Great white shark—research needed

The great white shark *Carcharodon carcharias* has provided the media, film-makers and fishermen with dramatic stories, but there is very little factual knowledge about this species. It has a wide range in coastal temperate and subtropical waters of both hemispheres and also occasionally appears in the tropics. Their longevity is not known, although estimates from annual growth bands in the vertebrae suggest about 25 years, with maturity at 9–10 years. It is not known how abundant they are, except that they are uncommon compared with other sharks. Attempts to measure changes in abundance have been made by examining the number of 'fresh' attack wounds on seals, frequency of capture by fishermen, attack rates on humans, frequency of sightings and frequency of capture in shark-mesh, but all these methods have biases. Little is known about home ranges or territoriality and virtually nothing about its reproduction.

Barry Bruce, Research Officer at the South Australian Department of Fisheries, says the reasons for the lack of information lie both in the logistical problems of establishing a research programme and in the low priority assigned to such research in the past. The adult white shark is too large to be kept in oceanariums for observation and opportunities for observing them in the wild are rare, partly because they are relatively uncommon.

Attitudes are changing as people are beginning to acknowledge the ecological significance of top-level predators such as great white sharks, and the importance of monitoring their abundance. One problem with conserving great white sharks is that they are feared because they attack humans and are hunted as a result. However, according to the US Navy Shark Attack File, a worldwide average of only 28 shark attacks have occurred each year since 1940 and fewer than 35 per cent were fatal. Sharks can also severely disrupt fishing activities by harassing abalone divers, by taking fish from handlining or longlining operations, by becoming entangled in and/or damaging gill nets, or by terrifying people fishing from boats. On the other hand, the great white shark is sought after by game fishermen just because it is such a formidable opponent and the species ranks highly as a tourist attraction in certain areas.

In South Australia, changes in the patterns in frequency of shark–human interactions have led to speculation that white shark numbers are declining. However, not enough is known to confirm or deny this, either locally or in other parts of the world from where there have been similar claims. There is a need to establish a research programme to collect information to form a white shark database. Several white sharks are captured in Australia each year, most of which are not even accurately measured, let alone examined biologically, and thus much potentially useful information is lost. The research will be lengthy and it will be some while before even a basic understanding of the species is gained. If it is to be successful it will need the co-operation and support of both the general public and scientists worldwide.

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The FFPS is funding a desk study on the great white shark as a first step to assessing its conservation needs *(see page 179).*

Ozone depletion and Antarctic species

Antarctic aquatic and terrestrial ecosystems are threatened by increased ultraviolet (UV-B) radiation as a result of the precipitous decline in stratospheric ozone (known as the Antarctic ozone hole). From September to November UV-B radiation reaching the surface increases by 20–200 per cent, to levels considerably higher than those to which Antarctic species are adapted.

Although steps have been taken to reduce the production of the substances that destroy the protective layer of ozone (under the Montreal Protocol, which entered into force on 1 January 1989 and has so far been ratified by

51 nations and the European Community), ozone depletion is predicted to continue for decades, even if current production of ozone-depleting substances were to cease altogether.

Since 1987 the US Antarctic programme has been encouraging biological research on the effects of the ozone hole, especially its effects on marine phytoplankton and krill. It is difficult to assess the potential impact of increased UV-B radiation on biological systems, and this is particularly the case for Antarctic systems because the necessary information from long-term population monitoring and the effects of UV-B radiation on organisms has not yet been collected. The studies that have been conducted so far use available information on distribution, potential physiological adaptations and food-web interactions of Antarctic species combined with documented UV-B damage on other species to identify potential impacts.

Terrestrial Antarctic species are already adapted to an extreme environment and these adaptations, for example living in crevices and being heavily pigmented with carotenoids, may also protect them from UV-B damage. Although there have been no studies on the effects of UV-B on Antarctic species, in terrestrial plants elsewhere UV-B has been found to cause changes that increase water loss and this could have serious implications for Antarctic plants, which live in a cold arid environment and are already under water stress.

While the disruption of plant populations could lead to effects on the small organisms that graze them, more complex and potentially more serious are the possible effects of UV-B on aquatic species. Parts of the Southern Ocean are some of the most productive ecosystems in the world. Production is especially high in spring and summer, mainly in coastal regions and along the edge of the receding ice. Studies in temperate, tropical and boreal regions have shown that UV-B is harmful to most aquatic organisms. Raised levels cause reductions in growth of phytoplankton, microbial populations, zooplankton and fish. The tolerance of UV-B in the species studied appears to be remarkably close to present exposure. In the Antarctic, effects of UV-B have been investigated only for the surface phytoplankton, which are apparently already UV-stressed at normal levels. Communities particularly at risk from exposure to excess UV-B are those associated with sea-ice and the surface film of organic matter on the sea. In clear water UV-B can also penetrate to 20–30 m, the zone where the primary food base for marine ecosystems originates.

The Antarctic food web is complex, the base communities of microplankton supporting a diverse macroplankton, including 500–700 million tonnes of krill, and upon these depend 120 species of finfish, 80 species of seabirds, six species of seals and 15 whales. Because of the complexity of the base of the food web it is difficult to predict the consequences but any reduced production due to increased UV-B levels is likely to disrupt the entire web. Phytoplankton respond negatively to an increase of as little as 0.01 per cent of incident UV-B and if production declines significantly then there will be a decrease in carbon dioxide demand, which can only exacerbate the greenhouse effect.

Krill are unlikely to encounter direct exposure to increases in UV-B and should not suffer direct damage; krill also appear to exhibit some feeding flexibility and may not be quite as dependent on phytoplankton as was once believed. However, if a 10 per cent reduction in primary production due to increased UV-B were translated into a similar reduction in krill biomass this would mean a loss of between 5 and 100 million tonnes, more than two orders of magnitude above the current loss to commercial exploitation.

Ozone depletion and its effects are global environmental problems. Internationally organized and co-ordinated data collection and research are critically needed to address the problem of ozone depletion and its effects on biological systems. The fact that very small changes in quality and intensity of ambient UV-B can have a negative impact on many organisms and the uncertainty of the future pattern of ozone depletion over polar areas as well as globally warrants support and funding of research. The most serious far-reaching potential effect of increased UV-B is the impact on the transfer of energy through the food

web but the current available data on organisms is inadequate to predict what changes there will be.

Source

Voytek, M. 1990. Addressing the biological effects of decreased ozone on the Antarctic environment. *Ambio*, **19** (2), 52–61.

WORKSHOP 90—a milestone for Amazon conservation

In early January 90 scientists and policy-makers met in Manaus, Brazil, to integrate the best available knowledge on conservation priorities for the Amazon region. The workshop produced the first comprehensive map of the Amazon basin's diversity and initiated a process of scientific and political collaboration to make conservation of the region effective.

Encompassing the largest remaining expanse of tropical forest in the world and parts of nine nations, the Amazon basin contains more species than any other area on earth. With only 10 per cent of this forest cleared to date much remains pristine, but the influx of settlers and massive development projects planned make the next 10 years crucial. Scientists and observers from Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Surinam and Venuzuela were joined by specialists from Germany, the Netherlands, Sweden, the UK and the US at the meeting, which was hosted by Brazil's National Institute for Amazonian Research and jointly funded by the Brazilian Institute of Environment, the W. Alton Jones Foundation and WWF-US.

Since a single detailed map of the entire Amazonian region had never been available, Conservation International, which organized and planned the workshop, created a new base map as a framework for the discussions. Specialized working groups met and assessed priorities, which were later integrated to create a final single map highlighting areas that have known value as reservoirs of diversity and endemism.

An atlas is being prepared of 12 maps developed during the workshop and the maps are being integrated into a database that will be used within each country to plan and co-ordinate conservation efforts. At periodic intervals scientists will reconvene to refine and update the maps, to discuss how the results are being applied in land-use planning and identify new priority areas for conservation.

Source

Tropicus: A quarterly report to the members of Conservation International, IV (2), 6–7.

Marine turtle conservation in Malaysia

During the past 30 years, the famous leatherback turtle *Dermochelys coriacea* nesting population of Terengganu, Malaysia has dropped precipitously. In the late 1950s an estimated 2000 females nested annually; in 1989 only about 30 to 50 females nested. The other three sea turtle species nesting in Malaysia—the green turtle *Chelonia mydas*, the hawksbill *Eretmochelys imbricata*, and the olive ridley *Lepidochelys olivacea*—although more numerous, are also highly endangered.

In March 1989, WWF-Malaysia launched a two-year 'Save the Turtles' campaign in an effort to raise $M600,000 ($US230,000) to assist state and federal government authorities to implement conservation and education programmes. These include a national survey to identify the most important nesting areas and offshore feeding grounds for all four species of sea turtles in Peninsular Malaysia, Sabah and Sarawak. WWF-Malaysia scientists and staff also gave practical help in managing a section of beach and a hatchery within the Rantau Abang Turtle Sanctuary in Terengganu. In the first year of the campaign, WWF-Malaysia raised $M311,000, of which it spent $M310,000. As a result of the work conducted by the Government and WWF-Malaysia, several new hatcheries and beach sanctuaries have been established, and the level of public awareness has been raised considerably.

This year, WWF-Malaysia will be working closely with the Fisheries Department in a joint effort to discourage the consumption of turtle eggs. The sale and consumption of leatherback eggs has been banned in the State

of Terengganu, which has more marine turtles than any other state, including the only significant population of leatherbacks anywhere in the country. However, in Terengganu, as in other states, there are few restrictions on the sale of eggs belonging to the other three turtle species.

In order to generate public awareness of the survival problems facing marine turtles, WWF-Malaysia has produced 12,000 copies of an educational chart entitled 'Malaysian Turtles in Danger'. The charts are being distributed free of charge to schools throughout the country. WWF-Malaysia regularly issues educational information to the press, radio and TV and it hopes to produce an educational video about Malaysian marine turtles.

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The threatened bears of Hokkaido

Although brown bears *Ursus arctos* were once present on Japan's two largest main islands, today they survive only on the northernmost of these, Hokkaido, and their population is declining fast.

Until 1869 Hokkaido was the territory of the native Ainnu tribe, who believed that the brown bear was the reincarnation of god and who performed ritual ceremonies centred on the bear. In the last 100 years, colonization and subsequent development have brought problems for the bear's population. The human population has increased to a total of 5.67 million and over one-quarter of the island is used for housing and farming.

Our research has shown that by 1984 bear habitat had been reduced by 50 per cent and only 1880–2285 bears remained, compared with an estimated 4500–5000 100 years ago (Kadosaki and Inukai, 1987). Today bear numbers must be even lower, for habitat loss and persecution continue. Between 1978 and 1983 2080 bears were hunted and killed. The bear is unprotected, being considered a harmful animal. In 1989, according to official records, bears were responsible for the injury or death of four horses or cows, the destruction of 42 beehives, 83 raids resulting in damage to 33 ha of corn fields, 24 raids on 3.5 ha of beet fields, and the injury of two hunters. For these reasons 155 bears were killed last year alone.

As the threats to the bears continue and no protected areas have been designated for the species, I am advocating that 10 per cent of the remaining forests be declared a wildlife preservation area to ensure the survival of *Ursus arctos* in Japan.

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The 'downside' of tourism

While tourism can be an aid to conservation, ensuring the protection of wildlife in order to bring in foreign currency, there is another side. The April issue of the *Bangkok Bird Club Bulletin* draws attention to the 'downside' of tourism in Thailand. Forests are being destroyed and pollution from sewage worsens as huge resorts are built in sensitive areas. The country's principal national park, Khao Yai, is under threat due to the profusion of new resorts and tour companies.

A bat cave in the park was once protected by villagers who harvested bat guano, but now that the National Parks Division is responsible, protection is much less effective. Ignorant or unscrupulous tour operators are, by making loud noises, forcing bats to leave the cave well before dusk so that tourists can see them and return to their hotels before dark. Thai guides have also been reported to knock bats to the ground so that tourists can examine them. The bat populations in the cave appear to have declined; a few years ago the mass dusk exodus lasted 20–40 minutes, while a count in January 1990 showed that it was over in 7 minutes. Although there could be other reasons for the apparent decline, it seems likely that disturbance by operators is a contributory if not major factor.

Primates in Bhutan

Bhutan is among the most sparsely inhabited countries of Asia. This small Himalayan kingdom has an area of 46,600 sq km with a population of about 1.5 million. Most of Bhutan is mountainous but there is a narrow strip of plains in the south. The climate ranges from tropical in the south to 'cold mountain' type in the north where most of the peaks of the Greater Himalaya remain permanently snow-covered.

Four species of primates occur in Bhutan: Assamese macaque *Macaca assamensis*, rhesus monkey *Macaca mulatta*, golden langur *Presbytis geei* and capped langur *Presbytis pileatus*. The common or hanuman langur *Presbytis entellus* may also occur.

Assamese and rhesus macaques occur throughout central and southern Bhutan. The former is scarce, preferring dense forest, while the rhesus monkey is found also near human settlements.

The golden langur is the most important primate of Bhutan; this country supports the bulk of this rare primate's populations, with other populations being found only in Assam. The golden langur is fairly widely distributed in the evergreen and semi-evergreen forests of south-central Bhutan, with its stronghold being in the Black Mountains. The Zoological Survey of India has launched several expeditions to Bhutan and counted some 1250 monkeys in the accessible roadside forests (Saha, 1980), which suggests that a much larger population, maybe more than 2000-3000, exists. These langurs occur up to 3000 m, and in winter some descend to lower elevations. This is also evident from the increase in numbers on the Assam side of the border in winter (Mukherjee, 1980). In Assam, the range of golden langur is limited by the Sankosh and Manas rivers, towards the west and east respectively (Choudhury, 1989), but in Bhutan, the upper reaches of these rivers are no barrier, and the monkeys are found along both banks and in the ravines and gorges of some of their tributaries.

The capped langur has not previously been reported in Bhutan, even in the Action Plan for Asian Primate Conservation: 1987-91 (Eudey, 1987). However, I observed a troop on the east bank of Manas river in October 1985, and the species probably occurs in the tropical evergreen and semi-evergreen forests of the south-eastern part of the country, east of Manas river. The habitat is contiguous with the forests in Assam.

The common or hanuman langur has not been recorded, but it may occur in the extreme south-west, on the borders of Sikkim and northern West Bengal, India.

The primates and other wildlife of Bhutan have been well protected in the past by the Buddhist beliefs of the people. However, in the main primate areas of southern Bhutan there are now large numbers of Nepali Hindu settlers. Although hunting of primates has not been reported to date, habitat destruction to accommodate the growing population as well as tree felling for commercial use (both legal and illegal), threaten the primates.

Some primates benefit from the 400-sq-km Manas Wildlife Sanctuary, which was established in 1966 adjacent to India's Manas Tiger Reserve. The best area for a wildlife sanctuary for capped langur is the 235-sq-km Khaling Reserved Forest in the south-east. A national park in the undisturbed Black Mountains to protect a large golden langur population is also recommended and detailed surveys are needed to determine the distribution and status of all the primates in Bhutan.

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