Assessing importance of ex-situ conservation of biodiversity

DR. M. A. BASHAR

CONSERVATION is the optimum rational use of natural resources and the environment, having regard to the various demands made upon them and the need to safeguard and maintain them for the future. It is the protection, improvement and use of natural resources according to principles that will assure their highest economic or social benefits. In ecology, conservation includes those measures concerned with the preservation, restoration, benefaction, maximization, reutilization, substitution, allocation, and integration of natural resources. In the present time, the term conservation has become an integral part of our everyday vocabulary; and various thinkers in the line started to focus their thoughts in different ways on the subject. Many authors tried to explain the concept of conservation for making it clear to a reader. Differences between interpretations largely reflect the preoccupation of the authors. Practically the authors could not come out of their professional ideas in describing the term conservation. According to Tivy and O'Hare (1981) the word 'conservation', like pollution has become popular and well-known to us, yet it is a particularly difficult to define precisely because it can cover a wide range of concept. It means to 'preserve' to retain intact or unchanged; in a wider context it can have wise use or management. The term 'biodiversity' is indeed commonly used to describe the number, variety and variability of living organisms. The very broad usage, embracing many different parameters, is essentially a synonym of 'Live on Earth'.

Ex-situ conservation is the conservation of biodiversity away from its natural habitat. Viable populations of many organisms can be maintained in cultivation or in captivity. Plants may also be maintained in seed banks and germplasm collections; similar techniques are under development for animals (storage of embryos, eggs, sperm) but are more problematic. In any event, ex-situ conservation is clearly only feasible at present for a small percentage of organisms. It is extremely costly in the case of most animals, and while it would in principle be possible to conserve a very large proportion of higher plants ex-situ, this would still amount to a small percentage of the world's organisms. It often involves a loss of genetic diversity through founder effects and the high probability of inbreeding.

Protected areas are the main device for in-situ conservation, relying on ecosystems to sustain themselves, with some help. An alternative for endangered species is to establish a captive population away from its natural habitat. This ex-situ approach includes captive breeding, release schemes and biodiversity banks such as seed collections. Several species have famously been saved from extinction by ex-situ schemes. Some species still only survive in captivity. The earliest known example of an ex-situ success is Pere David's deer, extinct in the Chinese wilds some 3,000 years ago but surviving in a park. Other celebrity examples include the NeNe goose of Hawaii, nurtured at the Wildfowl and Wetlands Trust, the black footed ferret in the USA, the entire remnant population taken into captivity between 1987 and 1991 to escape canine distemper, and the partula snails of Hawaii, a rare example of populated invertebrate conservation due to the survivors living in sandwich boxes at London zoo.

Ex-situ and in-situ conservation should not be thought as alternatives or rivals. Ex-situ schemes should be linked to in-situ projects to augment remaining populations or establish new ones. Ex-situ schemes can link directly with protected areas, providing stock to release, research data and, in the case of zoos, funds from ticket sales. Ex-situ populations are a refuge while in-situ threats can be dealt with. Captive stock create additional benefits as popular icons, inspiring interest and finance. They act as flagship and are important for education, spotlighting endemism, hot spots or particular threats. Successful release schemes are effective symbols, building more support for conservation. Wild population will be important to captive stock to maintain genetic diversity and reinforce captive bred stocks. Ex-situ programmes raise problems equal to their benefits.

The variety of past schemes and failure have driven attempts to codify principles and practice for ex-situ conservation. Ex-situ schemes are now seen as support for populations in their natural habitat. Ex-situ projects should be used as refuges for populations in immediate danger of extinction, as part of programmes to ensure the long-term survival and for education and research. Projects should promote the longevity, health and quality of life for captives, ensure reproduction maintains stocks to avoid taking more from the wild and maintains natural patterns of genetic diversity, sex ratios and age structures. Captive breeding can then support releases, re-establish ecologically or culturally important species and perhaps bring economic benefits. These goals need an understanding of the biology of small populations, the experience, training and technologies to carry them out and management to co-ordinate work, not just with the captive stock but responsive to changes in wild populations. The result is international co-ordination of ex-situ schemes, controlling both the management of captive stocks and attentive to wider priorities for species conservation.

The IUCN World Conservation Union have a Species Survival Commission to which the Captive Breeding Specialist Group (CBSG) reports on individual species. The International Species Information System (ISIS) uses tools such as the Animal Records Keeping System (ARKS) and studbooks which record the ancestry and whereabouts of individual animals. ISIS handles data on 4,200 animals, from 395 zoos in 39 countries. There are over 300 breeding programmes, featuring over 200 endangered species. Co-ordination extends beyond cataloguing existing schemes. The CBSG and taxon Advisory Groups use Conservation Assessment and Management Plans (CAMPs), which include Population and Habitat Viability Assessment (PHVAs) to identify priorities and future needs or opportunities. CAMPs are strategic plans for management of threatened taxa. Workshops collate existing data and assess threats and extinction probabilities and population estimates for both in-situ and ex-situ stocks. The species is then assigned to a category (critical, endangered, vulnerable or safe) and recommendations are made for action. These can include the need for PHVAs, management plan workshops, conservation ex-situ, gaps in research and technology or captive breeding. The outcome of a CAMPs review is a Global Captive Action Plan (GCAP), an international or regional plan for captive breeding but in support of in-situ conservation. GCAPs assess which species should remain in captivity, be added or need not be, and review available resources and technology plus research and financial benefits to wild populations (after: J. Jeffries, 1997).

+According to Snyder (1996) ex-situ conservation efforts have certain basic limitations in comparison with in situ preservation.

+ Population size. To prevent genetic drift, ex situ populations of at least several hundred individuals need to be maintained. No one zoo can maintain such large numbers of the larger animals, and only a few vertebrate species can be maintained in captivity at such numbers globally. In botanical gardens, only one or a few individuals of most species typically are maintained, especially in the case of trees.

+ Adaptation. Ex situ populations may undergo genetic adaptation to their artificial environment. For example, animal species kept in captivity for several generations may exhibit changes in mouthparts and digestive enzymes due to the diet of zoo food; when the animals from this altered population are returned to the wild, they may have difficulty eating their natural diet.

+ Learning skills. Individuals in ex situ populations may be ignorant of their natural environment and unable to survive in the wild. For example, captive-bred animals may no longer recognize wild foods as edible or be able to locate water sources if they are released back into the wild. This problem is most likely to occur among social mammals and birds in which juveniles learn survival skills and locations of critical resources from adult members of the populations. Migratory animals will not know where or when to migrate.

+ Genetic variability. Ex situ populations may represent only a limited portion of the gene pool of the species. For example, a captive population started using individuals collected from a warm lowland site may be unable to adapt physiologically to colder highland sites formerly occupied by the species.

+ Continuity. Ex situ conservation efforts require a continuous supply of funds and a steady institutional policy. While this is also true to some extent for in situ conservation efforts, interruption of care in a zoo, aquarium, or greenhouse lasting only days or weeks can result in considerable losses of both individuals and species. Frozen and chilled collections of sperm, eggs, tissues, and seeds are particularly vulnerable to the loss of electric power. The breakup of the former Soviet Union, the deterioration of the Russian economy, and civil wars in its outlying states provide abundant examples of how rapidly conditions can shift in a country. Zoos are not going to be able to maintain their animal collections under such circumstances.

+ Concentration. Because ex situ conservation efforts are sometimes concentrated in one relatively small place, there is a danger of an entire population of an endangered species being destroyed by a catastrophe such as fire, hurricane, or epidemic.

+ Surplus animals. Some species breed too easily in captivity. What should be done with surplus animals in captivity that no other zoo wants and that have no chance of surviving in the wild? This ethical issue must be addressed: the welfare of any animal taken into human custody is the responsibility of its captors, so it may be unacceptable to kill or sell an individual animal, particularly when each animal in a highly threatened species might represent a key component of the species future survival.

In spite of these limitations, ex situ conservation strategies may prove to be the best, perhaps the only alternative when in situ preservation of a species is difficult or impossible. (after: Primack 1998). In Bangladesh, we have many important places and spots which are mostly suitable for the use of 'ex-situ' conservation of biodiversity purpose. These are the Ecoparks, national parks, sanctuaries, different forest areas and even some agro-ecosystem areas for the terrestrial biodiversity conservation. In these 'ex-situ' situation, both plants and animal germ-plasm maintenance could made not only for biodiversity conservation but also for augmentation of materials for biotechnology development and sustenance. Of the animals, deer breeding and its population maximization could be made for commercial use and trade purposes easily in 'ex-situ' areas. In our country, haors, baors, bills, lakes and ponds could be used or modified as 'ex-situ' conservation sites for aquatic biodiversity and wetland biodiversity. In this way, both the species and genetic biodiversity conservation could be maintained in Bangladesh in a better way than of the other countries in the continent.

DR. M. A. Bashar is Prof. Department of Zoology, Dhaka University, and Pro-Vice Chancellor, Bangladesh Open University, Gazipur.

In our country, haors, baors, bills, lakes and ponds could be used or modified as 'ex-situ' conservation sites for aquatic biodiversity and wetland biodiversity. In this way, both the species and genetic biodiversity conservation could be maintained in Bangladesh in a better way than of the other countries in the continent.

The Kyoto treaty solemnly doomed?

BILLY I AHMED

FIFTEEN years of international effort to combat climate change appeared doomed after Russia said it would not ratify the Kyoto protocol, the world treaty on global warming.

Russian ratification is fundamental for the treaty to take effect. Andrei Illarionov, a senior economic adviser to President Vladimir Putin, said in an amazing announcement in Moscow that Russia was refusing to sign the agreement, reasoning that to do so would threaten the country's economic growth.

He said, after a meeting between President Putin and European businessmen, "In its current form, this protocol cannot be ratified. The Kyoto protocol places significant limitations on the economic growth of Russia. It's impossible to undertake responsibilities that place serious limits on the country's growth."

The decision by Moscow means biting the dust of the mechanism, agonisingly constructed by thousands officials from more than 150 countries over a decade and a half, for the world to try to deal with its greatest threat. United Nations scientists now predict that global average temperatures may rise by up to 6° C by the end of the century in a profound climatic destabilisation that will result in fiercer storms and rising sea levels.

In large areas of the world, agriculture may become impossible; other parts may become uninhabitable because of flooding, hurricanes, increased disease, or the disappearance of the land. This will take place while the earth's population is rising towards 10 billion or more.

The diplomats were trying to clarify the status of the Russian decision, by saying Moscow has many obstacles in the pact to limit emissions of the greenhouse gases, principally carbon dioxide from motor vehicles and electricity generation, which are causing the atmosphere to heat.

Since the treaty was agreed in December 1997, 120 countries including Britain have ratified it, but its fate has hung by a Russian thread since President George Bush withdrew the US from it in March 2001, also alleging a threat to economic competitiveness.

The treaty to be effective has to be ratified by nations responsible for 55 per cent or more of the greenhouse gas emissions. In the absence of the US, the world's biggest emitter with 25 per cent of the total, this could not be achieved without the Russian contribution of 17 per cent.

On a related story, The Independent notes that since January, many of the predicted consequences of a steadily warming atmosphere have started to come true. In June the World Meteorological Organisation drew attention to extreme weather events across the world and in a highly unusual move, linked them to global warming explicitly.

India, Sri Lanka and the United States have registered record high temperatures, rainfall and tornadoes this year. There have been an increasing number of scientific reports of rapidly melting ice in both the Arctic and the Antarctic, and rapidly melting mountain glaciers.

Continental Europe has seen forest fires like never before, and great rivers like Italy's Po have been reduced to a trickle.

Meanwhile, The Financial Times points out that something has to be done about global warming. If ever there was a case for taking precautionary action, it is surely in a situation where damage would be colossal, and irreversible. It is not enough to rely on "breakthrough technologies" emerging in energy efficiency, as urged by a senior US official.

Further, The Guardian reports that the Kyoto climate change pact looked to be in trouble after the European Commission warned that 13 of the EU's 15 member states were set to miss their emission reduction targets by a huge margin. The 1997 United Nations pact is seen as the world's only chance to reduce global warming in a meaningful way and requires major industrialised countries to slash their 1990 greenhouse gas emissions.

However, Margot Wallstrom, the EU's environment commissioner, warned that the EU's own efforts to cut greenhouse gas emissions were in crisis. Ms Wallstrom said that only two countries, Sweden and the UK, were on track to meet the EU's target of cutting 1990 greenhouse emissions by 8 percent before 2010 and that 13 of the EU's 15 member states would easily miss that goal.

In related stories, The Daily Telegraph reports that more than half of all ski resorts in the Alps could be forced out of business in the next 50 years by rising temperatures, according to research published.

Low-lying slopes such as Kitzbuhel in Austria and Oberstdorf in Germany may receive so little snow over the next 30 to 50 years that skiing, snowboarding and tobogganing cease to be viable winter industries. The warning comes in a study by the University of Zurich for The United Nations Environment Programme. Its predictions are based on scientific estimates that temperatures will increase by between 1.4˚C (2.5˚F) and 5.8˚C(10.4˚F) during this century.

Downhill skiing could disappear altogether at some resorts, while at others, a retreating snow line will cut off base villages from their ski runs as soon as 2030, warned the report by the UN Environment Programme.

"Climate change is happening now. We can measure it," said Klaus Toepfer, executive director of the UN programme. "This study shows that it is not just the developing world that will suffer."

Billy I Ahmed is a researcher.