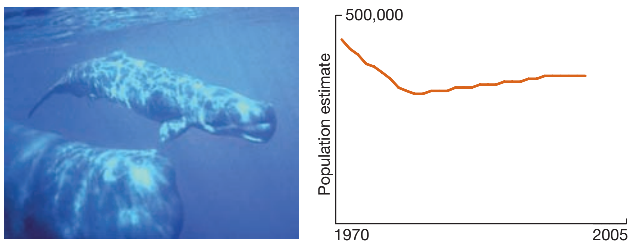
Amur tiger (*Panthera tigris*), Russia



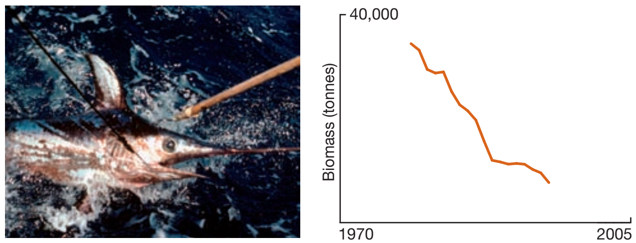
Polar bear (*Ursus maritimus*), Russia



Baiji (*Lipotes vexillifer*), China

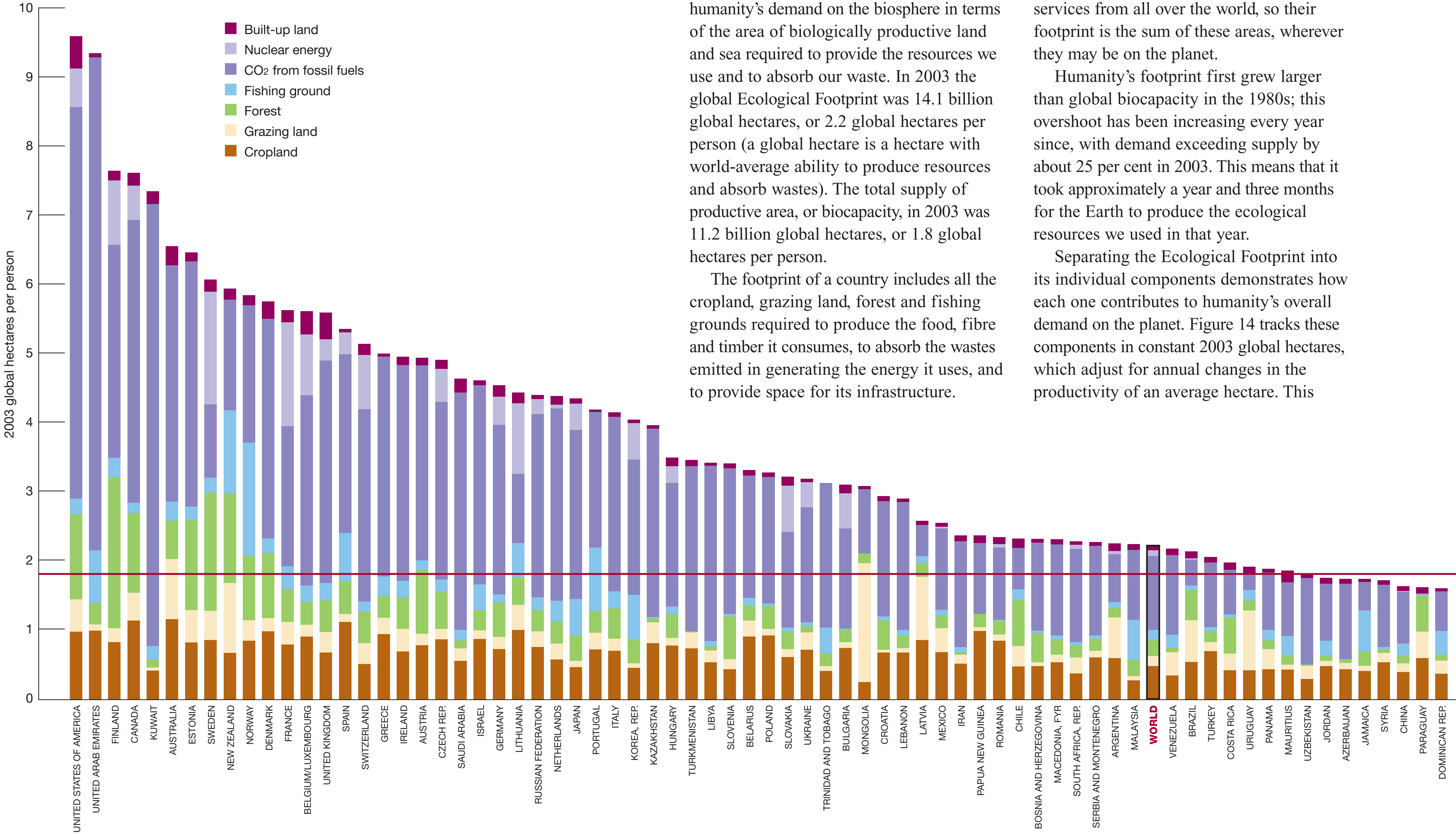


Sperm whale (*Physeter macrocephalus*), North Pacific



Swordfish (*Xiphias gladius*), North Atlantic

Fig. 13: ECOLOGICAL FOOTPRINT PER PERSON, BY COUNTRY, 2003



The Ecological Footprint measures humanity's demand on the biosphere in terms of the area of biologically productive land and sea required to provide the resources we use and to absorb our waste. In 2003 the global Ecological Footprint was 14.1 billion global hectares, or 2.2 global hectares per person (a global hectare is a hectare with world-average ability to produce resources and absorb wastes). The total supply of productive area, or biocapacity, in 2003 was 11.2 billion global hectares, or 1.8 global hectares per person.

The footprint of a country includes all the cropland, grazing land, forest and fishing grounds required to produce the food, fibre and timber it consumes, to absorb the wastes emitted in generating the energy it uses, and to provide space for its infrastructure.

People consume resources and ecological services from all over the world, so their footprint is the sum of these areas, wherever they may be on the planet.

Humanity's footprint first grew larger than global biocapacity in the 1980s; this overshoot has been increasing every year since, with demand exceeding supply by about 25 per cent in 2003. This means that it took approximately a year and three months for the Earth to produce the ecological resources we used in that year.

Separating the Ecological Footprint into its individual components demonstrates how each one contributes to humanity's overall demand on the planet. Figure 14 tracks these components in constant 2003 global hectares, which adjust for annual changes in the productivity of an average hectare. This makes it possible to compare absolute levels of demand over time. The carbon dioxide (CO_2) footprint, from the use of fossil fuels, was the fastest-growing component, increasing more than ninefold between 1961 and 2003.

How is it possible for an economy to continue operating in overshoot? Over time, the Earth builds up ecological assets, like forests and fisheries. These accumulated stocks can, for a limited period, be harvested faster than they regenerate. CO_2 can also be emitted into the atmosphere faster than it is removed, accumulating over time.

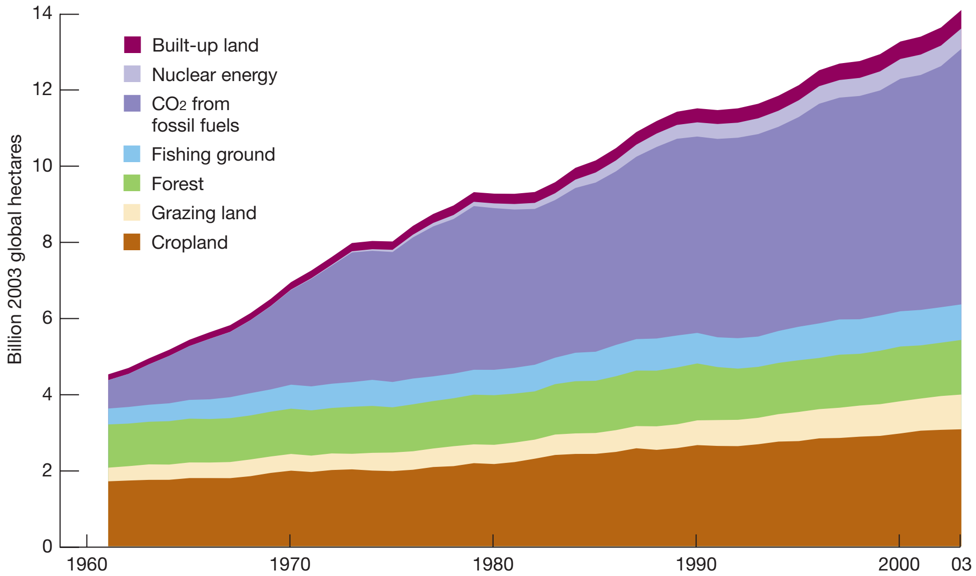
For three decades now we have been in overshoot, drawing down these assets and increasing the amount of CO_2 in the air. We cannot remain in overshoot much longer without depleting the planet's biological resources and interfering with its long-term ability to renew them.

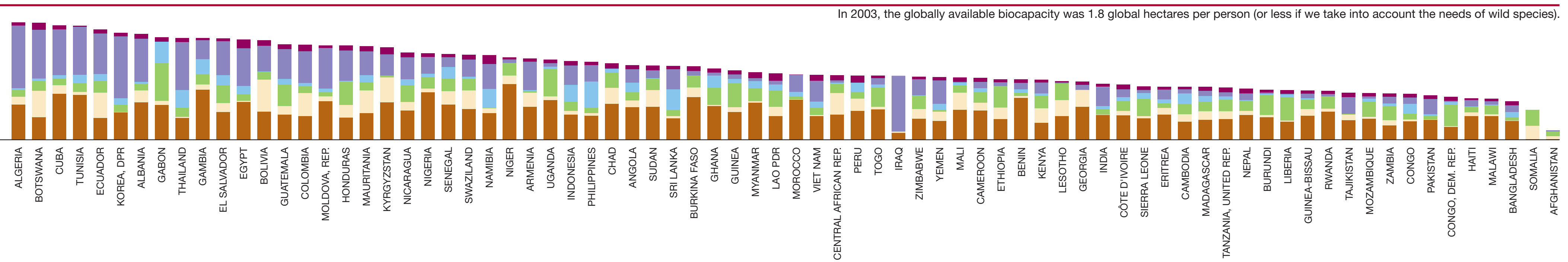
Figure 13: Ecological Footprint per person, by country. This includes all countries with populations greater than 1 million for which complete data are available.

Figure 14: Ecological Footprint by component. The footprint is shown in constant 2003 global hectares.

In both diagrams, hydropower is included in the built-up land footprint and fuelwood within the forest footprint. For additional information about the Ecological Footprint methodology, data sources, assumptions and definitions (including revisions to the UAE footprint), please visit www.footprintnetwork.org/2006technotes.

Fig. 14: **ECOLOGICAL FOOTPRINT BY COMPONENT,** 1961–2003





BIODIVERSITY – BUILDING SECURITY FOR THE FUTURE

Food, clean water, medicines and protection from natural hazards are important ingredients in maintaining our security and quality of life. Can we guarantee their continued availability? The answer is "yes" – but only if we conserve the biodiversity that underpins the natural habitats and ecosystems which, in turn, support them. The global community recognized the need to conserve biodiversity in 2002 when governments committed to achieving "a significant reduction of the current rate of biodiversity loss" by 2010. But this report clearly shows that this target is unlikely to be met, with biodiversity continuing to be lost.

Protecting biodiversity – the genetic pool, the extent and variety of species and ecosystems – is critical to maintaining and improving the quality of life of the world's people.

Neglecting biodiversity invites crop collapse, thirst, disease and disaster.

FACTS ON FOOD SECURITY

- Populations of teosinte, the closest wild relative of maize, shrank by more than 50 per cent in the last 40 years in Central America.
- 75 per cent of rice varieties grown in Sri Lanka are descended from one parent plant.
- Global fishing fleets are estimated to have a capacity 250 per cent greater than sustainable available catches.
- 75 per cent of global fish stocks are fully used, overused or in crisis.

The degradation of ecosystems has already taken us to new levels of vulnerability – and climate change is intensifying this. As ecosystems are degraded, species are lost and key natural services fail. Humanity is already incurring the costs of biodiversity loss, which are disproportionately borne by poor people and nations, but which also scale income levels and cross borders.

FOOD SECURITY

Of the 75,000 or so edible plant species, only around 150 are widely cultivated, just three of which provide 50 per cent of our food. In humanity's drive to feed an ever-growing population, we have become dependent on a few high-yielding varieties of these crops.

The maintenance of biodiversity, however, is key to ensuring we have crops that can withstand diseases and a changing climate. Traditional varieties and the wild relatives of commercial crops provide a critical reserve of genes that are regularly needed to strengthen and adapt their modern domestic cousins in a changing world. Allowing these to become extinct on farms or in the wild endangers food security. Yet research suggests that the world's centres of crop diversity remain inadequately protected, and that we may have already eradicated three-quarters of the planet's agricultural crop genetic diversity.

We are also failing to look after our ocean harvests. The annual catch of the global fishing industry is worth US$70–80 billion, with around 500 million people relying on fish as their principal source of animal protein.

FACTS ON WATER SECURITY

- Natural or semi-natural habitats can help to mitigate flooding.
- Protected areas can provide barriers against the impacts of drought and desertification.
- Freshwater species are thought to be some of the most threatened. A third of all freshwater species that have been assessed are threatened with extinction, and populations of freshwater species have declined by 30 per cent overall.
- Over 30 per cent of the world's largest cities rely directly on protected areas for their drinking water. A further 10 per cent obtain their water from sources that originate in "protected" watersheds, i.e. that include protected areas, or from forests that are managed in a way that prioritizes their water-securing functions.
- The economic value of watersheds is almost always underestimated or unrecognized.
- On top of the current 1.4 billion people living in water-stressed areas, by 2050, a further 700 million to 2.8 billion people are expected to face increased water shortages.

But the current fish catch is unsustainable. According to the Food and Agriculture Organization of the United Nations, more than 50 per cent of global fish stocks are fully exploited and 25 per cent overexploited, depleted or recovering from depletion. Some fisheries have already collapsed, and others are predicted to do so. According to some scientists, commercial fishing will no longer be viable by 2048. Yet, despite the role that marine protected areas can play in replenishing stocks, less than 1 per cent of the marine environment is protected.

When countries made the commitment to protect one-tenth of ecosystem types by 2010, they were, in part, agreeing to ensure future food supplies. But more systematic identification and protection of the places containing wild crop relatives and of key breeding and nursery areas for fish stocks are needed to secure the future food supply for a growing population.

WATER SUPPLY

Exploitation of the planet's freshwater is increasing to the extent that, by 2030, nearly half the world's population will be facing water shortages. Rivers have been dammed and diverted, and wetlands drained – all impacting freshwater ecosystems and species. Forest clearance, climate change, pollution and inefficient water use, combined with the global commitment to supply increasing numbers of people with a reliable supply of freshwater sufficient to meet their needs, are putting such pressure on water systems that only

FACTS ON HEALTH

- As many as 50 per cent of prescription drugs are based on a molecule that occurs naturally in a plant.
- Between 50,000 and 70,000 plant species are known to be used in traditional and modern medicinal systems throughout the world.
- In China, 40 per cent of urban patients and 90 per cent of rural patients rely on traditional medicine.
- Only about 200 million people in Sub-Saharan Africa (less than 30 per cent of the population) have access to modern health care and pharmaceuticals. The other 480 million rely on traditional medicines.
- In Sub-Saharan Africa, the ratio of traditional healers to the population is approximately 1:500, while the ratio of medical doctors to the population is 1:40,000.
- Internationally, the trade in medicinal plants is estimated to be worth US$60 billion per year.
- An estimated 323,000–470,000 households (2.6 million people) are engaged in the collection of wild medicinal plants for sale in Nepal.

desalination plants seem, in some places, to be guarantors of future supplies.

However, forests – a natural catchment infrastructure – are the most economic rehydration tool, yet currently are not the instrument of choice for enough of our centres of population. Carefully located and managed, protected forest areas can act as natural reservoirs, providing efficient water collection, natural filtration and aquifer replenishment.

HUMAN HEALTH

An estimated 80 per cent of people in developing countries rely on herbal remedies and medicines for their health care, with wild plants forming the primary ingredients. To maintain this natural pharmacy it is vital to both protect and provide for the sustainable use of these medicinal plants.

The pharmaceutical industry also relies on biodiversity. In 2002–2003, four-fifths of new chemicals introduced globally as drugs were inspired by natural products. But without systems and mechanisms that can conserve the diversity of life on Earth, how many potential cures will be lost as biodiversity is eroded?

The development of an international regime under the Convention on Biological Diversity for the equitable sharing of benefits from the use of genetic resources could benefit people in developing and developed countries alike. These benefits would provide a major incentive for the conservation of biodiversity and traditional knowledge, while in the longer term helping to ensure the health of all.

DISASTER MITIGATION

With climate change likely to bring rising sea levels, stronger storms and unpredictable rainfall patterns, it is suggested that as many as 150 million people could become environmental refugees by 2050. Inevitably such large movements of people are likely to lead to economic and political instability.

Protecting natural areas can lessen the impact of natural hazards, reducing the likelihood that they provoke disasters. Corals and mangrove forests, for example, can help mitigate the effects of storms in coastal areas, while forests and wetlands play a key role in preventing floods and landslides.

FACTS ON DISASTER MITIGATION

- Centuries ago, restoration of forests in the watershed above Malaga, Spain, ended the flooding that had been recorded at regular intervals over 500 years.
- In the Seychelles, wave energy has doubled as a result of sea-level rise, loss of coral reefs and changes to reef make-up. Models predict that wave energy will double again in the next decade due to further reef damage.
- Philippines President Gloria Arroyo blamed indiscriminate logging, which has left the country with less than 6 per cent of its original forest, for flash floods and landslides that left over 1,600 people dead or missing in 2004.

BUILDING SECURITY

The true protection of biodiversity can only happen through cross-sectoral action. From ministries of finance, health, agriculture and food to leaders of business and industry, producers and consumers, all have a role to play. Our efforts must be directed towards sustainability: of our food and water, our medicines, our economies and our existence.

RECOMMENDATIONS

WWF calls on governments to:

1. Develop joint biodiversity protection implementation plans between environment, agriculture, food, water, finance and health ministries in order to take urgent action to reduce the rate of biodiversity loss by 2010.

2. Urgently implement the Convention on Biological Diversity Programme of Work on Protected Areas prioritizing the protection of areas that are important for food security, water supply, medicine and disaster mitigation.

3. Implement incentive and financing measures that support the establishment and maintenance of protected areas.

4. Accelerate the development and adoption of an international regime on the equitable sharing of benefits from the utilization of genetic resources by 2010.

5. Take account of the true cost of ecosystem services in national budgets and adopt national indicators that measure the state of biodiversity and pressures on natural ecosystems.

Global Living Planet Index

The species population data used to calculate the LPI are gathered from a variety of sources published in scientific journals, NGO literature and on the worldwide web. All data used in constructing the index are time series of either population size or a proxy of population size. The terrestrial and marine datasets comprise data from 1960 to 2005 and the freshwater dataset from 1960 to 2003 owing to fewer numbers of time series from recent years. Generalized additive modelling was used to determine the underlying trend in each population time series. These were then used to calculate the average rate of change in each year across all species. All indices were calculated using population data from 1960 to 2005, or the most recent year for which data were available, and set equal to 1.0 in 1970 (pre-1970 trends are not shown). The global LPI was aggregated according to the hierarchy of indices shown in Figure 15. For further details please refer to Loh et al. (2005).

Regional indices

The indices for Europe and North America were aggregated by weighting two groups – bird species and all other vertebrate species – to reflect the actual species numbers in those groups from those regions (approximately 30 per cent are birds). This was because the data availability in Europe and North America is biased towards bird species (about 75 per cent of the data). This resulted in the mammal, fish, reptile and amphibian species representing over twice the weight of the bird species in the overall index for both regions. The species in the Asia-Pacific index were left unweighted.

Figure 15: Hierarchy of indices within the Living Planet Index. Each population carries equal weight within each species; each species carries equal weight within tropical and temperate realms or within each ocean basin; temperate and tropical realms, or ocean basins, carry equal weight within each system; each system carries equal weight within the overall LPI.

Table 1: **NUMBERS OF SPECIES WITHIN EACH SYSTEM AND VERTEBRATE CLASS**

	Terrestrial	Freshwater	Marine	Total
Fish		94	147	**241**
Amphibians	14	69		**83**
Reptiles	16	17	7	**40**
Birds	538	153	120	**811**
Mammals	245	11	46	**302**
Total	**813**	**344**	**320**	**1 477**

Table 2: **LIVING PLANET INDICES**

		1970	1975	1980	1985	1990	1995	2000	2005
Global Living Planet Index		**1.000**	**1.035**	**1.020**	**0.998**	**0.963**	**0.886**	**0.761**	**0.725**
Terrestrial	**Global**	**1.000**	**1.045**	**1.002**	**0.944**	**0.896**	**0.864**	**0.763**	**0.749**
	Temperate	1.000	0.980	0.995	0.976	1.004	1.026	1.052	1.039
	Tropical	1.000	1.114	1.008	0.913	0.800	0.727	0.554	0.540
Freshwater	**Global**	**1.000**	**1.027**	**1.070**	**1.052**	**0.946**	**0.802**	**0.678**	–
	Temperate	1.000	1.104	1.178	1.160	1.051	0.881	0.707	–
	Tropical	1.000	0.956	0.972	0.954	0.851	0.730	0.650	–
Regional terrestrial/freshwater	Europe	1.000	1.106	1.124	1.137	1.286	1.193	0.980	0.821
	North America	1.000	0.867	0.916	0.904	0.879	0.855	0.774	1.010
	Asia-Pacific	1.000	1.110	1.157	1.132	1.022	0.750	0.519	0.227
Marine	**Global**	**1.000**	**1.032**	**0.991**	**1.001**	**1.053**	**1.003**	**0.850**	**0.722**
	North Atlantic/Arctic Ocean	1.000	1.073	1.140	1.142	1.175	1.174	1.172	0.946
	North Pacific Ocean	1.000	1.111	1.165	1.322	1.374	1.227	1.100	1.096
	South Pacific/Indian Ocean	1.000	0.906	1.033	1.074	1.098	1.010	0.798	–
	South Atlantic/Southern Ocean	1.000	1.052	0.702	0.621	0.694	0.694	0.507	–
	Birds	1.000	1.035	1.091	1.130	1.246	1.197	1.061	0.861
	Fish	1.000	1.088	1.062	1.048	1.042	0.943	0.912	0.788

Fig. 15: **HIERARCHY OF INDICES WITHIN THE LIVING PLANET INDEX**

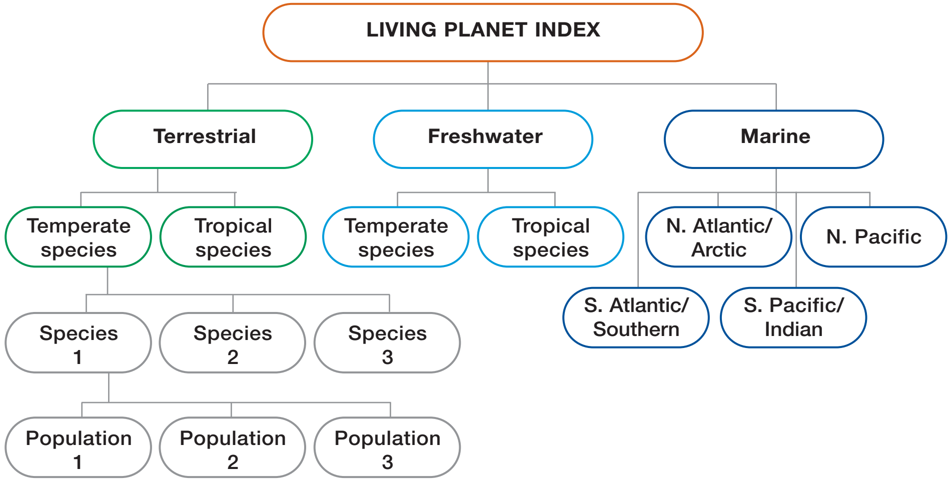


Table 3: **INDEX VALUES WITH 95% CONFIDENCE LIMITS**

		No. of species	Change (%) 1970–2005*	95% confidence limits Lower	Upper
Global Living Planet Index		1 477	-27	-37	-16
Terrestrial	Global	813	-25	-37	-9
	Temperate	591	3	-3	11
	Tropical	237	-46	-62	-22
Freshwater	Global	344	-29	-43	-12
	Temperate	293	-26	-39	-10
	Tropical	57	-35	-55	-6
Regional terrestrial/ freshwater	Europe	276	-12	–	–
	North America	576	1	–	–
	Asia-Pacific	165	-77	-88	-56
Marine	Global	320	-28	-47	-3
	North Atlantic/Arctic Ocean	185	-5	-33	34
	South Atlantic/Southern Ocean	48	-46	-70	3
	North Pacific Ocean	84	10	-23	52
	South Pacific/Indian Ocean	52	-53	-81	-1
	Birds	120	-14	-40	14
	Fish	145	-21	-41	5

* 1970–2003 for freshwater and temperate freshwater index; 1970–2000 for tropical freshwater index; 1970–2002 for South Pacific/Indian Ocean and South Atlantic/Southern Ocean indices.

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WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:
- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption.

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