IUCN – The World Conservation Union

19th Session of the General Assembly, 18–26 January 1994

I was one of over 1000 delegates, representing 103 countries and nearly 300 non-governmental organizations assembled in Buenos Aires, Argentina, to take part in the 19th session of IUCN's General Assembly, one of the premier events in the conservation calendar.

The Assembly was opened by Argentina's President, Carlos Menem, who welcomed the theme 'Caring for the Earth', stressed the need for holistic sustainability and urged participants to generate a new model of living that will maintain the harmony of the planet.

Over 150 resolutions – more than at the General Assembly in Australia 3 years ago – were debated, negotiated, discussed and adopted. Notable among them were those on sustainable use of wildlife, Antarctica, whaling, sustainable development and the role of the IUCN Commissions. However, FFPS's sponsored resolution on the Conservation of Country Endemic Species was passed with only minor amendment. The mission, strategy and role of the IUCN dominated discussions, both in the plenary sessions and on the fringe.

Delegates were highly concerned that IUCN was moving away from mainstream conservation and was aligning itself too much with the major development agencies. It was argued that this could affect the organization's central focus. Other concerns centred on the fear that IUCN's regionalization programme could lead to competition with its members rather than facilitate and enable their activities. The debate culminated in an agreed mission statement that focused on helping local communities world-wide to conserve their own biological diversity.

A report reviewing the role of all five IUCN Commissions was presented. This led to strong support for the Species Survival Commission and the Commission on National Parks and Protected Areas and the recommendation that closer links be forged between them. The Commission on Ecology was axed and a proposal for setting up a Commission of Ecosystem Management endorsed. In reviewing the Commissions, it became clear that, while progress is being made and, in some instances, vast resources in terms of volunteers are being used, they are still woefully underfunded. This matter needs urgent attention and it is hoped that it will not be adjourned for a decision at the next General Assembly.

During the Assembly Professor Vo Quy (Vietnam) was awarded the John Philips Medal and P. H. C. (Bing) Lucas was given the Packard Award. Peter Scott Awards of Merit were given posthumously to Dr Theodore A. Parker III, Dr Alwyn H. Gentry and Eduardo Aspiazu.

The Assembly was magnificently chaired by retiring President, Sir Shridath Ramphal, who welcomed the new President Elect, Jay D. Hair (USA) and the new Director Designate, David McDowell. The latter has held a number of senior appointments in the New Zealand Government, including Director General of the Department of Conservation, and is currently the New Zealand Ambassador to Japan. He takes up his appointment with IUCN in April. The President also paid tribute to the achievements and distinguished services of the retiring Director General, Martin Holdgate, who has been a driving force behind many of the Union's achievements over the last 5 years.

I think that all those attending would agree that the General Assembly was hectic, with, at times, more business being done around the periphery than in the Assembly itself. The workshops were an essential part of the process, helping to gain consensus and keeping the business on track. The increased number of resolutions did not help matters, particularly as a significant number could be regarded, at best, as inappropriate and, at worst, as a waste of time. It was, therefore, reassuring to hear in the summing-up that this and other institutional and organizational matters are to be reviewed before the next General Assembly. Given the hybrid nature of the Union and its stage of development, it is not surprising that internal matters should take up a significant proportion of time. There

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must always be room for such debate but it should not impinge on the direct conservation effort required to ensure that positive progress is made on appropriate resolutions. These should take up a much larger part of the reporting time in future than at this General Assembly. The responsibility for ensuring that this happens lies not with the Secretariat alone and will depend on the co-operation and actions of all Union members.

Contenders for hosting the 20th session of the General Assembly – to be called the World Conservation Congress – in 1997 are Canada and Zimbabwe.

Mark Rose, Director, FFPS

African elephants: a step towards ensuring their future

An important debate in the search for a sustainable future for Africa's elephants took place during the Wildlife Society of Zimbabwe's annual general meeting in August 1993. The Society was prompted to do this in view of the serious differences between wildlife experts in Southern and Eastern Africa regarding elephant management, which were revealed at the CITES meetings of 1989 and 1991. Mike Jones, senior ecologist in Zimbabwe's Department of National Parks and Wildlife Management, and Professor John Hanks, chief executive of the Southern Africa Nature Foundation, represented the Southern African point of view. Iain Douglas Hamilton and Simon Trevor, both from Kenya, gave personal East African perspectives. The debate was chaired by Colin Saunders, a former chairman of Zimbabwe's National Parks Board. A supplement to *Zimbabwe Wildlife* presented an almost verbatim report of the proceedings. It became clear during the meeting that all African countries with elephants should convene and attempt to reach a consensus of opinion in order to present a united front at the next meeting of CITES (in late 1994). Unless this were done, decisions concerning the future of the continent's elephants would, according to some of the participants, continue to be made by those who lived outside its borders. The meeting closed with a resolution that the Wildlife Society of Zimbabwe organize a more representative and higher-level meeting to help reconcile national policy differences in the interests of African elephants.

The presentations centred on two main points: culling as a management technique and the resumption of the legal trade in ivory. At the CITES meeting in 1989 the Southern African states, particularly South Africa and Zimbabwe, wanted the legal trade in elephants and their products to continue. They argued that the revenue from the ivory trade was going into local conservation funds and to local communities. Others, notably East African countries, argued that attempts to control the trade had failed and that keeping it open would result in even greater declines in elephant numbers. After acrimonious debate the delegates voted to ban the legal trade in elephants by moving them to Appendix I. The trade ban became effective on 18 January 1990 and within weeks the international trade in ivory collapsed.

Adaptive management in Zimbabwe

Zimbabwe's elephant management policies are based on regulating numbers so that the carrying capacity of the habitat is not exceeded. Evidence of the rates of change in woodland cover and loss of woodlands elsewhere in Africa suggests that elephants will remove entire woodlands unless their numbers are regulated, resulting in the loss of woodland plants and animals. In choosing to regulate elephant populations the Wildlife Department places an equal value on all the species that occur in protected areas. The aim is to have a small vibrant population of elephants with a full range of other plant and animal species that occur in such habitats, rather than degraded scrub land with a collapsed and declining elephant population.

The Zimbabwe Wildlife Department regulate elephant populations in several ways,

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including culling. Department staff selectively kill whole herds to minimize disturbance, although other herds will be disturbed to some extent by gunfire, people and vehicles.

While culling was undoubtedly distressing, Mike Jones considered the alternatives to be more so. If nothing were done, elephants would die a slow, possibly painful, death by starvation. Alternative methods were used where possible and large numbers of elephants had been captured and translocated. However, there is a limit to the number of places that elephants can be moved to and, in time, these populations will also exceed the carrying capacity of the habitat.

Jones said that contraception for elephants was not feasible at present. The hormonal implant is the size of a football and catching sufficient numbers of elephants of breeding age and treating them every 2 years would be more disturbing than culling because it would require the use of several helicopters, which induce panic in the animals.

Zimbabwe is one of the only places in Africa where elephant range is being expanded, commercially and communally. Private conservancies want to buy elephants because of their potential economic return. In the communal Campfire programme and in game ranching elephants are given as much value as possible, supporting four kinds of use: sport-hunting for ivory; cropping for food and hides for local use; establishment of manufacturing industries in rural areas to add value to the raw products; and non-consumptive tourism. All are legitimate uses and ensure sustainable survival in the long term.

Non-intervention management in Kenya

Simon Trevor explained how elephant management in Kenya differed from that in Southern Africa. Using Tsavo National Park in Kenya as his example, he explained that elephants have not been managed and that this policy of non-intervention has resulted in a park that supports large numbers of grazing species, large numbers of predators and thousands of tourists.

About 40 years ago Tsavo was heavily wooded and had few grazing animals, but by the late 1950s elephants were making such a big impact on the woodland that there was a suggestion that they be culled. In the years that followed elephants continued to demolish the woodland but calls for elephant culls were resisted. As a result of the elephant pressure, the habitat has gradually changed from dense *Commiphora* woodland to a more open and productive ecosystem of perennial grassland and *Acacia*. As the grassland spread so did the numbers of grazing animals, rodents, ground-nesting birds and predators.

The drought years of 1970–74 resulted in about 9000 of the 45,000 elephants in Tsavo dying and Trevor believes that, if there had been no poaching, the elephants would have continued to decline naturally until a balance with the vegetation was reached. As it was, elephant poaching spread, eventually reducing numbers in the park to 6500.

Prior to the ivory ban, Tsavo was losing three elephants a day to poachers; in 1990 only 15 elephants were killed and in 1991 not one elephant was killed in the park. The open *Acacia* habitat is ideal for game viewing and this brings in tourist revenue. Every cent is used by Kenya Wildlife Service in the parks and in improving the lives of local people.

Trevor believes that culling brings unacceptable stress to elephant groups near those culled. He feels that death by starvation, although distressing, is preferable to this because it is a natural death – one that comes to all elephants if they live long enough. He questions the degree to which management should be imposed: 'When we as humans take the huge step of treating them [elephants] as pawns in a game whose rules we have invented, we must beware that when that means killing them in large numbers, we had better be sure that the rules of the game are right.'

Trade in elephant products – the South African perspective

John Hanks, defending Southern Africa's point of view, said that there is a dramatic

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shortfall between the funds needed to guarantee lasting security for elephants and the funds provided by governments and international donors. The African Elephant Conservation Co-ordinating Group recently estimated that at least $US250 million was required to implement effective elephant conservation programmes in existing protected areas. The group did not consider the fate of the elephants outside protected areas. He asked where the money would come from and why impoverished African countries should look after such large and potentially destructive animals unless they have a value to the country as a whole or to local communities that are threatened by their presence. He believes that Africa cannot afford 600,000 elephants and that we should concentrate on conserving elephant populations in protected areas instead of believing that we can conserve elephants everywhere. Elephants outside protected areas can have a future only if they have a consumptive use because, while ecotourism could work in some places to generate funds, it was not the answer everywhere.

John Hanks felt that the ivory trade was closed because of intervention from vociferous groups at CITES who came from countries with no elephants. Uninformed sentiment and emotion have intruded into what should be essentially an African problem, resolved by African people. He believes that different elephant populations have different management needs and that the CITES mechanism for split-listing (some elephant populations to remain on Appendix I and others to be transferred to Appendix II) could accommodate these differences. He believes that South Africa now has a very strong case for a split-listing, for the marketing of raw ivory, that is sufficiently stringent to attract the support of other member states.

For an initial period South Africa would sell tusks derived from ecological management programmes or natural mortality only from Kruger National Park. The tusks would be stored at the Park headquarters and each tusk would be marked with a unique, tamper-proof hologram bearing a serial number. The ivory would be sold at an annual auction to approved nations, not to ivory traders, and would go straight to the consuming nation in sealed containers and straight to the major manufacturers of ivory products. A small sample from each tusk would be taken and stored for possible future identification purposes using isotopic analysis. For the system to work, much stricter controls would have to be put in place in the importing nations: current stocks of ivory in the possession of potential purchasers would have to be registered; all dealers would have to be registered and approved; the purchasing country would have to be able to implement an effective ban on the export or re-export of ivory and ivory products; and the authorities in the purchasing countries must be able to take ivory samples in their countries for isotopic analysis, to overcome the problems of identifying illegal ivory that is moved through the legal trade route.

Trade in elephant products – the East African perspective

Iain Douglas Hamilton, speaking from the East African perspective, denied that all members of the pro-ivory ban movement were sentimentalists, against elephant management, split-listing, sport-hunting and were narrow-minded preservationists. He believes that there are sound reasons for keeping the ivory trade closed and that there is strong African support for this north of the Zambesi.

Before the ban in 1989, population and ivory trade data indicated an elephant collapse in most of Africa. The only exceptions were in parts of Southern Africa, but it was feared that if the ivory offtake continued, poaching would inevitably spread to the remaining untouched populations and by then the elephant populations in the north would have largely been eradicated.

Since the ban, the price of ivory has collapsed and with it the ivory markets. Elephant poaching in most of Africa has fallen dramatically. The opinion of the wildlife departments in East Africa is that by lowering the price of ivory, the incentive to risk one's life as a poacher has also been lowered. Central and

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West African countries have also reported a dramatic fall in poaching for elephants, without any better policing.

Douglas Hamilton has no quarrel with Zimbabwe's solution to sustainable use of elephants and believes that meat and skin from sustainable sources could be traded internationally now and that split-listing for those elephant populations involved would be appropriate. He believes that any resumption of the trade in ivory would be the thin end of the wedge, sending out signals world-wide that buying, selling, owning and wearing ivory were once more acceptable. It would only be a matter of time before other countries demanded equal treatment to South Africa, even if they did not have the same tight management as the Kruger National Park. Then we would be back where we started – with an out-of-control international ivory trade. CITES controls are expensive to maintain and even South Africa has unscrupulous businessmen willing to exploit any flaw in the control system. He argued that, while isotopic analysis can be used successfully to identify the origin of ivory, it is very expensive. At $US200 per tusk, it would probably tax the few honest traders out of business if trade generally resumed. Even if it became cheaper, it would take years to translate the technique into an available procedure for African Customs officers. And it will never solve the problem of corruption, which has surrounded the commerce of ivory in most of Africa.

Referring to the main arguments of the pro-traders – that without ivory sales they would lose funds that could have been used to benefit conservation – he wondered how much of the money made by selling ivory actually did come back to conservation. He thought that the gain to South Africa from renewed trade in ivory would not be that significant in terms of the national economy and would be greatly outweighed by the extra costs other nations would have to pay, especially in East Africa, in terms of increased law enforcement, should the resumption of ivory trading prove to be a trigger to poaching elsewhere. He described how in Kenya the wildlife service was given independent status in 1990. Since then revenues have quadrupled and the organization has the ability to raise money from foreign revenues directly. He feels that Kenya set a good example to the world by burning its ivory and that as a result it has been able to attract international funds for conservation. The success of the ivory trade ban in East Africa has meant so far that development money for wildlife can be spent on more productive budgets than anti-poaching. He feels that tourist revenues have a very great potential and also thinks the priorities of the World Bank need changing – there are some things worth protecting and preserving that will never pay their way and somebody must pay for them.

The meeting represented a great step forward in trying to resolve the differences of approach to conserving elephants. It is hoped that further steps will result in African countries speaking with one voice at this year's CITES meeting, firmly taking future responsibility for the continent's elephant populations into their own hands.

Source: Zimbabwe's great elephant debate. Supplement to *Zimbabwe Wildlife,* October–December 1993, 20 pp.

Status of the tiger in 1993 and threats to its future

There are between 4600 and 7700 tigers in the wild today. These figures are largely guesses because naturally secretive tigers are difficult to count in their home forests. Of the eight recognized subspecies, the Bali tiger *Panthera tigris balica*, Caspian tiger *P. t. virgata* and Javan tiger *P. t. sondaica* are all probably extinct and the South China tiger *P. t. amoyensis* is virtually extinct, with only 30–80 individuals left. The Siberian tiger *P. t. altaica* numbers 250–400, the Sumatran tiger *P. t. sumatrae* numbers 400–500, the Indo-Chinese tiger *P. t. corbetti* 900–1500 and the Bengal tiger *P. t. tigris* numbers 3100–5300. Of the five extant subspecies, the Siberian tiger is threatened by poaching and the others are threatened by poaching and habitat loss.

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The current estimates of tiger numbers are based on replies to a questionnaire circulated in May 1993 to officials and non-officials of the 14 Asian countries with tiger populations, and on information collected at various times by the IUCN/SSC Cat Specialist Group. The countries questioned were Bangladesh, Bhutan, Cambodia, China, India, Indonesia, North Korea, Laos, Malaysia, Myanmar, Nepal, Russia, Thailand and Vietnam. No responses were received from Cambodia, China, Indonesia, North Korea and Laos. However, recent information was available from Indonesia.

Establishing tiger numbers is extremely difficult because they are naturally secretive, forest-dwelling animals, ranging over large areas of often rugged terrain. Only in India, where half the world's tigers live, and in Malaysia have attempts been made to establish a reasonably exact number of tigers by means of a series of censuses. In some other places, estimates of tiger numbers have been made by extrapolating the results of studies of tiger density to the known range. Other estimates were based on anecdotal reports by forest guards and local people.

Seven of the eight subspecies were included in the first edition of the *IUCN Red Data Book* in 1964. The Bengal tiger *Panthera t. tigris* was added in 1971 following alarm about the obvious decline resulting from hunting for sport and for skins. The alarm led to the launching by the World Wildlife Fund (now the World Wide Fund for Nature) of 'Operation Tiger' to raise $US1,000,000 to support conservation. In 1973, the Government of India initiated 'Project Tiger', based on total protection of the tiger and conservation of selected areas of habitat as reserves managed primarily for tigers.

The first pugmark census in India in 1971, admitted to be incomplete and to involve some double counting, produced a baseline figure of 1800 tigers. Official figures for subsequent censuses have shown tigers increasing to 4334 in 1989. Doubts have been expressed about the accuracy of this figure, with many Indian specialists suggesting that it is exaggerated. Results from an all-India census in 1993 are awaited.

While other countries had no specific tiger conservation programmes, most range states provided legal protection and tigers existed in protected areas, although some of these areas lacked protection on the ground.

Although it is generally agreed that other tiger subspecies have declined, data are generally lacking. This makes it difficult to provide a clear picture of the changes in the world tiger population in the past 20 years. If the extent of the increase in Bengal tigers in India is valid, it is likely to have counter-balanced declines elsewhere, so that there might be little difference in the overall number of tigers in 1973 and 1993. In the ultimate analysis, all depends on the authenticity of estimates of the tiger population in India. Non-official estimates suggest that there may be barely more than half as many tigers in India as officially reported. If this proved to be even nearly true, then a dramatic decline in tiger numbers in the past 20 years would be established.

Poaching and trade in tiger products

Poaching and trade in tiger products are widespread throughout tiger range despite the fact that the international trade is banned under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). By their clandestine nature, they are are difficult to detect. Unless there are sufficient forest guards, tiger carcasses are unlikely to be found and soon vanish. Poachers may bury remains, including skins, if bones are the target. While skins can be easily identified, only a handful of experts can identify bones, which can be readily transported and mistaken for other (legitimate) animal bones, in which there is normal trade.

The instances of poaching that come to light can be considered just the tip of the iceberg, which suggests that at least five or six times as many tigers are poached as instances known. Furthermore, the damage from poaching is not limited to the single animal involved. The killing of a tigress may mean the loss of up to four young cubs, while the death of a male tiger may lead to territorial battles between

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other males, resulting in infanticide and poor cub survival for even 2 years. Where a few tigers survive in an isolated population (a situation that exists in many places) the loss of just a few individuals, especially if they are females, could push the population below the survival level.

Little documentation of recovery of skins or bones is available, but information from Indian wildlife preservation authorities in 12 of India's 24 states and Delhi Territory revealed that 76 skins or skeletons were recovered between 1988 and 1992 – involving a possible loss of up to 400 tigers. In Nepal, a number of seizures of tiger bones have occurred and tiger products have been found in markets in Laos, Vietnam, Thailand, Taiwan and South Korea. Medicinal plaster, labelled as containing tiger bone, has been found in Geneva and Rome and tiger-bone wine in London. Some of these products, however, have been found by the US Fish and Wildlife Forensic Laboratory to contain no bone of any kind.

Six of the 14 tiger range countries are not Parties to CITES: Bhutan, Cambodia, North Korea, Laos, Myanmar and Vietnam. Implementation varies in strength among those that are Parties, but in none is it adequate to stem a considerable level of illegal international commerce. This is due largely to low political and administrative priority for wildlife conservation, insufficient staff, lack of training, equipment and financial support, as well as long and difficult border terrain where smuggling is relatively easy.

The tiger is reproducing well and is clearly in its evolutionary prime, its numbers limited only by human action: killing and destruction of habitat. Its future depends on: (1) international and national commitment to conservation; (2) effective implementation of existing international and national laws; (3) upgrading of the tiger's legal status wherever necessary; (4) strict implementation of CITES by all 14 tiger range countries; (5) co-operation between range countries in combatting poaching and trade in tiger products; (6) strenuous efforts to protect existing tiger populations and their habitat; (7) international support, moral and financial, for conservation in tiger range countries.

Source: A report by Peter Jackson, Chairman, IUCN/SSC Cat Specialist Group.

Gold-mining threatens Dumoga-Bone National Park

The Dumoga-Bone National Park in North Sulawesi, Indonesia, is seriously threatened due to illegal gold-mining. Unless immediate action is undertaken the park will certainly lose its value as a stronghold for a great number of endemic species. As well as gold-mining, rattan collection is causing great harm to the forest ecology, and the park's function as a water catchment area is under pressure.

The Dumoga-Bone National Park (300,000 ha and now called Nani-Wartabone) was declared a national park in 1984 by the Ministry of Forestry. Sulawesi has a high number of endemic species, with 65 per cent of mammals and 80 per cent of birds being endemic, and the highest level of endemism is found in the northern peninsula, making Dumoga-Bone of immense conservation importance.

Gold-mining is not a new threat. Even before the national park was established some gold-mining took place, creating clearings in the forest and disturbance. At the end of the 1980s it became clear that the problem could not be solved by park employees alone.

The present director of the park, Ir. Koesno, who was installed in April 1991, started negotiations with the authorities in an attempt to stop mining but he was unsuccessful. By 1993 the situation had seriously deteriorated; a visit to the park revealed that thousands of people in the Dumoga Valley (which has some 65,000 inhabitants) were involved in gold-mining, including police officers and park employees. Gold-trading takes place in restaurants, rocks containing gold are stored next to village houses and many children wear gold bracelets, collars and rings.

Groups of up to 300 gold-diggers live in semi-permanent camps deep inside the park.

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The forest has been completely destroyed or severely damaged in a wide area around the camps, not only from the gold-digging itself but also from the negative impact of transporting the gold, the use of timber as fuel and to build camps, and the trapping of animals for food. At the moment, only people from North Sulawesi seem to be involved. Most of them work for local traders, called 'gold kings', who may be local policemen or park employees. The mining activities take place in the entire park, with a concentration in the Toraut area in the east.

If the gold-digging is allowed to continue, this national park will be badly degraded in a few years. This may have serious consequences for agriculture in a great part of North Sulawesi because the park functions as a water catchment area for the region.

Illegal rattan collection has also increased in the park; the same visit in 1993 found rattan collectors all over the park in groups of up to 20 people. The forest ecology is seriously threatened by these activities.

If no immediate action is taken the park will certainly lose its function as one of the world's richest environments in terms of biodiversity. Both the director of the national park, and the head of the provincial nature conservation department, Ir. Palete, have expressed their concern and the head of the newly established research institute (Wallacea, near Toraut) has called for international protests.

Conservationists make progress at Thailand's threatened park

A combined effort between national conservation organizations in Thailand and bird conservation organizations in the UK has made substantial progress towards thwarting the degradation at Khao Sam Roi Yot National Park, which was reported in *Oryx* (**27** [4], 245–249). This important wetland has a long history of conflict between the authorities and landowners over the boundaries of the protected area. Encroachment for aquaculture, poor enforcement of the law, corruption and broken government promises made prospects for the park bleak.

In an effort to gain local support for the park, the Asia Foundation, under the auspices of the Seub Nakhasathien Foundation, funded a study tour to the UK for a local businessman from Sam Roi Yot, the District Officer from Kuibiri District, the Director of Marine National Parks, and the President of the Bird Conservation Society of Thailand. They visited some of the best wetland sites in East Anglia, where the autumn migration of birds were attracting large numbers of bird-watchers, and the headquarters of the Royal Society for the Protection of Birds and BirdLife International.

As a follow-up to the study tour, a meeting was held on 7 October 1993 at the Khao Sam Roi Yot National Park headquarters between all the members of the study group together with the President and Secretary-General of the Seub Nakhasathien Foundation and forestry officials. It was agreed that a committee of villagers, local and national government officials and representatives from national conservation organizations should be set up to consider further developments at the park. The committee was approved by the National Wetlands Committee at its first meeting on 26 October 1993.

Khao Sam Roi Yot National Park is still listed as one of the world's most threatened parks but, with the new committee to guide its wise management and support from at least some influential local people, there is hope.

John Parr, Bangkok, Thailand

Fish conservation workshop in Africa

A workshop on the conservation of diversity, *in situ* and *ex situ*, was held during the International Symposium on Biological Diversity in African Fresh and Brackish Water

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Fishes in Dakar, Senegal, 15–20 November 1993. Some of the main conclusions and recommendations resulting from the workshop are given below.

General action for conservation

The high biodiversity seen in African fresh and brackish water fishes is a living aquatic resource of immense economic and nutritional importance, but it is also a wildlife heritage. The prime aim of conservation activities is to retain biodiversity in nature and, as far as possible, to retain natural biotopes. To achieve this aim, active management is often required *in situ* and *ex situ*, both for commercial fisheries and for rare and endangered species, including those in wildlife reserves. There is a need to resolve potential conflicts of interest. For instance, the introduction of exotic or cultivated species to new locations may sometimes be beneficial for fisheries but such introductions can also pose threats to the survival of indigenous species.

An integrated, multidisciplinary approach to *in situ* and *ex situ* conservation is needed, involving the local community and wildlife conservation authorities (local, national and sometimes international). Such efforts may also require contributions from biologists over a wide-range of specialisms, from taxonomy and ecology to genetics and fisheries management, and to conservation education and export industries.

There is a need to review inventories of African fresh and brackish water fishes in relation to the *IUCN/SSC Red List of Threatened Species*. While southern Africa is covered in some detail, entries for the rest of Africa are inadequate. Throughout Africa there are localized communities of endemic species that are not listed and that are at least vulnerable, for example: several putative species in the *Barbus intermedius* complex in Lake Tana, Ethiopia; several described and undescribed freshwater species, particularly cichlids, of Madagascar; and endemic cichlids in the crater lakes of West Africa.

There is a also a need to evaluate critically the IUCN/SSC criteria for endangerment applied to African freshwater fishes. New criteria have been proposed, which aim to quantify the risk of extinction in genetic terms; they are elaborate, of uncertain application in the case of fishes and, as currently formulated, will probably be difficult to apply to practical conservation problems in the field. The IUCN/SSC Global Action Plan for Freshwater Fishes is currently being developed through the IUCN/SSC Freshwater Fish Specialist Group and will include prioritized proposals for the conservation of African freshwater species.

Conservation action *in situ*

There is a need to establish more fresh and brackish water national nature reserves and the recognition of more World Heritage Sites. A model enterprise is the recognition of the Lake Malawi National Park as the world's first freshwater park and World Heritage Site. It has been developed to protect a diverse biota including at least 200 endemic species of cichlid fishes. For such reserves to work, it is essential that traditional fishing interests are taken into consideration and that the local community benefits.

It is particularly important to monitor the impact of introduced species on indigenous fishes and to develop realistic management strategies to offset any adverse effects. A technique to measure the Index of Biotic Integrity (IBI), modified to suit local conditions, has promising applications in general fisheries conservation in Africa and in monitoring water quality in protected areas.

Life-history data are crucial to conservation planning and management but are lacking for many fish species, including those that are of conservation interest. A range of advanced techniques is now available, for example biotelemetry, which can rapidly and economically provide life-history data.

Local community support for conservation action may be obtained in part through environmental education initiatives at the site of the problem, or potential problem. There is

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also a need to train technical assistants (wildlife rangers) in aquatic ecology, fish biology and parks management.

Conservation action *ex situ*

Database and research material banks can increase efficiency in conservation but international co-ordination is required to avoid unnecessary duplication. FISHBASE, a global database is being developed by the International Center for Living Aquatic Resource Management (ICLARM) in collaboration with FAO. This includes information, on biology, geographical distribution and conservation status of more than 8000 species, but the African coverage is incomplete. Other extensive bibliographic databases available include FISHLIT, which is being complied by the J. L. B. Smith Institute of Ichthyology, South Africa. For *ex situ* conservation there is a need to expand the fish component in databases developed within the International Species Inventory System (ISIS).

There are countless ways in which laboratory studies can provide information of value in *in situ* conservation efforts. For example, many cichlid fishes are polychromatic in nature and genetic studies become crucial in species diagnosis and in assessing the conservation value of populations.

Artificial reproduction techniques have proved to be beneficial in supporting both *ex situ* breeding groups and natural fish populations that are being exploited. In particular, they can be used to maintain fish stocks during times of environmental disruption. For example, during the construction of a dam on the Comoe River, Burkina Faso, thousands of new recruits to the population of a threatened cyprinid *Labeo coubie* were provided through the administration of hormones to adult fishes, hand-stripping of eggs and milt and the artificial incubation of the fertilized eggs.

Cryobiological techniques and germplasm banks need to be developed to support the long-term maintenance of fish populations in the wild and in aquaculture. Cryopreservation would allow genetic material to be transported over long distances and increase the potential for invigorating genetic exchanges between *in situ* and *ex situ* fish populations. The technique facilitates retrospective genetic analysis of founder populations and serves as a form of insurance against the loss of species or important genetic lineages. While the cryopreservation of sperm is already a reality for species of tilapiine cichlids, no real success has yet been reported for ova or zygotes.

Zoo aquaria have a valuable role to play in the scientific study and captive breeding of species that are critically endangered or even extinct in the wild. There is a captive breeding programme for the Lake Victoria cichlids and one is being developed for Malagasy freshwater fishes. Internationally, these operate under the aegis of the IUCN/SSC Captive Breeding Specialist Group and nationally through Fish Taxon Advisory groups. Formal groups with co-ordinated breeding programmes need to be established in Africa.

The aquarium industry has a key role to play in conservation by trading ethically and responsibly. Less than 3 per cent of the world aquarium trade is African, but about 90 per cent of African exports of aquarium fishes are wild-caught rather than pond-raised fishes. A greater emphasis on aquaristic pond-culture in Africa would take the pressure off exploiting vulnerable wild stocks and should prove economically beneficial to local communities.

Other aspects of the aquarium trade that are of concern include capture, packing and handling operations, which involve unnecessarily high mortality rates of fishes. Practices that lead to the spread of fish and other aquatic life (including parasites and plants) beyond their home ranges are also of concern in that they can cause ecological disruption. One promising development is that of the International Aquatic Conservation Network (aquarists dedicated to the preservation of aquatic life), which, in conjunction with an expert review panel, is developing guidelines for aquarists on the contribution that they can make to captive-breeding programmes.

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