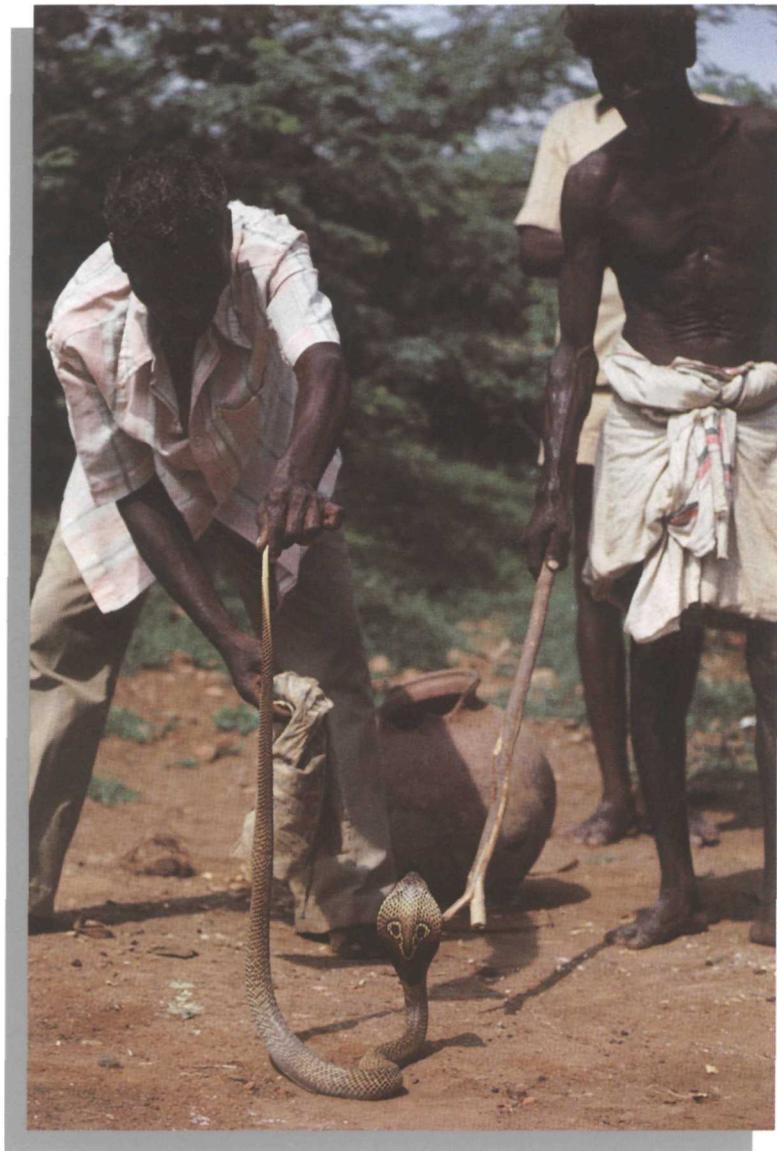


The IUCN Species Survival Commission

# Assessing the Sustainability of Uses of Wild Species

Case Studies and Initial Assessment Procedure

Edited by Robert and Christine Prescott-Allen



Occasional Paper of the IUCN Species Survival Commission No. 12

## IUCN/Species Survival Commission Conservation Communications Fund Contributors

In 1992, IUCN's Species Survival Commission established the Conservation Communications Fund to garner support for its expansive Publications Programme which promotes conservation by: (1) providing objective scientific information about biodiversity, habitats and ecosystems; (2) identifying high priority actions for conservation; and (3) delivering the information and recommendations to natural resource managers, decision-makers and others whose actions affect the conservation of biodiversity.

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The IUCN Species Survival Commission

# Assessing the Sustainability of Uses of Wild Species

## Case Studies and Initial Assessment Procedure

Edited by  
**Robert and Christine Prescott-Allen**  
for the **Specialist Group on Sustainable Use of Wild Species**  
(IUCN Species Survival Commission)

Occasional Paper of the IUCN Species Survival Commission No. 12

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This volume is intended as a contribution towards the development of policy on the sustainable use of wild species. The opinions expressed in this volume are those of the authors and do not necessarily represent official policy of IUCN or its members.

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### **Availability of materials in French and Spanish**

French and Spanish versions of the Draft Guidelines for the Ecological Sustainability of Nonconsumptive and Consumptive Uses of Wild Species are available from the Species Survival Programme at IUCN. The original Spanish versions of "Squirrel monkey viewing and tourism in Costa Rica" by Grace Wong and Eduardo Carrillo, and "Management and harvesting of caiman in Venezuela" by Alvaro Velasco B., Mirna Quero and Roldan De Sola, may be obtained from the authors (see Contributors, page 4).

# Introduction

Robert and Christine Prescott-Allen

Wild species (of plants, animals, and other organisms) provide most of the world's seafood and most of its timber. They supply countless human communities with other foods and fibres, as well as medicines, furs and skins, forage, and a means of earning income. Many communities could not do without them. They enrich people's cultural, religious and ceremonial lives; they stimulate intellectual growth; they nourish a sense of beauty. Many natural and semi-natural ecosystems owe their present existence and perhaps their future to the uses - from the loftiest to the most humble - that people make of the wild species within them.

Wild species, the natural and modified ecosystems of which they are a part, and the people who depend on them, are increasingly at risk. Ecosystems are being fragmented and degraded and their diversity reduced. Uses of wild species can slow or even halt this process (at least locally) when they give value to wild habitats and help to protect them from conversion to agriculture or settlements. But many uses do the opposite: depleting populations, damaging habitats, or both.

Determining and enhancing the sustainability and the social and conservation benefits of uses of wild species are difficult and controversial. There is no generally accepted guidance on how to define and assess sustainability, still less on how to achieve it. Without such guidance, two problems arise. One is that many uses continue to contribute to the depletion of species and destruction of ecosystems. The other is that uses with social and conservation benefits have to struggle against hostile policies. If, however, effective policies and methods could be devised and adopted, then uses of wild species could help to conserve biodiversity as well as contribute to human wellbeing.

At its 18th Session (Perth, Australia, November/December 1990), the General Assembly of IUCN resolved that the Director General should develop guidelines on the sustainable use of wildlife (Recommendation 18.24 of the General Assembly of IUCN, in Part 3 of this volume). Dr Stephen Edwards, Director of the Secretariat's Sustainable Use of

Wildlife Programme, was assigned the task of developing the guidelines.

At the same time, the Chairman of IUCN's Species Survival Commission (SSC), Dr George Rabb, asked us to be the founding Co-Chairs of a Specialist Group on the Sustainable Use of Wild Species (SG/SUWS). Under its terms of reference for 1991-1993, approved by the Steering Committee of the SSC, the group's mission was "to promote sustainable use of wild species as a tool for conserving species and the ecosystems of which they are part". Its first task was "to provide a standard for judging the sustainability of a use of a wild species, and advice on how to achieve the standard" (SG/SUWS 1991).

It was agreed that it would be sensible to combine the Secretariat's development of guidelines with the Specialist Group's development of a standard for judging sustainability. Dr Edwards and we worked together on several drafts of the guidelines. The first two were reviewed by the members of the SG/SUWS (a group that grew to more than 300) and other experts. The second draft was also reviewed by all governmental and nongovernmental members of IUCN. Later drafts were reviewed by the Steering Committee of the SSC. The final draft was reviewed, revised and approved by the IUCN Council for onward transmission by the Director General to the IUCN General Assembly. The Director General submitted this version to the 19th Session of the IUCN General Assembly (Buenos Aires, Argentina, January 1994). It is included in Part 3 of this volume, as Draft Guidelines for the Ecological Sustainability of Nonconsumptive and Consumptive Uses of Wild Species.

The method used to develop the draft Guidelines was intended to be the same as that used by IUCN to produce the *World Conservation Strategy* (IUCN/UNEP/WWF 1980), its successor, *Caring for the Earth* (IUCN/UNEP/WWF 1991), and the *IUCN Red List Categories* (IUCN 1994). The method involves using successive drafts to work out a consensus, primarily by mail, among IUCN's membership of hundreds of government agencies and nongovernmental organizations and thousands of commission members. A few meetings (one in the case

of the draft Guidelines, in conjunction with the IVth World Parks Congress, Caracas, Venezuela, February 1992) supplement communication by mail and fax. High level bodies within IUCN (such as the SSC Steering Committee and IUCN Council) decide matters of policy, and the IUCN Council approves the finished product. However, in this case, Council did not approve the final product (submitting it instead to the General Assembly), since it considered that the terms of Recommendation 18.24 did not give it the authority to do so.

Some individuals were strongly critical of this method to develop the Guidelines. They argued that a political consensus, if it could be achieved, would be worthless if it did not reflect practical experience. The Guidelines, they said, should draw from existing examples of sustainable use. However, the terms of reference of the SG/SUWS distinguished between the *what* and the *how*. The *what* - what do we mean by "sustainable"? (the "standard" referred to as the first task of the SG/SUWS) - is something that could and should be defined by consensus. The *how* - how can sustainability be achieved? - requires analysis of actual uses that approach that standard. In the draft Guidelines the standard (the *what*) is called "Criteria"; the *how* is called, rather unfortunately, "Requirements".

From the start, the SG/SUWS, like other SSC Specialist Groups, was chronically short of money. It was given welcome grants by the Peter Scott IUCN/SSC Action Plan Fund (funded by the Sultanate of Oman) and the Canadian Wildlife Service. But these covered mainly operating expenses. The bulk of our time (more than 80%), and all of that of other members of the Specialist Group, were donated. No money was available for meetings of the SG/SUWS or for assessments of uses.

Accepting that assessments of uses were needed to provide guidance on how to make uses sustainable, and anxious to have at least one meeting of the group, we sought funds for a meeting to develop an initial procedure for assessing the sustainability of uses of wild species. Happily, these were provided by the International Development Research Centre (IDRC), which has also supported preparation of this volume. We are very grateful to IDRC and the Peter Scott Fund for their assistance.

The SG/SUWS held its first meeting in Buenos Aires prior to the 19th Session of the IUCN General Assembly in January 1994. The meeting report is included in Part 3. The meeting reviewed the case studies in Part 1; and used them as a resource for drafting material for the assessment procedure and for examining the practicality of the draft Guidelines. Participants found that the draft Guidelines were often difficult to apply. The Criteria needed further clarification. The Requirements did not reflect the great variety of social, economic, legal, political and other human factors that affect sustainability in different societies. They concluded that the Guidelines

would not increase sustainability in all cases and could be misused to prevent uses with potential conservation benefits. Therefore most of the participants recommended that the IUCN General Assembly *not* adopt the draft Guidelines. Instead they advised that policies and other guidance be developed from the ground up, on the basis of assessments of a wide range of uses in a variety of social contexts. A General Assembly workshop organized by the IUCN Secretariat's Sustainable Use of Wildlife Programme reached similar conclusions.

Accordingly, the General Assembly did not adopt the Guidelines; but asked the Director General and the Chairman of the SSC to test them and provide revised draft guidelines for consideration at the 20th Session of the General Assembly (Resolution 19.54 of the General Assembly of IUCN, in Part 3 of this volume).

At the SG/SUWS meeting in Buenos Aires, three groups prepared material for an initial assessment procedure. A working group began to consolidate this into a first draft, which we completed after the meeting. In May 1994, we sent a second draft for review by all members of the SG/SUWS. The purpose of the initial assessment procedure was to provide members of the SG/SUWS and others with a common procedure for conducting a set of test assessments of the sustainability and conservation benefits of uses of wild species. The SG/SUWS and the Secretariat's Sustainable Use of Wildlife Programme planned to use the findings of the test assessments to:

- Develop assessment procedures for wider adoption and use. There is an enormous diversity of wild species; uses of species; and political, economic, cultural and ecological conditions in which the uses take place. It is unlikely that a single assessment procedure will be able to cover them all. Testing the initial procedure was expected to (a) lead to its revision for general use; and (b) identify uses or local conditions that require special assessment procedures.
- Improve understanding of the human and ecological factors that promote sustainability.
- Examine to what extent, and how, sustainable uses of wild species could help to conserve biodiversity and strengthen local and national economies in sustainable ways.
- Compile and publicize information about uses of wild species that help to conserve biodiversity and strengthen economies in sustainable ways.
- Prepare regionally-oriented policies and methods and practical "how to" guides, grounded in the ecological,

economic and social conditions operating in the different regions of the world. The aim was to assist users of wild species, governments, development assistance agencies and conservation organizations to enhance the sustainability of uses of wild species.

The initial procedure for assessing the sustainability of uses of wild species is included in Part 2 of this volume. It has been revised in response to the comments of SG/SUWS members on the second draft; and a workshop to test the assessment procedure on uses of plants in arid and semi-arid lands and subtropical forests (Tucson, June 1994; sponsored by the Arizona-Sonora Desert Museum, Sonoran Institute, SG/SUWS, Native Seeds/SEARCH and Conservation International). Funds to use the assessment procedure in the manner outlined above were never obtained.

We have produced this volume because we believe there is much to be learned from the case studies in Part 1 and from IUCN's attempts to develop guidelines. We discuss the lessons we have learned in "The good, the bad, and the neutral: assessing the sustainability of uses of wild species" in Part 2.

We also believe that a common and widespread understanding of what sustainability means and how to achieve it will come only from an understanding of actual cases. The more people around the world assess and transmit their own and others' experience, the better

the prospects for developing this understanding. A shared approach to assessment would greatly assist this process. The initial procedure for assessing the sustainability of uses of wild species, included in Part 2, is offered as a contribution to a shared approach.

*Please note that the scope of Part 2 and the draft Guidelines in Part 3 covers all wild species (plants, animals, and others) and all nonconsumptive and consumptive uses of wild species (including logging, fishing, plant gathering, and viewing wild animals).*

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chapter (in Part 2).*

# **PART 1. CASE STUDIES**

# Summaries

These summaries of the case studies draw from the papers that follow and on additional information supplied by the authors.

## **Capture of blue-fronted amazons and hunting of vizcachas and tegu lizards in Argentina**

*John E. Jackson, Enrique H. Bucher, and José María Chani*

Three cases were chosen to exemplify uses of wild species in Argentina:

- The Chaco subspecies of the blue-fronted amazon (*Amazona aestiva xanthopteryx*), a parrot captured for the pet trade.
- The vizcacha (*Lagostomus maximus*), a rodent hunted for its meat and pelt and for sport.
- Two tegu lizards, *Tupinambis teguixin* and *T. rufescens*, hunted for their skins.

Decision makers do not recognize the economic benefits of using wild species. Public and private landowners in Argentina do not regard uses of wild species as an alternative or additional source of income to ranching. Consequently, they do not bother to manage wildlife. Entrepreneurs make the most money out of wild species; but only a few have seen the need to invest some of the proceeds in management. The many poor rural dwellers who depend on wildlife for food and income have no tenure, so no incentive to regulate their uses. Such a weak incentive system might not matter if laws and organizations were strong. But they are just as weak. Laws are poorly enforced, provincial coordination is lacking, and management organizations are understaffed and underfunded. For some species, these problems are compounded by legal pest status, which at best leads to undervaluing a resource (the case of vizcacha), at worst

encourages overexploitation (the case of the blue-fronted amazon).

Knowledge about most commercially important wild species in Argentina is woefully insufficient to manage their use sustainably. Information on their current distribution and population trends is based on intuition and guesses. Little is known about the species' population dynamics or ecology or the scale and patterns of use. Funding for research has been sporadic. Recently, however, as in the case of the tegu lizards, trade associations have begun to support research to provide information for sustainable management.

## **Capture of blue-fronted amazons**

*Enrique H. Bucher*

Capture of blue-fronted amazons usually involves removal of the entire brood from the nest, destruction of nesting sites, and often felling of trees. The birds depend for nesting habitat on old-growth quebracho forests, which are being lost to logging and overgrazing. Because the parrots sometimes raid citrus orchards, they are also the target of pest control campaigns. This combination of pressures has greatly reduced and fragmented populations and their habitats.

Little is known about the population requirements or detailed habitat requirements of the birds or the full extent of use. The only use statistics are official export figures, which take no account of deaths before shipment or underdeclaration by traders. The size of the national market is not known. Nevertheless, it is obvious from the widespread and prolonged trends of shrinking range, population fragmentation, and loss or degradation of breeding and wintering habitats that current capture rates are unsustainable. Exports were banned for a three-year period in 1991; but trade continues within Argentina, encouraged by the pest status of the bird in several provinces.

Controlling use is practically impossible. The provinces are responsible for wildlife management, but there is no

coordination among them or with the federal government. Wildlife agencies do not have enough money, equipment or trained staff; and these problems are aggravated by corruption. Consequently, the author proposes that collecting be restricted to private landowners who practise approved use schemes. Capture levels would be set for particular ranches or management units. Reserves to act as refugia are also needed, because existing protected areas are too small, too few, and in the wrong places.

### **Vizcacha hunting**

*John E. Jackson*

The vizcacha (*Lagostomus maximus*) is a common rodent throughout much of the pampas - the grassland and scrubland of central and northern Argentina. The wetter eastern portion of its range is cultivated. The rest is modified ranchland, much of it degraded by overgrazing. Little natural pampa remains. Eradication campaigns using fumigants have eliminated vizcachas from parts of the cultivated portion of their range. But they are spreading or becoming more numerous on the northern and western margins. Overgrazing and habitat degradation in the semi-arid zone apparently facilitate colonization by vizcachas. Once established, their burrows and feeding further modify and degrade the ecosystem.

Vizcachas are hunted for their meat and pelt and for recreation. Officially classed as a "pest", they are also the target of eradication campaigns. Little is known about the distribution, abundance, population dynamics, harvest statistics or socioeconomic value of vizcachas in most provinces of Argentina. But their abundance in most parts of their range, despite efforts to eliminate them, indicate that populations are large, widespread and resilient. Many colonies that have been hunted heavily for many years still survive.

The abundance and resilience of vizcachas make them a good candidate for a sustainable use project - marketing the meat and using the proceeds to improve management and demonstrate the economic benefits of sustainable use. Estimates of distribution and population size might be obtained cost-effectively by counts of active colonies conducted on the ground or, in open areas, from the air. Censusing of burrows could be used to monitor populations, if population size is proportional to the colony area or the number of active burrows (this needs to be determined).

### **Tegu lizard hunting**

*José María Chani*

An average of 1.25 million skins have been exported annually from Argentina during most of the past decade.

Since 1988, commercial use of the lizards has been controlled by the *Comision Tupinambis* consisting of directors of provincial wildlife agencies, skin traders and others. The commission sets an overall quota for Argentina (currently 1.1 million skins, of which 1 million are for export) and constituent provincial quotas.

Population dynamics of tegu lizards are difficult to study because at any one time an unknown proportion of the population is hidden in burrows. Current monitoring is of variations in the sizes of skins sampled in tanneries and dealers' stocks: it is assumed that changes in abundance of skin size classes will indicate the impact of hunting. It is too soon to tell if this is so. Also, hunters and dealers stretch skins to get higher prices (tanneries restore them to their original size by soaking them). Population counts will still be needed to check that changes in age structure correspond to changes in population density. The relationship between skin size and reproductive status also needs to be determined.

### **Harvesting kangaroos in Australia**

*Gordon Grigg*

Five wallaby and kangaroo species are harvested commercially in Australia: whiptail wallaby (*Macropus parryi*), euro or wallaroo (*M. robustus*), and, particularly, the western grey kangaroo (*M. fuliginosus*), eastern grey kangaroo (*M. giganteus*), and red kangaroo (*M. rufus*). All are regarded as pests by rural communities, and the main motive for killing them has been to reduce competition with wheat or sheep. The majority of kangaroos live in the semi-arid chenopod shrubland that covers about 40% of the country. Overgrazing by sheep during the last 150 years has degraded much of this area. Most landholders see a significant reduction in kangaroos as the most valuable contribution to reducing grazing pressure - their aim being to manage the rangelands as a monoculture of sheep.

However, kangaroos are also Australia's national symbol. As such, all species are protected by legislation; and kangaroo kill quotas are set to maintain, not reduce, populations. Some 3-4 million animals are killed each year (less than the annual quota). Because this is not enough to reduce kangaroo populations, there is a large illegal kill, much of it inhumane. Almost no commercial use is made of animals killed illegally. Until recently, kangaroo meat could not be sold for human consumption in Australia (except South Australia). Large quantities were (and still are) fed to dogs, cats and crocodiles.

Rainfall and its effects on pasture condition are the main influence on kangaroo population densities. Drought reduces the populations, often severely, but afterwards they recover rapidly. In average rainfall seasons or better, populations frequently increase in the face of 15-

20% harvests. People have killed small numbers of kangaroos for thousands of years and large numbers for more than 100 years. Controls were introduced in 1970 and 1971, and annual population monitoring began in 1975 in New South Wales and 1978 in South Australia. The first Australia-wide survey was made in 1981. Aerial surveys of populations are now conducted annually in much of the harvested area. Impacts of hunting on sex ratios, age structure and genetics are being studied. The commercial industry is controlled by the issue of tags (which must be attached to the carcass), and licensing of shooters, processors and tanneries. Money from the sale of tags goes into a fund for monitoring, research and management. States meet annually to set quotas, based on population surveys and information on rainfall. States have the capacity to close the season, if drought makes it likely that the quota is too high.

The aim of allowing commercial use and raising the value of kangaroo products (especially meat) is to change the status of kangaroos from pest to resource, and so remove any incentive to kill kangaroos illegally. By providing a supplementary income to landowners, kangaroo harvesting would enable them to reduce the number of livestock on their properties and so take pressure off the range. Reduction of total grazing pressure would prevent further degradation and allow degraded land to recover. In addition, legal shooting is done humanely (and is considered to be as, if not more, humane than the treatment of domestic livestock).

## **Furbearer trapping in the Yukon, Canada**

*Brian G. Slough and R. Harvey Jessup*

The Yukon Territory of Canada consists of arctic and alpine tundra and boreal (subarctic) forest. Most of the ecosystem is natural, although logging and mining have modified some areas. Tiny fractions of the territory are cultivated and built. Some 500-800 residents (2-3% of all Yukon residents, 6-9% of rural residents), 70% of whom are aboriginal, are eligible to trap for furs. The furs are sold on the national or international fur markets or are used locally for personal clothing and the cottage garment industry. Fourteen species are trapped - 11 carnivores: arctic fox (*Alopex lagopus*), coyote (*Canis latrans*), grey wolf (*C. lupus*), red fox (*Vulpes vulpes*), lynx (*Felis lynx*), wolverine (*Gulo gulo*), river otter (*Lutra canadensis*), marten (*Martes americana*), fisher (*M. pennanti*), short-tailed weasel (*Mustela erminea*), mink (*M. vison*); and three rodents: beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), red squirrel (*Tamiasciurus hudsonicus*). Three of these species (lynx, beaver, muskrat) are taken for food as well as furs.

Trapping in the Yukon is managed through a system of Registered Trapping Concessions (RTCs), granted to individuals or groups of trappers. RTCs have renewable five-year terms, and nobody may trap without one. The number of RTCs is fixed at 372 and have an average size of 800 km<sup>2</sup>. In addition, 15 group areas of up to 63,700 km<sup>2</sup> are administered by First Nations (aboriginal peoples) for aboriginal communities. Covering 93% of the Yukon's 482,515 km<sup>2</sup>, RTCs and group areas are large enough to disperse trapping pressure and provide refugia, even for species with low population densities (such as wolverine with a density of 6/1,000 km<sup>2</sup>).

Furbearer harvests are monitored through a mandatory system of export permits, fur dealer returns, and seals for lynx, wolf and wolverine pelts. This accounts for all furs that leave the territory (90% of the total kill). Furbearer populations are monitored through annual reports by trappers on furbearer and prey abundance and population trends, supplemented by separate monitoring of lynx recruitment (via pelt measurements) and regional population surveys and indexing. The latter include winter track counts, beaver food cache surveys, muskrat "pushup" (winter feeding structures) surveys, and aerial wolf surveys. Biological studies are conducted on vulnerable populations (muskrats in northern Yukon, wolverine, and arctic fox) and to determine species' needs for refugia (especially wolverine, because of its large home range [75-270 km<sup>2</sup>]; and lynx and marten, because they are easy to trap).

Under the terms of an agreement by the Yukon and federal governments and the 14 First Nations, formal responsibility for managing wildlife will be shared by the Yukon government and the First Nations. The trappers themselves already participate in day-to-day management, including conducting population surveys, adjusting trapping levels to population size, and establishing refugia.

The Yukon Trappers' Association delivers a government-sanctioned education course on harvest management and humane trapping. The course, which is conducted in the communities, focusses on efficient and humane trapping techniques using the best available technology, biologically sound trapline management, and proper pelt preparation. First-time trappers must take the course and experienced trappers are encouraged to take regular refresher courses to upgrade their knowledge and skills. About 50% of all trappers have taken the course.

Monitoring of catch per unit effort, changes in relative abundance, and sex and age structure, is sensitive enough to ensure that harvests are at or below sustainable levels. The boreal forest ecosystem is resilient to various catastrophes (such as fires). Trapping furbearers has negligible impact relative to these catastrophes, and

harvests are so low that other components of the ecosystem are unaffected.

## **Squirrel monkey viewing and tourism in Costa Rica**

*Grace Wong and Eduardo Carhilo*

The northern subspecies of the Central American squirrel monkey (*Saimiri oerstedii citrinellus*) occurs only in the Manuel Antonio forest on the Pacific coast of Costa Rica. The population consists of 681 individuals, 300 of which are in Manuel Antonio National Park (683 hectares). The remainder occupy 1,100 hectares outside the park. The forest is part natural, part modified, and completely hemmed in by ocean on one side and oil palm plantations and cattle ranches on the others.

The park, and especially the monkeys, are a popular tourist attraction. The number of visitors has grown rapidly, from 25,000/year in 1982 to 192,000/year in 1992. The direct impact of viewing by tourists consists of some disturbance of the monkeys, including cases of taunting. Indirect impacts are a revival of the capture of monkeys for pets and loss of habitat due to expansion of tourism infrastructure. This last impact is much the most serious.

The growth of tourism infrastructure has kept pace with the numbers of tourists: 192 houses in 1988, 663 in 1992, with corresponding increases in restaurants and other facilities. In effect, tourism has fostered expansion of the built environment at the expense of the natural forest, which is quickly being fragmented and reduced. There is an urgent need to plan hotel and other development to ensure maintenance of suitable habitat patches and corridors. The most favourable habitat is a mixture of primary and secondary forest (least favourable is young degraded secondary forest), which needs to be linked by corridors of trees, preferably food trees.

Existing regulatory and incentive systems are unable to conserve habitat. Penalties exist for direct damage to an endangered species but not for indirect damage through habitat destruction. In particular, current laws cannot cope with the cumulative effects of individual property developments. It might be possible to appeal to the self-interest of the tourism industry, since the squirrel monkeys are a tourist attraction. However, the value of the monkeys relative to other attractions, such as the beach, needs to be determined. More important, most of the capital for tourism comes from outsiders, who receive most of the industry's economic rewards: 60% of the infrastructure has been developed with foreign capital; and only 2% of the income from tourism goes back to the local community. Hence there is little local interest in, or commitment to, conservation.

## **Snake capture and venom extraction in Tamil Nadu, India**

*Romulus Whitaker and Harry V. Andrews*

The Irulas are a tribal people living mainly in the state of Tamil Nadu and the neighbouring states of Andhra Pradesh and Karnataka. Because of their remarkable traditional skills in snake catching they were, for at least three generations, the main suppliers to the southern Indian snakeskin industry. In 1972, the central and state governments banned both the export and the domestic trade in snakeskins. This deprived the Irulas of virtually their only source of income.

The senior author devised an experimental snake venom collection project to provide the Irulas of Chinglepet district, Tamil Nadu, with a substitute income while preserving and using their hunting skills and knowledge of natural history. A cooperative society was registered in 1978 with a membership of 26 snake catchers (it has since grown to more than 100). Venom production did not begin until 1982 due to restrictions in the Wildlife Protection Act, limiting the capture of snakes.

The Irulas' cooperative is now India's largest venom producing unit, with annual sales of US\$15,000. Venom is extracted from four species: Asian cobra (*Naja naja*), Indian krait (*Bungarus caeruleus*), Russell's viper (*Vipera russelii*) and sawscaled viper (*Echis carinata*). The cooperative sells the venom to Indian laboratories that produce antivenin serum, the only proven cure for snakebite.

The cooperative is the only venom production unit in India in which snakes are obtained locally and not killed. Other institutions produce venom by extracting it repeatedly from each snake until the animal dies. At the cooperative, snakes are weighed, measured, sexed, and (except for sawscaled vipers, which are too small) marked with a clip-code for identification, to prevent premature recapture and to collect biological data. They are held in captivity for only three weeks, with one venom extraction per week. Then they are returned to the wild. Mortality is no more than 1% of total captures.

The project has enabled the Chinglepet Irulas to earn an income from live snakes that is several times greater per snake than their previous income from dead snakes. Each snake catcher is paid for every snake he brings to the cooperative. In addition, all members of the cooperative receive a dividend from venom sales. They are also eligible for medical and educational benefits and grants or loans for improved housing.

The resource base of the project appears to be more than adequate. The species are common and wide-ranging, with large populations. Before the skin industry was banned, Irulas caught and killed millions of snakes

(primarily cobras and Russell's vipers) from the same 546 km<sup>2</sup> area in which they now catch 65,000 a year for their venom. The snakes are caught in very disturbed habitats (cultivated and degraded land). Irula experience and long personal observation by the authors suggest that snake populations are probably much higher there than in forest habitats, because prey (rodents and amphibians) are more abundant. Only one of the four species, Russell's viper, is vulnerable to degradation of forest habitat. Irula do not hunt depleted areas because it is not energy-efficient and they are satisfied with current income levels. Juvenile snakes are not captured, and capture of gravid snakes is discouraged. Captured snakes are treated humanely, and 99% survive to be released. Snakes are released in forest land because the villagers do not want them back on their farmland. Mortality following release and the extent of recolonization of farmland and degraded areas are not known. The rate of recapture within six months to two years (the duration of clip-codes) is very low: 0.15%.

## **Lokta cutting and paper making in Nepal**

*Anil Chitrakar and Christine Prescott-Allen*

Handmade paper, made in Nepal for at least 800 years, is produced from the fibrous inner bark (or bast) of two wild shrubs, *Daphne bholua* and *D. papyracea*, known locally as lokta. Lokta paper has long been prized for its beauty, strength and durability.

In 1959, the Nepalese handmade paper industry lost its main export market when China closed the border with Tibet. Tibet was the largest importer of lokta paper, used mainly by monasteries for block printing Buddhist scriptures. The domestic market also declined, undercut by cheaper machine-made paper from India. By 1980, the industry was on the verge of economic extinction, depriving hundreds of lokta harvesters, paper makers and block printers of their livelihood.

UNICEF responded by launching its Community Development through the Production of Greeting Cards project in 1981. The main aim of the project was to promote community development in Nepal through income generating activities associated with lokta collection and transportation, paper making, and the manufacture of greeting cards. The project began in one community in each of three rural districts (Baglung, Myagdi, and Parbat) and one urban centre, Bhaktapur. It has since expanded to involve 69 communities in the three districts.

Bhaktapur Craft Printers (BCP)/UNICEF was given exclusive rights to lokta from the five major forests in the project area. Between 1981 and 1984, lack of a harvesting

management programme resulted in significantly reduced stands of lokta within reasonable distances of participating villages. A management programme introduced in 1985 assigned lokta resource blocks to participating villages, and established a quota and harvest rotation within each block. In 1986, following a comprehensive inventory of the lokta resource, harvest rotations were lengthened from four to six years. BCP's paper buying procedure was changed so that it bought only the number of sheets that could be made from each paper maker's allocation of lokta. However, this is not a sufficient incentive to paper makers to adhere to their allocation, because local merchants lend them money on condition that they sell paper to them.

The traditional Nepalese process of making lokta paper also uses wood for fuel (to cook the pulp) and ash (ash-lye solution speeds bark degeneration during cooking). To lessen the impact on an already depleted fuelwood resource, the UNICEF project has provided more efficient stoves and caustic soda (which reduces the amount of ash required). Even with these improvements, 1 kg of lokta requires about 4 kg of fuelwood.

Lokta harvesting and paper making are seasonal occupations, employing 884 families part-time (in 1989). The printing unit operates year round, and employs 100 persons full-time (in 1989). In 1989, average annual salaries to all part-time and full-time workers totalled 5.2 million Nepalese Rupees (or US\$200,250).

In addition, BCP's profits go into community development and welfare funds, which from 1982 to 1989 contributed some 723,000 Nepalese Rupees (US\$39,000) a year to development activities for the rural lokta harvesting and paper making communities in Baglung, Parbat and Myagdi Districts and the urban community in Bhaktapur. The activities are requested by the communities, which contribute 40% of the cost, and are approved by project participants at an annual workshop. They include: potable water supply, sanitation, health and veterinary services, education, irrigation, flood and landslide control, construction materials (for example, for community halls and schools), and tree nurseries and plantations.

The success of the UNICEF project helped to revive lokta paper making throughout the moist subtropical and temperate zones of Nepal. These areas were already severely affected by increasing and unregulated exploitation of forests for fodder, fuelwood, timber and other products.

Outside the three districts where UNICEF is operating, lokta stands are quickly being depleted. In Khotang district, for example, 10 years ago it took only 2-3 hours to reach lokta forests, now it takes seven days. Firewood cutting for fuel to cook and dry the lokta further reduces

the forests. As the forests diminish, the lokta also disappears. In many communities, fights break out among groups trying to harvest the same source of lokta.

Control of natural resources is held by the central government. Neither the central nor local government is capable of exercising this control, so harvesting and processing continue unchecked. Assessments of how much lokta and fuelwood are available and what the sustainable yields might be are out-of-date and cover only small parts of the country (except for the UNICEF project, and then only for lokta). Harvest levels are not known. Whether lokta is harvested correctly (by removing the bark only after cutting the tree 15 cm above ground, to preserve the stump and allow coppicing) is not monitored. Meanwhile, centralization of control prevents communities from taking responsibility for the resource and developing their own management system.

Except in the three UNICEF districts, the communities benefit little from lokta. Traders pay the villagers very poorly, so the villagers treat lokta as a source of extra income not as a valuable resource. Once lokta is finished, the traders will come for something else, such as mushrooms or medicinal plants.

The lokta and fuelwood resources need to be assessed and harvest levels determined. User groups should be formed in all communities that harvest or process lokta and given legal ownership of the resources; and the responsibility, skills and technical knowledge to use them sustainably.

## **Rush cutting in Natal, South Africa**

*Ricky H. Taylor*

The Zulu people of Natal harvest a rush, *Juncus kraussii*, which they call ncema. The plant typically grows in single-species stands fringing estuaries. When dried, the stalks are strong, pliable and durable. The most important use of ncema is for the manufacture of traditional sleeping mats, which are used in most rural households and are given as gifts to the bride at traditional Zulu wedding ceremonies. Ncema is also used to weave sorghum beer strainers and modern craft items such as baskets and place mats.

As human populations increase, and as much of the salt marsh habitat in which ncema grows is lost to development, the demand for the remaining ncema stocks has increased. Today, ncema occurs in significant quantities at only four sites in Natal: three in protected areas and the fourth under tribal authority. Since it is highly sought after and scarce, ncema is vulnerable to overexploitation.

The paper examines harvest management in one of the protected areas, the Greater St Lucia Wetland Park,

controlled by the Natal Parks Board (NPB). Since the late 1960s, the NPB has allowed controlled harvesting of ncema at St Lucia. The harvest started as a small scale operation, but over the years has expanded to become a major industry. An estimated 80,000-120,000 kg (wet mass) of ncema is now harvested annually. On average, about 1,000 people (mostly women) cut the ncema, each cutting for three to five days. Extensive informal transport networks bring the harvesters to St Lucia, some of whom travel more than 300 km. An informal distribution network transports and retails the more than 116,000 kg of dried ncema produced in Natal.

Since the late 1970s, the NPB has levied a small charge for a permit to harvest ncema. It has designated a harvesting zone, covering about a third of the area in which ncema occurs; and has established a harvest season. At first the season lasted 8-12 weeks; but, because of increased use, it is now terminated once most of the ncema has been cut - usually within one to three weeks. The harvest season is a more equitable way of controlling use than limiting the number of harvesters, since it avoids turning away harvesters who have travelled far to cut ncema. The NPB inspects the ncema stands, and rests areas where the plant appears to be growing less vigorously. Usually each area is rested every second year.

Women cut handfuls of rushes with a sickle or long-bladed knife. They keep only 25% of what they cut, discarding stalks that are flowering stems, too short, or blemished. Discards are often thrown onto living plants, reducing their ability to grow. To increase the selectivity of the harvest and reduce waste, the NPB has changed its permit system, imposed restrictions on cutting implements, and introduced an incentive scheme. Only the first of these has been successful.

The NPB has set up committees with representatives of the ncema cutters so that they can express their concerns. However, it has been difficult to get them to nominate representatives, and they have not participated in decisions on the use of ncema. Because they do not participate in decisions and have no formal rights to the resource, ncema users see no point in conserving the species or its habitat or in reducing their harvests.

Recently informal cartels have been established to harvest, transport and sell ncema. The cartels are run by people who demand protection money from anyone wishing to harvest ncema. In response, the NPB has considered alternative strategies for managing the ncema harvest. They include: small scale businesses, in which prospective users tender for rights to harvest a specified patch of ncema; a cooperative business, placing control of the ncema industry in the hands of a neighbouring community; harvesting by the NPB or by a concessionaire on its behalf, who would then sell the ncema to the users;

or joint ventures between the NPB and people wishing to harvest the ncema.

The NPB is responsible for ensuring that harvesting does not impair the long term viability of the ncema beds or harm associated species or the ecosystem. Since ncema grows in single-species stands at St Lucia, it is unlikely that current levels of harvesting affect other species. However, impacts on the ecosystem are hard to assess, because of the difficulty of distinguishing human and natural influences. For example, *Phragmites* reeds have invaded some areas, displacing ncema plants. This may be due to natural changes in soil-water relations or in salt concentrations in the soils or to human exploitation. Also, the ncema beds are subject to major floods, which cause considerable erosion and transform the landscape. The detailed monitoring required to separate human and natural changes would be very expensive.

A better understanding is needed of the socioeconomic benefits of ncema harvested in the Greater St Lucia Wetland Park, and of Natal's ncema industry as a whole. Monitoring is essential to manage both the ecological and the socioeconomic aspects of the programme, and integrate it into the economy and established social systems.

## **Management and harvesting of caiman in Venezuela**

*Alvaro Velasco B., Mirna Quero, and Roldan De Sola*

After a 10-year ban on hunting the common or spectacled caiman (*Caiman crocodilus*), the Venezuelan government started a harvesting and management programme in 1982. When annual harvests peaked at 232,063 in 1986, the programme was stopped for one year to assess the impact of hunting on the populations. It resumed with a smaller quota; and, since then, annual harvests have been between 100,000 and 150,000. In some years, harvests have been much lower than this, since quotas are cut when international demand for caiman skins drops.

Hunting is limited to private lands in five states in the llanos region, the floodplain of the Orinoco basin. Landowners submit an application to harvest caiman on their property, together with a report on the size of the population and each of its constituent size classes (four size classes are recognized). The report must be prepared at the landowner's expense by an individual or company certified by PROFAUNA, using an approved census method. PROFAUNA, the government agency responsible for wildlife, trains professionals to census caiman populations. Landowners must also provide a five-year management plan.

PROFAUNA allocates quotas based on the census reports. Only males of a total length of 180 cm (Class IV)

or more may be hunted, so protecting breeding females and the gene pool of younger males. A maximum of 25% of these large males may be harvested, or about 7% of the total censused population of each private landholding. Harvesting is not permitted if the percentage of Class IV individuals in a population is less than 15%.

All hides and meat are certified by members of the Venezuelan National Guard and brought to a checking centre for validation. Skins are sold to local tanners. Most are exported. The salted meat is sold locally and in the larger cities of Venezuela.

A recent re-examination of the ecological basis of harvest rates has defined seven ecologically distinct regions. Management models and harvest quotas have been worked out separately for each region. As a result, the total sustainable quota for the area covered by the caiman management programme is estimated to be in the order of 70,000 animals per year, or 20% of large (180 cm +) males. Hunting has been suspended in areas where the percentage of large males shows that recovery is inadequate. Each of the seven regions will be monitored separately.

Landowners receive the greatest direct economic benefit from caiman hunting. In addition, the programme has generated new jobs in caiman harvesting, processing and management. This has stimulated local economies through both increased employment and new business for retailers and service industries.

## **CAMPFIRE in Zimbabwe**

*Brian Child*

Zimbabwe has developed a two-pronged wildlife conservation strategy: one prong consists of protection and applies to the 13% of the country that is within protected areas; the other prong consists of sustainable use and applies to the remaining 87%. In 1955 legislation was adopted that allowed commercial (white) farmers to make use of the wildlife (notably elephant, antelope, zebra, giraffe) on their land. Today the livestock monocultures of the past are in the minority: some 75% of Zimbabwe's commercial ranches have a wildlife enterprise, usually alongside cattle production, but increasingly instead of it. Financially, wildlife enterprises consistently outperform livestock enterprises, partly because cattle can be sold only once (for meat) but a wild mammal can be sold three times (for viewing, as a hunting trophy, and then for meat). Wild mammals have steadily regained ground formerly lost to livestock.

Meanwhile on communal lands, where black rural people live, wildlife continued to decline. The communal lands are almost entirely modified and cultivated, with little natural ecosystem left. Cultivated and degraded

areas are displacing viable modified areas. An attempt to stop the decline failed because it did not provide communities with sufficient benefits or management responsibility. Consequently, CAMPFIRE (Communal Areas Management Programme For Indigenous Resources) was introduced in 1989. CAMPFIRE's rationale is that communities will sustain wild species and their habitats if they get the benefits from them. If they do not get the benefits, they will destroy the wild species - directly by killing pests and predators, and indirectly by replacing habitats with farms and livestock.

In effect, CAMPFIRE gives district councils the same rights to use wildlife as private landowners. Income from wildlife goes directly to the councils, which are also responsible for management. Government's role is to promote sustainability by monitoring harvests and ensuring that benefits reach the communities. The government reserves the right to control quotas until accountable institutions and effective incentive structures develop, and councils and communities learn the necessary skills. Communities are being trained to set quotas.

Currently, 24 districts (almost half the rural districts in the country) participate in CAMPFIRE. Gross income has grown from Z\$648,620 in 1989 to more than Z\$10 million (US\$1.6 million) in 1993. About 65% of the income reaches communities. In the case of safari hunting, each district develops a hunting quota in collaboration with the government. It then offers the quota for tender by safari outfitters. This responsibility has allowed the districts to develop marketing and business management skills. Their income from quotas almost tripled (in constant US\$) between 1990 and 1993; the ratio of income to quota unit doubled; and they have raised their share of net profits from safari operations to 75% (the operators get the remaining 25%). Districts and communities lacked the skills and experience necessary for wildlife management, but are developing them by gradually assuming management responsibilities.

Information requirements for CAMPFIRE are kept as simple as possible. Four components of the programme are monitored:

***Wildlife populations.*** Three sources are used: aerial surveys and other formal methods; safari operators; community estimates. Communities hold workshops in which they draw maps of wildlife numbers and locations. This not only provides useful estimates; it also directly involves community members in management and quota-setting.

***Offtake quantity and quality.*** Records are submitted of all animals killed (except by poaching). Trophy sizes are recorded, which allows trends in the age of animals killed to be detected.

***Earnings.*** This information is used to assist communities in bargaining with operators and helps to raise prices and income to the communities.

***How the money is used.*** This information is used to ensure that benefits go to the communities who live with the wildlife.

It is worth noting that two of the components are biological and two socioeconomic. The latter are regarded as crucial, since they help to keep track of the incentive system, without which the biological information would be redundant.

CAMPFIRE has had to confront some challenging issues. For example, in one community (Chikwarakara) a quota of three bull elephants (6%) out of an itinerant elephant population of about 50 exceeded the sustainable rate of 0.75% of bulls and 5% of the total population. But the hunting quota was *less unsustainable* than the status quo, in which wild mammals were declining sharply. The risk proved worth taking, since it contributed to the social changes necessary to arrest the decline and restore wildlife numbers. Short term unsustainability is sometimes necessary for long term sustainability.

# Capture of blue-fronted amazons and hunting of vizcachas and tegu lizards in Argentina

John E. Jackson, Enrique H. Bucher and José Maria Chani

## Introduction

John E. Jackson, Enrique H. Bucher and José Maria Chani

With a surface area of 3.76 million square kilometres, Argentina is the seventh largest country in the world and the fourth on the American continent. It has a wide range of ecosystems ranging from subtropical rain forest to polar ice pack, pampas grassland, Chaco thorn forest, Patagonian steppe and high Andean puna. Excluding the Antarctic territory, Argentina is 3,500 km long and 1,400 km across at its widest point. There are 23 provinces and a population of around 33 million people, mainly of recent European origin.

The wide diversity of terrestrial vertebrates includes more than 300 species of native mammals, and at least 17 mammal species introduced from the Old or New Worlds. Some 180 species of reptile and 69 amphibians have been described. About 1,130 bird species have been recorded from the Argentinean mainland.

## Commercial uses of wildlife

Besides noncommercial harvesting of flora and fauna for food, clothing, medicine and sport, exporting wildlife and wildlife products has been big business in Argentina for many years. In the 19th century, for example, the pampas deer (*Ozotoceros bezoarticus*) was hunted commercially, with numerous skins exported annually. At the height of the trade in 1860-70, official figures show that 2.13 million deer pelts were shipped, including 61,401 in 1880 alone. Overhunting was a cause of this species demise (Jackson 1978).

Commercial uses of wild vertebrates are a widespread, generally accepted and often lucrative activity throughout Argentina. The trade is complex and often furtive. Normally the hunter or gatherer is a local person, commonly a campesino; he sells or barter to a travelling merchant ("acopiador"), who in turn trades with other intermediaries before the product reaches the wholesalers,

factories or tanneries, retailers and exporters. Indigenous people use wildlife in the same way as other local inhabitants.

Many species have been or are used commercially for meat, skins, or sale alive. Most are native but some mammal species have been introduced: exporting meat from wild European hares (*Lepus capense*) is an industry worth up to US\$24 million annually (Jackson 1986). Other major exports are pelts from the coypu or nutria (*Myocastor myocastor*), foxes (*Dusicyon* spp.), guanaco (*Lama guanicoe*), small cats (*Felis* spp.), carpincho (*Hydrochaeris hydrochaeris*) and vizcacha (*Lagostomus maximus*), skins from tegu lizards (*Tupinambis* spp.), and birds for the pet trade.

According to official statistics, 1979 was probably the record year for exports of wildlife products: US\$173 million worth left Argentina legally, the same value as for canned meats from domestic livestock. In 1980, 10.8 million wildlife pelts and skins and 12.2 million kg of frozen wildlife meat were exported (Fujita & Calvo 1981; Mares & Ojeda 1984). Internal consumption of wildlife products is less well known but is estimated as an additional 10%. These figures do not account for animals killed but not marketed because they were substandard or hunted for sport or food. An additional unknown percentage is smuggled.

The most lucrative wildlife export category is furs and skins. Meat contributes about 25% of export income from wildlife. Export of live specimens - principally birds - is also significant.

## Legal framework

Although federal legislation may exist, the legal framework for species conservation in Argentina is provincial. Each province has a constitutional right to administer its own natural resources. Differences and conflicts in wildlife legislation occur between the federal government and the provinces, among provinces, and even within provinces (Reynoso & Bucher 1989).

Much of the legislation is outdated. Several economically important or threatened species are classed as local or national pests ("plaga nacional") whose destruction is obligatory and encouraged officially. Yet their status and impact may have changed radically since the legislation was passed, often in the early years of this century.

Enforcement of wildlife legislation in Argentina is inadequate at both provincial and national levels. National and provincial wildlife agencies lack resources, personnel and infrastructure. Resource limitations are aggravated by corruption. Argentina is a signatory to CITES; but weak enforcement of domestic laws makes it difficult to implement international agreements (Gruss & Waller 1988; Waller & Bertonatti 1992).

## Capture of blue-fronted amazons

Enrique H. Bucher

### Present status

The blue-fronted amazon, *Amazona aestiva*, is one of the best known amazons. It is a very popular pet in Argentina and many other countries due to its reputation as a "talker".

The Chaco subspecies, *A. a. xanthopteryx*, ranges from northern and eastern Bolivia and southwestern Mato Grosso, Brazil, south through Paraguay and northern Argentina as far as Cordoba and La Rioja. Deforestation, trapping and control campaigns have reduced and fragmented its original range considerably (Moschione & Banchs 1992; Bucher *et al.* 1993). The bird nests in hollow trunks of the dominant Chaco trees, particularly the red quebracho (*Schinopsis quebracho-colorado*) and the white quebracho (*Aspidosperma quebracho-bianco*). Typical nesting habitat is the western Chaco old growth forest, which is rapidly disappearing due to deforestation and overgrazing (Bucher & Martella 1988). Circumstantial evidence suggests that this parrot migrates seasonally in at least part of its range. However, there have been no banding programs to provide precise and reliable information. The food habits of the subspecies are still little-known; but evidence suggests that, like other amazons, it feeds mostly on fruits and leaf buds.

During winter, the blue-fronted amazon may cause damage in citrus orchards in northwest Argentina. For that reason, it has legal pest status in several provinces, allowing its unlimited exploitation or destruction. Pest status has not been given on the basis of reliable up-to-date estimates of crop losses, however. Today, damage to citrus crops by the subspecies in northwest Argentina is restricted to a small proportion of its geographical range, is very light, and is economically irrelevant (Bucher

*et al.* 1993; Navarro *et al.* 1991; Sauad *et al.* 1991). As is typical of bird damage (Bucher 1992), some orchards may suffer occasional heavy damage. In those few cases where control is warranted, nonlethal techniques would be effective.

Data on population dynamics are scant. Population size appears to be declining throughout the subspecies' range, which is already very fragmented. Clutch size and nest productivity have been measured in a few cases. Other key parameters - such as age-related survival and fecundity, age to maturity, proportion of adults breeding, age structure, density, dispersal and ranging behaviour, social behaviour and genetic composition - are unknown. The role of climatic factors on life-table parameters is unknown, although it may be crucial in the highly unpredictable climate of the Chaco savannas.

### Capture and trade

About 340,000 blue-fronted amazon parrots were exported from Argentina between 1981 and 1990, according to official figures (Thomsen *et al.* 1992). These statistics underestimate the actual number of birds taken from the wild, since they take no account of mortality of nestlings in captivity before shipment to overseas destinations (estimated at 20% by Bucher *et al.* 1993), or underdeclaration by traders to avoid taxes. Export figures also ignore birds sold on the national market, the scale of which is hard to assess.

Except for regulation of export quotas by the Argentina federal authorities, there is no management plan for the blue-fronted amazon. In 1991, exports of this parrot were banned for a three-year period; but trade within the country continues, favoured by the bird's pest status in several provinces.

By far the largest proportion of blue-fronted amazons entering the pet trade is taken from the wild as nestlings, collected throughout the main breeding area in the semi-arid Chaco savannas of northern Argentina. The remainder are adults trapped on the wintering grounds along the humid river valleys of northwest Argentina.

Across the Chaco, campesinos systematically remove the whole brood from the nest, precluding any recruitment of young birds into the population. Besides this direct effect on the population, the pet trade also contributes to forest destruction and loss of nest sites. To obtain nestlings, campesinos usually make a hole in the trunk, or even fell the tree, which leaves 95% of the cavities unusable for future nesting attempts. This practice is widespread in the Argentine Chaco and is now extending to the Paraguayan side (Bucher *et al.* 1993), steadily destroying prime breeding habitat. Preferred nesting trees are also valuable timber species.

In Argentina, trade in the blue-fronted amazon involves trappers, buyers in the field ("acopiadores"), and intermediaries at various levels. Adult birds are normally trapped by professionals in citrus plantations in winter. Nestlings are collected by rural people, both residents ("puesteros") and axe-men ("hacheros") who work temporarily in the forest as loggers. Living conditions are poor: most people own only a few goats or sheep, housing is substandard, and health and educational standards are deficient. Most campesinos live at a subsistence level, simply surviving from one day to the next. "Acopiadores" pay the hunters US\$4-US\$6 per parrot. The birds are transported to Buenos Aires by road or air and resold to intermediaries for about US\$8 each. Blue-fronted amazons can fetch US\$400 or more in pet stores in industrial countries.

### Steps to sustainability

The available information and the management difficulties outlined here show that current exploitation of the blue-fronted amazon is not sustainable and endangers the survival of the subspecies *A. a. xanthopteryx*.

A fuller appraisal of harvesting is desirable but presents real problems in practice. For example, evaluation of use based on quotas is extremely difficult if not unworkable in a South American context. Studies on population dynamics, true extractive pressures, social and economic aspects, and the extent of cheating throughout the commercial chain, are required. By its very nature, the last aspect is nearly impossible to quantify.

Ideally, a complete evaluation of the use might require as much data as feasible on population dynamics, habitat requirements, climatic stochasticity, classes of use and social, cultural and economic factors affecting the parrot stocks and trade. Due to climatic variation in the Chaco alone, these studies would need to be conducted for at least eight years (see Bessinger & Bucher 1992 for a detailed analysis). Given limited financial and human resources, it is not possible to obtain the information ideally required to understand all aspects of use of the blue-fronted amazon.

Assessing use of the subspecies based solely on monitoring and evaluation of appropriate indices of use, and of the status of the target populations, may be misleading since:

- Evaluating changes in population size, with confidence limits narrow enough to detect both short and long term variations, would be extremely difficult to do quickly enough to take adequate management decisions in time.

- Given the longevity of the blue-fronted amazon, a measurable change in population may become evident only slowly, even if there is a complete lack of recruitment due to collecting or other causes.
- Chance variations owing to the stochasticity of both biotic and abiotic factors may mask long term trends for several years, delaying appropriate management intervention.

Although a full assessment is Utopian, there are a few reliable indicators of population decline and habitat degradation that are comparatively simple to detect. They might, in principle, provide cost-effective tools for a rapid assessment of the species status. Detection of either of the following factors would be enough to consider the target population as threatened, requiring corrective management measures:

- A general and sustained trend towards a reduced range and fragmented population.
- Steady and widespread loss or degradation of breeding and wintering habitat.

However, even when these two indicators do not suggest any decline, the population is not necessarily safe. The detailed studies on the parrot stocks and the human aspects mentioned earlier may still be required. The costs of providing the financial and logistical framework for these investigations could easily exceed the monetary benefits accruing from the use.

Given the legal and social situation and the lack of coordination among provincial authorities, we consider that national quotas and widespread exploitation in both public and private lands are nearly impossible to assess and control in Argentina at present (Bucher & Reynoso 1989; Walter & Bertonatti 1992). Trapping parrots on public or fiscal land is unlikely to be regulated in Argentina, due to the apparently insurmountable restraints imposed by the areas and distances involved, deficient to nonexistent roads, and lack of resources and personnel in local and national government wildlife agencies. Even if the resources were available, the costs of enforcement could easily become too high in relation to the tax revenue available. The present system favours opportunistic enterprises that profit from the parrot trade in the Chaco but make no investment to ensure its sustainability.

Potential strategies for sustainable use of parrots, including economic and political aspects, are discussed in detail by Bessinger & Bucher (1992). Sustainable management through parrot ranching offers one approach to dealing with the problems threatening the blue-fronted

amazon. Because regulated harvesting of wildlife can result in sustainable land use practices on private land, it can complement the ecosystem protection offered by national parks and reserves. Restricting collecting blue-fronted amazons to approved ranching schemes, based on conservative sustained-harvest models, is far easier to assess and unlikely to result in overharvesting. Such schemes can also be initiated while biological data are being collected. Rather than try to develop quotas for a region or entire country, this approach is site-specific and would set a harvest level for a particular ranch or management unit. If a local population is stable or growing, any increase in its rate of growth resulting from management would produce a harvestable surplus while still maintaining a stable breeding nucleus.

Even so, no management scheme can be sustainable unless it provides for suitable reserves to act as refugia to ensure population survival. The size, number and location of the few existing protected areas in the Chaco are inadequate to ensure a year-round supply of appropriate habitats for the subspecies, especially as it is at least partially migratory.

Solving the biological problems associated with sustainable harvesting may be far easier than tackling the social and political ones. Some of the difficulties anticipated are:

- It is unlikely that parrots can be harvested sustainably if many birds continue to be taken illegally. Unless laws can give adequate protection from overharvesting, or enforcement efforts make parrot smuggling much more difficult and costly, it will always be easier and cheaper to take birds from the wild in an unsustainable way and market them through legal or illegal channels rather than invest in sustainable ranching schemes. Implementing the latter will require legislation to control the parrot trade and truly effective control of illegal harvesting.
- Regulation of parrot harvesting is essential at both national and international levels. Each ranching programme must be registered to harvest birds. Trained wildlife biologists must visit each site to conduct surveys and other research to establish cropping levels.
- Assuming unlicensed commercial operations can be outlawed, regulatory problems may persist. Maintaining a market for parrots may encourage catching birds from outside the managed population. Determining the source of nestlings is difficult, and cheating may be hard to detect and prove. Currently, no identification system is completely reliable. The continuing market for parrots may also foster poaching birds from the approved programmes if they can be

traded illegally. Ranching schemes on public land would be particularly prone to this problem compared to those on private property.

- In Argentina, the autonomy each province has over managing natural resources could complicate or frustrate the organization of well-coordinated, sustainable harvesting programmes, creating anarchy and favouring cheating.

## Vizcacha hunting

John E. Jackson

### Present status

The vizcacha (*Lagostomus maximus*) is a medium sized hystricomorph rodent, common throughout much of the rangelands of central and northern Argentina. Three subspecies of vizcacha are recognized, but with a widespread and continuous distribution, no endangered local or endemic populations are thought to exist. Adult males average 7-8 kg and females 4 kg. They live in communal burrow systems and are officially classed as a "pest" under national and many provincial laws. The species is nocturnal, emerging at dusk to forage near the colony or "vizcachera".

Extensive and intensive official campaigns have tried to eradicate this herbivore. Control efforts were largely successful in the richer, often arable areas of the wetter eastern sectors of the pampas; but this rodent still survives in the drier western grassland and scrub region and extends into Patagonia and the Chaco. Weir's prediction (1974) that the vizcacha would become extinct within a decade because of massive control operations has not come true. The direct and indirect effects of human activities have adversely affected many species of native wildlife in Argentina; and people have modified many ecosystems inhabited by the vizcacha. But evidence suggests that overgrazing and habitat degradation in semi-arid zones actually facilitate colonization by *Lagostomus*. Once established, the animals then modify and degrade the environment still more, allowing for further expansion of the vizcacheras. In marginal areas, vizcachas are apparently extending their range and numbers, although many provinces lack reliable distribution maps.

Despite the vizcacha's widespread distribution and real impact on rural ecosystems in Argentina, there is not enough information to prepare detailed management plans. Until recently, data on many basic parameters were totally lacking, and even now are becoming available for only two sites. In most provinces, distribution and abundance are not defined, little is known about

population dynamics, and statistics on harvest levels and methods are often vague. Information is scarce on the socioeconomic role of wildlife; and few people appreciate its values and contribution to the regional or national economy.

The only in-depth work was by Llanos & Crespo in Entre Rios (1952) until studies were undertaken by Jackson and co-workers in INTA in San Luis (e.g. Jackson 1989; Jackson 1990) and by Branch and collaborators in Lihuel Calel National Park in La Pampa (e.g. Branch 1993; Branch *et al.* 1993).

## Harvesting and trade

The vizcacha is important in semi-arid marginal zones as a source of meat and pelts; for sport hunting; and because of the damage it does to vegetation and the carrying capacity for domestic livestock. Vizcachas are normally shot at night near the colonies, using a spotlight and 0.22 rifle. On a good night, a crew of three professional hunters may take as many as 150 animals in open country where they are still abundant. Shooting is not size or sex specific, except that very young animals are spared as they are not marketable.

Vizcachas can also be trapped with unsophisticated and cheap wire cages (Llanos & Crespo 1952). A few commercial hunters prefer live trapping, stockpiling the rodents in captivity for several days before transporting them to central processing plants for slaughter. This method of live capture would allow the population structure to be manipulated.

The animal's feeding and burrowing habits can degrade pastures (Giulietti & Jackson 1986; Llanos & Crespo 1952); but it is an efficient converter of low quality forage (Jackson 1990). The vizcacha has good quality meat, which may be sold fresh or bottled in "escabeche". The meat is white with a good nutritional value due to its high coefficient of digestibility, low fat fusion point and high percentage of proteins (Machado 1942). In the past the meat has been exported but currently consumption is limited to the home market. Dried pelts may be exported uncured or made into medium-quality items such as cheaper coats, bedspreads and novelties, and then sold locally or overseas. Official figures for recent years show exports of up to 125,605 pelts annually (1977) with a maximum yearly value of US\$946,611 (1980) and a top unit price of US\$8.25.

Just how many vizcachas are shot or trapped is not known. The number of pelts exported officially is recorded, but their precise origin and when they were harvested are not always certain. There is no good estimate of how many may be taken mainly for meat, and whether these are consumed locally or traded. Most

provinces do not require licences to hunt vizcachas; and, since the species is classed as a pest, they impose no bag limits or closed seasons. Large numbers are harvested, however. A tentative estimate made in the mid 1980s for the central province of San Luis on the basis of hunter surveys suggested that as many as 250,000 are shot there each year.

The animals are also controlled with fumigants, primarily phosphene gas or sulphur, released into the partially blocked burrow systems. Poisoned baits, such as warfarin at 0.3% on whole maize, are also used. Strychnine was once common and its use persists in some areas.

## Steps to sustainability

Although the vizcacha has been eradicated or its range has contracted on the eastern side of its original distribution, it seems to be becoming more numerous on the northern and western margins, possibly linked to human-induced habitat degradation. Correct and coordinated use of fumigants does exterminate colonies; but, although the vizcacha is a high K strategy species, shooting does not eliminate it (Jackson 1989). Many vizcachas are heavily shot over with no evident long term reduction of population levels. Numerous colonies that have been heavily hunted for many years still survive. This suggests that the stocks are resilient to present extractive measures, which may be sustainable as they are. Uncontrolled hunting may not necessarily be synonymous with unsustainable harvesting. This needs to be confirmed.

In several provinces, people have expressed interest in encouraging and rationalizing vizcacha hunting with the dual goal of controlling the vizcacha's numbers and impact on rangeland while generating income in poor areas through the sale of meat and pelts. The scientific information to do this sustainably is largely lacking. How many vizcachas are killed by present hunting and poisoning techniques and the effects on population dynamics are unknown. Collecting data from hunters is of doubtful value and practicality as this hunting is often furtive and even bonafide hunters are reluctant to divulge information to officials. Commercial sales of poisons and fumigants for vizcacha control could suggest the numbers killed and provide a means of monitoring eradication effort, if the average amounts employed and the kill rate could be established. But they would not provide information on population trends.

However, enough data are now becoming available to attempt indicative population and harvesting modeling, using best and worst values. Robust working estimates of distribution and population might be obtained cost-

effectively by counts of active colonies on the ground or from the air in open areas. In well-grassed open habitats, a distinctive vegetation or "lawn" develops around the vizcachas. These lawns can be detected on aerial photographs and might even be visible on satellite images. Burrow censusing could form a cost-effective basis for monitoring vizcacha population responses to management or regulated harvesting. If either colony area or the number of active burrows is proportional to the size of the resident population (and once the proportion has been calculated), total or representative vizcacha stocks could be estimated with relative ease.

The present management philosophy is that the vizcacha is a "pest" species: if it does become extinct locally one can always harvest it elsewhere. Landowners often tolerate or encourage hunters on their land to try to reduce the numbers of vizcachas. The same is true of other pest species such as the hare. Yet gross calculations indicate that some landowners could make as much money from their fields by correctly cropping that resource as they could from cattle when beef prices are depressed. Attitudes might change if a system of smaller local processing plants were established, possibly linked to the present network for collecting and processing European hares (Jackson 1986). These plants would provide wildlife managers with:

- A sound, cost-effective way of studying and monitoring large samples of vizcachas at fixed collecting stations.
- The opportunity to obtain better information from the collectors.
- A mechanism to manipulate the market, and hence the resource, through selective buying or differential pricing.

Standards of hygiene, presentation, promotion and marketing should all benefit. Centralizing vizcacha processing could provide an effective mechanism for instilling the notions of sustainable harvesting of wildlife and facilitate cost-effective means of monitoring and investigation. Funding for management and research could come from a small levy on those using the processing plant.

There are marketing problems with the vizcacha but the potential is there for this "pest" to be turned into a profitable crop, given adequate promotion and a correct management system. People do not eat hare meat in Argentina, yet it commands a high price for export to western Europe (Jackson 1986). The meat expertise, processing plants and commercial chain exist. With adequate promotion, vizcacha might become a

gourmet food in the Old World, creating a new and lucrative market for a "pest" species that is used sustainably.

The risks from this pragmatic approach are negligible. The species is not in danger, and populations are widespread and resilient; so there is ample margin for error while a sustainable harvesting system is developed and adopted. The benefits could be significant: authorities in the areas where vizcachas are most abundant are seeking alternative enterprises to provide long term income for the rural workforce.

## **Tegu lizard hunting**

*José María Chani*

### **Present status**

Two species of tegu lizard (*Tupinambis teguixin* and *T. rufescens*) are heavily exploited for their skins in Argentina. *T. teguixin* occurs in the east and north of the country, whereas *T. rufescens* prefers more arid land. Both can excavate their own burrows but commonly take refuge in those made by other animals, such as vizcachas, or in natural cavities. Tegus are omnivorous: their diet includes carrion, eggs, snails, insects and fruits. Both species overwinter in burrows and become active in early spring. Mating is followed by nesting, females guarding their nesting burrows.

Information on many aspects of tegu biology has been greatly increased by the recent Tupinambis Research Program funded by WWF-US, CITES, and the Camera de Industriales de Curtidores de Reptiles de Argentina (CICUR) (Chani 1990; Chani 1993; Fitzgerald 1990; Fitzgerald *et al.* 1991; Fitzgerald *et al.* 1993). More information is still needed, particularly on population dynamics and habitat selection. The former is particularly difficult to study since at any time an unknown proportion of the population is hidden in burrows and not accessible for censusing (Fitzgerald *et al.* 1991).

### **Harvesting and trade**

On average, 1,250,000 skins of both tegu species have been exported annually from Argentina during most of the past decade. Skins are shipped to the United States, Canada, Mexico, Hong Kong, Japan, and several European countries. The traditional harvesting system consists of hunters (both professional and occasional) using dogs on both private and public lands. Hunters may sell skins directly to the tanneries but more often the skins pass through intermediaries. Hunters in remote areas sell or trade skins for goods to travelling sales

agents or "acopiadores", who then resell the skins to tanneries or to warehouse owners known as "barraqueros".

The present harvesting system is similar to that for other wildlife in Argentina, particularly parrots in the Chaco. Hunters are mostly rural workers who complement their meagre incomes by collecting tegus and other saleable species. They receive between US\$1 and US\$5 for each skin, according to size and quality. They have no economic incentive to conserve the resource. The only limit to the numbers they hunt is imposed by the time available, weather conditions, and the length of the season tegus are above ground.

### Steps to sustainability

As for any wild species, the more information available on its population dynamics, habitat requirements, general biology and ecology, and socioeconomic aspects of use, the better the assessment that can be made of its actual status and potential for use.

With tegus, there are considerable difficulties in assessing some basic parameters. For example, even during the season when they are most active (September-April), a variable and unknown proportion of individuals remains in their burrows. This affects the accuracy of any census, such as roadside counts or transects (Fitzgerald *et al.* 1991). Nests are hard to discover and disturbance by observers may affect maternal care and increase mortality through loss of humidity (Chani 1990). Current research is at the local level: further investigation is needed at regional level for both species of tegu. This will increase the requirement for trained personnel and resources.

At present, the *Comision Tupinambis* is responsible for controlling tegu commerce. This body, formed in 1988, consists of the directors of provincial wildlife agencies, skin traders, and others with an interest in tegu management and use. The main thrust of the Commission is to stabilize commerce within the provinces through tax incentives. The Commission also assigns quotas to each province as a proportion of the total quota for Argentina. This has been set at 1.1 million skins, of which 1 million are for export.

Management relies on monitoring variation in skin sizes sampled in tanneries and the stores of intermediaries. Monitoring began in the 1992-93 breeding season. In principle, monitoring skin size frequencies could prove a cost-effective management tool, providing an indicator of the impact of hunting on lizard populations by showing shifts in size (i.e. age) class abundance over time. This approach shows promise and requires further research. Limitations include:

- The approach is vulnerable to cheating. Possible sources of error include smuggling of skins from neighbouring Paraguay or Bolivia, enlarging skins by stretching, and hiding those that do not reach the minimum size. Skins can be, and normally are, stretched to the maximum by hunters and intermediaries, because larger skins fetch higher prices when dry. Soaking the skins before tanning apparently allows them to recover their original size, but it is impractical to soak every dry skin in intermediaries' stocks. This complicates comparison of data from the stocks of hunters and intermediaries with those from tanneries, making double checking hard.
- The relationship between skin size and reproductive status has not been established. Currently, there is information only for *T. rufescens* from a single locality (J.V.Gonzalez in Salta). It is not yet clear whether or not the 24 cm wide minimum size for tradeable skins includes young, pre-reproductive reptiles.
- Other population parameters for both species also require more research. They include age-related survival, age-related productivity, and habitat-related density and productivity.
- Observed shifts in age structure may not correspond to changes in population density and vice versa. The current monitoring system needs complementing with population counts to ensure that any sustained population decline can be detected early enough to intervene. Research to overcome the problem of censusing tegus in their burrows is vital.

If skin size is a reasonable indicator of age in tegus, and the problems listed above can be solved, it would be possible to set quotas based on minimum sizes. The principle behind this approach is that, if only a proportion of the reproductive individuals is being harvested, the remainder would be capable of producing sufficient offspring to ensure adequate recruitment.

An important and welcome development is that traders have made investments to conserve the resource through their support for the Tupinambis Research Project. Several captive rearing schemes have been initiated in Argentina but none has gone beyond the experimental stage. Apparently, their production costs cannot compete with wild-caught skins.

A crucial point about the sustainability of the present system is that it is purely extractive, with no attention paid to replacement of the resource. Therefore its long term sustainability - both ecological and commercial - is doubtful. From the start, the only replacement has been natural. Given the trend towards fragmentation and loss

of habitat, combined with the pressure of selective commercial hunting, the wild populations face an uncertain future. It is not known if a system that included the cost of replacement would be profitable enough to support a commercial industry. Consequently, I believe it is necessary to revise the entire system, along the lines of models being applied in Central America for the green iguana (*Iguana iguana*). A system based on production rather than extraction would enhance the sustainability of harvesting tegu species.

## General discussion and conclusions

John E. Jackson, Enrique H. Bucher and José María Chani

We have reviewed the cases of three heavily cropped species we have worked on personally. We believe that together they are largely representative of the many other land vertebrates in Argentina that are or may be overused and about which surprisingly little is known. Few activities that contribute so much to the local, national and international economy can be as undocumented as the wildlife trade.

Any assessment procedure needs to take account of two issues common to all three case studies.

The first and more obvious one is that it is difficult, and perhaps dangerous, to have a single procedure to assess the sustainability of uses of all wild species, at least beyond very broad and general guidelines. Practical, cost-effective procedures are difficult to obtain, given the logistic constraints associated with vast regions, the paucity of biological information available, and complex economic, social and political conditions. We strongly advocate a case-by-case approach to assessing sustainability. In each situation, support must be forthcoming for long term studies, an interdisciplinary and goal-orientated philosophy, and as much participation by local scientists as possible.

The second issue is that assessing sustainability of uses of wild land vertebrates requires a strong component of advanced population dynamics, habitat suitability analysis, and other theoretical ecological concepts. Peer review by leading authorities in the field should be encouraged for every management plan, as well as any general assessment procedure that might be proposed.

Although each of our cases has its own species-specific attributes and needs particular management studies and solutions, some common denominators apply to all wildlife management in Argentina. They may also be relevant to other countries, especially in South America. These points need to be addressed for sustainable harvesting to become a reality.

1. The state of knowledge about most commercially important wildlife species in Argentina is woefully insufficient to advance management plans for their sustainable use at present. The situation has been improving; but figures for even current distribution and population trends for major commercial species are often based on intuition and best guesses.

2. Funding for wildlife research aimed at producing the necessary data to manage any economically significant species has been, at best, sporadic. In the last few years, however, several trade associations have supported projects to produce guidelines for the sustainable management of the resource on which they depend. The research has been done by accredited scientists, often with additional input from abroad.

3. Although Argentina has a strong history of traditional biological research, applied wildlife investigations in the field, designed to produce basic data for management plans, have lagged behind. Practical, qualified wildlife biologists are still rare. This deficiency is being addressed.

4. The socioeconomic role of wildlife as a productive component of extensive and intensive agricultural and livestock systems is unrecognized at any level in Argentina. Landowners and decision makers do not yet consider wildlife use as a serious alternative or additional form of production.

5. Because they do not regard wildlife as part of the land's productive potential, private and state landowners are seldom involved in the wildlife trade. As a result, few landowners are concerned with the rational use of wildlife as a complementary source of income. They commonly allow resident workers to hunt to complement their salaries. Poaching is rife. Wildlife is treated as nobody's property, a classic example of the "tragedy of the commons" (Hardin 1968).

6. Currently, little or none of the income generated from using wildlife is spent on its conservation. With a few recent exceptions (notably the *Comision Tupinambis*), none of those profiting from the wildlife trade make any investment to ensure the long term viability of the resource. They behave opportunistically, preferring to move on to other less exploited areas or to shift to other species, according to availability and international prices. Funds from taxing wildlife exports at provincial and national levels have not been invested in conservation.

7. The people most likely to have a direct impact on the species and ecosystems concerned receive a

disproportionately small share of the benefits from the resource use. Intermediaries and exporters profit from the trade far more than the harvesters. The economic gains that many rural hunters derive from taking wildlife are short-lived, soon offset by the costs of environmental degradation and loss of resources. Problems of land tenure in some regions, poor education, and lack of ownership, do not encourage them to think in terms of long term investment. Landowners may also expect them to exploit wildlife to supplement low wages or as part of their perks as ranch-hands. Many rural dwellers, particularly in poorer areas, live at a subsistence level: income from wildlife is essential for survival, seldom generating enough extra money to improve their living standards. The socioeconomics of the Chaco are discussed in detail by Bucher & Schofield (1981) and Schofield & Bucher(1986).

8. In Argentina, provincial autonomy in natural resource management may complicate or even prevent the implementation of well thought out and coordinated sustainable harvesting programmes. This makes cheating easy and results in anarchy. A mechanism for integrating species management nationwide is fundamental for success.

9. Inadequate law enforcement may cause even the best designed programme to fail, or worse, transform it into a mechanism for cheating.

10. Agencies responsible for wildlife often lack sound scientific and management criteria, partly due to staff and resource limitations. Independent assessment and monitoring by scientists with international credibility should be built into all programmes and projects from the outset.

11. The pest status given by national and provincial agencies to a number of harvested species appears outdated and should be reviewed using modern damage evaluation criteria. Losses due to wildlife should be compared to those resulting from other factors. Where damage by wildlife is economically significant, nonlethal controls should be promoted.

12. It is crucial to adopt a comprehensive approach to the use of wild species. They form an important renewable natural resource in many regions of Argentina. They should be used sustainably. We would caution against assuming that overharvesting is the prime cause of a species' decline. Banning trade may be necessary in the short term; but it may also give a false sense of achievement. Other factors such as habitat destruction may be equally important.

13. A network of refugia of adequate size and distribution may be essential for long term wildlife use in Argentina. Argentina has many national parks and reserves; but the network needs expanding to encompass ecosystems that are less visually attractive and are not on international borders. For example, there is no national park in the pampas biome, which has almost disappeared apart from small reserves on land marginal for agriculture and livestock or along fenced railway lines. The last relics of pristine tussock grassland on the semi-arid western edge of the pampas are vanishing, together with associated endangered wildlife such as the pampas deer *Ozotoceros bezoarticus celer* (Jackson and Giulietti 1988).

14. Any attempt to develop sustainable management schemes for wildlife species in Argentina should adopt a strictly precautionary philosophy. Any plan must also take into account all the possible biological and logistical factors and not simply the most obvious ones or those which may be easiest to tackle or are politically most attractive. Solving the ecological problems associated with sustainable harvesting will be difficult but may be far easier than some of the inherent socio-political ones.

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# Harvesting kangaroos in Australia

Gordon Grigg

## Background

All 52 Australian species of the marsupial superfamily Macropodoidea are protected by legislation. Five are harvested commercially under government permit and control: whiptail wallaby, euro/wallaroo, red kangaroo, eastern grey kangaroo and western grey kangaroo. The rural community regards all these species as pests. Harvests of the three species of kangaroo total 3-4 million animals per year. This is less than the quotas, which are set annually based on population densities and climatic considerations. Large numbers of kangaroos have been shot for well over 100 years. However, only in the last 20-25 years have state and federal governments controlled the size of the harvests and devoted significant resources to conservation and management.

The motive for allowing the development of a commercial industry has for long been to reduce kangaroo numbers. Kangaroos are widely perceived as a pest in rural Australia because they are considered to compete with the production of wheat or sheep. However, kangaroos are also Australia's national symbol; and "Save the Kangaroo" campaigns in Australia and other countries erupt from time to time, claiming that pest-reduction harvesting threatens kangaroos with extinction. Yet extensive and intensive annual monitoring of kangaroos over the last 15-20 years has shown no sign of harvest-driven downward trends in kangaroo numbers. All the evidence shows that kangaroos are resilient to controlled harvesting.

The official attitude to harvesting kangaroos has changed greatly in recent years. It now favours using kangaroos as a sustainable resource, instead of allowing commercialization solely to fund a "pest control" harvest. I am a strong advocate of this, as a means to conserve both kangaroos and the land (Grigg 1991, 1993). Most of Australia's kangaroos are to be found in the sheep rangelands, semi-arid chenopod shrubland occupying about 40% of the country. Overgrazing by sheep during the last 150 years or so has led to widespread land degradation. Landholders and governments realize that

total grazing pressure must be reduced. Most landholders want to achieve this by sharply reducing the numbers of kangaroos, the better to manage the rangelands as a monoculture of sheep. But the high conservation significance of kangaroos ensures that this will never become policy. Indeed, the annual kangaroo quotas are set to maintain, not reduce, the populations.

In 1992 in the Blackall Shire in western Queensland, more than one million kilograms of kangaroo meat hit the ground and, after the shooter removed the hide, stayed there. Because it could not be sold for human consumption and so had little value, the meat from more than half the 3.5 million kangaroos shot legally in Australia each year became carrion.

I have been pushing the view that kangaroos are a much undervalued resource, particularly the meat, which is tasty and low in fat. An increase in the value of kangaroos - with the profits flowing to the landholders - would enable them to reduce total grazing pressure by reducing sheep numbers, while maintaining or increasing their income. This seems to me to be a perfect example of sustainable use of wild species for conservation. Reduction of sheep should allow recovery of native vegetation and, with it, other wildlife.

The first step towards this goal was taken recently. The sale of kangaroo meat for human consumption is now legal. Kangaroo meat is being actively promoted. The meat is already finding a specialty market in Australia, along with emu and crocodile. Many restaurants in all states now serve it routinely. Hardly a week goes by without an article in a major newspaper or magazine reporting on the growing enthusiasm for it. I look forward to the time when kangaroo meat occupies a firm place at the upper end of the price spectrum and a solid overseas market can be developed. The price of kangaroo meat is beginning to rise. With a limited, controlled supply, and a growing demand, we may expect additional increases in price. The prospects look bright for the development of a \$0.3 billion industry in Australia, based on sustainable harvesting of kangaroos, with conservation and animal welfare benefits as a result.

The guidelines followed by commercial shooters require a head shot and the rapid dispatch of a joey (baby kangaroo) if present. They have the approval of the Royal Society for the Prevention of Cruelty to Animals; and compare very favourably with the treatment of domestic livestock that are transported to, held at and finally killed at abattoirs.

## **Does kangaroo harvesting meet the draft Criteria and Requirements?**

I will now address briefly the extent of the match between current kangaroo management practice and the IUCN draft Guidelines.

### **Criteria**

Kangaroos were harvested widely and essentially without restraint for well over 100 years by European and Aboriginal Australians. Some states have records of skin exports for many decades, testifying to massive slaughter of kangaroos over wide areas. About 20 years ago kangaroo management and conservation began to be put on a firm scientific basis. Harvest quotas were introduced, set in the light of aerial survey data. Each state implemented controls on the size of the harvest. Maynes (1993) provides a review of the history of kangaroo management in Australia.

Opponents of kangaroo shooting often disparagingly refer to the harvesting of kangaroos in Australia as "the largest commercial slaughter of wildlife in the world". It may be. It may also be the best organized, with extensive monitoring and allocation of tags to control the total take, and the best supported by scientific and other data.

Many of the extensive studies of kangaroo biology have focussed on population ecology. The results have been published in, for example, Cairns & Grigg (1993), Caughley, Shepherd & Short (1987), Caughley, Grigg & Smith (1984), Grigg (1991, 1993), Grigg, Jarman & Hume (1989), Lavery (1985), and Maynes (1993). The main conclusions of this research are that kangaroos are resilient to controlled harvest; that rainfall (as the driver of pasture growth) is the controlling influence over population densities in the rangelands; but that populations decline where there is close agricultural use of the land. In other words, habitat loss - not harvesting - has a negative effect on the distribution and abundance of kangaroos.

In average or good seasons, populations frequently expanded despite 15-20% harvests. Drought reduces kangaroo numbers, often very severely, but populations recover rapidly once the drought is over. The dominant

factor controlling kangaroo numbers is pasture condition, a consequence of rainfall, rather than shooting intensity. This emphasizes the importance of good predictive models of population dynamics in relation to rainfall. Increasingly we are looking towards satellite-generated indices of "greenness", at a very fine resolution, rather than direct measurements of rainfall as the predictor.

The impact of harvesting on sex ratio and age structure has yet to be fully documented, but studies are well under way. The harvest concentrates on the larger male animals, so harvested populations have fewer large individuals. The genetics of this effect is the subject of a study recently begun on red kangaroos sampled at six sites across the breadth of the species' distribution.

In summary, the use of kangaroos, as currently managed in Australia, satisfies the draft Criteria (paragraph 19 of the draft Guidelines). Thus it can be argued that it is sustainable.

### **Requirements**

Kangaroo use in Australia also meets the draft Requirements (summarized in paragraph 30 of the draft Guidelines):

#### **Information**

The large database of information about the biology of kangaroos and their population dynamics has already been mentioned.

Two sets of variables are considered in the setting of quotas: aerial survey data and rainfall. Research on kangaroo survey methodology has been substantial. It began in the early 1970s with Graeme Caughley's pioneering work using fixed-wing aircraft and strip transects. It continues today with Clancy and Pople's helicopter surveys using line transect methodology. This latter is now being extended by Grigg, Beard and Pople with the aim of replacing the (expensive) helicopter with an (inexpensive) ultralight aircraft. Both strip and line transects have their place. Strip transects, using the so-called Caughley correction factors, are now known to underestimate densities, particularly of grey kangaroos. However, they provide a useful comparative index of density and can be conducted over a wide area inexpensively. The annual surveys undertaken in many of the harvested areas depend heavily on this method. Line transects, conducted from a helicopter or an ultralight aircraft, have been calibrated to foot surveys and proven to be valid. They are the method of choice where an intensive survey is required in a smaller area. It is likely that graziers soon will wish to know the size of kangaroo populations on their properties, so that tags can be

allocated to individual properties. This development underlies the need to reduce survey costs by replacing the helicopter with an ultralight plane.

### Management system

Kangaroo range states are committed to conservation of kangaroos. Once quotas are set, tags that are attached to carcasses provide a mechanism for controlling the size of the harvest. Tags are purchased by the user, the money going to further research and to monitoring and management (details vary among the different states). All states have the capacity to close the season if, for example, a severe drought sets in and casts doubt on the suitability of the quota set in advance for that year.

The quotas are set at an annual meeting of the states, representatives of the federal Australian Nature Conservation Agency and representatives of scientific NGOs. In Australia, the constitution provides for each state to have responsibility for management of its own wildlife, but for the federal authorities to control wildlife exports. In practice, the export quotas equal the total commercial harvest in each state.

### Legal framework

Legislation in all states protects kangaroos. Permits allow pest destruction in areas outside the commercial zones. The commercial industry is controlled by the issue of tags (see above), and licensing of shooters, processors and tanneries. Nevertheless a lot of illegal shooting for pest destruction does occur. Almost no commercial use is made of kangaroos killed illegally. Of course, population monitoring takes account of all kangaroos killed, whether legally or illegally. Since illegal shooting is a consequence of the perception of kangaroos as pests rather than resources, raising the value of kangaroo products should result in its virtual cessation.

### Social and economic incentives

As Australia's national symbol the country has a great incentive to conserve kangaroos. Their unique gait and

general appeal to people everywhere ensure a high position on any scale of desirability for conservation.

Most important, the growing awareness of the economic potential of kangaroos, and the conservation benefits of a kangaroo harvest, should ensure that economic and conservation motives reinforce each other. Indeed it is hard to think of a better example of the principle.

### Precautionary principle and safeguards to ensure the survival of the species

Typically, harvests are set around 12-15%, known from experience not to inhibit population increases in average or better seasons, and comfortably below the intrinsic rate of increase (30-40% per year).

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# Furbearer trapping in the Yukon, Canada

Brian G. Slough and R. Harvey Jessup

## Background

The fur trade profoundly shaped the recent history of Canada. Beginning in the mid-17th century, trading companies from Great Britain and France sought furs from territories previously unexplored by Europeans. They obtained the furs from Indians, who also acted as intermediaries, giving the traders access to remote regions through existing trade routes. The most valuable furbearer was beaver (*Castor canadensis*), whose fur was used to make fashionable felt hats. Pressure on the beaver decimated populations and led the fur trading companies north and west across North America. A similar overharvest of the sea otter (*Enhydra lutris*) in coastal Alaska, a resource exploited by Russians and later Americans, shifted interest inland to valuable furs such as marten (*Martes americana*) and red fox (*Vulpes vulpes*).

Thus the Yukon Territory entered the fur trade in the early 19th century, initially through coastal Indian intermediaries. By the mid-1800s, the Hudson's Bay Company had set up trading posts in the Yukon to compete more effectively with the coastal Indians. European settlers followed the fur traders across Canada, exploiting agricultural lands, timber, minerals and other natural resources. The Klondike Gold Rush of 1896-98 brought many new settlers to the Yukon who put additional pressure on the fur resources through unregulated trapping (McCandless 1985). By the early 20th century governments across Canada recognized the vulnerability of the fur resources, which had in some cases been seriously depleted. They began to enact laws to control harvests and numbers of trappers. Today, in the Yukon and across Canada, management practices have allowed furbearer populations to rebuild to the extent that none is endangered, except where non-trapping related impacts, such as habitat changes from agriculture and forestry, are taking their toll.

In the Yukon Territory, some 500-800 persons, 70% of whom are aboriginal, are eligible to harvest furs. This represents 1.7-2.7% of all Yukon residents, or 5.8-9.2%

of rural residents. In addition to beaver, marten and red fox, trappers harvest muskrat (*Ondatra zibethicus*), red squirrel (*Tamiasciurus hudsonicus*), lynx (*Felis lynx*), arctic fox (*Alopex lagopus*), coyote (*Canis latrans*), grey wolf (*C. lupus*), short-tailed weasel (*Mustela erminea*), mink (*M. vison*), river otter (*Lutra canadensis*), fisher (*Martes pennanti*), and wolverine (*Gulo gulo*). Besides being harvested for their furs, beaver, muskrat and lynx are "country" foods. Furs are sold either on national and international fur markets or are used locally in the cottage garment industry or personally for clothing. Trapping is an important social, cultural and traditional activity for many residents.

## Does furbearer trapping meet the draft Criteria?

Furbearers are managed to both maximize annual harvests and ensure the long term viability of populations. This is achieved in part through a legal framework which limits open season lengths and harvest quotas (Slough *et al.* 1987), and a "Registered Trapping Concession" (RTC) system.

RTCs are granted to individuals or groups of trappers for specific land areas, averaging 800km<sup>2</sup>. The number of RTCs is limited to 372 (plus 15 larger group areas). Therefore the number of individuals with rights to trap is also limited. This system of trapline tenure eliminates the commons. RTCs have renewable 5-year terms, preventing competition for the resources and fostering a sense of stewardship, where trappers are key players in the management of furbearers (Novak 1983). First Nations (aboriginal peoples) administer group areas for their communities. They also disburse trapping pressure with a traditional system of family trapline tenure.

The Yukon Trapper's Association (YTA) delivers an educational programme, sanctioned by the government. The course provides trappers with up-to-date biological information to manage their harvests of furbearers and to harvest them humanely (Yukon Trapper's Association

[YTA] and Yukon Department of Renewable Resources [YDRR] 1991). Trapper education is mandatory for all first-time trappers. Experienced trappers are encouraged to upgrade regularly their knowledge and skills. An estimated 50% of all trappers have taken the course. Management by trappers includes conducting population surveys/indexing, modifying trapping intensity with population and harvest levels, and incorporating refugia from trapping to conserve breeding stock (YDRR, Yukon Trapline Management Series). The large size of concessions allows trappers to manage all species for a sustainable harvest. The low level of transportation infrastructure required by the human population of 29,000 guarantees, by default, the existence of refugia for even those species with the lowest population densities (wolf and wolverine).

RTCs cover all lands except national parks, or 93.3% of the Yukon's 500,000km<sup>2</sup> land mass. The federal government controls 98% of the land, the territorial government 1%. The remaining 1% is privately owned. Under the First Nations aboriginal land claims agreements, First Nations will obtain title to 8% of the Yukon. Although the land is eligible for other uses such as mining, forestry and agriculture, trapping remains the most viable use for much of the area. It is also the land use in which many residents, particularly rural, prefer to participate. First Nations may also trap for "subsistence" use of furbearers (that is, personal clothing or food) on all lands. In addition, under negotiated First Nation Final Agreements, First Nation members will gain access to commercial fur harvesting in national parks. When other land uses are being considered, the significance of the area for trapping is always assessed. Trappers and governments are concerned to maintain the ecosystems that support furbearer populations. Recent legal cases have recognized the rights of RTC-holders over other resource users on government-owned land.

Trapping has no known deleterious impacts on other species of plants or animals. The nearctic boreal forest is characterized by fluctuations: for example, the famous 3-5 year vole (*Cricetidae*) and 8-11 year snowshoe hare (*Lepus americanus*) population cycles. The region is resilient to ecocatastrophes - such as those caused by mass migrations of caribou (*Rangifer tarandus*), fires, and so on - and returns quickly to its original state. Trapping of furbearers of the boreal forests or arctic does not induce ecological instability, because the impacts are well within the natural limits of variation found in the ecosystem.

Ecosystem rehabilitation or other forms of habitat management have not been necessary. However, forest management policies such as the wildfire policy provide for maintenance of ecosystems, so as to sustain species that depend on natural fire cycles (for example, lynx and

moose [*Alces alces*]). Wildfires are the most notable stochastic event to perturb the boreal forest of the Yukon. The RTC-based management system copes well with ecosystems fluctuating from cyclic and random events, such as changes to species composition that result from a fire.

Trapping itself has minimal impact on habitats. Three of the harvested species are herbivores: beaver, muskrat, and red squirrel. Beaver habitat is either permanent, in the case of shoreline willows (*Salix* spp.) maintained by seasonal water fluctuations, or transient, in the case of fire-induced aspen (*Populus tremuloides*). Trapping of beaver colonies can influence the cycle of colony site occupancy and abandonment, caused by willow or aspen depletion, by conserving food species and promoting longer periods of occupancy. Beaver management prolongs the life of fire-dependent aspen stands, which are destroyed by repeated cutting by beavers. Trappers are encouraged to practice beaver/aspen management, since aspen stands maintain higher beaver densities than any other food. Trapping muskrats has been shown to conserve marsh vegetation in southern North America, but muskrat densities and harvest pressure are much lower in the Yukon. In fact, harvests of all three herbivores are low at present due to self-management by trappers, the remoteness of trapping concessions, and a lack of economic incentives.

Harvesting carnivores could theoretically alter habitats by increasing herbivorous prey populations. This does not happen, due to compensatory predation by the many other avian and mammalian predators, and independent factors such as disease and weather. Coyotes have been present in the Yukon only since about 1900. There is evidence that their expansion beyond the Great Plains of North America was aided by habitat destruction and the decimation of wolf populations by "predator control" programmes (Nowak 1978). Wolf management is now consistent with the "wolf manifesto" of the IUCN/SSC Wolf Specialist Group.

Furbearer populations may have been depleted in the early- or mid-20th century (McCandless 1985). Since then, implementation of a management system has restored them to carrying capacity (Slough *et al.* 1987). It is doubtful that genetic diversity was ever impaired. Furbearer management began with the Game Ordinance (now the Wildlife Act), which established trapping seasons in 1920, began licensing trappers in 1937, and registering traplines in 1951. Large scale improvements to the fur harvest and population monitoring programmes were initiated with the establishment of a "Fur Section" in the Wildlife Branch of the Yukon Department of Renewable Resources in 1975. Today, a furbearer biologist and a fur harvest manager continue to work for the sustainable use of the fur resource.

The sensitivity of species to trapping depends on several factors including abundance, harvest pressure, and ease of capture. Wolverines, with large home ranges (75-270 km<sup>2</sup>) and low densities (6/1000 km<sup>2</sup>), require large refugia from trapping. Lynx and marten, which are easy to trap, also require refugia. Certain trap sets are relatively species-specific and can be used in place of non-discriminating sets. Trappers are thus able to focus harvest pressure on preferred species. Some non-target birds and mammals are killed in traps set for furbearers. However, trappers are educated in methods to avoid this, and impacts are low. Populations of some non-target species such as raptors and snowshoe hares are monitored as well.

Nonconsumptive use of furbearers and their ecosystems is high during summer but minimal during the period of winter harvest (November through March for most species). The impact of trapping on wildlife viewing is negligible. Some trappers, in fact, sell ecotourism packages on their traplines during winter. The opportunity to participate in the trapping lifestyle is as popular as nature viewing with some tourists.

## **Does furbearer trapping meet the draft Requirements?**

### **Information**

Furbearer harvests are monitored through a system of mandatory export permits, fur dealer returns, and sealing of lynx, wolf and wolverine pelts (Slough *et al.* 1987). Since 90% of furs are exported from the territory by fur dealers or trappers, only a small percentage of the harvest is unaccounted for. Wolf and wolverine furs are the most likely to remain in the north for use in the cottage garment industry, but these must be reported and sealed whether exported or not. Lynx are also sealed in response to population concerns in other Canadian jurisdictions and their CITES status (lynx is an Appendix II look-alike of *Felis pardina*). CITES export permits are required for the export of wolf, lynx or otter out of Canada. All the above information is collected by area (that is, for each RTC).

A comprehensive programme monitors furbearer populations (Slough *et al.* 1987). All licenced trappers are requested annually to respond to a questionnaire on furbearer and prey abundance and population trends. This, too, is reported by area, and analyzed on a regional basis. Lynx recruitment is monitored with pelt measurements taken at the time of pelt sealing. The relationship of pelt size to age has been tested in the Yukon (Slough & Ward 1989). Additional regional population surveys or indexing include winter track

counts, beaver food cache surveys, muskrat "pushup" (winter feeding structures) surveys, and aerial wolf surveys (Hayes *et al.* 1991; Simpson *et al.* 1989; Slough & Jessup 1984; Slough & Ward 1989; B.G.Slough, YDRR, unpublished data and survey reports). Many survey techniques were pioneered in the Yukon or were modified to accommodate local population characteristics and behaviour.

Biological studies have been conducted on vulnerable populations and to answer trapline management issues. For example, the muskrats of the Old Crow Flats (Simpson *et al.* 1989; Simpson & Boutin 1993), wolverine (Banci 1987, 1990; Banci & Harestad 1988), and arctic fox, which are limited in the Yukon by denning habitat (Smith *et al.* 1993; Smits *et al.* 1988; Smits & Slough 1993), are considered to be vulnerable. We have also investigated trapline management issues, such as the importance of refugia from trapping in maintaining lynx populations (Breitenmoser *et al.* 1993; B.G.Slough & G.Mowat, YDRR, unpublished data), and the response of northwestern muskrats to harvest pressure (Simpson *et al.* 1989). We have participated in transplants of species to vacant habitats: a marten transplant within the Yukon (to natural vacancies in habitats not contiguous with local marten populations) (Slough 1989, 1994); and a lynx transplant to regenerating habitat in New York, USA (Brocke *et al.* 1990a, 1990b). These transplants complied with the IUCN position statement on translocation of living organisms (IUCN 1987).

Trapper education in sustainable furbearer management complements the incentives provided by the RTC system. Harvest strategies have been developed for six species (beaver, muskrat, lynx, wolf, wolverine, and marten) and are provided to all trappers (YDRR, Yukon Trapline Management Series).

### **Management system**

The management system is responsive to changing conditions and improved information. Yukon wildlife is managed by the YDRR with public counsel from the Yukon Fish and Wildlife Management Board (YFWMB). The YFWMB consists of 12 members: six First Nation nominees and six government nominees. Under conditions set out under the Umbrella and First Nations Final Agreements (legal land claim agreements between the Yukon and federal governments, the Council for Yukon Indians and each of 14 First Nations), wildlife will eventually be co-managed by YDRR, the YFWMB, and 14 Renewable Resource Councils, which will provide advice to the Minister of Renewable Resources. The Renewable Resource Councils, appointed for each of the 14 traditional Indian territories, are councils of district

residents with half their members nominated by the local First Nation and half by the Yukon government. Each council can make recommendations on wildlife management and harvesting issues to the Minister of Renewable Resources, federal ministers who have fish and wildlife responsibilities, the YFWMB, and the First Nation concerned. The main components of the furbearer management system, trapper education and trapping regulations, are subject to annual review.

This wildlife management system clearly creates a partnership between government and users. The users have long term rights and responsibilities in furbearer management. In future, trappers will assume even greater roles in the conservation and management of the fur resource (Novak 1987). A furbearer management plan has been drafted and is used as a guideline, although it has not been adopted as policy (YDRR 1991). The plan includes management objectives, policy, and management strategies. Public interest groups are reviewing a lynx management plan for the Klondike River valley, where significant and vulnerable lynx/hare population refugia exist (YDRR 1993).

The harvest of furbearers is susceptible to many social, cultural and economic factors independent of the availability of furbearers. Market conditions, weather conditions, trapper skill, changes to trapping technology (notably the move to more "humane" trap standards), and motivation (such as the availability of alternative economic support, or motivation to pursue traditional cultural activities), all affect the harvest of furs. The fur market is driven by economic factors and fashion rather than the supply of furs. Trappers and management agencies cannot manipulate these influences.

### **Legal framework**

The legal framework is both supportive and effective (Wildlife Act [1982], Trapping Regulations [1993], Environment Act [1991]). Local people, including First Nations, participate in the legislative review process through the YFWMB and Renewable Resource Councils described above. The YDRR maintains regional enforcement staff to deter and punish the illegal harvest of furbearers and to ensure compliance with other aspects of the legal framework for trapping.

### **Social and economic incentives**

The benefits from trapping and incentives to maintain target populations and supporting ecosystems are clearly connected. The co-management system, involving public groups and indigenous communities assists in the

implementation of furbearer management plans. The territorial and federal governments provide incentives to trappers to maintain the trapping industry through economic hard times, periods of change (such as current trap replacement programmes), and to encourage trapper education.

The Standing Committee on Aboriginal Affairs monitors the federal governments commitment to accelerate funding for trap research, standards development, trapper education and trap replacement in order to ensure that Canadian wild fur products will continue to have access to the EU market despite European Union plans to impose in 1996 a restriction on the import of 12 Canadian wild fur species (House of Commons Canada 1993).

Trappers, garment manufacturers, retailers, native organizations, conservation organizations, animal welfare groups, and all levels of government have joined forces and established the Fur Institute of Canada (FIC) to provide comprehensive leadership for the fur industry. The mission of the FIC is to promote the conservation and growth of the fur industry in Canada. The objects of the FIC include to:

1. Promote a standard of excellence in the conservation and optimum development of the fur resources of Canada.
2. Promote development and implementation of the most humane possible means of harvesting furbearers.
3. Develop, compile and distribute information relevant to Canada's fur industry that will:
  - improve the skills of those persons directly or indirectly involved in the primary fur industry;
  - promote an understanding of historical, current and emerging issues important to the industry, government and public in Canada and abroad;
  - promote general interest in and understanding of furbearer management and use.
4. Promote the conservation of wild furbearer populations through the practice of biologically sound management.

The Government of Yukon introduced "Trapping Awareness Week" in 1989 to highlight the economic and social contributions trapping makes to the territory. It emphasizes the value of an industry based on a renewable resource. Presentations are made in schools in each community of the Yukon and information is made available through the media.

The majority of Yukon furs are marketed internationally through established auction houses in southern Canada. The return to the trapper depends on world demand for furs. Fashion trends dictate the difference in value between one species and another. A small cottage industry supplying traditional clothing and taxidermy products to local people and tourists accounts for less than 10% of the Yukon's annual wild fur harvest.

The Wild Fur Council was formed in 1992 "to promote and market wild furs, nationally and internationally, through marketing, advertising, public relations and public education, and in any manner deemed proper by the board and to work with any groups of like interest in promoting the fur industry and the wise use of furs". Funding for the Wild Fur Council comes from a voluntary levy deducted from each wild fur pelt sold at auction and from project funding from government. The Council's flagship is their "Northern Supreme" label, which assures the consuming public that their garments are made from furs of the highest quality and harvested sustainably.

Trapper education in the Yukon incorporates three basic principles endorsed by all Canadian jurisdictions:

1. Efficient trapping techniques focusing on the latest developments in technology to ensure use of the most humane method of harvest.
2. Proper pelt preparation to ensure maximum financial remuneration per unit of effort.
3. Biologically sound trapline management that recognizes trappers as partners in management and instills a sense of stewardship in the resource to ensure that the harvest of furbearers is sustainable.

Trapper education in the Yukon is mandatory for first time licenced trappers and strongly recommended for the experienced trappers. It is delivered at the community level and often includes one-on-one instruction in the field.

Humane trap development has advanced considerably since government funded research began in 1973. The Federal/ Provincial Committee for Humane Trapping (FPCHT) oversaw the first extensive programme, with a mandate "to recommend to provinces, traps and trapping techniques for all furbearers which will, in so far as the state of the science or art will allow, provide the greatest humaneness in holding or killing furbearers". After this mandate expired in 1981, the Fur Institute of Canada (FIC) was formed in 1983 with a mandate "to carry on and promote development and implementation of the most humane possible means of harvesting furbearing animals". Traps are tested in a sequence of steps in near-

natural environments. The final test is carried out in the field on real traplines using real trappers. By protocol, each trap must meet performance criteria established for each step before moving on to the next step (Fur Institute of Canada 1990). The research is overseen by an animal care committee working under the guidelines of the Canadian Council of Animal Care, and is reported in scientific journals (Barrett *et al.* 1988). Since 1985, 11 humane killing systems have been developed for nine furbearing species (Proulx 1992).

### **The precautionary principle and other safeguards**

Monitoring of harvests and populations is sensitive enough to detect when changes are needed to ensure that use levels are sustainable. It is not necessary to know the size of a target population or its intrinsic rate of increase before a use is permitted. As long as monitoring techniques are sensitive and the legislative process responsive, overuse can be detected and corrected quickly. Nevertheless, cautious harvest rates are advisable. Furbearer populations are presently harvested well within sustainable levels, due to self-management by trappers, lack of economic incentives, and the size and remoteness of traplines.

The Protected Areas Strategy, under the Green Plan of Canada's Department of Environment, promotes the conservation of ecosystems. Many protected areas are already in place (6.7% of the Yukon), with a goal of 12% coverage by the year 2000. However, a protected area system cannot assure the survival and genetic diversity of Yukon's furbearers. None of the furbearers requires rare ecosystems. Many species are carnivores and need a large land base to maintain population integrity. Therefore, management outside protected areas is critical for carnivore conservation. Traplines are an important furbearer management tool (Novak 1987). The provision for refugia, which are effective safeguards against overharvest, is integrated into the trapline management system.

### **Comments on the draft Criteria and Requirements**

Uses of wild species need only be tested against the Requirements and not the Criteria as well, since the former are derived from the latter. We encountered considerable redundancy in our testing of each. The Requirements should be tightened to avoid ambiguity and ensure completeness. For example the word "may" opens paragraphs to interpretation.

Information on population size (paragraphs 31 [a] and 33) is not necessary. Monitoring of catch/unit effort, changes to relative abundance or sex and age structure is enough to detect changes in the sustainability of use levels. A responsive legislative process would then be able to make necessary changes to the legal framework.

The humane clause (paragraph 10[f]) should be a requirement. Paragraph 14 sets a precedent by giving developing countries the option to apply the guidelines as they see fit: there should be no distinction between standards applied to developing and developed countries. The Requirements should be classed as either mandatory or optional, with some, such as humaneness, being mandatory for all countries.

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# Squirrel monkey viewing and tourism in Costa Rica

Grace Wong and Eduardo Carrillo

## Background and assessment of use of the species

The Central American squirrel monkey (*Saimiri oerstedii*) is endemic to Costa Rica and Panama. Its geographical distribution is restricted to the central and southern Pacific coast of Costa Rica and the northern Pacific zone of Panama. Records of a century ago show that the species was common in this area. Today, however, the population has been reduced and is scattered. In Panama, the species is considered to be almost extinct. Since 1970, *S. oerstedii* has been included in Appendix I of the Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES). The IUCN Primate Specialist Group considers it to be the species in greatest risk of extinction in Central America.

Deforestation, agrochemicals and capture for the pet trade are the main causes of the species' reduced numbers. Other factors include: an epidemic of yellow fever in the 1950s; and, in the last five years, tourism in the zone of Manuel Antonio, Costa Rica. In addition, although there is no documentary evidence, people say that in the 1960s a North American company bought hundreds of squirrel monkeys, possibly for biomedical research.

The species comprises two subspecies. One, *S. o. oerstedii*, occupies the Panamanian and southern Costa Rican portion of the area of distribution. In Costa Rica, it is protected in Corcovado National Park and in Golfito National Wildlife Refuge. It is not protected in Panama.

The other subspecies, *S. o. citrinellus*, is found only in the northern Costa Rican portion of the area of distribution. The only protected population is in Manuel Antonio National Park. However, the park is 863 ha - too small to ensure the survival of the subspecies.

In 1989-1990, the population of squirrel monkeys in Manuel Antonio National Park numbered 300. An additional 381 lived in the 1,100 ha of forest outside the park. Most groups of monkeys in these two areas communicate with each other.

In 1989, the State began promoting Costa Rica as a tourist destination, opening it to foreign investment. The

combination of foreign investment, the scenic beauty of Manuel Antonio, and its proximity to the capital San José, resulted in a rapid expansion of tourism, with attendant problems for the squirrel monkey. The annual number of visitors to Manuel Antonio rose from 25,000 in 1982 to 192,000 in 1992. In response to this growth, land owners around the park began building hotels, restaurants, and other facilities. The number of rooms in Manuel Antonio grew from 192 in 1988 to 663 in 1992. Restaurants, cafes, stores, and so on, increased in proportion.

Tourism has a direct impact on the squirrel monkeys, through the effects that visitors have on the groups they observe, and the revival of the capture of monkeys for sale as pets. It also has an indirect impact, by reducing the monkey's habitat and isolating groups from each other. Tourism's use of the squirrel monkey is reducing the long term viability of the subspecies. It is doing so not through the direct impact of the use *per se* (that is, viewing of the monkeys by tourists) but indirectly through the loss of habitat to tourism infrastructure. In 1988, it was determined that 75% of the tourists that visit Manuel Antonio do so to observe nature: mainly animals, including the squirrel monkey. Yet in spite of the importance of the remaining forest patches, their destruction has been accelerated. Tourism development has been unplanned and is not sustainable. If, however, it were planned, tourism and its use of the squirrel monkey could become sustainable.

## Information required for a full assessment of tourism's use of the squirrel monkey

Squirrel monkey (*Saimiri* spp.) ecology has been studied at several sites within the range of the genus in Central and South America. Basic biological and ecological information on *S. o. citrinellus* has been collected since 1987.

In Manuel Antonio, as elsewhere, the area required by a troop of squirrel monkeys depends on the size of the

troop and the quality of the habitat. The monkeys feed mainly on arthropods, fruits, flowers, and occasionally birds' eggs and small vertebrates. The most favourable site is a mixture of forest types, since this provides a greater abundance of food than a single forest type.

In Manuel Antonio, groups are larger where the habitat consists of a combination of primary forest and secondary forest in several stages of modification. Groups are smaller in young and degraded secondary forest.

The monkeys need corridors of trees to link their sites. They have been observed to walk on the forest floor for up to 200 metres to reach sites not linked by trees. Corridors should include tree species that the monkeys use for food. They should be wide enough to allow the animals to forage in them, not simply pass along them.

More research is needed, because the squirrel monkeys of Manuel Antonio have been undergoing intense changes to their habitat in the last five years. Therefore, it is likely that the dynamics, size and structure of the population have also changed. Information is needed on deaths, births, the distribution of groups, sex ratios, population density, growth rate, and other important variables. Some of this information could be obtained by students as thesis topics. Some would require longer term investigation.

Information on the status of the habitat is fundamental to sustainable use of the subspecies. It is necessary to:

- Map the area to determine monkeys have been or are becoming isolated due to loss of corridors.
- Locate zones where the habitat should be improved by planting species that the monkeys use for food.
- Establish where the development of additional tourism infrastructure should be prohibited or limited.
- Estimate the need to provide artificial feeding stations for animals at sites where infrastructure has had the greatest impact.

## **Management system for the squirrel monkeys of Manuel Antonio**

The medium to long term survival of the squirrel monkeys of Manuel Antonio depends largely on habitat management and environmental education.

A mosaic of different forest types needs to be maintained within the park. Maintenance of a mosaic is likely to require interventions in forest areas that are reaching maturity. Presumably, since protecting the population of squirrel monkeys is one of the objectives of the park, this will be done whenever necessary.

Outside the park, management needs to address the loss of habitat to tourism development. For tourism to be sustainable, development of hotels and other infrastructure must be well planned. Habitat management needs to include establishment of corridors and enrichment of highly degraded forest patches.

The land outside the park is privately owned; and about 60% of existing infrastructure has been developed with foreign capital. As a result, there is little interest in or commitment to conservation. In the Manuel Antonio area, efforts to conserve the squirrel monkey have become separated from efforts to develop tourism. One of the problems of the zone is that the human population is highly heterogeneous. Even though it numbers fewer than 1,000 persons, it cannot be considered a community because the groups that comprise it have very different interests. However, many of them share the view that the situation of the squirrel monkey is neither a problem nor their concern. Instead they are preoccupied constantly with how to encourage more tourists to come to the area.

An environmental education programme is urgently needed to build commitment to conservation of the natural resources of the area. The programme should enable the owners and managers of hotels and other tourism facilities to understand that nature conservation and tourism development are compatible, provided they are adequately planned with the aim of maintaining long term investment.

Owners of hotels and other businesses that rely on tourism could be stimulated to participate in a programme to conserve the squirrel monkey. Their efforts could be publicized in newspapers, magazines and other media, identifying the businesses that are cooperating. This could provide an economic incentive, since tourists are likely to favour businesses that contribute to conservation of the subspecies.

At the same time, the Costa Rican government should establish a system of land use planning for Manuel Antonio, backed by the necessary laws and regulations. Manuel Antonio is surrounded by oil palm plantations and ranches. Consequently, there is little room for tourism development, which is concentrated in a small area, so leading to environmental degradation. Overcoming this problem requires a land use plan to define the limits of infrastructure development, as well as sites where landowners must establish corridors for the squirrel monkeys and other forest species.

Existing legislation on the establishment of infrastructure has been inadequate to cope with the rapid growth of the tourism industry, and has been unable to prevent environmental degradation. The law regulates each property, but does not consider the cumulative effect of developing many properties. Manuel Antonio is

regarded throughout Costa Rica as a classical example of this problem, and one of the worst cases of unplanned tourism.

The legislation on wildlife also needs improvement. In Costa Rica, the squirrel monkey has been declared an endangered species. The law punishes direct (consumptive) use of the species but not indirect impacts. Since it is the indirect impact that is damaging the monkey, this should be changed. Establishing and enforcing more effective land use planning legislation and legislation protecting wild populations and controlling their use are equally important.

### **Proposed procedure for a full assessment of the use**

A full assessment of tourism's use of the squirrel monkey in Manuel Antonio could consist of two components. One component would be a survey of tourists visiting Manuel Antonio to find out how important the squirrel monkey is as a tourist attraction. This would allow us to estimate the value of the subspecies to tourism in the area.

The other component would be to determine the current status of the population of the subspecies (throughout the zone) and of its habitat outside the park. This would provide the information required to:

- Decide where to exclude or limit development of tourism infrastructure.
- Define sites for habitat restoration or enrichment.
- Locate artificial feeding stations, if necessary.

### **Points to consider when assessing the sustainability of the use of a wild species**

Information on the condition of the habitat is as important as information on the biology of the species. In cases such as that of the squirrel monkey, conservation and sustainable use are not limited by biological factors (such as a low birth rate or very specific food requirements) but by habitat problems. Even so, the habitat requirements of the squirrel monkey are not as difficult to meet as are those of some other species. For example, the subspecies does not need exclusively primary forest but benefits from a mosaic of different types of forest.

It is vital to establish the sustainable relationship between the population of the species being used and the human activity that benefits from it; and how much an area can be developed without affecting the species. Neither is obvious when the impacts of the activity on the species are indirect; or the activity (tourism) is not aware that it benefits from the species.

# Snake capture and venom extraction in Tamil Nadu, India

Romulus Whitaker and Harry V. Andrews

## Introduction

In 1976 the export of snake skins from India was banned to protect the ecological role of snakes as rodent predators. The ban left destitute many of the 20,000 Irulas of Tamil Nadu, who were the main suppliers of snake skins to the industry. The Irulas are the aboriginal inhabitants of the plains and scrub jungles of Chinglepet taluk (district), near Madras. Most still subsist largely on hunting and gathering. Their expertise in hunting deadly snakes is locally almost legendary.

In 1978 the senior author assisted a group of Irulas with whom he had been working for a decade to form a registered cooperative society. The initial primary objective of the cooperative was to establish a venom centre. A cooperative was considered the best system of management of a tribal business because, if run properly, it ensures equal income opportunities for all its members. Under license from the Forest Department, Irulas would bring freshly caught venomous snakes to the centre for venom extraction. The venom would be dried and sold to Indian antivenom serum manufacturers. The snakes would be returned to the wild after three weeks in captivity.

Now, after 15 years, the Irula Cooperative Venom Centre is a small but flourishing example of how a tribal community can maintain its traditional skills and lifestyle through the sustained-yield use of wildlife. The Irulas undertake most of the management and all of the work, from the skilled and dangerous job of capturing the snakes and extracting their venom to operating the state-of-the-art lyophilizer (freeze dryer) which processes the venom. The senior author started as the president of the society, but has now been able to limit his role to technical adviser.

## Use of snake venom as a resource

Worldwide, perhaps 30,000-40,000 people die annually of snake bite. Of these, 25% or about 10,000 die in India

(Swaroop & Grab 1954; Sawai & Homma 1976). The only effective cure for serious snake bite is antivenom serum, made by immunising horses with gradually increasing doses of raw venom. Consequently, stocks of snake venoms of the medically important species are always needed. In India, the four snakes that cause the vast majority of fatal bites are the cobra (*Naja naja*), krait (*Bungarus caeruleus*), Russell's viper (*Vipera russelii*) and sawscaled viper (*Echis carinata*), all species found throughout much of India.

Rearing snakes in captivity has proved to be expensive and difficult, particularly in the large numbers needed to collect quantities of venom required for antivenom production. Therefore, venom is taken from wild snakes. Most venom production schemes involve local people (tribal or specialized snake catchers) in collecting snakes and selling them to the venom laboratory. The snakes, which have an average lifespan of 10-20 years in the wild, are kept and their venom extracted until they die - generally within a few months.

Few, if any, studies exist on the impact of collecting large numbers of snakes for commercial use. However, personal observation, anecdotes, and information on the rattlesnake roundups in the USA suggest that snake populations are vulnerable to overcollection. The system of capture/extraction/release used by the Irula Cooperative was intended to avoid this problem. It was also acceptable to the government licensing authority (the State Forest Department), which needed to be convinced that exploitation of the snakes would have a minimal impact on their populations. Under the Wildlife Protection Act, all snakes are protected and the cobra and the Russell's viper are on the second highest protected Schedule. These laws have discouraged others from starting venom projects in India, although two State Government projects exist.

The capture of snakes and extraction of venom by the Irula Cooperative results in a 1% mortality of snakes during captivity. Provided the death rate once the snakes are released back to the wild is just as minimal, this use poses no threat to the future use potential or long term

viability of the animals. The snakes are caught in very disturbed habitats: farmlands, degraded scrub forests, and hedgerows. These habitats contain a super-abundance of prey animals such as rodents and amphibians (both benefited by rice farming), providing snakes and other predators with a year-round supply. Snake populations in these areas probably are much higher than in pristine habitats such as forests. Few published data exist to support this contention, but long personal observation and the experience of Irula hunters bear it out.

The conversion of forest to farmland and fallow land seems to benefit three of the four species of snakes exploited by the Irulas. Only the Russell's viper is predominantly a forest species and not a hole dweller as are the cobra and krait. Unless bounded by dense hedgerows (preferably of cactus and agave), farmlands are not good habitats for Russell's viper, even though they provide more prey. This is the one species of the four that seems fairly vulnerable to degradation of its original habitat. By contrast, the sawscaled viper - a small species that prefers dry rocky areas and small thorn bushes - seems greatly to benefit from the conversion of scrub jungle to open wasteland.

## **The Irula approach to the use of snakes for venom extraction**

The Irula Cooperative's Venom Centre was set up for one main reason: to provide the Irula tribe with income-generating employment that used their traditional skills without overexploiting any wild taxon. Snake venom was an obvious choice, because Irulas traditionally caught venomous snakes with an unrivalled skill and knowledge of snake natural history. At first, little attention was paid to snake populations, harvests and other considerations. The number of snakes caught was set by the licensing authority; and each of the 101 members of the Cooperative was given the set number of snakes he could catch on his license each year.

Each Irula hunts the area radiating from his village or encampment as far as he can easily walk with his family in one day. Irulas rarely go out on several-day hunts to unexploited potential "hot spots". This is one of the natural limitations to Irulas' overexploiting the wildlife on which they subsist. The Irulas find the snakes mainly by looking for tracks and other signs (feces, shed skins) at rat holes, termite mounds and dense hedgerows. They dig out the snakes with short crow bars; then pin and bag them. They sell the snakes (usually one to three large snakes in a good day's hunt) to the Cooperative.

Before 1972 when the skin industry was banned, Irulas caught and killed millions of snakes (primarily cobras and Russell's vipers) from the same area in which

they now catch a few thousand a year for their venom. This greatly reduced use of snakes is probably sustainable, especially since virtually all of the snakes are released. Nevertheless, it is important to make an adequate evaluation of the whole system to provide empirical confirmation. The Cooperative is fortunate in having the cooperation of the State Forest Department with whom we have worked out a legal framework for licensing and accounting for the snakes caught, the amount of venom collected, and the supervised return of the snakes to the wild.

The Irulas benefit directly from capturing the snakes and selling them to their Cooperative. But the other local people have little love for snakes (even though the cobra is revered by Hindus) and will kill them on sight. Part of the work of the Irula Cooperative is to publicize the use of antivenom serum. It stresses the facts that the great majority of snakes are harmless and that it is fairly simple to identify the four medically important species. The Cooperative also points out to visitors, and to the farmers with whom the Irulas interact daily, that snakes are extremely valuable "friends of the farmer" due to all the destructive rodents they consume.

Irulas have no formal methods of assessing the sustainability of their uses of wild species. However, their sensitivity to changes in habitat and changes of season, and knowledge of the biology of the species, allow them to be effective exploiters. They will not hunt depleted areas for the simple fact that it is not "energy-effective". Irulas will not overcollect an area because they are generally satisfied with an income that provides them with their needs for a week or so. They hunt snakes intensively for a few days (enough to make the money they may need for the family for a few weeks). Then they are likely to concentrate on hunting food animals (rats, hares, mongoose, monitor lizards, turtles) and gathering food and medicinal plants. Irulas have a religious regard for many things in nature, including the cobra (their main goddess is Naga-kanni) and the edible tuber Veli kodi kezhangu. Men and women generally collect this root from the scrub jungle by locating the vine, digging up the root, and then replanting the top of the root left connected to the vine. This practice is an ancient form of forest agriculture in which the plant is carefully used and allowed to regrow to produce another tuber.

## **Species maintenance**

The Irula Cooperative makes every effort to ensure that capture and venom extraction are both sustainable and humane. The duration of captivity is limited to three weeks, and milking for venom is performed only once

**Table 1. Total venom production by Irula Snake Catchers Industrial Cooperative Society, by species, December 1982 - October 1994**

Species	Number caught	Grams dry venom
Asian cobra	2,917	1,178.159
Indian krait	9,904	325.324
Russell's viper	1,831	498.412
Sawscaled viper	52,450	300.705
<b>Total</b>	<b>67,102</b>	<b>2,302.600</b>

**Table 2. Annual venom sales**

Year	Rupees	Year	Rupees
<b>1982-83</b>	5,680	<b>1988-89</b>	240,750
<b>1983-84</b>	121,650	<b>1989-90</b>	312,991
<b>1984-85</b>	98,000	<b>1990-91</b>	233,000
<b>1985-86</b>	98,800	<b>1991-92</b>	166,000
<b>1986-87</b>	141,210	<b>1992-93</b>	182,000
<b>1987-88</b>	106,500	<b>1993-94</b>	707,000

each week. The snakes are kept in mud pots, which allow quick and easy handling, keep the snakes cool, and keep infrastructural and maintenance costs low. At the start of the project, the mortality rate of snakes was 1.3% of captures, mainly during the summer months when temperatures are between 38°C and 41°C. Sprinkling water and keeping the snake pit cool has reduced mortality to below 1%.

Care is taken to ensure that the extractor is gentle and careful when pinning, and the entire process of venom extraction takes no longer than two minutes per snake. The animals are given water but not food (healthy snakes can do well without food for many weeks). All snakes are released to nearby Reserved Forests.

To detect (and prevent) premature recapture and to provide biological data, all snakes (except sawscaled vipers, which at 30 cm are too small) are coded by clipping the ventral scales. Records are kept for each of the three larger species. Clip-codes last from six months to two years. The rate of recapture during this period is extremely low: of more than 13,000 of the large species that have been caught, only 20 have had codes.

To avoid pressure on too few populations, snakes are caught throughout the district by members from widely scattered villages. The Cooperative does not accept juvenile snakes, and members are discouraged from collecting gravid females.

## Project sustainability

The resource base of the Irula venom project appears to be large. In most cases, the habitat of the species concerned is actually increasing. Close to 100% of the targeted snake species are released after the commercial product (venom) is extracted, and it seems that survival of the released snakes is high.

An important achievement of the Irula Cooperative is the application of "tribal technology" to generate income and use wild snakes sustainably. This particular commercial use does not change tribal tradition, and the only "imported" technology is the simple one of venom extraction and processing.

The Cooperative is now the largest producer of venom in India. Except for three years, the project has made a profit since its inception. Since 1984, the Cooperative has been financially self-sufficient for basic costs through its venom sales (95% of income) and sale of tickets to visitors wishing to observe the venom extraction process (5% of income). Basic costs include salaries and administrative costs, but not transport (the project needs one more jeep) and research on breeding biology, population densities and dynamics, and ecology.

Economic data are given in Tables 1-4.

## Information needed for a full assessment

The Irula Cooperative hopes to expand its activities to other parts of the state, increasing the quantities of venom production. The Cooperative may also start collecting venom from other species of snakes as well as exporting venom. Although at present the Irula snake venom project probably has little impact on populations of the target species, assessing the snake resource and other factors is considered important for the project's long term sustainability.

The main factors to be considered are:

- Population status and dynamics of the four medically important snakes in Chinglepet taluk (the area of licensed snake hunting operation by the Irulas). This would include a determination of how big a harvest

**Table 3. Price paid per gram of dry venom for each species used in the project**

Year	Cobra	Krait	Russell's Viper	Saw-Scaled viper
1982	400	1000	400	1400
1983	400	1000	400	1400
1984	400	2000	400	1500
1985	400	2000	400	1500
1986	400	2500	400	1500
1987	400	2500	400	1500
1988	500	3000	500	2000
1989	500	3500	500	2000
1990	500	4000	500	2000
1991	500	4000	500	2000
1992	1500	4000	1500	2000
1993	1500	4000	1500	2000
1994	2000	5000	2000	2000

**Table 4. Annual profit (or loss) of Irula Snake Catchers Industrial Cooperative Society**

Year	Rupees	Year	Rupees
1982-83	2,159	1988-89	29,542
1983-84	6,086	1989-90	60,737
1984-85	60,288	1990-91	14,459
1985-86	31,792	1991-92	(80,206)
1986-87	21,725	1992-93	(67,398)
1987-88	27,221	1993-94	176,750

can be sustained by populations in various habitats (for example, dry versus irrigated farmlands). Similarly, seasons and abundance in various size/age classes of the species should be examined.

- Changes in snake habitat, prey abundance, effect of agricultural chemicals and other factors on snake populations in the long term. In the Irula area, a long,

severe dry season is offset by a brief but intense north-east (winter) monsoon. In some years, climatic extremes may bring prolonged drought (leading to hardships for prey and predator species) or bumper crops (enhancing prey numbers and thereby probably influencing population dynamics of predators). These dynamic trends need to be more fully understood.

- The importance of snakes as predators of crop destroying rodents.
- Snake mortality in captivity.
- Survival rate of snakes released after venom extraction, including habitat requirements of the target populations, particularly at the release sites.
- Numbers of snakes needed for India's venom requirements for antivenom serum production.
- Potential economic benefits to the Irula community.

There are a few studies on snake population dynamics in other parts of the world (for example: Brown 1991), but none has been carried out in India. The size, structure and dynamics of the populations of the four species we are concerned with here can be investigated in a standard field biological study. A three-year study would be required involving at least two full time researchers at the Ph.D/M.Sc level with laboratory and logistics support from an institution such as the Centre for Herpetology, Madras. It is estimated that such a study would cost US\$30,000-US\$40,000. Field research in India can be more cost-effective than elsewhere in the world because of the low overheads, the availability of highly qualified personnel, and the very important technical inputs of the Irulas themselves.

Many species of snakes, including the cobra, krait and Russell's viper, eat a lot of rodents. Some data exist to show the importance of this predation in controlling crop pests such as the lesser mole rat (*Bandicota bengalensis*) and rice rat (*Rattus meltada*) (Whitaker & Advani 1983; Whitaker 1984). Removing snakes from croplands for venom extraction could favour rodents (and therefore crop destruction). Snakes also prey on amphibians, which are beneficial to crops. These relationships should be evaluated by carrying out a comprehensive field study.

Snake mortality in captivity at the Irula Cooperative is recorded as a matter of routine because the Forest Department requires an exact, up-to-date inventory of all snakes caught and maintained for venom extraction. Various improvements in keeping the snakes have been made over the years to minimize mortality. The three week period of captivity (three to four venom extractions)

was arrived at because the snakes start losing weight if they are kept any longer. It is important that the snakes are healthy and strong at the time of release.

Field research on the survival rate of snakes after release will be more difficult and time consuming. Usually, the snakes are captured in and around farms near villages. However, they cannot be released in the same places because the local people do not want them back! So the snakes are released in Reserved Forests (which consist of degraded scrub forest and plantations of cashew nut and eucalyptus). No doubt snakes move back to their preferred cropland habitat, which provides them with optimum prey and shelter; but it is possible that some die before they reach it. It is also possible that snakes taken to unfamiliar territories may have a hard time adapting to them.

The Forest Department, on whose benevolence and cooperation the Cooperative depends for licenses and snake quotas, is particularly interested in the fate of snakes after release. Accordingly, a brief pilot study was carried out in 1991. About 100 kraits were released with fluorescent paint marks on their backs. Searches were made by day and by night for a week following the release. Very few snakes were seen and these only by night, suggesting that all (except one found dead) had found shelter in the scrub forest or migrated to rat holes in nearby croplands. It is proposed to carry out an intensive study of this sort using capture/mark/recapture techniques long used to determine population dynamics of other wild animals. Such a study could produce results in 12 months with one researcher plus Irula assistants. It would cost US\$10,000-US\$15,000.

Two cultural and economic issues need to be carefully examined. First, when a community such as the Irulas suddenly enters the cash economy, people must learn how to use their income carefully and avoid difficulties from go-betweens, con artists and money lenders. Second, income from venoms and the viability of the project could be considerably enhanced by developing an export market and encouraging increased production, distribution and sale of antivenom serum.

The Cooperative will identify research personnel and seek grants from national and international agencies to carry out the necessary studies. Long term monitoring of snake populations and continued research and development must become the financial responsibility of the Cooperative. To this end, its members will be briefed on the need to establish a fund for research from the Cooperative's profits and to provide local logistical support for researchers. In addition, the State and Central Wildlife Department, the Government Department of Science and Technology and the Department of Tribal Welfare will be requested to provide research permits, equipment and, where possible, financial support.

## Related projects

The Irulas are also skilled rat catchers. Rats form the largest source of protein for the community. This skill has caused them to be hired by farmers desperate to cut the tremendous annual losses of rice to the field rodents. A pilot project to demonstrate the cost-effectiveness of the Irula approach to rat control as compared to standard pesticide use was carried out in 1984 with the support of Oxfam (India). Subsequently the Government of India granted a quarter million rupees for a larger project over a two year period. The results were so encouraging (200,000 rats caught, tons of grain saved) that it is now contemplated to establish an Irula-operated pest control agency.

The Irula Tribal Womens' Society was set up in 1986, initially to establish nurseries of forest trees and reforest fallow public and private lands. The Society received a million rupee grant from the National Wasteland Development Board and has been actively planting. Now, with over 175 members, the primary focus is on growing and marketing medicinal plants. The project includes an education centre for tribals, with funds from NORAD, Canada Fund, Indo German Social Service Society, and Womankind.

The next likely project is commercial crocodile farming. The Madras Crocodile Bank, a private trust operated by the authors and a board of trustees, produces a surplus of more than 5000 crocodile eggs each year. At present, laws prevent the commercial use of crocodiles in India. However, we have drafted a project for government approval that would allow the Irulas to use this surplus. Crocodile eggs or young will be purchased from the Crocodile Bank and reared for meat (for local use) and skins (for export and foreign exchange earning). The projected profitability of such an operation is excellent. Since hundreds of thousands of rats would need to be caught to feed the crocodiles, the rice farmers would benefit as well.

In the long run, other kinds of local wildlife use (for example, deer ranching, crocodile farming, medicinal plant harvesting and frog farming) may be developed with the help of other agencies with expertise in these areas of sustainable resource use.

The Irula Cooperative has the potential to expand, given some additional financial input plus encouragement from the government. If larger quotas of snakes were granted, snake venom could be exported for medicinal and research uses. Other species of snakes (for example, sea snakes and pit vipers) with valuable venoms could also be used. Research needs to be done, both related directly to the Venom Centre's operations and on snakes and rodents in general. More facilities and help for the Irulas (considered one of the poorest tribes of India) are

also needed. As a good example of how one tribe of skilled naturalists can use wildlife sustainably and earn a living with traditional knowledge, the Irula Cooperative deserves local and international assistance, funds and technology.

## Commentary on the draft Criteria and Requirements

### Criteria

The Irulas, who once caught and killed snakes for the unlicensed and therefore uncontrolled skin industry now have their own Cooperative Society. Their exploitation of snakes is limited to numbers fixed by the State Government Forest Department for extraction of venom and subsequent release. From the limited available information on the biology and status of the four snake species being used, it is inferred that their large, wide-ranging populations can easily sustain present rates of exploitation. This inference is based on the fact that:

- The now banned skin industry, which lasted for decades, exploited millions of snakes from the same areas where only thousands of snakes per year are used now.
- All the snakes are released back to the wild.
- The four target species are common and widely distributed with plenty of permanently assured habitat.

The ecosystems from which the snakes are caught (farmlands and marginal, degraded scrub jungle) are actually increasing in area as more forest land and wasteland is converted to agricultural land and, in the case of low-lying areas, irrigated for rice.

On average, 6,000 snakes a year are caught by the 101 licensed Cooperative members from an area totalling 546 km<sup>2</sup>, helping to ensure that there is no heavy drain on any single genetic population of the four target species.

The Irulas' activities can actually enhance conservation of other species of snakes (such as the rodent-eating Asian ratsnake, *Coluber mucosus*) by helping farmers differentiate between venomous and nonvenomous species and by showing that the nonvenomous rodent-eaters are "friends of the farmer".

### Requirements

#### Information

Not enough information is available about the target populations or their habitats to confirm the inferred long

term viability of the Irula operation, especially if it expands.

### Management system

The management system, which was suggested by the senior author in the late 1970s, is still being followed. The state government licensing authority decides how many Irulas to license, and the numbers of snakes permitted to be caught. Changes may be made only once more baseline data on the target species and habitat become available.

The indigenous management system consists simply of:

- The Irula's natural range limitation. The area they hunt is generally limited to how far they can walk in a day's hunt, usually a 10 km radius from their villages.
- The fact that as soon as an Irula family has made enough money to sustain itself for a week or so it tends to pursue activities other than income generation.

At present, the Irulas have only a vague concept of sustainability, since their only related experiences are seasonal shortages of snakes (different seasons, different species) and occasional drops in numbers in places where a major habitat change may have taken place.

Only Irulas catch snakes in Tamil Nadu and only some of the Irulas (perhaps 5-10% of their total population of about 20,000) were regular catchers when the skin industry flourished. The Irulas' respect for wildlife and knowledge of natural history are far greater than those of other local people. This makes the local management system easier to develop and control.

### Legal framework

The legal framework is supportive in the sense that the government allows limited use of snakes, imposing restrictions on the number of licensed catchers and the quota of snakes that may be caught. These regulations are arbitrary and need to be based on solid information about the species and habitats. Their effectiveness has depended mainly on the integrity of the Cooperative and its members.

### Social and economic incentives

The Irula snake hunters have very few alternative ways of earning money. Snake hunting can be a year round occupation, whereas digging or harvesting jobs are seasonal. The Irulas get a fair share of the Cooperative's income.

Village people are very frightened of venomous snakes, many having witnessed or experienced painful bites. They are happy that Irulas take the snakes away from around their houses and farmlands and have no desire to conserve them (even though Hindus revere the cobra).

### Precautionary principle and safeguards

Snakes are not easy to find and capture. The Irulas are the only local people with the skill and bravery to catch them. Besides the biological factors of fecundity, increased prey and habitat availability in human-altered habitats, their cryptic nature is an important safeguard ensuring the long term survival of snake populations. However, increased use of pesticides, herbicides and chemical fertilizers could adversely affect snake populations.

Without adequate data on snake populations it is difficult to know how to establish or recommend additional safeguards. Encouraging natural farming techniques and preservation of hedgerows and scrub forest margins of fields would enhance the habitats of snakes.

Most of the forest land surrounding the agricultural land in the district where the Irulas operate is Reserved Forest. As such it is completely protected (although often not rigorously) and a good repository of snake populations for recruitment into exploited areas.

### Issues for consideration in an assessment procedure

The less a use of a wild species involves killing, the better. In the case of snakes, only the venom is taken. Other examples of harvesting with no or low kill rates include musk from musk deer, civet musk from civet cats, feathers from peacocks, and antlers from deer.

Marginal land or totally altered habitat can be much more productive of some wild species than pristine jungle. This is particularly true for several species of snakes where cultivation vastly increases the numbers of prey.

Especially in the case of indigenous peoples, it is best if commercial wildlife use involves minimal departure from traditional methods and exploitation levels.

Suddenly introducing or substantially expanding a cash economy can do a lot of damage to isolated or long impoverished communities. Where necessary, the people concerned should be provided with training (for example, in managing money) or tools to help them manage the

resource and the wealth they derive from it. Too often, lucrative projects are politicized or taken over by intermediaries or other exploitative people from the larger society. An assessment procedure should recognize such socioeconomic issues, since the long term viability of sustainable use projects will depend on their resolution.

In some countries (India, for example), specialized occupations are reserved for certain communities. This may not be particularly democratic, but it is perhaps the best way to allow tribal people to make a living doing what they know best.

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# Lokta cutting and paper making in Nepal

Anil Chitrakar and Christine Prescott-Allen

## Lokta paper and UNICEF's Community Development through the Production of Greeting Cards Project

*Christine Prescott-Allen*

Handmade paper, crafted in Nepal for at least 800 years, is produced from the fibrous inner bark (or bast) of two wild shrubs, *Daphne bholua* and *D. papyracea*, known locally as lokta. Lokta paper has long been prized for its beauty, strength and durability. Its strength is due to the fibres' high length-to-width ratio, and its durability to natural insecticides and fungicides in the plants.

In 1959, the Nepalese handmade paper industry lost its main export market when China closed the border with Tibet. Tibet was the largest importer of lokta paper, used mainly by monasteries for block printing Buddhist scriptures. The domestic market also declined, undercut by cheaper machine-made paper from India. The only domestic uses of handmade paper that remained were for judiciary, loan, deed and land registration documents that must last for many generations. By 1980, the industry was on the verge of economic extinction, depriving hundreds of lokta harvesters, paper makers and block printers of their livelihood.

UNICEF responded by launching its Community Development through the Production of Greeting Cards project in 1981. The main aim of the project was to promote community development in Nepal through income generating activities associated with lokta collection and transportation, paper making, and the manufacture of greeting cards. For the first two years of the project, only greeting cards were produced, all bought by UNICEF's Greeting Card Operation in Geneva, Switzerland. In 1984, both the product line and the market were diversified.

The project began in three rural communities, Hatiya, Myagdi and Pang, in the districts of Baglung, Myagdi and Parbat respectively; and one urban centre, Bhaktapur. Hatiya had a tradition of lokta harvesting, Myagdi had a supply of lokta, and Pang was recognized for its paper making skills. Bhaktapur was chosen for the printing unit,

because of its tradition of woodblock printing and its status as the economically most depressed city in the Kathmandu Valley. All four places had a plentiful labour force.

Bhaktapur Craft Printers (BCP)/UNICEF was given exclusive rights to lokta from the five major forests in the project area. Between 1981 and 1984, lack of a harvesting management programme resulted in significantly reduced stands of lokta within reasonable distances of participating villages. A management programme introduced in 1985 assigned lokta resource blocks to participating villages, and established a quota and harvest rotation within each block. In 1986, following a comprehensive inventory of the lokta resource in the three participating districts, harvest rotations were lengthened from four to six years. BCP's paper buying procedure was changed so that it bought only the number of sheets that could be made from each paper maker's allocation of lokta. However, this is not a sufficient incentive to paper makers to adhere to their allocation, because local merchants give them loans on condition that they sell paper to them.

The correct way to harvest lokta is to cut the tree 15 cm above ground and then remove the bark, so that meristematic tissues of the stump are not destroyed and coppicing can occur. Lokta harvesters in the three districts are taught to use this technique at an annual workshop, but the incidence of correct cutting has not yet been monitored.

The traditional Nepalese process of making lokta paper also uses wood for fuel (to cook the pulp) and ash (ash-lye solution speeds bark degeneration during cooking). To lessen the impact on an already depleted fuelwood resource, the project has provided more efficient stoves and caustic soda (which reduces the amount of ash required). Even with these improvements, 1 kg of lokta requires about 4 kg of fuelwood. The project has also funded fuelwood plantations.

The project has expanded to involve 69 communities (65 in harvesting, two in paper making, and two in both harvesting and paper making) in the three districts. Lokta harvesting and paper making are seasonal occupations, employing 884 families part-time (in 1989, compared

with 282 in 1982). The printing unit operates year round, and employs 100 persons full-time (in 1989, compared with 33 in 1982). In 1989, average annual salaries to all part-time and full-time workers totalled 5.2 million Nepalese Rupees (or US\$200,250).

In addition, BCP's profits go into community development and welfare funds, which from 1982 to 1989 contributed some 723,000 Nepalese Rupees (US\$39,000) a year to development activities for the rural lokta harvesting and paper making communities in Baglung, Parbat and Myagdi Districts and the urban community in Bhaktapur. The activities are requested by the communities, which contribute 40% of the cost, and are approved by project participants at an annual workshop. They include: potable water supply, sanitation, health and veterinary services, education, irrigation, flood and landslide control, construction materials (for example, for community halls and schools), and tree nurseries and plantations.

In theory, the project has been financially self-sufficient since 1985. However, it continues to be cushioned by UNICEF's ownership of BCP and its purchasing power. UNICEF provides US\$30,000 a year of marketing assistance; BCP pays no taxes; and 71% of BCP's sales in 1989 were to UNICEF. UNICEF intends to turn BCP into a private limited company, to be owned by the participating communities (45%), the Agricultural Development Bank of Nepal (50%), and BCP staff (5%). Meanwhile, BCP needs help in developing markets other than UNICEF.

A still more pressing need is to make sure that supplies of lokta and fuelwood are sustainable. Lokta cutters and paper makers must be fully involved in management of these resources. Harvests of lokta (including supplies to unofficial buyers) and fuelwood (including fuelwood used for other purposes) must be determined. And harvests and production of lokta and fuelwood must be brought into balance, by reducing the harvests or increasing production. This need could be met through a community forestry project along the lines of the Nepal-Australia Forestry Project. BCP, the Department of Forests and the Department of Cottage and Village Industries are together conducting research on the use of alternative native species for handmade paper production.

## **The lokta paper making process in Nepal**

*Anil Chitrakar*

### **The Nepali village scene**

More than 90% of Nepal's 18 million people live in scattered villages that are not served by roads, markets,

communication facilities, or electricity. Life in these villages depends completely on the use of locally available natural resources. Over the past 30 years, Nepal's resources have deteriorated rapidly, due to:

- Population growth, estimated at 2.1% annually.
- Central government control over natural resources, which discourages local conservation initiatives.
- Wrongly planned and implemented development projects, which consider the environment as an abundant and free good.
- Opening of new markets for natural resources, such as timber, medicinal plants, orchids, fibrous plants, and wild animal products.
- Lack of local government capability to plan, regulate and enforce the concept of sustainability.

With the decline in environmental health, the quality of life has also gone down for the Nepali people. Due to water pollution, Nepal has one of the highest infant mortality rates in the world. The flow of people from villages to urban areas is estimated to be 5.6% a year. Cities such as Kathmandu face severe water shortages, air pollution, and solid waste dumps. Those who remain in the villages suffer from malnutrition and disease, and would leave if they could. The difficulty of life in these villages is reflected by the fact that many women work up to 18 hours a day simply to survive. Literacy is very low.

### **How resources are harvested**

Business people or their intermediaries come to these deprived villages and offer cash for supplies of the local natural resources. If someone offers more cash, then more natural resources are harvested. The intermediaries then supply the raw materials to a factory where it is processed into a marketable finished product.

Lokta harvesting follows this pattern. Merchants and traders go to villages and offer cash for the harvest and processing of lokta into sheets of paper. The sheets are sold in bulk and transported to factories in cities where they are made into various products including UNICEF cards and Body Shop bags. This process is true for all hill areas of Nepal including the three districts where UNICEF has been implementing its Community Development through the Production of Greeting Cards Project (Baglung, Myagdi, and Parbat).

## **Current harvesting practice and IUCN's draft guidelines**

Outside the three districts where UNICEF has its Greeting Cards Project, current harvesting and processing practices are not sustainable because:

- They have reduced regeneration of the species to such an extent that in Khotang District, for example, 10 years ago it took only 2-3 hours to reach lokta forests, now it takes seven days.
- Large amounts of firewood are required to cook and dry the lokta. Consequently, forests have receded, and with them the lokta. When the forest disappears, the lokta also disappears (Dr T.B.Shrestha personal communication).
- In many communities "gang fights" break out among groups trying to harvest the same lokta forest.

As for the requirements for fulfilling the Criteria:

- An updated and accessible information system on lokta does not exist.
- In common with other uses of wild species, most lokta harvesting and processing is illegal, reflecting the lack of a management system.
- Decentralization of forestry is a much talked of subject but is not really practiced. Hence, although the legal framework exists, its implementation is weak.
- Intermediaries pay the local people very little (90-165 Nepali Rupees [US\$3-6] per 200 sheets of lokta paper). Except in the three UNICEF districts, the communities do not benefit directly.
- Rather than a precautionary principle and safeguards, there seems to be real competition to get hold of as much lokta as possible, while it is still there.

## **Issues to be considered in an assessment procedure and guidelines for sustainability**

It is difficult to understand how the draft Guidelines will be effective in the existing economic system, which puts a dollar value on a chopped tree but makes a living tree valueless. This system also awards dollar values to university degrees but not to traditional wisdom on how to use and manage natural resources. In addition, it distorts the definition of who is poor and rich. How is it

that a hill farmer with agricultural land, a forest, grazing area and river, is poor; whereas someone else with a bunch of plastic cards is rich? Everyone in the village now wants to become "rich".

Everyone in the lokta business in Nepal - from the salespersons of the finished products to the villagers who go to the forests collecting lokta bark - is worried that his or her source of livelihood is soon going to end. All appreciate the efforts to prepare guidelines for its sustainable harvest. They are willing to participate in any further efforts towards this, and feel strongly that alone they cannot do much. Based on past experience, they are not convinced that the central or local governments are capable of implementing a management plan.

In Nepal, all natural resources are government property. The government decides which forests to turn into national parks and which to turn into open mines. This is a major problem. What good are local initiatives to conserve a tree when higher levels of government can chop it and take it away? What good are local efforts to harvest fish sustainably when the central government decides to build a dam on the river?

Another vital aspect that needs to be looked at is the capability of local governments to internalize and implement the principles of sustainable development. Current capabilities are nonexistent or extremely low.

The communities involved in lokta harvesting and processing are interested in ensuring its supply for ever. They would like to avoid the growing conflicts over a declining resource. Nevertheless, the resource continues to disappear. The reasons for this are:

- There is no clear ownership of the resource.
- Most lokta harvesting and processing and associated fuelwood harvesting are illegal.
- In most villages, people do not rely on lokta for survival but treat it as a source of extra income.
- Local people do not appreciate that the resource is limited.
- Lokta harvesting is demand driven. Intermediaries go from village to village paying local people to harvest lokta. Once lokta is finished, they will come for mushrooms or medicinal plants.
- The factories in Kathmandu and the harvesters have no direct contact (except in the UNICEF project).
- How much lokta is available and what the sustainable yield might be has not been assessed (except for the UNICEF project).

- How much fuelwood is available and what the sustainable yield might be has not been assessed.

Overcoming these problems must involve:

1. Recognition by the government (Ministry of Forestry) that lokta is an important forest product and a quantitative analysis of the resource. Local capabilities at the district forest offices also need to be built. It is impossible for local people to have access to training, literature or other technical assistance that is available only in far away Kathmandu.
2. Facilitating the formation of user committees in all communities that harvest or process lokta and giving them legal ownership of the resource. These user groups also need to be empowered with the skills and technical

knowledge to harvest their natural resources sustainably. For example, there seems to be no local knowledge on how to regenerate lokta.

3. Contracting the user committees so that they receive the benefits of lokta and are responsible for ensuring that harvests are sustainable. This should include monitoring the harvest and paper making, using clear and verifiable indicators.
4. Research on regeneration, better tools, cooking pots and furnaces, to increase efficiency and reduce natural resource use.
5. Ensuring lokta harvesting becomes an integral part of efforts to decentralize resource management and planning

<b>Table 1. Lokta paper making process and suggested indicators</b>			
<b>Process</b>	<b>Indicators</b>		<b>Remarks</b>
	<i>Socioeconomic</i>	<i>Ecological</i>	
Bark harvest	Reason for harvesting	Distance from village	Rest of plant is discarded
	Local knowledge of lokta	Gap between harvests (3-10 years)	Lokta needs forests to thrive
	Conflicts among villagers		
Soaking after cleaning bark		Available running water	
Cooking with ash/caustic soda		Quantity of fuelwood used per kg of lokta (70 kg/5 kg lokta)	Open fire & open pot
Pulping with wooden mallet	Time spent by women		
Washing/panning pulp in frame		Available running water	
Drying in sun or by large fire	Land available (wealth)	Quantity of fuelwood used per sheet	Deforestation is due to drying process
Dyeing	Occupational hazards	Type of dye: chemical or natural	Disposal of waste chemicals
Rolling or calendar			
Printing, cutting, packing	Number of women employed		
Recycling of scraps		Percentage recovered	Jute & wool mixtures
Marketing	Quality of life; income; community development	Percentage invested in conservation	Pricing & demand management

in Nepal, including the village and district level planning exercises proposed by IUCN.

The local people have the information needed for a full assessment of the use of lokta; and are able to mark aerial photographs to show the distribution of lokta and fuelwood and other information on the resource. The practicalities of obtaining this information will depend on the person involved. Fluency in the local language and knowledge of local measurement systems (for example, one kori = 200 sheets of lokta paper) are essential. Accessibility is a problem: most areas are 3-4 days walk from the nearest airfield or 4-10 days walk from the nearest road.

Table 1 shows the entire process that a piece of lokta undergoes from the time the bark is removed to the point of marketing the final products. Indicators are suggested for various stages of the process. Two sets of indicators are needed: socioeconomic; and ecological. Some

indicators reflect the process; others the product. Some are quantifiable; others are qualitative. Comparative studies on the process in different villages are needed to improve these indicators.

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# Rush cutting in Natal, South Africa

Ricky H. Taylor

## Introduction

The salt marsh rush (*Juncus kraussii*), or ncema as it is called in Zulu, is harvested as a fibre source by the Zulu people in Natal. The plant typically grows in monospecific stands fringing estuaries. It produces spike-like culms (stalks), each 4-8 mm in diameter and 40-120 cm tall. When dried, the culms are strong and pliable and are highly suitable as a durable fibre material. The most important use of ncema is for the manufacture of traditional sleeping mats, which are used in most rural households and are given as gifts to the bride at traditional Zulu wedding ceremonies. In addition, ncema is used to weave other articles such as sorghum beer strainers and modern craft items such as baskets and place mats.

As human populations increase, and as much of the salt marsh habitat in which ncema grows is lost to development, so the demand for the remaining ncema stocks has increased. Nowadays, ncema occurs in significant quantities at only four sites in Natal. Three of these sites are within designated nature conservation areas (Greater St Lucia Wetland Park, Kosi Bay Nature Reserve, and Umlalazi Nature Reserve) and the fourth (at Umgababa) is under tribal authority. Since it is highly sought after and scarce, ncema is vulnerable to overexploitation.

Ncema is usually harvested by women. The woman grasps a handful of the culms, and cuts them at the base with a sickle or long-bladed knife. She then holds the handful at the top, grasping only the tips of the longer culms, and with a vigorous shake discards all the short culms. The preferred length is greater than 60 cm. She then inspects the longer culms and discards all flowering stems and culms with blemishes or deformities. Because of such careful selection only 25% of what is cut is retained (Heinsohn 1991). Not only is this wasteful, but the discarded material is often thrown onto the living plants, seriously reducing their ability to grow.

After cutting and sorting, the ncema is dried by spreading it out in the sun. It is turned regularly and taken in at night so that the dew does not wet it. Drying takes

several days, until the culms become golden-brown and are dry enough to be stored. Once dry, the plant is ready to be sold or used for weaving.

At St Lucia, where an estimated 80,000-120,000 kg (wet mass) of ncema is harvested annually, a considerable ncema-based economy has developed. On average, about 1,000 people cut the ncema, each cutting for three to five days. Extensive informal transport networks have developed to bring the harvesters to St Lucia, some of whom travel more than 300 km. An informal distribution network transports and retails the dried ncema, which in Natal is estimated at more than 116,000 kg (dry mass) per year (Heinsohn 1991). Large numbers of finished craft products made of ncema are on sale at markets and curio shops throughout Natal.

## Management of ncema at St Lucia

The St Lucia harvest site is in the Greater St Lucia Wetland Park, which is controlled by the Natal Parks Board (NPB), the agency responsible for nature conservation. Since the late 1960s, the NPB has allowed controlled harvesting of ncema at St Lucia, where 400-500 ha of the plant grows. This harvest started as a small scale operation, but over the years has expanded to become a major industry. Ensuring that the use remains sustainable and the resource is not depleted requires considerable management by the NPB.

Since the late 1970s, the NPB has levied a small charge for a permit to harvest ncema. Over the years, this charge has increased, but it is still small; and the income is not sufficient to cover management costs. The fact that the users are willing to pay indicates that they value the resource.

A harvesting zone has been designated, covering about a third of the area in which ncema occurs. The zone is part of an already established high intensity use zone. It was considered necessary to protect the remaining two-thirds from exploitation because little is known about the long term effects of harvesting. Zoning also

aids control as it confines the people who harvest ncema to specific areas. Harvest areas are rotated: ncema stands are inspected, and areas where the plant appears to be growing less vigorously are rested. Usually each area is rested every second year.

Some harvesting occurs all year, but most is from March to July, peaking in June. Based on this pattern and on the results of plant phenology studies, a harvest season was initiated in 1982. This starts at the beginning of May each year. At first the season lasted 8-12 weeks; but, because of increased use, it is now terminated once most of the ncema has been cut - usually within one to three weeks. The harvest season allows for better and more cost-effective control, since the game guard force has to be deployed only during the season. It is a more equitable way of controlling use than limiting the number of harvesters. Some harvesters travel great distances to cut ncema and cannot be turned away once they have arrived.

### **Increasing harvesting selectivity and reducing waste**

To increase the selectivity of the harvest and reduce waste, the NPB has changed its permit system, imposed restrictions on cutting implements, and introduced an incentive scheme.

Instead of selling a ticket (permit) that allows the holder to cut an unlimited quantity of ncema for one day, the NPB now sells tickets that allow the holder to cut one bundle of ncema per ticket. A bundle is defined as an armload with a circumference of 100 cm (the wet weight is about 20 kg). This system encourages the ticket holder to be selective and cut only the ncema she wants to keep. She may buy as many tickets as she wishes, and on average most women harvest two to three bundles per day. We believe that this system has been successful. Not only has it encouraged more selective cutting, it has made control easier, because each harvested bundle must have a ticket fixed to it. It is easier to check bundles than harvesters, because many of the people in the ncema beds are not harvesting but are transporting the rushes and do not require tickets. Another advantage of the system is that it allows the NPB to quantify better the amount being harvested.

Also to increase selectivity, the use of sickles was banned and the length of knife blades limited to less than 20 cm. This was unpopular and had to be enforced by the game guards. These restrictions remain contentious and, from a public relations perspective, have not been entirely successful.

Cutting implements are also the focus of an incentive scheme. At Kosi Bay, where the ncema is generally

longer and more robust than at St Lucia, the women often harvest the plants by selecting individual culms and plucking them one at a time. The NPB tried to encourage the women at St Lucia to do the same. However, this method is very hard on the hands - especially at St Lucia where ncema has narrower culms - and met with little success. The NPB then developed a small knife, consisting of a disposable hook-shaped cutter blade mounted in a handle, which could cut only one culm at a time. Large numbers of this knife were handed out. Then, once the ncema stocks for the year were almost depleted, the women who were prepared either to pluck the ncema or use the small hook-bladed knife were allowed to harvest in the area that was being rested that year. Unfortunately, the privilege was abused. After some of the women were found to be using nonselective methods, the experiment was abandoned.

### **Substitutes**

Substitutes and other ways of reducing pressure on wild populations of ncema have been considered. Other species, such as some *Cyperus* species, are used for crafts but are not as durable as ncema. There is no substitute for ncema for the ceremonial wedding gift of a sleeping mat. The Institute of Natural Resources of the University of Natal has investigated the feasibility of cultivating ncema. Ncema grows well in non-saline soils as long as it is not shaded out by competing plants (Heinsohn 1991). Small scale cultivation is possible and would reduce demands on the wild populations. Rushes could also be imported, but this is unlikely to be a viable option because the users are poor.

### **Conservation education**

The NPB recognizes the need to concentrate more on the social aspects of the ncema harvest. In 1982, it set up an interpretation and conservation education programme, which included radio programmes, talks, audio-visual presentations, and the use of game guards as interpreters.

Information about the ncema harvest was broadcast on the Zulu language radio programmes. This was partly to notify people of the starting date of the harvest season, and partly as an interpretation exercise. The broadcasts explained the concepts of sustainable use, rotational use, and how to care for limited resources. These seem to have increased the general public's awareness of the ncema harvest.

One of the NPB's Zulu education officers gave talks and an audio-visual presentation to the women who came to harvest ncema. This was not very successful

because the women had travelled far and paid a lot of money to cut ncema, and were not inclined to listen to presentations. They were also too awed by the audio-visual equipment to pay attention to the message.

The NPB set up a programme to inform its game guards, who oversee the ncema harvest, about its conservation aspects. Before the start of the harvest season, field days were conducted to educate the guards in all aspects of the ncema industry. They were also taken to the experimental agricultural farm where they saw trial cultivation of ncema. Now the game guards communicate their understanding individually with the harvesters, in the course of their daily law enforcement activities. This has proved to be the most effective way of communicating a conservation message to the women cutting ncema.

### **Representation by the users**

The NPB has set up committees with representatives of the ncema cutters for them to communicate their concerns. To date, success has been limited. Ncema harvesters are not a cohesive community, and it has been difficult to get them to nominate representatives.

I believe that the main shortcoming in the management of the ncema harvest has been the lack of effective representation for the harvesters to give them direct involvement in decisions on the use of ncema. Unless this is achieved in a manner that enables users to develop a sense of participation and formal rights to use ncema, it is unlikely that they will value ncema as a sustainable resource. Lack of participation and rights has resulted in no one valuing the conservation of ncema or its habitat. The resource is regarded as nobody's property, towards which the prevailing attitude is, "if I do not take the maximum I can now, someone else will take what I leave - so why should I leave anything?" This is the so-called "tragedy of the commons" (Hardin 1968).

Recently informal cartels seem to have been established to harvest, transport and sell ncema. These started with various people employing women to cut ncema for them; and then developed into a situation in which certain individuals demanded protection money from anyone wishing to harvest ncema. This makes management difficult and inequitable.

### **Future management strategies**

As a result of the development of cartels, the NPB has considered several ways of managing the ncema harvest. The aim is to be equitable and follow free market principles as far as possible. The strategies include:

- Small scale subsistence use. This is the current situation, but it is becoming inequitable as cartels form and a few individuals monopolize the industry.
- Small scale businesses, in which prospective users tender for rights to harvest a specified patch of ncema. This would be more efficient than the present system but would exclude the small user. Control would be easier, and the money paid to the NPB could go directly into the management of the ncema harvest.
- A cooperative business, placing control of the ncema industry in the hands of a neighbouring community. This would be unfair to people from further away who have been harvesting ncema at St Lucia for more than two decades. However, its advantage is that the park's neighbours would benefit from it, so promoting (it is hoped) greater recognition of the regional value of nature conservation. Greater participation of the users in decisions on the ncema harvest would be essential for this to work.
- Harvesting by the NPB or by a concessionaire on its behalf, who would then sell the ncema to the users. This would be efficient and require less management than the alternatives, but would harm the small scale user and might be perceived as autocratic.
- Joint ventures between the NPB and people wishing to harvest the ncema. This could be a powerful strategy as a group with technological knowledge and financial backing would be teamed with people who have a traditional understanding of how to harvest the resource. This may provide the best balance between equity and efficiency.

### **Assessment of ncema harvesting**

The controlled ncema harvest at St Lucia has developed over the past two and a half decades. Through trial and error, supported by a limited amount of research, it has become a successful harvesting project. It has evolved to cope with increasing demands and, although there are still challenges to be met, much can be learnt from it.

### **Is the ncema harvest sustainable?**

It is extremely difficult to know whether the use of ncema at St Lucia is sustainable. The NPB is responsible for ensuring that harvesting does not impair the long term viability of the ncema beds or have an adverse impact on associated species or the ecosystem within

which ncema grows. No study or risk assessment has been done to see if this is the case. The nature and magnitude of the effects of the harvest should be considered in the context of the natural dynamics of the ecosystem. Various temporal and spatial scales need to be born in mind. Annual seasonal patterns affect growth and hence crop size; wet-dry cycles have a periodicity of about a decade; and large floods, occurring once every 20 to once every 50 years, control the geomorphology of the area.

We have to be aware of the different perspectives of these temporal and spatial scales. We also need to separate human-caused changes from the natural dynamics. The detailed monitoring required to detect such changes would be very expensive. For instance:

- In some localities, there has been an invasion of *Phragmites* reeds, which shade out and displace the ncema plants. This may be due to subtle changes in soil-water relations or reductions in salt concentrations in the soils. But the concern remains as to whether the delicate balance between ncema and *Phragmites* has been altered by human exploitation.
- It is possible that continued harvesting will lead to long term nutrient depletion. The effects of this would be difficult to detect.
- The area where the ncema beds occur is subject to flooding. Major floods cause considerable erosion and transform the landscape. This may modify the physical characteristics of the site where the ncema grows.

Impacts on non-target species are difficult to discern. However, since ncema grows in monospecific stands at St Lucia we believe that harvesting has few impacts on other species.

### **What are the benefits to the users and to nature conservation?**

A better understanding is needed of the socioeconomic benefits resulting from the use of ncema obtained from a protected area. Detailed economic surveys are required to understand fully the value of ncema in Natal. This information should then be communicated to the users and general public so that they realize the value of the resource and of nature conservation.

### **Associated problems**

Problems associated with the people who harvest the ncema need to be addressed. These include the lack of

accommodation for the influx of people, litter, inadequate drinking water supplies, sanitation problems, crime, and the incompatibility of this form of land use with tourism in the St Lucia holiday resort. The rights of the home owners, town residents, visitors and holiday makers need to be considered.

Possibly these problems could be minimized by providing the harvesters with a campsite with enough space for them to dry their crop. A site could also be developed for the display of their weaving and sale of their crafts. This would help the ncema and tourism industries to benefit from each other.

### **Lessons for future programmes**

There are two ways to set up a sustainable use programme. One way is to start small and gradually expand until the carrying capacity of the resource is reached. This is the adaptive management method that was used with ncema at St Lucia. The NPB addressed problems, one at a time, as they became apparent. This requires monitoring, which can be expensive, but the costs can be spread over several years. Ideally, a system should be developed so that the running costs are born by the users of the resource. Some of the users should be trained to carry out some of the monitoring.

The other way is by conducting a rapid assessment and establishing the programme at its maximum sustainable level. A team of experienced resource use facilitators would carry out the assessment. The team would base its initial assessment on theoretical understanding and expertise and traditional knowledge. The team would consider supply factors, such as plant population size, distribution, dynamics and production, impacts of use, and habitat change. They would balance these against demand factors, such as human population density, type of economy (for example, subsistence or commercial), consumption rates, and form of use (for example, craftwork) (Cunningham et al. 1992). Traditional use systems could then be adapted to develop viable harvesting systems and set sustainable use levels.

There will be few cases in which comprehensive field-based research can be afforded. Consequently, expert systems, or similar decision support systems that can accumulate empirical knowledge, are needed. These can be used to control the harvest and guide monitoring programmes. Monitoring is essential to manage both the ecological and the social and economic aspects of the programme. We need to know how the users respond, whether the programme is integrated into the fabric of the economy, and how it fits into established social systems.

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# Management and harvesting of caiman in Venezuela

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## Caiman management programme

In 1982, the Ministry of Environment and Renewable Natural Resources [Ministerio del Ambiente y de los Recursos Naturales Renovables (MARNR)] issued the first regulation permitting the rational use of the common or spectacled caiman (*Caiman crocodilus*) in five states in the floodplain (Llanos region) of Venezuela. It abolished a 10-year ban on taking the species and initiated a management programme.

The programme is run by the Autonomous Service for the Protection, Restoration, Promotion and Rational Use of Wild and Aquatic Fauna (PROFAUNA). PROFAUNA was established as part of MARNR in 1989, under Presidential Decree #277. It is responsible for wildlife administration, conservation and enforcement.

The policy of the caiman management programme is to promote the sustainable and full use of the caiman resource (skin, meat, bones, viscera, teeth, and so on) and encourage the participation of rural people.

## Assessing populations and regulating harvests

The scientific basis of the programme originated in research conducted during the period of the ban. Seijas (1993) provides a bibliographic review of this research. In addition, from 1983 to 1988, PROFAUNA conducted population censuses of the species in potential harvest areas. The censuses were undertaken in the spring, at night, when the animals are on the water and can be spotted with lamps. The average density of caimans per hectare of water is calculated on the basis of these counts. Extrapolating this calculation to the rest of the landholding allows the total population to be estimated.

In 1986, the programme was stopped for a year to assess the response of the populations to harvesting (Seijas 1986). Various private lands were censused by night and by day, using the method described above.

The legal framework of the caiman management programme consists of laws covering central administration, environment, and protection of wild animals, and the regulations of MARNR.

International trade is regulated in accordance with the Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES), to which Venezuela has been party since 1976.

Regulations of MARNR, published in the Official Gazette of the Republic of Venezuela, are the legal instruments governing the caiman management programme. They have been modified several times during the last 10 years, to improve them and adapt them to local conditions. The regulations cover such matters as receipt of documents, movement of products, permits, the area of implementation of the programme, percentage of meat used, hunting method, stamping of skins and tagging of skin and meat, and establishment of checking centres.

The programme is conducted only on private lands. Harvesting the species in protected areas, along national rivers, on water bodies less than 150 metres from national highways, and on municipal lands is forbidden.

Since 1989, because of a significant increase in applications to harvest caiman by landowners, and as a result of an international workshop held at the Simon Bolivar University in Caracas, PROFAUNA has required landowners to provide an annual technical report prepared by certified professionals on the size and structure of their caiman population. These professionals must be trained in the most appropriate census methods for estimating caiman populations. The census report estimates both the number of animals of each size class on the landholding and the total population.

The programme recognizes four size classes, based on the size classification proposed by Ayarzaguen (1983):

- Class I. Individuals up to 59.9 cm in total length.
- Class II. Juveniles from 60 to 119.9 cm in total length.
- Class III. Females and males from 120 to 179.9 cm in total length.
- Class IV. Males of 180 cm or more in total length.

Only Class IV individuals are harvested. Since reproductive females and young males in Class III are not affected, the population's reproductive potential and gene pool are maintained. Caiman are opportunistic predators (Ayarzaguena 1983; Thorbjarnarson 1993) and their habitat is the entire llanos. Consequently, harvesting caiman has a negligible effect on other species or the ecosystem.

Each private landholding must provide a five-year management plan setting out the measures it will take to improve populations and ensure that harvesting is sustainable over the long term. The management plan includes actions to maintain and improve habitats - for example, by building dikes, improving access to water bodies, and dredging lagoons and channels; guard programmes to protect caiman populations on the landholding and prevent poaching; captive rearing and release of young back to the wild; protection of nesting areas; environmental education programmes for hunters, guards, and estate workers; and training in guard duties, harvesting, skinning, preservation of skin and meat, collection and incubation of eggs, and captive rearing.

Once it has reviewed the reports and annual censuses, PROFAUNA may allow harvesting up to a maximum of 25% of individuals in Class IV, or 7% of the estimated total population of each landholding. Harvesting is not permitted if the percentage of Class IV individuals in a population is less than 15%.

PROFAUNA periodically assesses the impacts of harvesting and the actions taken by landowners; and adjusts the percentage of Class IV animals that may be taken accordingly. One way of estimating the impact of harvesting on the population is by monitoring skin size. This has been done since 1987 at MARNR's checking centres. The largest skins make up the biggest percentage of the take, indicating that recruitment continues to be good. If the percentage declined significantly, it would suggest that the resource is being overexploited.

Another factor taken into account when setting the quota is supply and demand for the products. For example, a drop in international demand for the skin partially paralyzed trade, resulting in a build-up of stocks. In response, the annual harvest was cut drastically to 30,000 animals.

The ecological basis of harvest rates was re-examined recently in a research project that was partially supported by the Secretariat of CITES, the European Community and the Government of Japan. Information from annual censuses and the management plans for each landholding, together with the results of national research on the species, have enabled us to define seven ecologically

distinct regions: Bajo Apure, Alto Apure, Cajon del Arauca, Aguas Claras, Llanos Boscosos, Arismendi, and Guarico. Management models and harvest quotas have been worked out separately for each of these regions. As a result, we estimate that the total quota for the area covered by the caiman management programme should be in the order of 70,000 animals per year, or 20% of Class IV individuals (Velasco & Ayarzaguena in press).

Therefore, hunting in areas where it has been heaviest has been temporarily suspended. One such area is the region of Guarico, where the low percentage (7%) of individuals in Class IV shows that recovery is inadequate.

Each of the seven ecological regions of the llanos will be monitored separately. PROFAUNA has made agreements with universities, associations of landowners and other nongovernmental organizations to carry out the required research. This includes studies of population dynamics, parasites, diet, and the effect of returning captive reared animals to the wild.

## Economic benefits

The main social and economic incentives provided by the programme are the major economic benefits for both landowners and the regional economy. The programme has generated new jobs in caiman harvesting, processing and management; and has stimulated local economies through increased employment as well as new business for retailers and service industries (hotels, restaurants, car-rental companies, among others). Most of the money earned from caiman harvesting is spent in the region of production.

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# CAMPFIRE in Zimbabwe

Brian Child

## Introduction

In a growing acceptance of the role of sustainable use in conserving wild resources, IUCN has drafted Guidelines to assess the merits of programmes that claim to be based on the principles of sustainable use. These draft Guidelines are extremely important, and are already being used to judge programmes.

Over the previous three decades, Zimbabwe has developed a philosophy where wildlife conservation outside protected areas (13% of Zimbabwe) is based on sustainable use. This has been highly successful on private land, with huge areas integrating or replacing livestock monocultures with wildlife enterprises, conserving wildlife and generating higher profits. This success on private land led to the CAMPFIRE programme, which tackles some of Africa's most complex resource problems. CAMPFIRE, too, is based on sustainable use of wild species, and is starting to revolutionize resource management in remote and marginal communal areas. In conjunction with the evolution of CAMPFIRE, a Zimbabwean team of sociologists, economists and ecologists has developed an understanding of the principles and practices that promote successful community-based natural resource management. Given its practical success, and the philosophical understanding of its evolution and effects, CAMPFIRE has a valuable contribution to make to the present debate. Indeed, "CAMPFIRE" refers to a set of concepts as much as to a programme.

This paper summarizes the history and the progress of CAMPFIRE. It argues that it is successful, at least so far. CAMPFIRE is increasingly recognized as one of the most successful and exciting conservation programmes on land managed by poor communities. Evaluating the draft Guidelines against this programme will therefore be very illuminating as to their worth over large areas of the globe where resource problems are most severe. It will show whether the draft Guidelines favour or prejudice the new approaches and solutions that are so desperately needed to replace the centralized protectionism that is failing everywhere.

Sustainable use is not intended to replace protected areas but to conserve the wildlife that lives outside them on land used by people. Therefore, this paper is concerned not with the 10% or so of a country set aside to preserve nature, but with the remainder. It refers to land whose purpose is to support people and where, consequently, economic factors are paramount in deciding which resources to promote and which to replace. It specifically focuses on communal lands in developing countries.

This paper's approach to the conservation of wildlife and other natural resources on this predominantly agricultural land is based on proprietorship, price and exchange. These are the building blocks of an economic system. The absence of this system on communal lands is the prime reason for resource deterioration. The new management system is designed to supplant the failed colonial approach which depended on centralizing wildlife management; preservation rather than use; and protecting the resources through tyranny, dictate, law enforcement and policing. The removal of wildlife from the jurisdiction of local people removed its value to them and caused so much resentment that they purposely eliminated it. This must not be allowed to happen again.

## **Before CAMPFIRE: from wildlife management against the people to wildlife management for the people**

CAMPFIRE (Communal Areas Management Programme For Indigenous Resources) grew out of the folly and failure of colonial legislation, which banned all use of wildlife for commercial as well as traditional hunting, and moved some people to make way for national parks. Because communities were disenfranchised from their resources, the resources became valueless. Wildlife also became a symbol of oppression, so that its destruction was encouraged and poachers were heroes. This phase of alienation of people from wildlife may be categorized as the period of wildlife management *against* the people.

**Table 1. Results of a financial and economic appraisal of game and cattle enterprise survey (1989/90). Economic results differ from financial results by removing the effects of economic distortions such as subsidies.**

Profitability	Financial results		Economic results	
	Cattle enterprises (n=77)	Wildlife enterprises (n=44)	Cattle enterprises (n=77)	Wildlife enterprises (n=44)
<b>"LOSS"</b> Negative net revenue	30 (39%)	4 (9%)	11 (14%)	1 (2%)
<b>"MARGINAL"</b> Positive net revenue	47 (61%)	40 (91%)	66 (86%)	43 (98%)
<b>"PROFITABLE"</b> Return on investment positive and >10%	4 (5%)	24 (54%)	40 (52%)	35 (80%)

The results were easy to predict. People were not allowed to benefit from wildlife so they simply replaced it with crops or domestic animals that did benefit them. The consequence was the rapid disappearance of wildlife.

As far back as 1955, the inevitable outcome of this folly was recognized. The Department of National Parks and Wildlife Management (DNPWM [it had a different name then]) took the unique and brave step of giving people - or, at least, commercial (white) farmers - back their wildlife. This step was vehemently criticized on the grounds that if farmers were allowed to use their wildlife commercially, it would disappear. The results were the exact opposite: farmers began to benefit from their wildlife, and therefore began to look after it. Thus was born the successful game ranching industry, and the expansion of wildlife over large tracts of farmland.

Zimbabwe, in contrast to world trends, has been at pains to make its wildlife as valuable as possible by actively promoting use and higher prices. The result has been a significant shift from livestock monocultures to natural ecosystems with a wide range of indigenous species. Elephants, antelope, zebra and giraffe live on ranches and are sold to safari hunters and tourists: an enterprise that is more profitable than cattle.

A group of ranchers recently removed all cattle from their 350,000 hectares. They replaced them with wildlife, partly by nurturing surviving stocks of antelope and partly by capturing and reintroducing entire herds of elephant, rhino, and buffalo - animals that were destroyed as vermin as recently as the 1970s. The area of Hwange National Park has effectively been increased by 250,000 hectares as ranchers on its boundaries do the same.

The advantage of wildlife is that it earns more than cattle while using the environment more lightly. The same animal can be photographed, then sold to a foreign

client as a hunting trophy, and finally sold through the butchery for meat. Cattle can be sold only once: for meat.

Legislation that allows landholders to exploit this inherent advantage has resulted in a rapid proliferation of wildlife on private land throughout the country. Some 75% of Zimbabwe's commercial ranches now have a wildlife enterprise. Usually wildlife production is alongside cattle production; but increasingly it is on its own as the wildlife industry, based as it is on recreation and services, out-competes the beef industry.

A financial appraisal of 91 enterprises in 1989/90 (Table 1) shows that cattle ranching was marginally viable with 39% of cattle enterprises losing money and only 5% making significant profits (that is, a return on investment greater than 10%). By contrast, 91% of game enterprises were viable, with 54% making significant profits. With the removal of distortions from the economy, both enterprises would improve significantly, but wildlife would retain its superiority over cattle.

While game ranching was prospering on private land, communal wildlife resources - including high value species such as buffalo, lions and elephants - were being rapidly eroded. This was a symptom of the protectionist legislation often imposed by Western nations in the belief that wildlife belonged to the "king" and not the people. But it made no economic sense. Commercial ranchers had developed a viable new technology for using marginal lands. The trick was to transfer this technology to communal lands, through legislative change and adaptive and multi-disciplinary implementation.

The first attempt formally to link communal people to wildlife management was Project WINDFALL. Money from culling in national parks, and from safari hunting in communal areas (but still managed by the State), was given to district councils. Because the State, through the

**Table 2. Summary of improvements in the system for managing wildlife in Zimbabwe's communal areas. Note how regulation, authority, management and benefit have evolved until the regulation remains centralized but the others are a community responsibility. Hypothesis: benefit, management and authority should be the same unit, but regulatory functions should be separate.**

	<b>Colonial Period 1890-1970s</b>	<b>WINDFALL 1978-1989</b>	<b>1989-1993</b>	<b>CAMPFIRE Future</b>
<b>The State</b>	Regulation Authority Management Benefit	Regulation Authority Management Benefit (50%)	Regulation	Regulation
<b>District Councils</b>		Benefit (50%)	Authority	coordination policy
<b>People: communities living with wildlife</b>	de-facto management = "poaching"	de-facto management = "poaching"	Management Benefit	Authority (?) Management Benefit

DNPWM, still did all the management, this phase may usefully be categorized as wildlife management *for* the people. This too was not successful. Money stayed in councils, and the people living with wildlife saw few benefits. Local people were not involved in wildlife management and developed no interest in it.

### **CAMPFIRE: wildlife management by the people**

To rectify these faults, the Parks and Wildlife Act of 1975 was revised to allow district councils to become the "appropriate authority" for wildlife on their land. This effectively gave district councils the same rights to use wildlife as private landholders. Monies are now returned directly to councils, and government steps back into a role of ensuring that various principles and practices are followed. The only exception is that, in the interim, the DNPWM reserves the right to control quotas. These controls are necessary until appropriate and accountable institutions and incentive structures develop, and councils and communities learn the necessary skills. The controls are being phased out by training communities to set quotas, which are submitted to DNPWM for approval (and correction) as a check.

Although devolution to council level is a very positive step, particularly given the maturity of most councils in recognizing the need for further devolution, this structure is still prone to misappropriation. To be self-regulating and to reduce the need for external monitoring, the situation summarized in Table 2 under "CAMPFIRE future" needs to apply. A few councils are implementing this approach, but legislative changes giving appropriate authority to producer communities are required to entrench it nationally.

The authority for wildlife in communal areas is still in the hands of councils rather than the communities. CAMPFIRE guidelines were developed to ensure that councils are accountable to the landholders they represent. They improve transparency and make sure that communities (rather than councils) manage and benefit from wildlife. They guard against the tendency for cash-strapped councils to use wildlife to fund their administrations, thereby depriving communities of their rightful benefits and disadvantaging wildlife.

The CAMPFIRE guidelines insist that the majority of the revenue from wildlife is paid to the "producer" community; that decision-making is devolved; and that the council's actions are transparent. For example, all marketing should be open and competitive. Thus the authority to manage wildlife was given to councils on condition that benefit and management were further devolved to the community. We now have wildlife management by the people.

A hypothesis that has evolved with CAMPFIRE is that, for wildlife management to be successful:

- The unit of benefit, the unit of management, and the unit of authority should be the same - that is the community that "produces" the wildlife.
- Scale is critical. The unit should be small (fewer than 200 households) and able to "meet under a tree".
- The unit of regulation should be separated from benefit, management and authority.

Table 2 summarizes the evolution of CAMPFIRE showing progress towards this situation. The current debate is whether, and how, to modify the legislation

to further devolve authority from councils to communities.

### The expansion of CAMPFIRE

The first two districts (Nyaminyami and Guruve) received appropriate authority status in 1989, but by early 1991 a further 10 districts had been gazetted with another 12 applying. Within four years, CAMPFIRE had spread to 75 wards and 56,752 households (500,000 people). The financial status of CAMPFIRE is summarized in Table 3: gross income increased from \$648,620 in 1989 to \$6.9 million in 1992 and to more than \$10 million in 1993.

### Devolution to communities

The rapid growth and geographic spread of CAMPFIRE was accompanied by the devolution of benefits and management to the communities involved (Tables 3 and 4), once the strength of devolution was demonstrated by cases such as Chikwarakwara (described below).

Devolution was actively encouraged by the DNPWM and the agencies that collaborate.

When CAMPFIRE implementation proper began in 1989, councils were very reluctant to decentralize revenues and certainly did not intend to pay cash to households. By 1992, however, nine of the 12 districts had devolved more than 50% of revenue to communities. Overall, some 65% of revenue is expected to reach communities compared to 40% in 1991 and 1990 (1989 data refer only to Nyaminyami and Guruve). Aid grants allowed for greater distribution than would otherwise have occurred. Unfortunately, this aid entrenched high centralized costs to run vehicles, staff, and so on, so that these districts were less able to devolve revenues in later years.

Councils are increasingly entrusting communities with cash and project implementation. By March 1993, some \$1.9 million of the 1992 revenue was devolved of which \$417,070 was distributed as cash. Since some \$2.5 million is still to be allocated at the time of writing, this suggests that 65% of gross income will reach producer communities directly (Table 3). Project implementation is also being decentralized (Table 4).

**Table 3. National summary of CAMPFIRE's financial status (Z\$). Note: spending of 1992 revenues is still incomplete; devolved expenditure should exceed 60%.**

	1989	1990	1991	1992
<b>Income:</b> earned	648,620	1,574,157	2,899,518	6,936,452
donated	120,225	78,876	95,114	37,842
<b>Total expenditure</b> (% of wildlife income)	748,707 (100+%)	1,160,449 (74%)	2,176,008 (85%)	4,403,128 (64%)
<b>1. Council's general expenses</b>	279,447 (43%)	302,947 (19%)	494,172 (27%)	914,219 (13%)
<b>2. Centralized wildlife management</b>	46,575 (7%)	202,076 (13%)	475,832 (16%)	742,970 (11%)
<b>3. Community expenditure/benefits</b>	422,685 (65%)	655,426 (43%)	1,206,005 (42%)	2,745,938 (40+%) (4.5m 65%)*
- council run projects	378,805	527,021	383,400	20,034
- devolved expenditure	43,880 (7%)	128,405 (8%)	815,943 (28%)	1,888,875 (27+%)
- cash	43,880	72,205	191,560	417,070
- projects	0	56,200	385,475	343,539
- management including wildlife	0	0	6,662	10,850
<b>Balance remaining (i.e. unused)</b>	20,138 (3%)	492,584 (30%)	818,624 (18%)	2,571,166 (37%)

## Developing skills: marketing safari hunting

The example of safari hunting enterprises illustrates how quickly rural communities can learn or apply commercial skills when they have the incentives to do so, and shows that they are quite capable of dealing in large sums.

Wildlife is marketed by the following process. Each district develops a sustainable hunting quota (in collaboration with the DNPWM). The quota will be used by a safari outfitter who has the capital and skills to find and guide international clients.

To find the best outfitter, the council advertises its quota in the national press, usually offering a concession for three to five years. Outfitters submit tenders. The best offer may be chosen at this stage. But selection and price are improved by interviewing shortlisted outfitters. This allows assessment of the outfitter's character as well as further bargaining. Problems may occur if the selection process is not open to scrutiny, or if the panel is not dominated by members of the community that provides the wildlife.

In 1989, councils had little marketing experience. They have since more than doubled their income per unit

of hunting, with some training by the DNPWM and the Worldwide Fund for Nature (WWF). Table 5 shows that for each unit of trophies marketed (using standard prices), councils earned Z\$0.61 in 1990 but Z\$2.94 by 1992. Some of this improvement resulted from the rapid softening of the Z\$. But even in terms of US\$, improved marketing skills doubled incomes from US\$0.24 in 1990 to US\$0.40 thereafter. This suggests that, initially, it is better to invest in marketing than in improved production techniques. Only once communities have the incentive to develop the wildlife resource will they absorb the improved management techniques. Usually, however, assistance starts by focussing on production techniques, an effort that may be wasted for lack of incentives to implement them.

Intermediaries such as outfitters are often accused of retaining a disproportionately large share of profits. This may happen when contracts and prices are set by bureaucratic decree, but is eliminated by competition. The cost structure of safari hunting is that, of every dollar paid by foreign clients, 60 cents are the outfitter's costs and 40 cents profit. When prices were set by decree (before CAMPFIRE), councils got about 15 cents of this

**Table 4. Classification of expenditure (Z\$) in communities according to whether it is done by council or is devolved to the community. Note: Some of the revenue allocated to communities has not yet been allocated to specific projects. The 1992 allocation was not complete at the time of writing.**

Year	Income allocated to communities	Council run projects	Devolved expenditure
1989	\$422,685 (65%)	\$378,805 (58%)	\$43,880 (7%)
1990	\$655,426 (43%)	\$527,021 (33%)	\$128,405 (8%)
1991	\$1,206,005 (42%)	\$383,400 (13%)	\$815,943 (28%)
1992	\$2,745,938 (40+%)	\$20,034 (<1%)	\$1,888,875+ (27%+)

**Table 5. Trends in efficiency of marketing hunting quotas to safari outfitters.**

	1990	1991	1992	1993
Value of quota using standard (Z\$) prices	2,464,445	2,555,045	3,164,495	3,526,055
Income received (1992=expected)	1,505,956	2,725,868	6,016,738	10,365,485
Income/quota	0.61	1.07	1.9	2.94
Income (US\$)	602,382	1,090,347	1,203,348	1,645,315
Ratio: US\$ income/quota value	0.24	0.43	0.38	0.47
Exchange rate: Z\$:US\$	2.5	2.5	5.0	6.3

profit. With the introduction of fierce competition among operators, with up to 12 operators bidding to hunt in the same communal area, councils have driven up their share to more than 30 cents, or more than 75% of net profit. In one case they receive 40% of gross income. Competition has pruned the outfitter's share of profits to a quarter.

Councils now market wildlife better than the government itself. Although having a more limited resource, with much lower densities of wildlife, councils earn some 50% more per animal from communal areas than does the state from the wildlife in prime safari areas. The irony is that governments often refuse to decentralize on the grounds that rural communities are incompetent. Similarly, the international community does not trust such local wildlife management.

### **Catch 22: devolving management to institutions with no management experience**

When initiating CAMPFIRE, the DNPWM also feared that communities would be unable to manage wildlife, because of their long alienation from it. Could wildlife management be devolved to institutions with no wildlife management experience? The dilemma was that communities would never learn these management skills until they were entrusted with management, because there is no substitute for experience. The DNPWM recognized that the failure of the centrally controlled system was inevitable, and the risks inherent in devolving authority should be weighed against this. It therefore decided to devolve wildlife management, limiting the risks by implementing this process in a planned and responsible manner, using an adaptive management approach. (Adaptive management involves setting a goal, trying a management action, monitoring and assessing the results, modifying the action and trying it again. In other words, it is trial and error supported by monitoring and assessment.)

The approach has paid off. A system based on proprietary use is evolving successfully, notwithstanding a limited capacity to support it with technical inputs. Indeed, these limitations may be beneficial. They promote the sustainability of the programme, since the communities cannot abrogate the responsibility for management or financing to the facilitating agencies. The programme has to be self-sufficient. The result is leaner activities that can be sustained by the resources they serve. Indeed, districts with support from donors have tended to develop more slowly, and have suffered from excessive overhead costs. For example, the need to maintain donated vehicles, buildings or other large capital items has reduced the amount of money returned to the communities. Also, such capital items have seldom been cost-effective.

## **The process of implementing CAMPFIRE**

Implementation of CAMPFIRE is a five-step process. The first step is the development of a supportive legislative and political environment. The second step is to make councils aware of the potential of wildlife, and then wait for them to request the programme. Indeed, most aspects of CAMPFIRE are "demand-driven". This avoids the imposition of ideas and ensures that assistance is focused on willing people and real needs. The third step is to earn money by identifying and marketing commercial opportunities, be they hunting, wildlife products or tourism. The fourth step, is the effective use of the revenues to achieve the kinds of development described for Chikwarakwara in the next section. Here the full involvement of communities is critical. The benefits and the empowerment associated with them start to change attitudes to wildlife and provide the platform for the fifth and final step: improving wildlife management and institutions. This step requires considerable effort in training.

An attempt was made to assess the progress made by each district in each step on a three or four point scale. The overall performance of the 12 districts is summarized in Table 6, with "perfection" being either 36 or 48 points. Table 6 covers only steps 2-5 since step 1 is done at the national level.

Awareness of CAMPFIRE spread rapidly with 24 of Zimbabwe's 57 rural districts requesting the programme within four years (step 2). (Half of the rural districts are in areas with moderately high to high agricultural potential, land is intensively used, and few commercially exploitable wild resources remain.) Commercial skills (step 3) also quickly improved, as already discussed. Within four years of the start of the programme safari hunting was fully used (score: 33 out of 36). Non-hunting tourism, being more complex, has been slower to develop.

Community participation in revenue distribution (step 4) increased satisfactorily (from 16 to 35 out of 48). This is a big step: whereas a district may market only one concession every five years, it will need to distribute these revenues to several (even many) communities every year. The natural reluctance by the centre to devolve to communities must be overcome. Moreover, participation is more complex and slower to evolve than marketing. This makes the progress even more remarkable.

The benefits from wildlife have begun to change attitudes towards it. This has been more rapid at the council level because, until now, wildlife management has been concentrated at that level. However, community attitudes are also beginning change, as in Chikwarakwara (described in the next section).

These attitudinal changes, of necessity, precede the development of active local-level management (step 5).

**Table 6. Assessing the national implementation of CAMPFIRE (steps 2-5). See main text for explanation.**

	1989	1991	1992	Possible score
<b>Step 2: AWARENESS OF CAMPFIRE AT COUNCIL LEVEL</b>				
Awareness of value of wildlife	12	16	19	24
Application for Appropriate Authority (n=57)	2	12	24	-
Award of Appropriate Authority (n=57)	2	12	12	-
<b>Step 3: EARNING MONEY</b>				
Is safari hunting used effectively?	15	32	33	36
Marketing skills	11	30	37	48
Are (non-hunting) tourism opportunities used fully?	0	3	10	36
Marketing skills	0	7	24	48
<b>Step 4: SPENDING MONEY</b>				
Amount of participation in distribution	16	31	35	48
<b>Step 5.1: UNDERSTANDING/ATTITUDES</b>				
Attitudes towards wildlife in communities concerned	5	15	22	48
Awareness of/commitment to CAMPFIRE philosophy in Council	11	36	41	48
<b>Step 5.2: WILDLIFE MANAGEMENT &amp; INSTITUTIONS</b>				
Monitoring safari hunting	0	19	22	36
Quota-setting	0	0	23	36
PAC management	4	16	20	36
Anti-poaching	6	22	23	36
Marketing skills (at Council)	3	21	26	36
Financial records	8	20	21	36
Implementation of micro-projects	1	10	15	36
Expansion of CAMPFIRE into other resources				
grazing	0	3	3	36
trees/woodlands	2	3	3	36
land use planning	3	7	12	36
minerals	0	0	0	36

They provide the foundation on which improvements in wildlife management and land use practices can be built. The next phase of the programme, therefore, is to consolidate present gains by involving local communities ever more closely in management. This will require the development of a broad-based understanding of CAMPFIRE, plus the acquisition of specific management skills and institutions (for example, the management of problem animals) by some 400 villages. This is already beginning to occur.

### **Institutional support structure**

CAMPFIRE is administered by two government agencies. It is led by DNPWM whose role is to ensure that the programme is sustainable by monitoring offtake and ensuring that benefits reach communities. There is strong support from the Ministry of Local Government, who sees CAMPFIRE as spearheading decentralized development.

Four NGOs have been coopted to assist the programme. The CAMPFIRE Association is a producer association formed by districts to lobby for their interests and provide them with services. The other three are facilitating agencies. The Centre for Applied Social Studies (CASS) at the University of Zimbabwe monitors the social aspects of CAMPFIRE, providing other technical agencies with advice. The Zimbabwe Trust has specialized in institutional development, and helps communities to develop and train committees to run the programme. WWF provides councils and communities with ecological and economic advice. It is currently developing techniques that communities can use for wildlife management to reduce their dependency on high-tech solutions.

The main implementors of CAMPFIRE are the councils and communities themselves.

## **CAMPFIRE in action: the example of Chikwarakwara**

### **Land use problems**

Chikwarakwara, in Beitbridge District, is a remote village at the confluence of the Limpopo and Bubyer rivers, opposite Kruger National Park in South Africa. A "village" is a Zimbabwean administrative term for an area of land occupied by 100-200 households. There are four to six villages in a ward, and up to thirty wards are represented in the district council by the ward chairmen.

Chikwarakwara suffers from all the resource problems of similar villages throughout Zimbabwe. The people are

exceedingly poor, largely uneducated and geriatric: most school-leavers work elsewhere. The community is centred on an irrigation scheme, built and jointly managed by two large bureaucracies. The scheme is working at under 25% of capacity, forcing people to clear the magnificent riverine vegetation (including the fever trees of Kipling fame) to scratch a living from dryland crops - crops that succeed only once or twice a decade. Chikwarakwara has only moderate herds of livestock; but its grazing is destroyed when people from elsewhere who, having finished their own grass, come in search of more. This reduces the carrying capacity for wildlife. Outsiders also poach heavily, using dogs and wire snares, while tending their cattle.

The root causes of resource problems are disenfranchisement of the community from its resources, the resulting open access regime, and the consequent absence of the economic institutions (for example, the right of exclusion) and signals (for example, prices) necessary for management. The effects of open access are exacerbated by the rapid demographically-driven change in the ratio between resources and demands on them. Traditional controls have been destroyed, but new resource management systems have failed to evolve to meet the increasing challenges of resource scarcity. A resource free-for-all has resulted. With no rights of exclusion, scarce resources are unpriced and therefore allocated very inefficiently. In many cases, they are overused to the point of destruction, yet used so inefficiently that people remain in poverty. In this economic non-system the people of Chikwarakwara feel little hope, have limited dreams, and see development as begging from donors (whom they are expert at manipulating).

Lack of hope is a critical factor retarding development. Years of dependency have destroyed people's self-esteem and their ability to develop themselves. In this and other communities the essence of development is the mind. Dependency and its relation - lack of vision - mean that the potential of the environment to support the community sustainably is untapped. So Chikwarakwara lurks in poverty, even though its environment could easily support development: aquifers from the Limpopo allow irrigation; there is enough grazing land for each household to have six cattle; and wild animals, including buffalo and elephant, are a valuable resource.

### **The story of development in Chikwarakwara**

Chikwarakwara and communities like it overexploited the common wildlife resource, considering it highly undesirable. Wildlife revenues were captured by the state, and then by the district council for general management (for example, administration costs and

various projects). Few benefits reached rural people, and they were not involved in decision making.

In 1989, three elephant, four buffalo and some other animals were sold to a safari outfitter and hunted in Chikwarakwara village. They were worth \$60,000. Beitbridge District Council believes that development depends on devolving management and benefits to the local level. Accordingly, it made two critical, and pioneering, decisions. First, the Council resolved that wildlife monies would be returned to the village in whose area the animals were shot. It knew that wildlife was disappearing rapidly and that, if communities did not soon link wildlife with benefits, it would be gone.

Second, the Council believed that the entire village, not just the leadership, should be involved in deciding how to use this money. It stressed that communities had the right to use "their" money in any way they wished, just as they did with their revenues from cattle or crops. This included the option of keeping it as household cash.

Officials, and even NGOs promoting devolution and community management, were uncomfortable with these unprecedented decisions, and many opposed them.

The \$60,000 was taken to the community as cash. Over a period of four days its use was discussed by the whole community sitting under their baobab tree. (A rule of thumb is that community management will be successful only where the whole community is involved and can sit under the same tree to discuss it. This limits size to about 200 households and to an area that allows people to walk to the meeting place.)

The first step was to list the animals shot and their values, thereby linking wildlife to the benefits from it.

The second step was to establish village membership: who in the village should be classified as shareholders? This took several hours over two days since it involved considerable debate including the definition of membership and the discussion of specific cases.

The third step was the critical decision on how the money should be divided. The community decided that it would be divided equally among all households and paid out to them as cash. Each of the 149 households was due \$400, a huge amount in their cash-starved economy.

The fourth step was to appraise various projects and to agree (by majority) on whether or not to return some of the \$400 to one or more projects.

The fifth step was a revenue distribution ceremony at which households received their monies and returned proportions as agreed. At this ceremony the links between wildlife and benefit, and the principles and history of CAMPFIRE, were reinforced through explanation and drama, and by \$60,000 in \$20 bills piled high on the table.

This process had several crucial advantages:

### 1. "Beggars" become "proprietors"

As "beggars" become "proprietors" they make better resource trade-offs and gain self-esteem. When first told that they would receive about \$60,000 in wildlife revenue, the community went into donor-mode and soon trotted out its wish list of projects, most of which were not viable. However, when presented with the stark choice of using its own money for project implementation, decisions were much more rational. On a near unanimous vote (all except the young men who wanted the entire \$400 as cash), each household agreed to invest \$ 170 in a grinding mill and \$30 in their school, retaining \$200 as cash. They rejected the weak projects on the wish list, and selected only projects with good benefit/cost ratios. The grinding mill would save considerable travel and work (especially for women) and would attract business into the village. Education was seen as essential for the future of the village. Cash was scarce and important for soap, school fees, and so on.

### 2. Accountable institutions are developed

Committees were elected to oversee the use of this money. At the distribution ceremony, each household was called up to receive its \$400 in banknotes. It then paid \$170 to the grinding mill committee, and \$30 to the headmaster.

In effect, the pile of banknotes on the table (\$60,000), and the cash in their hands (\$400), represented income. The \$170 and \$30, placed in containers in front of the grinding mill and school committees respectively, represented expenditure. Thus the "accounts" were presented in a highly visual manner easily understood by an illiterate community.

The strength of the programme lies in this transparency and accountability. "Putting the money on the table" generated excitement, accountability, understanding and a sense of ownership - of the wildlife and of projects arising from it. The entire village knew exactly where all the money was, from where it derived, and what it was intended for. Responsibilities were clearly defined and projects were implemented quickly. This contrasted with the system it replaced, where the process was less transparent, and where implementation was slow and mismanagement or misappropriation possible. Under the former system, all decisions were made by a few leaders in the council, and consequently community members remained unaware of wildlife, its benefits and what they were used for. Hence they neither valued wildlife nor learned how to manage it.

### 3. The community unifies

Within three months, Chikwarakwara had built its grinding mill. This activity served to unify the village,

with men and women, Shangaans and Vendas, working together to construct the building.

#### 4. Wildlife is linked to benefits

The process linked wildlife and benefits in the minds of the community. At the ceremony to open the grinding mill, schoolchildren acted out the history of CAMPFIRE in Chikwarakwara, wearing animal costumes to which banknotes were stapled. Discussions with villagers more than a year later showed that they clearly understood the programme and its goals. This understanding is seldom evident in programmes with a centralist approach.

#### 5. Attitudes improve and become more positive

Attitudes shifted dramatically, reversing the hatred of wildlife. Snaring, which had been rife, was controlled informally. Community controls appear to be more effective, cheaper and more acceptable than centralized law enforcement. Centralized systems have the disadvantage that the wildlife is perceived as belonging to council which is resented for arresting members of its own constituency. Villagers see little difference in being controlled by council or central government.

#### 6. Managerial capacity is developed

Although the people of Chikwarakwara are largely illiterate, their grinding mill runs more smoothly and more profitably than most of those operated by councils. Revenue distribution, by generating a sense of proprietorship, is itself financially profitable. The Chikwarakwara grinding mill makes \$10,000 annually whereas council run grinding mills usually lose money. Thus a given investment is far more valuable spent through a community-managed process than by council. And intangible values like accountability and proprietorship can be "priced", albeit partially, at about \$10,000 per year. These intangible benefits, however, go far beyond the grinding mill, and probably significantly exceed the financial benefits from the wildlife programme. Chikwarakwara is gaining confidence in its own ability, is a more united community, and is developing management capability. With these newfound strengths, it is beginning to tackle the resource problems described at the beginning of this section.

#### 7. Land uses and development are being planned

Having developed (a) self-esteem, (b) a new awareness that resources are scarce and therefore need to be allocated carefully, and (c) trust in facilitating agencies, the

community (with some facilitation) sat under its baobab tree to plan its development.

The community's plan recognizes that the key to reorganizing land use and increasing output is the irrigation scheme. It can provide employment, food and cash. It permits the village to phase out dryland cultivation and the deforestation it causes, and to consolidate settlement. Consolidation makes it easier to provide services (health, education) and promote economic activities (trade). Irrigation and consolidation also help to retain remote and wild land, valuable for wildlife and tourism. In the plan, consideration has been given to developing a water supply with the dual purpose of providing water to the clinic and community, and keeping cattle away from prime wildlife areas. Land has been zoned for wildlife and cattle; and it is proposed to demarcate the village's boundary and exclude outsider's cattle. Implementation of the plan has already begun.

Some of the scattered households have been moved to the main village, and new settlement outside the centre has been stopped. An implementation strategy to rebuild the irrigation scheme has been developed. The village has approached a donor for enough money to buy the first pump and engine. This money will be lent to a group of 20 farmers, who will develop their portion of the irrigation system. They will repay the village with the profits from their irrigation. This money will then be recycled for a second pump unit, and so on until the scheme is fully operational with four pumps. If this works, the village will consider buying out the existing government infrastructure.

The village has recognized the problem of overgrazing and its causes (an open access regime). It has decided to limit cattle numbers to 800, and to exclude outsider's cattle by fencing or marking its boundary. They are also demarcating the prime Limpopo riverine floodplain for wildlife. A game guard has been employed to accompany the outfitter who has leased hunting in the area. Maps of the area have been sketched marking where animals were seen, counting them, and setting sustainable offtake rates. Although it lacks technical expertise, the village has begun to actively manage its wildlife.

The wildlife programme is giving rise to a public works programme and a much needed rural tax base. This may lead to development of a decentralized community management system. To maintain the proposed central piped water supply, each household may be taxed the annual running cost (\$25).

Thus wildlife, by giving this community its financial independence for the first time, has catalyzed a critical attitude change, land use planning, enterprise development, active resource management, and a village-based development "company". Beitbridge and Chikwarakwara have a poorer wildlife resource than most CAMPFIRE districts, suggesting that strength of

purpose and adherence to the CAMPFIRE principles are more important than resource endowment.

### CAMPFIRE and IUCN's draft Guidelines

To be successful, a programme must be holistic, combining economic, social and ecological aspects. The choice of entry point is critical but will depend on the situation. Zimbabwe's entry point has been economic. Results have been rapid and the requirement for external support relatively low. However, the process is heavily dependent on appropriate legislation and on ensuring compliance with sound economic and democratic principles. By contrast, the successful Namibian programme was started through social empowerment and is slower, but the absence of devolutionary legislation left few other options. Both models are gaining by incorporating each other's strengths.

Outside Zimbabwe and Namibia, most programmes have been initiated by concerned environmentalists, rather than by economists and sociologists with their people-dominated objectives. Entry through the ecological sphere is seldom successful, because it lacks incentives. Although the Zimbabwean and Namibian programmes have approached conservation obliquely, they are probably the most successful conservation programmes in Africa's rural areas. Conservation has been a byproduct of economic and social empowerment.

This has implications for the tone and focus of IUCN's Guidelines. Although the Guidelines should set rules for biological use, this is probably a secondary need. The real threat to higher trophic levels like wildlife is not overuse but replacement by more profitable enterprises. For the Guidelines to promote sustainable use successfully, they must insist on the re-enfranchisement of local people, proprietorship and pride in wildlife resources, making wildlife as profitable as possible, and on new locally-based systems of resource management. They must aim to maximize the revenue from wildlife to the "unit of production", be it a private landholder or rural community.

CAMPFIRE is a successful community-based wildlife management programme. This section uses the Guidelines to assess CAMPFIRE, with the objective of determining how useful they are. It is imperative that the Guidelines strengthen programmes such as CAMPFIRE. The danger is that they will be conservative and restrictive, and that they will impede the evolution of new solutions. This must not be allowed to happen.

### CAMPFIRE and the Criteria

Table 7 summarizes an assessment of CAMPFIRE against the Criteria for Sustainable Use (paragraph 19 of the draft Guidelines). CAMPFIRE fulfills the Criteria, but what is interesting is that it does so indirectly through socioeconomic processes. This implies that the draft

**Table 7. An assessment of CAMPFIRE against the "Criteria for Sustainable Use".**

<b>Criteria</b>	<b>Assessment of CAMPFIRE</b>
Use does not reduce the future use potential of the target population or impair its long term viability.	There is some risk of overusing adult males through trophy hunting. This action was taken deliberately to maximize short term benefits and jump start the programme. It recognized that trophy hunting has little effect on the population, but that some populations would soon disappear unless there was an economic incentive to conserve them.
Use is compatible with maintenance of the long term viability of supporting and dependent ecosystems.	Wildlife management has little impact compared to agriculture, livestock, and human population growth and migration. In the longer term, however, the programme imparts an improved philosophy and capacity to manage all indigenous resources. This is not a function of sustainable wildlife management itself, but of the management systems developed around wildlife which then spread to other resources.
Use does not reduce the future use potential or impair the long term viability of other species.	Making wildlife valuable has had a positive impact on all wild species. For example, some communities have used social controls to protect wild animals, or have developed land use plans to rationalize agriculture and settlement patterns with the objective of improving wildlife habitats. More importantly, wildlife has allowed greater economic gain while extracting less energy from the environment. Genuine conservation requires greater financial gain with less impact on the primary resource base (soil, vegetation). It is this that should be encouraged, not necessarily wild species. The scope of the Guidelines, as laid out in paragraph 11, needs reassessment.

**Table 8. An assessment of CAMPFIRE against the information requirements.**

Information requirement	Assessment of CAMPFIRE
Target populations: size, structure, dynamics, recruitment, mortality rates, age structure, size distribution, sex ratio, density, growth rates, age to maturity, dispersal, ranging behaviour, social behaviour, genetic composition	How much of this detailed information is necessary? Even with a only very rough indication of population size and simple monitoring, CAMPFIRE can be safely implemented. Zimbabwe uses rule of thumb offtake rates based on practical experience and a broad understanding of population dynamics and behaviour. Although populations have been hunted for several decades and still appear to be healthy, it would be difficult to provide a full scientific explanation for the offtake rates we use (except for elephant, for which sophisticated population models have been developed). Monitoring of trophy quality suggests that the rules of thumb work. Also, a feedback loop is built into trophy hunting because if trophy quality declines too much clients will hunt elsewhere.
Information on habitats or other ecosystem components necessary for the survival of the target population	The only information we have is that wild animals are present, implying that some habitat must remain. Ecological information is largely unnecessary because the impact of wildlife on habitats is minuscule compared to human activities. The impact of socioeconomic and cultural factors on the ecosystem is critical. These include settlement patterns, crop and livestock depredation, and attitudes towards wildlife. The financial and proprietary incentives provided by CAMPFIRE are increasing wildlife habitat. For example, Chikwarakwara, Mahenye and Masoka have organized settlement to increase wild lands, and Masoka and Binga have reduced bushfires. Care will have to be taken to prevent overpopulations of species that have a high impact on the environment (e.g., elephant). Thus information requirements change.
Abiotic factors that might influence the status of the target population or its supporting ecosystems	Drought is a major factor in savannas (in the last 12 years some 80% of wildlife populations have been decimated twice in some areas of Zimbabwe), but cannot be predicted with certainty. Drought makes a mockery of the concept of a steady sustained yield. In environments controlled by episodic events, management should be opportunistic.
Information about types of use, levels of use, manner of use, or alternative uses that may be more sustainable	<p>Clarity is needed on what is being used. Lower trophic levels are more important: primary production &gt; secondary production &gt; tertiary production; grass &gt; antelope &gt; lion. In Zimbabwe, the primary resource is grass, which may be used by livestock or wildlife. To focus only on wildlife, or to promote use primarily as an excuse for wildlife conservation, focuses on the wrong trophic level and neglects the major ecological problem: overgrazing and soil erosion. Given the importance of vegetation and soil, the aim of CAMPFIRE is not to conserve wild animals but to provide alternative enterprises that make more money while using primary production less intensively.</p> <p>The impact of the use on the environment needs to be compared to the impact of alternative uses, using social, economic, financial and ecological criteria. In Zimbabwe, these questions were studied in depth, with the conclusion that the commercial attributes of wildlife give it significant environmental advantages over livestock: wildlife uses grass less intensively but can generate greater profits, adding more value by combining nonconsumptive (tourism), marginally consumptive (safari hunting) and consumptive (meat) uses.</p>
Social, cultural and economic factors that affect use	Markets, commerce, exchange rates, tax systems, etc., are critical variables, and more weight should be given to them. In CAMPFIRE it will take years for wildlife populations to increase but improved marketing has increased the value of these animals five-fold in four years.

**Table 8. An assessment of CAMPFIRE against the information requirements (continued).**

Information requirement	Assessment of CAMPFIRE
Markets or technology	Major factors in the success of CAMPFIRE have been an understanding of the role of markets (exchange) in allocating resources properly and an ability to use markets to drive up the price of wildlife. Knowledge about markets is expensive to obtain. Our understanding of trophy hunting is better than that of markets for ecotourism. This has limited the growth of nonconsumptive tourism. We are also naive in dealing with international lobby groups that affect CAMPFIRE's markets.
Elasticity of supply and demand	
The degree to which markets can be manipulated	20 years ago wildlife was worth very little. Prices for elephants were set by the state all over Africa, and were about US\$500. From about 1975, Zimbabwe slowly increased its prices for wildlife, drawing other countries along with it. The objective was to make wildlife a competitive rural commodity. With the demise of many suppliers of wildlife, especially of elephant, Zimbabwe has gained a more monopolistic position and has been able to increase prices rapidly. In the 1980s, prices increased by about 50% annually. Elephants now fetch US\$30-35,000.
Economic and property relations	CAMPFIRE is fundamentally a programme to develop economic systems that guide the allocation (use) of natural resources by "pricing" them properly. Much of the strength of the programme has been the analysis of economic systems, their effects on natural resources, and how to improve them. Success depends on: <ol style="list-style-type: none"> <li>1. Getting pricing mechanisms right. Only by developing rights of access and exclusion does one person have to pay another for a resource.</li> <li>2. Improving prices for wildlife. To achieve this, markets have to be developed.</li> </ol>
Power and authority relations	Local, national and international power and authority relationships are critical for natural resource management. CAMPFIRE's emphasis on devolution and accountability arises from a growing understanding of such relationships.
Values and perceptions	An understanding of these is important for designing management systems. Changes in attitudes are essential for communities to manage sustainably. In CAMPFIRE, encouraging positive values and perceptions towards sustainable wildlife management has been key.

Guidelines are a useful measure of output - the impact of socioeconomic processes on biological conservation - but of little value in designing inputs.

Assessing the case of Chikwarakwara raised many questions about application of the Criteria. In Beitbridge District, wildlife had all but disappeared by 1989. A quota was set for species such as elephant and antelope. There were almost no population data, and a significant risk that offtake rates for trophy males were unsustainable. For example, there may have been 20 to 50 elephants in the district, so the quota of three adult males was undoubtedly higher than the sustainable offtake rate of 0.75%. Would the Criteria judge this programme to be sustainable? Is the elephant quota of 3 bulls (6%) out of an itinerant population of 50 elephants acceptable if the sustainable harvest rate for bulls is 0.75% and for the population 5%?

Because of the lack of population data, and the high risk that trophy hunting was unsustainable, a literal use of the Criteria would probably have resulted in trophy hunting being stopped or reduced. This could have caused the programme to fail and wildlife to disappear. However, in developing the programme the broader implications were considered, much weight was given to socioeconomic factors, and the risk to the elephants was accepted. This decision paid off.

The programme has been running for four years. It has greatly improved the information on wildlife populations, largely because they have been hunted. Moreover, income from hunting changed the communities' attitudes towards wildlife: in 1989 they wanted all wildlife eliminated; now they are actually moving settlements to create more space for animals. In Chikwarakwara, people hated wildlife and

village snaring used to be rife. In only four years, people's attitudes have reversed: they understand, manage and value wildlife. Social controls have reduced poaching very significantly. The outfitter once used to fill his vehicle with wire, but now has found only one snare in an entire season's hunting. When I first camped on the Limpopo near the village, I seldom saw signs of wildlife. Four years later I saw, heard or tracked elephant, buffalo, lion, leopard, nyala, kudu and impala in a single day.

There are no social or wildlife surveys to support our conclusions that attitudes to wildlife have improved and wildlife populations are increasing. But different lines of informal evidence have been triangulated to suggest strongly that we are correct. The Guidelines have high demands for data but are ambiguous as to what sort of data are acceptable. For Chikwarakwara, do we need more data? Are not the informal data sufficient and more cost-effective?

Although the programme is a major breakthrough in resource management, and fulfills the broad long term goals of the Criteria, it could pass or fail the Guidelines depending on the bias (biological versus socioeconomic; short term versus long term) of the judge's interpretation of the Guidelines. Would the Guidelines have allowed the programme to proceed? With their bias towards biological factors, and their requirements for data, probably not. Even if they did, the Guidelines do little to enhance such programmes. If they are judged sustainable, what benefits are there to the producers: will someone pay more for hunting elephant with the sustainable label, and will this offset the costs of obtaining this label? Is the whole effort worthwhile?

A mechanism needs to be built in so that the Guidelines provide some advantage to sustainable programmes and are not merely burdensome. If they focused more strongly on socioeconomic aspects, they might well encourage sustainable programmes. There is often a trade-off between socioeconomic and biological factors, but little hint in the draft Guidelines about how to judge these trade-offs. There is also no mention of risk. Further, when are the Guidelines applied? Before a programme is allowed to begin? Or continuously, recognizing that conservation initiatives are long term processes. Most importantly, who judges whether or not this programme is sustainable - who is God?

### **CAMPFIRE and the Requirements**

The large number of Requirements for fulfilling the Criteria are collected under the headings: information, management system, legal framework, social or economic incentives, and precautionary principle and safeguards. Judging a programme against this multitude of requirements is nigh impossible. Nonetheless, they are

listed and discussed in the light of CAMPFIRE to provide some indication of their relative importance to a real programme. Again, these comments emphasize that knowledge and development of socioeconomic systems is central, and the accent on biological factors in the Guidelines should be questioned.

### **Information**

The draft Guidelines provide lists of factors about which information is required. What guidance do these lists provide as to whether a programme is sustainable or not? Table 8 lists the information requirements noted in the draft Guidelines, and discusses them in the light of the CAMPFIRE. In many cases it is not so much information, but knowledge of how the system works, that has been critical in the success of CAMPFIRE. Getting the principles right, rather than measuring their outcome, has been a major ingredient of success. Perhaps the Guidelines should do the same.

Table 8 shows that the majority of inputs into CAMPFIRE fall into the category of social, cultural and economic factors that affect use. Although ecological factors are certainly taken into account, and are a major targeted output, there is little direct focus on ecology. It is not a tool that can be used for successful natural resource management, but a product of the successful development of management systems. The real tools are property rights, markets, social and economic devolution and empowerment, information, and so on. Markets have to be developed against a background of opposition to the commercialization of wildlife, the view that wildlife is a non-commodity, and in competition with traditional agricultural produce with many years of investment in markets.

This has significant implications for the use of the Guidelines. It suggests that, with their heavy emphasis on ecology (the output), they are a measuring stick of what has gone before. It follows that their major application is in evaluating programmes that are already well underway. The minor emphasis on driving variables such as property rights, a use philosophy (for example, maximize returns to landholders), and political economics (who controls what) means that they cannot drive a process. They can only measure the outcome of one. If the Guidelines are intended to drive a process of sustainable development, they will have to be modified significantly to focus on socioeconomic tools rather than biological measuring.

### **Information used to monitor CAMPFIRE**

The draft Guidelines provide little guidance on what information is required to promote and monitor

sustainable use. CAMPFIRE, which depends on adaptive management and therefore on monitoring, indicates what information may be necessary and how it can be collected.

CAMPFIRE is monitored by the DNPWM to guide the development of principles and practices through adaptive management, and to reduce the risk of failure. Monitoring is centralized, but every attempt is made to decentralize it by incorporating the information into local management. Indeed, devolution reduces the need for centralized monitoring. For example, if money is paid out to households as cash as in Chikwarakwara, social checks and balances automatically come into play. The increased accountability significantly reduces the need for a central body to audit financial flows. It is hoped that CAMPFIRE areas will approach the status of private land where government no longer needs to monitor wildlife use. Ranchers have strong incentives to manage their wildlife properly. If they abuse it their community has the power through the Natural Resources Act to set quotas or insist on destocking. Government will step in only as a last resort, but this is rarely needed. In other words, the system is largely self-regulating and is therefore sustainable.

Table 9 lists the information collected to monitor CAMPFIRE. Councils are required to submit annual reports to the DNPWM describing wildlife offtake and financial flows. These formal reports are supplemented by regular contacts with councils, communities and hunters. Information requirements are designed to be

"lean and mean". Some of the most important information is not recorded but is informal and intuitive, for instance about attitudes and politics.

### Management system

The key to sustainable natural resource management is an appropriate management system that follows sound economic principles, taking into account property rights, accountability, democratic decision making, monitoring, and so on. The draft Guidelines give little guidance on the type of management system to be developed. It is therefore difficult to judge CAMPFIRE against them.

This section of the Guidelines, which is critical, is weak and ambiguous, primarily because it appears not to be based on a sound underlying philosophy. This must be rectified because in programmes like CAMPFIRE the philosophy has proved to be the backbone around which success is built. CAMPFIRE has been successful because it has defined clear objectives and a clear philosophy, and these have suggested a clear process of implementation.

The draft Guidelines state that effective management requires clear property rights (paragraph 39.a), fair sharing of costs and benefits (39.b), and information (39.c). CAMPFIRE fulfills these requirements well, and agrees strongly with them. However, the draft Guidelines do not recognize the critical difference between users of

**Table 9. Information needed to monitor CAMPFIRE. Note that sustainability refers to both biological and socioeconomic systems, and that monitoring is designed to accommodate this.**

Data	Source and use
Wildlife populations	Three sources are used: <ul style="list-style-type: none"> <li>• Aerial surveys and other formal methods.</li> <li>• Community estimates. At workshops communities draw maps on which they mark wildlife. This provides fair estimates. More importantly, it gets large numbers of people directly involved in management and quota-setting.</li> <li>• Safari operators - good sources, often getting to know individual herds, small populations, etc., by spending much time in the field.</li> </ul>
Offtake and offtake quality	Records of all animals killed formally are submitted (poaching offtake is difficult to monitor). The size of trophies is recorded, and over a few years trends can be detected. A decrease in horn length implies that younger animals are being killed and that the quota should be reduced.
Earnings	This information is used to assist communities in bargaining with safari operators and is invaluable in raising prices. The objective is to force operators to pay communities as much as possible because, as landholders, the communities make the real decisions on how to allocate resources, and whether to have wildlife or cattle or crops.
How the money is used	This is the most important information, essential to ensure that benefits get back to communities.

wildlife on the one hand and producers or owners of wildlife on the other. CAMPFIRE does not have this ambiguity: in CAMPFIRE, communities produce wildlife; the users are the safari operators. CAMPFIRE emphasizes that the landholder, not the user, controls use. It is imperative that the unit that benefits from and allocates resources to wildlife is the same unit that allocates resources to cattle or crops. Costs and benefits must be internalized to the same unit to ensure that proper resource trade-offs are made. If decisions about wildlife are made by its users and decisions about cattle by a different set of users, there is no mechanism to resolve conflict. The environment will suffer accordingly. The Guidelines would be strengthened by recognizing that wildlife will survive only if the benefits are returned to production units (not necessarily the users), and by insisting on this. This should be the key criterion for judging whether use will be sustainable or not, and should be incorporated prominently into the Guidelines.

Paragraph 39.b is also unclear, and may be naive in supposing that the benefits from a wild species can both cover the costs of management and provide an incentive. CAMPFIRE is clear on this issue. It maximizes the return to the landholder, not the user. It also recognizes that wild species may not be competitive, and accepts that if they are not they will be replaced. If they have sufficient national or global values that they should be conserved, but the values are not commercial, then the nation or international community must accept the costs of developing a protected area for them. CAMPFIRE, whose stated long term objective is to improve the livelihoods of rural people, stands for the most profitable and sustainable use of the environment, not for conserving wildlife *per se*.

Paragraph 39.c recognizes the importance of information, but with different underpinnings to CAMPFIRE. The draft Guidelines imply hard data on populations and habitats. CAMPFIRE also emphasizes information, but with the aim of oiling accountability and guiding resource allocation. It therefore gives primacy to information on who makes what decisions and on costs and benefits. With respect to data on wildlife populations, CAMPFIRE currently focuses on the process of getting the data, rather than the data themselves. Data are much less of a constraint to sustainability than involvement and attitudes. Communities are therefore involved in assessing wildlife populations, although other methods might give better estimates, at least in the short term. This process of involving people with their wildlife is improving their ability to produce their own data and to manage the system themselves.

CAMPFIRE would be unable to present a "resource management plan" (paragraphs 40-42) to someone assessing it according to the Criteria. It could present a

philosophy and implementation strategy, and would argue that it was developing economic signals (rather than a plan) to guide resource allocation. But as in a market economy, and unlike a centrally controlled economy, it could not produce a plan.

The draft Guidelines intimate that some management agency will develop the plan, in cooperation with users, local communities and other interest groups. This is exactly the situation that CAMPFIRE has attempted to prevent. Although planning is important, there are many dangers associated with a word that represents so many different processes ranging from top-down imposition to bottom-up consensus. Indeed, one of the catalysts for CAMPFIRE was to empower communities to make their own plans to prevent large-scale, generally insensitive and inappropriate, office-manufactured top-down plans being imposed on them. Now that attitudes towards wildlife are improving, CAMPFIRE communities are beginning to develop community-based resource management plans. These will evolve over time, and are likely to take the form of community consensus rather than a written document.

### **Legal framework**

Only some of the legal requirements are relevant (Table 10) and several are wrong. If taken literally, CAMPFIRE would fulfil almost none of the legal controls proposed in paragraph 45. These requirements would tend to entrench a centralized bureaucratic system, even though it does not work and must be replaced. Their tone is negative and restrictive. Not enough thought is given to positive incentives. Most of the legal sanctions appear to be based on the proposition that landholders do not want to husband wildlife, and must be coerced into doing so. Yet they could easily destroy wildlife legally by, for example, fencing off cattle water points. If incentives are provided to look after wildlife, the necessity for much of this legislation falls away.

By contrast, Zimbabwe's legislation was amended to remove most government control because this was a major impediment to success. CAMPFIRE has broken with traditional conservation practices in that it has passed responsibility to landholders and reduced the role of government enforcement. More than anything, the success of CAMPFIRE relative to similar programmes in surrounding countries is because CAMPFIRE is supported by legislation that devolves authority to community representatives. Elsewhere, government has retained authority, complicating implementation and creating ambiguity: who really owns the resources? Should a community sustain a resource when it is not sure it is the owner, or should it replace it with one it does own?

**Table 10. An assessment of CAMPFIRE against the legal requirements**

<b>Legal requirement</b>	<b>Assessment of CAMPFIRE</b>
Legislation controlling sustainable use	Zimbabwe's wildlife industry started out with strict controls over use. These proved unworkable. Now, virtually the only control exerted by government is that they reserve the right to control or prevent use if abuses occur. Would this meet the requirement?
Designation of protected areas within use zones	In Zimbabwe, land is either protected, in which case uses are severely limited (e.g., national parks), or not protected in which case all uses are possible (e.g., farms, communal areas). Increasing protection in use zones would severely prejudice wildlife. Communities already associate wildlife with the expropriation of their land and rights.
Establish wild species management norms in other regulations	
Enable local communities to manage or participate, and to benefit	CAMPFIRE would fulfil this. It is CAMPFIRE's primary goal.
EIA of development activities on wild species	CAMPFIRE would address such negative impacts through a political forum (CAMPFIRE Association) driven by beneficiaries who might be affected.
Legal seasons for harvesting	This is of little relevance in tropical countries. However, CAMPFIRE is encouraging the hunting of elephant in the non-traditional wet season so that each elephant shot doubles as a trophy and for crop protection.
Establish punishments for illegal use	This is essential, but expensive. Zimbabwe has these laws, but they are difficult to enforce, especially for minor crimes. Therefore, the strategy is to encourage as many community social controls as possible and to reserve the formal system for habitual poachers and major offenders such as rhino and elephant poachers.
Develop capacity of State and other agencies to enforce laws	CAMPFIRE has not yet done this. Great care would need to be taken to ensure that landholders are empowered and not divested of their rights. The danger is that landholders have small voices and that other lobby groups would get this power: but, not being landholders, they are not directly accountable for the resources and should not have authority over them.
Provide budgets to underwrite these legal measures.	Herein lies the fundamental weakness of all this legislation. It cannot be enforced without funds, but in developing countries funds are scarce. To be realistic, priorities should be set and legislation tailored to the funding. CAMPFIRE requires very little funding because checks and balances are built into the system through proprietorship and transparency.
Laws to extract user fees to fund agencies to support wild species' viability	CAMPFIRE would not encourage the legal extraction of funds from producers because disproportionate taxation of wildlife reduces its ability to compete. In Zimbabwe, private or communal landholders pay no license fees whatsoever. Cattle and crops are not taxed directly (producers are). Wildlife should be treated in the same way. Nonetheless, CAMPFIRE communities and private landholders pay mutually agreed levies to their associations for functions such as lobbying, public relations, coordination, information, and marketing.
Ensure by law that user contracts adhere to Criteria	No such laws govern CAMPFIRE activities. The authority has been devolved to landholders. Their responsibility has proven adequate and should not be undermined.

This legislation is so critical to developing custodianship among landholders that it should be a specific requirement. Insisting on devolution, however, will be difficult politically, especially as it is likely to undercut elites. These elites are often the resource users, expropriating the resources from legitimate owners. They often "mine" resources because their long term links with them are tenuous, and because they are mobile. Having raped one resource, they can easily move on to the next. Landholders cannot do this. Therefore, they are predisposed to manage sustainably, given the knowledge to do so and the rights to, and responsibility for, their resources.

### **Social and economic incentives**

The provision of social and economic incentives is the cornerstone of sustainable use. CAMPFIRE fulfills the requirements in paragraph 47, but defines them more clearly:

- Rights of access and exclusion are clearly defined, set at an appropriate scale (the village or ranch), and supported by appropriate democratic and accountable management structures.
- Landholders get the benefits, so there is a clear relationship between benefits and conservation.

The benefits of having the species exceed both its direct costs and opportunity costs.

The points in paragraph 48 are assessed in relation to CAMPFIRE but are too vague for the assessment to be satisfactory (Table 11).

The sentiments in paragraph 49 are often expressed in relation to CAMPFIRE: "if we make elephants too valuable surely they will be overharvested?" This is true if access to elephants is open, but the key to Zimbabwe's programmes is a combination of ownership and higher prices. This distinction should be strongly made in the Guidelines. Use is likely to be sustainable only if these twin conditions occur.

If products from sustainable use cannot compete with those from unsustainable use, we have a real problem. The present solution has been to discourage the use of any wildlife products, and has had negative consequences for CAMPFIRE. The ivory ban, for example, has reduced income from \$20 million to \$12 million; and market resistance is reducing the prices of other wildlife products. This is self-defeating in the long term because wildlife will be unable to compete for space. The real solution is to provide consumers with information, encouraging them to buy sustainably produced wildlife products.

### **The precautionary principle**

If CAMPFIRE had adhered to the precautionary principle, some programmes would never have started. As in the example of Chikwarakwara, it can be wise to risk overuse against the certainty that wildlife would disappear unless people benefitted from it directly and soon.

### **Conclusions**

The draft Guidelines are a reasonable start towards generic rules for complicated and variable situations. However, they contain too much ambiguity and not enough specific direction or priorities to be of practical use. Is it practical to have generic guidelines for all uses?

The draft Guidelines focus on wild and semi-wild species, without emphasizing that the real focus should be on primary production (soil, vegetation). Is this satisfactory, or should the relative importance of different trophic layers be debated?

The draft Guidelines confuse protected areas and non-protected areas where land use objectives are fundamentally different: preservation and profit respectively. In straddling both, it is unclear whether they recognize that the fundamental problem is for wildlife to compete economically for space. There is too much focus on biological measurement and protection against the fear that higher values will lead to unsustainable use, and not enough on guiding the establishment of working economic systems where the critical variables are ownership and price.

In capturing a broad consensus, the draft Guidelines have not developed the strong philosophical spine necessary for the development of truly sustainable use. As they stand, with considerable ambiguity and insufficient emphasis on socioeconomic reality, there is a real danger that they will be interpreted in such a way that they will prevent the evolution of sustainable management systems such as CAMPFIRE.

The draft Guidelines therefore need to be assessed against both succeeding and failing initiatives. Any vagueness must be removed, and the scope limited to spelling out key factors. Serious consideration should be given to changing the emphasis of the Guidelines so that they become prescriptive policy, and actively promote the global implementation of sustainable use systems. In their present state they are merely a measuring tool for what has gone before.

In this respect, the philosophy underlying Zimbabwe's successful wildlife industry has lessons to offer for the Guidelines. First, it has a clear purpose: to make wildlife so valuable that farmers conserve it. It recognizes that resources compete for space, and that in certain situations

**Table 11. Assessment of CAMPFIRE against the requirements for social and economic incentives**

**Requirements for social and economic incentives**

**Assessment of CAMPFIRE**

Encourage local traditions and rights	Given a century of alienation from their wildlife, and huge demographic changes in the meantime, most local traditions have disappeared. CAMPFIRE does not harp on the overplayed theme of the "noble savage". It gives communities the rights to do what they want to do. Some traditions have been conserved: for example, the formation of hunting clubs using traditional methods or the revival of traditional clothing for tourism. In the main, however, modern institutions are being developed to control use, and communities are developing the self-esteem to design their own solutions.
Support sound traditions	Who decides what is sound?
Provide technical assistance on demand (economic, institutional, biological)	Much of the efforts of the facilitating agencies are devoted to this. CAMPFIRE is demand driven. When the programme started, these agencies were implementors but have since purposely moved out of implementation (because this undermines the development of local capacity and esteem) to focus on the provision of services.
Education on the value of species	This is done through the schools curriculum. CAMPFIRE also produces materials. But CAMPFIRE could improve its understanding of how well various methods (theatre, written, audio-visual, workshops) work. In addition, facilitators should be trained in communication skills and techniques since their major role is to pass on information to the implementors - the communities themselves.
Help communities to develop sustainable programmes to demonstrate their values	The strategy is to get models working in some communities, then allow them to spread spontaneously to other areas. Spreading is encouraged through information and visits. The programme has spread rapidly in Zimbabwe, and similar schemes are developing throughout southern Africa.
Help local communities to develop managerial capacity	The long term objective of CAMPFIRE is for communities to be competent and independent managers. Managerial capacity is built during the latter stages of implementation: once people receive benefits, attitudes become positive, people become receptive to training, and managerial capacity develops
Provide market and pricing information	Discussed in the section on information.
Encourage producers' associations to assist marketing, production, etc.	In the short term, the CAMPFIRE Association has been valuable, especially politically, because the fact that a black grassroots organization supports wildlife reduces suspicion that it is an elite, often white, resource. In the longer term, producer associations will be expected to take over the management of the industry reducing the roles of government and environmental NGOs. This has already started for crocodiles and ostriches.
Drive up prices of wild products	This is vital and Zimbabwe has had some success. However, the international pressure to de-commercialize wildlife requires Zimbabwe to devote considerable resources (staff time) to fighting for markets. This is a major cost, diverting resources away from local communities where they are desperately needed.
Promote sustainable "labels"	This is an excellent idea, and provides one of the few carrots for producers who fulfil the Guidelines. If implemented, the international community could encourage consumers to buy sustainably produced wild resources: "The IUCN/WWF stamp of sustainability"?

wildlife is the most productive and sustainable form of land use. It recognizes that economic signals will decide the survival of wildlife outside protected areas, and therefore aims to ensure that these signals reflect the true value of wildlife. It then identifies how this can be achieved: promote the value of wildlife in a situation where landholders and communities are resource proprietors. It acknowledges that the people who live with wildlife ultimately decide its fate; and that they will manage it sustainably only when there is an

economic motive to do so. This depends on their having secure rights to manage the resource and reap the full rewards of their management, and to prevent others from doing so.

These are the pillars supporting CAMPFIRE. They are translated into policy and legislation, and into more specific guidelines. The process is supported by monitoring and information and driven by incentives; not controlled by dictate and enforcement. Would IUCN's Guidelines not be more effective if they took the same approach?

## **PART 2. ASSESSING THE SUSTAINABILITY OF USES OF WILD SPECIES**

# The good, the bad, and the neutral: assessing the sustainability of uses of wild species

Robert and Christine Prescott-Allen

## Introduction

In this paper we make six points about assessing the sustainability of human activities, including uses of wild species:

1. Assessment is meaningful only if done systemically - taking account of the system in which the use occurs.
2. The system in question is the ecosystem and its human subsystem. We need to consider both together, giving them equal weight.
3. Assessment is done against a specified standard or objective. The impacts of a use are positive or negative - acceptable or unacceptable - depending on what we want to achieve. We propose a goal of improving and maintaining the wellbeing of people and the ecosystem.
4. In assessing the use and the system, we need a clear sense of direction: are the conditions of people and the ecosystem getting better or worse? and what difference does the use make?
5. A systemic assessment of sustainability may conclude that the use is either good (= probably sustainable), or bad (= probably unsustainable), or neutral (= makes little or no difference); or that its impact is unknown.
6. Suggested responses to these conclusions are: if the use is good, encourage it; if it is bad, reform or stop it; if it is neutral, don't bother with it; and if its impacts are unknown, investigate it.

We explore these points by looking at the case studies in Part 1. The data are from the authors of the case studies. We alone are responsible for our interpretations of the cases and the conclusions we draw from them. We then discuss the implications for an assessment procedure and for guidelines for achieving sustainability.

## The need for a systemic approach

To understand why we should assess uses systemically - not in isolation but in their ecological and human context - imagine two societies. One is Almostperfectia. It destroys a rare ecological community to establish a mine. It uses the money to eradicate poverty and introduce social reforms that provide the means and motivation for people to conserve many other ecological communities.

The other society is Hopelessmessia. A rich minority oppresses a wretchedly poor majority and is looting the country of its resources. To obtain a World Bank loan (which it has no intention of repaying) it adopts an environmental action plan and a model sustainable use project. Tourists come in carefully regulated numbers to admire its last remaining wild habitat.

The unsustainability of Almostperfectia's project is justifiable, given its contribution to the overall sustainability of the society and its ecosystem. The sustainability of Hopelessmessia's project is trivial, because it makes no difference to that society's overall unsustainability. Yet assessments of these projects that ignored their contexts would condemn the former and bless the latter. It is less important to know whether a use, at a particular moment, is above or below the rate of increase of the population being used, than it is to know whether the use is contributing to society's overall progress toward sustainability.

## Defining the system

To say that the system we are talking about is the human system within the ecosystem is stating the obvious; but it is often overlooked. The most common model of sustainability is a triangle: with economic sustainability on one side, social sustainability on the second side, and environmental sustainability on the third. This model is dangerously misleading for three reasons:

First, it caricatures human values and behaviour as being either economic or social rather than something much more complex.

Second, it invites trade-offs among economic, social and environmental concerns. This is virtually impossible to do. It dilutes the importance of environmental concerns. It sets human and ecological needs against each other rather than accommodating both: overall sustainability cannot be achieved by compensating for reduced environmental goods with increased economic or social goods (or vice versa).

Third and most important, it is false, placing the human system outside the ecosystem rather than within it.

A better model is the egg of sustainability (Figure 1). The yolk is the human system, and the surrounding white is the ecosystem. If either the white or the yolk is bad, the egg is bad. For the egg to be good, both have to be good. A society is sustainable only if *both* the human condition and the condition of the ecosystem are satisfactory or improving. If *either* is unsatisfactory or worsening, the society is unsustainable.

The model of sustainability as an egg reflects the fact that people are an integral part of the ecosystem and the wellbeing of one is bound up in the wellbeing of the other. Hence the condition of each is equally important.

## A goal

The impacts of a use are acceptable or unacceptable, depending on what we want to achieve. Therefore, as

Child (this volume) points out, we have to assess against a specified goal.

In light of our model of the system, a logical goal for any society is to improve and maintain the wellbeing of people *and* the ecosystem:

**Ecosystem wellbeing** is a condition in which ecosystems maintain their quality and diversity and thus their potential to adapt to change and provide a wide range of choices and opportunities for the future.

**Human wellbeing** is a condition in which all members of society are able to define and meet their needs and have a large range of choices and opportunities to fulfil their potential.

A sustainable society would be able to achieve both conditions - as well as the capacity to anticipate change and recover from setbacks - and maintain them over many generations.

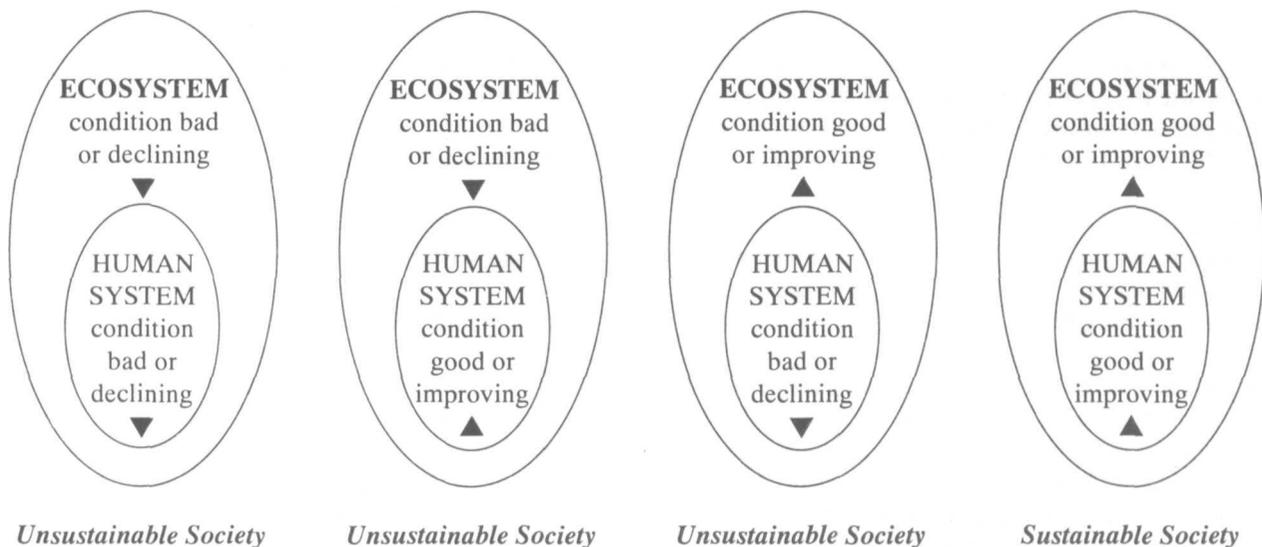
## A sense of direction

In assessing the system and the use, we need a clear sense of direction:

Are human wellbeing and ecosystem wellbeing - the condition of people and the ecosystem - getting better or worse?

What difference does the use make to any improvement or decline?

Figure 1. The egg of sustainability (Prescott-Allen 1995)



Assessing sustainability is difficult. But it is not as hard as the mushrooming literature and multiplying gurus on the subject would suggest. Much of the confusion has been caused by efforts to identify indicators without first defining the model of the system and the goal (Hodge 1993).

Assessing in light of a sound model of the system and a goal that is consistent with that model clarifies what information is most important for assessment, and frees one from assembling unnecessary information. Given such a model and goal, all societies are capable of assembling the information required. A method of assessing progress toward sustainable societies is described in Prescott-Allen (1995).

A sense of how well the ecosystem is doing may be obtained by looking at four sets of issues:

**Ecosystem naturalness or conversion.** How much of the ecosystem is natural, modified, cultivated, or built (see Appendix 1, page 101, for definitions). This provides a bird's-eye view of the scale and rate of human impact on the ecosystem.

**Ecosystem quality or degradation.** The extent and severity of degradation of land, water, and air. Degradation includes pollution.

**Biodiversity maintenance or loss.** Whether the diversity of ecological communities, wild species and populations, and domesticated varieties and breeds is being maintained or is declining.

**Resource conservation or depletion.** Whether wood, forage, wildlife, soil, water and other resources supplied by the ecosystem are being maintained or depleted.

A sense of how well people are doing may be obtained by looking at four sets of issues:

**Health and population.** Fertility, mortality, longevity, good health, food and nutrition, and healthful living conditions. A long and healthy life increases the opportunity for a person to pursue goals and develop abilities.

**Wealth and livelihood.** Income, employment, housing, infrastructure, technology. Money and other resources enable people to survive, expand opportunities and provide means to exploit them.

**Knowledge.** The knowledge system includes education, research, and communication. It equips individuals, organizations and society to fulfil their potential, improve understanding of the ecosystem and human system,

learn from experience, and develop the information and skills required to live sustainably.

**Behaviour and institutions.** Social behaviour and institutions in their widest sense: the values, customs, laws, incentives and organizations that enable societies to manage people's relationships with each other and with the ecosystem. The focus here is on the distribution of decision making, the extent to which people have control over their lives, and the balance of laws and incentives.

## Good, bad, neutral, unknown: assessing the impacts of uses

It is impossible to determine unequivocally that a use is sustainable, since information is never complete and often fraught with uncertainty, and ecological and human conditions change. But it is possible to assess the main impacts of a use on people and the ecosystem and judge the probability of its being sustainable or unsustainable.

An assessment should begin with a sense of the ecosystem and human system involved in the use. Are conditions improving or declining, in what ways, and why? The impacts of the use on the ecosystem and on people should be assessed separately in light of conditions and trends. The impacts will be either positive; neutral/negligible; negative; or unknown. The separate assessments of impacts on people and the ecosystem may then be combined as follows:

positive + positive or neutral = good (= probably sustainable)

negative + positive, neutral, or negative = bad (= probably unsustainable)

neutral/negligible + neutral/negligible = neutral (= makes little or no difference)

unknown + positive, neutral, or unknown = unknown (= inadequate information)

Table 1 sets out these conclusions in the form of a matrix. We use the case studies in Part 1 to illustrate the application of this framework.

### Impact on the ecosystem

Of the 11 uses considered here, we conclude that two have a positive impact on the ecosystem, four have a neutral or negligible impact, three have a negative impact,

**Table 1. Assessing the combined impacts of an activity on the ecosystem and the human system: possible conclusions (conclusions shown in *italics*).**

Impact on the human system	Impact on the ecosystem			
	Positive	Neutral/ Negligible	Negative	Unknown
Positive	<i>GOOD probably sustainable</i>	<i>GOOD probably sustainable</i>	<i>BAD probably unsustainable</i>	<i>UNKNOWN inadequate information</i>
Neutral/ Negligible	<i>GOOD probably sustainable</i>	<i>NEUTRAL makes little or no difference</i>	<i>BAD probably unsustainable</i>	<i>UNKNOWN inadequate information</i>
Negative	<i>BAD probably unsustainable</i>	<i>BAD probably unsustainable</i>	<i>BAD probably unsustainable</i>	<i>BAD probably unsustainable</i>
Unknown	<i>UNKNOWN inadequate information</i>	<i>UNKNOWN inadequate information</i>	<i>BAD probably unsustainable</i>	<i>UNKNOWN inadequate information</i>

and the impact of two is unknown. Table 2 shows how we arrive at these conclusions. The column on use identifies the case study concerned and defines the geographical area to which our assessment applies. The column on condition and trend of the ecosystem describes the state of the ecosystem in terms of:

Naturalness = ecosystem naturalness or conversion (whether the ecosystem is natural, modified, cultivated, or built)

Quality = ecosystem quality or degradation (whether degradation or pollution is a problem)

Diversity = diversity of ecological communities and wild species (whether this is being maintained or is declining)

Resources = resource conservation or depletion (whether the resources supplied by the ecosystem are being maintained or depleted)

The column on impacts of use on the ecosystem describes the use's impacts in terms of these same factors. The column on summation of impacts classifies the combination of impacts *in the context of the state of the ecosystem* as positive, neutral (or negligible), negative, or unknown.

The two cases with a positive impact on the ecosystem are CAMPFIRE in Zimbabwe and kangaroo hunting

in Australia. In both cases, agriculture and livestock grazing are reducing the extent of natural and viable modified ecosystems and increasing degradation. In Zimbabwe, these pressures are also destroying wildlife habitat. In both cases, wild mammals are also under attack because, officially or unofficially, they are classified as pests. CAMPFIRE's beneficial impact is being demonstrated. Communities that can benefit economically from uses of wild mammals, and can participate in their management, have incentives to restore and maintain both the mammal populations and the ecosystems. Both are showing signs of recovery.

In Australia, the opening of kangaroos to commercial hunting for meat is too recent to see the benefits. But the logic appears to be sound. Kangaroos are good for the ecosystem, but the landowners make no money from them. On the contrary, they regard kangaroos as pests, taking money away from them by competing with sheep for pasture. Official protection of the kangaroos has not prevented landowners from killing them: it has simply driven the killing underground, increasing the animals' risk of pain and suffering. Sheep are bad for the ecosystem, but landowners prefer them because they can make money out of them. If landowners can make enough money from kangaroos to allow them to replace or coexist with sheep, the condition of the ecosystem will improve.

The four cases with a neutral or negligible impact are vizcacha hunting in Argentina, furbearer trapping in the Yukon (Canada), snake capture and venom extraction in Tamil Nadu (India), and caiman hunting in Venezuela. Vizcacha populations are so robust that they have survived intensive eradication campaigns, except in cultivated

**Table 2. Assessment of the impacts of uses on the ecosystem.**

<b>Use</b>	<b>Condition and trend of ecosystem</b>	<b>Impacts of use on ecosystem</b>	<b>Summation of impacts</b>
Parrot capture: northern Argentina (especially the Chaco)	<p>Naturalness: Old-growth quebracho forests being lost to logging &amp; overgrazing</p> <p>Quality: Presumably degraded by overgrazing</p> <p>Diversity: Presumably declining due to above</p> <p>Resources: Presumably being depleted due to above</p>	<p>Naturalness: Felling of trees modifies old-growth forests</p> <p>Quality: Nesting sites destroyed</p> <p>Diversity: Presumably reduced by above impacts</p> <p>Resource: Harvest rate above rate of increase; populations seem to be declining; habitat is being destroyed and fragmented</p>	NEGATIVE
Vizcacha hunting: pampas, Argentina	<p>Naturalness: Some cultivated; most modified; little natural pampas left</p> <p>Quality: Much of the pampas is degraded by overgrazing; vizcachas cause some additional degradation</p> <p>Diversity: Declining</p> <p>Resources: Not mentioned</p>	<p>Naturalness: Negligible impact</p> <p>Quality: Negligible or positive impact if harvests high enough to reduce degradation by vizcachas</p> <p>Diversity: Negligible impact</p> <p>Resource: Hunted populations large, widespread &amp; resilient</p>	NEUTRAL
Tegu lizard hunting: northern Argentina	<p>Naturalness: Not mentioned</p> <p>Quality: Not mentioned</p> <p>Diversity: Not mentioned</p> <p>Resources: Not mentioned</p>	<p>Naturalness: Presumably negligible</p> <p>Quality: Presumably negligible</p> <p>Diversity: Presumably negligible</p> <p>Resource: Not known</p>	UNKNOWN
Kangaroo hunting: semi-arid chenopod shrubland, Australia	<p>Naturalness: Mostly modified</p> <p>Quality: Overgrazing by sheep has degraded much of the area</p> <p>Diversity: Presumably declining due to above</p> <p>Resources: Presumably being depleted due to above</p>	<p>Naturalness: Expected to lead to retention of modified/natural range instead of further modification or cultivation</p> <p>Quality: Expected to restore degraded land &amp; prevent further degradation</p> <p>Diversity: Expected to restore or maintain native diversity</p> <p>Resource: Harvest rate below rate of increase; quotas set to maintain populations</p>	POSITIVE

**Table 2. Assessment of the impacts of uses on the ecosystem (continued).**

<b>Use</b>	<b>Condition and trend of ecosystem</b>	<b>Impacts of use on ecosystem</b>	<b>Summation of impacts</b>
Furbearer trapping: Yukon, Canada	Naturalness: Most of the Yukon is natural; logging & mining have modified some areas; little is cultivated or built	Naturalness: Limited modification where aspen stands are artificially maintained to encourage high beaver densities; otherwise compatible with maintenance of natural ecosystem since impacts are within limits of natural variation	NEUTRAL
	Quality: Mining causes local degradation	Quality: Negligible impact; harvests of herbivores kept below levels at which they might influence vegetation; and harvests of carnivores below levels at which they might influence herbivores	
	Diversity: Presumably stable due to above	Diversity: Compatible with maintenance of diversity; very few non-target species killed	
	Resources: Furbearer populations have rebuilt to carrying capacity except in areas affected by agriculture or logging	Resource: Harvest rates below rates of increase	
Monkey viewing & tourism: Manuel Antonio forest, Costa Rica	Naturalness: An island of natural & modified forest & built area surrounded by cultivation	Naturalness: Tourism infrastructure converts forest to built area	NEGATIVE
	Quality: No mention of pressures unrelated to tourism	Quality: Infrastructure fragments & degrades forest	
	Diversity: Vulnerable due to the island effect	Diversity: Infrastructure reduces diversity	
	Resources: No mention of pressures unrelated to tourism	Resource: Viewing impact low, although some tourists taunt monkeys; tourism has revived capture for pets; infrastructure destroys habitat	
Snake capture & venom extraction: Chinglepet district, Tamil Nadu, India	Naturalness: Cultivated + modified; cultivated area increasing	Naturalness: Negligible impact	NEUTRAL
	Quality: Much of the modified area is degraded	Quality: Negligible impact	
	Diversity: Presumably reduced due to above	Diversity: Negligible impact; potential to enhance conservation of other snake species	
	Resources: Populations of 3 of the 4 snake species have probably increased due to higher prey numbers in cultivated areas	Resource: Snakes returned to ecosystem; species abundant; death rates very low	

**Table 2. Assessment of the impacts of uses on the ecosystem (continued).**

Use	Condition and trend of ecosystem	Impacts of use on ecosystem	Summation of impacts
Lokta cutting & paper making: moist subtropical & temperate zones, Nepal	Naturalness: Modified + cultivated with small & diminishing natural areas	Naturalness: Lokta & fuelwood harvests further modify forests	NEGATIVE
	Quality: Forests degraded by excessive exploitation	Quality: Overcutting of fuelwood contributes to degradation	
	Diversity: Presumably declining due to above	Diversity: Likely to reduce diversity	
	Resources: Forests diminishing due to increasing unregulated exploitation for fodder, fuel & timber	Resource: Lokta harvests in UNICEF areas may be within rate of increase but exceed it elsewhere; lokta being depleted; harvest methods may prevent coppicing; fuelwood harvests exceed rate of increase	
Rush cutting: salt marshes of Natal, South Africa	Naturalness: Much of the salt marsh ecosystem is being converted to cultivated & built areas	Naturalness: Negligible impact; 3 of the 4 harvested areas already protected	UNKNOWN
	Quality: Not mentioned	Quality: Probably negligible, but hard to distinguish harvest impacts from natural changes	
	Diversity: Not mentioned	Diversity: Negligible impact, since ncema grows in single species stands	
	Resources: Limited by reduced area of salt marshes	Resource: Harvest method wasteful; harvesting restricted to one third of the area where ncema grows	
Caiman hunting: llanos, Venezuela	Naturalness: Mostly modified	Naturalness: Negligible impact	NEUTRAL
	Quality: Not mentioned	Quality: Negligible impact	
	Diversity: Not mentioned	Diversity: Negligible impact	
	Resources: Not mentioned	Resource: Harvest rate within rate of increase	
CAMPFIRE: communal lands, Zimbabwe	Naturalness: Modified + cultivated with small & diminishing natural areas	Naturalness: Promotes maintenance of natural/least modified areas & reduces conversion to cultivation	POSITIVE
	Quality: Continuing degradation due to overgrazing & inappropriate cultivation	Quality: Promotes restoration of degraded land & is preventing further degradation	
	Diversity: Declining due to above	Diversity: Likely to maintain or restore native diversity	
	Resources: Being depleted; poaching rife	Resource: Some harvest rates temporarily above rates of increase; poaching much reduced	

areas where their habitat has been eliminated. Theoretically, hunting vizcachas might benefit the ecosystem by allowing degraded areas to recover; but current levels of hunting do not seem to suppress their numbers enough.

The Yukon still has large tracts of natural ecosystem. Kill levels of furbearers are within the natural fluctuations of the ecosystem and the furbearer populations. Any negative impacts are negligible. So, too, are any positive impacts on the ecosystem. Socially and economically, trapping is the most viable use of much of the ecosystem. Ecologically, it is the least harmful consumptive use. Recent legal cases have recognized the rights of holders of Registered Trapping Concessions (RTCs) over other resource users on government-owned land (most of the territory). But the economic clout of trapping is not necessarily sufficient to save an area from being logged or mined.

The difference in classification between hunting in Australia and Zimbabwe on the one hand and trapping in the Yukon on the other is due to the different contexts. Ecosystem conditions are deteriorating in the case areas in Australia and Zimbabwe. CAMPFIRE's uses of mammals are helping to stop the decline in Zimbabwe; kangaroo hunting will probably do likewise in Australia. Thus they are *promoting* an improved ecosystem condition. Ecosystem conditions are much better in the Yukon and the threats of change are few and local. Furbearer trapping is *compatible with* an already good ecosystem condition, but does not necessarily promote it. A useful guide is to ask the question: what would happen to the ecosystem if the use did not exist? In Australia and Zimbabwe, the ecosystem would probably get worse. In the Yukon, it would probably stay the same.

Snake capture and venom extraction have an extremely low impact on the snakes, especially compared with the high kill rates when the snakeskin trade was allowed. They have virtually no impact on the ecosystem, which is cultivated and degraded. Caiman hunting is compatible with maintenance of Venezuela's llanos ecosystem, much of which is modified. Thorbjarnarson (1991) judges the caiman harvest programme to be very conservative.

The three cases with a negative impact are parrot capture in Argentina, squirrel monkey viewing in Costa Rica, and lokta cutting and paper making in Nepal. Capture rates of parrots seem to be above the rate of increase (the population is declining). Some capture methods involve felling trees and destroying nesting sites, compounding the damage done by logging and overgrazing.

Although the direct impact of monkey viewing on the ecosystem is probably negligible, its indirect impact is high. Tourism is driving the expansion of the built

environment at the expense of a tiny island of natural and modified forest, without which the monkeys will become extinct. Squirrel monkey viewing is not the only tourism activity, of course, but it is a contributor.

The hill forests of Nepal are already being reduced by cutting for fodder, fuel and timber. The fuelwood demands of paper making add to this pressure. As the forests diminish, so does the lokta. Except possibly in the UNICEF project area, lokta is also being overcut.

The two cases whose impacts are unknown are tegu lizard hunting in Argentina and ncema rush cutting in South Africa. For at least 10 years, Argentina has exported 1.25 million tegu lizard skins a year; an additional domestic trade has not been quantified (Fitzgerald, Chani & Donadío 1991). As Chani (this volume) makes clear, not enough is known about tegu populations or the pattern of hunting to tell whether the persistence of trade is a sign that its impacts are acceptable.

The long term impact of rush cutting in Natal is unclear. We suspect that it is negligible, but classify it as unknown, pending confirmation that restricting harvesting to one third of the area where the species grows assures adequate regeneration.

### Impact on the human system

Of the 11 uses considered here, we conclude that five have a positive impact on the human system, four have a neutral or negligible impact, one has a negative impact, and the impact of one is unknown. Table 3 shows how we arrive at these conclusions. As in Table 2, the column on use identifies the case study concerned and defines the geographical area to which our assessment applies. The column on condition and trend of the human system describes the state of the human system in terms of:

- Health= longevity, good health and access to healthful living conditions (clean water, sanitation)
- Wealth= per capita income and supply of culturally important resources
- Knowledge = knowledge system (education and monitoring and assessment capacities)
- Institutions = participation and empowerment (the distribution and effectiveness of decision making and the extent to which people have control over their lives)

In the column on condition and trends, health, resources and knowledge are indicated by, respectively: life

expectancy at birth (in years); adjusted real gross domestic product per capita (in purchasing power parities) as an indicator of income; and the UNDP index of educational attainment (combining the adult literacy rate and mean years of schooling). These data come from UNDP (1993). All are national averages, and may not reflect conditions in the case study areas. In addition, in the knowledge field, there is usually a comment on research and assessment capacities.

The column on impacts of use on the human system describes the use's impacts in terms of the above four factors (but indicators of health, education and wealth are not used). The column on summation of impacts classifies the combination of impacts *in the context of the state of the human system* as positive, neutral (or negligible), negative, or unknown.

Impacts on the human system are more difficult to combine in one summation than are impacts on the ecosystem. Ecosystem impacts (on naturalness, quality, biodiversity, and resources) tend to be similar and often reinforce each other. By contrast, impacts on health, wealth, knowledge and institutions often conflict with each other, some being strongly positive, some being negligible (weakly positive or negative), and occasionally some being negative. For the purposes of this paper, we have adopted the following criteria for summing the impacts of a use on the human system:

Positive	A positive impact on at least two factors. No negative impact or crucial lack of knowledge.
Neutral	No negative impact or crucial lack of knowledge.
Negative	One or more negative impacts.
Unknown	A crucial lack of knowledge.

The five cases with a positive impact on the human system are furbearer trapping in the Yukon, snake capture and venom extraction in Tamil Nadu, CAMPFIRE in Zimbabwe, caiman hunting in Venezuela, and tegu lizard hunting in Argentina. The first three have improved the quality of life (wealth plus health or education) of the people living with wild species. In the Yukon, furbearer trapping is a mainstay of the culture and economy of aboriginal communities, which otherwise have little means of support. In Tamil Nadu, the snake venom business enables the Irulas to increase the benefits of their traditional skills. Directly and indirectly, CAMPFIRE is helping to improve the living conditions, education, income, security and self-reliance of

participating communities. All three uses empower communities, by giving them opportunities to develop new skills, by restoring management responsibilities, or both. All three also include mechanisms for participants to assess experience and adapt to change (although much less so in the snake venom project than in the Yukon or CAMPFIRE).

The caiman hunting programme in Venezuela has brought economic improvements and involves landowners in monitoring and assessment. But it is less empowering than the first three uses: the state retains control and large landowners get most of the benefits. Like the other Argentinean uses, tegu lizard hunting provides resources to the rural poor. Unlike the other uses, however, traders support research and assessment through the Tupinambis Commission.

The four cases with a neutral or negligible impact are parrot capture and vizcacha hunting in Argentina; kangaroo hunting in Australia; and lokta cutting and paper making in Nepal. Although the economic and social contributions of the Argentinean uses are sketchily known, they undoubtedly make important contributions to the incomes of the rural poor. But the people who rely on these resources have no formal rights to them and are not involved in their management. Systems for obtaining and acting on information about the ecological and human impacts of the uses are extremely weak. In Australia, commercial hunting is expected to increase landowners' incomes enough to change their attitudes to kangaroos, but its other social and economic impacts are probably marginal.

In most of Nepal, lokta cutting and paper making have a negligible impact on health, income or knowledge. Management and ownership are centralized, and monitoring and assessment lacking. The exception is the area covered by the UNICEF project, which provides rural and urban people with major benefits and some involvement in management. Hence, we classify the impact of the lokta industry as neutral overall, but positive in the UNICEF area.

Rush cutting in South Africa is economically and culturally important. However, the emergence of cartels and protection rackets is a negative impact that overshadows the benefits.

We classify the impact of monkey viewing and tourism in Costa Rica as unknown, because how much tourism benefits from the monkeys and other forest species - and how those benefits are distributed - are crucial bits of missing information. If the main draw is sun, sea and sand, there is little point in appealing to the self-interest of the tourism industry to protect squirrel monkeys and their habitat. If monkey viewing is a major attraction, and local people benefit significantly, the prospects of allying conservation and development are better.

**Table 3. Assessment of the impacts of uses on the human system.**

<b>Use</b>	<b>Condition and trend of human system</b>	<b>Impacts of use on human system</b>	<b>Summation of impacts</b>
Parrot capture: northern Argentina (especially the Chaco)	<p>Health: Life expectancy 71.0</p> <p>Wealth: Income 4,295</p> <p>Knowledge: Education 2.61 but people living with wildlife below average; inadequate research &amp; assessment</p> <p>Institutions: Private and state landowners own the resources but are not interested in conserving them; federal-provincial &amp; interprovincial conflicts</p>	<p>Health: Presumably negligible</p> <p>Wealth: Important income source for rural poor</p> <p>Knowledge: Presumably negligible</p> <p>Institutions: People living with wildlife have no rights to wildlife or involvement in management; land tenure problems in some areas</p>	NEUTRAL
Vizcacha hunting: pampas, Argentina	<p>Health: Life expectancy 71.0</p> <p>Wealth: Income 4,295</p> <p>Knowledge: Education 2.61 but people living with wildlife below average; inadequate research &amp; assessment</p> <p>Institutions: Private and state landowners own the resources but are not interested in conserving them; federal-provincial and interprovincial conflicts</p>	<p>Health: Presumably negligible</p> <p>Wealth: Income source for rural poor; contributes to food supply but importance not known</p> <p>Knowledge: Presumably negligible</p> <p>Institutions: People living with wildlife have no rights to wildlife or involvement in management; land tenure problems in some areas</p>	NEUTRAL
Tegu lizard hunting: northern Argentina	<p>Health: Life expectancy 71.0</p> <p>Wealth: Income 4,295</p> <p>Knowledge: Education 2.61 but people living with wildlife below average; inadequate research &amp; assessment</p> <p>Institutions: Private and state landowners own the resources but are not interested in conserving them; federal-provincial and interprovincial conflicts</p>	<p>Health: Presumably negligible</p> <p>Wealth: Important income source for rural poor; contributes to food supply</p> <p>Knowledge: Traders have joined Tupinambis Commission to support research toward sustainability</p> <p>Institutions: People living with wildlife have no rights to wildlife or involvement in management; land tenure problems in some areas</p>	POSITIVE

**Table 3. Assessment of the impacts of uses on the human system (continued).**

<b>Use</b>	<b>Condition and trend of human system</b>	<b>Impacts of use on human system</b>	<b>Summation of impacts</b>
Kangaroo hunting: semi-arid chenopod shrubland, Australia	<p>Health: Life expectancy 76.5</p> <p>Wealth: Income 5,044</p> <p>Knowledge: Education 2.94; good monitoring &amp; assessment enables adaptive responses to changing conditions</p> <p>Institutions: Land is privately owned; harvest quotas set by the state; laws unable to prevent illegal &amp; inhumane killing</p>	<p>Health: Presumably negligible</p> <p>Wealth: Marginal contribution to food supply</p> <p>Knowledge: Presumably negligible</p> <p>Institutions: Landowners expected to make decisions in response to market; legal sale of meat expected to remove incentives for illegal &amp; inhumane killing</p>	NEUTRAL
Furbearer trapping: Yukon, Canada	<p>Health: Life expectancy 77.0 but aboriginal people well below this national average</p> <p>Wealth: Income 5,052 but aboriginal people well below this national average</p> <p>Knowledge: Education 2.98 but aboriginal people below this national average; good monitoring &amp; assessment; responsive to changing conditions &amp; improved information</p> <p>Institutions: Most land formerly owned by state; now a mixture of state &amp; aboriginal ownership; trapping areas licensed to individuals &amp; groups</p>	<p>Health: Not mentioned</p> <p>Wealth: One of the few income sources available to aboriginal peoples; beaver, muskrat &amp; lynx contribute to food supply</p> <p>Knowledge: Trapper education courses provided; trappers participate in monitoring &amp; assessment</p> <p>Institutions: Trapping is an important social &amp; cultural activity for many residents; Yukon government &amp; aboriginal peoples will share responsibility for managing wildlife; trappers already participate in day-to-day management</p>	POSITIVE
Monkey viewing & tourism: Manuel Antonio forest, Costa Rica	<p>Health: Life expectancy 74.9</p> <p>Wealth: Income 4,542</p> <p>Knowledge: Education 2.31; no effective monitoring &amp; assessment</p> <p>Institutions: 60% of the capital for tourism comes from foreigners; only 2% of the income from tourism goes to local community; no planning</p>	<p>Health: Presumably negligible</p> <p>Wealth: Impact on income not known</p> <p>Knowledge: Presumably negligible</p> <p>Institutions: Local people do not value the resource and are not involved in management</p>	UNKNOWN

**Table 3. Assessment of the impacts of uses on the human system (continued).**

<b>Use</b>	<b>Condition and trend of human system</b>	<b>Impacts of use on human system</b>	<b>Summation of impacts</b>
Snake capture & venom extraction: Chinglepet district, Tamil Nadu, India	Health: Life expectancy 59.1	Health: Snake catching is dangerous; cooperative provides medical benefits	POSITIVE
	Wealth: Income 1,072 but tribal people below this national average & Irulas one of the poorest tribes in India	Wealth: Has increased the Irulas' income & is their main, & only year round, source of income	
	Knowledge: Education 0.93	Knowledge: Cooperative provides educational benefits; project monitors impacts, e.g. recapture rates; Irulas stop hunting areas when it ceases to be energy-efficient	
	Institutions: Management is centralized in the state	Institutions: Has enabled Irulas to maintain their traditional skills & lifestyle while acquiring new skills & responsibilities	
Lokta cutting & paper making: moist subtropical & temperate zones, Nepal	Health: Life expectancy 52.2	Health: Negligible impact except in UNICEF area, where community development funds contribute to water supply, sanitation & health services	NEUTRAL (POSITIVE in UNICEF project area)
	Wealth: Income 920	Wealth: Marginal source of income for rural people except in UNICEF area where it provides seasonal employment for almost 900 families + 100 full time urban jobs in printing	
	Knowledge: Education 0.35; poor monitoring & assessment	Knowledge: Negligible impact except in UNICEF area, where community development & welfare funds contribute to education	
	Institutions: Ownership and management of resources is centralized; central & local governments unable to control use	Institutions: Centralization prevents communities from managing resource; local institutions generally weak; fights break out over lokta; local committees run UNICEF community development & welfare funds	
Rush cutting: salt marshes of Natal, South Africa	Health: Life expectancy 61.7	Health: Presumably negligible	NEGATIVE
	Wealth: Income 4,841	Wealth: Supports a significant but not well understood economy	
	Knowledge: Education 1.59; state monitors & addresses problems as they arise	Knowledge: Presumably negligible	
	Institutions: State owns 3 sites (protected areas) & tribe owns 1; management of protected areas centralized	Institutions: Important role in Zulu tradition; harvesters have no rights to the resource & do not participate in management; a few individuals have formed cartels to monopolize the industry & extort protection money from harvesters; some conflicts between harvesting & tourism	

**Table 3. Assessment of the impacts of uses on the human system (continued).**

<b>Use</b>	<b>Condition and trend of human system</b>	<b>Impacts of use on human system</b>	<b>Summation of impacts</b>
Caiman hunting: llanos, Venezuela	Health: Life expectancy 70.0 Wealth: Income 4,902  Knowledge: Education 2.24; regular monitoring & assessment, including assessment of scientific basis of management  Institutions: Land is privately owned; state sets harvest quotas & prescribes management	Health: Presumably negligible  Wealth: Provides landowners with income; has generated new jobs & stimulated local economies; contributes to food supply  Knowledge: Landowners participate in monitoring  Institutions: Subject to state quotas, landowners make decisions in response to market	POSITIVE
CAMPFIRE: communal lands Zimbabwe	Health: Life expectancy 59.6  Wealth: Income 1,484  Knowledge: Education 1.44; management is adaptive, relying on monitoring & assessment of wildlife populations, quantity & quality of harvests, earnings, & how earnings are used  Institutions: Roles of state, districts and communities evolving	Health: Consolidation of settlements will improve health delivery  Wealth: Income >US\$1.6 million/year (1993), of which 65% expected to reach communities  Knowledge: Some income invested in education; districts & communities increasingly involved in monitoring and assessment  Institutions: Communities manage wildlife & receive most of the benefits; district councils have formal authority for management but this likely to be further devolved to communities; state retains power to control quotas until councils & communities develop accountable institutions & management skills; districts have acquired new marketing & business management skills; communities are developing self-esteem & capacity to manage investment projects	POSITIVE

**Combining the impacts**

Table 4 combines our assessments of the impacts of the 11 uses on the ecosystem and the human system. We conclude that five uses are good, one neutral, four bad, and the impact of one is unknown. We stress that these are not formal assessments. They are simply an exercise to show that the approach proposed here is feasible. The case studies - supplemented by glances at the literature and personal experience of two of the uses (the snake venom and lokta paper businesses) - have provided

enough information to make initial assessments of 10 of the 11 uses.

Examining the impacts of a use on the human system as well as the ecosystem, and doing so in light of the condition and trends of both, may seem excessively ambitious. Biologists and resource managers prefer to concentrate on the ecosystem. Economists and sociologists would rather focus on people. Both-like many of our case study authors - can point to gross information deficiencies that cast doubt on the most careful assessments. Even so, we hope the exercise (despite any flaws) demonstrates the

**Table 4. Assessments of 11 uses of wild species, based on their combined impacts on the ecosystem and the human system. Our assessment is shown in *ITALICS*. Note that one of the uses - lokta cutting and paper making in Nepal - has two assessments: one for the UNICEF project area, the other for the rest of Nepal.**

Impact on the human system	Impact on the ecosystem			
	Positive	Neutral/ Negligible	Negative	Unknown
<b>Positive</b>	<i>GOOD</i> CAMPFIRE, Zimbabwe	<i>GOOD</i> Furbearer trapping, Canada Snake capture & venom extraction, India Caiman hunting, Venezuela	<i>BAD</i> Lokta cutting & paper making, Nepal (UNICEF project area)	<i>UNKNOWN</i> Tegu lizard hunting, Argentina
<b>Neutral/ Negligible</b>	<i>GOOD</i> Kangaroo hunting, Australia	<i>NEUTRAL</i> Vizcacha hunting, Argentina	<i>BAD</i> Parrot capture, Argentina Lokta cutting & paper making, Nepal (remainder)	<i>UNKNOWN</i>
<b>Negative</b>	<i>BAD</i>	<i>BAD</i>	<i>BAD</i>	<i>BAD</i> Rush cutting, South Africa
<b>Unknown</b>	<i>UNKNOWN</i>	<i>UNKNOWN</i>	<i>BAD</i> Monkey viewing, Costa Rica	<i>UNKNOWN</i>

power and relative simplicity of giving equal weight to people and the ecosystem and of assessing against the goal of improving the wellbeing of both.

### Responses to the conclusions of assessment

We suggest the following responses to the conclusions of assessment (Table 5):

Good uses	Encourage.
Neutral uses	No action (low priority for attention).
Unknown impact	Investigate.
Bad uses	Reform (= make into good or neutral uses) or, if that is not possible, stop.

It is just as important to encourage good uses as it is to reform or stop bad uses. Progress toward sustainable societies demands activities that are good for people and

the ecosystem. The main problems faced by the good uses are trade barriers (kangaroo hunting, CAMPFIRE, furbearer trapping) and reluctance to give more management responsibility to the communities living with the wild species (snake capture). Some of these restrictions are imposed in the name of sustainability. Yet, judging from the case studies, they are more likely to provoke unsustainable behaviour. International conservation groups have devoted so much energy for such a long time to stopping bad uses that it will be hard for them vigorously to promote good uses. We urge them to do so and to start by pressing for the removal of trade barriers to good uses.

It is better to reform a bad use than stop it, because most bad uses have some good in them. Reform may also be easier than trying to eliminate the use, which can drive it underground, maximizing its bad side and minimizing its good. Centralized regulatory systems have been unable to prevent overharvesting of parrots in Argentina or lokta in Nepal. Almost certainly they do not have the power to stop trade altogether.

The main lesson of the good uses that would help to reform bad uses is the importance of supportive values,

**Table 5. Responding to the conclusions of assessment. Conclusions are in *ITALICS*. Responses are in *bold italics*.**

Impact on the human system	Impact on the ecosystem			
	Positive	Neutral/ Negligible	Negative	Unknown
<b>Positive</b>	<i>GOOD probably sustainable: encourage</i>	<i>GOOD probably sustainable: encourage</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>UNKNOWN inadequate information: investigate</i>
<b>Neutral/ Negligible</b>	<i>GOOD probably sustainable: encourage</i>	<i>NEUTRAL makes little or no difference: no action</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>UNKNOWN inadequate information: investigate</i>
<b>Negative</b>	<i>BAD probably unsustainable: reform or stop</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>BAD probably unsustainable: reform or stop</i>
<b>Unknown</b>	<i>UNKNOWN inadequate information: investigate</i>	<i>UNKNOWN inadequate information: investigate</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>UNKNOWN inadequate information: investigate</i>

incentives, and laws. In the Yukon, values, incentives and laws reinforce each other in favour of conservation. Progress is being made in this direction in Australia and, especially, Zimbabwe. In Argentina and Nepal, the incentives are weak and regulations weaker still (the only reason why vizcachas are not being overexploited is that they are abundant and resilient). In Costa Rica, the law is not equipped to control habitat destruction on private land; and incentives are completely askew: only 2% of income from tourism goes back to the local community.

In the Yukon, furbearers are respected as a resource because communities receive a fair share of benefits from them. The same applies to Irulas and snakes. In both Zimbabwe and Australia, a crucial step has been to change values by changing the incentive structure (the flow of benefits), so that landowners and communities regard the wild mammals not as pests but as resources. This has not been done in Argentina, and landowners and the state consider parrots and vizcachas to be pests.

The next step is to make beneficiaries responsible for sustaining the resources by involving them closely in management. This is already done in Zimbabwe and the Yukon and to some extent Venezuela. Participation in management helps resource users to understand interactions between the ecosystem and the human system and to take (or endorse) the actions needed to support both systems.

Bucher (this volume) proposes that parrot collecting be restricted to private landowners who practice approved use schemes. Such a system works in Venezuela with caiman hunting. However, given the weakness of Argentina's wildlife agencies, and the lack of enforcement of existing controls, we wonder if the proposal is realistic. People are likely to continue to take parrots from public land. It is doubtful that unlicensed commercial operations could be outlawed or that effective incentives could be given to private landowners competing with an illegal but cheap supply of birds from public land.

One option might be to allocate public lands to groups of rural people, giving them a means of benefiting from licensed schemes on public land. This could be done for vizcachas and tegu lizards as well as parrots (in fact for many wild animals). It could enable the rural poor to increase their income from wild species, expand their skills, and raise their self-esteem. Chitrakar (this volume) makes a similar proposal for lokta in Nepal. He recommends that user groups be formed in all communities that harvest or process lokta. The groups should be given legal ownership of the resources, and the responsibility, skills and technical knowledge to use them sustainably. Communities could control impacts on local forests much more easily than the state, if they had the rights and training to do so and could be assured the benefits of using the resources sustainably. Communities already manage

forests successfully in some parts of Nepal (Gilmour & Fisher 1992).

In the Costa Rican case, it is not monkey viewing as such that is bad: the infrastructure of tourism is doing the damage. Wong & Carrillo (this volume) propose land use planning and environmental education to reform tourism's impact on the ecosystem. Clearly, planning backed by legislation is necessary to keep intact an adequate area of forest. Environmental education will be most effective if it can show that squirrel monkey viewing contributes significantly to local incomes. A study of the economic impact of wildlife viewing is therefore essential. If the income from wildlife viewing is substantial but little of it goes to the residents of Manuel Antonio, ways need to be explored to increase their share.

Rush cutting in Natal is the only case where the negative impact is not on the ecosystem but on society. The Natal Parks Board is already exploring strategies to exclude cartels and protection rackets (Taylor, this volume). None is without social costs, but we believe the most promising would be a cooperative business owned by the neighbouring community. This would cause hardship to harvesters outside the community, who would be excluded. But as pressures on the ecosystem mount, the support of the people who live nearby will become more important. Increasing their stake in the ecosystem would give them a strong incentive. An alternative strategy - joint ventures between the Natal Parks Board and harvesters - would not exclude non-local harvesters. But it could be dangerous, since a joint venture would make the Board both beneficiary and regulator.

## **Implications for an assessment procedure and for guidelines for sustainability**

The scope of the draft Guidelines for the Ecological Sustainability on Nonconsumptive and Consumptive Uses of Wild Species (Part 3 of this volume) is "ecological sustainability". For the reasons given at the beginning of this paper, we believe that sustainability embraces both the human system and the ecosystem. The scope of the Guidelines and of an assessment procedure should be expanded accordingly.

We agree with Child (this volume) that assessments and guidelines are meaningful only in relation to a specified goal. We disagree that the draft Guidelines lack such a goal. A goal can consist of a standard; and the draft Guidelines propose a standard in the Criteria for Sustainable Use. Unfortunately, the Criteria are narrowly ecological, omitting the human dimension. Also, a disadvantage of a standard is that it must be expressed more rigorously than a broad goal. Finding a balance

between rigour and realism has proven elusive. The Criteria demand that a use not reduce the "future use potential" or impair the "long term viability" of the target population, any other species or the ecosystem. As these terms are defined in the draft Guidelines, the demand is impossible to meet. We propose that the Criteria be replaced with a goal statement, (such as: to improve and maintain the wellbeing of people *and* the ecosystem).

Broad definitions of human and ecosystem wellbeing are needed together with a minimum set of indicative issues - issues that indicate the condition of the ecosystem and the condition of the human system (see Prescott-Allen 1995). These are required so that users of the Guidelines or the assessment procedure have a common framework for determining progress toward (or regress from) ecosystem and human wellbeing. We believe that fuller or more precise definition than this would not provide better guidance and might thwart creativity.

Child (this volume) observes that "there is often a trade-off between socioeconomic and biological factors". Conventional wisdom agrees, but we do not. To put people before the ecosystem is old-fashioned development, just as to put the ecosystem before people is old-fashioned conservation. We believe that progress toward sustainability will be made only by giving human and ecological factors equal weight, and not trading them off against each other. Using the framework of Table 1, it has proved possible to do this for the 11 uses described in the case studies. We suggest this approach is widely applicable.

The goal and the indicative issues are the *what* of sustainability: what we want to achieve. Then there is the *how*. how to assess the sustainability of a use (in the case of the assessment procedure) or how to make a use sustainable (in the case of the Guidelines). In the draft Guidelines the *how* is covered by the Requirements. This word conveys entirely the wrong impression. Slough & Jessup (this volume) urge that some Requirements be mandatory and others optional (with the word "may" used only in the latter). We believe that none should be mandatory and hence none is a requirement. There are many ways of progressing toward sustainability; and the variety of human and ecological situations in which the assessment procedure and Guidelines could be applied is huge. What works in one situation may not work in another. It is better, then, simply to offer advice. The advice is bound to be general. More specific guidance may be given locally.

## **Information**

Information requirements for assessment need not be onerous. Formal sources (for example, monitoring

indicators of population trends) and informal sources (for example, maps and reports by wildlife users) can be combined to provide a reasonably reliable picture of conditions and trends. Although information about the impacts of the 11 uses is far from complete, and more information would be useful, in only one case (tegu lizard hunting in Argentina) do we consider more information to be necessary to come to a conclusion about whether the use is good, bad, or neutral. In general, there is better information about the impacts of the uses on ecosystems than on human systems. We have drawn interim conclusions, but information on impacts on people needs to be improved.

Slough & Jessup (this volume) note that information on population size or intrinsic rate of increase is not necessary. Monitoring of catch/unit effort and changes to relative abundance or sex and age structure is enough to detect changes in the sustainability of use levels. CAMPFIRE monitors wildlife populations (using aerial surveys and other formal methods, and information from communities and safari operators); harvest quantity (records of all animals killed legally); harvest quality (using trophy size as a rule of thumb); earnings; and how the money is used. This is a perfectly adequate information system. Nothing in the information requirements section of the draft Guidelines would suggest otherwise.

### **Management system, legal framework, incentives**

Among the management "requirements" called for by the draft Guidelines are clearly defined rights and responsibilities concerning the species being used and the ecosystem; and fair sharing of the costs and benefits of using wild species among the people involved in the use. The "people involved in the use" are defined confusingly in the draft Guidelines. Child (this volume) classifies the people involved in CAMPFIRE as producers (the communities), users (the safari operators), managers (the communities), authorities (the district councils), and regulators (the state). We find this just as confusing, and offer the following as an alternative.

*Users* mean harvesters in the case of consumptive uses; and viewers, tourists, etc., in the case of nonconsumptive uses. *Managers* are the people responsible for managing the use (they may also be users or resource controllers). *Resource controllers* are the people who have *de facto* control over the species being used or its habitat (they may be users, managers, or public or private landowners). Others involved in uses of wild species may be: *entrepreneurs* (brokers, dealers, or traders in wild species or their products; tourism operators, safari outfitters);

*manufacturers* (people who make products from wild species); and *consumers* (people who consume or are end users of wild species or their products). Users, resource controllers, entrepreneurs, manufacturers and consumers are, to varying degrees, *beneficiaries* of the use.

CAMPFIRE's recipe for successful sustainable use is: ownership of wild resources + making wild species as profitable as possible (higher prices) + locally based systems of resource management + empowerment of local people. Table 6 compares the 11 uses with this recipe. Among the good uses, all four ingredients are present in CAMPFIRE, three in kangaroo hunting and furbearer trapping, two in caiman hunting, and one in snake capture. Among the bad uses, two ingredients are present in rush cutting, and effectively none in the rest. This suggests that the CAMPFIRE management system is not highly generalizable.

However, assessment of the uses reveals that two principles of CAMPFIRE are widely applicable. One principle (translated into our terminology) is that resource controllers must benefit enough from wild species to give them priority over activities that otherwise would displace the species (or their habitats). All five good uses satisfy this principle. The other uses do not (with the possible exception of rush cutting in Natal, which is an exceptional case).

The other principle is that the resource controller must also be the manager - but not the only manager (there must be a separate "regulator"). All the good uses satisfy this principle, except for snake capture in Tamil Nadu, where the state is the sole manager. The other uses do not - again except for rush cutting in Natal, where the state is both resource controller and sole manager.

Thus "locally based systems of resource management" does not mean exclusively local management but management shared between the local resource controller and a protector of the public interest (usually the state). This is the case with most of the good uses. In CAMPFIRE, management is shared. The state retains ultimate control but has delegated "authority" to district councils with the proviso that they delegate responsibility for day-to-day management to the communities. Similarly, in the Yukon, management is shared among the state, aboriginal peoples, and individual trappers. In Venezuela, caiman management is shared by the state and landowners. By contrast, in uses with a negative impact on the ecosystem (parrot capture in Argentina, lokta cutting in Nepal, tourism in Costa Rica), the state is the sole manager, even though it is not capable of exercising this responsibility.

There are at least four types of relationship between uses of wild species and other human influences on the ecosystem:

**Table 6. Comparison of 11 uses with CAMPFIRE's recipe for successful sustainable use.**

<b>Use (Impact)</b>	<b>Ownership by resource controller?</b>	<b>More profitable than competing activities?</b>	<b>Locally based management?</b>	<b>Empowerment of local people?</b>
Kangaroo hunting (good)	Yes (landowner)	Yes	Yes in part (landowner + state)	No
CAMPFIRE (good)	Yes (community)	Yes	Yes in part (community + district + state)	Yes
Furbearer trapping (good)	Yes (trapper or aboriginal group)	No competing activity	Yes in part (trapper + aboriginal people + state)	Yes
Snake capture (good)	No	No competing activity	No	Yes
Caiman hunting (good)	Yes (landowner)	No competing activity	Yes in part (landowner + state)	No
Vizcacha hunting (neutral)	Yes (private land only) & no	No competing activity	No	No
Parrot capture (bad)	Yes (private land only) & no	No	No	No
Lokta cutting (bad)	No	No	No	No
Monkey viewing & tourism (bad)	No	No	No	No
Rush cutting (bad)	Yes (state)	Yes	No	No
Tegu lizard hunting (unknown)	Yes (private land only) & no	No competing activity	No	No

1. The use is the main human influence on the ecosystem. Examples: furbearer trapping (except for local agriculture, building, logging, or mining); monkey viewing/tourism; rush cutting; also logging and many fisheries.

2. A competing activity (that is, an activity that eventually would replace the use or make it impossible) is the main human influence on the ecosystem. Examples: kangaroo hunting; CAMPFIRE.

3. A competing activity is the main human influence on the ecosystem but the use compounds the impacts of the competing activity. Examples: parrot capture; lokta cutting.

4. The main human influence on the ecosystem is an activity that does not compete with the use. Examples: snake capture; caiman hunting; vizcacha hunting; tegu lizard hunting.

CAMPFIRE has been designed to deal with the second type of relationship. This type is widespread but it is not, as Child asserts, the main threat to all "higher trophic levels like wildlife", let alone to forests or fisheries. Nonetheless, we conclude that a revised version of CAMPFIRE's recipe would provide an effective management system for uses in any of the four types of relationship. Empowerment of local people is a vital part of improving human wellbeing, but it is not essential for management. The three essential ingredients are:

- Ownership (or at least tenure) by the resource controller.
- No competing activity or, if there is one, the use must be the more profitable activity.
- Management shared by the resource controller and a protector of the public interest (usually the state).

These are a package. One without the others will not work.

### **Precautionary principle and safeguards**

Jackson, Bucher & Chani (this volume) argue that management schemes should adopt a strict precautionary philosophy. They also stress the importance of protected areas as refugia, particularly in the Chaco and pampas. Protected areas provide some insurance that populations of exploited species will persist, as well as conserving species that are sensitive to human disturbance. They can also maintain parts of the ecosystem in its natural (or least modified state) with which modifications elsewhere can be compared. In the Yukon, provision of refugia is an integral part of the trapline management system, with special care taken to provide for the species (wolverine, lynx, marten) that need them most.

Child (this volume) claims that if CAMPFIRE had adhered to the precautionary principle, the Chikwarakwara programme would never have started, since the harvest of three male elephants was above the sustainable rate. This might have been true if the principle were applied to the elephants. But if it were applied to the ecosystem, as we think it should be, the programme would have gone ahead. The greater threat was to the soil and vegetation; and the proceeds from the elephant hunt provided the incentive for the community to conserve soil, vegetation and the elephant population.

### **Pain and suffering**

It is widely agreed (and IUCN policy) that people should protect wild animals from cruelty and avoidable suffering and that this obligation extends to uses of wild species. Whether the issue should be covered by an assessment of sustainability is controversial, since arguably it is not a matter of sustainability: it is possible for a use to cause wild animals avoidable pain and stress yet be sustainable in terms of its impacts on the population and ecosystem.

Slough & Jessup (this volume) state that the relevant clause in the draft Guidelines (paragraph 10[f])-"People should protect wild animals from cruelty and avoidable suffering" - should be a requirement. We asked reviewers of the draft initial assessment procedure (next chapter) whether assessment of pain and stress should be included. Of the 19 who answered this question, 10 said yes, nine no. The main reason for including suffering was that pain is unquestionably an impact of many uses of animals. One cannot give a true picture of the use's impacts if it is ignored. The main reason for excluding it was that assessing pain is "subjective" (a "value judgment").

Our own opinion is that uses should not cause "avoidable suffering" and that pain should be among the potential impacts of a use that are assessed. Grigg, Slough & Jessup, and Whitaker & Andrews include the issue in their discussions of (respectively) kangaroo hunting, furbearer trapping, and snake capture and venom extraction. One of the arguments in favour of kangaroo hunting is that legal methods of killing kangaroos are as humane as (if not more humane than) methods of killing livestock, whereas the methods used to exterminate them illegally are cruel. The development of humane killing systems is a major part of the management of the Canadian fur industry. The Irula Cooperative makes sure that the duration and conditions of captivity, and the method and number of venom extractions, do not cause the snakes pain or stress.

These examples show that the issue can be addressed sensibly and effectively. Difficult though it is, it is no more subjective and value laden than many other aspects of sustainability. The main fear seems to be that animal rights activists will use the issue to shut down uses that might otherwise be assessed as good or neutral. There are grounds for concern. Environmental ideologues have tried to close elephant harvesting and safari hunting in Zimbabwe because they do not accord with their personal notions of sustainability. Child's fears about the draft Guidelines stem from this experience.

We believe that nothing is to be gained by attempting to narrow sustainability to a core set of uncontroversial issues. Uncertainty and argument surround every issue. The most hopeful course is to adopt a clear and inclusive concept of sustainability; to assess uses transparently in terms of that concept; to defend uses that are assessed to be good or neutral; and to be equally vigorous in reforming uses that are assessed to be bad.

### **A concluding remark**

The concepts of sustainability and sustainable use are often criticized because of:

- Lack of evidence of sustainability. Many uses are either obviously unsustainable or cannot be proved to be sustainable.
- Disagreement over what is required to achieve sustainability.
- False claims of sustainability.

None of these is reason to abandon the quest for sustainability. The only alternative to sustainability is unsustainability - more widespread and severe declines in the wellbeing of people and the ecosystem.

We do not need to know exactly what sustainability would be like to know we need it. We know whether or not the conditions of people and the ecosystem are improving or declining, and we would prefer them to improve. Making progress toward sustainability is like going to a country we have never been to before, without a map, but with a compass and a sense of geography and the principles of navigation. We do not know what the destination will be like. We are not sure how to get there. But we do know if we are going in the right direction.

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## Appendix 1. Classification of ecosystem conversion levels

Conversion level	Definition	Indicator species	Positive, neutral and negative activities
NATURAL Negligibly to lightly human-influenced	The scale and rate of human impact on the ecosystem are of the same order as the impact of other organisms	Introduced species absent Domesticated species absent	Positive: promotes maintenance of the natural ecosystem Neutral: Compatible with maintenance of the natural ecosystem Negative: Modifies (reduces the quality & native diversity of) the natural ecosystem Negative: Converts the natural ecosystem to cultivated or built
MODIFIED Moderately to heavily human-influenced	Not cultivated but human impact on the ecosystem is greater than that of other species	Introduced species present Domesticated species absent	Positive: Increases the quality & native diversity of the modified ecosystem (including restores a degraded modified ecosystem) Positive: Promotes maintenance of the quality & native diversity of the modified ecosystem Neutral: Compatible with maintenance of the quality & native diversity of the modified ecosystem Negative: Degrades (reduces the quality & native diversity of) the modified ecosystem Negative: Converts the modified ecosystem to cultivated or built
CULTIVATED Human-dominated	More than 50% cultivated	Introduced species present Domesticated species present	Positive: Increases the quality & diversity of the ecosystem (including restores a degraded cultivated ecosystem) Positive: Promotes maintenance of the quality & diversity of the cultivated ecosystem Neutral: Compatible with maintenance of the quality & diversity of the cultivated ecosystem Negative: Degrades (reduces the quality & diversity of) the cultivated ecosystem Negative: Converts the cultivated ecosystem to built
BUILT Human-centred	More than 50% covered by roads, buildings or other human structures	Introduced species present Domesticated species present	Positive: Increases the quality & diversity of the built ecosystem Neutral: Maintains the quality & diversity of the built ecosystem Negative: Degrades (reduces the quality & diversity of) the built ecosystem

# An initial procedure for assessing the sustainability of uses of wild species

Members of the IUCN SSC Specialist Group on Sustainable Use of Wild Species

## 1. The why, who, when, what, and how of assessing the sustainability of uses of wild species

### Why assess the sustainability of uses of wild species?

Assessments are needed to:

1. Improve management of the use, enable management to be more adaptive, and increase the probability of the use being sustainable. Information - on the species being used, on the people involved in the use, and on their human and ecological contexts - is never complete; and biophysical, social and economic conditions are constantly changing. An adaptive management system aims to be flexible in response to these changes, to maximize capacity to learn from experience, and to adjust use levels, incentives and regulations accordingly. Monitoring, assessment, and corrective actions in light of assessment, are the keys to adaptive management.
2. Improve understanding of sustainability; the effects of uses on the species, ecosystems and people concerned; the effects of human attitudes and practices on the sustainability of uses; and the incentives, laws, and other factors likely to promote sustainability in different human and ecological contexts.
3. Build public confidence in the use.

### Who should assess the sustainability of uses of wild species?

If the purpose of assessment is to improve management, the managers of the use (or their appointees) should undertake the assessment. Others having a direct interest in the species or ecosystem affected by the use should be involved as well.

Assessments to improve understanding could be undertaken by any qualified individual or organization.

Where public confidence in the use is an issue, assessment may need to involve representatives of a variety of major interest groups.

### When should an assessment be made?

Assessment to improve management should be a regular part of the process. Frequency of assessment will depend on how rapidly and significantly conditions are changing, and how great is the risk of negative impacts on the species and ecosystem concerned. Assessment to improve understanding may be done at any time.

### What should the assessment cover?

Assessment should begin by defining the:

#### Scope and goal of the assessment (section 2)

It should then provide a:

#### Description of the use (section 3)

Then it should provide and analyze four sets of information:

#### Condition and trend of the ecosystem (section 4)

#### Impacts of the use on the ecosystem (including the species being used) (section 5)

#### Condition and trend of the human system (section 6)

#### Impacts of the use on the human system (section 7)

Finally, it would be useful to identify:

#### Conclusions and priority actions (section 8)

## How is an assessment done?

Sections 2-8 provide general advice on how to do an assessment. There are other possible approaches besides the one proposed here. Readers should feel free to adapt the procedure as they see fit. This procedure suggests indicative issues (such as diversity, participation), but does not list the indicators that could be used to measure change concerning these issues. Nor does it describe methods or techniques to monitor and analyze populations (for example, minimum viable population analysis), pollution, health, and so on.

Throughout any assessment, the method used to answer each question should be described (indicators used, source of information, confidence in the information, etc.).

## 2. Scope and goal of the assessment

### Scope of the assessment

The scope is defined by asking three questions:

1. **What is the use to be assessed?** For example: tourism and monkey viewing at Manuel Antonio (Costa Rica); kangaroo hunting, Australia.

2. **What is the ecosystem?** This may be of any size but should include the area in which the use takes place and that directly supports the species being used (the habitats and range of the populations or ecological communities that are used). For example: the 2,000 ha (20 km<sup>2</sup>) Manuel Antonio forest in Costa Rica; the 3 million km<sup>2</sup> of semi-arid chenopod shrubland in Australia.

The area should be large enough to sustain the use. For example, the ecosystem of a logging operation is the area required to support more than two rotations, not just the area currently being logged. In the case of migratory and other highly mobile animals, a practical limit may have to be placed on how much of the species' range is included.

3. **What is the human system?** This should include at least three categories of people involved in the use:

*Users.* Proximate users: harvesters (hunters, fishers, trappers, loggers, gatherers, etc.), in the case of consumptive uses; viewers, tourists, etc., in the case of nonconsumptive uses.

*Resource controllers.* The people who have *de facto* control over the species being used or its habitat (they may be users, managers, or public or private landowners).

Usually, they are landowners on private land; rural communities on municipal or occupied (populated) state-owned land; and the state on unoccupied state-owned land (such as national parks).

*Managers.* The people responsible for managing the use. Managers may also be users or resource controllers. Management may be shared - for example: by the state and private landowners (Australia, Venezuela); by the state, district councils, and communities (Zimbabwe).

The human system may also include others involved in the use: *entrepreneurs* (brokers, dealers, or traders in wild species or their products; tourism operators, safari outfitters); *manufacturers* (people who make products from wild species); and *consumers* (people who consume or are end users of wild species or their products).

It may also include others who live in the ecosystem (as defined) or influence the species or ecosystem being used.

The choice of whom to include in the human system depends on what is most informative, practical and convenient. Because Manuel Antonio is a small well-defined area, and many residents potentially benefit from and influence the monkeys and forest, it would be sensible to include the population of Manuel Antonio (which includes resource controllers on private land), tourists (the users), and government managers (which include resource controllers in the national park). In Australia, the area is so big that it would be sensible to limit the human system to users, resource controllers, and managers.

### Goal of the assessment

Assessment is done against a goal. The impacts of a use on the ecosystem and human system are positive or negative depending on what the people making the assessment want to achieve (or what they regard as a desirable standard or objective). Therefore, a goal needs to be defined. It could be to:

Improve and maintain the wellbeing of people and the ecosystem (the human system and ecosystem as defined in the scope).

Alternatively, a more specific goal could be chosen. For example: to improve and maintain the wellbeing of the people and ecosystem of Manuel Antonio. In this case, changes in the wellbeing of tourists and non-resident government managers would be irrelevant (unless they had a significant impact on the wellbeing of the people and ecosystem of Manuel Antonio).

A narrower goal might be: to maintain a viable population of squirrel monkeys and viable areas of forest, while maintaining (and preferably improving) the wellbeing of the people of Manuel Antonio.

### 3. Description of the use

The description provides basic information on the use:

#### 1. Characterization of the use and its infrastructure.

The infrastructure of a use includes such things as logging roads, hotels for tourists, and so on, that are within the ecosystem covered by the assessment.

For example: the use involves visits by tourists to Manuel Antonio National Park to view monkeys, and the building and operation of hotels, other tourist accommodation, restaurants, shops, roads, and houses and other accommodation of the people who operate and service the tourism industry in Manuel Antonio.

Or: the use involves cutting lokta and fuelwood and making lokta paper (products from lokta paper are manufactured outside the ecosystem covered by the assessment).

**2. The species, group of species or ecological community that is the target of the use** (not species or communities that are affected incidentally). Some uses target more than one species (for example, snake capture) or an ecological community (for example, logging a forest, or viewing a coral reef).

**3. Whether the species, group of species or ecological community that is the target of the use is endemic, rare, vulnerable (threatened), or endangered.** If the group of species or ecological community is common or widespread but a constituent species is endemic, rare, vulnerable or endangered, this should be indicated.

**4. The current level of use.** For example: number of tourists viewing monkeys + size of tourism infrastructure; number of snakes captured (by species) + amount of venom extracted; number of kangaroos killed (by species).

**5. How long the use has been going on in the ecosystem covered by the assessment; and how long it has persisted at the current level of use.** This may be expressed in years or in generation times of the species being used (ideally both). If more than one species or ecological community is the target of use, express generation times in terms of the longest-lived one. Other information on the trend in use level would be helpful.

## 4. Condition and trend of the ecosystem

Four sets of indicative issues are proposed for assessment of the condition and trend of the ecosystem:

1. **Ecosystem naturalness or conversion.** How much of the ecosystem is natural, modified, cultivated, or built (see Appendix 1 for definitions), and where? This provides a bird's-eye view of the scale and rate of human impact on the ecosystem; and a context for assessing degradation, diversity loss, and resource depletion. List in approximate order of importance the human activities and natural factors that are the main causes of ecosystem conversion (natural—•modified—•cultivated—•built).

The easiest way to assess naturalness/conversion of land ecosystems is with satellite imagery or aerial photographs. Differences among natural, modified, cultivated, or built areas are usually clearly visible (some ground truthing may be necessary). Areas that are mixtures of small patches of natural, modified, cultivated and built (or any two or more of these) may be defined as predominantly natural, modified, cultivated or built, depending on which covers the most total area. "Small" means smaller than the mapping unit (1 ha, 10ha, 100 ha, or 1,000 ha, depending on the scale of the map).

On the ground, built, cultivated and modified/natural areas are readily distinguished. Ecologists and local experts can usually tell whether a forest is natural (old-growth), modified (not old-growth and not planted), or cultivated (planted). The same applies to grasslands and other non-forest ecosystems. The presence or absence of domesticated and introduced species provides a further check (see Appendix 1), but this requires an inventory of native, introduced and domesticated species in at least one large phylum or division (for example, chordates, flowering plants).

Differences between natural and modified freshwater and marine ecosystems are difficult to determine without assessment in the field (in the water). Presence/absence of native or introduced molluscs may be one indicator.

2. **Ecosystem quality or degradation.** What is the extent and severity of degradation of land, water, and air? Degradation here means a reduction in quality. It includes pollution, as well as erosion (soil loss above background rates), salinization of soils, and so on. List in approximate order of importance the human activities and natural factors that are the main causes of degradation.

It is recommended that existing data and monitoring reports be used, rather than attempting a new assessment. Pollution rates may be used in lieu of direct measurements of air or water quality.

3. **Biodiversity maintenance or loss.** Is the diversity of ecological communities, native wild species and populations, and domesticated varieties (crops) and breeds (livestock) being maintained or is it declining? List in approximate order of importance the human activities and natural factors that are the main causes of declines in diversity.

List any ecological community, species, or variety (in the ecosystem being assessed) that is endemic, rare, vulnerable (threatened) or endangered.

It is recommended that existing data and monitoring reports be used, rather than attempting a new assessment. Data on ecological communities, crop varieties and livestock breeds may be deficient or absent. Data on native wild species may cover only a few classes or phyla. They should suffice.

4. **Resource conservation or depletion.** What are the main resources supplied by the ecosystem: for example, timber, wildlife, fish, livestock, crops? Are they increasing, stable, or declining?

If one set of resources is increasing at the expense of another (for example, livestock and crops at the expense of wild resources, or timber at the expense of wildlife), this should be indicated. A broad sense of the direction of resource production is more useful than a mass of data on many resources. List in approximate order of importance the human activities and natural factors that are the main causes of resource depletion or replacement.

The lists of human activities and natural factors that are the main causes of ecosystem conversion, degradation, diversity loss, and resource depletion - together with the other information on the condition and trend of the ecosystem - provide a context and perspective for assessing the impacts of the use. If the use of the wild species is the main human influence on the ecosystem - as it often is in logging or ocean fisheries - then management of the use will have a major effect on the quality and native diversity of the ecosystem. If natural conditions change slowly and do not fluctuate, changes in quality and diversity will largely be due to the use. If, however, the use is one of several human influences, the use may have an additive effect, a mitigating effect, or its impact may be minor compared to those of urban pollution, industry, agriculture, introduction of exotic plants and animals, and so on. These other activities may also be degrading or destroying habitats on which the use depends. The use may also compound, moderate or be masked by natural fluctuations, such as drought in Zimbabwe or natural population cycles in the Yukon. The use may be a means of managing the impacts of natural events (for example, when animals are harvested during droughts to reduce damage to vegetation and

soil); or provide incentives to maintain the quality and native diversity of ecosystems (as with CAMPFIRE in Zimbabwe and kangaroo hunting in Australia).

## 5. Impacts of the use on the ecosystem

The impacts of a use include the impacts of any infrastructure required for the use (see section 3). Assessment of the impacts of the use is in two parts:

1. Impacts of the use on the resource (the species, groups of species, or ecological community being used).
2. Impacts of the use on the rest of the ecosystem, including non-target species.

At best, it is possible to know the impacts of the use only approximately. Population demography is difficult and uncertain. Impacts on genetic quality may take a long time to show up or express themselves in unexpected ways: for example, selective harvesting could reduce a population's ability to survive diseases (some traits such as plumage brightness in birds have been linked to immuno-competence) (Marion East pers. comm. 29 August 1994). Impacts on the ecosystem may take even longer to reveal themselves, particularly if they are cumulative or are masked by the effects of other human activities or by natural changes.

The aim, therefore, is not for certainty but for an indication of whether the impact of the use is positive, neutral or negative *in relation to the current condition and trend of the ecosystem* (section 4). As far as budgets allow, ecological and other research should continue to improve understanding of the resource and the rest of the ecosystem. Cross-checking information from a variety of scientific and informal sources can increase the reliability of monitoring tools and indicators, which should be tested regularly against the results of research.

### 5.1. Impacts of the use on the resource (the species, groups of species, or ecological community being used)

The main concern is the use's *demographic sustainability* — or the impact of the use on the populations being used. To be demographically sustainable, the use must be at a rate that is within the population's capacity for renewal (equal to or less than the population's rate of renewal).

It is essential to monitor the level of use (see section 3) and one or more indicators of the impacts of the use on

the population. Impacts may be on: population size (absolute or relative abundance), population structure (sex and age ratios), and demographic processes (fertility, recruitment rate, survivorship, mortality). At a minimum, it is necessary to know the impact on population size. With most species, it is difficult to estimate total population size and usually not essential. In general, it is sufficient to determine population trends. A reliable indicator of population trends needs to be identified.

Kangaroo management in Australia uses aerial surveys (strip transects and line transects) to estimate kangaroo numbers. The accuracy of the two aerial survey methods is checked against ground surveys. The Yukon furbearer management programme monitors catch/unit effort and changes to relative abundance or to sex and age structure. Trappers report their observations on furbearer and prey abundance and population trends. Pelt size is used as an indicator of lynx recruitment. Indicators used in population estimates include winter tracks, food caches (beavers) and feeding structures (muskrats). Caiman management in Venezuela includes annual population censuses and monitoring skin size. CAMPFIRE in Zimbabwe monitors wildlife populations (using aerial surveys and other formal methods, and information from communities and safari operators); harvest quantity (records of all animals killed legally); and harvest quality (using trophy size as a rule of thumb).

If the use increases the population (for example, by helping it to recover from depletion) or prevents its reduction by another activity (for example, by providing an incentive to people who would otherwise reduce the population), the impact of the use on the resource is positive. If the use is simply within the population's capacity for renewal, its impact is neutral. If the use exceeds the population's capacity for renewal, its impact on the resource is negative.

## 5.2. Impacts of the use on the rest of the ecosystem, including non-target species

It is possible for a use to be demographically sustainable yet alter the quality and diversity of the ecosystem. For example, large and sustainable yields of deer can be produced by converting an old-growth forest to a mixture of second-growth forest and open fields. Many fisheries have an impact on non-target species, including birds, sea turtles, marine mammals, fish, molluscs and crustaceans. The compatibility of a use with the quality and diversity of the ecosystem is sometimes referred to as its *ecological sustainability*.

Three factors need to be assessed:

### a. *Impact of the use on the naturalness of the ecosystem.*

What is the impact of the use on the conversion level of the ecosystem? Appendix I defines the four conversion levels (natural, modified, cultivated, built). For examples, see the entries on naturalness in Table 2 of the previous chapter. The impact of the use on the naturalness of the ecosystem is:

Positive, if the ecosystem is natural and the use *promotes* maintenance of the natural condition (i.e., prevents it from being modified by some other activity or from being cultivated or built); or if the ecosystem is already modified and the use *promotes* maintenance of the current condition (i.e., prevents it from being cultivated or built).

Neutral, if the ecosystem is natural and the use *is compatible with* maintenance of the natural condition (i.e., the use does not modify it or convert it to cultivated or built); or if the ecosystem is already modified and the use *is compatible with* maintenance of the current condition (i.e., the use does not convert it to cultivated or built); or if the ecosystem is already cultivated or built.

Negative, if the ecosystem is natural and the use modifies it or converts it to cultivated or built; or if the ecosystem is already modified and the use converts it to cultivated or built.

Note: changes in quality or diversity that do not involve changes in conversion level are assessed separately (see below).

### b. *Impact of the use on the quality of the ecosystem.*

Quality refers to the condition of the land (especially soil), water, and air. Soil quality refers to soil structure and fertility. The use may have a negligible impact on these factors. But it is important to consider whether this is so. Some uses, such as logging and livestock grazing, often affect soil and water quality. Uses that do not reduce land, water and air quality may provide an alternative to activities that do. Impacts on land, water, and air quality should be assessed separately. For examples, see the entries on quality in Table 2 of the previous chapter.

Does the use pollute or degrade the land? If yes, in what ways and how severely?

Does the use pollute the air? If yes, in what ways and how severely?

Does the use pollute the water? If yes, in what ways and how severely?

If the answer is yes to any of these questions, the impact of the use on the quality of the ecosystem is negative.

If the answer is no (or negligibly) to all of these questions, does the use help to restore land, air or water that is degraded, or does it (wholly or partly) replace an activity that degrades land, air or water? If the answer is no, the impact of the use on the quality of the ecosystem is neutral. If the answer is yes, the impact of the use on the quality of the ecosystem is positive.

### ***c. Impact of the use on the diversity of the ecosystem.***

Possible impacts include changes (usually reductions) in native species richness (the number of native species in the ecosystem concerned); changes in the number, distribution, proportions or structure of communities or habitats in the ecosystem (i.e., particular associations of species); and changes in the size, structure or dynamics of populations of non-target species. Changes are unavoidable. However, given that the impact of the use on the target species (the resource) must not exceed its rate of renewal, so its impacts on non-target species must be within their capacity for renewal. Habitat alteration in favour of the species being used is a common management practice. For example: artificially maintaining aspen stands in the Yukon to encourage high beaver densities. Restraint is needed, since what may be good for the target species may be bad for non-target species.

It is impossible to monitor every species that the use might affect, but a practical alternative is to identify and monitor the species that are likely to be particularly sensitive. For example, logging in the temperate rain forests of North America needs to assess and limit its impacts on species associated with old-growth forests such as the marbled murrelet (a bird, *Brachyrhamphus marmoratus*). The list of endemic, rare, vulnerable (threatened) or endangered ecological communities, species, and varieties (section 4) provides a starting point.

In addition, changes in the number or size of readily identifiable ecological communities could indicate that certain species are under excessive pressure. Ecological communities can be of any size (from a rock pool to an ocean), depending on whoever is defining them: a practical scale needs to be chosen. Also communities come and go much more quickly than do the species that comprise them, so their value as an indicator is limited.

Is the use reducing the number of native species? Does the use threaten any native species? Is the use reducing

the number of ecological communities (or habitats)? Is the use fragmenting any ecological community? Does the use exceed the capacity for renewal of any non-target population?

If the answer is yes to any of these questions, the impact of the use on diversity is negative.

If the answer is no to all the questions, does the use promote maintenance of the current number of native species, or number and size of ecological communities (i.e., is it preventing declines or threats due to other activities [apart from natural factors])? Is the use restoring the number of native species or restoring any ecological community? Is the use restoring any non-target population or preventing its reduction by another activity?

If the answer is yes to any of these questions, the impact of the use on diversity is positive. If it is no to all the questions, the impact is neutral.

*Care must be taken to avoid claiming that an impact (whether on species richness, ecological communities, or non-target species) is positive. The positive impact of a use is a function of context: the greater the danger to species or ecological communities posed by competing activities and the more effective the use is at preventing those activities, the safer it is to assume that the impact of the use is positive. Otherwise, if it is not known whether the use has a negative impact, it is better to respond that the impact is neutral or unknown. If there is no evidence that the impact is negative, but the most frequent answer to the other questions is "don't know", then it is better to conclude that the impact on diversity is unknown.*

Assessment of clearcutting, livestock grazing and other uses involving large scale impacts on the ecosystem should cover other factors besides those listed here - notably the extent, frequency and duration of disturbance (area, timing, rotation period).

Impacts may change over time. Some logging operations, for example, may have short term negative impacts on the ecosystem, which eventually as the forest recovers may be shown to be neutral (David Lamb pers, comm. 4 July 1994). Assessors should bear in mind the generation times of the species and ecological communities they cover in the assessment and state the time scale they have chosen.

### **Pain and stress**

Some assessors of uses of animals may wish to consider whether the use is causing avoidable pain and stress. If so, different aspects would need to be covered depending

on whether the use requires killing animals, capture and transport of live animals, removal of parts or products of live animals, or is nonconsumptive. A possible, and very preliminary, format for assessing pain and stress to animals is given in Appendix 2.

## 6. Condition and trend of the human system

Four sets of indicative issues are proposed for assessment of the condition and trend of the human system:

1. **Health and population.** Fertility, mortality, longevity, good health, food and nutrition, and healthful living conditions (clean water, sanitation). A long and healthy life increases the opportunity for a person to pursue goals and develop abilities. Indicators include: life expectancy at birth; % of population with access to safe water, sanitation, health services; maternal mortality rate; infant mortality rate; under-five mortality rate; daily calorie supply as % of requirements; malnutrition.

It is recommended that existing data and monitoring reports be used, rather than attempting a new assessment. If only national data are readily available, they could be annotated with remarks on the main differences between national averages and the local situation.

2. **Wealth and livelihood.** Income, employment, housing, infrastructure, technology. Money and other resources expand opportunities and provide means to exploit them. Indicators include: gross domestic product per capita; employment income; unemployment rate.

It is recommended that existing data and monitoring reports be used, rather than attempting a new assessment. If only national data are readily available, they could be annotated with remarks on the main differences between national averages and the local situation. However, it may be helpful to know local employment conditions (unemployment rate, need for year round versus seasonal jobs, need for part time versus full time jobs).

3. **Knowledge.** Knowledge, education, training, research, communication, and information. The knowledge system equips people for life and trains them to learn from experience and adapt to changing human and ecological conditions. It includes individual education and training (indicators: adult literacy rate [%]; mean years of schooling; primary, secondary, and tertiary enrolment). It also includes monitoring and assessment capacities. Progress toward sustainability will depend on the ability of communities and organizations (governments, citizens' groups, corporations) to assess change, learn from it, and respond effectively. It is recommended that

existing data and monitoring reports on individual education be used, rather than attempting a new assessment. If only national data are readily available, they could be annotated with remarks on the main differences between national averages and the local situation. In addition, the society's monitoring and assessment capacities need to be described in general terms to provide a frame of reference for the assessment of the impacts of the use on the knowledge system (section 7).

4. **Behaviour and institutions.** Each society has an institutional system of values, customs, laws, incentives and organizations to manage human relationships with each other and with the ecosystem. This huge field includes the distribution of decision making, the extent to which people have control over their lives, and the interpersonal respect needed to balance individual and community needs. It also includes the society's responsiveness to changing conditions, and the reflectiveness of its organizations (do they encourage questioning, creativity, and reassessment?). The priority aspects on which to focus in an assessment of use are: the structures of resource ownership and decision making; and the balance of laws and incentives. Who owns (has tenure rights to) the land and natural resources? How is decision making shared among the national government, lower levels of government, local communities, nongovernmental organizations (in the broadest sense), and individuals? Are values, laws and incentives mutually supportive?

If possible and relevant, when assessing health and population, wealth and livelihood, knowledge, and behaviour and institutions, note male-female and rural-urban differences, and the condition of the least advantaged 20% of the population compared with either the average or the most advantaged 20%.

## 7. Impacts of the use on the human system

### Health

Uses may affect health in five ways: by providing food; by supplying medicines or other health products; by providing resources for the supply of clean water, sanitation or health services; by injuring or killing users; or by polluting air or water. Only the first four are considered here, because pollution is covered under impacts of the use on the ecosystem (section 5).

Uses that pose an unacceptable risk to users, and do not contribute even marginally to the supply of

food, medicines, clean water, sanitation and health services, have a negative impact on health. *Users are entitled to their own evaluation of what is an unacceptable risk.*

Uses that contribute significantly to the supply of food, medicines, clean water, sanitation or health services have a positive impact on health (for example, the UNICEF lokta project). If the use poses a risk to the users, this may neutralize the impact or the impact may still, on balance, be considered positive. For example, in the period 1982-1989 snakes bit 42 Irulas, killing four of them. Because of the cultural importance of snake catching to the Irulas, they regard this as an acceptable risk. At the same time, the venom used in antivenin serum saves thousands of lives each year. In addition, the Cooperative provides medical benefits and accident insurance to members and their families and pays all expenses for treatment of snakebite. On balance, therefore, the impact of snake catching on health is positive.

Uses that contribute marginally to the supply of food, medicines, clean water, sanitation and health services have a neutral impact on health. If the use poses a risk to the users, the impact may be considered neutral or negative depending on the users' assessment of the risk.

The difference between a significant contribution and a marginal contribution is a matter of judgement.

## **Wealth and livelihood**

Obviously, all consumptive and many nonconsumptive uses contribute to wealth and livelihood. The three important contributions to consider here are the extent to which the use is a source of income, employment, or resources that are culturally important to the local people (for example, ncema rushes in Natal, and game and furs in the Yukon).

How much income does the use generate and how much of that income goes to the users, resource controllers, managers, and others (entrepreneurs and manufacturers)? (It is also useful to know the revenues to society: for example, taxes by the state.)

How important is the income for users and resource controllers (what proportion of their total incomes?)? Does the income provide enough of an incentive to the resource controller to favour the use over competing activities? What proportion of the costs of management is covered by the income received by managers?

Is the use important for employment? In what ways (year round and seasonal jobs, part time and full time jobs)? Does it provide jobs for groups with limited

opportunities for earning income (such as women or aboriginal people)?

Does the use provide resources that are culturally important to the local people? In what ways and how much?

If the use provides a significant proportion of the income of users, resource controllers or managers, the impact of the use on wealth and livelihood is positive. Significant means more than 5% (but if data are not good enough to calculate percentages, it means "more than pocket money"). The impact of the use is also positive if it is a significant source of employment (what is significant depends on local employment conditions) or of resources that are culturally important to the local people.

If the use is not a significant source of income, employment or culturally important resources, its impact on wealth and livelihood is neutral.

## **Knowledge**

Uses contribute to a society's knowledge system mainly by providing resources for education and by improving research, monitoring and assessment.

Uses have a positive impact on education if they provide resources for the provision of education (as with CAMPFIRE and the UNICEF lokta project), or if education or training is a major part of the use (for example, the trapper education programme in the Yukon). Otherwise, the impact of the use on education is neutral.

Uses have a positive impact on research, monitoring and assessment if they provide new information on the resource or the ecosystem, or beneficiaries of the use provide support for research. For example: the support of traders for research on tegu lizard ecology and the sustainability of current hunting levels, through Argentina's Tupinambis Commission. The impact of the use is also positive when users participate in monitoring and assessment (as with trappers in the Yukon). Otherwise the impact of the use on research, monitoring and assessment is neutral.

It is important to know how well the use is monitored and assessed; the role of research; participation in monitoring and assessment; and the effectiveness of managers at responding to assessments. There are two groups of questions:

1. Are monitoring and assessment - of the use and its impact on the ecosystem and human system - an integral part of management? Are management assumptions and practices (including laws and incentives) regularly reviewed in light of assessments, and changed whenever necessary?

2. Do all the groups involved in management participate in monitoring and assessment? Is information obtained from all the groups involved in the use? Do information and the results of assessment flow back to them in a form they can use? Do the assessments identify research priorities and are those priorities being met?

If the answer is yes to both questions in the first group and any of the questions in the second group, the assessment situation is positive. If not, but no significant management problem arises, the situation is neutral. If not, and significant management problems ensue, the situation is negative.

For the use's overall impact on knowledge (education + research, monitoring and assessment) to be considered positive, there must be at least one positive impact and no negative impact. If there is a negative impact and no positive impact, the overall impact is negative. If there is a negative impact and one or more positive impacts, or if all impacts are neutral, the overall impact is neutral.

## **Behaviour and institutions**

Key aspects are: ownership of the resource (tenure rights); how management is shared; whether the use contributes to the empowerment of local communities - including the development of new rights, responsibilities and skills, and the impact on social harmony, including conflicts with other land/resource uses.

The resource controllers (the people who have *de facto* control over the species being used or its habitat) were identified in section 2 (scope of the assessment). Do they also have *de jure* control (are they legal owners?)? If no, who has? What conflicts arise and how are they managed? What rights do the users have to the resource?

If the resource controller is the owner of the resource (or at least has tenure rights to it), the impact on tenure is positive. If not, but no significant management problem arises, the impact is neutral. If not, and significant management problems ensue, the impact is negative.

The managers were also identified in section 2. This information needs to be repeated here. Who is responsible for management? If more than one group - for example, the state and private landowners (resource controller) in Venezuela, or the state, aboriginal people (resource controller) and trapper (user and resource controller) in the Yukon - what are the different responsibilities of each and how is management shared? If users and resource controllers are not identified as managers, how do they participate in management (if at all)?

If management is shared - at a minimum by the resource controller and a protector of the public interest (usually, but not necessarily, the state) - the impact on management is positive. If not, but no significant management problem arises, the impact is neutral. If not, and significant management problems ensue, the impact is negative.

Two questions relate to empowerment:

1. Does the use contribute to the empowerment of local communities? If yes, how? For example, does it enable them to develop new rights, responsibilities or skills?

2. Is the use a source of serious conflict within or among communities and interest groups or the focus for the oppression of one group by another?

If the answer is yes to the first question and no to the second, the impact on empowerment is positive. If the answer is no to both questions, the impact is neutral. If the answer is no to the first question and yes to the second, the impact is negative. If the answer is yes to both questions, the impact may be positive, neutral or negative, depending on evaluation of the trade-offs.

For the use's overall impact on behaviour and institutions (resource ownership + management sharing + empowerment) to be considered positive, there must be at least one positive impact and no negative impact. If there is a negative impact, the overall impact is negative. Otherwise, the overall impact is neutral.

## **8. Conclusions and priority actions**

### **Combining the impacts of the use on the ecosystem**

The impacts of the use on the resource, the conversion level (naturalness) of the ecosystem, the quality (degradation) of the ecosystem, and diversity of the ecosystem have been assessed separately (section 5). These impacts may be combined into a single assessment as follows:

Positive: minimum of one positive impact; impacts on the resource and the conversion level either positive or neutral; maximum of one unknown impact; no negative impact.

Neutral: impacts on the resource and the conversion level neutral; maximum of one unknown impact; no negative impact.

Negative: one or more negative impacts. An exception may be if the use temporarily exceeds the resource's capacity for renewal but impacts on the conversion level and at least one other issue are positive.

Unknown: impacts on the resource or the conversion level unknown; or impact on more than one issue unknown; no negative impact.

### Combining the impacts of the use on the human system

The impacts of the use on health, wealth and livelihood, knowledge, and behaviour and institutions, have been assessed separately (section 6). These impacts may be combined into a single assessment as follows:

Positive: minimum of two positive impacts; no unknown impact; no negative impact.

Neutral: more positive or neutral impacts than unknown impacts; no negative impact.

Negative: one or more negative impacts.

Unknown: more unknown impacts than positive or neutral impacts; no negative impact.

### Combining the impacts on the ecosystem and the human system

The impacts on the ecosystem and the human system may be combined using the method described in the previous chapter. For convenience, Table 5 from that chapter is reproduced here as Table 1.

### Priority actions

Priority actions may then be decided to encourage and improve good uses, reform bad uses, and investigate uses whose combined impact is unknown. Additional analysis may be needed to identify and address the best ways of reforming bad uses and to overcome obstacles faced by good uses.

**Table 1. Conclusions of assessment and suggested responses. Conclusions are in *italics*. Responses are in **bold italics**.**

Impact on the human system	Impact on the ecosystem			
	Positive	Neutral/ Negligible	Negative	Unknown
<b>Positive</b>	<i>GOOD probably sustainable: encourage</i>	<i>GOOD probably sustainable: encourage</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>UNKNOWN inadequate information: investigate</i>
<b>Neutral/ Negligible</b>	<i>GOOD probably sustainable: encourage</i>	<i>NEUTRAL makes little or no difference: no action</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>UNKNOWN inadequate information: investigate</i>
<b>Negative</b>	<i>BAD probably unsustainable: reform or stop</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>BAD probably unsustainable: reform or stop</i>
<b>Unknown</b>	<i>UNKNOWN inadequate information: investigate</i>	<i>UNKNOWN inadequate information: investigate</i>	<i>BAD probably unsustainable: reform or stop</i>	<i>UNKNOWN inadequate information: investigate</i>

## Appendix 1. Classification of ecosystem conversion levels

Conversion level	Definition	Indicator species	Classification of impacts of uses of wild species on conversion level*
NATURAL Negligibly to lightly human-influenced	The scale & rate of human impact on the ecosystem are of the same order as the impact of other organisms	Introduced species absent Domesticated species absent	Positive: promotes maintenance of the natural ecosystem Neutral: Compatible with maintenance of the natural ecosystem Negative: Modifies (reduces the quality & native diversity of) the natural ecosystem Negative: Converts the natural ecosystem to cultivated or built
MODIFIED Moderately to heavily human-influenced	Not cultivated but human impact on the ecosystem is greater than that of other species	Introduced species present Domesticated species absent	Positive: Promotes maintenance of the quality & native diversity of the modified ecosystem Neutral: Compatible with maintenance of the quality & native diversity of the modified ecosystem Negative: Converts the modified ecosystem to cultivated or built
CULTIVATED Human-dominated	More than 50% cultivated	Introduced species present Domesticated species present	Neutral: The ecosystem is already cultivated
BUILT Human-centred	More than 50% covered by roads, buildings or other human structures	Introduced species present Domesticated species present	Neutral: The ecosystem is already built

\* This version of the classification includes only impacts that affect the conversion level of the ecosystem. It does not include changes in the quality (degradation/restoration) or diversity (maintenance/loss) of the ecosystem at a particular level, except in the case of a natural ecosystem because such changes convert it to a modified ecosystem. For a fuller classification of activities that includes these changes, see Appendix I of the previous chapter (page 101).

## Appendix 2. Possible format for assessing pain and stress to animals

This very preliminary format is based on "Sustainable use of wildlife: assessment of animal welfare" (1993), by Arthur Lindley, Head of the Wildlife Department, Royal Society for Prevention of Cruelty to Animals, England, prepared for a joint project of the IUCN SSC Specialist Group on Sustainable Use of Wild Species and the IUCN Working Group on Ethics.

Assessors should answer each question, and describe the method used to arrive at the answer (except "don't know").

### Uses that require killing animals

- a. What % of animals are injured but not killed?  
less than 1 % of the number of animals killed  
more than 1% of the number of animals killed  
not known

- b. Are pain and stress to the animals during hunting and killing of low intensity and short duration\*?  
yes  
no  
don't know

- c. Does insensibility follow almost instantaneously from administration of the killing blow, followed by death without recovery of consciousness\*?  
99% (or better) of the time  
less than 99% of the time  
don't know

- d. Are procedures in place to kill animals as quickly as possible in the cases where (c) is not met?  
yes  
no  
don't know

\*Note on duration of pain and stress and time to unconsciousness: The Fur Institute of Canada considers a killing trap to be humane if it renders 9/9 (0 failures) or 13/14 (1 failure) animals unconscious within three minutes, with inevitable subsidence into death. A live holding device is considered humane if it holds 9/9 or 13/14 animals for 24 hours without serious injury. At that success level, it was determined that a trap could be expected - at a 95% level of confidence - to kill or hold humanely at least 70% of all target furbearers captured on traplines. (Brian Slough & Harvey Jessup, personal communication, March 1995).

### Uses that require capture and transport of live animals

a. How many animals are killed during capture, holding and transport?

- less than 1% of animals captured
- more than 1% of animals captured
- not known

b. How many animals are injured during capture, holding and transport?

- less than 1% of animals captured
- more than 1% of animals captured
- not known

c. Are pain and stress to the animals during capture, holding and transport of low intensity and short duration?

- yes
- no
- don't know

d. Is medical care for injured animals provided and are severely injured animals painlessly killed?

- yes
- no
- don't know

### Uses that require removal of parts or products of animals

a. Are pain and stress during removal of the part or product of low intensity and short duration?

- yes
- no
- don't know

b. Is medical care available if there is any risk of injury during harvest of the part or product?

- yes
- no
- don't know

c. Is the physical or behavioural effect on the animal of removal of the part or product

- negligible
- significant
- not known

d. If the use involves capture, is the animal released and does it survive in its environment?

- yes
- no
- don't know

### Nonconsumptive uses of animals

Does the use (including provision of facilities) cause:

a. Significant damage to the animals' habitat, food, or water supply, or other items important to the animals observed?

- no
- yes
- don't know

b. Pain, suffering or significant stress to the animals?

- no
- yes
- don't know

c. Significant disruption of the animals' social group?

- no
- yes
- don't know

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## **PART 3. BACKGROUND MATERIAL**

# Recommendation 18.24 of the General Assembly of IUCN

## Conservation of Wildlife through Wise Use as a Renewable Natural Resource

**Recognizing** that use of wildlife may be consumptive or non-consumptive;

**Noting** that some countries successfully conserve many species of their wildlife without using them consumptively, and that in many other countries the use of wildlife is necessary for the well-being of their people;

**Recalling** that two fundamental aims of the World Conservation Strategy are to ensure the conservation of species and ecosystems for their intrinsic value and for the benefit of humankind;

**Acknowledging** that the mission of IUCN is to provide leadership and promote a common approach for the world conservation movement in order to safeguard the integrity and diversity of the natural world, and to ensure that human use of natural resources is appropriate, sustainable and equitable;

**Recognizing** that some wildlife conservation programmes provide for sustainable use;

**Conscious** of the complementary role provided by protected area management for wildlife conservation and the importance of such protected areas in maintaining biological diversity;

**Understanding** that a country's land (including its rivers, wetlands and territorial seas) are fundamental assets due to their potential for producing food and other natural products and that there are economic and humanitarian constraints on the extent to which they can be maintained as natural habitats;

**Recognizing** that more effective mechanisms must be found that contribute towards the future economies of countries through wise use and conservation of their renewable natural resources;

**Concerned** that the decline of species and the loss of genetic diversity are often due to loss of suitable habitat and exploitation at levels that cannot be sustained;

**Believing** that properly managed projects for the sustainable use of wildlife can enhance the conservation of wildlife populations and their ecosystems because of the economic and other benefits that such use provides;

**Noting** that governments, IUCN members, development assistance agencies, and others are seeking guidance and assistance in the formulation of policies and the practical design and implementation of field projects on sustainable use of wildlife;

**Recognizing** that the process of developing IUCN guidelines (including safeguards) for sustainable use of wildlife was initiated by a Workshop on Sustainable Utilization of Wildlife, held at this session of the General Assembly;

The General Assembly of IUCN - The World Conservation Union, at its 18th Session in Perth, Australia, 28 November - 5 December 1990:

1. **Affirms** that ethical, wise and sustainable use of some wildlife can provide an alternative or supplementary means of productive land-use, and can be consistent with and encourage conservation, where such use is in accordance with adequate safeguards, namely:

a. sound, scientifically-based monitoring mechanisms to ensure that such use is maintained at levels which can be sustained by the wild populations without adversely affecting the species' role in the ecosystem or the ecosystem itself;

b. compliance with national and international legal obligations and policies;

- c. provision for the protection of wild animals from avoidable cruelty and suffering;
  - d. conformity with the IUCN guidelines to be developed in accordance with sub-paragraph 5(a) below;
2. **Urges** all countries to:
- a. establish an adequate system of protected areas as an adjunct to the development of sustainable wildlife use programmes to further ensure the conservation of the species involved in such programmes;
  - b. consider whether such sustainable use programmes based on IUCN guidelines, to be developed in accordance with sub-paragraph 5(a) below, would create economic and other incentives for the retention, rehabilitation and management of natural habitats and their biological assemblages outside such protected areas;
  - c. urgently review, where necessary and desirable, current programmes and practices involving the use of wildlife and modify them to ensure their sustainability and conformity with the IUCN guidelines to be developed in accordance with sub-paragraph 5(a) below;
3. **Recognizes** that, consistent with national and international legal obligations and policies, trade in clearly identified products derived from properly managed sustainable use of wildlife carried out in accordance with agreed guidelines and safeguards (as developed in accordance with sub-paragraph 5(a) below) can confer incentives that enhance the conservation of the species or population involved;
4. **Encourages** range states of shared populations of wildlife to cooperate in the conservation of such populations through international agreements;
5. **Requests** the Director General to coordinate IUCN programme activities, in consultation with the Species Survival Commission and in collaboration with IUCN members, to:
- a. develop guidelines based on scientific, socio-economic, and traditional knowledge, the principle of equitable allocation of resources and distribution of benefits, and on other criteria recommended by the Workshop on Sustainable Utilization of Wildlife, for consideration by the Council;
  - b. work to achieve the agreement of IUCN members to endorse and implement those guidelines;
  - c. undertake or sponsor field projects to research and test factors needed to ensure successful sustainable use of wildlife;
  - d. review as appropriate existing programmes and practices involving the use of wildlife and recommend modifications necessary in order to conform with the IUCN guidelines;
6. **Requests** the Director General to investigate mechanisms to ensure, in so far as practicable, the equitable distribution of income and other benefits derived from the use of wildlife as set forth in this recommendation.

# Draft Guidelines for the Ecological Sustainability of Nonconsumptive and Consumptive Uses of Wild Species

*Note: these Guidelines were not adopted by IUCN, and are provided here only for information.*

## Introduction

1. People throughout the world use a great number of wild species, both consumptively and nonconsumptively, for food, medicine, clothing, shelter, fuel, fibre and income. Wild species also have cultural, religious, ritual, ceremonial, recreational, intellectual and aesthetic importance. They are economically significant in all countries and vital to the economic and cultural survival of many communities.

2. A fundamental aim of *Caring for the Earth* is to ensure the conservation of species and ecosystems for their intrinsic value and as a foundation for human development.

3. Protection of species, ecosystems and areas provides an important means by which wild species and biodiversity can be maintained.

4. Many species and their supporting ecosystems are under increasing human pressure. Unsustainable use depletes these resources, eventually resulting in loss of the species or populations, degradation of associated ecosystems, or both.

5. By contrast, sustainable use of wild species has the potential to provide both:

(a) Development benefits - assuring the long term supply of valuable resources to people, and enabling species and populations depleted by overuse to recover; and

(b) Conservation benefits - conserving not only the species concerned but also associated ecosystems and species.

6. If there is use of species and ecosystems, ensuring that it is sustainable is a basic principle of conservation and sustainable development, enunciated in many international and national policy documents.

7. However, understanding of sustainability has changed over the past 30 years; and "sustainable use" has been interpreted in a number of ways. In these guidelines, "sustainable use" means use that does not reduce the future use potential, or impair the long-term viability, of either the species being used or other species; and is compatible with maintenance of the long-term viability of supporting and dependent ecosystems. "Sustainability" may involve ecological, economic, and social factors, but in this document refers only to ecological sustainability.

8. The purpose of these guidelines is to provide a working definition of sustainable use, and guidance on how to increase the probability that a particular use is sustainable. The matter of probability must be stressed. It is much more difficult to demonstrate that a use is sustainable than it is to show that it does not endanger the species' survival. The intention is neither to condemn nor encourage uses of wild species, but to help ensure that any uses are likely to be sustainable. If wild species are used, then these guidelines should apply.

9. Respect for nature is fundamental to the concepts of sustainable use. It is recognized that ethical perceptions of uses and types of use vary among countries and cultures. Therefore, in certain cases ecologically sustainable uses may be precluded on ethical and other grounds.

10. It is recognized that nature does not exist exclusively for human use but that it has its own intrinsic value. Also, not all species should be regarded as being available for human use. Therefore, these guidelines are based on the ethical context outlined below:

(a) People should conduct their activities with respect for the viability of wild species and the integrity of natural systems.

(b) There should be recognition of individual and collective responsibility for the commons of nature.

(c) People should seek an equity of benefits among the present generation and between the present and future generations.

(d) People have a right to the resources needed for a decent standard of living, which may include deriving economic, scientific, aesthetic or other benefits from some wild species, provided they do so sustainably.

(e) People have the responsibility to ensure that their uses of wild species are sustainable and non-wasteful.

(f) People should protect wild animals from cruelty and avoidable suffering.

11. The guidelines cover any wild and semi-wild species that are used for human benefit; and all nonconsumptive and consumptive uses, including logging, fishing, hunting, capturing, trapping, gathering, and viewing. They do not address exotic populations, feral populations, semi-domesticated populations or domesticated populations. (All these terms are defined in the Glossary.)

12. The guidelines provide Criteria and Requirements. The Criteria define conditions to be met if a use of a wild species is to be ecologically sustainable. A use that does not meet the Criteria is unlikely to be sustainable over the long term. The Requirements set out basic operational conditions necessary to fulfill the Criteria.

13. Together, the Criteria and Requirements are intended to guide policies, laws and administrative procedures aimed at ensuring that any uses of wild species are sustainable and that the affected species and their supporting ecosystems are conserved. They are intended to be used by governments, resource users, communities, businesses, conservation organizations, research institutions, development banks, aid agencies and others that share this aim.

14. Countries may have difficulty applying the guidelines. They may have to choose where first to apply the guidelines and do so progressively. Countries and organizations in a position to assist others to build the necessary management capacity should endeavour to do so, if requested.

15. More detailed provisions will be needed to guide the sustainable use of particular species and ecosystems under specific local conditions. The present Criteria and Requirements are designed as a framework within which such provisions may be developed.

16. IUCN will attempt to support these guidelines with more specific guides backed by case studies. These guides will apply to major categories of use such as hunting and

trapping, logging, fishing, and nonconsumptive uses. The case studies will test the Criteria and Requirements and examine ways of implementing them. IUCN will also attempt to clarify the complex ethical issues arising from nonconsumptive and consumptive uses of wild species. IUCN will also supplement the suggestions given here for a legal framework for sustainable use.

17. These guidelines will be reviewed and revised periodically, as efforts to use wild species sustainably are evaluated and understanding of the subject improves. The first review will be within three years of adoption of the guidelines as IUCN policy by the IUCN General Assembly.

18. To promote the sustainability of uses of wild species, States and conservation organizations should disseminate these guidelines widely.

## **Criteria for Sustainable Use**

19. A use of a wild species is likely to be sustainable if:

(a) It does not reduce the future use potential of the target population or impair its long-term viability;

(b) it is compatible with maintenance of the long-term viability of supporting and dependent ecosystems;

(c) it does not reduce the future use potential or impair the long-term viability of other species.

## **Interpretation of the Criteria**

20. Long-term viability can be impaired by impacts on the target population's size, productivity, sex ratio, age structure, social behaviour, genetic diversity, or on components of its ecosystem. In many cases, some of these factors may vary from year to year. Use often affects such variation. This is acceptable as long as it is within the normal range of variation of the target population and ecosystem components concerned.

21. The use should be managed to ensure:

(a) No reduction of the future use potential of the target population. In the case of consumptive uses, both short-term and long-term harvest levels of the target population should be set with full regard for the precautionary principle (see paragraphs 50-52).

(b) Low risk. Risk of seriously depleting the target population should be negligible.

(c) Restoration. Uses of target populations that have been overused in the past should allow recovery of the population to a level consistent with the expected long-term capacity of the ecosystem (not necessarily its historical capacity). Where necessary, the ecosystem should be rehabilitated or restored to promote recovery of the population.

The relative importance of the above three elements will vary from case to case.

22. Loss of genetic diversity should be avoided by carefully monitoring and limiting harvests where the risk is greatest - in particular where harvesting:

(a) Concentrates on particular sex, age or size classes;

(b) includes geographically distinct or genetically well differentiated or rare populations;

(c) includes populations at the geographical, elevational (including depth in the case of marine species) or other locational extremes of a species' range; or

(d) includes endemic populations restricted to a small area.

23. The ecosystem components necessary for the survival of the target population may include habitats, predators, prey, pollinators, seed dispersers, and the structure and fertility of the soil. Natural events can change these components, as can human activities. It is important to be aware of such changes, including likely but unpredictable events such as hurricanes and drought, and to alter use levels in response to them. It is also important that use of the target population does not reduce the capacity of the habitat to support the species or other species within that habitat. It is recognized that the populations of non-target species may fluctuate in relation to use of the target species.

24. Impacts on associated ecosystems and other species are likely to be of most concern when:

(a) The use is not species-specific and incidental impacts are high;

(b) many other species depend on the target species; or

(c) the associated ecosystems or non-target species are rare, threatened, or economically or culturally important.

25. In the first case, impacts on the most sensitive species need to be specially considered. In the second case, the ecological role of the target species needs to be assessed and use levels adjusted to accommodate and maintain the integrity of the ecosystem and the viability of other species. In the third case, the main uses requiring careful assessment are: consumptive uses that involve high levels of incidental take or habitat alteration (such as logging, fishing, grazing of livestock on wild vegetation); and nonconsumptive use of wild species and ecosystems where visitor pressure is high.

### **Application of the Criteria**

26. The Criteria are challenging and are not likely to be met immediately in many situations. There are large numbers of species used consumptively and nonconsumptively and considerable information may be needed to show that the Criteria have been met. It may take years to obtain this information in particular cases, and given limited personnel and financial resources, countries should follow the precautionary principle in controlling uses of wild species. However, where uses are clearly likely to have little impact, it is unreasonable to insist that they must demonstrate compliance with the Criteria or be stopped.

27. Accordingly, it is recommended that priority attention be paid to situations where the scale of use or the condition of the target population or its supporting ecosystems engenders concern about ecological sustainability. Uses should be made to conform with the Criteria before the use causes significant damage to the target population, associated ecosystems or other species. Adopting the precautionary principle, lack of information must not be used to justify continuing a potentially unsustainable use without efforts to gather the necessary information in a timely manner.

28. The sustainable use of migratory species often depends on adequate habitat maintenance in places far from the area of use. Making sure that the Criteria are met is especially difficult under these circumstances, and will require cooperation by managers and users in many jurisdictions (see also paragraph 46).

### **Requirements for Fulfilling the Criteria**

29. These Requirements do not apply to uses whose impacts are obviously inconsequential.

30. The Requirements for making uses sustainable are:

(a) **Information** on the target population and its associated ecosystems, on current and proposed uses, and on social and economic factors affecting them.

(b) A **management system** that can respond rapidly to changing conditions or better information.

(c) A supportive and effective **legal framework**.

(d) **Social or economic incentives** for the people living with the target population or its supporting ecosystems to conserve them.

(e) Acceptance of the **precautionary principle and safeguards** to ensure the survival of wild species, populations and supporting ecosystems.

## Information

### Interpretation

31. Reliable information is needed to determine the long-term viability of the target population and its associated ecosystems under current and proposed conditions of use. Depending on the species, and on the type and level of use, such information may include:

(a) The size, structure and dynamics of the target population. This may include such factors as recruitment and natural mortality rates, age structure, size distribution, sex ratio, density, growth rates, age to maturity, dispersal and ranging behaviour, social behaviour, and genetic composition.

(b) Habitats or other ecosystem components necessary for the survival of the target population.

(c) The relationships between the target population and associated species and communities (such as predators, parasites, prey, seed dispersers, pollinators, epiphytes, competitors, disease organisms).

(d) Abiotic factors (such as climate and weather, fire, soil conditions, water quality) that might influence the status of the target population or its supporting ecosystems.

(e) Types of use (e.g., viewing, hunting, logging), levels of use (e.g., size of harvest, numbers of visitors, catch per unit of effort), manner of use (e.g., life stages used, locations and seasons of use), alternative uses that may be more sustainable.

(f) Social, cultural and economic factors affecting use, such as changes in markets or technology, elasticity of demand and supply, the degree to which markets can be manipulated, economic and property relations, power and authority relationships, and values and perceptions.

### Application

32. Judgement is needed as to what constitutes adequate data. It would be impracticable to insist on comprehensive scientific information before any use can be sanctioned. However, the less information available, the lower the safe level of use. Sometimes, particular indicators of population or ecosystem health may be available. Monitoring systems, local or traditional knowledge, and scientific research are sources of information. In all cases, those managing use ought to be satisfied that they have enough knowledge to provide early warning of unsustainable trends.

33. For new uses, the minimum requirement is an estimate of the size and structure of the target population. In the case of a new consumptive use, a limited harvest programme using a range of harvest levels may be a suitable means of acquiring the information needed, if accompanied by a monitoring and evaluation programme.

34. For continuing uses it is essential to have a programme to monitor and evaluate appropriate indicators of use levels and the status of the target population. It is also necessary to monitor the status of habitats and the impact of the use on supporting ecosystems. In addition, it is important to identify any other information required to enable the use to meet the Criteria, and to implement a cost-effective system to obtain the information as quickly as possible.

35. Information required to determine the long-term viability of a population or ecosystem requires many years to assemble and verify, since several key variables (such as recruitment) can change naturally from year to year. Survey methods should be employed consistently to ensure that data are comparable from year to year.

## Management system

### Interpretation

36. A management system is needed that is able to adapt and adjust uses in response to changes in the target population, its supporting ecosystems, and other affected

species. Such a system recognizes that all the information needed to ensure sustainable use may not be available. It therefore sets use levels cautiously and adjusts them in response to monitoring and other sources of information.

37. In addition, management should take account of changes in demand for the target population as a result of changes in human population numbers, per capita resource consumption, or technologies. It should also take account of impacts of other human activities on the target population or its supporting ecosystems (such as pollution and habitat destruction).

### Application

38. Management involves a partnership between managers and users or other beneficiaries of the use. Common arrangements include:

- (a) Government (manager) for the people (users/beneficiaries).
- (b) Community (manager) for community members (users/beneficiaries).
- (c) Private landholder (manager) for him/herself and dependants (users/beneficiaries).

39. Effective management requires:

- (a) Clear definition of rights and responsibilities with respect to the target population and its supporting ecosystems. This includes providing the users of the target population with legally established long-term rights and responsibilities in its management. The exclusivity, duration and other characteristics of the rights and responsibilities will vary with the nature of the target population and the resource ownership system. The closest possible linkage should be made between the benefits that users derive from wild species and their accountability for using them sustainably.
- (b) Fair sharing of the costs and benefits of using wild species among the different managers and users. The benefits should be sufficient to cover the costs of management and provide an incentive for conservation of the species used and their supporting ecosystems.
- (c) Exchanges of information on the status and trends of the target population and its supporting ecosystems, and on sustainable use practices and benefits, among all those involved in the use. This can be achieved through consultation, training (including on-site

demonstration projects), formal and informal educational programmes, and extension services.

40. A resource management plan should help the manager make scientifically and economically sound decisions. It is especially important in any of the following cases:

- (a) Target populations are declining.
- (b) Consumptive uses are on a large or increasing scale, relative to the target population or its supporting ecosystem.
- (c) Consumptive uses have a significant impact on supporting ecosystems or other species.
- (d) Nonconsumptive uses have a significant impact on the target population, other species or supporting ecosystems. Significant impacts include, for example, frequent disturbance of animals, trampling of coral reefs, and erosion.
- (e) Potential changes in land use or other conditions could have a significant impact on supporting ecosystems or the target or non-target species.
- (f) Management requires coordination of a number of managers or users, because the species being used comes under more than one jurisdiction.

41. The resource management plan may cover one or more species or a particular area. Area coverage is often preferable, to encourage both an ecosystem approach to management and local participation in the plan. The plan should show how the Criteria will be met with respect to the species and area concerned. It should summarize the information on which management is based, identify the priority information gaps, and set out a programme to fill the gaps. The plan should address how a target population, its supporting ecosystem, and use levels will be monitored, and procedures for adjusting use levels on the basis of monitoring. It should describe how uses will be regulated and how the manager will ensure compliance with regulations.

42. The plan should be prepared by the party responsible for management, in cooperation with users, local communities, and other relevant interest groups. Depending on the management system, the responsible party may be a government agency, a community group, an association of resource users, or a landholder. An area plan may involve more than one management agency, in which case a single party should be designated as having principal responsibility for use of particular resources.

The plan should be periodically evaluated by an independent, informed and impartial body from the country concerned. Both the plan and the evaluation should be open to public input and available for public review.

## Legal framework

### Interpretation

43. States, including their competent local authorities, should ensure that populations of wild species found within their jurisdictions are conserved and, if used, are used sustainably. Government agencies should be legally authorized to advise and assist resource managers to ensure that uses are sustainable. The responsibility and participation of local communities, including indigenous peoples, should be recognized in national legislation for the sustainable use of wild species.

44. These Criteria for the sustainable use of wild species should be incorporated clearly into the legislative and administrative framework of each State, incorporating the precautionary principle as a fundamental element of such laws.

### Application

45. Governments' policies, laws and institutions should ensure that any use of wild species is ecologically sustainable. However, States' systems of governance and laws vary. Nevertheless, to provide effective management of wild species, States ought to adopt a legal framework that takes into account the following:

(a) Adopting, or amending when necessary, legislation governing the sustainable use of wild species, publishing and disseminating it to all levels of government and making it readily available to the public;

(b) identifying habitats necessary to maintain viable populations of species and reserving where required these areas by legislation to prevent inconsistent uses;

(c) designating through law the corridors, transition zones and buffers to safeguard effectively threatened wild species whose habitat or range includes unprotected as well as protected areas;

(d) establishing norms for the management of wild species as an integral part of land use regulations, such

as town and country planning or zoning or coastal zone management regimes;

(e) enabling local communities and/or individuals to manage, or participate in the management of wild species, and to derive legitimate benefits from their sustainable use;

(f) requiring that environmental impact assessment procedures evaluate adverse effects of development on wild species, including analysis of base-line data about possibly affected wild species and identification of alternatives or mitigation measures essential to ensure the viability of wild species;

(g) establishing legally the seasons during which the taking of species is allowed or prohibited, and other such limitations as necessary to ensure that use does not result in the impairment of viability through impact on species' functions such as breeding, migration, and resting;

(h) establishing and enforcing administrative and criminal sanctions to deter and, where necessary, to punish illegal uses such as poaching or smuggling;

(i) establishing, training and equipping State and local conservation and other agencies to administer and enforce applicable statutes and regulations for the conservation and sustainable use of wild species, and providing for administrative and judicial review to facilitate their consistent and lawful function;

(j) providing for routine budgetary allotments to underwrite these legal measures, and enact laws establishing appropriate user fees and management payments and enabling establishment of trust funds or other mechanisms for channeling financial contributions to enhance the viability of wild species;

(k) ensuring by law that contracts or permits for tourism operations and other commercial interests, such as parks concessionaires, require adherence to these Criteria.

46. A target population whose range crosses or straddles international boundaries should be the subject of a management agreement between the countries concerned, unless its long-term viability is already assured. The agreement should be designed to meet the Criteria. Where a target population occurs outside the jurisdiction of any government, it should be used only under an agreement that upholds the Criteria and includes mechanisms for enforcement of the agreement. In the

case of marine populations that are in the high seas, or cross or are shared by two or more Exclusive Economic Zones (EEZs) or an EEZ and the high seas, governments should cooperate with the appropriate international management agency. New uses should not reach substantial levels before the appropriate management agency has been identified or established. In addition, States should both:

(a) Adhere to and implement international agreements designed to enhance wild species' viability, and further ensure as required by international law that all activities within a State's jurisdiction or control shall not impair the viability of wild species in another State or in areas of international jurisdiction; and

(b) establish emergency response capabilities to protect wild species from avoidable negative impacts of military activities during times of armed conflict, as required by international law.

## **Social and economic incentives**

### **Interpretation**

47. The social and economic benefits from sustainable use could provide powerful incentives to conserve wild species and their supporting ecosystems, provided:

(a) The people most likely to have a direct impact on the species and ecosystems concerned receive a fair share of the benefits from the use. Resource users are more likely to conserve and use wild species sustainably if it is in their interests to do so.

(b) There is a clear connection between the benefits and conservation. Fulfillment of the Criteria yields immediate and sustained net benefits for people, and a portion of these benefits should be reinvested in maintaining target populations and their supporting ecosystems.

### **Application**

48. Governments, development banks, aid agencies, conservation organizations, and businesses may be able to establish or enhance incentives for conservation of wild species and their supporting ecosystems and assist in the implementation of resource management plans by:

(a) Respecting and encouraging rights and traditions of local communities that are compatible with conservation of wild species.

(b) Supporting traditional customs that are ecologically sound.

(c) Providing fiscal incentives to encourage the sustainability of uses of wild species.

(d) Providing economic, institutional, biological and other technical assistance on request.

(e) Developing community-level education programmes on the uniqueness and importance of local wild species.

(f) Cooperating with rural communities to develop sustainable use projects that demonstrate the value of maintaining those populations used and their supporting ecosystems.

(g) Cooperating in the creation of effective management systems for use by the local people living near or in a target population or ecosystem.

(h) Determining the values of wild species and populations, assessing the size and characteristics of markets, building up expertise in reaching and developing markets, and improving terms of trade in the products of wild species.

(i) Investing in the creation of producers' organizations to assist in the efficient production, distribution and marketing of the resources concerned.

(j) Improving the price and profitability to local people of nonconsumptive and consumptive uses of wild species, and by helping local people to add value to sustainable uses and retain the added value.

(k) Developing and publicly identifying, through labels or otherwise, sustainable uses of wild species to replace unsustainable uses.

49. It is recognized that attempts to increase economic benefits from uses of wild species run the risk of promoting unsustainable levels and types of use. The impacts of such attempts will need to be monitored very closely. It is also recognized that making uses sustainable may cost more than some forms of unsustainable use. Hence products from sustainable use may not be able to compete with similar products from unsustainable use, unless specific trade or fiscal measures are taken to favour the products from sustainable use.

## The Precautionary Principle and Other Safeguards

### Interpretation

50. The precautionary principle requires approaching questions of sustainability of use with the commitment to act in the way least likely to impair the viability of the species or ecosystem. This may result in decisions not to use. This precautionary principle is especially important when estimating sustainable use levels. Use levels should always be cautious and well within the calculated capacity of the target population and its supporting ecosystems. Target populations and supporting ecosystems may need to be safeguarded by management regimes that include the designation of protected areas.

### Application

51. In applying the precautionary principle, it is important to consider those elements of the ecosystem affected by the use that are most vulnerable to long-term or irreversible damage. In some instances, it may be the target population. In others - for example, the harvesting of animals in drought prone areas - it may be the animals' habitat. In the former case, the precautionary principle may be satisfied by a low rate of harvest. In the latter case, it may be satisfied by a higher rate of harvest that protects the habitat from being degraded (for example, by overgrazing).

52. Methods of estimating sustainable use levels, and their likely range of error, should be thoroughly investigated and documented in the management plan. Use levels should be set with sufficient room to:

(a) Accommodate potential negative effects of miscalculation, unforeseen factors or unpredictable events (such as disease, natural disasters, drought).

(b) Allow for uncertainty and lack of information about the target population and its supporting ecosystems, and the impact of the use on associated species and ecosystems.

For example, in the case of consumptive uses, a recommended general rule is that the harvest rate should usually be half or less than half of the intrinsic rate of increase of the population.

53. A system of protected areas that includes a country's major ecosystem types, as well as rare and unique ecosystems, can provide valuable comparative baseline data for monitoring the status of populations and ecosystems that are being used.

54. National protected area systems can also be a reservoir of genetic diversity, protecting populations of many target species. However, they are usually unable to protect migratory species or species with widely dispersed populations (such as large carnivores, marine turtles, and tunas). Such species will depend largely on management outside protected areas, supplemented by protection of parts of their populations during crucial stages in their life history (for example, protection of breeding and staging areas). International cooperation, through bilateral, regional and global conservation agreements, will often be needed.

## Glossary

**Biodiversity:** The variety among living organisms including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

**Conservation:** Protection, maintenance, rehabilitation, restoration, and enhancement of populations and ecosystems, including the management of human use of organisms or ecosystems to ensure such use is sustainable.

**Consumptive use:** An activity by which human beings derive benefit from a population or ecosystem **by permanently removing** organisms or their products from the population or ecosystem concerned. Hunting, egg collecting, trapping, live capturing, fishing, shellfish gathering, logging, plant gathering, and mushroom collecting are examples of uses that permanently remove whole organisms. Tapping wild trees for exudates and similar activities involving animals (for example, milking wild snakes for venom), gathering fruits, collecting honey from wild bees, cutting plants for thatch or fodder, and putting livestock to graze on wild vegetation are examples of uses that permanently remove only certain products and not the producing organism.

**Domesticated population:** A population that is adapted to life in close association with and to the advantage of humans, and whose entire life cycle is carried out under human management.

**Ecosystem:** A dynamic system of plants, animals and other organisms interacting together and with the non-living components of their environment in a defined area.

**Endemic population:** A population native to, and restricted to, a particular geographic area, often within a State.

species. Such a system recognizes that all the information needed to ensure sustainable use may not be available. It therefore sets use levels cautiously and adjusts them in response to monitoring and other sources of information.

37. In addition, management should take account of changes in demand for the target population as a result of changes in human population numbers, per capita resource consumption, or technologies. It should also take account of impacts of other human activities on the target population or its supporting ecosystems (such as pollution and habitat destruction).

### Application

38. Management involves a partnership between managers and users or other beneficiaries of the use. Common arrangements include:

- (a) Government (manager) for the people (users/beneficiaries).
- (b) Community (manager) for community members (users/beneficiaries).
- (c) Private landholder (manager) for him/herself and dependants (users/beneficiaries).

39. Effective management requires:

- (a) Clear definition of rights and responsibilities with respect to the target population and its supporting ecosystems. This includes providing the users of the target population with legally established long-term rights and responsibilities in its management. The exclusivity, duration and other characteristics of the rights and responsibilities will vary with the nature of the target population and the resource ownership system. The closest possible linkage should be made between the benefits that users derive from wild species and their accountability for using them sustainably.
- (b) Fair sharing of the costs and benefits of using wild species among the different managers and users. The benefits should be sufficient to cover the costs of management and provide an incentive for conservation of the species used and their supporting ecosystems.
- (c) Exchanges of information on the status and trends of the target population and its supporting ecosystems, and on sustainable use practices and benefits, among all those involved in the use. This can be achieved through consultation, training (including on-site

demonstration projects), formal and informal educational programmes, and extension services.

40. A resource management plan should help the manager make scientifically and economically sound decisions. It is especially important in any of the following cases:

- (a) Target populations are declining.
- (b) Consumptive uses are on a large or increasing scale, relative to the target population or its supporting ecosystem.
- (c) Consumptive uses have a significant impact on supporting ecosystems or other species.
- (d) Nonconsumptive uses have a significant impact on the target population, other species or supporting ecosystems. Significant impacts include, for example, frequent disturbance of animals, trampling of coral reefs, and erosion.
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(b) Allow for uncertainty and lack of information about the target population and its supporting ecosystems, and the impact of the use on associated species and ecosystems.

For example, in the case of consumptive uses, a recommended general rule is that the harvest rate should usually be half or less than half of the intrinsic rate of increase of the population.

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**Conservation:** Protection, maintenance, rehabilitation, restoration, and enhancement of populations and ecosystems, including the management of human use of organisms or ecosystems to ensure such use is sustainable.

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**Domesticated population:** A population that is adapted to life in close association with and to the advantage of humans, and whose entire life cycle is carried out under human management.

**Ecosystem:** A dynamic system of plants, animals and other organisms interacting together and with the non-living components of their environment in a defined area.

**Endemic population:** A population native to, and restricted to, a particular geographic area, often within a State.

**Exotic population:** A population that exists in a free state in an area outside its historically known range as a result of intentional or accidental introduction by human activities.

**Feral population:** A population that has escaped or been released from cultivation or domestication and maintains itself in the wild state.

**Gene:** The part of the DNA molecule that encodes a single enzyme or structural protein unit and transmits unique hereditary information from one generation to another.

**Genetic diversity:** The variety of kinds, forms (alleles), frequencies, and structural arrangements of genes in a population or species, or among populations or species of higher taxa. Sometimes used to refer to the total genetic variety of all species in a defined area.

**Habitat:** A place or ecological community where a particular species occurs and that provides conditions for its survival (such as food and shelter).

**Integrity of ecosystems:** The intactness of the natural array of biotic and abiotic components in an ecosystem, along with the functional balances and interdependencies among them. Large-scale environmental phenomena (such as natural fires, rainfall, cloud cover) are also involved in regard to management of landscapes or biomes. See also "viability" of ecosystems.

**Intrinsic rate of increase:** The maximal growth rate of a population under prevailing ecological conditions but without the effects of competition from members of the same species. This rate is specific to a species, and often to a population, but the actual rate of growth depends on the population's density and structure and its environmental situation at the time.

**Nonconsumptive use:** An activity by which human beings derive benefit from a population or ecosystem **without permanently removing** organisms or their products from the population or ecosystem concerned. Examples include wildlife viewing, visiting sacred groves and other culturally important ecosystems, and managing wild insects for crop pollination.

**Organism:** A living being or form of life that is a cell or is composed of cells. Any member of the kingdoms Monera (prokaryotes or bacteria and blue-green algae), Protocista (other algae, protozoa and single-celled organisms that are not prokaryotes or fungi), Fungi (mushrooms, yeasts, lichens, etc.), Animalia

(invertebrates, fishes, amphibians, reptiles, birds, mammals), or Plantae (mosses, ferns, conifers, flowering plants, etc.).

**Population:** A group of individuals of the same species separated geographically, or sometimes temporally, from other such groups. Populations often are distinctive entities within a species, showing substantial genetic differences as groups across the geographic range of a species.

**Protected area:** An area managed through legal or customary regimes so as to protect and maintain biodiversity and natural and cultural resources.

**Resource:** A population or ecosystem that is the subject of nonconsumptive or consumptive use.

**Semi-domesticated population:** A population that reproduces with human assistance but otherwise lives freely in naturally-regenerating habitats to which it is not native. For example, trees from non-local seed that are planted on forest land that is not otherwise tended. Note: the definitions of semi-domesticated and semi-wild populations represent somewhat arbitrary points on the continuum from wild to domesticated.

**Semi-wild population:** A population that reproduces with human assistance but otherwise lives freely in naturally-regenerating habitats to which it is native; or that reproduces without human assistance but requires supplementary feeding to ensure survival because its habitat cannot support it throughout the year. For example, fish fry produced in hatcheries from eggs collected from wild or semi-wild fish and returned to the stream from which the eggs were collected; winter-fed deer in Europe and North America. Note: the definitions of semi-domesticated and semi-wild populations represent somewhat arbitrary points on the continuum from wild to domesticated.

**Species:** For sexually reproducing organisms, a species is a distinct population or group of populations that actually or potentially interbreeds, and which is innately isolated reproductively from any other population or group of populations; for asexual or unisexual organisms, a species is a distinct population or group of populations in which all individuals are ecologically interchangeable and/or genetically identical, and which share a common ancestry and descent potential unique to the population or group of populations.

**Sustainability:** Throughout this document, sustainability refers to the Sustainability of use, as defined under "sustainable use" below.

**Sustainable use:** Use that does not reduce the future use potential, or impair the long-term viability, of either the species being used or other species; and is compatible with maintenance of the long-term viability of supporting and dependent ecosystems.

**Target population/Species/Ecosystem:** The population, group of populations, species, group of species, or ecosystem that is the object of use.

**Use:** An activity by which human beings derive benefit from a population, species or ecosystem. Uses are either consumptive or nonconsumptive. They may be personal or domestic (subsistence), for income from trade in local, national or international markets, for food, medicine, clothing, shelter, fuel, fibre, and cultural needs (including religious, ritual, ceremonial, recreational, intellectual and aesthetic). "Use" does not include control of a species that may be considered harmful to people.

**Viability:** When applied to a **species or population**, viability refers to the capacity of the target species or population to: (a) maintain genetic diversity; (b) maintain its potential for evolutionary adaptation; and (c) be at

minimal risk of extinction (in the case of a species) or extirpation (in the case of a population of a widespread species) from demographic fluctuations, environmental variation and potential catastrophe (including over-use).

When applied to an **ecosystem**, viability refers to the capacity of the ecosystem to: (a) maintain the diversity of its components (habitats, species, genes); (b) maintain its capacity for continuity and renewal; and (c) maintain its productivity.

**Viable:** Used in relation to populations, species and ecosystems as possessing the quality of "viability", as defined above.

**Wild population:** A population that reproduces without human assistance in naturally-regenerating habitats to which it is native.

## References

IUCN/UNEP/WWF. 1991. *Caring for the Earth. A Strategy for Sustainable Living*. IUCN/UNEP/WWF, Gland, Switzerland.

# Report of the First Meeting of the IUCN/SSC Specialist Group on Sustainable Use of Wild Species (SG/SUWS)

Hotel Libertador Kempinski, Buenos Aires, Argentina, 12-14 January 1994

## "Assessing the sustainability of uses of wild species"

Twenty four members of the SG/SUWS and six officers and staff of SSC and IUCN secretariat participated in this three-day meeting. The participants are listed at the end of the report.

Financial support for the meeting was provided by the International Development Research Centre, Canada, and the Peter Scott IUCN/SSC Action Plan Fund.

The main purpose was to develop an initial procedure for assessing the sustainability of uses of wild species.

### Case papers

Nine papers were prepared for the meeting, providing 11 preliminary case studies to focus its work. Eight papers were presented and discussed on the first day. The paper on ncema rushes in South Africa could not be presented due to lack of funds. The papers proved to be extremely useful, and were constantly drawn on by participants during the discussions on the second and third days.

*Capture of parrots and hunting of rodents and lizards in Argentina (John E. Jackson, Enrique H. Bucher & José Maria Chani)*

*Uses of kangaroos in Australia (Gordon Grigg)*

*Trapping of furbearers in the Yukon, Canada (Brian G. Slough & R. Harvey Jessup)*

*Viewing of monkeys by tourists and the impact of tourism infrastructure in Costa Rica (Grace Wong & Eduardo Carrillo)*

*Extraction of venom from snakes in India (Romulus Whitaker & Harry Andrews)*

*Lokta harvesting and paper making in Nepal (Anil Chitrakar)*

*Gathering of ncema rushes in South Africa (Ricky H. Taylor)*

*Hunting of caiman in Venezuela (Alvaro Velasco, Mirna Quero & Roldan De Sola)*

*The CAMPFIRE programme in Zimbabwe (Brian Child)*

### Draft procedure for assessing the sustainability of uses of wild species

On the second day, participants formed three working groups. Each group prepared material for a draft procedure for assessing the sustainability of uses of wild species. They considered why assessments should be undertaken, who should do them, what factors they should cover, and how they should be carried out.

On the third day, the meeting discussed the main issues raised by the three working groups. Participants who were staying on for the IUCN General Assembly agreed to form a working group to revise and consolidate the three reports into a single draft procedure for assessment.

The following is a summary of the main points:

- Assessment is a matter of determining the probability of sustainability. Assessment should be ongoing. Frequency of assessment should be determined by the risk of unsustainability.
- The main purpose of assessment is to improve management - to increase the probability of a use being sustainable. The aim is to promote uses that contribute to maintenance of native biodiversity; and to stop uses that are harmful, if measures to make them sustainable are not taken, or if the evidence suggests that they cannot be sustainable.
- Assessment should cover both the condition of the ecosystem and the effect of the use on the condition of the ecosystem. Uses that improve the condition of the ecosystem should be encouraged.

- Assessment should be in two parts: (1) ecological sustainability (impact of the use on the target population and its supporting ecosystem); (2) social, economic, political and other human factors. The latter should cover the value, tenure, ownership, reward and control system, and if and how it works.

The draft assessment procedure will be sent for review by all members of the SG/SUWS and participants in the meeting. It will then be revised. The revised assessment procedure will be tested by members of the SG/SUWS and others who wish to participate.

The assessment procedure should be tested on as many cases as possible, selected so that:

- collectively they are representative of the full range of uses of wild species;
- they are representative of the membership of the SG/SUWS; and
- they include uses that are unsustainable, uses that are beneficial, and uses that are in between.

### **Workplan of the SG/SUWS for 1994-1996**

Participants also discussed the workplan of the SG/SUWS for 1994-1996 and the draft IUCN Guidelines for the Ecological Sustainability of Nonconsumptive and Consumptive Uses of Wild Species.

The Co-Chair proposed the following mission for the SG/SUWS:

1. Define and assess the sustainability of uses of wild species.
2. Promote the sustainability of uses of wild species.
3. Formulate guidelines for ethical uses of wild species.
4. Develop networks of people with the knowledge and skills to achieve these objectives.

It was pointed out that these are action headings rather than objectives. A clear statement of objectives is needed. A logical framework analysis could be conducted to decide precise ways of achieving the objectives.

Several members recommended that the third item be dropped. The first two items were a higher priority and would provide the SG/SUWS with more than enough work. Progress was much more likely to be made with

the first two items than with the third, which could become bogged down in controversy and conflict.

The group should assess the conservation benefits of uses of wild species and promote uses that have conservation benefits.

The group will continue to expand, in particular to include more social scientists and economists. Regional networks will also include members of user groups.

A large working meeting should be held to:

- Review the test cases.
- Revise the assessment procedure.
- Review the implications of the test cases for the guidelines.

A regionally representative Steering Committee will be formed.

The Co-Chairs of the SG/SUWS and the Director of the IUCN Sustainable Use of Wildlife Programme are discussing how to integrate both activities into one programme.

The proposed workplan will be reviewed by all members of the SG/SUWS.

### **Draft IUCN Guidelines for the Ecological Sustainability of Nonconsumptive and Consumptive Uses of Wild Species**

The draft guidelines that were submitted to the IUCN Council reflected a consensus of the SG/SUWS. The changes made by the Council do not reflect that consensus.

The case papers presented to the meeting found that the Guidelines (in either draft) are often difficult to apply.

The criteria need clarification. The requirements, in many cases, are not requirements. It is possible to provide a generic description of ecological sustainability. But social, economic, legal, political and other human factors that affect sustainability vary greatly from society to society. Analysis of a wide range of uses and social contexts is needed to provide advice that is widely applicable and to provide specific guidance on particular uses.

As they stand, the guidelines would not increase sustainability in all cases and could be misused to prevent uses with potential conservation benefits.

Therefore, with one exception, participants recommended that the IUCN General Assembly *not* adopt the draft guidelines. Instead the General Assembly

is asked to request the SG/SUWS to test the guidelines and revise them accordingly for the next session of the General Assembly.

It is proposed that the tests of the assessment procedure (see above) be used to test the guidelines.

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# Resolution 19.54 of the General Assembly of IUCN

## Sustainability of Nonconsumptive and Consumptive Uses of Wild Species

**Acknowledging** the great interest in the sustainable use of wild species as a conservation tool;

**Recalling** that both the World Conservation Strategy and *Caring for the Earth* emphasize that wild species should be conserved for their intrinsic value and for the benefit of people;

**Noting** that uses of wild species involve plants as well as animals, and that uses may be consumptive and nonconsumptive;

**Noting** further that the development of guidelines for ecologically sustainable use does not imply, where existing range State legislation sets an effective standard of protection for a specific wild species within that State, that such protection should be removed;

**Aware** that numerous cases exist where wild species are not being used sustainably and that these undermine conservation and public confidence in arguments for sustainable use;

**Recognizing** the extensive work carried out by the IUCN/SSC Specialist Group on the Sustainable Use of Wild Species and the IUCN Sustainable Use Programme to prepare draft Guidelines for the Ecological Sustainability of Nonconsumptive and Consumptive Uses of Wild Species as called for in Recommendation 18.24 of the 18th Session of the General Assembly;

**Aware**, however, that a meeting of the IUCN/SSC Specialist Group on the Sustainable Use of Wild Species and the Workshop on Sustainable Use of Living Natural Resources recommended that the Guidelines not be adopted by the General Assembly, but instead be tested and revised in consultation with a wide range of IUCN members;

The General Assembly of IUCN - The World Conservation Union, at its 19th Session in Buenos Aires, Argentina, 17-26 January 1994:

1. **Reaffirms** that Recommendation 18.24 defines IUCN policy and is the basis for all relevant IUCN decisions on the sustainable use of wild species, and that this policy is an integral part of the Mission of the Union;

2. **Urges** all States to ensure to the extent possible that any use of wild species is ecologically sustainable;

3. **Requests** the Director General and the Chair of SSC, within available resources, and in cooperation with the members of the Union and interested governments:

(a) to test the draft Guidelines in the context of enhancing the conservation of species and habitats;

(b) to ensure that the revised guidelines take into account *inter alia* the different socio-economic, cultural and legal conditions that prevail in different parts of the world;

4. **Requests** the Director General, within available resources:

(a) to provide revised draft Guidelines for consideration at the 20th Session of the General Assembly;

(b) in cooperation with members and Commissions, to strengthen the IUCN programmes concerned with ecologically sustainable use:

(i) to take a lead in communicating the role and importance that ecologically sustainable use of wild species can have in conserving biodiversity;

(ii) to work, as a priority, with governments to correct situations in which wild species are being used unsustainably.

## Occasional Papers of the IUCN Species Survival Commission

*Species Conservation Priorities in the Tropical Forests of Southeast Asia*. Edited by R.A. Mittermeier and W.R. Constant, 1985, 58pp (Out of print)

*Priorites en matiere de conservation des especes a Madagascar*. Edited by R.A. Mittermeier, L.H. Rakotovao, V. Randrianasolo, E.J. Sterling and D. Devitre, 1987, 167pp.

*Biology and Conservation of River Dolphins*. Edited by W.F. Perrin, R.K. Brownell, Zhou Kaiya and Liu Jiankang, 1989, 173pp.

*Rodents. A World Survey of Species of Conservation Concern*. Edited by W.Z. Lidicker, Jr., 1989, 60pp.

*The Conservation Biology of Tortoises*. Edited by I.R. Swingland and M.W. Klemens, 1989, 202pp.

*Biodiversity in Sub-Saharan Africa and its Islands: Conservation, Management, and Sustainable Use*. Compiled by Simon N Stuart and Richard J Adams, with a contribution from Martin D Jenkins, 1991, 242 pp.

*Polar Bears: Proceedings of the Tenth Working Meeting of the IUCN/SSC Polar Bear Specialist Group, 1991*.

*Conservation Biology of Lycaenidae (Butterflies)*. Edited by T.R. New, 1993, 173 pp.

*The Conservation Biology of Molluscs: Proceedings of a Symposium held at the 9th International Malacological Congress, Edinburgh, Scotland, 1986*. Edited by Alison Kay. Including a Status Report on Molluscan Diversity, written by Alison Kay, 1995, 81 pp.

*Polar Bears: Proceedings of the Eleventh Working Meeting of the IUCN/SSC Polar Bear Specialist Group, January 25-28 1993, Copenhagen, Denmark*. Compiled and Edited by Oystein Wiig, Erik W. Born and Gerald W. Garner, 1995, 192 pp.

*African Elephant Database 1995*. M.Y.Said, R.N.Chunge, G.C.Craig, C.R.Thouless, R.F.W. Barnes and H.T.Dublin, 1995, 225 pp.

## **IUCN/Species Survival Commission**

The Species Survival Commission (SSC) is one of six volunteer commissions of IUCN - The World Conservation Union, a union of sovereign states, government agencies and non-governmental organizations. IUCN has three basic conservation objectives: to secure the conservation of nature, and especially of biological diversity, as an essential foundation for the future; to ensure that where the earth's natural resources are used this is done in a wise, equitable and sustainable way; and to guide the development of human communities towards ways of life that are both of good quality and in enduring harmony with other components of the biosphere.

The SSC's mission is to conserve biological diversity by developing and executing programs to save, restore and wisely manage species and their habitats. A volunteer network comprised of nearly 7,000 scientists, field researchers, government officials and conservation leaders from 188 countries, the SSC membership is an unmatched source of information about biological diversity and its conservation. As such, SSC members provide technical and scientific counsel for conservation projects throughout the world and serve as resources to governments, international conventions and conservation organizations.

IUCN/SSC also publishes an Action Plan series that assesses the conservation status of species and their habitats, and specifies conservation priorities. The series is one of the world's most authoritative sources of species conservation information available to nature resource managers, conservationists and government officials around the world.

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