

NSD WIREK
(from Auott)

Local impacts

HUMANS AND HABITATS

Every species has its habitat. The habitat of a species is the environment or location where it normally lives. For example, the habitat of *Pinus arizata* (bristlecone pine) is exposed, dry, rocky slopes and ridges in the sub-alpine zone of mountains in Colorado, New Mexico and California. The habitat of *Hippocampus ramulosus* (seahorse) is among seaweeds and sea-grasses on the seabed in shallow parts of the Mediterranean and the Atlantic as far north as the English Channel. Many human activities have an impact on a specific habitat - a local impact. Introduction of alien species can have devastating effects on a habitat - for example, the introduction of rats to New Zealand.

THE INTRODUCTION OF RATS TO BIG SOUTH CAPE ISLAND

Three species of rat that were introduced to the mainland of New Zealand during the nineteenth century eliminated many species of bird from the mainland. On islands that remained free of rats, some of these birds were able to survive. Until the 1950s Big South Cape Island (right) in the far south of New Zealand remained rat free and was a haven for many rare birds. Three types were, by then, found nowhere else: South Island saddleback (right), Stewart Island snipe and Stead's bush wren (bottom right).

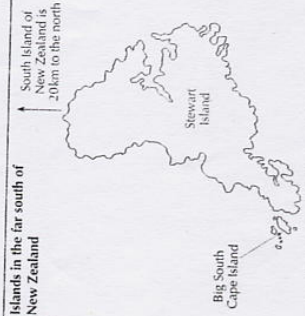
In the mid-1950s black rats (*Rattus rattus*) reached Big South Cape Island. Their numbers rose exponentially and by 1964 there were huge numbers on the island. They attacked eggs, young birds in nests and even adult birds, which were not behaviourally adapted to resist them. It became obvious that human intervention was needed to save the three rarest species of bird. Ecologists from the New Zealand Wildlife Service trapped as many of the remaining individuals as they could. Only two Stewart Island snipe were trapped and they died soon after, so this species became extinct. Nine Stead's bush wrens were trapped and transferred to another island that was still rat free. Unfortunately they failed to breed and gradually died out, so this species also became extinct.

Forty-one South Island saddlebacks were caught and transferred to two other rat-free islands. They survived and bred and were eventually distributed to other islands. In the 1980s they were re-introduced to Little Barrier Island after another alien species had been eliminated - wild cats. The South Island saddleback was the first species of bird to be saved from extinction by human intervention. Its future for the moment seems relatively secure.

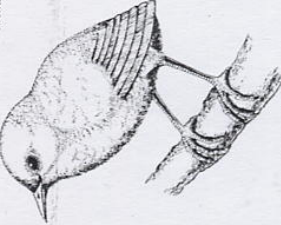
South Island Saddleback



Islands in the far south of New Zealand



Stead's bush wren



REDUCING THE IMPACT OF ALIEN SPECIES

- Various lessons can be learned from Big South Cape Island.
- Alien species should never be introduced to habitats containing rare or endangered species.
 - Alien species can sometimes be eliminated by trapping, poisoning or other methods.
 - Human intervention is sometimes essential to save a species, for example moving a population to a safer area.
 - Island nature reserves can play a vital role in ensuring the survival of rare and endangered species.
- Some methods for controlling alien species that have been tried elsewhere have been found to have serious risks. For example predators have been introduced to try to control alien species, but they have sometimes attacked native species rather than the alien species. Diseases have also been introduced, but again this is a risky policy, as the spread of the disease cannot be predicted with certainty.

Global impacts

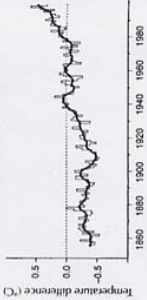
HUMANS AND THE BIOSPHERE

The ecosystems of the world are not isolated. They have effects on each other and sometimes even depend on each other. For example, carbon dioxide produced by one ecosystem can be carried in winds to another ecosystem and there be used in photosynthesis. Ecosystems function together as a system called the **biosphere**. The biosphere is the thin layer of interdependent and interrelated ecosystems that cover the Earth. Many human activities have affected the biosphere. Even the ice of the Antarctic has been affected - it contains lead from vehicle exhausts and large amounts of it have melted as a result of the increased greenhouse effect. The increased greenhouse effect is an example of human activities having a global impact.

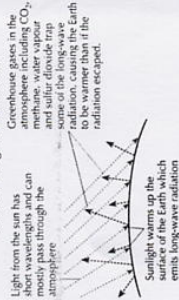
RIISING GLOBAL TEMPERATURES

Temperature records have been analysed to find the mean for the whole world in each year from 1856 onwards. The figure (right) shows the difference between the mean temperature for each year and an overall mean temperature for the years 1961 - 1990. The trends are that, from 1856 until about 1910, temperatures were relatively stable. From 1910 until 1940 temperatures rose and were then stable and from 1970 there has been a rapid rise. These changes in temperature could have various causes, but the most likely cause is an increased greenhouse effect. The figure (below right) shows how gases in the atmosphere cause the greenhouse effect on Earth. Carbon dioxide has the greatest overall effect.

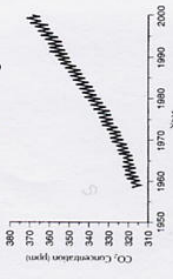
Graph of global temperatures



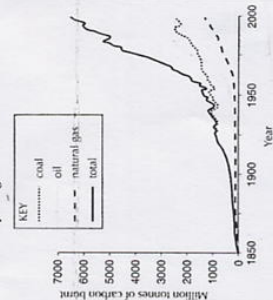
Cause of the greenhouse effect



Graph of atmospheric CO₂ levels



Graph of global use of fossil fuels



RIISING CARBON DIOXIDE LEVELS

The carbon dioxide concentration of bubbles of air trapped in Antarctic ice at different dates have been measured. These show that for 2000 years before 1880 the carbon dioxide concentration of the atmosphere remained fairly constant at about 270 parts per million (ppm). From 1880 onwards, the concentration rose. Since 1958 the concentration has been monitored continuously at Mauna Loa, Hawaii (below right). There is an annual fluctuation, but the overall trend has been upwards and the concentration is now 100 ppm higher than in 1880. This rise is enough to cause a significant increase in the greenhouse effect.

CONSEQUENCES OF THE INCREASED GREENHOUSE EFFECT

- The whole biosphere is likely to be affected in many ways:
- Global warming by up to 3°C over the next 50 years.
 - Rising sea levels due mainly to thermal expansion of water.
 - Flooding of low-lying land including coral atolls.
 - Melting of glaciers and polar ice.
 - More frequent storms and hurricanes.
 - Changes to weather patterns, with different areas becoming warmer or colder and wetter or drier.

MEASURES NEEDED TO REDUCE THE GREENHOUSE EFFECT

- Rising carbon dioxide levels are due to changes in the carbon cycle (page 43) including less photosynthesis and more burning of fossil fuels (right). To reduce the greenhouse effect, carbon dioxide absorption by photosynthesis must be encouraged and emissions from burning of fossil fuels must be reduced.
- The following measures would help.
- Restoration of ecosystems where there has been deforestation, desertification or other damage, to encourage the growth of photosynthesizing plants.
 - Spreading nutrients such as iron in nutrient-deficient oceans to encourage growth of photosynthesizing algae.
 - Reducing energy consumption, for example by thermal insulation of homes, driving smaller vehicles or eating food grown locally rather than food transported great distances.
 - Changing from fossil fuels as an energy source to solar, wind or nuclear power.