Sustainable Use of Wildlife Programme

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18th Session of the General Assembly
IUCN - The World Conservation Union
Perth, Australia
28 November - 5 December 1990

IUCN
The World Conservation Union

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Founded in 1948, IUCN - The World Conservation Union brings together States, government agencies and a diverse range of non-governmental organizations in a unique world partnership : some 770 members in all, spread across 123 countries.

As a union, IUCN exists to serve its members - to represent their views on the world stage and to provide them with the concepts, strategies and technical support they need to achieve their goals. Through its six Commissions, IUCN draws together over 5000 expert volunteers in project teams and action groups. A central secretariat coordinates the IUCN Programme and leads initiatives on the conservation and sustainable use of the world's biological diversity and the management of habitats and natural resources, as well as providing a range of services. The Union has helped many countries to prepare National Conservation Strategies, and demonstrates the application of its knowledge through the field projects it supervises. Operations are increasingly decentralized and are carried forward by an expanding network of regional and country offices, located principally in developing countries.

IUCN - The World Conservation Union seeks above all to work with its members to achieve development that is sustainable and that provides a lasting improvement in the quality of life for people all over the world.

IUCN Sustainable Use of Wildlife Programme

The mission of the IUCN Sustainable Use of Wildlife Programme (SUWP) is to ensure that the uses of wild species are sustainable. The basic premise of the Programme is that the people who share the ecosystem with the wild species determine whether or not the resources are conserved. To encourage their commitment, the Programme promotes economic and cultural incentives for people to conserve wild species through sustainable management. The Programme is implemented by helping develop demonstration projects, providing advisory and technical services, promoting standards, and building professional and institutional capacity for sustainable use of wild species.

Sustainable Use Of Wildlife

Arising from a Workshop held during the 18th Session of the General Assembly of IUCN Perth, Australia 28 November - 5 December 1990

IUCN - The World Conservation Union 1993

Published by: IUCN, Gland, Switzerland, and Cambridge, U.K.

IUCN
The World Conservation Union

ISBN: 2-8317-0195-3

Produced by: IUCN Sustainable Use of Wildlife Programme with assistance from the staff of the IUCN Office (USA).

Available from: Sustainable Use of Wildlife Programme
IUCN Office, 1400 16th St NW, Washington DC 20036, USA

Printed on chlorine-free paper.

TABLE OF CONTENTS

IV: APPENDICES

FOREWORD

These proceedings document the process in the development of guidelines for the sustainable use of wild species. The process started with a workshop on sustainable use of wildlife, held at the 18th Session of the IUCN General Assembly (Perth, Australia; 1990). Over one hundred and fifty people participated in the two-day workshop, representing developed and developing countries. Workshop participants prepared Recommendation 18.24 (Conservation of Wildlife Through Wise Use of Renewable Natural Resources), which was adopted unanimously by the General Assembly. Continued collaboration and research led to IUCN's Council approval of *Guidelines for the Ecological Sustainability of Non-consumptive and Consumptive Uses of Wild Species [for the Director General to submit to the 19th Session of the General Assembly in Buenos Aires; January 1994].*

In the months since the Perth General Assembly, IUCN established the Sustainable Use of Wildlife Programme (SUWP) to research and test the requirements for sustainable use of wild species and serve as a focal point for providing technical assistance to its members and affiliate organizations. The SUWP has developed demonstration projects for community-based management of wild species and has advised countries on requirements for sustainable use of wild species. The IUCN/SSC established the Specialist Group for Sustainable Use of Wild Species in 1991. This Specialist Group has developed a global network of professionals working for the sustainable use of wild species, has prepared a plan of action to document efforts to utilize wild species sustainably, and has begun examining the ethical basis for uses of wild species.

Both the SUWP and the co-chairs of the Specialist Group collaborated in the drafting of guidelines for the sustainable use of wild species and facilitated extensive review and comment from IUCN members and associates. No other IUCN policy has received such extensive review from the membership.

These proceedings are organized chronologically. Part I includes the introduction and overview. Part II is comprised of background papers on such thematic topics as the history of sustainable use, legal trade, economics and human population factors affecting the sustainable use of wild species. Part III is made up of case studies from eight countries. Part IV provides appendices containing the Recommendation 18.24, *Conservation of Wildlife through Wise Use of Renewable Natural Resources*, prepared during the workshop, and the *Guidelines for the Ecological Sustainability of Non-Consumptive and Consumptive Uses of Wild Species.*

We are indebted to the authors of the following papers for providing a solid base of knowledge and experience from which to begin this critical process of identifying the requirements for utilizing wild species sustainably. We also wish to thank those participants who worked tirelessly throughout the workshop and who have continued to provide valuable input and advise in the development of the *Guidelines*.

Stephen R. Edwards
Workshop Convenor
Director, IUCN Sustainable Use of Wildlife Programme

I. INTRODUCTION

SUSTAINABLE USE OF WILDLIFE
AN IUCN PERSPECTIVE

Martin W. Holdgate
and
Stephen R. Edwards

HISTORICAL BACKDROP

There is evidence, from the earliest times that certain species, particularly large mammals such as mammoths, mastodon, and South American giant sloth were over-exploited by humans. Throughout recorded history we see an emerging pattern of controls designed to limit wildlife harvesting, ranging from indigenous cultural taboos and mores prohibiting hunting in prescribed areas to the establishment of private hunting preserves by the royal families of Europe. In most cases these controls were tied to property rights, of the aristocracy or the tribal chiefs. Since the 16th century there has been a progressive and systematic codification of laws directed at securing and maintaining land for wild game and controlling harvests of individual species.

With European colonization of Asia, Africa and the "new world", indigenous populations were systematically subjugated to "common law or civilian system ... imposed by a colonial power and retained after independence" (Forster 1990). In most cases colonial laws disregarded pre-existing customs or tradition applying to the use of wildlife. These legal systems were generally designed to control harvesting by restricting access to particular species, and authority and control over the wildlife resources was vested with colonial government. The relationship of the rural people with the wildlife resources upon which they were/are dependent was generally ignored.

Colonial governments were influenced by demand in the colonizing country for harvests of certain species, which often led to excessive exploitation. For example the dodo and sea mink were harvested to extinction to serve European markets. The North American bison and beaver were nearly extirpated because of external market demand. Refinements in harvesting methods and the use of more sophisticated weapons accelerated the slaughter. In each instance, the supply must have seemed inexhaustible in the beginning and the trend to extinction was most likely driven by increasing prices as the supply dwindled. The pattern in developed industrialized countries is well established and persists to today, causing the precipitous decline of species like the African and Asian elephants and rhinos and certain species of parrots.

For the most part marine species have been treated as an open access resource and, in the absence of any strict legal controls, similar results have been realized for several species of whales, fur seals, and turtles which have been hunted to near extinction primarily to serve markets in industrialized countries.

Nevertheless, during this period of uncontrolled exploitation, basic principles of wildlife (population) management began to emerge with the establishment of hunting preserves, harvest quotas, season, and the like. Further, as the consequences of over-exploitation became better known the basic values of people in industrialized countries have changed. Demand for certain wildlife products (i.e., fur coats made of cat or seal skins, ivory) has dropped precipitously in recent years. There is greater emphasis on the importance of preserving the environment and species. And more rigorous laws and controls have been promulgated, often through international cooperation.

As a result wild species have been given more rigorous and effective protection for tourism, sport, food, and numerous products of economic importance. This is particularly true where property rights have been applied to the wildlife estate (i.e., parks, hunting/tourism concessions, harvest rights, etc) have been established. In those cases the species that have greater economic or social value than other wildlife that might compete for other land uses.

PRESSURES FOR HABITAT CONVERSION

Development processes (both social and economic) have obligated conversion of wild habitat to yield the maximum human benefit either in the form of high-yield (genetically altered) food crops such as rice and grain, cash crops such as cotton, livestock, such as cattle or sheep. The growing human population has added to the pressures on the environment in general, and wild species especially, through habitat conversion for agricultural purposes and large-scale use of pesticides.

Because wildlife lacks value until it is used, managed land has been perceived as being more valuable than that regulated through natural processes. So, there has been continuing pressure to convert natural lands for agricultural purposes, and to replace wild species with managed domesticates.

While conversions of natural land for managed purposes (primarily agricultural) have been increasing over the past 25 years, the return on such investment has been declining. This is particularly true in low income countries where, between 1960 and 1980, they were unable to increase their share of the overall agricultural commodity production. At the same time, one reason for the global decline in the value of agricultural products is over production and subsequent price reductions (Swanson 1990). In many cases the land conversion was dependent upon massive loans. With the reduction in value and market share, many of these countries have been unable to repay their debts. According to Swanson, an overall positive trade balance of $55.8 billion with developed countries in 1980 shifted to a $1.2 billion deficit by 1985.

In comparison, those countries that have not followed a conversion strategy have done as well or better in maintaining commodity values. While there are few detailed studies of the economic tradeoffs between conversion of land for agricultural purposes and harvests of natural products, those that have been done indicate that natural harvest systems tend to be superior economically. For example, the conversion of Brazil's rainforests to cattle ranching has demonstrated that land-use conversion reduces the value of the land. Income from beef sales cover only about 45% of the recurring costs (Browder 1988), and could not continue without massive government subsidies. The conversion of Malaysia's tropical forests for cultivation has decreased their net production value from US$2,455 per hectare to US$217 ha - a loss of over 90% (Watson 1988)!

From another perspective, many countries have made considerable investments in establishing and maintaining game preserves, parks, and other forms of protected areas. Going back to the affluent 18th and 19th centuries in Europe, and extending throughout the world today, the retention of wild lands for sport and recreation is generally accepted irrespective of prevailing economic forces operating on other lands. In fact, in most cases, these natural lands have become national assets, generating millions of dollars in revenues each year from tourism.

Nevertheless, in most instances the need to respond to the essential requirements of human populations dictates national policies in most developing countries and the long-term loss of their "natural capital" is not taken into account in land-use decisions.

WILDLIFE UTILIZATION AND CONSERVATION

The World Conservation Strategy, published 10 years ago, recognized the principle that sustained use of wildlife is a rational conservation tool to ensure the survival of species. In fact this concept is based on a more fundamental principle: conservation of wildlife resources, and the associated habitat, is dependent upon local people benefiting, within their cultural context, from that resource.

IUCN is evaluating the concept of wildlife utilization in relation to sustainable development to identify those factors that contribute to successful conservation. What is emerging from this assessment is a range of use activities that starts with the harvesting of wild species from their natural habitats, to enhanced management of habitat and population dynamics to favour those species of economic value, to semi-domestication through maintenance of species in closed captive-breeding facilities, and to translocation of selected species of high economic value to other countries exclusively for commercial exploitation. With each step in this progression,

the relevance of the activity to the conservation objectives of the Union becomes less obvious until it is totally lost in the extreme situation where the species is managed exclusively ex situ for commercial purposes, except where there may be a risk of translocated exotic species excaping and impacting on native populations.

Wildlife products serve a global market today which has meant that most developing nations' wildlife resources are being "mined" at levels that cannot be sustained in many cases. Ways must be found to ensure long-term "capital" as renewable resources rather than as targets for short-term uncontrolled exploitation.

From the perspective of economic development it is crucial to know whether or not natural systems can be productive enough to support sustainable utilization of wildlife. It is also important to understand how the benefits are distributed among the participants in a utilization programme, whether population monitoring and harvest controls are adequate to prevent over-exploitation, and whether demand for the product can be controlled.

Trade levels and values of wildlife products at the global level are not well understood. What information that there is, primarily through the Convention of International Trade on Endangered Species of Wild Fauna and Flora (CITES), World Conservation Monitoring Centre (WCMC), and TRAFFIC (an independent trade monitoring network jointly sponsored by WWF and IUCN), indicates that modern-day utilization patterns are often dominated by illegal harvests. Rural communities rarely benefit, governments realize very little if any economic return, and most profit accrues to traders outside of the country. In most cases, international trade in wildlife products with high commercial values is controlled by a relatively few individuals remain insulated from the enforcement of protective legislation in the source country. For example, the bulk of the trade in elephant ivory is believed to have been controlled by only two individuals. In 1989, prior to the imposition of the ban on imports of ivory in most industrialized countries, 60,000 kg were exported with an estimated value of US$ 8,640,000. It is estimated that 1,000,000 crocodilian skins are traded each year, of which half is obtained illegally. In India, over 40,000,000 frogs were harvested each year for the frog-legs market in Europe, prior to the imposition of an export ban in 1984. And several million songbirds are exported annually from Tanzania for an estimated net return of only US$ 20,000 to the country.

What is evident from this information is the need to enhance our ability to monitor international trade in species products and to identify illegal and/or over-exploitive harvests. Governments need to be informed of illegal trafficking. Consumer prices must be communicated to exporting governments.

CONSERVATION PERSPECTIVE

Based on our assessment of the concept of sustainable use of wildlife, from IUCN's perspective, the following conclusions can be drawn:

1. Direct conservation benefits should accrue for species and its habitat. The species must be biologically amenable to harvest and the status of the wild populations must be adequate to support the utilization programme. Following baseline censuring, procedures must be adopted to monitor the status of the wild populations periodically to ensure that harvest rates are not exceeding the reproductive capacity of the ecosystem. Changes should be identified and accounted for in the management programme.

2. The activity must contribute to enhancing the capacity of rural people to manage their natural resources. Rural people should be involved in defining the goals, implementing the activities, and in the overall administration of sustainable use activities. Cultural traditions should be emphasized to the extent practicable.

3. The government must have the necessary infrastructure of laws and enforcement capability to ensure that harvests are within sustainable limits and commercial activities are controllable. In many cases, governments will have to change their legislation to allow for wild harvesting and more rigorous enforcement. The relationships and balance of authority between government agencies and the rural communities will need to be clarified. If the products are exported, equitable tax systems will have to be implemented to ensure that the government has adequate resources to cover the costs of enforcement.

4. The potential demand for the species-related products needs to be evaluated at the local, national, regional and international levels. Trade patterns need to be identified and their impact on the sustainable use activity assessed. A history of illegal trade will require considerable more effort to develop and implement controls adequate to prevent further illegal harvesting of wild specimens. And, the trade goals of a particular activity must be consistent with national laws and international treaties such as CITES.

5. The economic feasibility of wildlife utilization activities should be assessed before they are implemented. The present pattern of wildlife harvesting provides very little economic benefit to rural communities. With the exception of relatively small payments to individual collectors and the generally disproportionately small export taxes collected by the State, the bulk of the "profit" goes to entrepreneurs outside of the country. Projects should be designed to retain a larger percentage of the "added value" in the producer country by encouraging development of controlled commercial activities such as tanneries, manufactures and meat packaging within the country. As a result, export values can be increased (hence tax revenues) and needed foreign exchange can be retained in the country. With mechanisms in place for the equitable distribution of income to rural communities their economic status can be enhanced.

6. Personnel associated with implementing sustainable use activities must be sensitive to the needs of the local communities and support the applied objectives of the project. Basic research requirements must be directed toward the practical requirements of managing the wildlife resource in a sustainable manner.

The relative benefits of utilization of wildlife in semi-natural conditions as opposed to management in controlled systems needs to be evaluated. Such evaluations must take into account the indirect values derived from such "services" as hydrological regulation; the direct income from sales of products at the local, national, regional, and international levels; ancillary economic benefits such as earned foreign exchange; development of infrastructures to accommodate commercial processing; and the costs of establishing and maintaining the government controls and infrastructure necessary to service development activities, including tourism.

The relative costs and benefits derived from wildlife utilization versus other forms of utilization of the land such as agriculture, tree plantations etc., need to be better understood. New techniques are needed to evaluate the economic implications of utilization of natural environments. Better, more robust, figures are needed to defend the concept of maintaining natural habitats which we believe can provide greater economic returns than could be realized if the land were converted to another use.

The societal implications of the wildlife management activity must be addressed. Methodologies must be developed to guide integrated management of different species-components of diverse ecosystems. Greater value from individual species could be derived for example by harvest of the bones and offal to produce high-protein feeds to supplement the diets of other species. Staggered harvests of different species can provide a more balanced off-take while providing opportunities for other people in the rural community to benefit from the development activity. Rotation of harvests among different areas might be necessary; and multiple use patterns for wildlife resources (e.g., hunting, harvesting, and tourism) need to be considered. Governments must be sensitive to the inherent value of their natural environments. Mechanisms must be developed to communicate basic principles associated with sustainable use of wild species.

In many cases implementation of wildlife utilization schemes may depend on restoration of habitats that have been converted for other uses. Shifting from cattle ranching to game cropping requires re-introduction of native

flora and other fauna to support the managed species. This in turn may imply that projects take into account the need for successional re-conversion of habitats. and the time required to obtain the desired results.

PROSPECTIVE

There is no question that human populations will continue to expand. With this population growth will come ever increasing demands for natural resources and land for settlement and food production.

As a result, natural lands will be converted to cultivation and currently cultivated lands will be more intensively managed to produce higher yields. Technology exists to accommodate the needs by emphasizing enhanced production from existing agricultural lands where the soils are good and the capacity for more intensive management is in place. Wild, or natural areas, contain relatively small areas suitable for conversion to agricultural lands to meet long-term needs. For example, it is estimated that only between 10% and 15% of the Amazon Basin could be used for agricultural purposes.

Sustainable harvesting of wild species is most likely to be the optimum strategy in most developing areas of the world. It is certainly the tactic that should be used in relation to the bulk of the marine environment. Only along the coasts will intensive mariculture be possible.

Tourism, most likely will continue to provide an important source of passive utilization of wildlife resources in some areas. As such it would provide a major source of foreign exchange earnings for developing states. Further, the intangible benefit of educating and sensitizing tourists is a factor that should be considered. Nevertheless, an effective tourism industry is dependent upon having the necessary infrastructure in place to accommodate the needs of the tourists. Further, within any area, there most likely will be an upper limit - carrying capacity if you like - to the number of tourists that can be accommodated in an area before tourism becomes detrimental to the environment.

We in the Union look to our members as an important vehicle to focus world attention on the potential of wildlife utilization - and on the many problems that will have to be surmounted as the concept is implemented and elaborated. As the World Conservation Union, we intend to work with our members and volunteer networks to further define better ways to manage wildlife for the express purpose of ensuring the conservation of our environment.

SUSTAINABLE USE OF WILDLIFE
OPENING REMARKS

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To the Chairman of the Species Survival Commission, Dr George Rabb, the ladies and gentlemen who took up their valuable time preparing country and background papers for this workshop, colleagues in conservation of natural resources.

First, I feel honored and greatly privileged that IUCN requested me to chair this very important workshop on sustainable use of wildlife. Secondly, I request you to join me in commending IUCN for its foresightedness once again in issues of world conservation problems. Use of wildlife is indeed a major problem which, if not dealt with now, here in Perth, the world will have lost a heritage that this and future generations will painfully regret forever.

Ladies and gentlemen, this workshop is most important to most of us because we believe it is going to be the beginning of breaking the Berlin Walls of lack of trust and understanding between various conservation groups worldwide and particularly between the developed and developing regions. I am not cheating myself that achieving this will be easy, yet it is my greatest hope and desire that this will be achieved in the next two days.

What is the problem in wildlife conservation today? I will present my perception of the problem as someone from a developing country. But, as you will see, this has great implications for the industrialized countries as well.

Let me start by defining conservation. Dudley (1977) has in my humble opinion very adequately defined conservation. He says conservation includes a range of values, amongst which are the preservation of species and their habitats, the wise use of natural resources based on scientific analysis, and a moral commitment to the future generations of mankind. Conservation involves sensitivity to human environment, an acknowledgement of a limitation of natural resources use, and the development of a collective and individual responsibility towards natural resources.

What have we done wrong? Three points in Dudley's definition of conservation, in my opinion, are the root causes of our failure to conserve wildlife. One, use may include the preservation of the resources for use by future generations, i.e., a moral commitment to the future generations of mankind. There are numerous cases in many regions particularly in developing countries where use of wildlife is far beyond sustainability. Some papers presented here will allude to this.

Ladies and gentlemen, if we are going to come out victors from this workshop and indeed out of the entire General Assembly, we must find solutions to this problem.

Two, scientifically evaluated derivation of benefits. This is the concept of sustainable use. The major problem here is that what constitutes a scientific analysis in the developing world is not the same in the developed world. This is the point where trust and understanding between the two groups diverge. Usually the standards put forward by western conservation groups cannot be met by the developing world - mainly because of lack of financial resources.

What do we do when we are at crossroads like this? We argue amongst ourselves in huge convention halls until those clever with language confuse everybody with resolutions that are not workable. Meanwhile, the wildlife of the world is becoming extinct. We heard many cries that nearly 80% of animal protein consumed in Africa comes from the continent's wild resources. If one of us here has alternative sources, then let us hear them during these two days. Otherwise as they say in English, "if you can't beat them, join them". By joining them, we may be able to influence decisions along sustainability lines.

I am not saying that scientific evaluation is not necessary in sustainable use. In fact, it is a prerequisite and the western countries have a major role to play here. All I am saying is this should not stop us from calling on the world for sustainable use of a resource. Indeed, in other cases we may stop use until the resource has regenerated.

Thirdly, and this could be most important for Africa and probably for all the countries that were colonized. This is the element of a collective and individual responsibility for wildlife resources. In many parts of Africa rural communities are denied this vital conservation responsibility. How did this come about? I will illustrate this with an example from Malawi, which is where I come from.

In Malawi we have concluded that our failure in wildlife conservation is attributed to the way the colonial administration introduced the concept of conservation which was not at all scientific or rational. When Europeans first came to Malawi they found a lot of wildlife. Within a few decades the numbers of wildlife declined. The large number of wildlife when the Europeans arrived is attributed to the African methods of conservation which included:

- Game hunting as an occasional activity engaged in by people who were permitted by a local chief - a concept of controlled sustainable use.

- In some societies there existed the custom of totemism, which forbade people to eat animals which were their totems. These were usually animals that were rare and/or endangered. A concept of moral commitment to future generations of mankind.

- Hunting of wild animals within sacred places was prohibited - a concept of zoning for wildlife sanctuaries for protection of endangered habitats and species.

The arrival of Europeans disrupted this (adequate) management of wildlife. At that time any European who had a gun (and many had guns) shot at anything that had four legs or anything with feathers, regardless of whether it was endangered or not.

The decline in numbers of wildlife was followed by a strong settlers' reaction to the declining hunting rounds. It was during this period that the so called conservation movement started in Malawi. It had no scientific base, nor was it rational. However, the critical point in that movement was that it denied local participation and responsibility over the management of wildlife. Now the world is discovering that, where this was the case, it certainly was wrong and we are having to pay dearly. Worse still, the wildlife is suffering the most.

Ladies and gentlemen, let me not take up too much of your time because I know that my colleagues here have prepared papers that are excellent, challenging and extremely provocative. However, before I conclude my remarks, let me remind you that we must all bear in mind the rapidly increasing human population and the desire for better standards of living. There is an urgent need to develop strategies for sustainable use of natural resources, including wildlife. If wildlife has to compete with other forms of land uses then there is merit, I believe, for it to generate employment and earn revenue through sustainable yields.

Harvesting wildlife is the oldest form of land use known to man. It is still widely practiced throughout the world. Management of wildlife today is simply an intervention that has evolved through an expanding human population and changing market forces. In order to be successful, this intervention must be based on the acceptance that all successful human endeavors must be socio-politically acceptable, ecologically and economically viable and sustainable.

Wildlife can compete, and in many instances competes favorably, with cattle and grain. But to do this it must be acknowledged as a renewable natural resource that can and should be managed sustainably to benefit people who ultimately decide how much land will be set aside for wildlife.

II: BACKGROUND PAPERS

AN HISTORICAL PERSPECTIVE OF SUSTAINABLE WILDLIFE UTILIZATION

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INTRODUCTION

Wildlife utilization is the oldest and remains the most widespread use of renewable resources by man. Wildlife includes all living organisms except the few that have been domesticated, and wildlife utilization is the process by which people derive benefits from natural and semi-natural ecosystems dominated by wild plants and animals. It is the primary use of ecosystems dominated by wild plants and animals. It is the primary use over some 85% of the world's land and all but a small fraction of its major water bodies. Wildlife management includes disciplines like fisheries, forestry, extensive livestock rearing, as well as wildlife and protected area management. This presentation, however, focuses on large terrestrial wild animals, especially those outside protected areas.

An historical perspective of the topic indicates general principles for achieving species conservation in sustainable environments inhabited by people. This should help explain the failure of much highly motivated efforts to preserve biological diversity.

NATURE OF THE RESOURCE

The first step is to describe the salient features of the resource under discussion. Large spectacular wild animals have inherent biological properties that limit how they can be managed; but their management is greatly influenced by peoples' attitudes. These natural and implied characteristics are sketched separately below.

Inherent Biological Features

The mobility and elusiveness of wild animals distinguish them from other renewable resources used by people, making many species difficult to manage. Movements range from seasonal shifts in habitat preferences, through nomadism, to extensive stereotyped annual migrations. These have led to a wide range of management practices over the past 5000 years.

The way people have responded to the fugitive properties of the resource has depended on the predictability of the movements and the importance of particular species to local human welfare. Hunting territories, with regulated harvests, were used by Canadian Indians of the sub-Arctic for valuable fur and food producers like beaver. Such zonation was possible because the animals were resident. The Innuit people, further north, were nomadic, moving seasonally to food sources. They favoured caribou, however, and were fastidious in minimizing disturbance of the highly mobile herds. Where mobile species were less important for survival, people have been inclined to use the animals opportunistically, sometimes to excess. Domestication of selected indigenous animals or the introduction of exotic domesticates was probably a response to the fugitive nature of wild animals.

A second attribute of wild animals, important to sustainable resource use, is their community structure and behavioral adaptations. Before man was able to impact significantly on natural systems, wild animals occurred as self generating populations whose distribution and numerical strength reflected geological and climatic effects on their evolutionary history.

The adaptation of wild populations within the local environment favoured the efficient use of the available habitats, although this may not have maximized the production of potential human benefits; for example these may have been a trade-off between growth and hence meat production and adaptation to an arid environment. Assuming natural conditions (which are rare on land but may be more common in the sea), a wild fauna will tend to remain at or near the ecological carrying capacity. Under- harvesting animals has little effect on the self-regulating system, while over-harvesting enhances the "ecological capital" that drives it. Where their habitats remain intact, animal numbers can usually build up as soon as over-use ceases; as the law of diminishing returns comes into play before populations are exterminated. Exceptions have included easily hunted species, especially in restricted habitats such as islands.

It follows that, from an environmental point of view, abusing wild animal populations is preferable to abusing their habitats. Herbivore numbers are limited by the available habitats and predators by their prey. A biologically efficient production system is one that meets human requirements while harvesting the highest possible trophic level. This need not preclude the use of plants and the soil; but history has taught that harvesting wild animals is ecologically safer than exploiting their habitat components, particularly where these are vulnerable to mismanagement. A hypothetical example may illustrate this point. If rare forest parrots were harvested sustainably to meet the local people's needs, this would be preferable to harvesting the trees or clearing the forest to provide the people with agricultural land.

There is an important practical distinction between harvesting wild populations, in a self regulating natural or semi-natural system, and the use of wild and/or domestic animals to harvest the natural vegetation. In the first case the number of wild animals is limited by the system and the removal of secondary producers reduces the animal biomass and hence plant consumption. With the introduction of domesticated stock, or the artificial raising of wild animal numbers through manipulation of factors limiting population growth (such as the availability of surface water in arid and semi-arid environments), the animal biomass is raised in order to provide usable animals. This is prone to lead to over-grazing, often caused by a lack of awareness of the limitations to animal production imposed by plant production over time. It may also be unavoidable if the unit value of the animals is insufficient to support an economically viable production system, with the animals at a sustainable stocking rate.

In conclusion, under near natural conditions, populations of wild animals seldom cause lasting damage to the environment, while they make the most use of the standing biomass under prevailing ecological circumstances. An inability, or unwillingness, to use locally adapted natural secondary production to support viable economic systems led to changes in the patterns of resource use. The most common was a transition to agriculture and pastoralism, which led to widespread modification of wildlife habitats and reduced biological diversity which curtailed resource use options. The emphasis on using the soil and natural vegetation, the latter for a limited range or species, has proved environmentally hazardous in many parts of the world, especially in areas unsuited to long term crop and livestock production.

THE HUMAN DIMENSION IN CONSERVING WILDLIFE

People Keep Animals They Value

Local people generally determine how wild animals are managed and landholders are inclined to favour only those species of value to themselves. The value may be positive or negative and may be measured in utilitarian, recreational or aesthetic terms. It often reflects prevailing socio-economic circumstances, especially market "prices", which are measures of peoples' appreciation of the worth of the animals. Where the animals have no tangible value, their retention for aesthetic reasons represents a sacrifice in realizable production.

Some Wildlife Has "Charismatic" Values

Much of the aesthetic and recreational, and some of the utilitarian, value of wild animals is rooted in their appeal to humans. Throughout history people have given certain species a charismatic appeal in addition to their utilitarian value, while others have been treated as vermin.

Values Change

These multivalent attitudes vary among cultures and individuals, have fluctuated over time for the same species in the same community as people first fought to tame the wilderness and then sought to save natural values. The process is dynamic and ongoing, being influenced by such factors as affluence, technological development and urbanization. In societies that have become isolated from their environment, it has served to create a perceptible gulf between themselves and wild animals and their habitats.

People Manage Animals, Not Habitats

Two problems occur because of the way in which people perceive wild animals. Wildlife (and domestic stock) has often been managed as individual species, independently of their habitats. Within parks and reserves preoccupation with animals (resulting in over populations) has led to habitat degradation and cascading ecosystem disruption, especially where dominant herbivores are involved.

Treating animals in isolation from the socio-economic systems in which they occur, has usually compounded the damaging effects of treating them separately from their habitats. Inherently valuable animals have been neglected outside protected areas by resource managers, planners and decision makers, because their intrinsic value has not been reflected in market prices. While public attention has sometimes focused on the plight of high profile species, it has done little to prevent accelerating local exterminations.

To be sustainable, species management must be reconciled with the well-being of landholders. A great deal of effort to prevent the loss of species has been dissipated by addressing the ecological manifestations of the problems, rather than their underlying socio-economic causes. With growing resource scarcity, the human dimension, particularly at grass-roots level, is of increasing significance in maintaining biological diversity and maximizing sustainable rural productivity. Unfortunately the vital linkages between socio-economically realistic and ecologically sound wildlife conservation programmes are usually under emphasized.

EVOLVING CONSERVATION PRACTICES

Two sets of factors determine how a scarce resource can be used sustainably. These are its natural capacity to provide goods and services without impairment, and the ability of socio-economic institutions to regulate use to within these natural parameters. Active measures to conserve wildlife (or other renewable resources) are not needed while the resources are plentiful. Before human populations and other pressures made wildlife "scarce" there was no harm in the animals remaining free access "common property". Once the threshold of scarcity was reached and excessive use commenced, institutions became essential.

Such institutions, however, are likely to have evolved only where the benefits resulting from better resource management outweighed the social and other costs associated with their implementation. For example, shifting from common to individual rights to use resources may be costly or raise popular objection and these initial obstacles need to be overcome. Historically, measures to conserve a species seem to have been a response by individual communities when a species of substantial worth reached the level of scarcity when it or its habitat was being over utilized.

In traditional societies generally, resource scarcity will have occurred fairly gradually, allowing for cultural adjustment to curb over-exploitation where this was worthwhile. Few societies, however, can have escaped historical upheavals that precipitated scarcities beyond the control of these mechanisms. Indigenous institutions may have been swept aside by outside influences, or have been unable to adjust quickly enough to rapid endogenous developments such as the acquisition of new technologies like fire arms or modern transportation. The causes and effects have varied with species, time and location, but space does not allow fuller coverage of the topic here. Instead we concentrate on two contrasting models that have been used extensively, with variations. This allows a number of conclusions which, we hope, will prove to be provocative.

Centralized Conservation

The first model is based on the centrally regulated management of game. Such systems go back a long way in the annals of many societies and tend to be well documented because they were a pre-occupation of the ruling class. Despite their antiquity, widespread application and general acceptance, game has given ground to agriculture and livestock in many parts of the world. This has happened even where wildlife has been a prime responsibility of the highest authority in the land, which brings the widespread application to the model into question.

Centralized control of game may be a legacy of autocratic government, a response to the fugitive nature of the resource (which made it difficult to allocate rights to individuals to use it or to hold them accountable for doing so correctly), or a combination of both. The interest in hunting of many elitist ruling classes suggests that they favoured centralized control as a means of reserving declining hunting for themselves. Occasionally this privilege was extended to the exclusive ownership of the derivatives from rare or elusive species.

In the late 19th and early 20th centuries, public concern in North America invoked centralized control over hunting as an emergency measure to curb severe over-exploitation of game. Access to the animals had been open and these controls were successful, although there are several factors that question their durability. It is noteworthy that, from the outset, the actions did not extend to preserving wildlife habitats outside protected areas. Access to wildlife was still open but its use was regulated by the State, curbing the ability of landholders to manage the resource or benefit directly from it. Nonetheless, trespass laws allowed private property owners a measure of control over who could use the game on their land. Recently, the trespass laws have been used increasingly to internalize the benefits from the use of this wildlife, by raising "entry fees" or other charges.

Central management of wild animals has always relied heavily on protectionist devices and policing. Although protectionism has gained support after its success in North America, the concept has fundamental socio-economic defects and its general use deserves critical examination. The widespread early decline of game, despite the draconian penalties associated with breaches of the game laws, suggests that in many situations centralized management was inadequate to conserve even a plentiful resource. In southern Africa, for example, settler farmers eliminated large numbers of wildlife by hunting or controlling the game's access to water, because "one could not farm in a zoo".

Recently, political pressure groups, particularly in wealthy, urban dominated societies, have used the new sensationalist media to promote emotionalism and to lobby politicians against the killing of wild animals in rural areas, at home and abroad. Such imposition of exogenous values on rural production systems is possible because of centralized control of the resource. In many cases, distorted media coverage has obstructed the legal harvesting of wild populations, even where this is sustainable and provided the incentives essential for preventing wildlife being replaced by agriculture.

In any event, the flaws and self-defeating contradictions in much protectionist legislation have been accentuated by intensifying "land hunger" (caused by expanding human populations, declining terms of trade for many rural products, and environmental degradation) and the rapidly changing world economy. These have increased the desire to replace wildlife with other land uses, which arises from the economic and perceived disassociation of game from the rural systems of which it is part and on which it depends outside protected areas.

Defects in the protectionist philosophy have often included:

- Contradictions in legislation. For example, game is treated as a priceless asset but under-valued by prohibiting trade in its derivatives. The noble art of hunting is acknowledged as a legitimate activity but is under-priced despite its obvious commercial value. Any measures suppressing the value of wildlife to landholders, such as inhibiting free legitimate trade, are likely to prejudice the ability of game to compete for increasingly scarce resources. With game unable to realize its economic advantages, people have turned to other more rewarding resource uses, even if these are environmentally hazardous. This artificial inhibition to the sustainable use of wildlife has been especially deplorable in agrarian nations, like many in Africa. It has denied these countries an important economic option for redressing their desperate ecological and economic plight. Moreover, this has disadvantaged wildlife as people have been obliged to put the land to alternative uses, leading to the destruction of both wild animals and their habitats.

- While game laws are necessary, they are likely to be counterproductive if they have a negative effect on landholders, because these people can usually eliminate any species they wish, easily and legally, by manipulating the habitats.

- Authority for wildlife is usually vested in a central bureaucracy, whose accountability is primarily political and linked to an official's own career prospects, rather than to the resource. Management decisions become distorted, are distanced from their implementation, become over generalized, and lack sufficient sensitivity to prevailing local socio-economic and environmental conditions. Even dedicated professional wildlife managers are unable to avoid such pitfalls.

- The opportunity costs of conserving wild populations are ignored. They have been imposed on the rural people, often the most disadvantaged segments of society. These people have derived few, if any, benefits from the wildlife which they ar obliged to tolerate in direct competition with their livelihoods. Besides the social injustice this has been a disincentive to conserving wildlife, which remains public property over which the rural people have no jurisdiction even on their land. Such impositions may be justified in a national emergency to prevent the loss of a valuable species (as in the N. American case mentioned above), especially if landholders are compensated. In the case of imminent extinctions costs are because animal numbers are small. The situation becomes progressively unacceptable as animal numbers and opportunity costs increase; or as rural people are forced to intensify land use in order to remain viable; or when the animal numbers are already high, as in the case of elephant in parts of Africa.

Because of its natural appeal, many landholders tolerate or encourage wildlife where it does not conflict seriously with the primary use of the land. This happened in the United States while threatened species were rehabilitated, and was evident in Zimbabwe, especially among wealthy landholders, before protectionist legislation was repealed in 1960. Tolerance of wild animals was related to the financial circumstances of adverse farming conditions. In other words, game's survival depended mainly on landholder affluence and philanthropy, which acted independently of centralized control. Before commercial use of wildlife was permitted in Zimbabwe, some rich farmers could afford to conserve wildlife but their poor colleagues could not.

Centralized regulation of a "priceless" but valueless resource is not appropriate in many situations, especially in poor countries. It is preferable to transfer wildlife from the political to the economic market place where it is less vulnerable to the vacillations of politics, which invariably give it a low priority.

Local Management

Decentralized management of wildlife has generally been less formal and, as with any informal sector of the economy, less well documented. Informal artisanal use of game animals (theoretically poaching) has often occurred illegally. For example, for many years, in parallel with protective centralized management in parts of Africa. Such arrangements force the industry underground with the effect that institutional mechanisms, whereby beneficiaries of the use of wildlife can reinvest in "their" resource, have not developed. Use is likely to be inefficient and extractive without sufficient husbanding of the resource. Moreover the utilization is certainly less open to scrutiny or controls to ensure sustainability. Nonetheless, there have been many formal and less formal local arrangements which have been successful in conserving wildlife, some of which go back over a thousand years. This suggests that a return to such systems may have merit, provided that they have remained effective and can cope with rapid changes in demand for resources.

Decentralized management of wildlife avoids many of the socio-economic defects of centralized control, but has often failed because the scale of operations has been too small or the institutions regulating it have not been sufficiently robust.

The Zimbabwean Experience

Faced with obvious failure of the conventional protectionist type legislation in force in Zimbabwe before 1960, but reluctant to abrogate its responsibilities for wildlife, the government embarked on a cautious programme of legal reform. While game remained State property, people with it on their land were allowed increasing freedom in using it and were encouraged to maximize their profits from doing so, in order to compound the aesthetic justification for preserving it.

The initiative cost little and led to a rapid reversal in the downward trend in game populations, as landholders responded by conserving "their" game and allocating more land and other resources to it. Within two decades, over-populations of game in previously denuded areas emerged as a threat to habitats, as landholders consistently under-used the wild populations that were now valuable to them.

Once tested in the more economically resilient commercial farming sector, the model has been adapted to communal peasant land tenure systems with remarkable ease and success, often on the initiative of local communities. Problems, particularly of a technical nature, persist; but the Zimbabwean experience has demonstrated the power of appropriate institutions in favouring conservation and sustainable use of wildlife. It is based on four simple principles:

- Wildlife is a renewable resource which, like others, must be conserved and used wisely. Its continued existence outside protected areas will depend on its competitiveness in terms of landholder benefits.

- Conservation or the sustainable utilization of wildlife requires the active co-operation of rural landholders. It will benefit the resource on a large scale only where usage rights are clearly delineated and right-holders are free to use and trade in the products generated by the resource.

- Wildlife can compete with other land uses because it has a comparative economic advantage, but it will be conserved only if this advantage is reflected in market prices and landholders receive a sufficient share of the benefits.

- Government has an obligation to encourage and not to inhibit the growth of a profitable and sustainable wildlife industry. It cannot abrogate its ultimate responsibility for protecting long term resource values, but should achieve this aim through positive (economic) rather than negative (enforcement of inequitable legislation) measures.

Zimbabwe's philosophy has been successful because people bearing the opportunity costs of having game were given rights to use it for profit, while still remaining accountable for using it sustainably. Quasi ownership provided the private sector with the incentives to conserve the resource and develop a profitable wildlife based industry. Abuses were prevented, in the first instance, through social sanction within landholder communities and these were backed by law. Government retained the ability to take unilateral action where necessary, but has had to do so only once in 15 years.

With wildlife able to realize its comparative economic advantage it has outdone many of its competitors, which often face deteriorating terms of trade arising from global over-production of many agricultural commodities. Bureaucratic impediments to free trading were reduced to the minimum needed to prevent illegal activities and to support the industry. State competition previously tended to undercut the industry because, for example, hunting on State land was cheap. This competition has been reduced by marketing the hunting through open auctions.

The wildlife industry has expanded rapidly to provide a sustainable form of land use. For economic, rather than ecological or aesthetic reasons, the previous encroachment by agriculture and livestock into wildlife habitats is being reversed, in some cases very dramatically. Management decisions are made by landholders, who are accountable to their community for the proper use of "their" game. They make the many day-to-day decisions needed for efficient management and have a vested interest in the continued success of their wildlife ventures.

This "bottom-up" approach has not weakened the Department of National and Wild Life Management. Rather the added political and economic significance of the wildlife industry has made the Department more influential and effective. The interplay between government and the private sector has become more akin to that in a free market economy, with many parallel advantages for conservation. Our experience over three decades indicates that central control over wildlife has many similar disadvantages to those that caused the recent collapse of centrally controlled economies of Eastern Europe and the former Soviet Union. As Richard Bell has pointed out, centralized conservation is as inappropriate in Africa as centralized control of the economies has been in Eastern Europe.

USE OF WILDLIFE

Wild animals have always provided the only practicable means by which people can tap the harvestable biological energy from most marine and other large aquatic ecosystems, and from polar and sub-polar regions. It also provides what is probably the best use of other terrestrial habitats that are, or have become, unsuitable for agriculture and pastoralism.

Wildlife has always been used in a variety of ways to provide food, shelter, other useful goods and pleasure, and has been the basis of considerable trade from earliest human history. Benefits from wildlife may be immediate and tangible and depend on the consumptive use of animals, or they may be essentially non-consumptive and rely on the aesthetic qualities of the animals. This dichotomy of values is a very old social feature that is well illustrated in folklore and by rock-art left by our stone age forebears in many parts of the world. These people were hunter-gatherers but, like the Bushmen and Innuit of today, they also revered the animals they hunted.

There is no scientific logic against using wild animals sustainably to generate human benefits, and many good reasons why this is desirable in the interests of people, the environment and the animals themselves. For example, where people live in areas unsuited to agriculture and pastoralism, use of wildlife may be the only socio-economic justification for protecting the natural ecosystems against destructive developments. In many cases, the use of wildlife, alone or in combination with agriculture, forestry and pastoralism, offers the best sustainable alternative to over-exploitation of habitats.

Since animals and plants were first domesticated some 5000 to 6000 years ago, wildlife has made a progressively smaller, but still significant, contribution to rural economies. This trend may now be reversing due to the growth in outdoor recreation which has been of the order of 10 to 12% each year for a decade or more. Economic activity based on outdoor recreation in the U.S.A. for example , is already about three quarters of that generated by the agricultural sector.

A shift from dependence on wild animals to agriculture and pastoralism was motivated by economic considerations affecting local rural societies. To this day, different societies, or segments within societies, remain at different stages in the transition which has generally been disadvantageous for wildlife and habitats. The general pattern seems to have been that as communities secured control over the flow of necessities from the living environment, the emphasis in their perception of the importance of wildlife shifted from utilitarian to recreational values. The growth of outdoor recreation, including sport hunting, has been fuelled by growing affluence, leisure time and urbanization. This has tended to reverse those earlier economic trends, at least locally, favouring a switch back from agriculture towards wilderness.

Hunters were amongst the earliest wildlife conservationist in most societies. They conserved wild populations (and occasionally their habitats) and evolved complex hunting ethics to this end and to maximize the social satisfaction from each kill. From measuring satisfaction with hunting by the size of the kill, societies have generally matured to where the quality of the hunt is paramount. This has often included the introduction of artificial requirements, in the name of sportsmanship, to make hunting more difficult.

Evolution of the "hunting ethic" reached an extreme with the emergence of non-consumptive "hunting" in the form of game viewing and wildlife photography. At this point, the use of game animals for hunting begins to

overlap with its use to satisfy the purely emotional and moral justifications for its protection, although the two have different economic implications to which we will return.

Unfortunately attitudes towards different uses of wildlife have polarized and become antagonistic in response to personal and group vested interests. They seldom acknowledge giving the resource a spectrum of values which reinforce each other. The wide range of values of game can be used to add economic tiers to a meat and product generating system, through such uses as lightly consumptive trophy hunting and non-consumptive game viewing. These service-intensive activities allow on-site vertical integration of the product, where it is most beneficial to the resource and the people on the land. This makes it possible to raise the financial return per unit of standing animal biomass several fold, while extracting very little additional energy from the local ecosystem. It is this ability to add value to a high trophic level in the system, in situ, rather than any inherent ecological advantages, which makes wildlife competitive with other uses of the land, like pastoralism.

There is a clear economic distinction between the use of wildlife for recreation and its protection for emotional or moral reasons. Correctly priced recreation benefits producers, from the State to individual farmers, with little production of food or other tradable products foregone. It allows the addition of economic tiers to the production system, diversification, on-site vertical integration, greater profits and more resilience to market fluctuations. Protecting game for purely emotional or moral reasons destroys most of these advantages and imposes costs on landholders. This is inequitable and disadvantages the resource. The beneficiaries are the people who enjoy the emotional satisfaction of preserving animals, for which they probably pay nothing (unless they own and manage the land). Moreover, they are often beneficiaries in perception only, for in reality they impose a disincentive to conserving wild animals.

Especially within the past four or five decades, wildlife based recreation has added greatly to the extensive trade in wildlife derivatives (such as skins, ivory, meat and many more). It has become a massive industry of great significance to the conservation of the resource on a global scale. Trade in animal products, which probably predates any other form of trade and has influenced the course of history in most countries, has grown into a multi-billion dollar activity. This trade generates economic activity from the local to the international level, and is highly significant to the welfare of unknown millions of producers, manufacturers and traders.

DISCUSSION

Many cultures have imbued man with a moral obligation to respect and conserve the wild animals with which he shares the biosphere; an ancient manifestation of the modern concept of preserving biological diversity. While conservationists accept the concept and its likely benefits for the human race, these claims are questioned by the many extinctions that have taken place without any apparent detrimental effect. To the contrary, the loss of biological diversity that has accompanied agricultural and other economic developments has often seemed beneficial and has been sustainable for hundreds of years.

If the need to conserve biological diversity is to be accepted on a broad global front over time, it must be widely credible. A major argument for retaining a wide spectrum of species is that resource use options remain open, but this is contradicted by measures to prevent the efficient sustainable use of wildlife. Communities that have conserved a broad spectrum of large wild animals and their habitats, and are thus complying with the concept in a practical way, are discouraged from continuing to do so by opposition to the consumptive use of wildlife and to the free trade in legitimate derivatives. Such opposition has led to game becoming socio-politically unacceptable and economically nonviable, in the local situations in which the animals occur. The game animals are thus unable to conform with at least two of the three essential requirements for success in any long term endeavour and disappear.

The economic use of wildlife has a long tradition. It is a logical option for diversifying and enhancing rural productivity in many, largely unproductive, parts of the world where environmental problems are associated with increasing resource scarcity. It provides an opportunity for conserving biological diversity that is, simultaneously, profitable and yielding immediate tangible human benefits. Achieving the dual goals of conservation and development requires that appropriate institutions are in place to regulate the use of resources properly. In this case it is necessary to realize wildlife's comparative advantage within an incentive structure that recognizes this advantage. Where this is evolving, as in Zimbabwe, it is leading to enhanced sustainable rural production, in a largely self-supporting conservation programme of significance to a much broader spectrum of plants and animals than the target species themselves.

SUSTAINABLE UTILIZATION OF WILDLIFE FOR TRADE

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INTRODUCTION

As background, and to provide a basis for further discussion, this paper attempts to review some aspects of the scope and value of wildlife exploitation for international markets. Wild plants and animals are used for a great variety of purposes, some of which have persisted from palaeolithic times. They are used directly as food, fodder, fuel, fibre, medicinal products and other essential raw materials; as a resource for genetic improvement of crops and livestock; as commodities for trade or barter; for scientific research, including the development of new pharmaceutical products; and for recreational purposes. They also have other intrinsic values which can be evaluated in economic terms.

Many of these uses are extremely difficult to quantify, especially those that do not involve the exchange of money, but international trade is one for which reasonable statistics exist. The trade is widely recognized by governments as economically important, because it generates foreign exchange, and it is therefore possible to derive some figures for longer term trends in trade.

In terms of international trade, timber (including paper and pulp) is probably the world's most important wildlife commodity. Christine and Robert Prescott-Allen (1982) estimated from FAO statistics that developing country exports of wood products in 1979 were worth US$6 billion, as compared with fisheries exports (the next biggest item) in the same year, valued at US$5.5 billion. Total world trade in these two categories is far larger than this, and their economic importance is largely responsible for the fact that the FAO collects statistics on a regular basis. Economic use of other wildlife products is not assessed in a similar way and information available derives from sporadic, isolated studies. Fitzgerald (1989) estimated that the annual trade in exotic wildlife was worth some US$5 billion, comprising approximately 40,000 primates, the tusks of 90,000 elephants (international trade in African elephant ivory has been largely prohibited since January 1990), one million orchids, 10 million reptile skins, 15 million pelts from wild furbearers, over 350 million tropical fish, and numerous other species and species products. Luxmoore (1989) has assessed international trade in the products of wild ungulates as comprising some 30,000 tonnes a year (valued at about US$50 million) of meat, and about US$30 million worth of medicinal products, primarily velvet (the soft antlers of deer) and musk.

Such statistics, may help to demonstrate that wildlife is an important economic resource and this, in turn, can be used to promote conservation policies and slow the rate of habitat conversion. However this alone is not sufficient justification for supporting the principle of wildlife trade. Conservationists must be satisfied that the trade is not detrimental to the survival of the species or a given population but making such a judgement requires a substantial amount of scientific knowledge that, for the most part, is not available. The paucity of information on the status, reproductive biology, population dynamics, ecology and other parameters of an overwhelming proportion of the plant and animal species entering international trade precludes any definitive assessment of the sustainability of such exploitation. That monitoring and regulation of exploitation for international trade must currently rely to such a large degree on guesswork, expert opinion and, worse, on the limited financial and political investment of the governments responsible for managing these resources, constitutes a serious cause of concern. It will become more so as pressure on wildlife and habitats increases.

This paper concentrates on those aspects of wildlife trade which are not summarized in other centralized data sources (i.e., it excludes fisheries and timber trade). It is divided into two sections; the first reviews the types of wildlife exploitation practiced in a selection of countries to enable an overview of the different species used and of the different types of use; the second examines the international trade in certain commodities over a period of time. The commodities were selected on the basis that long term data were available so that inferences can be drawn about the impact of the trade.

OVERVIEW OF UTILIZATION IN SELECTED COUNTRIES

Canada

The most extensive use of wildlife in Canada for trade is unquestionably the trapping of furbearers for the international fur industry. Many species, although reduced by early trapping, have recovered in most parts of Canada as a result of intensive wildlife management. Examples of over-harvesting in the past are: beaver (*Castor canadensis*), black bear (*Ursus americanus*) and sea otter (*Enhydra lutris*) (Deems & Pursley 1983).

There are more professional trappers in Canada than in the United States, although the latter country reportedly traps more animals for the fur industry than any other in the world (Nilsson 1980). In many Canadian provinces and territories a block system is arranged whereby specific trappers are licensed to trap in each area. In Ontario, for example, where 13 of the 19 resident furbearers are trapped for the trade, more than 17,000 of the 70,000 trappers in Canada were registered in the early 1980s (Monk 1981). For many, trapping represents a part-time vocation; for others, such as aboriginal peoples in remote settlements of the north, trapping provides their only cash crop.

While most trapping is for the fur trade, trapping is also vital to several communities, especially aboriginal, in that it provides a meat supply and money from meat sales. Meat for human consumption derived from muskrat (*Ondatra zibethicus*), beaver and other species represents a sales value of US$ 5-10 million annually (Monk 1981). In addition, Canada's seal harvest industry, which traditionally has been based on export of skins but has undergone a dramatic change as a result of public opinion, remains viable as an industry in part because of the importance of seal meat.

Other forms of wildlife utilization for meat include a very significant (and well regulated) gamebird and deer hunting industry. Likewise, sport hunting for trophies is an important revenue earner that includes a variety of species such as elk (*Cervus elaphus*), sheep (*Ovis canadensis*), muskox (*Ovibos moschatus*), and bear. In addition to the revenue earned from trophy quotas, these species also provide an important source of locally consumed meat.

Chile

Chile has a long tradition of commercial wildlife utilization. Export records for several wildlife commodities date back to the turn of the century. For one species, the chinchilla (*Chinchilla* spp.), export statistics date as far back as 1828. Today, laws and enforcement are quite restrictive and effective.

For centuries, the principal exploitation was of mammals for their pelts. The main species exploited were chinchilla, otters (*Lutra felina* and *L. provocax*), foxes (*Dusicyon griseus* and *D. culpaeus*), and fur seals (*Arctocephalus australis* and *A. philippii*) (Iriarte & Jaksic 1986). Hunting and trapping of these furbearers lacked any control. The evident over-exploitation of fur seals led to the first regulation of their hunting as early as 1893, but the law went absolutely unenforced, driving the Chilean fur seal populations to the verge of extinction. A similar fate befell the chinchilla, resulting in an international treaty between Chile, Argentina and Bolivia to ban its hunting and commercialization in 1910 (Inskipp & Wells 1979) .

In recent years, the pelt trade has been restricted to only a few species, namely coypu (*Myocastor coypus*), rabbit (*Oryctogalus cuniculus*), hare (*Lepus capensis*), foxes, and sea lion (*Otaria byronia*) (Iriarte & Jaksic 1986). The total pelt trade, however, has declined dramatically from about 200,000 per year in the early 1950s to an average of about 6,000 per year in the 1980s (Iriarte & Jaksic 1986; Broad *et al.* 1988; Ginsberg & Macdonald 1990). The collapse of the skin industry is primarily due to export bans or other restrictions on the trade. In the case of the skins of foxes, changed consumer habits may also have played a role.

Chile also has a small trade in live animals, primarily for zoos, and some farming of pudu (*Pudu pudu*). A recently developed management programme for the vicuna (*Vicugna vicugna*) resulted in its downlisting to Appendix II of CITES to allow trade in wool from sheared live animals.

Guyana

Guyana's small size belies its remarkably rich fauna and flora. Several factors contribute to this richness, including its geographical position on the edge of the Amazon basin and its wide variety of habitats ranging from sea coasts and coastal swamps to grassy savannas, humid forests and the highlands of the Guyana shield. Many species of the tepui highlands occur only in Guyana and the adjacent zone of southern Venezuela. Because the human population is very small and highly localized in the coastal region, most of Guyana is still largely an undisturbed wilderness; consequently very few animal and plant species are seriously threatened.

While certain domestic utilization of wildlife for meat (in particular primates, tapir and caiman) is carried out by indigenous communities in the interior, wildlife utilization for international markets plays a much larger role both in terms of volume and economics. Over the past decade Guyana has slowly become one of the most important neotropical suppliers of live animals for the commercial pet trade (Thomsen & Brautigam, in press). While initially this trade was largely uncontrolled, in 1987 Guyana instituted a quota system with the support of the CITES Secretariat. In the absence of population data for almost all species of economic value, quotas have been established on the basis of average trade figures of previous years (Thomsen, 1988). In addition, traders have been organized in a Wildlife Traders Association and are allocated individual annual quotas. Finally, a minimum value has been established for each quota species. In order to comply with the foreign exchange regulations, an exporter must receive payment for a shipment in US dollars and must receive at least the minimum value fixed for a particular species. The full amount in dollars is then paid to the National Bank, which in turn pays the exporter back in local currency (Schouten, 1988; Thomsen, unpubl.).

During the past few years, Guyana has been exporting an average of about 25,000 live birds per year. Five species of parrots are exported in the greatest numbers: three amazons (*Amazona amazonica*, A. *ochrocephala*, *A. farinosa*) and two macaws (*Ara ararauna*, A. *chloroptera*). In addition to birds, 15 species of mammals are being exported, for example an average of about 2,500 *Saimiri sciureus* and 100 each of *Potos flavus* and *Dasyprocta aguti* per year. Live reptiles are also an important export commodity for international pet markets: e.g., 13,000 *Caiman crocodilus*, 6,000 *Iguana iguana*, 7,500 *Ameiva ameiva*, 1,000 *Corallus enhydris*, and 10,000 *Aviculara aviculara* per year.

Using estimates from Suriname of value to the exporter per bird and the average number of birds exported per year from 1981 through 1987, it can be estimated that Guyana earned about US$1.3 million (G$42.9 million) per year from exporting parrots. If the entire quota of parrots were exported, the value of the parrot trade would be about US$1.8 million (G$59.4 million) (Thomsen & Brautigam, in press; Thomsen, unpubl.).

In addition to the live animal trade, Guyana also has a potential for managed exploitation of its caiman resources. A management plant for the utilization and commercial trade in caiman hide has recently been developed and is currently being considered by the Guyanese government (Edwards 1990).

Indonesia

Indonesia is extremely rich in natural resources, having extensive areas of forest remaining. Its trade in wildlife products is correspondingly large and varied. Some of the main products exported are reptile skins, principally of water monitor *Varanus salvator* and snakes. Annual exports of *V. salvator* are estimated to be in the region of 1-1.5 million (Luxmoore and Groombridge, 1990), and of snake skins well over two million. Some 18 species of snakes are involved, the most valuable being *Python reticulatus* and *Python curtus*, with about half a million of the two species combined (Groombridge and Luxmoore, 1990). Water snakes (especially *Cerberus rhynchops*), whip snakes (*Ptyas* spp.) and karung (*Acrochordus* spp.) form the bulk of the trade in numerical terms. There is also a trade in frog skins. Populations of crocodiles have been extirpated in much of the country, but persist in Irian Jaya, where a management programme allows the offtake of 4,000 *Crocodylus*

porosus and 12,000 *C. novaeguineae*. Several crocodile farms are being developed. Sea turtle skins (*Eretmochelys imbricata* and *Chelonia mydas*) were previously exported to Japan in substantial quantities, but this trade has apparently largely ceased, as has the trade in stuffed green turtles (Milliken, 1990). Hawksbill shell has been exported in large quantities to Japan, from 1970 to 1986 a minimum of 105 tonnes (Milliken and Tokunaga, 1987). There is evidence that this trade may have slowed or been re-routed in response to changing Japanese legislation (Milliken, 1990).

Reptiles and frogs are also exploited for meat; the main species are the freshwater turtle, *Trionyx cartilagineus*, two species of frogs, *Rana macrodon*, and *Rana catesbeiana*, and the green turtle *C. mydas*. The majority of the population of Indonesia is Moslem and do not eat the meat of reptiles; consequently most is exported. However, the Balinese are predominantly Hindu and have a long tradition of eating green turtles, consuming around 15,000 a year (Milliken, 1990). There are fewer religious objections to eating turtle eggs, and they are collected avidly throughout the country so that very few nests escape depredation (Groombridge and Luxmoore, 1989). There is a large export trade in *T. cartilagineus* from Sumatra and Kalimantan to Singapore and thence on to other destinations in eastern Asia, the annual quota being over 400,000. Export of frogs' legs amounts to some 2,000-3,000 tonnes a year, mostly to Europe and North America (Le Serrec, 1988).

Reptiles and amphibians are also exported live for the pet trade, some 14 species of frog, 11 lizards and 25 snakes being allocated capture quotas. The bulk of the pet trade is in birds, of which 42 species of parrot (68,675 specimens) and 53 other bird species are listed in the quotas. Ornamental marine fish and corals are exported for the aquarium trade, and there are several major exporters in Jakarta. The most valuable freshwater fish is the red colour variety of the Asian boneytongue *Scleropages formosus*, which only occurs in the upper reaches of the Kapuas River, West Kalimantan, and has been severely depleted by the trade. Attempts at large-scale captive-breeding have recently been successful and an export quota has now been granted, though illegal trade still continues. Butterflies are also collected for export and an initiative has been developed in Irian Jaya to ranch them in the wild. There is a substantial export trade in orchids from a few major nurseries. Theoretically, export of wild-collected plants is prohibited but, in reality, the bulk of exports are of this source (Callister, 1989). Several wildlife products are exported for oriental cuisine and medicine. Some of the most valuable are edible birdsnests, of which Indonesia and Singapore combined supply some 115 tonnes a year to Hong Kong (Lau, 1990).

There is some commercial hunting of the introduced rusa deer *Cervus timorensis* in Irian Jaya, mainly for local sale of meat, but there are also hopes of developing an export market (Fraser Stewart, 1988). Some 49 tonnes of antlers were exported in 1988.

Madagascar

Except to a few local tribespeople, wild animals do not contribute substantially to the human diet although there is a widespread low level of hunting for food and medicinal products. Little bushmeat is sold, but there is a market for other products. The radiated tortoise *Geochelone radiata* has been severely depleted as a result of collection for food in the 18th and 19th centuries and lately also for the pet trade. The principal commercial hunting is for crocodiles, and was encouraged by the adoption of export quotas in 1987. Prior to that, export had been prohibited since 1975, although skin products were widely sold. After a peak trade in 1988, current quotas have been reduced. Initially, a crocodile farm was in existence, but this has now been replaced by a new ranching operation, run under the control of a national management scheme. Reptiles and amphibia are also hunted for the pet trade; recent exports have particularly affected lizards of the genera *Phelsuma* and *Chamaeleo* (Luxmoore *et al.*, 1988). There is also a substantial export trade in psittacines, particularly *Agapornis cana* and *Coracopsis* spp. The main trade in CITES-listed species involves plants, some hundreds of thousands of which are exported annually of the genera *Pachypodium*, *Alluaudia*, *Euphobia*, *Aloe* and numerous orchids. Plants feature extensively in traditional medicine and pots made of tree ferns are sold within the country.

Niger

There has been a total ban on hunting in Niger since 1974 and trade in wild animal product has been prohibited since 1964. Consequently there is no organized utilization of wildlife in the country, although there is hunting for local consumption of meat and for use in traditional medicine and magic. Such products are widely traded in markets, in contravention of the law, and small numbers of souvenirs are on sale to tourists (C. Magin, pers. comm., 1990). CITES annual reports reveal few exports from Niger other than some reptile skin products, mostly *Varanus* spp. and *Python sebae*, and some African grey parrots, *Psittacus erithacus*.

Zambia

The most extensive use of wildlife in Zambia is undoubtedly for local use as food, but this is characteristically difficult to quantify. A centrally planned project to provide elephant and hippo meat for local consumption in 1965 foundered partially because, unbeknown to the project planners, the people already had sufficient protein from wildlife (Martin, 1984). More recently, attempts have been made to involve local people in game management programmes in several areas, particularly in the Luangwa Valley. The scheme which has run for longest, the Lupande Project, derives most of its income from fees paid by safari hunting outfits but also harvests surplus hippo for local meat sales (Lewis *et al.*, 1988). The scheme has been extended to other Game Management Areas, under the title of ADMADE - Administrative Design for Game Management Areas - and has had significant impact in involving locals in the prevention of poaching. The safari industry relies on foreign clients who pay fees ranging from US$20 for a baboon to US$5,000 for an elephant. Estimates of the amount of ivory in international trade said to have originated in Zambia ranged from 22.5 tonnes in 1980 to 1.6 tonnes in 1988 (Luxmoore *et al.*, 1989). In 1989, permits were issued for the export of 839 tusks (2,330 kg) (Caldwell and Luxmoore, 1990) all for commercial purposes. Illegal ivory traffic is known to flow through the country from Zaire en route to South Africa, although this may have declined recently (Meredith, 1989). Zambians have played a central role in the poaching of rhinos in the region. The species was systematically eradicated in the Luangwa Valley (Leader Williams, 1988) and poachers from the country are implicated in the killing of most of the rhinos on the Zimbabwean side of the Zambezi Valley.

Formerly, crocodiles were hunted in the wild, but this practice was prohibited in 1987 in favour of developing a crocodile ranching industry. There are now a total of seven ranches, the oldest of which was established in 1980. Few skins have been produced as yet (about 1,000 in 1988), but output is expected to grow; quotas were allocated for the collection of 18,000 eggs in 1989 (Anon., 1989). There is a danger that, unless the operation of the ranches is carefully monitored, they will be used as a cover for the resumption of an illegal wild harvest.

VOLUMES AND TRADE TRENDS IN SELECTED GROUPS OF SPECIES

Exotic Bird Trade

The total volume of the international trade in birds is unknown. Many wild guesses have appeared in the popular literature but very few authoritative estimates. Based on extrapolations from known bird trade volumes in Europe, Japan and the U.S., it is likely that the international bird trade involves between 3.5 and 5 million individuals a year (Thomsen & Hemley, 1987; T. Inskipp, unpubl.). This figure does not, of course, include the number of birds that die during capture, transport and holding prior to their export, nor does it include the number of birds traded internally as pets in exporting countries. Although no detailed studies have been carried out, there are indications that these unknowns may involve very large numbers. Studies by Bruggers (1982), Inskipp (1983), Panagis & Stutterheim (1985), and Ramos & Inigo (1985) suggest that pre-export mortality varies greatly from country to country and from species to species. In certain countries, pre-export mortality may be as high as 40 to 60 per cent (Senegal: Bruggers, 1982; Mexico: Ramos & Inigo, 1985). If one *arbitrarily* sets all pre-export mortality for all species at 50 percent then the offtake for the international bird trade would involve between 5.25 and 7.5 million birds.

While the total volume of internal bird trade in exporting countries is unknown, it is known that in certain Asian and Latin American countries this trade probably involves several hundred thousand birds per year (e.g.,

Carvalho, 1986; Nichol, 1987; Thomsen & Brautigam, 1991). It is unlikely, however, that the total internal trade volume in wild-caught birds should be of a size equal to that of the international trade and it seems likely that currently the total trade-related offtake from wild bird populations is less than 10 million per year but more than 5 million.

During the period 1901 to 1988, a minimum of 25 million exotic birds were imported to the U.S., currently the largest market for exotic birds in the world (Fig. 1). As no import records were kept during the period 1943 to 1967, and as an import ban on psittacines was in effect from the early 1930s to 1967, it is difficult to estimate the exact number of birds likely to have entered the U.S. during this century. However, the figure is likely to be several hundred thousand birds higher than that shown in Figure 1.

Figure 1 illustrates the sharp fluctuations that have occurred in the U.S. bird trade during this century. For the most part, these fluctuations can be explained by domestic or international events during the same period. The significant drop in imports during the second decade of this century coincides with the first World War. Most of the game birds (especially partridges *Perdix perdix* and pheasants *Phaisianus colchicus*) and the canaries, which made up the majority of the imports at that time, came from Europe. Banks (1976) notes that by 1917 there was a total suspension of imports from Central Europe and a prohibition of exports from the United Kingdom. During these years, the number of shipments from Latin America and Asia increased and the seaport of San Francisco became almost as important for bird shipments as that of New York.

After the First World War, imports increased rapidly and soon exceeded pre-war proportions except for a small set-back in 1924 when a progressive import duty of up to 20 percent was introduced for all cage bird shipments (Banks, 1976). Imports peaked in 1929 and 1930 when several factors had a negative impact on the trade. The beginning of the economic depression, the introduction of the Lacey Act, and an import ban on psittacines all contributed to a total crash in the trade. This continued during the 1930s and was further affected by the second World War (Fig. 1). Imports apparently ceased completely in 1942 (Banks, 1976).

The dramatic increase in imports in 1968 is artificial and is caused by the fact that trade figures from the 1950s and early 1960s are unavailable. While one would expect a significant demand for exotic birds after the war and therefore a fairly high trade level in the late 1950s and 1960s, it is nevertheless clear that there was an exceptional demand for exotic birds in the late 1960s and early 1970s. In fact, the peak in 1970 and 1971 represents the highest import volume ever recorded in the U.S. According to figures presented by Banks (1976), in each of the years 1970 and 1971 more than one million birds were imported. Compared to the imports prior to the second World War, it is clear that the species composition had changed dramatically and many species that had not previously been traded at all, or in significant numbers, were available in the U.S. market. Most dramatic is the increase in the volume and number of species of psittacines traded. Where during the pre-war years psittacines had rarely represented more than 10 to 15 percent of the trade, in 1971 they made up fully 20 per cent.

The sudden drop in psittacine imports in 1972, proportionally much greater than the decrease in imports of other species of birds, reflects the US Department of Agriculture ban on the import of psittacines that went into effect several months before the general ban on all species that lasted through 1973 (Banks 1976). When bird imports resumed, psittacines took over even more of the trade and ten years later, in 1984, imports represented more than one-third of the trade. By the end of the 1980s, psittacines had again increased their commercial importance or, as psittacine imports volumes actually remained fairly stable during the 1980s, other species decreased in importance; with the result that by the end of the 1980s, psittacine imports represented up to 53 percent of the trade. Some of these trends were clearly forced upon the importers and might not have happened were it not for certain events that took place in the last part of the 1980s. The fact that public pressure on the bird industry increased considerably as animal welfare groups intensified their campaigns against the bird trade during this period may have had some impact. The impact of such pressure, however, is very difficult to estimate, except when it results in increased federal attention and legal restrictions.

In May 1988, after considerable legal battle and court injunction, the controversial "Humane and Healthful Transport of Wild Mammals and Birds to the United States" regulations entered into force. As the bird industry

had been expecting these regulations for some time, it was quite clear that traders had been curtailing their imports in preparation for the uncertain legal liability resulting from their introduction. As psittacines generally survive quite well in transit and proportionally experience lower mortality and fatal trade-related stress than do finches, their import level remained more-or-less stable and was clearly unaffected by the prospect of the transport regulations. Finches, on the other hand, often experience high mortality and are often treated with less care than other species. Their import volume dropped from some 440,000 in 1986 to some 176,000 in 1988. Likewise, in 1988, the overall trade volume had dropped to the lowest in that decade, less than half a million birds.

Reptile Skin Trade

The most valuable of reptile skins, and those which have the longest history in trade, are the skins of crocodilians. The American alligator *Alligator mississippiensis* was exploited as far back as the mid-nineteenth century, as was the Nile crocodile *Crocodylus niloticus*. The peak trade probably occurred in the 1950s and 1960s, including saltwater crocodile *Crocodylus porosus* skins from South East Asia and Australia and caiman and crocodile skins from South America. The trade in classic crocodilian skins probably reached over half a million skins a year, before declining, owing to a combination of protective legislation and depleted wild populations. With the supply of the more valuable skins restricted, the trade turned to those of the spectacled caiman *Caiman crocodilus* from Central and South America. At the end of the 1970s, trade reported to CITES amounted to some three-quarters of a million caiman skins a year, and it is probable that the total trade was twice this size (Hemley and Caldwell, 1986).

The stricter implementation of CITES controls, in particular the dropping of reservations on crocodiles by Italy and France in 1984, caused the trade in classic crocodile skins to fall further, to some 100,000 - 150,000 skins in 1984 (IACTS, 1988). However, this coincided with the development of crocodilian farming operations in many countries and rational management programmes in others. The legal supply of crocodilian skins, especially *A. mississippiensis*, *C. niloticus* and *C. porosus*, started to increase once more (Luxmoore, 1990), and was predicted to rise to some 350,000 by 1992 (Ashley, 1990).

Trade in other reptile skins developed in the early twentieth century, and involved mainly snakes and lizards. As with the crocodilians, it was the most valuable snake skins which were exploited first, principally the large boids. The main species were the Indian rock python *Python molurus*, the reticulated python *Python reticulatus* from South East Asia, the African rock python *Python sebae*, and anacondas *Eunectes murinus* and *Eunectes notaeus*, and boa constrictors *Boa constrictor* from South and Central America.

Unlike crocodilians, there is less evidence of wild populations of snakes having declined as a result of hunting for the skin trade. This may be partly because snakes are generally more secretive and therefore difficult to survey than crocodilians. In India, *Python molurus* became locally extinct and was banned from trade in 1984 (Inskipp, 1981). *Python reticulatus* skins derive mainly from Indonesia and Thailand, and the exports of all snake skins from these countries is shown in Fig. 2. In the 1960s and 1970s, exports from Indonesia were running at around 20-60 t a year, which represents about 80,000 - 240,000 skins of *P. reticulatus*. In the late 1980s, annual exports of this species rose to around three-quarters of a million, however there was no indication of what impact this trade was having on wild populations (Groombridge & Luxmoore, 1990). Part of the increasing level of trade in snake skins in the 1970s was attributable to the appearance of new species in the trade. A substantial proportion now constitutes whip snakes *Ptyas mucosus*, dog-faced water Snakes *Cerberus rhynchops*, cobras *Naja naja* and *Ophiophagus hannah*, Karung *Acrochordus* spp., *Homalopsis buccata*, and a variety of other minor species. These are much smaller and of less value than the python skins, but they are traded in much greater numbers. Over 1.5 million *P. mucosus* skins were exported from Indonesia alone in 1986 (Groombridge & Luxmoore, 1990). There is also a substantial trade in skins of sea snakes, including *Laticauda* spp., *Lapemis hardwickii* and *Hydrophis cyanocinctus*, most of which are now exported from the Philippines.

In contrast, the trade in snake skins from Latin America is very much lower. Annual exports reported from 1980 to 1985 averaged 40,076 *B. constrictor*, 12,280 *E. murinus* and 12,810 *E. notaeus* (Luxmoore *et al.*, 1988).

There are three genera of lizards used for the skin trade, the monitors *Varanus* spp., tejus *Tupinambis* spp., and iguanas *Iguana iguana*. Teju skins mostly derive from southern South America, especially Argentina and Paraguay. Net exports reported to CITES from 1980 to 1986 averaged 1.4 million a year (Luxmoore & Groombridge, 1990). In spite of the substantial and continuing trade, there was no evidence what impact this was having on wild populations and so a monitoring programme was initiated (Fitzgerald *et al.*, 1989).

In comparison, iguana skins have never featured as prominently in the leather trade, around 20,000 - 30,000 being recorded in 1980 and 1982, with fewer since then (Luxmoore *et al.*, 1988).

The main monitor lizard used for skins is the water monitor *Varanus salvator*, most of which derive from Indonesia and Thailand. As with python skins, the trade has been increasing over the second half of the twentieth century and exports from Indonesia have now reached around a million skins a year. However there is similarly no evidence of the impact of the trade. The increasing trade appears to be fuelled by growing affluence in the principal consumer markets of Europe and Japan, and made possible by a growing number of hunters in Indonesia and an increase in the area hunted (Luxmoore and Groombridge, 1990). Two other species from Asia which are used for the skin trade are the Bengal monitor *Varanus bengalensis* and the yellow monitor *Varanus flavescens*. Both were previously exported in large numbers from India before their trade was prohibited and they were included in Appendix I of CITES. Since then the principal supplies have come from Bangladesh and Pakistan. Almost all are exported to Japan, and the trade has fallen from 1.5 million in 1978 to just under half a million in 1987. *V. flavescens* is restricted in distribution and may have contracted in range as a result of the trade (Luxmoore and Groombridge, 1990). Monitor lizard skins are also exported from Africa, the species involved being the Nile monitor *Varanus niloticus* and the savanna monitor *Varanus exanthematicus*. Around half a million skins of the former and up to 200,000 of the latter are exported each year, principally from Nigeria, Sudan, Mali and Cameroon (Luxmoore *et al.*, 1988).

Ivory Trade

The trade in ivory from African elephants has a long history dating back at least to the time of the Pharaohs. Parker (1979) documented the early history and showed how the trade spread from various coastal ports to cover the entire continent. In the fifteenth and sixteenth centuries, the principal centres were on the Mozambique coast and in West Africa, spreading into the Sudan, and encroaching inland to meet in Central Africa by the end of the nineteenth century. By this time, the trade from West Africa had begun to decline as elephants had become scarce and their range fragmented. Elephants had become extinct in North Africa in the Middle Ages, and the populations in West Africa have never recovered. However, population declines in East and southern Africa were reversed by the introduction of protection measures during the middle part of the twentieth century.

It is difficult to quantify the historical trade, but Parker (1979) estimated that it rose from some 200 tonnes in the sixteenth century to around 900 tonnes before the first World War. The war, coupled with the introduction of plastic substitutes, sharply reduced the demand for ivory, and the trade in the 1920s was at a relatively low level. But it increased rapidly, as demand for ivory as a luxury carving medium increased in the Far East, until, by the 1960s, it was probably at its peak level of around 1000 tonnes (fig. 3). The burgeoning trade was accompanied by a rapid increase in the value of ivory and this, coupled with the wider availability of firearms, encouraged widespread poaching of the elephant populations in East and Central Africa which showed particularly sharp declines during the 1980s, causing the population of the species to halve to an estimated 625,000 over the course of the decade. Only the relatively well protected populations in southern Africa survived the depredation, and actually increased.

International attempts to control the trade were introduced in 1976, when the species was added to the CITES Appendices, but this was initially ineffective in stemming the flow. A quota system was devised in 1986, whereby the exporting countries declared export quotas and agreed to mark each tusk individually and record

these on export permits. The reported trade fell sharply over the next three years (fig. 3) but illegal (unreported) trade continued. It is probable that the total volume of ivory leaving Africa actually declined, but the illegal trade was certainly substantial, leading to public alarm and a call for a cessation of all trade. This was agreed at the Conference of the Parties to CITES in 1989, and was accompanied by massive publicity to educate the consumers against buying ivory in Europe and North America. It is not clear yet whether the ban has been effective, but preliminary indications are that the trade has reduced to a trickle and that consumer demand in all of the former major markets except the Far East has virtually collapsed (Luxmoore and Caldwell, 1990; O'Connell and Sutton, 1990).

Cat Skin Trade

The skins of wild cats (Felidae) have been highly valued by the fur trade for many decades. The trade, mainly producing "fashion garments", has focused upon what have been perceived as the more attractive skin patterns, textures and colours, often concentrating on the larger species, the skins of which are needed in fewer numbers per garment. During the first half of the twentieth century, world demand for coats, rugs and other items made from the "classic" cat species such as tiger (*Panthera tigris*), leopard (*P. pardus*), snow leopard (*P. uncia*), jaguar (*P. onca*), clouded leopard (*Neofelis nebulosa*) and cheetah (*Acinonyx jubatus*) was at a peak.

Available evidence suggests that a number of these species suffered significant population declines under the pressure of this trade combined with increasing habitat modification. During the 1960s, the trade in large cat species reached its peak. Estimates of annual imports into Europe and the USA in the latter part of that decade indicate that 3,000-5,000 cheetah skins, 15,000 jaguar skins and over 10,000 leopard skins reached the market each year: a jaguar skin coat could be worth as much as US$20,000 in the USA (Fitzgerald, 1989). A variety of factors caused the decline of this trade. The importing countries began to introduce trade restrictions in the early 1970s, and public opinion and fashions changed. In 1971, the International Fur Trade Federation called for a voluntary halt to further trade in skins of three large cat species. This was followed in 1975 by the listing in CITES Appendix I of all of the six species mentioned above, with the exception of one subspecies of tiger (*Panthera tigris altaica*) which appeared in CITES Appendix II until 1987, when it was transferred to Appendix I. In 1990, many of the species involved in this trade suffer persecution as a result of conflict with human populations. Some legal trophy hunting is carried out, particularly of leopards and many countries are forced to implement control schemes for "problem animals".

During the late 1960s, the fur trade began to shift its attention to the smaller cats of the genus *Felis*. By the late 1960s, skins of these species were appearing in trade in vast numbers, totalling perhaps 500,000 skins each year (Williams, 1985). The numbers in trade apparently remained steady through the 1970s before falling to around 200,000 skins per year in the early 1980s (Fitzgerald, 1989). Although skins of most of the 30 or so, *Felis* species appeared in trade in some quantity during this period, the vast majority came from two distinct groups. Firstly, the Latin American spotted cats, chiefly, the ocelot (*Felis pardalis*), Geoffroy's cat (*F. geoffroyi*), little spotted cat (*F. tigrina*) and margay (*F. wiedii*). The second group are the North American species, bobcat (*F. rufa*) and North American lynx (*F. lynx canadensis*), and the Asian/Eurasian species, Bengal leopard cat (*F. bengalensis*) and Eurasian lynx (*F. lynx lynx*).

The Latin American species made up the majority of the trade in small cat skins for many years (fig. 4). The ocelot was the main species in trade until the mid-1970s: US imports alone totalled over 100,000 skins per year during the late 1960s. Demand for skins of the other Latin American species increased as supplies of ocelot skins decreased. By the early 1970s, the US market for Latin American spotted cat skins had declined significantly, owing to import restrictions and changes in fashion; other markets, principally Germany and, to a lesser extent, France, Japan and Italy, grew in size rapidly and total world demand appeared to increase. The main exporting countries were Brazil (largely illegally), Colombia, Bolivia, Paraguay, Peru and Argentina. By the early 1980s CITES controls, began to provide basic information showing the sources of skins in trade (all of the species involved were listed in Appendix II, with some populations in Appendix I). Many source countries introduced, or began to enforce, export restrictions, western European fashions changed, and slowly the trade decreased (Broad, 1987). After 1984, the only significant legal exports were of stock-piled skins and, in 1989, the CITES Parties agreed to transfer ocelot, margay and little spotted cat to Appendix I. Some illegal

trade continues; certainly, garments made from these species appear on sale in Greece in limited numbers. It does, however, appear that large scale commercial hunting has reduced significantly.

Unlike the trade in Latin American species, exploitation of bobcat, lynx and Bengal leopard cat has continued steadily, between 100,000 and 200,000 skins per year since the mid-1970s when skins of these species started to become particularly popular (Fitzgerald, 1989). By 1984, these species were supplying the majority of the felid skins in trade (see fig. 4); the skins are usually less clearly marked than those of the spotted cats popular in trade in the 1960s and 1970s; they remain very much part of the mainstream fur trade. Bobcat and North American lynx harvests remain under national control in the USA and Canada. Many skins are used within these countries, so international trade figures underestimate the level of harvest. The strikingly marked Bengal leopard cat skins became increasingly popular in trade in the early 1980s, probably partially replacing the Latin American cat skins in the remaining markets, particularly Japan (Milliken, 1984). Most of these originate in China; very little is known about the effects of harvest but the species is widespread.

Utilization of felids for international trade has been problematical in the past. Vast numbers of some species have been exported with very little knowledge of the effects on wild populations and with very little ability to control the species or numbers in trade. It appears, however, that the residual trade occurring in the late 1980s was reasonably well controlled and there is no evidence of serious problems for the species involved.

The real effects of large scale skin trade on wild populations of the large cat species and the Latin American species traded in large numbers in the past will possibly never be known. Localized declines in populations of some Latin American species undoubtedly occurred, but the chief concern was the lack of control of the numbers of skins appearing in trade and the combination of trade with other threats to populations (Melquist, 1984). Some studies indicate that cat populations could be robust, even under heavy harvest regimes (Martin and De Meulenaer, 1988). The extent and effects of habitat alteration and destruction are more feasible to assess and these factors are certainly significant for some felid species. Future exploitation of large cat species will probably be dominated by game viewing and limited trophy hunting, both potential sources of considerable income. For small cat species such exploitation is not often possible, therefore the choice is likely to be between dependency on habitat conservation with no direct exploitation of these species or re-introduction of harvest for the skin trade, albeit under controlled conditions. The latter option would be difficult to implement, although Melquist (1984) considered it feasible for some species. Furthermore, it would require the re-opening of a market which has been closed largely outside the influence of CITES, by exporting countries attempting to cope with uncontrolled exploitation and under the pressure of adverse public opinion in importing countries.

Seal Skin Trade

Pinnipeds have been exploited for centuries for food, fertilizer, and a variety of products, most importantly oil and hides. The southern elephant seal *Mirounga leonina* has been particularly killed for oil, while the fur (*Arctocephalus* and *Callorhinus*) and hair seals, such as the harp and hooded seals *Phoca groenlandica* and *Cystophora cristata*, have been killed for their skins and meat. Commercial sealing expeditions to the Americas and polar regions since as early as the sixteenth century harvested millions of animals and resulted in dramatic reductions in most populations of the *Arctocephalus* and the two *Mirounga* species, and the near extirpation of others. In addition, over-exploitation and other human-induced pressures were most likely responsible for the extinction of the Carribean monk seal *Monachus tropicalis* and the extirpation of the Mediterranean monk seal *M. monachus* over most of its former range.

Although many pinniped species continue to be harvested for food and other products by native peoples, especially in Arctic regions, and for fertilizer, international trade has been largely restricted to skins, oil, walrus ivory and products made from them. Live specimens, occasionally but consistently, enter trade for zoo and aquaria. An apparently increasing trade centers on seal penises or bacula, sought for aphrodisiacal purposes in oriental markets.

Barzdo and Caldwell (1982) and Dixon (1984) have reviewed levels of international trade in seals, the latter exclusively in skins for the European market. They identified the following species as those most heavily

exploited for international commercial markets during the periods they studied: *Arctocephalus* spp., *Callorhinus ursinus*, *Phoca groenlandica*, *Phoca hispida*, *Phoca vitulina*, and *Cystophora cristata*.

According to Dixon, the European market in seal skins focused primarily on four taxa, *Arctocephalus pusillus pusillus*, *Phoca hispida*, *Phoca groenlandica*, and *Cystophora cristata*, and involving ten exporting countries: Canada, Greenland, Iceland, Namibia, Norway, South Africa, the United Kingdom, Uruguay, the United States, and the Soviet Union. A prohibition, introduced by the European Economic Community in 1984, on imports of baby seal skins of *Phoca groenlandica* and *Cystophora cristata*, appears to have altered considerably the volume and species composition of European seal skin imports and is known to have had severe economic consequences for countries, such as Canada and Greenland, that formerly exported much higher numbers of skins.

Anne York of the U.S. National Marine Fisheries Service has reported (pers. comm. to A. Brautigam, 1989) that there is considerable international demand for seal bacula, commonly referred to as "seal sticks", and that in some parts of the world the entire genital tract is extracted from the seal carcass for subsequent sale. This trade involves at least *Arctocephalus* spp. from South Africa and Uruguay and *Callorhinus ursinus* from the United States, but possibly other species as well. The baculum of the latter species sold for US$35.00 in 1989 and is currently reported to be worth more than the pelt; one kilogram comprises the bacula of more than 40 sub-adult male *Callorhinus ursinus* (York, pers. comm., 1989 *in* Brautigam, 1989). According to the FAO Yearbook of Fishery Statistics (Anon., 1981; 1988b; 1989b; 1990), between 6,000 and 10,000 specimens of *Arctocephalus australis* were killed in Uruguay annually between 1980 and 1988. CITES reports, however, document a comparatively minor trade in products of this species, usually limited to 200-300 skins. The majority of skins reported exported in recent years were to Japanese companies. 1988 exports totalled 274 skins.

In the early 1980s, South Africa's reported exports of skins of *Arctocephalus pusillus pusillus* ranged from almost 190,000 in 1982 to 700 in 1986; seal skin exports from South Africa reported for 1988 totalled 10,006. Countries importing skins have also shifted; from Germany, formerly the largest importer along with Norway and Denmark, to Hong Kong. The population of *A. pusillus pusillus* is estimated to exceed one million animals. Wildlife authorities in Namibia and South Africa have followed a management policy that called for the culling of between 20,000 and 40,000 animals per year during the 1970s and 1980s, with the result that large numbers of stockpiled skins were put on the market in the early 1980s (see fig. 5). The proposed culling of 30,500 animals for export of skins and bacula to Taiwan in early 1990 was suspended in response to protests from animal welfare groups (*New York Times*, 3.07.1990).

The decline in seal skin exports from South Africa and Namibia may have been offset by an apparent increase in exports of seal bacula and products derived from them, registered variously as "bones," "specimens," or "derivatives". For example, large shipments of *Arctocephalus* derivatives, reported as illegal, were intercepted on import from Hong Kong into the United States in both 1984 (7,261) and 1988 (10,655).

In *Canada*, exports of seal skins declined from 137,164 in 1984 to 100 in 1986. This number has since increased to about 10,000-20,000 per year in recent years (fig. 5). The total collapse of Canadian seal skin exports in the mid-1980s was a result of the restrictions imposed by the EEC on the import of certain baby seal skins, as well as a dramatic change in consumer attitudes as a consequence of anti-sealing campaigns. The majority of seals harvested were, and still are, of two species, *Phoca groenlandica* and *Phoca hispida*, in that order. The harvest appears to have regained the levels recorded in the early 1980s, prior to the anti-sealing campaigns. In 1988, for example, Canada harvested 84,238 *P. groenlandica* (Anon., 1990).

Danish exports of skins of *Phoca groenlandica* and *P. hispida* from Greenland have fallen during the 1980s, from some 110,000 in 1979 to 74,917 in 1986 and only 6,831 skins in 1989. These statistics indicate a total collapse in the Greenland seal skin trade, which is known to have had serious economic consequences for the indigenous communities.

Greenland seal harvest figures have generally remained much larger than export figures, indicating the continued local importance of seals as a source of meat and other products. Reported 1988 harvest figures for *P. groenlandica*, *P. hispida*, and *Cystophora cristata* were 8,879, 50,757, and 1,669 respectively (Anon., 1990).

Whereas Norwegian statistics indicate that the country's past and continued importance is as an intermediary for fur seal skins from Namibia and South Africa, its harvest figures indicate the apparent continued importance of *P. groenlandica* and *Cystophora cristata* as sources of blubber and other products. The total harvest of 85,071 of these two species in 1976 fell to as few as 11,436 in 1984, but rose again to 35,110 in 1988, with *P. groenlandica* comprising from 75% to 99.6% of the harvest since 1976. Skins from this harvest are apparently used within Norway. The wholesale price per skin has dropped by almost two-thirds since 1980 (Anon., 1988a).

Most noteworthy amongst the seal species utilized for subsistence purposes in the United States is the North Pacific fur seal *Callorhinus ursinus*. Harvested under international agreements from 1911 until 1985, when the Interim Convention on Conservation of North Pacific Fur Seals expired, the species is now subject to national regulations of the countries in which it occurs. A commercial harvest of female fur seals from 1956-1968 on St. Paul Island in the Pribilof Islands, Alaska, where the largest population of this species occurs, was adjusted to a harvest of 25,000 sub-adult males through 1984, from which time only an annual subsistence harvest of around 2,000 has been allowed. A decline in this population, by almost two-thirds since the 1950s, prompted the U.S. National Marine Fisheries Service in 1988 to designate the Pribilof population as a "depleted stock" under the U.S. Marine Mammal Protection Act, thereby instituting increased protection measures.

Although considerably lower today than at the time of commercial harvest, U.S. exports of skins of this species have continued since 1984. Because no inventory was made of seal skins and bacula in stock at that time, U.S. authorities have reported experiencing difficulties enforcing export regulations, and there are concerns that stocks from the commercial harvest may be serving as a loophole for international trade in illegally taken animals. For example, 3,000 units of baculum plus testes consigned to a Hong Kong company were detained in 1987, and over 10,000 units in 1988 (Anon., 1989a). A proposal to include this species on Appendix II of CITES was withdrawn prior to the 1989 CITES meeting; experts on the species felt, these problems notwithstanding, that international trade was not a threat to this species's survival.

It is known that the fishing fleets of Japan, the Soviet Union, South Korea, and Taiwan are harvesting pinnipeds around the Antarctic. The volumes are not reported, but the catch limits established under the Convention for the Conservation of Antarctic Seals provide some indication of at least the potential harvest: 175,000 *Lobodon carcinophagus* and 5,000 *Leptonychotes weddelli*. The former species, in particular, is known to be used as a source of meat for both humans and animals.

Although current figures appear to be unavailable, reports from the early 1980s (Barzdo and Caldwell, 1982), and in this volume, indicate the harvest of substantial numbers of seals of several species in the Soviet Union. The impact of harvest on populations of two of the land-locked seals, *Phoca ladogensis* and *P. sibirica*, warrant further investigation, given their relatively low populations; others, however, such as *P. caspica*, may also merit attention.

The total seal harvest worldwide has followed the general pattern apparent with individual species. Harvest levels dropped dramatically in the mid-1980s because of anti-sealing campaigns but bounced back considerably by the end of the decade (fig. 5). Based on these data, it would appear that seal products remain important wildlife commodities in both internal and international commerce.

Whale Product Trade

Whales are one group of mammals that have been hunted for centuries, with many species and stocks brought close to extinction. The exploitation of whales is one of the best documented, and one of the most debated forms of exploitation within the conservation community. The pattern of exploitation has been to hunt one species till it becomes too scarce to be of commercial value, then turn to another (Clark 1973). First, the largest whales, the blue whale (*Balaenoptera musculus*) in particular, were exploited, followed by the fin (*Balaenoptera*

physalus), humpback (*Megaptera novaeangliae*) and sei whales (*Balaenoptera borealis*) in turn. More recently, whalers sought sperm whales (*Physeter catodon*) and the much smaller minke whale (*Balaenoptera acutorostrata*) (Nilsson 1983).

The world catch of whales has declined because of declining populations and, more recently, because international quotas and, subsequently, a moratorium have limited the catch (fig. 6). Certain subsistence and scientific whaling continue in a few places but, overall, the whaling industry has been brought to a halt (Fitter 1986).

Commercial Fish Trade

World fish catch is 92 percent from marine waters and eight percent from fresh waters (FAO Fishery Statistics). Fish catch increased dramatically from the 1950s to the early 1970s. A sharp decline in the early 1970s was a result of the precipitous drop in harvest of anchovies (*Engraulus ringens*) off the coast of Peru (Prescott-Allen & Prescott-Allen 1982). This fishery was almost eliminated by overfishing and by a rapid influx of warm water in 1972, which greatly reduced nutrient levels and numbers of fish. The anchovy fishery has not recovered, and less than one million tonnes are harvested yearly (WRI 1990).

However, except for anchovies, the world fish catch has continued to increase, but the kinds of species harvested have changed over the years. There has been a decline in some of the most prized fin fish species, such as Atlantic cod and the flounder, and an increase in crustaceans and mollusks (FAO Fishery Statistics). Increasingly, countries are managing their fisheries. The United Nations Food and Agriculture Organization estimates that the world fishery yield of conventional species could be sustained at about 120 million tonnes per year if all countries were to manage their fisheries on an optimum basis.

DISCUSSION

Although wildlife has been used locally throughout the history of mankind and, indeed, primitive societies were entirely dependent on it, the international trade in most wildlife products has been increasing and has now reached unprecedented levels. This has been associated with growing affluence and a general increase in international trade in all commodities. Nevertheless, trade in a few wildlife products has declined, and this can be attributed to three principal reasons: changing fashions or demand, resource depletion and control measures. A few examples will demonstrate these.

Ostrich feathers were traded in large quantities at the turn of the century for millinery, and a farming industry grew up in South Africa to support this. However, fashions have now changed and the feather trade is very much smaller, skins and meat being the major products. The large trade in fur seal skins during the nineteenth century was mainly to supply felt, which is no longer in demand, and any residual trade is now for whole pelts, meat, or penis for the medicinal trade. Whalebone (baleen) and oil were the incentives for the early whaling, the meat being discarded. The reverse is now true as whalebone is no longer needed. Ivory trade declined transiently in the early twentieth century as its earlier utilitarian use was rendered obsolete by the introduction of plastics. More recently, consumer demand has turned against the use of ivory as a result of public concern about elephant conservation. A similar aversion to trade in the fur skins of cats and seals caused these industries to decline within the last 10 years.

There are a few examples where trade has diminished as a result of long-term depletion of the resource. The collapse of the trade in Antarctic and Northern fur seals was due to the commercial extinction of both species. Populations of the large baleen whales, especially Blue, Fin and right whales, were reduced to commercial extinction and, had no alternative species been available, this would have caused the virtual halting of the trade. Crocodilian populations were severely reduced in many countries, especially *Alligator mississippiensis* in the USA, *Crocodylus intermedius* in Venezuela, *Crocodylus acutus* and *Melanosuchus niger* throughout their range in Central and South America, *Crocodylus porosus* in Australia and some parts of South East Asia, *Crocodylus siamensis* in South East Asia and *Gavialis gangeticus* in the Indian subcontinent. The skin exports from these

sources declined progressively, and the overall volume was only maintained by switching to other less valuable species, such as *Caiman crocodilus*.

Trade control and field protection measures have been effective in curtailing trade in some instances. Some of the most spectacular declines in the imports of birds to the USA have been attributable to the introduction of bans associated with veterinary health controls, for example to prevent the spread of Newcastle disease and Psittacosis. These effects have generally been short-lived and, once the ban was relaxed, the trade rapidly increased back to its previous levels. The examples where the ban has generally had a longer lasting effect, such as with cat and seal skins, have also been associated with a change in consumer preference. It is this analogy which suggests that the ivory ban may prove effective. *In situ* measures to protect wild populations can also reduce levels of offtake and therefore trade or, at least, hold it at sufficiently low levels to allow the populations to recover. This has been successful with alligators in the USA, crocodiles in Australia and Zimbabwe, and elephants in much of southern Africa. It is worth noting that these are all countries with relatively well developed security infrastructures, and that attempts to prevent poaching in most producer countries rich in natural resources have been remarkably unsuccessful. Furthermore, there are some products of particularly high value which have resisted all attempts at trade control. A notable example is the horn of rhinos, which continue to be illegally hunted throughout their rapidly shrinking range despite anti-poaching measures. Certain parrots also appear to come under increasing pressure as they become rarer and therefore more valuable. The transfer to Appendix I of the Hyacinth macaw *Anodorhynchus hyacinthinus* seems to have presaged its accelerated decline in the wild.

The effects of the increasing levels of trade reported in most wildlife commodities are not always obvious. It goes without saying that there must be a finite limit to the levels of offtake of any renewable, but limited, resource. But it is less easy to say what that limit is or when it has been passed, thus causing the population to decline. Some of the examples where this can be demonstrated have been discussed above, but there are a great number of cases where trade levels appear to be increasing without any documented adverse effects on wild populations. Examples include the great majority of bird species used in the pet trade and most reptiles used in the skin trade. In many, perhaps most, cases this may be due to a lack of population census data which may conceal population declines. In others, it may be because the trade is still within sustainable limits. In some species, the trade may be self-regulating; this can occur if the products are of sufficiently low value that, when the supply becomes limited, it is no longer profitable to hunt them. This is particularly likely for commodities for which there is a similar substitute available and which therefore do not acquire rarity value. This is why captive breeding may prove successful in reducing high-trade volumes for many wild-caught bird species. Sustainable levels of trade can also be achieved by design, if control mechanisms have been set up to limit the trade. This is the goal for which wildlife managers and conservationists strive, but it is all too rarely achieved. Of all of the examples considered in this paper, probably only the harvest of fur seals in Namibia and South Africa, Bobcat and Lynx in North America, and of some species of crocodilians can be said to be effectively managed. Almost all of the rest are either unsustainable or within sustainable limits by chance. In view of the generally increasing levels of trade, it can be expected that some of the examples in the latter category may exceed sustainable limits in the near future unless management procedures are improved.

If this is really true, then it is necessary to reassess the sometimes uncritical support which is often given to wildlife management programmes simply on the basis of the general principles outlined in the World Conservation Strategy. Unless it can be demonstrated that trade really is within sustainable limits, then the fact that people are gaining an income from wildlife should not be used as the only justification for its exploitation. It should be emphasized that it is not necessary to carry out research into every last aspect of the biology of a species before exploiting it. In practice, it is simply necessary to have a monitoring system in place so that population changes as a result of the exploitation can be detected. It is also necessary to have sufficient enforcement potential to ensure that the trade can be controlled should it become necessary.

REFERENCES

Anon. 1981. Yearbook of Fishery Statistics 1980. Vol. 50. Food and Agriculture Organization of the United Nations.

Anon. 1987. Amendments to Appendices I and II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Proposal for Inclusion of *Odobenus rosmarus* in Appendix II.

Anon. 1988a. Fishery Statistics 1988. Central Bureau of Statistics of Norway.

Anon. 1988b. Yearbook of Fishery Statistics 1986. Vol. 62. Food and Agriculture Organization of the United Nations.

Anon. 1989a. Amendments to Appendices I and II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Proposal for Inclusion of *Callorhinus ursinus* in Appendix II.

Anon. 1989b. Yearbook of Fishery Statistics 1987. Vol. 64. Food and Agriculture Organization of the United Nations.

Anon. 1989c. Maintenance in Appendix II of the Zambian population of *Crocodylus niloticus*. Proposal submitted to the 7th meeting of the Conference of the Parties to CITES.

Anon. 1990. Yearbook of Fishery Statistics 1988. Vol. 66. Food and Agriculture Organization of the United Nations.

Ashley, J.D. 1990. Market production and the IACTS review. In Banks, R.C. 1976. *Wildlife Importation into the United States, 1900-1972.* Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, U.S. Department of Interior.

Barzdo, J. and J. Caldwell. 1982. A Review of International Trade in Marine Mammals. *TRAFFIC Bulletin* IV(4/5): 40-60.

Broad, S. 1987. The harvest of and trade in Latin American spotted cats (Felidae) and otters (Lutrinae). CITES Secretariat, Lausanne, Switzerland,139 pp.

Broad, S., Luxmoore, R. & Jenkins, M. 1988. *Significant Trade in Wildlife: A Review of Selected Species in CITES Appendix II. Volume 1: Mammals.* IUCN and CITES Secretariat, Gland and Lausanne.

Brautigam, A., ed. 1989. Inclusion of *Callorhinus ursinus* in Appendix II. pp. 99-102. In *IUCN Analyses of Proposals to Amend the CITES Appendices.* Submitted to the Seventh Meeting of the Conference of the Parties. IUCN/SSC Trade Specialist Group, TRAFFIC, and World Conservation Monitoring Centre.

Bruggers, R.L. 1982. The exportation of cage birds from Senegal. *TRAFFIC Bulletin* IV(2):12-23.

Caldwell, J.R. and Luxmoore, R.A. 1990 Recent changes in the world ivory trade. In: Regional perspectives and situation regarding elephant conservation and the ivory trade. pp 145-174.

Carvalho, C.E. 1986. *A preliminary list of Brazilian fauna sold in Duque de Caxias market, state of Rio de Janeiro.* Birdwatchers Club, Rio de Janeiro.

Clark, C.W. 1973. The economics of over-exploitation. *Science* 181:630:634.

Deems, E.F & D. Pursley, Eds. 1983. North American Furbearers - A Contemporary Reference. International Association of Fish and Wildlife Agencies.

Dixon, A. 1984. The European Trade in Sealskins. *TRAFFIC Bulletin* VI(3/4): 54-65.

Edwards, S.R. 1990. Crocodilian resources in Guyana. Part 2. Management and conservation recommendations. *In Crocodilian Resources in Guyana.* Ministry of Agriculture. Cooperative Republic of Guyana; CITES Secretariat, Sustained Management Systems and IUCN - The World Conservation Union. IUCN, Gland.

Fitter, R. 1988. *Wildlife for Man.* Collins, London.

Fitzgerald, S. 1989. *International wildlife trade: Whose business is it?*, World Wildlife Fund - US, Washington D.C., 459 pp.

Fitzgerald, L.A., Chani, J.M. and Donadio, O.E. 1989. *Tupinambis* lizards in Argentina: implementing management of a traditionally exploited resource. Paper presented at the 1st World Congress of Herpetology.

Fraser-Stewart, J. 1988. Strategies for implementing deer management in Irian Jaya. UNDP/IBRD Project INS/83/013.

Ginsberg, J.R. & D.W. Macdonald. 1990. Foxes, Wolver, Jackals, and Dogs. An action plan for the conservation of canids. IUCN - The World Conservation Union, Gland.

Groombridge, B. and Luxmoore, R. 1989. *The green turtle and hawksbill (Reptilia: Cheloniidae) world status, exploitation and trade.* CITES, Lausanne, Switzerland. 610 pp.

Groombridge, B. and Luxmoore, R. 1990. *Pythons in South-East Asia. A review of distribution, status and trade in three selected species.* Unpublished report to CITES, 127 pp.

Hemley, G. and Caldwell, J. 1986. The crocodile skin trade since 1979. In: *Crocodiles: Proceedings of the 7th Working Meeting of the Crocodile Specialist Group of the Species Survival Commission of IUCN.* pp. 398-412.

IACTS. 1988. *International Alligator/Crocodile Trade Study.* Ashley Associates, Inc.

Inskipp, T. 1981. Indian trade in reptile skins. *TRAFFIC Bulletin*, Special Issue 1981.

Inskipp, T. 1983. The Indian bird trade. *TRAFFIC Bulletin* V(3/4):26-46.

Inskipp, T. & S. Wells. 1979. International Trade in Wildlife. Earthscan.

Iriarte, J.A. & F.M. Jaksic. 1986. The fur trade in Chile: an overview of seventy-five years of export data (1910-1984). *Biological Conservation* 38(1986):243-253.

Lau, A.S.M., & Melville, D.S. in press. *International Trade in Swiftlet Nests With Special Reference to Hong Kong.* TRAFFIC International, Cambridge.

Leader-Williams, N. 1988. Patterns of depletion in a black rhino population in Luangwa Valley, Zambia. *African Journal of Ecology* 26:181-187.

Lewis, D.M., Kaweche, G.B., and Mwenya, A. 1988. Wildlife conservation outside protected areas - lessons from an experiment in Zambia. In Wildlife Management in Sub-Saharan Africa, pp. 332-358.

Luxmoore, R. 1989. International trade. In Hudson, R.J., Drew, R.R. & Baskin, L.M. (Eds). *Wildlife Production Systems: economic utilisation of wild ungulates.* Cambridge University Press, Cambridge.

Luxmoore, R.A. 1990. International crocodilian skin trade: trends and sources. In: *Proceedings of the 10th Working Meeting of the Crocodile Specialist Group of the Species Survival Commission of IUCN - The World Conservation Union.* Crocodile Specialist Group, Gainsville.

Luxmoore, R.A. and Caldwell, J.R. 1990. Recent changes in the world ivory trade. *TRAFFIC Bulletin* 11(4): 50-58.

Luxmoore, R.A. and Groombridge, B. 1990. Asian monitor lizards, a review of distribution, status exploitation and trade in four selected species. CITES Secretariat.

Luxmoore, R., Groombridge, B. and Broad, S. 1988. *Significant trade in wildlife: a review of selected species in CITES Appendix II. Volume 2: reptiles and invertebrates.* IUCN and CITES, 306 pp.

Martin, R.B. 1984 Wildlife utilizations. In: Bell, R.H.V. and McShane-Caluzi, E. (eds) Conservation and wildlife management in Africa, pp 220-253. US Peace Corps.

Martin, R.B. and De Meulenaer, T. 1988. *Survey of the status of the leopard (*Panthera pardus*) in sub-Saharan Africa*, CITES Secretariat, Lausanne, Switzerland, 106 pp.

Melquist, W.E. 1984. Status survey of otters (Lutrinae) and spotted cats (Felidae) in Latin America. Unpublished report to IUCN, Gland, Switzerland, 269 pp.

Meredith, M. 1989. Illegal flows of ivory in southern Africa. In: The ivory trade and the future of the African Elephant.

Milliken, T. 1984. Japan's trade in cat skins. Report to IUCN/SSC Cat Specialist Group Meeting, Kanha, India, April 1984.

Milliken, T. 1990. Aspects of sea turtle exploitation in Indonesia. Specialist Group Meeting, Kanha, India, April 1984.

Milliken, T. and Tokunaga, H. 1987. The Japanese sea turtle trade 1970 - 1986. TRAFFIC(Japan).

Monk, C.E. 1981. History and present status of fur management in Ontario. Worldwide Furbearer Conference Proceedings.

Nichol, J. 1987. *The Animal Smugglers.* Christopher Helm, London.

Nilsson, G. 1980. Facts About Furs. Animal Welfare Institute, Washington D.C.

O'Connell, M.A. and Sutton, M. 1990. *The effects of trade moratoria on international commerce in African Elephant ivory. A preliminary report.* WWF and the Conservation Foundation, Washington, USA 36.

Panagis, K. & I.M. Stutterheim. 1985. Mortalities in birds caught for the export trade in South West Africa/Namibia. *Madooua* 14(2):173-175.

Parker, I.S.C. 1979. The Ivory Trade. Consultant's Report to US Fish and Wildlife and IUCN.

Prescott-Allen, Christine and Robert. 1982. *What's Wildlife Worth?* Earthscan Press, London.

Ramos, M.A. & E.E. Inigo E. 1985. Commercializacion de psittaciformes en Mexico. In *Primer Simposium Internacional de Fauna Silvestre*, Mexico City.

Schouten, K. 1988. The Trade in parrots from Guyana. *TRAFFIC Bulletin* 10(1/2):14-16

Thomsen, J.B. 1988. Guyana and Suriname establish quotas on parrot exports. Parrotletter 1(1):11-12.

Thomsen, J.B. and Brautigam, A. 1991. Sustainable Use of Neotropical Parrots. In Robinson, J.G. & Redford, K.H. 1991. *Neotropical Wildlife Use and Conservation*. The university of Chicago Press, Chicago.

Thomsen, J.B. & G. Hemley. 1987. Bird trade...bird bans. *TRAFFIC(U.S.A.)* 3 7(2/3):1.21-24.

Williams, E. 1985. Small cats: Forgotten, exploited. *Audubon* 87(6): 34-40.

WRI. 1990. *World Resources 1990-91*. The World Resources Institute, New York.

FIGURE 1

EXOTIC BIRD IMPORTS INTO THE UNITED STATES FROM 1901 TO 1988

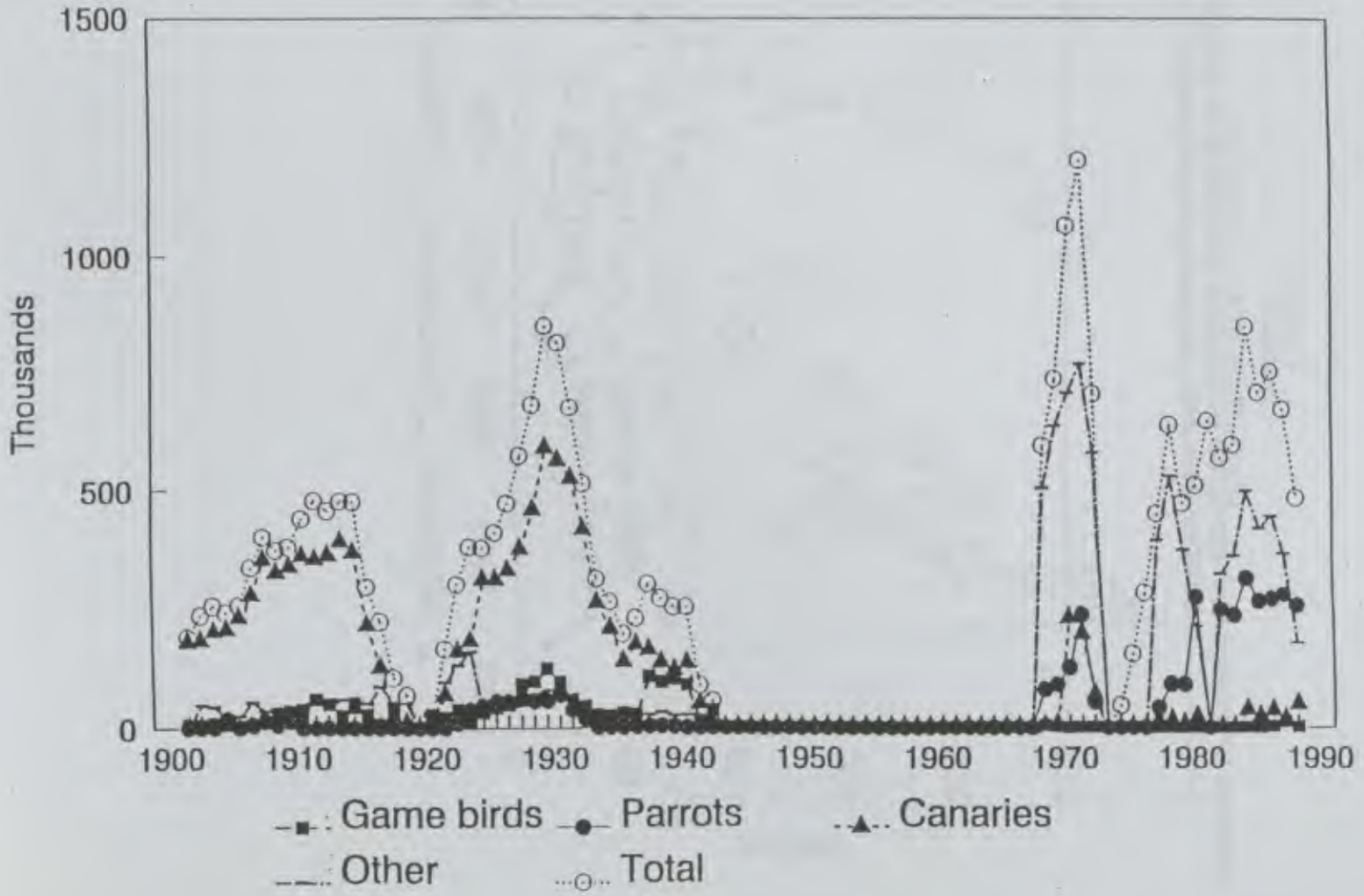


FIGURE 2

EXPORTS OF SNAKE SKINS REPORTED IN CUSTOMS STATISTICS OF SINGAPORE (1955-1982), INDONESIA (1968-1988) AND THAILAND (1970-1988)

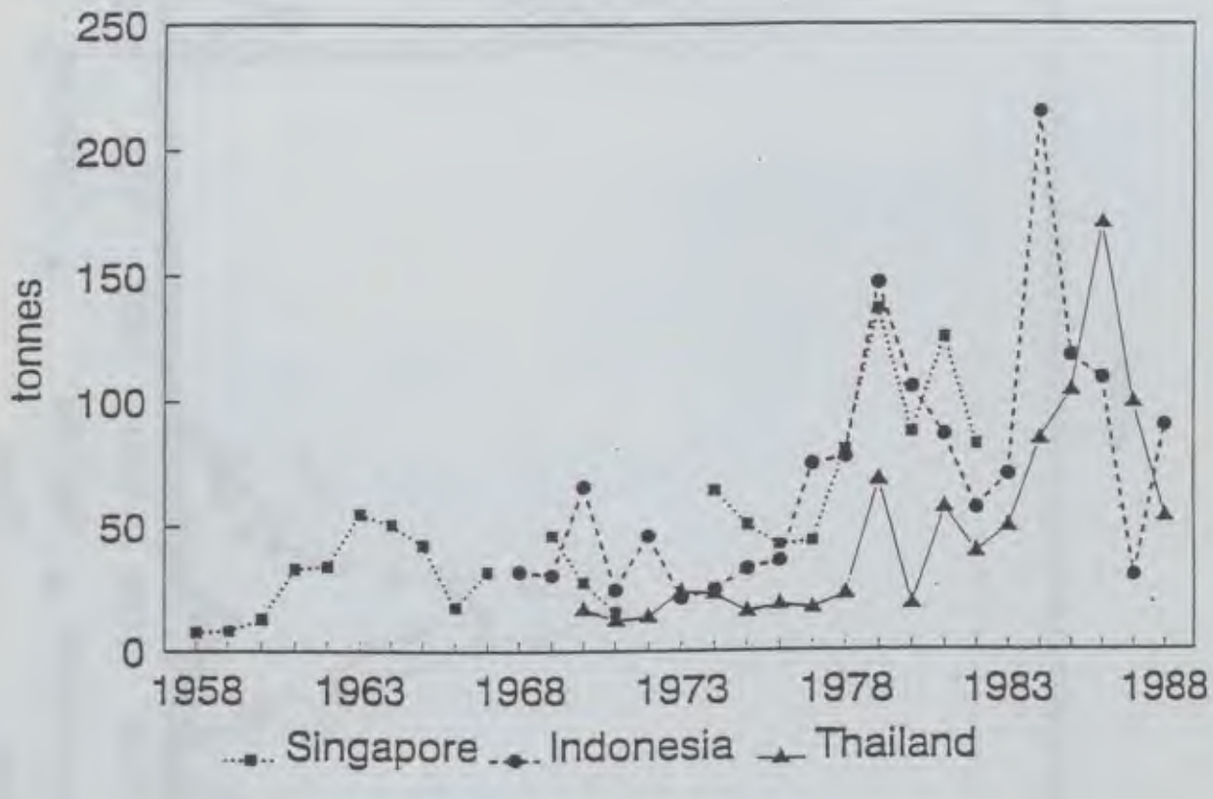


FIGURE 3

ESTIMATES OF RAW IVORY TRADE

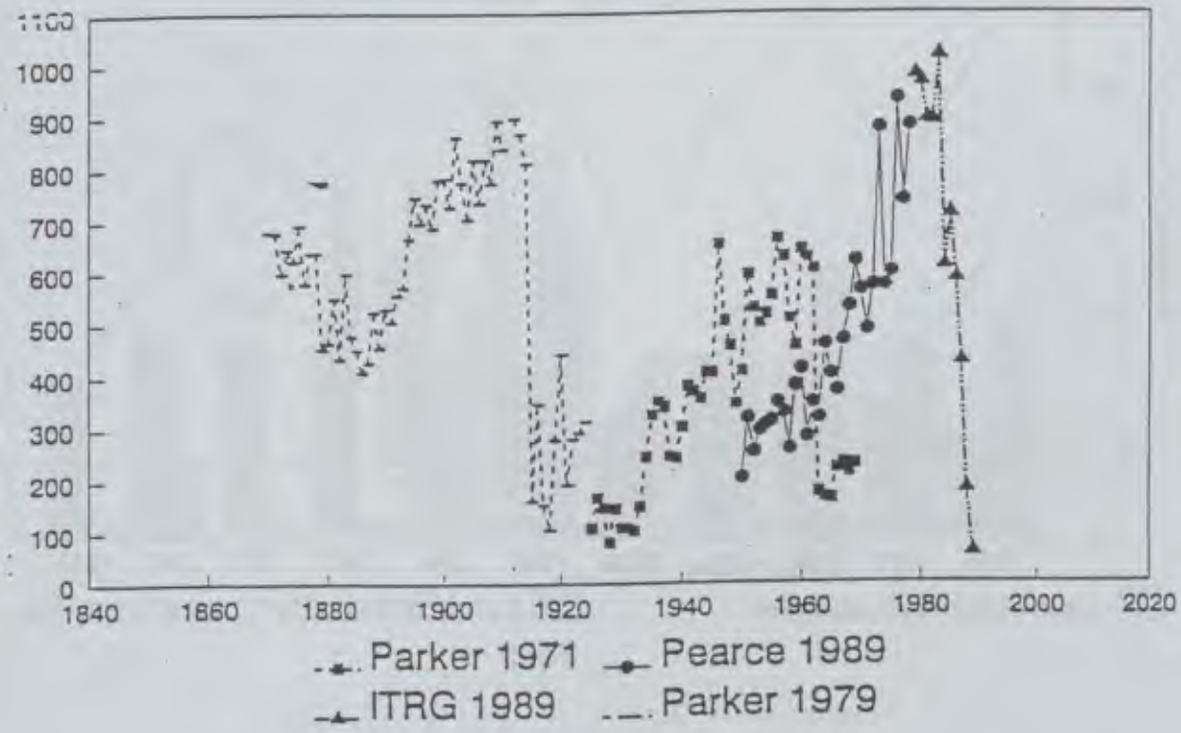


FIGURE 4

TRADE IN SMALL CAT SKINS FROM 1978 TO 1988

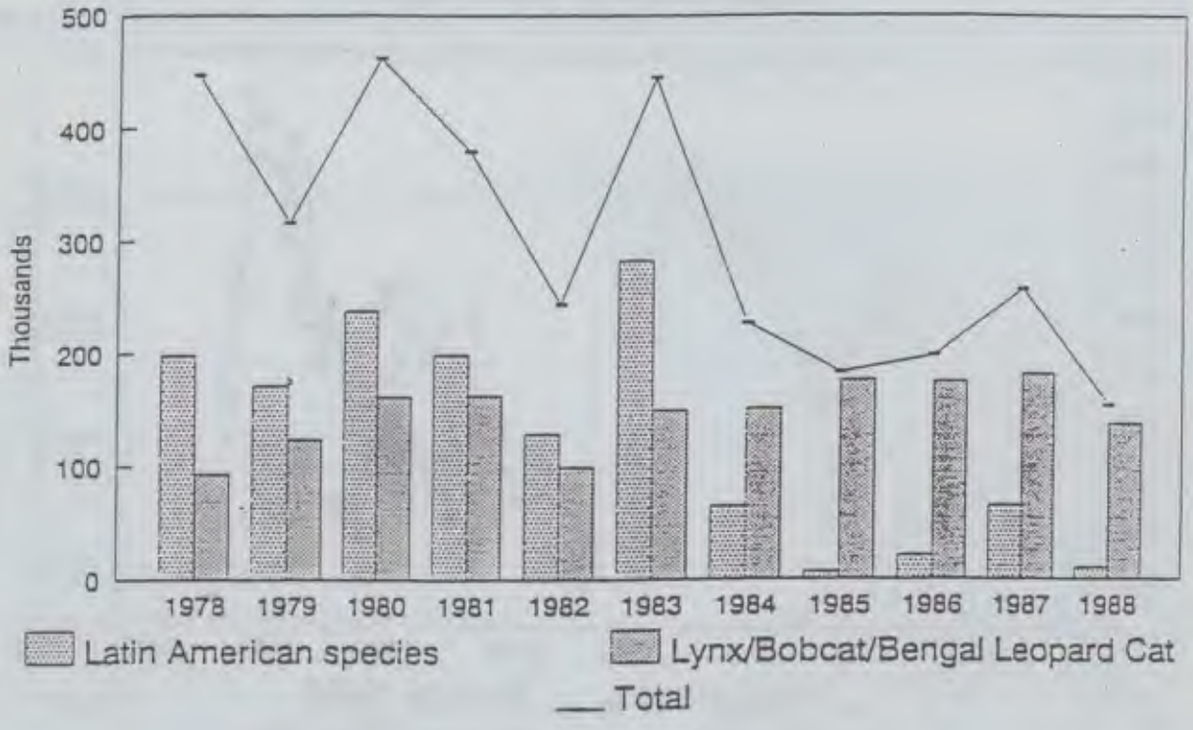


FIGURE 5

TRADE IN SEAL SKINS FROM 1979 TO 1988

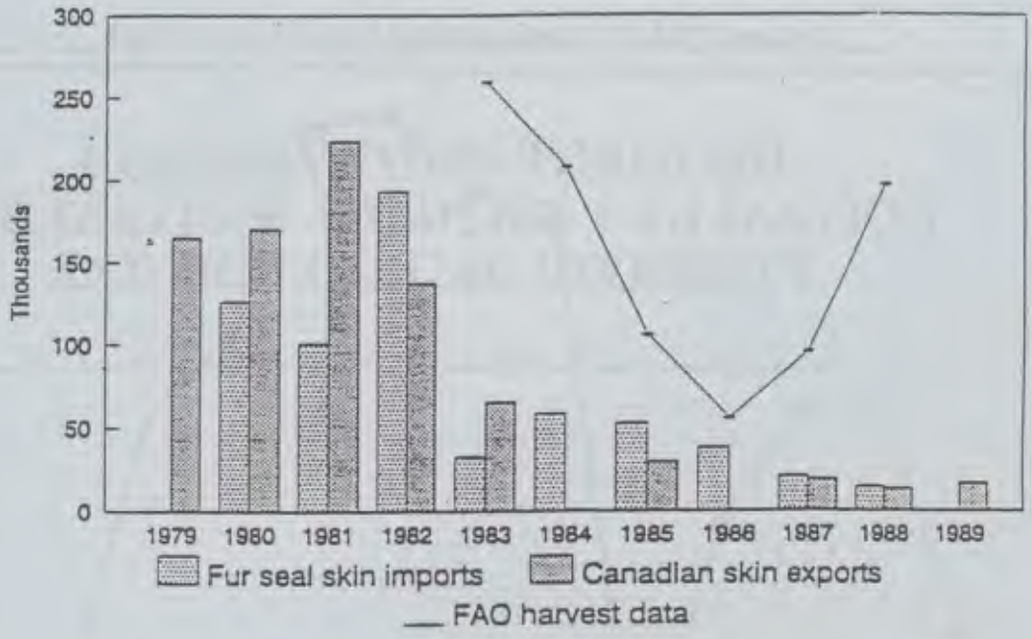
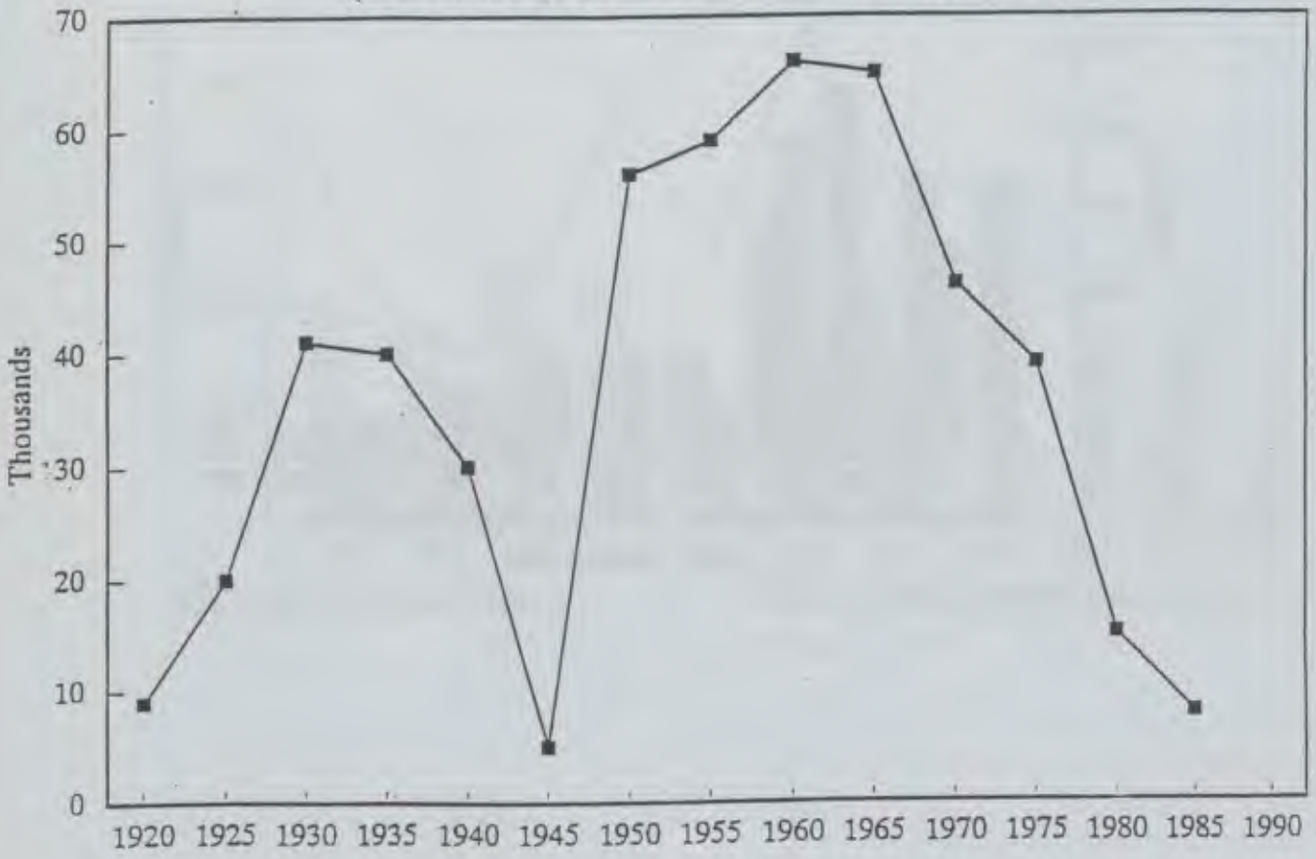


FIGURE 6

WORLD CATCH OF LARGER WHALES

(Source: TRAFFIC International from FAO statistics)



CONSERVATION THROUGH UTILIZATION: WILDLIFE UTILIZATION AND BIOLOGICAL DIVERSITY

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MAINTENANCE VERSUS PRESERVATION

The global loss of biological diversity, or "biodiversity", is currently one of the major problems facing the world. It was recognized as such in the publication of the World Conservation Strategy in 1980. In the interim period, several movements have developed for the purpose of preserving the remaining areas of significant biological diversity, i.e., natural habitat. They include the establishment of national parks and wilderness areas, the arrangement of "debt for nature" swaps, and even a proposed international convention for the development of an international fund for the conservation of biological diversity.

These measures have achieved a certain amount of success. For example, almost 5 percent of remaining tropical forest has received some form of legal protection. On the other hand, these measures can only have very limited success, because they do not address the forces which generate the losses in biological diversity. On account of this, the rate at which unprotected natural habitats are being lost remains largely undiminished.

Preservation has been an approach to saving natural habitat which has been focused on the "tip of the iceberg". It is necessary to broaden this approach in a way that will address the importance of maintaining the 95 percent of natural habitat which is currently unprotected.

In addition, the strategy of preservation is subject to concerns about its long term viability. This is because a promise to protect a designated area is much more readily kept while other areas are available for development. At current rates of exploitation, the remaining unprotected natural habitat will all be subject to some development within the next century. Protected areas will come under increasing pressure as this buffer stock is eroded.

Finally, the idea of preservation has been promoted in a way which renders it antithetical to development. The maintenance of natural habitat has been viewed as wholly inconsistent with the process of development. In part, this is necessarily true, but not always. It is possible to develop natural habitat areas in ways which allow local communities to make significant uses of the resources, while also maintaining the biological diversity of the habitat.

This is the core of the idea of maintaining natural habitats by harnessing the forces of development, rather than battling against them. Constructive utilization of the resources in natural habitats can act to provide the incentive to keep them. This is the means by which the 95 percent of remaining natural habitat which is unprotected might yet be maintained.

THE MEANING OF BIODIVERSITY

Biological diversity, in the biologist's sense of the word, is the natural stock of genetic material within an ecosystem. This stock may be determined by the actual number of genes existing within the system. The number of genes range between organisms; from about 1,000 in bacteria to 10,000 in some fungi, and to around 100,000 in a typical mammal. The greatest number of genes actually belong to the flowering plants, often in excess of 400,000. Genes are important because they determine the particular characteristics of a given organism. They encode the information which determines the specific capabilities of that organism. The greater the variety of genetic material, the greater is the variety of organisms which exist or which will exist in the near future.

The ecologist's idea of biological diversity is defined in terms of the ecosystem. Any given ecosystem provides a natural flow of services, in particular the flow of the primary (or photosynthetic) product (NPP); this concept represents the ecosystem's capacity to capture and utilize the energy provided by the sun. For example, inorganic matter, such as asphalt, has no capacity to utilize the power of the sun's energy in the form of new leafy matter, or in reproduction. From the ecologist's perspective, it is not only the absolute amount of genetic material which exists that matters, but the relative quantities of particular organisms. Substantial alterations in the relative proportions of organisms within a given ecosystem can result in a substantial fall in NPP. For example, the removal of a large number of a particular species of tree from a hillside may make little difference in the amount of genetic material existing (so long as at least one of that species remains), but it might place

the entire ecosystem in danger. This might be the case if the removal of a high proportion of the trees resulted in an increased possibility of flooding, and hence in a loss of a substantial portion of ecosystem services.

The usual unit of analysis in studies of biodiversity is the number of existing species. The number of described species is around 1.4 million; however, the number of species which have not yet been catalogued far exceeds that number. Best estimates place the total number of species somewhere between five and 10 million.

The vast majority of these species are insects, and other smaller organisms. Among the better studied categories, vertebrates and flowering plants, the numbers are much lower and more certain. For example, it is known that there are about 43,853 vertebrates in existence, of which only 4,000 are mammals, 9,000 are birds, 6,300 are reptiles and 4,184 are amphibians. By way of contrast, it is known that there exist at least 50,000 different species of mollusks (Wilson, 1988). By reason of forces largely unknown to us, the amount of natural variety is mostly constant across natural habitats which are approximately equal in size, make-up and climate. Also, there is a clear relationship between the area of the natural habitat and the variety of species it contains. Studies of "islands" of natural habitat, that is isolated by water or whatever, indicate that the number of species doubles with a tenfold increase in the area of the island. Conversely, a reduction in the size of the natural habitat by 90 percent will result in a halving of the number of species which it will contain (Wilson, 1986).

These relationships have been obtained by comparing the number of species on similar islands of differing sizes. If the larger island was compared instead with not one but many islands, whose combined area was less than the larger island, this would be more analogous to the process of reduction and fragmentation of natural habitats which is occurring. This fragmentation will itself contribute to some extinctions.

Of course, extinction is itself a natural process. Studies show that the natural longevity of many species lies in the range of one to 10 million years. It is not any specific stock of species which is necessary to maintain biological diversity, but rather the general stock; the actual constituency of that stock has always varied across time.

The problem of biological diversity arises when the rate of extinction of species far exceeds the rate of creation. In these eras of mass extinctions there is a potential threat to the entire global biology. In the distant past, so-called "deep time", there have been a number of such mass extinctions. There are at least five occasions indicated in the fossil record during which over 50 percent of the then-existing animal species became extinct (Raup, 1986).

Even averaging in these periods of mass extinctions, the natural rate of extinction over deep time appears to have been in the neighborhood of 9 per million years, or approximately .00009 percent per year (Raup, 1988). That is, the current stock of biological diversity is the result of several billion years of mostly low frequency mutation and extinction, which has given to us a legacy which cannot be recreated in any shorter length of time. In this respect biological diversity is one of the stocks of "ancient capital", along with the fossil fuels, rich soils and ancient groundwater, which cannot be replaced once destroyed. It is an "exhaustible resource", in the phraseology of economics, which is in many cases being exhausted without ever being utilized. It is fundamental that the value of this resource be taken into account in determining its rate of utilization. This is the basic nature of the economic problem of biodiversity.

THE CURRENT EPISODE OF MASS EXTINCTIONS - THE NATURE OF THE PROBLEM

It is estimated that about half of the world's species are contained in the remaining tropical forests, and much of the attention on the current rates of extinction are therefore focused on these regions.

The so-called "megadiversity states" identified by the World Wide Fund for Nature are: Brazil, Columbia, Indonesia, Madagascar, Mexico and Zaire. Four of these states together account for approximately 75 percent

of all primate species. In sum, it is estimated that 50 to 80 percent of the world's biological diversity is to be found in six to 12 tropical countries, including those mentioned above (Mittermeier, 1988).

Species loss in the tropics over the next few decades is projected to approach the magnitude of the previous mass extinctions. A range of estimates project a total species loss of between 20 and 50 percent. A fairly conservative estimate would seem to be that the current rate of extinction in tropical areas is about 1,000 to 10,000 times the natural rate of extinction (Wilson, 1988).

TABLE I: ESTIMATES OF THE CURRENT RATES OF SPECIES EXTINCTION

Estimate of Loss	Basis	Source
33-50% of species by 2000	forest area loss	Lovejoy (1990)
50% of species by 2000	forest area loss	Ehrlich & Ehrlich
25-30% of species by 2000	unknown	Myers (1983)
33% of species in 21st century	forest area loss	Simberloff (1986)
20-25% of species	present trends	Norton (1986)

These extinctions are resulting primarily from the loss of the natural habitat upon which these species depend. It was noted previously that studies have demonstrated a correspondence between the loss of habitat and the extinction of a predictable proportion of species in that habitat. In fact, it has been found that the extinction of species from such losses will usually occur relatively soon after habitat modification.

For example, the Barro Colorado island was created by the rise of Gatun Lake during the construction of the Panama Canal. Prior to that it had been a part of a much larger area of natural habitat. Studies by biologists surveying the island predicted that the loss of natural habitat area would ultimately result in a loss of about 15 percent of its species. In fact, the number of bird species made extinct on that island within 50 years of its creation was 12 percent of the initial stock. Thus, the phenomenon of extinction linked to natural habitat losses can be a relatively certain, and rapid phenomenon (Terborgh, 1974).

Most of the estimates of current extinction rates flow from the use of these observed relationships between the loss of natural habitat and the loss of species. It currently happens to be the case that human populations are expanding, and natural habitats declining, most rapidly in the zones of most diversity. The rate of deforestation in the tropical zones has been estimated at between 10 to 20 million hectares per year, or an area approximately the size of California lost every two years (OTA, 1984). Given our current understanding of the relationship between natural habitat and species diversity, it is possible to predict the dire consequences of these loses of natural habitat for global biodiversity.

Natural habitat is declining in the face of ever increasing human pressure for a greater share of the earth's product. As described earlier, the ecologist's notion of ecosystem services is Net Primary Product (NPP): the product of biological material making use of the sun's energy. Although the human species is only one of millions, it currently sequesters to its own purposes over 40 percent of the earth's terrestrial product.

TABLE 2: HUMAN APPROPRIATION OF THE EARTH'S BIOLOGICAL PRODUCT

Net Primary Product (NNP) is the sum total of an ecosystem's flow of services in a given period of time. Although the human species is only one of about five to 10 million species, it prevents other species from making use of about 40 percent of terrestrial NPP. Of this amount, humans only directly use about 4 percent. Their production methods remove another 36 percent from the use of other species, which is not directly consumed by humans. Of this, about 26 percent represents indirect use, e.g. unused produce returned to the earth, while another 10 percent represents pure waste, e.g. asphalted soil.

Use	Share of NPP
Direct Use	4%
Indirect Use	26%
Losses	10%
Total	40%

Source: Vitousek, P., Ehrlich, P., Ehrlich, A., and Matson, P. 1986. "Human Appropriation of the Products of Photosynthesis", Bioscience, 36(6):368-373.

The problem of biodiversity does not lie in the proportion of the earth's product which humans use, but rather in the proportion of the earth's product which humans deny other species any use. That is, we use directly only 10 percent of the resources which we reserve to ourselves; the other resources we deny to other species by reason of the manner in which we take our 4 percent of NPP.

The above figures indicate that we reduce NPP a full 10 percent, more than twice what we consume, in terms of pure wastage. This results most dramatically when good soil is paved under for a road, but also occurs when a natural forest or pasture is ploughed under to produce a monocrop such as corn. The total biomass of the ecosystem is often reduced by virtue of the replacement of a vast number of different species with a single one. This is because species are expert at finding any available niche in which to prosper. The natural stock of biological diversity has resulted largely on account of this natural process of niche identification. The replacement of this natural diversity with a single species will very often leave a large number of such niches unfilled, thus resulting in a net loss in ecosystem product.

The far more significant figure is the amount of ecosystem services which we indirectly use; this constitutes fully 26 percent of total NPP. These uses include the parts of the plants that we grow which are not consumed by us, and thus return to the earth unused by a higher organism. It also includes the amount of biological matter which is cleared and burned in the agricultural process. All of this material could be used by higher species before its return to the earth, but this use is denied to them by humans in the process of creating the 4 percent of NPP which is ultimately used.

It is not really a problem that the human species directly consumes 4 percent of NPP, which given the size and energy requirements of the species is not grossly disproportionate (Ehrlich, 1986). On the other hand, the denial of 40 percent of NPP to the other species of the earth, and primarily the other higher organisms, is at the source of the problem of biological diversity. The other five to 10 million species cannot be expected to survive on the remainder of the earth's product, when they have been accustomed to a far greater share over the course of evolution.

The source of the problem then is the amount of wastage which humans generate in the process of consuming NPP. In the long run it will be necessary to achieve some sort of restraint on the direct use of ecosystem product. However, in the short run, it is necessary to tackle the high level of indirect use in order to avoid imminent mass extinctions. This points to the manner in which development might be compatible with the maintenance of biological diversity. In short, it should be possible to maintain or even increase current levels of direct use of NPP, while simultaneously increasing the amount of resources allowed to other species. All

that is required is an overhaul of our methods of agricultural production in order to reduce the amounts of waste and indirect use currently within the system.

THE CONSERVATION OF NATURAL HABITAT - THE SOURCE OF THE PROBLEM

Agriculture has itself been developed in response to economic forces; in particular, it is the result of the application of the law of specialization to the countryside.

The law of specialization is one of the first and most important principles of economics. At its crudest it states that if an individual undertakes the same task many times, i.e., specializes, that person will be more productive than if he or she had undertaken to do the same number of different tasks. Adam Smith first discussed this principle in the context of an early factory in which the breakdown of manufacturing into a number of discrete tasks, performed repeatedly, was capable of vastly outperforming a single individual attempting to perform all of the tasks by himself. Obviously, the principle caught hold and is currently the basis for most of production in the western world.

There is a clear trade-off between productivity and variety in the principle of specialization. Although these factories are capable of producing vastly greater quantities, they do so at the expense of reducing each individual's task to an unvaryingly routine one. In addition, larger factories and more specialization can further reduce costs resulting in a larger price differential between goods produced by this method and those which are produced in accordance with an individual's order, i.e., "hand crafted". Therefore, there is a loss of variety in the tasks performed and the goods produced in a accordance with the force of specialization.

Specialization came to the countryside long ago. Settled agriculture of the western variety has usually involved the clearing of the natural habitat for replacement by one or few cultivated species. Such monocultural production has great advantages in terms of specialization, but obviously reduces the diversity of the produce.

Specialization in agricultural production confers productivity gains by virtue of doing repeated tasks; that is, it is easier to plant a field in one crop than in several. In addition, the homogeneity of the crop allows the owner to invest in capital goods which are able to do a single task much more quickly and capably than a human; for example, converting a piece of land to the production of a single crop allows the use of machinery for planting and harvesting, and the use of chemicals which are capable of targeting all competitors ("pests") of the chosen crop. These gains of agricultural specialization have long been known as the initial steps along the road of western style development.

It is this process of conversion from heterogeneous production to specialized homogeneous production which is largely responsible for the high levels of human indirect use of NPP. This is because specialized production requires the removal of much habitat which would otherwise "get in the way" of mass production, e.g., trees and brush are often cleared or burnt. Furthermore, specialized production results in a large quantity of edible (by some species) matter, of which humans usually take only the fruit or seeds for direct consumption (e.g., maize kernels, roots of certain crops). Nevertheless, the entirety of the crop is withheld from these other species in order to protect the small proportion humans directly consume. Ultimately much of this biomass is returned to the soil without being used by a higher organism; and this is the primary contributing factor to the high rate of human use of ecosystem services. Therefore, the gains in labour productivity have often come at the expense of disproportionate withdrawals of these resources from other species.

The global impact of the force of specialization on natural habitat is staggering. Estimates of aggregate natural habitat losses over the past two centuries range from 25 to 50 percent (Myers, 1980; IIED, 1989). Two hundred million hectares of forest and 11 million hectares of grasslands were converted to specialized agriculture between 1960 and 1980 alone (Holdgate et. al., 1982).

The losses of variety resulting from these conversions are readily demonstrated. Of the thousands of species of plants which are deemed edible and adequate substitutes for human consumption, there are now only 20 species which produce the vast majority of the world's food (Vietmeyer, 1986). In fact, the four big carbohydrate crops (wheat, rice, maize and potatoes) feed more people than the next 256 crops combined (Witt, 1985).

In the developed countries of Europe and the U.S., the force of specialization has largely completed its task. The proportion of Europe which is now natural habitat is certifiably zero. In the U.S., a mere 500 years after the entry of the first Europeans, the natural habitat is now down to 5 percent (World Resources Institute, 1990). These figures may be compared to a worldwide average of 39 percent of all land which remains undeveloped.

The process of conversion continues at a rapid pace. Although there remains little land to convert to specialized production in the developed countries, the developing countries have adopted and implemented this strategy with real enthusiasm over the past thirty years.

TABLE 3: RATES OF CONVERSION OF NATURAL HABITAT TO AGRICULTURE

During the past three decades the developing countries have been pursuing a strategy of rapidly converting natural habitat to agricultural production. This process has been largely completed in the developed world; the amount of certifiable natural habitat remaining there is less than one percent (compared with 39 percent worldwide). Therefore, little conversion continues to occur in the developed world.

Developing	1960 (ha.)	1980 (ha.)	Percent. Change
Sub-S. Africa	161m.	222m.	37.8
Latin America	104m.	142m.	36.5
South Asia	153m.	210m.	37.2
S.E. Asia	40m.	55m.	37.5
Developed			
North America	205m.	203m.	0.1
Europe	151m.	137m.	-10.0
U.S.S.R.	225m.	233m.	2.0

Source: Repetto,R. and Gillis,M., (eds.) 1988. Public Policies and the Misuse of Forest Resources, World Resources Institute: Cambridge.

These rates of conversion of natural habitat represent region-wide rates of increases of agricultural lands of over 17 percent per decade. Recently, these aggregate rates have declined somewhat (14.1 percent for South America; 4.6 percent for Africa in the decade to 1987). However, the current rates of increase exceed the rates of the previous two decades in certain areas at the core of the remaining biological diversity. In short, it is to be expected that the conversion rates, as measured by the percentage increase in the stocks of agricultural lands, must fall over time on an aggregate basis. It is alarming that these rates remain high in precisely those countries where substantial quantities of natural habitat remain.

TABLE 4: RECENT RATES OF CONSERVATION TO AGRICULTURE

The general rates of conversion between 1960 and 1980 were very high (in excess of 17 percent) as the doctrine of classical development was implemented across wide ranges of the developing world. Rates of increase even in excess of these rates still continue in certain areas of the world; many of them those which harbor the vast majority of remaining biological diversity, i.e., the tropical forested nations.

Conversions to Cropland		Conversions to Pastureland	
1. Paraguay	71.2%	1. Ecuador	61.5%
2. Niger	32.0%	2. Costa Rica	34.1%
3. Mongolia	31.9%	3. Thailand	32.1%
4. Brazil	22.7%	4. Philippines	26.2%
5. Ivory Cst.	22.4%	5. Paraguay	26.0%
6. Uganda	21.4%	6. Vietnam	14.0%
7. Guyana	21.3%	7. Nicaragua	11.8%
8. Burkina F.	19.4%		
9. Rwanda	18.6%		
10. Thailand	17.1%		

Source: World Resources Institute and International Institute for Environment and Development [1990], World Resources 1990-91, Earthscan:London.

In sum, the problem of biological diversity is largely attributable to the losses in natural habitat. In turn, these losses of natural habitat are occurring by reason of the process of conversion of these lands to specialized production. Specialized production is one of the hallmarks of western-style development, but it implies substantial losses of diversity whenever it is applied. To address the basic causes of biodiversity losses will required the in-depth examination of this link between development and specialized production, and the conversion of natural habitat which it implies in the agricultural context. Conversions from heterogeneous and diverse means of production ("natural habitat production") to homogeneous and single species production ("specialized agricultural production") has been an assumed necessary step along the path to development. This need not always be the case, even if it has been true in the past.

THE CASE AGAINST CONTINUING NATURAL HABITAT CONVERSIONS

There is substantial evidence accumulating which indicates that the financial returns to following the classical path to development, and especially specialized agricultural production, are declining rapidly. For example, in spite of the fact that developing countries have converted substantial amounts of formerly natural habitat to the production of traditional agricultural commodities, these countries have realized no relative increase in value from these conversions; that is, although the value of their production of these conversions; that is, although the value of their production of these commodities has increased, it has not increased any more than has the value of the production of the developed countries (who have not converted any natural habitat in the same period).

A general explanation for this trend is the absence of significant demand for the additional quantities of the same commodities. Specialized agricultural production has been constructed around the mass production of large quantities of a few basic commodities. Capital goods, chemicals and techniques have species. Mass production requires the sacrificing of variety in the pursuit of cost savings, and agricultural specialization has focused on meeting the demand for a small number of basic commodities that are insubstantial demand by most of the world's consumers.

TABLE 5: THE VALUE OF CONVERTING NATURAL HABITAT

Between 1960 and 1980 the developing countries have increased the proportion of their lands which are dedicated to specialized agricultural production by substantial percentages, while the developed countries have converted none. In spite of this, the increase in the value of production of these agricultural commodities has been almost equal in the two regions. There has been no relative return to the increased rates of conversion.

Region	Conversion to Agriculture	Increased in Value
Developing	37% increase	24% increase
Developed	No Change	21% increase

Source: Holdgate, M., Kassas, M., White, G. (eds.) 1982. The World Environment 1972 - 1982, UNEP.

However, western production already goes far toward completely satisfying this demand. Further production of these already overproduced commodities will only result in depressing the prices overproduced commodities will only result in depressing the prices of the commodities. This is an example of what economist's know as operating on the inelastic portion of the demand curve for a given commodity. In essence, price inelasticity means that further quantities of the good on the market will necessitate more than proportional reductions in the price in order to dispose of them. The net effect is that more production results in lost revenues.

Some studies of commodity production in the less developed countries have reported this effect in practice. For example, in Sub-saharan Africa 60 per cent of export earnings come from commodities for which demand is inelastic, so that an increase in production of those commodities would actually reduce earnings. (Godfrey, 1985). This pattern is much more general than a specific example demonstrates, however. In fact, the general index of commodity prices has fallen by 50% over the past thirty years, the same period in which the majority of conversions to specialized agricultural production have occurred.

TABLE 6: THE TREND IN THE PRICES OF TRADITIONAL COMMODITIES

The reason for the absence of a financial return to the conversion of natural habitat is the effect which increased production has had upon the prices of these commodities. Most of these commodities have long been in surplus on the world's markets, and thus increases in supply result in further falls in the relative price of the good. Over the past thirty years, the real value of the traditional commodities has fallen by nearly 50%.

Year	Commodities Price Index (1960=100)
1957	112
1960	100
1965	95
1970	91
1975	105 (impact of oil cartel)
1980	85
1985	65
1987	62

Source: International Monetary Fund. 1988. World Economic Outlook 1988, Washington.

Overall, classical development policies have not worked well for a large portion of the developing world, in particular for those countries focusing on the development of production in the traditional export commodities.

While agricultural production in the developing countries has skyrocketed by virtue of the conversion of large quantities of previously natural habitat (1960-1980: Africa 35%, Latin America 75%, South Asia 45%), there has been no corresponding relative increase in the value of this production. To some extent, these countries have chosen to follow an already too well trodden path toward development, and there no longer exists any room in the market at the end of that road.

THE VALUE OF NATURAL HABITAT PRODUCTION

There are two specific reasons why the value of the goods and services which flow from natural habitats might be expected to exceed its converted value. The first is the relative scarcity value of natural habitat, and hence its products. The second is the increased NPP of natural habitat.

As conversions of natural habitat have occurred, the remaining stock has been irretrievably reduced. This means that the obvious sources of supply of the unique products of natural habitat have been diminished. This unambiguously points to an increase in the price of such goods and services. At the same time, the amount of lands dedicated to traditional agricultural commodity production has increased, thereby reducing their relative value. The dynamics of this process indicated that the comparative advantage of natural habitat production must have been increasing throughout the past three decades, and that it would be predictable that in some instances the financial returns from the use of the products of the land if it were to be converted.

A number of studies have demonstrated precisely this effect. The use of natural habitat for wildlife products (hunting, skins, ivory etc.) in Zimbabwe has been demonstrated to be the finest best use of those lands in that country. In Kenya, the use of natural habitat for the purpose of wildlife tourism far exceeds its alternative use value. Cattle ranching in Brazil and Peru has been demonstrated to be an inferior use of converted rainforest. Similarly, in Malaysia, the transfer of rainforest to intensive cultivation was found to result in a substantial net loss in value.

TABLE 7: THE COMPARATIVE VALUE OF NATURAL HABITAT PRODUCTION

A number of studies have demonstrated that the value of the product of natural habitat is greater than the value of its product if it were to be converted to another use.

Country	Natural Habitat Use & Value	Alternative Use & Value
Kenya	Wildlife Tourism	Cattle Ranching
Zimbabwe	Wildlife Product. Z$4.20/ha.	Cattle Ranching Z$3.58/ha.
Malaysia	Forest Production $2455/ha.	Intensive Agric. $ 217/ha.
Peru	Forest Production $6820/ha.	Clear-cut $1000/ha.

Sources: Zimbabwe-Child (1986); Kenya-Western (1984); Malaysia-Watson (1988); Peru- Peters, et. al. (1989).

Each of these studies demonstrates that the value of the products of natural habitats exceeds the value of the land if converted to traditional agricultural commodity production. In the case of Zimbabwe, that value is captured by marketing products from elephants (ivory and skins) and other game animals as well as by allowing local communities to utilize the thatch grown within the reserves. In the cast of Malaysia, the natural habitat products include rattan and fuelwood. In Peru, the products are primarily fruits and latex, with some selective logging and fuelwood use.

These examples demonstrate the value of the diversity of uses that natural habitat production can supply. Clearly, natural habitats can produce game for food and commodities for trade. In addition, a primary source

of energy throughout much of the developing world is fuelwood, much of which comes from natural habitat. (Prescott-Allan and Prescott-Allan, 1982). Even the provision of the necessary materials for dwellings is provided by natural habitat; the value of the harvest of thatch from Royal Chitwan National Park in Nepal exceeds $600,000 annually. (Mishra, 1984). In Venezuela, it has been found that the designation of a high altitude national park was sufficient to assure high quality water supplies from that watershed. (Garcia, 1984). Therefore, one of the important characteristics of natural habitats is the sheer variety of uses which it can generate: food, energy, building materials, exchangeable commodities, even water supplies. There is a supplementary value to having such a "portfolio" of goods and services available to any given community.

Some of the value of natural habitat production is already being attained, but is unaccounted for in national accounts and decision-making. For example, many indigenous peoples depend upon the value of natural habitat production for their very survival. Estimates of regional reliance upon "game meat" exceed 80% in Peru, and 70% throughout rural Ghana. (Ajayi, 1979; Sale, 1981). A large proportion of states take a substantial amount of their animal protein from natural habitats. Many times, these products of natural habitats do not pass through a market, because they are used directly by local communities, and hence are not given a specific value in the process; however, it is fundamentally important that this production be given its correct valuation in national accounts, and in determinations concerning land use.

TABLE 8: UNACCOUNTED FOR VALUE OF NATURAL HABITAT PRODUCTION

Many persons currently use natural habitats as a primary source of their food supplies. Much of this produce is consumed directly, and is never taken into consideration as the produce of the natural habitat. It is essential that the subsistence value of natural habitat production be considered in making conversion decisions.

Avg. Percentage of Animal Protein	Number of States
20 - 29	15
30 - 39	17
40 - 49	12
50 +	19

Source: Prescott-Allan, R. and Prescott-Allan, C., [1982]. What's Wildlife Worth?, Earthscan: London.

Very likely, the greatest earning power of natural habitat in the future lies not in its capacity to produce unique goods, but instead in its capacity to produce unique services. International tourism has been one of the world's growth industries for the past two decades; it has increased tenfold during that period. It now represents 5% of all international trade. (World Tourism Organization, 1990).

In the developed world the recreational value of the natural habitat that remains dwarfs the produce value of that same habitat. For example, the value of the great Lakes as a source of recreation (for the purposes of fishing) was determined to be $500 million in 1984, while the value of the fish taken was only $6 million. (Robinson and Bolen, 1989). Similarly, in the Scottish Salmon fisheries, it has recently been the case that sports fishing clubs have been buying out the fishing rights of the long-standing commercial fishing companies. (Luxmoore and Swanson, 1991).

In the developing world, the value of eco-tourism is also rising against the other uses of remaining natural habitat. For example, in several of the tropically forested states: Costa Rica, Ecuador, Philippines and Thailand, tourism ranks among the top five industries and brings in more foreign exchange than does timber sales. Similarly, in Africa, wildlife-related tourism is a substantial generator of export earnings (30% in Kenya;, $6 million for hunting licenses alone in Zimbabwe).

The goods and services of natural habitats are limited to the remaining unaltered habitat, which is ever dwindling in size. For this reason, the comparative value of these products is increasing. Just as importantly, natural habitat production has the additional advantage of increasing the ratio of direct to indirect use of a given piece of land. That is, production of goods in the context of a natural habitat implies the minimum intervention required for their production, and hence the minimum amount of indirect use of resources in the production process. This is ultimately the way in which development can be unlinked from diversity destruction. If the direct use of a given ecosystem's produce can be increased, even substantially, while simultaneously decreasing the indirect use, then it is possible to have growth in combination with the preservation of diversity.

As previously noted, the current rate of human use of NPP is 40%, but 36% of this use is indirect or wastage. If production occurs in the context of natural habitats rather than specialized agriculture, then it would be possible to have substantial increases in the proportion of NPP consumed by humans, while still making greater portions of NPP available to other species as well (since indirect use and wastage could then be substantially reduced). Following the classic path to development cannot accomplish this objective, as its indirect use requirements (26% of NPP) are too high to be compatible with significant amounts of biological diversity. Natural habitat production is the method by which development and diversity might be linked; this is the real value of this method of production.

USE IT OR LOSE IT

To many, the concept of natural habitat utilization will seem antithetical to the entire idea of natural habitat conservation. That is, from this "preservationist" perspective, the value of the natural habitat is lost once any manner of human intervention occurs.

This is a reasonable interpretation of the history of specialized intervention in the environment. However, many cultures have not been so determined to make use of their environment by initially "clearing the slate", and many of these peoples have managed to live within their environment with a much lower level of intervention. To presume that they would be unable to balance use and preservation is largely arguing against their historical record.

The primary justification for the development of the role of sustainable utilization of natural habitats lies in the fact that 95% of existing natural habitats remain unprotected, and all of them are subject to the forces for conversion. Their maintenance at anything like existing levels will require the demonstration of their value. "Optimal intervention", for the purpose of harvesting or generating greater productivity, will be a necessary component of a strategy of natural habitat maintenance.

Intervention for the purpose of sustainable harvests of natural habitat production is an obvious component of a strategy of optimal utilization. Intervention at earlier stages for the purpose of increasing those harvests is more controversial, but an equally important part of such a programme. For example, in the "ranching" of some lizards it has been discovered that intervention at the stage of egg incubation can reduce infant mortality from 95% to 5%, with a modest investment in egg collection and incubation equipment. Hence, a productivity gain of about 1800% is achievable by means of the intervention at this stage, with the subsequent release of the animals back into the natural habitat after hatching. (Nelson, 1986). Similar productivity gains may be achievable with regard to many reptiles by the use of like methods.

Intervention might occur at any of a number of stages in the development of a harvestable species: breeding, infancy, juvenilehood, harvestable adult. The correct calculation would weigh the benefits against the costs of the withdrawal of the species from the natural habitat during each of the above periods. For example, once again regarding reptiles, the productivity gains for intervention at the stage of infancy are substantial enough to warrant the removal then of the lizard species described above from the natural habitat, but at no other stage until harvest. Throughout the remainder of its lifetime, this lizard feeds on the naturally occurring products of the tropical forest. For crocodiles, on the other hand, it pays to leave a breeding population in the wild, while taking eggs for hatching and development in captivity through all successive stages until the time of harvesting.

In this way, these two species are contributing in their own ways to the appropriation of the value of their natural habitats, and hence to the maintenance of those habitats. This species of lizard can do this by eating the leaves of tropical trees, rather than the commercial feeds that would otherwise by necessary, and turning those leaves into ultimately valuable meat, eggs, and skins. Crocodiles do this by inhabiting and using tropical wetlands and rivers, and contributing an annual clutch of eggs as their payment in kind. These eggs are then developed by specialized farming methods into crocodile skins and meat.

These interventions are ultimately necessary as the means of appropriating the value of the natural habitat through the mechanism of these individual species. Although it is not a purist solution, it is probably the only possible solution. The development of more and better mechanisms for capturing the value of natural habitat will be fundamental to its maintenance. From this perspective, it is better to make some use of this natural habitat than it is to lose it all.

PROBLEMS TO BE SOLVED IN NATURAL HABITAT MAINTENANCE

There are several important problems which stand as significant hurdles to the maintenance of remaining natural habitat. The first is the nature of some of the important products of natural habitat (primarily information), which are very difficult to value. The second is the nature of the ownership structure (common) for natural habitats, which is generally difficult to implement effectively. Finally, there is the problem of conflicting uses; the difficulty of obtaining the value of one use without seriously reducing that of another. The nature of each of these problems will be described briefly here in order to indicate the scale of the difficulties that must be overcome, if the object of natural habitat maintenance is to be effected.

Many of the goods and services of natural habitats are of the nature of so-called "collective goods"; that is, these products are beneficial not to a particular user, but rather to a broad swathe of humanity. One of the primary attributes of natural habitat is the untapped information which it represents. For example, there are at present 119 plant-derived drugs in use throughout the world, obtained from less than 90 species of plant. (Farnsworth, 1986). Yet, there are about 250.000 to 750,000 species of plants yet to be tested. There is a substantial value to be placed on the maintenance of this stock of potential information, but the benefit is largely for all.

Similarly the value of the variety which exists in the wild is also of importance for the improvement of domestic species. The discovery of a species of wild maize (teosinte) in Mexico in 1979 which is naturally virus resistant was of potential billion dollar importance to the domestic species; yet, when its importance was discovered, all that remained of the species was a 6 hectare patch high on the Sierra de Manantlan. This is a simple but laborious process of collecting species and then undertaking careful analysis of their differences; for example, the collection of a species of wild tomato in the Andes in 1963 resulted, after 10 generations of crossing with the domestic species, in a marked commercial improvement valued at about $8 million per annum. (Iltis, 1988).

Natural habitat represents a library of such information, but the value of that information accrues to all, and is likely to be considered by no one individual when deciding whether to convert the habitat. This indicates the difference between financial analysis and economic analysis; the latter states that, even when individuals do not take real value into account, systems must be created which do.

Other collective benefits of natural habitat are equally difficult to value through ordinary mechanisms. For example, forested habitat often plays an important role in both the maintenance of watersheds and the fixing of carbon, as was discussed in an earlier chapter. These values must also be taken into account in determining the amount of natural habitat that must be maintained.

Finally, the mere existence of habitat is of significant value. This is indicated in part by the fact that individuals are willing to contribute money to organizations whose stated objective is the preservation of natural habitat and wild species. For example, in 1990, the donated budgets of the National Wildlife Federation and the World Wildlife Fund were $100m. and $50m., respectively.

The first hurdle to the maintenance of significant quantities of natural habitat is the creation of mechanisms which are capable of capturing some of these less tangible, but equally important, values. The maximum amount of habitat can be maintained only if all of this value is captured by those individuals actually making the decisions whether or not to convert remaining natural habitats.

The second hurdle to be crossed involves the form and character of the management of natural habitats. Usually, natural habitat will require a significant amount of land to be held in an undivided state; interventions which subdivide natural habitat (e.g., fencing) usually lead to extinctions. The management of parcels of natural habitat of substantial size is a difficult proposition because it makes it difficult to ensure that all users are acting in common interest. A typical response to the problem of large parcels of natural habitat has been their "nationalization", i.e., the holding of the resource as a state-owned asset. This is also problematic, due to the difficulties implied in the bureaucratic management of assets. (Berkes, 1989; Marks, 1984).

Much of the activity in natural habitat is currently being undertaken on an unsustainable basis, to the detriment of all users, precisely because it is undertaken in natural habitat; there are significant institutional problems involved in managing natural habitat. There are two directions for work to proceed on this issue. The first approach is the enlistment of local community efforts in the management of the habitat, which is most easily acquired by making them the first appropriators of the value of the habitat, i.e., the "owners". In short, there must be a reversal of the process of bureaucratizing natural resources. (Baden, J. and Stroup, R., 1981).

The second approach is the enlistment of the rationalized assistance of consumer groups to this end. To date, consumers have done little to discriminate between sustainable and nonsustainable users of wildlife, while there is a vital difference between the two. The former probably contribute more to the maintenance of natural habitat than do any other single group of people, while the latter probably contribute as greatly to its destruction. Consumer groups must not "ban" indiscriminately, but must act to encourage sustainable users while penalizing the nonsustainable. (Swanson, 1988).

Finally, it is important to note that in some cases it will be difficult to sum up all of the values of natural habitat, simply because some of them are mutually exclusive. That is, some uses (e.g. more non-consumptive uses such as wildlife tourism) are not very compatible with others (e.g. more consumptive uses such as game hunting). It will be necessary to make the right choices with regard to any particular piece of habitat, in order to maximize its particular value, and therefore its chances for survival.

TABLE 9: IMPORTANT PROBLEMS TO BE ADDRESSED IN UTILIZATION

The maintenance of natural habitat through utilization is itself a difficult proposition, with fundamental problems to be resolved. However, it is of equally fundamental importance that these are the issues which are addressed, rather than the value of wildlife utilization itself. The resolution of these problems should address both the concerns of most opponents of wildlife utilization and the concerns of the proponents of natural habitats.

1. **Capturing the value of natural habitats.**
2. **Implementing correct management of natural habitats.**
3. **Resolving conflicts in the use of natural habitats.**

Therefore, the maintenance of natural habitats through their utilization is itself fraught with difficulties, but attention must now be turned to the solution of these problems not their avoidance. There is no other alternative, other than the exhaustion of this ancient resource. We must take actions which will give the remaining natural habitat at least a chance of long term survival, in the least modified state possible.

REFERENCES

Ajayi, S. 1979. *Utilization of Forest Wildlife in West Africa*, FAO: Rome.

Baden, J., and Stroup, R. (eds.) 1981. *Bureaucracy vs. Environment*, University of Michigan Press: Ann Arbor.

Bell, R. and McShane-Caluzi, E., (eds.) 1984. *Conservation and Wildlife Management in Africa*. U.S. Peace Corps: Washington.

Berkes, F. (ed.) 1989. *Common Property Resources: Ecology and Community Based Sustainable Development*, Belhaven:London.

Browder, J. 1988. "Public Policy and Deforestation in the Brazilian Amazon", in Repetto,R. and Gillis,M. (eds.), op. cit.

Child, G. 1984. "Managing Wildlife for People in Zimbabwe", in McNeely,J. and Miller,K. (eds.), op. cit.

Child, G., and Child, B. 1991. "An Historical Perspective on Sustainable Wildlife Utilization", in *Proceedings of the IUCN Workshop on Wildlife Utilization*, IUCN:Gland.

Ehrlich, P. and Ehrlich, A. 1981. *Extinction. The Causes of the Disappearance of Species.* Random House: New York.

Ehrlich, P. 1986. "The Loss of Diversity: Causes and Consequences", in E.O. Wilson (ed.), *Biodiversity*, op. cit.

Eltringham, S. 1984. *Wildlife Resources and Economic Development*, John Wiley:New York.

Farnsworth, N. 1986. "Screening Plants for New Medicines", in E.O. Wilson (ed.), Biodiversity, op. cit.

FAO. 1980. *Production, Consumption and Trade of Minor Meats - Trends, Prospects and Development Issues*, Rome.

FAO. 1988. *Yearbook of Forest Products*, Rome.

FAO. 1988. *Yearbook of Fishery Statistics*, Rome.

Gadgil, M. and Iyer, P. 1988. "On the Diversification of Common Property Resource Use in Indian Society", in Berkes,F. (ed.), op. cit.

Garcia, J. 1984. "Waterfalls, Hydropower, and Water for Industry: Contributions from Canaima National Park", in McNeely, J. and Miller, K. (eds), op. cit.

Gillis, M. 1988. "Indonesia: Public Policies, Resource Management, and the Tropical Forest", in Repette, R and Gillis, M., (eds.), op. cit.

Godfrey, M. 1985. in T. Rose (ed.) *Crisis and Recovery in Sub-Saharan Africa*, Paris:OECD.

Holdgate, M., Kassas, M., White, G. (eds.) 1982. *The World Environment 1972 - 1982*, United Nations Environment Programme: Nairobi.

Iltis, H. 1986. "Serendipity in the Exploration of Biodiversity", in E.O. Wilson, Biodiversity, op. cit.

International Institute for Environment and Development and World Resources Institute 1989, *World Resources 1988-89*, Basic Books: New York.

International Monetary Fund. 1987. *International Financial Statistics*, Washington.

International Monetary Fund. 1988. *World Economic Outlook 1988*, Washington.

Kiss, A. (ed.) 1990. *Living With Wildlife*, draft report of World Bank Environment Division, World Bank: Washington.

Lovejoy, T. 1980. "A Projection of Species Extinctions", in G.O. Barney (ed.), *The Global 2000 Report to the President. Entering the Twenty-First Century*. Council on Environmental Quality: Washington.

Lugo, A. 1986. "Estimating Reductions in the Diversity of Tropical Forest Species", in E.O. Wilson (ed.), *Biodiversity*, op. cit.

Luxmoore, R. 1989. "Impact on Conservation", in Hudson,R., Drew,K. and Baskin,L., *Wildlife Production Systems: Economic Utilization of Wild Ungulates*, Cambridge University Press: Cambridge.

Luxmoore, R. and Swanson, T. 1991. "The Impact of Domestication on the Remaining Wild Populations of a Species - The Case of the Scottish Salmon Fisheries", work in progress.

MacKinnon, J., MacKinnon, K., Chil, G., and Thorsell, J. 1986. *Managing Protected Areas in the Tropics*, International Union for the Conservation of Nature: Gland.

Marks, S. 1984. *The Imperial Lion*, Westview Press: Boulder.

Martin, R. 1984. "Wildlife Utilization", in Bell,R. and McShane-Culvzi,E. (eds.), op. cit.

McNeely, J. and Miller, K., (eds.) 1984. *National Parks, Conservation and Development*, Smithsonian Institution: Washington.

Mishra, H. 1984. "A Delicate Balance: Tigers, Rhinoceros, Tourists and Park Management vs. The Needs 6 the Local People in Royal Chitwan National Park, Nepal", in McNeely,J. and Miller,K. (eds), op. cit.

Mittermeier, R. 1986. "Primate Diversity and the Tropical Forest", in E.O. Wilson (ed.), Biodiversity, op.

Myers, N. 1979. *The Sinking Ark. A Look at the Problem of Disappearing Species*. Pergamon: New York.

Myers, N. 1983. *A Wealth of Wild Species*, Westview: Boulder.

Myers, N. 1984. *The Primary Source*, Norton: New York.

Nelson, L. 1986. "Economic Analysis of Iguana Ranching", unpublished manuscript.

Norton, B. (ed.) 1986. *The Preservation of Species*, Princeton University Press: Princeton, New Jersey.

Parker, I. 1984. "Perspectives on Wildlife Cropping or Culling", in Bell,R. and McShane-Culvzi,E. (eds.)

Peters, C., Gentry, A., and Mendelsohn, R., "Valuation of an Amazonian Rainforest", Nature, vol. 339, June 29, p. 655.

Plotkin, M. 1986. "The Outlook for New Agricultural and Industrial Products from the Tropics", in E.O. Wilson (ed.), *Biodiversity*, op. cit.

Prescott-Allan, R. and Prescott-Allan, C. 1982. *What's Wildlife Worth?*, Earthscan: London.

Raup, D. 1986. "Diversity Crises in the Geological Past", in E.O. Wilson (ed.), *Biodiversity*, op. cit.

Repetto, R. (ed.) 1985. *The Global Possible*, Yale University Press: New Haven.

Repetto, R. 1986. "Soil Loss and Population Pressure on Java", *Ambio*, vol. 15, p. 14.

Repetto, R. and Gillis, M., (eds.) 1988. *Public Policies and the Misuse of Forest Resources*, World Resources Institute: Cambridge.

Robinson, W. and Bolen, E. 1989. *Wildlife Ecology and Management*, (2d ed), MacMillan: New York.

Salle, J. 1981. *The Importance and Values of Wild Plants and Animals in Africa*, International Union for the Conservation of Nature: Gland.

Simberloff, D. 1986. "Are We on the Verge of a Mass Extinction in Tropical Rain Forests?", in D.K. Elliot (ed.), *Dynamics of Extinction*, John Wiles and Sons: New York.

Swanson, T. 1989. "The Regulation of the Ivory Trade", in Cobb, S. (ed.), *The African Elephant and the Ivory Trade*, Report of the Ivory Trade Review Group.

Swanson, T. 1991. "The Environmental Economics of Wildlife Utilization", in *Proceedings of the IUCN Workshop on Wildlife Utilization*, IUCN: Gland.

Terborgh, J. 1974. "Preservation of Natural Diversity: The Problem of Extinction-Prone Species", *Bioscience*, 24:715-722.

Thomsen, J. and Luxmoore, R. 1991. "Sustainable Utilization of Wildlife for Trade", in *Proceedings of the IUCN Workshop on Wildlife Utilization*, IUCN: Gland.

Vietmeyer, N. 1986. "Lesser Known Plants of Potential Use in Agriculture and Forestry", *Science*, 232:1179-1384.

Vitousek, P., Ehrlich, P., Ehrlich, A., and Matson, P. 1986. "Human Appropriation of the Products of Photosynthesis", *Bioscience*, 36(6):368-373.

Watson, D. 1988. "The Evolution of Appropriate Resource Management Systems", in F. Berkes (ed.), *Common Property Resources: Ecology and Community Based Management*, op. cit.

Western, D. 1984. "Amboseli National Park: Hman Values and the Conservation of a Savanna Ecosystem", in McNeely, J. and Miller, K. (eds.), op. cit.

Wilson, E.O. (ed.) 1986. *Biodiversity*, National Academy: Washington.

Wilson, E.O. 1986a. "The Current State of Biological Diversity", in Wilson,E. (ed.), op. cit.

Witt, S. 1985. *Biotechnology and Genetic Diversity*, California Agricultural Lands Project: San Francisco.

World Bank 1989. *World Development Report*, Oxford Univ. Press: Oxford.

World Resources Institute and International Institute for Environment and Development [1990], *World Resources 1990-91*, Earthscan: London.

WTO. 1990. *World Tourism and Travel Statistics*, New York.

Yeager, R. and Miller, N. 1986. *Wild Life, Wild Death*, State University of New York: Albany, New York.

HUMAN DEMOGRAPHIC PATTERNS AFFECTING UTILIZATION OF WILDLIFE

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INTRODUCTION

The primary objective of this paper is to examine the impact of human population patterns on the utilization of wildlife resources. More specifically, the implications of population growth and population distribution are considered in terms of sustainable use of wildlife. In addition, a theoretical framework is proposed for the study of the impact of human population-related factors on conservation of wildlife resources.

The relationship between human population factors and the utilization of wildlife resources is a complex one involving diverse disciplines such as anthropology, sociology, agriculture, economics, forestry, development planning, international trade, and government legal system. In its simple form, the growth of human population implies additional demand on land resources for cultivation and residence, thus leading to increasing encroachment into the areas previously claimed by the natural habitat of wildlife. However, such simplification is potentially deceptive. There are several other factors which confound this direct effect of human population growth on wildlife.

Figure 1 presents a framework for studying the relationship between human population factors and wildlife. The 'outcome' (also termed as 'dependent' variable in statistical analysis) is the "wildlife resource level", which is influenced both by the 'independent' variables of human population and 'influencing' variables through which the effects of independent variables are mediated. The main independent variables are: human population growth; human population distribution; and human population consumption patterns. The intermediate variables which are affected by the independent variables and which in turn affect the outcome variable are: public awareness; government policies; economic development level; and habitat resource level.

It is not very difficult to establish the impact of human population growth on wildlife. At a given economic and natural resource level, more people put more demands on resources such as land, food, and housing. To the extent that additional resources to meet these demands are above the levels required for the sustainable development of wildlife, one of the two (i.e., wildlife or human beings) suffers; and it is usually the wildlife. Human population distribution is closely related with human population growth and covers both the rural-urban and regional distribution of population. The consumption patterns of human population can have more important bearings on wildlife than the human numbers *per se*. For example, a particular resource-damaging pattern by a small segment of human population can cause more losses to wildlife than the resource-neutral pattern by the majority. In many societies, these patterns have been shaped by traditions and culture. Certain types of wildlife are preferred for consumption. In other societies the affluent segments can have greater impact on the sustainability of harvests of wildlife (e.g., African elephant; mink; leopard; crocodile; fox; kuala; seals; etc.) for clothing, and decoration, etc. Whereas hunting or capture by the poor for subsistence and even for income could be sustainable, the sustainability is often determined by the more affluent with little benefit to the local people. Certain cultures can have greater preference for certain wildlife species. For example, in the Far-East certain animal organs are used for medicine and in Yemen the handles of daggers traditionally carried by men at all occasions are made of rhinoceros horn. In some societies, ivory is highly valued.

The influence of independent variables is conditioned by the intermediate variables. Public awareness could play an important role in mitigating population-related effects on wildlife, as manifested by campaigns against hunting rare species as well as species considered in danger of over-exploitation, for example seals, whales, elephants, and rhinoceros. Public awareness can also influence governments to adopt policies which protect or encourage more sustainable use of wildlife resources. Government policies can also influence migration or settlements of human populations.

The economic development level of a country sometimes has a crucial impact on the use of wildlife; for foreign trade and foreign exchange earnings. Countries with no other means of earning foreign exchange are frequently less sensitive to the loss of wildlife for earnings. The forest resource level is also critical because the forest areas are often the natural habitat for many wildlife resources. Deforestation has been found to be responsible for the loss of wildlife and many scientists have considered this a principal cause for species extinction. The World Resources 1988-89 Report (World Resource Institute and International Institute for Environment and Development, 1988) points out that while tropical closed forests cover only about six per cent of the world's land surface, they contain 50-90 per cent of all the Earth's species.

It is obvious that a comprehensive study on the wildlife resource level and its sustainable utilization involves a careful investigation of these factors. Cultural norms and traditions are important and a topic for study in itself. Similarly economic and political factors require detailed assessments. The loss of natural habitat due to deforestation also merits a careful study. The resurgence of interest, especially in some countries, about sustainable use of resources requires in-depth consideration. This paper, however, focuses on the demographic patterns in a few representative countries and their implications for wildlife.

DEMOGRAPHIC BACKGROUND

It is possible to present the demographic background globally or regionally. However, such descriptions mask a wide variety of patterns within the unit of study and, therefore, it is instructive to consider a number of selected countries as case studies. Nine countries from four regions are selected: Canada from North America; Greenland and France from Europe; Chile and Guyana from Latin America and The Caribbean; India and Indonesia from Asia; and Niger and Zambia from Africa. The availability and reliability of data range from excellent in Canada to poor in the African countries. Since a comparative profile for countries of such diversity in demographic and socio-cultural patterns is difficult to draw, each country is examined individually. The figures on total, urban, and rural population from 1960 to 2025 are given in Figure 2 and Tables 1 and 2. The estimates for 1995 and onward are based on projections with 'medium variant' assumptions about human population growth. Further details are given in the Annexed Tables for each country.

Canada

With a land area of 9,220,970 square kilometers and an estimated human population of 26.5 million in 1990, Canada is the second largest country in the world (after Russia) in terms of area. However, as characteristic of all economically developed countries, its human population growth has been low (below 2% per year) and declining (Table 1). From 1985 to 1990, the growth rate was 0.9% per year, indicating a doubling time of 87 years. In 1990, 76% lived in urban areas and this proportion is expected to increase to 86% by 2025. Because of its slow growth rate the human population of Canada is expected to increase to 32 million by year 2025. Both fertility and mortality have reached low levels and the net reproduction rate has been below one since 1980.

No government policies exist to influence the human population growth or distribution. The rate of growth is considered satisfactory and official policy favours immigration, which was 2 per 1,000 population in 1989.

Canada is one of the largest producers and exporters of grains and minerals. Sixty-two per cent of its GNP is from the service sector, followed by 35% from manufacturing; and from agriculture the remaining 3%. In 1986, 40.4 million visitors were reported and the earnings from this source was estimated to be $3.9 billion in 1986. Over one third (35%) of its total land area consists of forest and woodland, and fish and other wildlife resources are ample.

It is estimated that 65% of Canada's original wilderness is still preserved (World Resource Institute and International Institute for Environment and Development, 1988). In 1988, there were 79 sites with 23 million hectares of protected wildlife habitat areas. The animal species threatened in Canada were reported in 1988 to include 8 mammals, 7 birds, and one reptile. Except for the rapid urbanization and increased industrialization, the human population-related factors in Canada do not appear to be imposing greater demands on its wildlife than can be sustained. The factors of population growth and migration are relatively minor in relation to industrialization and deforestation, in terms of influence on wildlife resources. The related factors that negatively affect wildlife are construction of highways, trailways, and bridges.

France

With a total land area of 545,630 square kilometers and an estimated population of 56 million in 1990, France is the largest among West European nations. It has a coastline of 3,427 kilometers and most of the terrain is flat plains or gently rolling hills in the north and west. Twenty-seven per cent of its land area is covered by forest and woodland. France is also characterized by a slow growth rate of its human population and its increasing urbanization. By 2025, the 56 million in 1990 is expected to reach 60 million - a trivial increase compared to other countries considered in this report. The population growth rate is estimated at 0.36% per annum, but is expected to decline further to below 0.2% from 2005 onward. The growth rate for the rural population has been negative since 1985, and is expected to decline further. The total fertility rates are estimated to be between 1.85 and 1.9 children per woman during the period 1985 to 2025. The population had already reached replacement level in the 1970s and is now below replacement level.

France represents the lowest extreme of the human population growth spectrum, which is characterized by below replacement level of fertility and extremely low population growth rates. The mortality rate is low and life expectancy is high. The government is concerned about the low growth rate and encourages high fertility by incentives for child rearing and caring. There is no significant policy with regard to the geographical distribution of human population, but the immigration policy is restrictive.

France has substantial agricultural resources and a highly diversified modern industrial sector. It is largely self-sufficient in agricultural products and is a major exporter of wheat and dairy products. The total forest and woodland area amounted to 123,660 square kilometers in 1965 and increased to 146,200 square kilometers in 1986. The main problem in France is not so much deforestation as forest fires. During 1975-84, an average 42,646 hectares were lost annually due to forest fires (World Resources Institute and the International Institute for Environment and Development, 1988).

Information on wildlife in France is scanty. The government has declared a total of 4.7 million hectares as protected wildlife habitat areas. Just as in Canada, the human demographic factors in terms of population growth and distribution do not seem to impose major constraints to wildlife in France. However, its rapid modernization and industrialization can have adverse consequences for wildlife. Thus, the consumption patterns of its human population rather than its numbers or growth seem to be of significance in their implication for the sustainability of wildlife resources.

Greenland

Greenland is one of the world's largest islands with a total land area of 341,700 square kilometers (ice free) and an estimated human population of 55,000 in 1990. It is under the home rule as a self-governing overseas administrative division of Denmark. It has no forests, nor agricultural land. Greenland is sparsely populated with much of its human population confined to small settlements along the coast. The birth rate and death rate are low and there was a net emigration of 1 per 1,000 in 1989. The total fertility rate is 2.4 children per woman in 1988. Nearly all of its working population is engaged in fishing, hunting, or sheep rearing.

Over the last 25 years, its economy has changed from one based on subsistence whaling, hunting, and fishing to one dependent on foreign trade. Fishing, however, is still the most important industry, accounting for over 75% of exports.

Projections by the Denmarks Statistik (1989) indicate that the human population of Greenland will increase to 61,294 by the year 2010. Most of it is rural and the only highway is about 80 kilometers long. Because of its weather conditions and sparsely populated area, Greenland has been estimated to have preserved 99% of its wilderness (World Resource Institute and International Institute for Environment and Development, 1988). Much of its wildlife resources have, therefore, been protected from the human related factors.

Chile

With a total land area of 748,800 square kilometers, Chile is located on the western coast of South America. Its human population was estimated to be 13 million in 1990, with 86% living in urban areas. The population growth rate has been declining, from 2.4% per year during 1960-65 to 1.7% during 1985-90 (Table A-2). The growth rate for the rural human population has been negative since the 1960s and this trend is expected to continue. Fertility levels have also come down to a total fertility rate of 2.7 children per woman and the net reproduction rate was close to one in 1985-90. With its current growth rate, the population is expected to double in 41 years and to reach about 20 million by 2025. By that year, 93% of its human population is expected to be living in urban areas.

Twenty-one per cent of its land areas is covered by forest and woodland and much of its economy is based on fishing, agriculture and manufacturing. Copper is Chile's main export, accounting for nearly 50% of its export earnings. Since Chile's entire western frontier is the Pacific shoreline, its resources of fish are immense.

Unlike Canada, the Government of Chile has formulated policies for human population growth and spatial distribution. The rate of human population growth is considered too low, however it follows a policy of non-intervention. Similarly, the level of fertility is viewed as too low, but no action is being implemented to increase fertility. With regard to migration, official policy emphasizes incentives to encourage Chileans to inhabit underpopulated regions in the south.

Chile has expanded the development of its forestry and fisheries industries over the last 20 years. Its annual fish catch increased from 4.5 million metric tons in 1984 to 5.6 million in 1986. With a length of 4,200 kilometers and an average width of 180 kilometers, Chile has a wider variety of climate and topography than any other country of comparable size. This ranges from the desert in the north; to the fertile central valley; the humid forest region in south; to the open grasslands further south. In 1986, 547,000 tourists visited the country and the total earnings from this source amounted to $172 million.

Information on wildlife resources other than fish are not readily available, but fishery is probably the largest resource of Chile. Some information is available for guanaco, which were estimated to number 22,950 to 25,650 in 1989 (Cunazza, 1990). Historically, over exploitation for pelts and meat as well as competition from domestic stock for pasture lands resulted in a decline of the guanaco population. The particular topography of Chile, combined with low human population pressures, primarily due to low growth rates, do not suggest excessive depletion of wildlife resources. The number of areas protected for wildlife habitat is 65 with a size of 13 million hectares. The animal species threatened include 10 mammals, 6 birds, and 3 reptiles.

Guyana

With a total land area of 196,850 square kilometers and an estimated human population of one million, Guyana is characterized by its tropical forests which comprise 83% of its total land area. The human population growth rate is low in comparison to many other developing countries and the emigration rate relatively high with 19 per 1,000 population leaving Guyana in 1989. Both birth and death rates are low and, consequently, the rate of increase is low. If the current rate prevails its human population is expected to double in 40 years. Although 65% lived in rural areas in 1990, the rate of urbanization, due to migration from rural to urban areas, is increasing, and from the year 2000, the rural population is expected to have negative growth. The average total fertility rate during the period 1985-90 was estimated as 2.8 children per woman, but it is expected to fall to 2 by the year 2000 (Table A-4).

The government perceives the growth and fertility rates to be satisfactory. However, it views the flow of migrants from rural to urban areas as inappropriate for its development policies and for its stated goal of food self-sufficiency. It has instituted programmes for irrigation and housing and social services in rural areas to stem the flow. The official policy is to encourage immigration, but through emigration the loss of skilled workers is high.

Despite a large area covered by forest and woodland, the exploitation of the forest has been minimal, primarily due to difficult accessibility. Fishing has expanded in recent years and aquaculture is now a major proportion of all its exports. The total fish catch was 42,095 tons in 1985. Earnings from tourists were estimated to be $4 million in 1986.

The main demographic trend for Guyana can be described in terms of emigration from the country and influx of migrants from rural areas to the capital city Georgetown. Its dense forest resources provide home to numerous wildlife, but no details are available. The rates of deforestation and industrialization are relatively low, implying less pressures on wildlife. The trend towards urbanization probably does not have serious implications for wildlife in Guyana. The topography of Guyana and inaccessibility of forest areas have helped in the preservation of forest areas and, thus, protection of species living in forests.

India

With an estimated total human population of 853 million in 1990, India is the second most populous country after China. The total land area is 2,973,190 square kilometers, 23% of which comprise of forest and woodland. During 1985-90, its human population was growing at a rate of 2.1% per year, which indicates a doubling time of 33 years (Table A-5). In fact, the human population of India is expected to match that of China in 2025. Twenty eight per cent of India's population lived in urban areas in 1990, but by 2025 over half (54%) are expected to live in urban areas (Table 2). Despite a decline in fertility, the total fertility rate is still high - 4.3 children per woman in 1985-90. Mortality and especially infant mortality is still quite high and only 36% of the total population are literate.

The government views the rate of human population growth and fertility levels as too high in relation to the poverty and unemployment in the country. India was one of the first countries to launch a policy to curtail growth through reducing fertility by means of providing family planning services. India has no specific policy regarding international migration. However, its spatial distribution policy aims at slowing metropolitan growth, promoting small towns and intermediate cities, and adjusting the spatial distribution pattern by agricultural and rural development and industrial location policies.

Nearly 40% of its human population are below age 15 and 70% of its labour force are involved in agricultural activities. The agriculture sector suffers from low productivity and soil erosion. The growing demand for fuelwood for energy needs is causing large scale deforestation. The fish catch in 1986 was estimated at 2,921,8000 tons. In 1986, 1.5 million visitors were reported and earnings from this source amounted to $1.4 billion.

India is also known for its wildlife and some rare species. In 1988, 267 areas with 12.9 million hectares were protected for wildlife habitat. The figures on the threatened species in the mid-1980s were 29 mammals, 5 birds, 12 reptiles, and 2 swallowtail butterflies.

Among the countries considered so far, the pressure of human population growth and distribution on wildlife appears most severe in India. The rapid population growth and fragmentation of land holdings have accelerated the search for new land for cultivation. In addition, the growing population has meant increasing demand for the fuelwood. Soil erosion and deforestation are the two most common problems. It has been estimated that 80% of the original wildlife habitat had been lost (Table 3) by 1986. It seems, therefore, urgent to protect wilderness from further reductions and to halt the rapid human population growth which exerts pressure on the wildlife resources.

Indonesia

The land area of Indonesia, an archipelago of 13,500 islands (6,000 of which are inhabited, is 1,826,440 square kilometers. Most (67%) of the land area is covered by forest and woodland. With an estimated human population of 181 million in 1990 (Table 2), Indonesia is the fourth most populous country in the world (after China, India, Russia, and the USA). The population was estimated to be growing at the rate of 1.6% per year

during 1985-90 (Table A-6). In 1990, 29% was living in rural areas. This proportion is expected to rise to 56% by 2025. Indonesia has one of the more successful family planning programmes in Asia and its annual birth rates have been declining since the 1970s. The total fertility rate in 1985-90 was estimated at 3.3 children per woman and by the year 2000 the net reproduction rate is expected to be one. With the present growth rate the human population is expected to double in 43 years. But this growth rate is projected to fall in the coming years. The level of literacy is 62% and 55% of the labour force are involved in agricultural activities including fishery and forestry.

Indonesia's human population policy aims to reduce growth and achieve a more equitable pattern of distribution. Its Family Planning Programme and Transmigration Programme are the two major initiatives of the government with regard to human population growth and distribution. In 1983, the Ministry of Population and Environment was created to formulate policies for human population and environment management. In an effort to bring about a more equitable population distribution, the government has sponsored a transmigration programme to move people from densely populated areas (Java) to less populated areas. This programme was established in the 1950s following independence, but did not gain momentum until 20 years later, when, under the Third Development Plan (Repelita) 500,000 families were resettled in islands outside Java. Under the Fourth Five-Year Plan, four million people are expected to be resettled. However, people continue to be attracted to Java which offers better employment opportunities as well as education and health facilities, and government-sponsored transmigration out of Java is offset by a counter stream of migrants into Java.

Recognition of the archipelagic state in 1982 permitted Indonesia to declare the waters separating its many islands as an Exclusive Economic Zone. This allowed undisputed control of the vast marine fisheries resources of the sea. The total fish catch amounted to 2.5 million tons in 1986. Indonesia also has one of the most extensive concentrations of tropical hardwoods, which were exploited at a rapid rate during 1960s. The continued excessive exploitation of forests reached such a level that the government instituted policies to regulate deforestation. The government has increasingly required logging companies to introduce selective cutting policies and, in 1985, the practice of total tree felling was banned.

Indonesia is also popular among tourists who numbered 825,000 in 1986. The total receipts from this source amounted to $590 million in that year. The wildlife habitat area was estimated to have been reduced by 49% by 1986. In 1988, 135 sites with a total size of 13.6 million hectares were protected. The threatened animal species reported in the mid-1980s were: 22 mammals, 14 birds, 11 reptiles, and 14 swallowtail butterflies.

Although human population growth in Indonesia is being increasingly curtailed, the loss of wildlife due to deforestation and resettlement is continuing at an alarming rate. Deforestation combined with hunting and capture has already caused a major loss of Indonesia's primate population. The government's resettlement policies have also indirectly contributed to the loss of wildlife, because most of the people are settled in areas which were previously natural habitat. In addition, land is claimed for agricultural activities squeezing out wildlife.

Niger

Niger, in West Africa, has a total land area of 1,266,700 square kilometers. Its human population was estimated to be growing at 3% per year during 1985-90 (Table A-7) and was seven million in 1990 (Table 1). By 2025, it is expected to reach 18.9 million. With the prevailing rate of growth, it would require only 23 years to double. Fertility is high with a total fertility rate of 7.1 children per woman during 1985-90. In 1990, the proportion of human population living in urban areas was 19%, but this is expected to increase to 46% by 2025.

Recurrent drought and desertification severely affect the marginal agricultural activities. The government has recently issued statements indicating deep concern over the growing size of the human population and has changed its policy towards family planning services, which are now provided with the stated objective of improving family health and wellbeing. The spatial distribution of human population is also considered unsatisfactory. Government policy in this respect is aimed at rural development to check the exodus of migrants from rural areas. Niger had lost 77% of its original wildlife habitat by 1986. Only 2% of its total land area

is covered by forest and woodland. The government has set aside three sites with an area of 372,000 hectares as protected areas.

Niger is one of the least developed countries with a rapidly increasing human population. The economy depends heavily on the exploitation of uranium deposits. There is relatively little known about its wildlife resources. However, the rapid growth of its human population, together with rural-urban migration and the need for new areas for cultivation would have major implications for its wildlife.

Zambia

The total land area of Zambia is 740,720 square kilometers. Its human population was estimated to be 8.5 million (Table 1) and grew at the rate of 3.8% per year during 1985-90 (Table A-8). Among the nine countries considered here, Zambia has the highest rate of human population growth, resulting in a doubling of its population in 18 years. In 1990, the proportion of its human population living in urban areas amounted to 56%, but is likely to reach 78% by 2025. Fertility is high with a total fertility rate of over seven children per woman.

The government is concerned about the high growth rate of human population and high fertility. In order to improve spatial distribution, a rural development programme has been launched which aims at utilizing urban unemployed to work on the land. Other plans include regrouping of villages and isolated rural settlements, and the promotion of small-scale industries in rural areas.

Twenty-seven per cent of Zambia's total land area is covered by forest and woodland. However, deforestation has been accelerating. The government has established a 'Task Force' to prepare a national conservation strategy for protecting the country's natural resources. It has also established 19 sites with a total land area of 6.4 million hectares as protected areas for wildlife. It is estimated that by 1986 the country had lost 29% of its original wildlife habitat.

Zambia is also one of the poorer countries with 45% of its human population below age 15 years. Soil erosion and desertification have affected agricultural productivity, and the large family size has caused fragmentation of land holdings. Earnings from visitors numbering 100,000 amounted to $7 million in 1986.

Among the countries considered in this paper, Zambia's rate of human population growth is the highest. Deforestation has contributed to droughts and soil erosion which in turn have displaced much of the rural population. Because of the economic hardship, forest resources are widely traded. The effect of human population growth on wildlife is found to be more substantial in Zambia than in any other country. In addition, the prospects for economic recovery or of curtailing the growth of human population are not promising, at least in the immediate future.

SUMMARY AND CONCLUSIONS

The Report on World Resources 1988-89 (World Resources Institute and the International Institute for Environment and Development, 1988) concludes that wildlife diversity continues to decline steadily throughout the world and many species are close to extinction. It is estimated that 68% and 65% of the original wildlife habitat has been lost in Southeast Asia and Sub-Saharan Africa, respectively. Island habitats and species are particularly vulnerable to disturbance.

Much of deforestation is caused by demographic and closely related economic factors. With rapid papulation growth and traditional farming practices of 'slash and burn', forest areas are cleared for new crops or residence. In addition, excessive human population growth leads to fragmentation of land holdings, which in turn induces opening of new for cultivation.

The assessment of the demographic factors and of closely related aspects for nine countries from different regions of the world shows a wide variety of patterns. The loss of original habitat ranged from 1% in Greenland to 80% in India (Table 3). The human population growth also varied from low levels in Canada, Greenland,

France, and Chile, to moderate in Guyana and Indonesia, to high in India, Niger and Zambia. Government policies to curtail human population growth and influence spatial distribution are active in India, Indonesia, and Zambia. Policies for the protection of environments and wildlife habitat are in effect in Canada, France, India, Indonesia, and Zambia. Taking all these factors into account and barring major changes in the human population trands and government policies, an assessment of the prospects for wildlife, in the short run, is offered as follows:

	Impact on Wildlife Due to:			
Country	**Population Growth**	**Population Movements**	**Habitat Loss**	**Prospects for Wildlife**
Canada	Low	Low	Low	Good
Greenland	Low	Low	-	Good
France	Low	Low	Low	Good
Chile	Low	Low	Low	Good
Guyana	Low	Moderate	Low	Good
India	High	Moderate	High	Fair
Indonesia	Moderate	High	High	Poor
Niger	High	High	High	Poor
Zambia	Very High	High	High	Poor

The need for protected areas of natural habitat and for the preservation of wildlife requires urgent attention. The current trends in deforestation, hunting, and, to some extent, consumption, should be checked. Similarly, human population growth especially in areas with low economic development needs to be slowed. The lower rates of human population growth are advantageous for a better quality of life as well for the preservation of wildlife.

GLOSSARY

The term **wildlife** refers to any wild, non-feral species of animal or plant.

Sustainable wildlife utilization refers to any exploitation of species in a manner that: (a) contributes to the conservation of the species in the wild; (b) produces products that are traded; and (c) enhances the quality of lives of local people. In most cases the utilization scheme will imply financial benefit (i.e., profit) and foreign exchange earnings (or import substitutions).

The **crude birth** and **death rates** indicate respectively the number of live births and deaths occurring per thousand of population in a year. These are averaged over a five-year period in the tables included.

The **total fertility rate** presents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children at each age in accordance with prevailing age-specific fertility rates.

Population growth rates are period averages calculated from midyear populations. The estimates for the year 1990-95 and onward are based on figures for projected population.

The **net reproduction rate** (NRR) measures the number of daughters a newborn girl will bear during her lifetime, assuming fixed age-specific fertility and mortality rates. This measure reflects the extent to which a cohort of newborn girls will reproduce themselves. An NRR of 1 indicates that fertility is at replacement level: at this rate women will bear, on average, only enough daughters to replace themselves in the population.

Infant mortality rate indicates the number of infants, per 1,000 live births, likely to die before reaching the age of one year. It is calculated by dividing the number of deaths before age one by the number of live births in that year.

Life expectancy at birth indicates the number of years a newborn infant would live if patterns of mortality prevailing for all people at the time of its birth were to stay the same throughout its life.

Labour force in agriculture refers to the labour force (both sexes) in farming, forestry, hunting and fishing as a percentage of total labour force.

Agricultural land estimates the area used for crops, pastures, market and kitchen gardens, or lying fallow, as a percent age of total land area (excluding area under inland water and rivers).

Agricultural density is the population per square kilometer of agricultural land.

Forests and woodland is the land, in square kilometers, under natural or planted stands of trees, whether productive or not, including land from which forests have been cleared but that will be reforested in the foreseeable future.

Net deforestation rate is the annual rate of change the of forest and woodland area. A positive sign indicates an increase in the forested area.

Gross National Product (GNP) measures the total domestic and foreign output claimed by residents of a country. It is shown as per capita in US $.

REFERENCES

Blakemore, H. 1988. Chile in *South America, Central America and the Caribbean 1988*, Europa Publications Limited.

Church, R.J.H. 1989. Niger in *Africa South of the Sahara, 1989*, Europa Publications Limited.

Cunazza, C. 1990. El Guanaco (Lama Guanicoe) en Chile, situacion actual y perspectives futures de manejo.

Demaine, H. 1989. Indonesia: Physical and Social Geography in *The Far East and Australasia, 1989*, Europa Publications Limited.

Denmarks Statistik. 1989. Gronland 1988: Kalaallit Nunaat, Copenhagen: Statsministeriet.

Farmer, B. H. 1989. India: Physical and Social Geography in *The Far East and Australasia, 1989*, Europa Publications Limited.

Thomas-Hope, E. 1988. Guyana in *South America, Central America and the Caribbean, 1988*, Europa Publications Limited.

Thompson, V. 1989. Madagascar in *Africa South of the Sahara, 1989*, Europa Publications Limited.

United Nations. 1989. *World Population Prospects*, ST/ESA/SER.A/106, Population Studies No. 106, New York: United Nations.

United Nations. 1990. *World Population Monitoring 1989*, Population Studies No. 113, ST/ESA/SER.A/113, New York: United Nations.

Williams, G.J. 1989. Zambia in *Africa South of the Sahara, 1989*, Europa Publications Limited.

World Bank. 1989. *Social Indicators of Development 1989*, Baltimore: The Johns Hopkins University Press.

World Resources Institute and the International Institute for Environment and Development. 1988. *World Resources 1988-89*, New York: Basic Books, Inc.

Figure 1: Framework on the relationship between population and wildlife resources

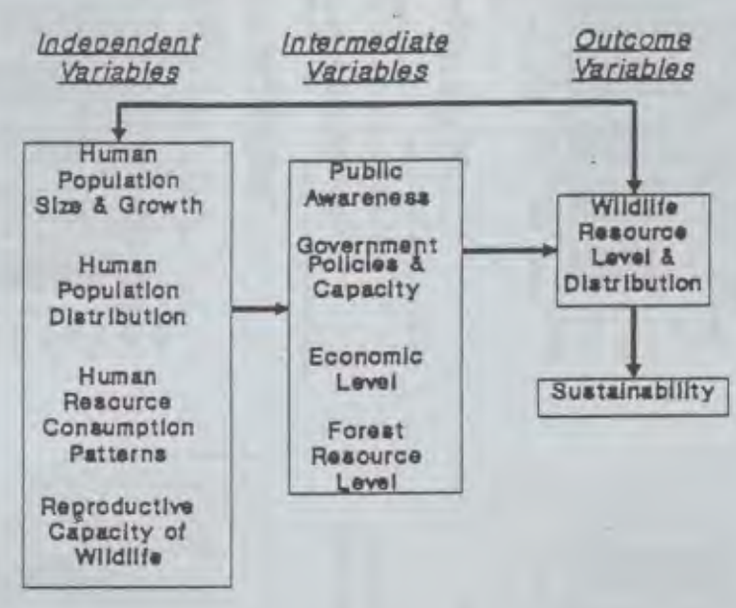
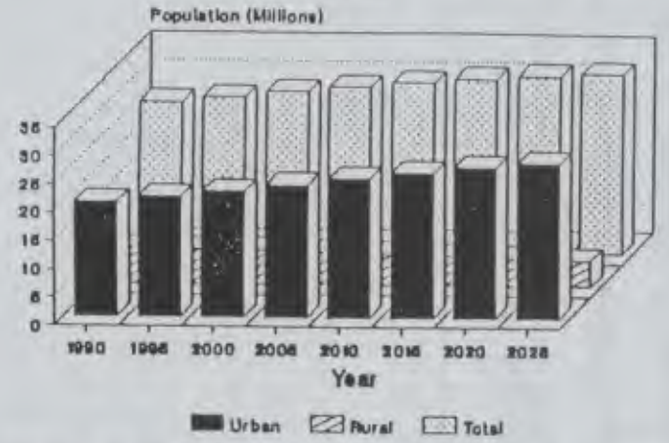
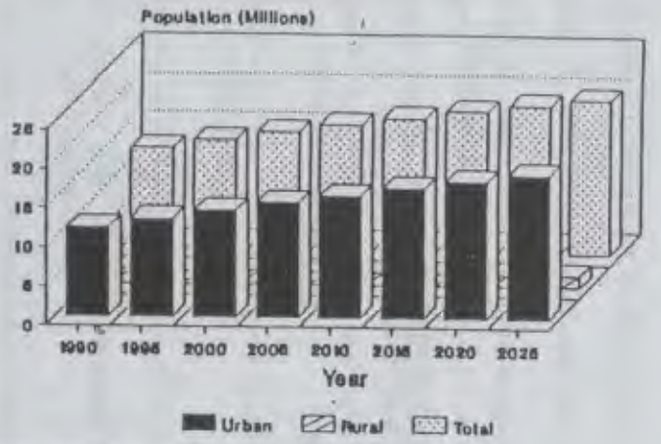


Figure 2A: Population by Area, 1990-2025
Canada



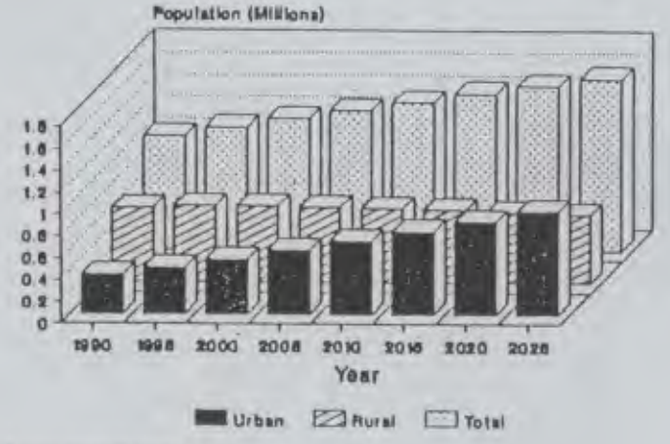
Source: United Nations (1990)

Figure 2B: Population by Area, 1990-2025
Chile



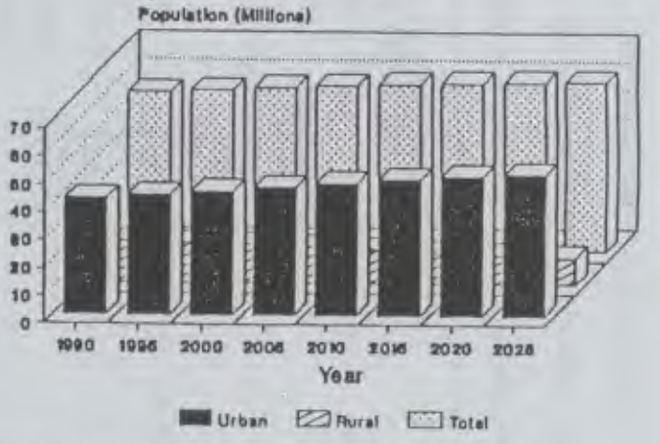
Source: United Nations (1990)

Figure 2C: Population by Area, 1990-2025
Guyana



Source: United Nations (1990)

Figure 2D: Population by Area, 1990-2025
France

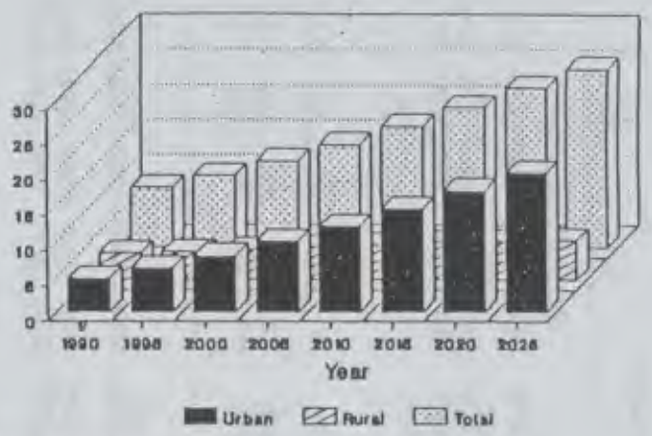


Source: United Nations (1990)

Figure 2E: Population by Area, 1990-2025
Niger

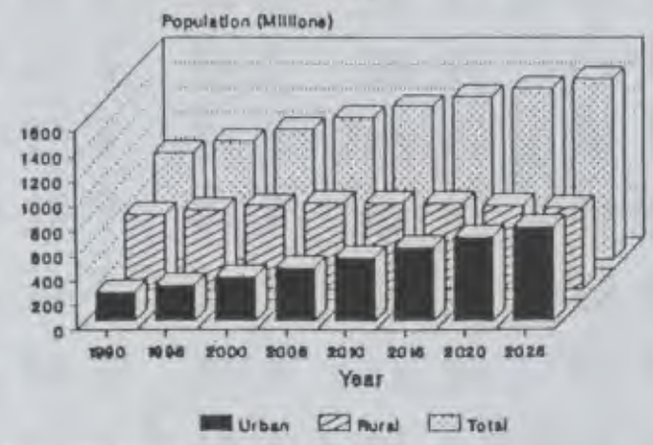
Source: United Nations (1988)

Figure 2F: Population by Area, 1990-2025
Zambia



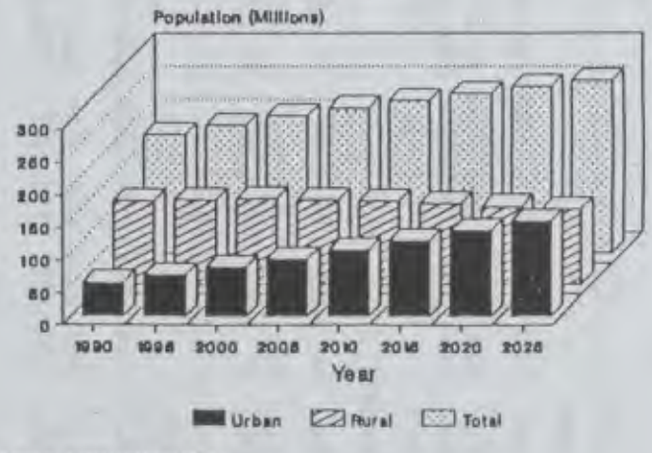
Source: United Nations (1988)

Figure 2G: Population by Area, 1990-2025
India



Source: United Nations (1988)

Figure 2H: Population by Area, 1990-2025
Indonesia



Source: United Nations (1988)

TABLE 1: TOTAL, URBAN, AND RURAL POPULATION, 1960-2025, BY COUNTRY

Country	Year 1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025
	Population (Thousands)													
Canada														
Total	17909	19678	21324	22727	23941	25379	26525	27567	28508	29364	30197	30954	31587	32051
Urban	12340	14344	16133	17184	18114	19253	20274	21323	22400	23506	24676	25765	26732	27532
Rural	5569	5334	5191	5543	5826	6126	6251	6244	6108	5858	5522	5189	4856	4519
Greenland														
Total	32	NA	NA	50	50	53	55	57	59	61	61	NA	NA	NA
Urban	NA	NA	NA	2	2	2	NA	NA	NA	NA	NA	NA	NA	NA
Rural	32	NA	NA	47	48	51	NA	NA	NA	NA	NA	NA	NA	NA
France														
Total	45684	48758	50772	52699	53880	55170	56173	57188	58196	58889	59430	59867	60229	60442
Urban	28501	32738	36061	38479	39456	40518	41603	42929	44469	45956	47469	48824	50044	51070
Rural	17183	16020	14711	14221	14424	14653	14570	14258	13727	12933	11961	11043	10185	9372
Chile														
Total	7614	8579	9504	10350	11145	12121	13173	14237	15272	16245	17182	18100	18973	19774
Urban	5165	6151	7150	8103	9035	10130	11280	12429	13538	14574	15558	16528	17458	18322
Rural	2449	2428	2355	2247	2110	1992	1894	1808	1734	1671	1624	1572	1515	1452
Guyana														
Total	569	645	709	780	865	953	1040	1119	1197	1272	1352	1431	1504	1570
Urban	165	188	209	231	264	307	360	423	501	583	672	765	858	949
Rural	404	457	501	549	601	647	680	696	696	689	680	666	646	621
Niger														
Total	3234	3736	4146	4665	5311	6115	7109	8313	9750	11415	13266	15201	17114	18940
Urban	187	254	353	496	701	989	1385	1917	2613	3485	4567	5839	7260	8786
Rural	3047	3482	3793	4169	4610	5127	5725	6396	7138	7930	8699	9362	9854	10154
Zambia														
Total	3141	3614	4189	4841	5738	7007	8456	10174	12197	14531	17152	19938	22743	25466
Urban	541	843	1272	1760	2455	3466	4700	6195	7962	9990	12236	14700	17268	19848
Rural	2600	2771	2917	3082	3284	3541	3756	3979	4234	4542	4916	5238	5475	5618

Source: United Nations (1989) for all, except Greenland for which the source is Danmarks Statistik (1988)

TABLE 2: TOTAL, URBAN, AND RURAL POPULATION, 1960-2025, INDIA AND INDONESIA

Country	Year 1960	1965	1970	1975	1980	1985	1990
	Population (Thousands)						
India							
Total	442346	495157	554911	620701	688856	769183	853373
Urban	79414	93084	109616	133267	161402	196228	238946
Rural	362933	402073	445295	487434	527454	572955	614427
Indonesia							
Total	96194	107041	120280	135666	150958	166464	180514
Urban	14032	16902	20534	26259	33514	42170	51975
Rural	82162	90139	99746	109408	117444	124294	128539

	Year 1995	2000	2005	2010	2015	2020	2025
India							
Total	947326	1042530	1136085	1225305	1306261	1374470	1445570
Urban	292814	356875	430932	513903	599820	684609	774315
Rural	654512	685654	705153	711403	706442	689861	671256
Indonesia							
Total	194811	208329	220575	231956	243040	253561	263251
Urban	63371	75960	89300	103177	117654	132405	147077
Rural	131441	132369	131275	128779	125386	121155	116174

Source: United Nations (1989)

TABLE A-1: DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION OF CANADA, 1960-2025

Indicators	Year												
	1960 -1965	1965 -1970	1970 -1975	1975 -1980	1980 -1985	1985 -1990	1990 -1995	1995 -2000	2000 -2005	2005 -2010	2010 -2015	2015 -2020	2020 -2025
Growth rate (%)													
Total	1.88	1.61	1.27	1.04	1.17	0.88	0.77	0.67	0.59	0.56	0.49	0.40	0.29
Urban	3.01	2.35	1.26	1.05	1.22	1.03	1.01	0.99	0.96	0.97	0.86	0.74	0.59
Rural	-0.86	-0.54	1.31	1.00	1.00	0.41	-0.02	-0.44	-0.84	-1.18	-1.24	-1.33	-1.43
Crude Birth Rate (/1000)	24.6	18.4	16.0	15.5	15.2	14.1	12.9	12.0	11.7	11.7	11.5	11.1	10.7
Crude Death Rate (/1000)	7.7	7.5	7.4	7.2	7.1	7.4	7.7	8.0	8.3	8.6	9.0	9.4	10.1
Total Fertility Rate (TFR)	1.75	1.22	0.96	0.86	0.81	1.65	1.65	1.70	1.75	1.80	1.80	1.80	1.80
Net Reproduction Rate	1.69	1.18	1.12	0.90	0.79	0.79	0.79	0.82	0.84	0.86	0.86	0.86	0.87
Infant Mortality Rate (/1000 Births)	26.0	21.0	16.0	12.0	9.0	7.0	7.0	6.0	6.0	6.0	6.0	5.0	5.0
Life Expectancy at Birth (Both Sexes)	71.4	72.0	73.1	74.2	75.9	76.7	77.3	78.0	78.5	79.0	79.5	80.0	80.4

Source: United Nations (1989)

TABLE A-2: DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION OF CHILE, 1960-2025

Indicators	Year												
	1960 -1965	1965 -1970	1970 -1975	1975 -1980	1980 -1985	1985 -1990	1990 -1995	1995 -2000	2000 -2005	2005 -2010	2010 -2015	2015 -2020	2020 -2025
Growth rate (%)													
Total	2.39	2.05	1.71	1.48	1.68	1.66	1.55	1.40	1.24	1.12	1.04	0.94	0.83
Urban	3.49	3.01	2.50	2.18	2.29	2.15	1.94	1.71	1.48	1.31	1.21	1.09	0.97
Rural	-0.17	-0.61	-0.94	-1.26	-1.15	-1.01	-0.92	-0.84	-0.74	-0.57	-0.65	-0.74	-0.85
Crude Birth Rate (/1000)	36.8	31.6	27.6	23.7	24.2	23.8	22.5	20.9	19.4	18.5	18.0	17.3	16.6
Crude Death Rate (/1000)	4.1	10.4	8.9	7.5	6.3	6.4	6.4	6.5	6.6	6.9	7.2	7.6	8.1
Total Fertility Rate (TFR)	5.28	4.44	3.63	2.90	2.80	2.73	2.66	2.60	2.50	2.41	2.35	2.29	2.25
Net Reproduction Rate	2.16	1.89	1.60	1.32	1.32	1.30	1.27	1.24	1.19	1.15	1.13	1.10	1.08
Infant Mortality Rate (/1000 Births)	111.0	95.0	70.0	46.0	23.0	20.0	19.0	18.0	17.0	17.0	16.0	15.0	14.0
Life Expectancy at Birth (Both Sexes)	58.1	60.6	63.6	67.2	71.0	71.5	72.0	72.5	72.9	73.4	73.8	74.2	74.5

Source: United Nations (1989)

TABLE A-3: DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION OF FRANCE, 1960-2025

Indicators	Year												
	1960 -1965	1965 -1970	1970 -1975	1975 -1980	1980 -1985	1985 -1990	1990 -1995	1995 -2000	2000 -2005	2005 -2010	2010 -2015	2015 -2020	2020 -2025
Growth rate (%)													
Total	1.30	0.81	0.74	0.44	0.47	0.36	0.36	0.35	0.24	0.18	0.15	0.12	0.07
Urban	2.77	1.93	1.30	0.50	0.53	0.53	0.63	0.70	0.66	0.65	0.56	0.49	0.41
Rural	-1.40	-1.71	-0.68	0.28	0.31	-0.11	-0.43	-0.76	-1.19	-1.56	-1.60	-1.62	-1.66
Crude Birth Rate (/1000)	18.0	17.1	16.3	14.0	14.5	14.0	13.6	13.0	12.4	12.0	11.8	11.7	11.4
Crude Death Rate (/1000)	11.2	11.1	10.6	10.3	11.2	10.4	10.0	9.5	10.0	10.2	10.3	10.5	10.7
Total Fertility Rate (TFR)	2.85	2.61	2.31	1.86	1.87	1.85	1.84	1.85	1.87	1.90	1.90	1.90	1.90
Net Reproduction Rate	1.34	1.23	1.10	0.89	0.90	0.89	0.88	0.89	0.90	0.91	0.91	0.91	0.91
Infant Mortality Rate (/1000 Births)	25.0	21.0	16.0	11.0	9.0	8.0	7.0	7.0	6.0	6.0	6.0	5.0	5.0
Life Expectancy at Birth (Both Sexes)	71.0	71.5	72.4	73.7	74.7	75.6	76.6	77.2	77.8	78.5	79.0	79.5	79.9

Source: United Nations (1989)

TABLE A-4: DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION OF GUYANA, 1960-2025

Indicators	Year												
	1960 -1965	1965 -1970	1970 -1975	1975 -1980	1980 -1985	1985 -1990	1990 -1995	1995 -2000	2000 -2005	2005 -2010	2010 -2015	2015 -2020	2020 -2025
Growth rate (%)													
Total	2.52	1.90	1.89	2.07	1.95	1.74	1.46	1.34	1.22	1.23	1.13	1.00	0.86
Urban	2.66	2.04	2.02	2.68	3.01	3.19	3.24	3.36	3.04	2.86	2.58	2.30	2.01
Rural	2.47	1.85	1.83	1.81	1.47	1.01	0.45	0.01	-0.20	-0.26	-0.43	-0.61	-0.79
Crude Birth Rate (/1000)	40.4	35.4	32.5	31.5	28.5	24.8	21.6	19.3	18.0	17.4	16.6	15.6	14.8
Crude Death Rate (/1000)	8.6	7.7	7.6	6.7	5.9	5.4	5.2	5.0	5.0	5.1	5.3	5.7	6.2
Total Fertility Rate (TFR)	6.05	5.33	4.55	3.94	3.26	2.75	2.42	2.19	2.09	2.09	2.09	2.09	2.09
Net Reproduction Rate	2.63	2.35	2.01	1.76	1.50	1.28	1.14	1.04	1.00	1.00	1.00	1.01	1.01
Infant Mortality Rate (/1000 Births)	61.0	56.0	56.0	49.0	36.0	30.0	25.0	21.0	18.0	15.0	13.0	11.0	9.0
Life Expectancy at Birth (Both Sexes)	61.2	62.5	64.1	66.5	68.2	69.7	71.0	72.2	73.3	74.3	75.2	76.0	76.8

Source: United Nations (1989)

TABLE A-5: DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION OF INDIA, 1960-2025

Indicators	Year												
	1960 -1965	1965 -1970	1970 -1975	1975 -1980	1980 -1985	1985 -1990	1990 -1995	1995 -2000	2000 -2005	2005 -2010	2010 -2015	2015 -2020	2020 -2025
Growth rate (%)													
Total	2.26	2.28	2.24	2.08	2.21	2.08	2.09	1.92	1.72	1.51	1.28	1.02	1.01
Urban	3.18	3.27	3.91	3.83	3.91	3.94	4.07	3.96	3.77	3.52	3.09	2.64	2.46
Rural	2.05	2.04	1.81	1.58	1.65	1.40	1.26	0.93	0.56	0.18	-0.14	-0.48	-0.55
Crude Birth Rate (/1000)	42.0	40.2	38.2	34.7	34.7	32.0	31.1	28.2	25.3	22.6	19.8	17.0	17.0
Crude Death Rate (/1000)	19.4	17.5	15.8	13.9	12.7	11.3	10.2	9.0	8.1	7.4	7.0	6.8	6.9
Total Fertility Rate (TFR)	5.81	5.69	5.43	4.83	4.75	4.30	4.10	3.69	3.28	2.87	2.46	2.07	2.07
Net Reproduction Rate	1.82	1.87	1.85	1.73	1.78	1.67	1.65	1.53	1.40	1.25	1.10	0.93	0.94
Infant Mortality Rate (/1000 Births)	157.0	145.0	135.0	126.0	110.0	99.0	88.0	77.0	67.0	56.0	48.0	41.0	35.0
Life Expectancy at Birth (Both Sexes)	45.5	48.0	50.3	52.9	55.4	57.9	60.4	62.9	65.2	67.2	69.0	70.4	71.6

Source: United Nations (1989)

TABLE A-6: DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION OF INDONESIA, 1960-2025

Indicators	Year												
	1960 -1965	1965 -1970	1970 -1975	1975 -1980	1980 -1985	1985 -1990	1990 -1995	1995 -2000	2000 -2005	2005 -2010	2010 -2015	2015 -2020	2020 -2025
Growth rate (%)													
Total	2.14	2.33	2.41	2.14	1.96	1.62	1.52	1.34	1.14	1.01	0.93	0.85	0.75
Urban	3.72	3.89	4.92	4.88	4.60	4.18	2.96	3.62	3.24	2.89	2.63	2.36	2.10
Rural	1.85	2.03	1.85	1.42	1.13	0.67	0.45	0.14	-0.17	-0.38	-0.53	-0.69	-0.84
Crude Birth Rate (/1000)	42.9	42.6	38.2	35.4	32.2	27.4	25.4	22.6	19.9	18.2	17.3	16.4	15.6
Crude Death Rate (/1000)	21.5	19.3	17.3	15.1	12.6	11.2	10.1	9.2	8.5	8.1	7.9	8.0	8.1
Total Fertility Rate (TFR)	5.42	5.57	5.10	4.68	4.10	3.30	2.90	2.50	2.20	2.07	2.07	2.07	2.07
Net Reproduction Rate	1.72	1.86	1.76	1.70	1.56	1.30	1.18	1.04	0.94	0.90	0.92	0.93	0.94
Infant Mortality Rate (/1000 Births)	133.0	124.0	114.0	105.0	95.0	84.0	74.0	64.0	55.0	46.0	39.0	34.0	29.0
Life Expectancy at Birth (Both Sexes)	42.5	45.1	47.5	50.0	53.5	56.0	58.5	61.0	63.4	65.6	67.5	69.1	70.5

Source: United Nations (1989)

TABLE A-7: DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION OF NIGER, 1960-2025

Indicators	Year 1960 -1965	1965 -1970	1970 -1975	1975 -1980	1980 -1985	1985 -1990	1990 -1995	1995 -2000	2000 -2005	2005 -2010	2010 -2015	2015 -2020	2020 -2025
Growth rate (%)													
Total	2.89	2.08	2.36	2.59	2.82	3.01	3.13	3.19	3.15	3.00	2.72	2.37	2.03
Urban	6.12	6.55	6.81	6.93	6.87	6.74	6.50	6.19	5.77	5.40	4.91	4.36	3.82
Rural	2.67	1.71	1.89	2.01	2.12	2.21	2.22	2.20	2.10	1.85	1.47	1.02	0.60
Crude Birth Rate (/1000)	45.8	49.4	50.4	50.9	51.0	50.9	50.2	48.9	46.8	43.6	39.2	34.3	29.7
Crude Death Rate (/1000)	29.5	28.6	26.8	25.0	22.9	20.9	19.0	17.1	15.3	13.7	12.1	10.6	9.4
Total Fertility Rate (TFR)	7.06	7.10	7.09	7.10	7.10	7.10	7.00	6.80	6.44	5.89	5.14	4.30	3.55
Net Reproduction Rate	1.96	2.04	2.11	2.18	2.26	2.35	2.40	2.41	2.36	2.23	2.00	1.72	1.46
Infant Mortality Rate (/1000 Births)	186.0	176.0	166.0	157.0	146.0	135.0	124.0	114.0	105.0	96.0	87.0	79.0	71.0
Life Expectancy at Birth (Both Sexes)	36.0	37.5	39.0	40.5	42.5	44.5	46.5	48.5	50.5	52.5	54.5	56.5	58.5

Source: United Nations (1989)

TABLE A-8: DEMOGRAPHIC CHARACTERISTICS OF THE POPULATION OF ZAMBIA, 1960-2025

Indicators	Year												
	1960 -1965	1965 -1970	1970 -1975	1975 -1980	1980 -1985	1985 -1990	1990 -1995	1995 -2000	2000 -2005	2005 -2010	2010 -2015	2015 -2020	2020 -2025
Growth rate (%)													
Total	2.80	2.96	2.89	3.40	4.00	3.76	3.70	3.63	3.50	3.32	3.01	2.63	2.26
Urban	8.87	8.24	6.49	6.66	6.90	6.09	5.52	5.02	4.54	4.06	3.67	3.22	2.79
Rural	1.27	1.03	1.10	1.27	1.51	1.18	1.15	1.25	1.40	1.58	1.27	0.89	0.51
Crude Birth Rate (/1000)	49.4	48.9	49.1	51.6	50.8	51.2	49.1	47.0	44.5	41.5	37.3	32.6	28.3
Crude Death Rate (/1000)	21.4	19.3	18.0	16.5	14.9	13.7	12.2	10.9	9.6	8.4	7.3	6.4	5.7
Total Fertility Rate (TFR)	6.62	6.65	6.90	7.20	7.20	7.20	7.00	6.80	6.44	5.89	5.14	4.30	3.55
Net Reproduction Rate	2.12	2.23	2.40	2.58	2.63	2.72	2.72	2.71	2.63	2.47	2.20	1.89	1.59
Infant Mortality Rate (/1000 Births)	130.0	115.0	100.0	94.0	88.0	80.0	72.0	64.0	56.0	49.0	42.0	36.0	31.0
Life Expectancy at Birth (Both Sexes)	42.8	45.3	47.3	49.3	51.4	53.4	55.4	57.4	59.4	61.4	63.4	65.4	67.2

Source: United Nations (1989)

TABLE 3: THE LOSS OF WILDLIFE HABITAT IN SELECTED COUNTRIES, 1986

Country	Original Wildlife Habitat (Km^2)	Amount Remaining (Km^2)	Habitat Loss (% of Original)
India	3,017,009	615,095	80
Indonesia	1,446,433	746,861	49
Madagascar	595,211	148,803	75
Niger	566,000	127,880	77
Zambia	752,600	534,346	29
Total	6,377,253	2,172,985	66

Source: Mackinnon and Mackinnon (1986), cited in World Resources Institute and the International Institute for Environment and Development (1988)

SOME LEGAL AND INSTITUTIONAL ASPECTS OF ECONOMIC UTILIZATION OF WILDLIFE

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INTRODUCTION

This paper focuses on the relationship between wildlife in its wild state and the principles of legal ownership. It stresses that recognition of private property rights in wildlife vested in individuals is a rare phenomenon. The paper concludes that vesting wildlife in the State or the public at large is an unhelpful device in conservation terms, even when combined with a system of administrative regulations such as a permit system for the regulation of taking. The paper argues that, in many parts of the world, the most effective management of wildlife resources can be achieved by placing that management in the hands of local communities small enough to feel some sense of identity with the resources in question and to derive direct economic benefit from their sound management.

WILDLIFE AS PRIVATE PROPERTY

In many legal systems, wildlife presents a curious anomaly in that it is rarely subjected to the legal regime which might be thought most effectively to have promoted its sound management and exploitation, namely the recognition of wildlife as subject-matter property rights. The determination of these rights and their enforcement against third parties are among the earliest aspects of private law to develop and present a very high degree of sophistication in all the legal systems in which they appear. Certainly, there has been no difficulty in extending the over-arching principles of property law from the relatively simple forms for which they may have originally been devised (usually chattels, such as swords, jewels, clothes, domestic animals, etc.) to infinitely and increasingly more refined forms of property, such as future interests, negotiable instruments, shares and other securities in joint stock companies, mortgages, rights under distributorship agreements, copyrights and the whole gamut of rights collectively known as intellectual property.

There have even been property interests of surprising complexity enjoyed by human beings in other human beings. Yet it is altogether exceptional to find this apparently intensely adaptable system of legal rights extended to wildlife in its natural state, unless they have been "reduced into possession" by being killed or captured, in which case they are treated as private property in much the same way as their skins or products might be.

This is so even in respect of species which have a direct and obvious economic value to humans. Thus, while it might be understandable that nobody might want to own wolves or mosquitoes, neither do we find absolute private property rights asserted by individuals over rabbits, pheasants, deer, or oysters, despite the capacity of these species to provide meat, furs, leather, and pearls.

The most which can be demonstrated for most legal systems is that a group, whether familial, cultic or communal, might together assert something approaching dominion over certain species of economic or spiritual importance within a defined geographical area, but this rarely if ever extends to all creatures as a whole. Even such a limited right is unusual in European legal systems and those deriving from them[1]. The systems tend, in most cases, to recognize nothing more than a mere right to take individual specimens (often only of certain species), a right which is frequently furthermore dependent upon, ancillary to or expressed to be in derogation of other third party rights over some other form of property which is legally recognized as being subject to rights of ownership, of which the most typical form is land or some interest in land. Thus, a right to take wildlife amounts to little more than an aspect of the ownership of that other property or to a mere legitimation of what would otherwise be an unlawful interference with that other property. It does not amount to the recognition of property rights vested in an individual plaintiff in the wildlife in question.

It should also be noted that these legal systems have not been inhibited from recognizing individual rights of private property in other natural resources. Thus, it is commonplace to find minerals as the subject of property. Similarly, in many jurisdictions, trees belong to landowners as if they were to be regarded as an integral part of the land itself. In some jurisdictions, the same can be said of water rights, although this is less usual (at least in the case of water flowing in watercourses.

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[1] The influence of European legal systems extends far beyond their mere imitation in other parts of the world, including sub-Saharan Africa. In many places where a common law or civilian system has been imposed by a colonial power and retained after independence, the European rules have not only supplanted but often have extinguished pre-existing customary principles applying to wildlife, which therefore fail to play even a supplementary role in the existing legal regime of wildlife.

The recognition of private rights in game may have, in theory, some advantages, of which the most obvious is the natural tendency of property owners to expend more care and attention on things in which they have proprietary rights. The complexities of applying these rights to things which stray at random from one private landholding to another, and perhaps the undesirable and unlooked-for consequences of the steps which might be taken by landowners to prevent this straying, have resulted in the abandonment of this particular legal regime in most systems.

WILDLIFE AS STATE OR PUBLIC PROPERTY

While there are few examples of cases in which wildlife has been the subject of private property rights, there are abundant examples of legal systems which have rejected that solution in favor of the opposite extreme. There are many national laws which have removed wildlife totally from the range of private property interests. In some cases, for example in Burkina Faso until 1985, and in Kenya, this policy has been undergirded by an express prohibition of hunting. This approach still attracts supporters. A similar ban has more recently been imposed (for a three-year period running from 1989) in the Sudan.

These systems typically provide that wildlife is in some sense public or State property. Thus, in Ethiopia, Burkina Faso, and the Central African Republic all wild animals are the property of the State. In Tanzania, all game (and indeed all land) belongs to the State, as do water and trees (unless these are artificially raised in plantations).

The objectives of "nationalizing" wildlife and other natural resources were in most cases entirely admirable. It was thought that such important elements of the biosphere should not be in the hands of private owners, nor should they be susceptible to uncontrolled acquisition by individuals or small groups.

In practice these objectives have rarely been realized. Few developing countries have been able to devise and put in place a strategic management plan for the utilization and sound management of natural resources of any sort, much less for the extremely sophisticated management required for good wildlife management. More fundamentally, however, problems inherent in the concentration of "property rights" to wildlife in a remote and impersonal national entity were exacerbated in areas in which the national government was regarded with suspicion and disfavor, perhaps on cultural or tribal grounds. In such cases the vesting of wildlife in the State was potentially disastrous. Local populations were notionally deprived of the benefits from the wildlife in favor of a government which appeared to have no personal use for it and which, in some cases, appeared to value the wildlife largely, if not exclusively, to attract wealthy foreign tourists or game-hunters from whom the government (but not usually the local population) derived substantial supplies of foreign exchange.

A not uncommon result of the vesting of wildlife in the State, therefore, has been an attitude among local populations of disinterest and even downright hostility to wildlife values. Subsistence farmers whose cattle are killed by lions or whose crops are destroyed by elephants are unlikely to be willing to tolerate these losses if the benefits to be gained by preserving the offending wildlife accrue to the national treasury. The suffering farmer is more likely than not to resort to traps and poison bait, in the probably quite sincere belief that he is not in any real sense "depriving" the State of any tangible property whatsoever.

GRANTING ACCESS TO WILDLIFE RESOURCES THROUGH A PERMITTING SYSTEM

Where wildlife is not the subject of individual property rights, but either capable of being reduced into possession by the owner of the land or his licensees or where the ownership of wildlife is vested in the State or some other public body, the usual method by which access to the resource is granted is through the operation of a system of permits.

Where the legal system accords to a landowner the right to allocate access to wildlife resources, these permits can take one of a number of forms. They may be purely private contractual agreements, under the terms of which the landowner grants to the other party a mere license to come onto his land in order to exercise (for a limited

period) the rights to exploit the wildlife occurring there, a right which is an attribute of the landowner's title to the land. Such agreements should deal with the question of who is to have title to the wildlife which is taken as a result of the exercise of these powers by the licensee. In other cases, however, what is granted to the licensee is a subsidiary interest in the land. Thus, a lease or other subsidiary grant of sporting rights may be made.

Where the wildlife is vested in the State or some other public entity, it is more usual to find access to the resource controlled by the issuing of licenses or permits through some kind of administrative procedure. Systems of this sort are very widespread, being common to legal systems which recognize the right of the land owner to dispose of rights to exploit the wildlife (even though he or she does not own the wildlife itself) and to systems where this right is denied.

COMMUNAL MANAGEMENT OF WILDLIFE BY LOCAL POPULATIONS

A curious feature in many countries is that there is little express recognition, in the legislation relating to the management of wildlife resources, of the protection of traditional rights in wildlife recognized by the customary, as opposed to the written, law.

It would appear that customary rights relating to the management of wildlife frequently fail to achieve recognition in the written law, which in many cases give the impression of having been drafted without any consideration for customary law rules and perhaps even without any knowledge of them. In many cases, this state of affairs is a legacy from the colonial era. During that period legislation was commonly (although not invariably) drafted by the colonial government on a pattern which reflected the cultural and jurisprudential values of the colonial power, using legal concepts which were essentially foreign to the customary law systems upon which they were imposed. Furthermore, at least in the case of game, land, and some other natural resources, the legislation tended to favour the interest of settlers rather than the indigenous communities.

Be that as it may, there is, today, little excuse for continuing to ignore traditional systems of wildlife management. On the other hand, it cannot be stressed too forcibly that there are important differences between the management problems addressed by traditional customary law rules in the colonial or pre-colonial period and those which the inhabitants of the areas must now address; of which the need to accommodate a significantly higher level of local population and to satisfy a potentially lucrative foreign-based tourism or sport-hunting industry at commercially viable levels of operation are only the most striking.

Nonetheless, in many parts of the world, government departments charged with the management of wildlife but ill-equipped both in personnel and other resources have begun to turn to local communities to assist them in this task, drawing upon the store of expertise locked up there. This tendency does not necessarily entail the acceptance unchanged of customary rules and rights (although a readiness to consider such acceptance would undoubtedly make such a system more workable). But it does involve a readiness to recognize a certain nexus between the local population and the resource which it is to manage. In many cases the nexus exists in fact, in that it is in some senses in the interest of the local population to ensure the sustainable utilization of the wildlife resource base, but governments should be cautious about making in too facile a manner the assumption that this will always be the case. Local populations will tailor their attitude to wildlife resources in direct proportion to themselves. Of course, this value may not always be economic, but may be religious, cultic or cultural. In many, perhaps most cases, however, the value will be related either to direct use of the resource by the community (for meat, skins, etc) or to the ability to convert the resource into cash or other benefits in trade. Thus, a population which is accustomed to utilize its wildlife resources in these ways will usually be prepared to manage it sustainably.

Governments must realize, however, that such a simple pattern is in modern conditions likely to be overlaid by a number of complicating factors. Improved agricultural methods or the introduction of cash-crops may have weakened the link between wildlife and food production or economic performance; alternatively, soil degradation or population expansion may promote short-term necessity above long-term prudence in the community approach to wildlife. Also, the nexus described above depends upon, at the very least, a tacit recognition of the right of the community to manage and exploit the resource. Too many written laws insist upon the expropriation of that right. If this expropriation were rigidly enforced, the maintenance of the nexus would argue an unrealistic degree of

altruism among the local population. The position is made much worse when the welfare of "nationalized" wildlife is promoted, at the expense of grazing and forestry rights for sometime hard-pressed local populations, for the benefit of rich foreign tourists or hunters. In extreme cases populations may actually be physically moved from traditional areas rich in wildlife. In such a situation it is hardly surprising that the attitude of the local population is one of resentment, which manifests itself in surreptitious poisoning or trapping of wildlife, poaching, etc - entirely predictable results of the local population's sense of being less important than the wildlife (or the hard currency it generates).

Thus the effective involvement of the local population with wildlife management must produce a tangible benefit, most usually in the form of economic gain for that population itself. Of course there is a sense in which hunting and permitting systems do this, in that hunters, trackers, guides and wildlife rangers derive personal income from the activities and this enriches part of the community[2]. Furthermore there may be a "trickle-down" effect, in the sense that fees, etc, paid to national agencies augment the governmental budget and are available for the improvement of the lot of the local population. Experience would suggest that such claims have more validity in theory than in practice, in that the benefits are normally not widely distributed (nor are they appreciated) throughout the local community.

If the local community is to identify itself wholly with the task of wildlife management in its area, it would seem that there must not only be an economic benefit, but that the economic benefit must accrue (in part at least) to the community. Only in this way is the intimacy of the connection between the management operation and the economic return to be grasped.

A trend towards this kind of institutional structure is developing.

Far and away the most significant illustration of the principle of local management of wildlife in Africa is that established in Zimbabwe, under the auspices of the "Campfire" programme.

This programme (which is presently confined in its operation to Communal Land) has the extremely ambitious aim of providing a framework within which local communities can exercise "proprietorship" over the entire natural resource base (including soil, grazing, etc). But in its initial stages it has concentrated on wildlife, which is seen as having an immediate economic value in that it is immediately and easily marketable.

The programme set out to redress the balance, which was seen to have been tipped against wildlife by virtue of the tendency to give priority to domestic animals in allocating land use, thus edging wild species out of the best grazing areas. The status of wildlife as common property (on communal land) also militated against its conservation.

The programme therefore concentrated on developing the commercial value of the wildlife to the community. The essence of the Campfire programme is the transfer of wildlife management responsibilities from the national to the local level. The Zimbabwe government has devised the concept of "appropriate authority" for wildlife management. The local authority of a common land district may be designated an "appropriate authority" for this purpose. This involves the authority to decide the extent of rights of access to the resource which are to be permitted, deciding to whom they are to be allocated[3] and on what conditions, and in handling the unfamiliar and dangerous issues of the control of poaching and other law enforcement matters.

The Department of National Parks has been very careful to ensure that delegation of wildlife management rights has only been made to local authorities who have carefully worked out the distribution of benefits. The authority must have devised a plan for allocating these benefits among the villages, families and other communities living

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[2]. This thesis assumes, of course, that these people are necessarily drawn from the local community, which is not always the case.

[3]. Discussion of the Campfire programme has tended to focus on the potential for generating income from outsiders, either in the form of tourists, hunters or purchasers of trophies, but it should not be overlooked that the Campfire authority is equally capable of permitting subsistence hunting to take place lawfully, rather than as small-scale poaching.

in the area and bearing the costs of the management operation. An essential requirement is that the programme be democratically constituted. In this context it is essential that there be co-ordination and understanding between the district authority and the lower tiers of local government in the wards and the villages. Each appropriate authority therefore has a Board of Management on which the wards are represented. Villages have representatives looking after their interests on the ward wildlife management committees.

The Campfire programme also integrates the work of a number of governmental and private sector agencies, in addition to the community itself.

Since the inception of the programme wildlife management has gained a competitive edge over livestock in land-use terms on many areas of communal land, largely because once it is given the chance to compete as an economic crop, wildlife is able to demonstrate its greater productivity, especially on marginal land. This also enables the programme to look at a range of utilization options, from using the wildlife as primarily a source of food, through sport hunting to photographic safaris and other non-consumptive uses.

In practice, overseas aid has been deployed largely in capital infrastructure, with the result that revenues generated by the wildlife have become immediately available for the local community.

This has stimulated the view of wildlife as a viable economic user of land, and communities have volunteered to undertake tasks such as stopping squatters moving into land used by wildlife, voluntarily restricting crop-planting on such land and conducting vigilante patrols to discourage poachers.

The Campfire programme had a somewhat slow start. Initially, only two district councils were designated as appropriate authorities, but by mid-1990 ten more had been nominated.

Although the programme is the best known and undoubtedly the most highly-developed system of this sort, other countries are beginning to give serious consideration to similar schemes. Something like it has been proposed in Tanzania, where the wildlife "industry" is a major foreign currency earner worth approximately $100 million annually. A draft wildlife policy, prepared for the Ministry of Lands, Natural Resources and Tourism in September 1989, declared that a more active wildlife policy, aimed at more than mere preservation, depended upon the government allowing rural communities and private individuals to utilize wildlife for their own benefit, with the right to participate in management decisions. This would represent a major departure for the Tanzanian Government, never renowned for its sensitivity to local interests, and which currently has:

> ". . . no guidelines on how to develop and encourage a wildlife industry where village cooperatives, individuals and companies can participate. The present system of wildlife utilization concentrates on wildlife tourism and safari hunting, but neglects other forms of wildlife utilization such as game ranching, game farming and village utilization schemes."

The draft policy envisages that these utilization schemes would enable a village to be empowered to utilize the state-owned wildlife in its area and to retain the income and products arising from that utilization, whether in the form of hunting, cropping or tourism. As "custodian" of the wildlife, the village would thereby assume a responsibility for its well being, with a consequent reduction in poaching, etc. Safari companies and others would negotiate directly with the village, to whom all payments would be made.

Similarly in Burkina Faso, where game plays an extremely important role in the rural economy, the government carried out, in the early 1980s, a number of surveys to identify the areas rich in game. As a result, the government established a network of protected areas which are managed for the benefit of wildlife. This includes five national parks, a number of hunting areas (dedicated both to subsistence hunting and for sport), and some game ranches[4].

[4] There are also a number of bird sanctuaries and two biosphere reserves.

To secure the proper management of these areas the Burkina government has turned to the local inhabitants, whose expertise is recognized as being of importance in this context. Action has been taken to confer upon the village councils the necessary powers to enable them to protect the wildlife in their districts and to take such wildlife as may be necessary to satisfy their own reasonable needs. This policy is, of course, consonant with the broad political orientation of the country. The government is also striving to establish organizations of hunters for the same purpose[5]. These associations are established not only in order to represent the interests of the hunters, but also to participate in the task of conserving natural resources (particularly by habitat conservation and public education). Forest officers will act as technical advisers to the associations.

A regulation (raabo) of 1989[6] now governs hunting by village communities in their own districts. This hunting must be carried out exclusively by the village hunters' organization and only extends to small game. Villagers who want to take other kinds of game must apply for a permit in the ordinary manner. Only subsistence hunting is envisaged and no game taken (or its products) can be sold or bartered. Neither may the villagers exercise their rights in zones which have been hunting areas set aside for sporting purposes. Village hunting permits under the 1989 rabbo are issued by the governmental department (after consultation with the forest service), and are valid for six months.

Village hunting rights are subject to the general law as to open and closed seasons, protected areas and bag-limits. There are also restrictions on the hunting methods which can be employed[7].

This strategy has already produced good results, especially in reducing the tensions previously existing between the peasants and the forest officers (as the involvement of the former has lightened the load of surveillance borne by the latter). There is however, a legacy of mistrust among the peasants, who have had long experience of restrictive and inappropriate game legislation.

In addition, the law relating to the disposal of meat from animals killed in lawful hunting operations does also confer some interest on local populations. As mentioned above, if the person killing the animal is an expatriate or a tourist, the inhabitants of the village nearest to the spot are entitled to a proportion of the meat. The remainder of the meat is sold in the open market.

Similar systems are found in other parts of the world. They form, for example, an element in the South Pacific approach to wildlife management.

The intensity of the sympathy felt by the people of the South Pacific for their custom land and their traditional way of life with its close intimacy with the natural world has had a profound impact upon successful protected area management in the region. There are some practical examples in the region of the institution of protected areas on a local basis with the close involvement of the local population.

Perhaps the best known and the most instructive system is that established in Papua New Guinea under the provisions of the *Fauna (Protection and Control) Act* 1966. This statute provides, *inter alia*, for the establishing of Wildlife Management Areas (WMAs). But the manner in which this is done is dependent not only upon continued co-operation in the implementation of the legal regime of protection and management of the area on a day to day basis. One limitation is that a WMA can only be declared if the custom land owners request that it be established. The declaration does not affect the custom ownership of the land in any respect. The uses to which

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5. These organizations reflect the usual administrative hierarchial structure - village, departmental, provincial and national.

6. Raabo no.an VII-001/FP/MET/MATS portant definition et reglementation de la chasse villageoise.

7. Only one dog per person may take part in the hunt. Sticks, clubs, spears, bows, stones, slings and certain firearms can be used. Hunting may be conducted on horses or camels. If hunting is undertaken in large groups, these must have been approved by the forest service, must only range over half of the district, must only take place three times per season, etc. After such a *chasse collective*, those taking part may not exercise their village hunting rights for one month.

the owners may put the land are certainly restricted, but by virtue of the custom owners themselves choosing to place limitations upon the human activities which will be tolerated in the area.

In practice the process is initiated at the instigation of the government, who will propose to the custom owners that a WMA should be established. Discussions then centre on the particular issues which have led the government to recommend the WMA, e.g. because of over-harvesting. The aim of these discussions is to identify the cause of the problem and, once this has been done, to try to investigate which traditional laws and practices could contribute towards a solution. A strategy for the management of the area is then worked out, based on the conclusions of these discussions, and the parties settle on the precise outlines of the area in which this strategy is to be applied. Finally, a WMA management committee is formed, on which the local population form a majority, and decisions are taken as to who is to sit on the committee.

Once all these preliminaries have been completed and the area is ready for designation, a final formal meeting is held with the local custom owners to settle boundaries, management committee membership and the precise content of the regulations for the management of the area. The resolutions of this meeting are then finally embodied in a formal declaration by the Minister.

Thereafter, day-to-day management of the area and implementation of the management plan lies in the hands of the local population, acting through the management committee. Provision is made for the committee to meet every so often (usually every six months) in order to review the success or failure of the rules and to change them (by consensus) if need be, informing the headquarters of the conservation service if this is done[8].

The principal operational (not to mention, political) merit of this model is not far to seek:

> "The great advantage would seem to be that the people become involved in the conservation of their own wildlife; it is not something which is being forced on them from the outside."[9]

There are also technical benefits, from the legal point of view:

> "There are no problems of transfer of land, all rights are retained by the customary owners. Traditional methods of management and hunting are encouraged..."[10]

A number of these WMAs have been established. In one such area quite strict controls on hunting imposed with the agreement of the custom owners. Outsiders are obliged to pay license fees for the right to take game from the area and a royalty per head is charged. Under the agreement this income is subject to a fairly sophisticated distribution pattern. The license fees and half the royalties are paid into a bank account on trust, to be used to promote the development and welfare of the whole area[11], while the other half of the royalties goes to the individual owner of the land in question[12].

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[8]. See generally, *Case Study: Wildlife Management Areas in Papua New Guinea*, in SPC 1985, pp. 253 et seq.

[9]. P. Eaton, *Land Tenure and Conservation: Protected Areas in the South Pacific*, SPREP Topic Review 17, Noumea 1985 [hereinafter cited as *"Land Tenure"*], at p.33.

[10]. Ibid., at p.42.

[11]. P. Eaton, *Protected Areas int he South Pacific - 1. Tonda Wildlife Management Area*, (1985) 1 PLES 4, SPC Noumea [hereinafter cited as *Tonda*], at p.10.

[12]. Eaton recognizes that, "To some extent, this represents an individualization of land tenure, as traditionally hunting rights tended to be collective over the group territory. In an area where land disputes are rare, mainly due to the low pressure of population on land, it is interesting that the payment of royalties has in one case led to a dispute which was settled by mediation. Not all the people benefit directly from these royalties."

It must be said, however, that in reality some difficulties have been experienced and the system does not work as smoothly as might be hoped. It is essential that the framework of regulations agreed with the custom owners is sufficiently comprehensive[13] and the more comprehensive the conservation agency wishes to make them the greater the danger of provoking the custom owners into having second thoughts. Clearly, the proper discharge by the management committees is essential to the implementation of the rules, and the evidence is that the regularity of the committees' review meetings soon breaks down[14].

Another difficulty experienced in WMAs is also described by Eaton:

> "One limitation would seem to be that, although they may be effective in restricting the activities of outsiders, they do not always provide rigid enough controls over hunting by members of the group themselves."[15]

Although the Papua New Guinea WMAs are perhaps the best known and most fully-documented system of local control of protected areas, there are other examples throughout the region. In Fiji, for example, the device has been institutionalized in a system of honorary fish wardens (appointed now by the Permanent Secretary of the Ministry of Agriculture and Fisheries, exercising powers delegated by the Minister). These community wardens are responsible for the prevention and detection of offenses under the Act[16].

There may also be considerable scope for negotiated agreements for the conservation of environmental values on an occasional basis. In a well-known case in Fiji, a conservation body (the Fiji National Trust) was able to negotiate an agreement with the custom owners in order to establish a reserve for the conservation of a threatened species of iguana, when the legislative structure had proved inadequate to overcome *(inter alia)* customary law difficulties[17].

The utilization of mechanisms such as these represents a delicate balancing act. On the one hand, there is the inestimable advantage of securing the committed support of people to whom conservation principles are intensely

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[13]. Eaton, *Land Tenure*, at p.33.

[14]. See Eaton, *Land Tenure*, at pp.55,57; *Tonda*, at p.13. N.B., Eaton points out that this is partly because of the scale of the WMAs established in Papua New Guinea means that the distance and transport difficulties loom very large. Tonda WMA covers 5900 sq.kms. Eaton also points out that there is little effective governmental support for the Tonda project, as the parks officer responsible for overseeing it has no funding, no training facilities and little other material support of any kind.

[15]. *Land Tenure*, at p.42.

[16]. Fiji *Fisheries Act*, s.3.

[17]. This is the Yadua Taba case. For a full description, see Biranda Singh, *Owner Involvement in the Establishment of Parks*, in SPC 1985.

Eaton has pointed out, however, that there were many special factors surrounding this case, which (in view of its notoriety) should perhaps be spelled out. These included the fact that there was no permanent settlement on the island subject to the agreement, which was relatively inaccessible with no special resources to make it attractive for settlement; and the particular species, the crested iguana, had important traditional significance for the local people as a totem and thus was not hunted, but rather feared and avoided. He also points out that an integral part of the deal was a payment to the custom owners of $1,500 per annum, funded by international conservation organizations. Indeed, in another similar case (that of the Waisala Forest Reserve on Vanau Levu), the Fiji National Trust was unable to repeat its success when the logging company offered to surrender part of its concession area for conservation purposes. In that case the proposal was that the custom owners were to receive not only a premium and annual rent, but they also sought compensation for timber royalties foregone, which they assessed at $32,000 - see *Land Tenure*, at pp.64-66.

familiar (albeit in a slightly different context), but who are uneasy about the implications of formal protected area systems:

> ". . . village rule can be called upon to enforce the conservation measures and ensure that the village people abide by them. Furthermore, the villagers' suspicions that they many eventually lose their land to the government can be eliminated and the long-term protection of the area is therefore assured."[18]

On the other hand, it is possible to paint too rosy a picture of the readiness of custom owners to abide rigidly to sound conservation practices or even to the agreed management measures. Of the Papua New Guinea WMAs, Eaton has written warningly:

> ". . . their effectiveness will depend on the consistency with which protective measures are applied and also on continued support and assistance from government"[19].

It would therefore seem that one should guard against euphoria about the introduction of communal management systems as a panacea for wildlife conservation ills. Clearly they provide an enormous incentive to local populations to involve themselves in conservation programs and thereby make available to the wildlife management authorities at the national level an immense wealth of manpower and expertise which has hitherto been lying dormant (at best). On the other hand, the national administration may not be able entirely to abdicate its responsibilities in the matter. Local populations having unfettered discretion over wildlife management may be tempted, when conditions are right, to regard the resource as a source of cash and no more. There is more to wildlife conservation than running a business.

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[18]. I.Reti, *op.cit*, at p.159.

[19]. *Tonda*, at p.4.

III: COUNTRY CASE STUDIES

AN OVERVIEW OF WILDLIFE MANAGEMENT IN THE NORTHWEST TERRITORIES, CANADA

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INTRODUCTION

The indigenous people form the majority of the population of the NWT and they (Inuit, Inuvialuit, Dene and Metis) have a lifestyle and an economy which has a long history of dependence on renewable natural resources and the habitat. The local people already have substantial influence over the future of wildlife and its habitat. There is a pronounced conservation ethic which has its roots in the political process of reaching consensus in traditional, aboriginal societies.

The full implementation for three primary land claims between the aboriginal people and the Government of Canada will establish a variety of co-management systems. These will firmly secure a prominent and primary role for aboriginal people in *all aspects* of the management of renewable resources and their habitat. Aboriginal people in the NWT have tremendous respect for wildlife which has enormous value to them. This value includes not just the social, cultural, and nutritional, but also the economic. The economic value includes the replacement of country food and intersettlement trade and also the value of current and potential exports. The replacement value of country food, fuel and other renewable resources is approximately 60 million Canadian dollars per year in 1990 dollars. Most of the hunting in the NWT is for meat and concentrates on ungulates. This has produced few conservation problems. During the last century, there have been population declines in muskox and wood bison which were partly the result of hunting, though the trends have now been reversed.

As only one example, surveys of some 1.5 million barren-ground caribou are conducted once every four years to a standard which is better than a coefficient of variation of 0.15. The people of the NWT are prepared to have their programmes for wildlife management reviewed and are interested in the very significant benefits that could result from the potential trade in edible and non-edible parts of wildlife. It is difficult to ensure stability in the renewable resource economy when many of the market forces are beyond the control of people in the NWT. They are interested in the conservative development of a range of market opportunities which includes future emphasis on opportunities for wildlife viewing. The young people of the NWT are struggling to identify their opportunities for the future. Their hopes and dreams will centre on the opportunity to choose a lifestyle which is a blend of traditional activities and a career in "mainstream Canada".

The NWT is blessed with an abundance of fish, terrestrial wildlife, migratory birds, marine mammals and pristine habitat. Many of the wildlife species in the NWT are migratory; some migrate into other jurisdictions in Canada and significant numbers cross international boundaries (Porcupine Caribou Management Board 1989, Beverly and Kaminuriak Caribou Management Board 1987, Cournoyea and Bromley 1986). The land, water and wildlife management decisions that are taken in the NWT affect the opportunities available to people in other jurisdictions.

By any standards, the NWT is vast. It occupies 1/3 the area of Canada (3,426,000 km2) and its people are of many distinct cultural and ethnic origins. The human population of 55,000 is sparsely distributed over 64 small communities; most of which are readily accessible only by air. The population growth rate is in the order of four per cent per year and the unemployment rate is 16 percent.

Wildlife management receives considerable attention by the elected Legislative Assembly of the Government of the Northwest Territories (GNWT). Most of the 24 members of the Assembly are hunters and fishermen from families within communities that have depended on fish, wildlife and marine mammals for decades and, in some cases, centuries. The NWT is the only jurisdiction in Canada where native people form the majority of the population.

Economic growth in the NWT has been the fastest in Canada and at times the Gross Domestic Product (GDP) has exceeded twenty per cent per year. The GDP can be subdivided as follows (NWT Data Book):

(a) Mining - 26 per cent
(b) Government - 28 per cent
(c) Construction - 14 per cent
(d) Personal and business services - 9 per cent
(e) Retail business - 8 per cent
(f) Transportation - 6 per cent

There is tremendous variation in personal income among regions and among communities. The average annual income of people in gainful occupations in 1986 was $20,809, slightly above the national average. The per capita income is well below the national average - indicating that fewer people work and these people have above average wages. The cost of living in the NWT is significantly higher than in southern Canada; Yellowknife is 32 per cent higher than in southern Canadian cities and higher in remote communities than in Yellowknife.

The NWT Data Book (1990) makes the following observation about tourism in the NWT:

> "Tourism has become increasingly important in the Northwest Territories' economy in the past few years. It is actively promoted by government and by regional travel-tourism associations, as well as by individual entrepreneurs, as a revenue-generating industry which can be compatible with northern community lifestyles and environmental preservation. The NWT offers the traveller attractions of great and varied natural beauty, fishing, wildlife and the fascination of frontier lifestyles.
>
> During the summer of 1988 approximately 60,000 people visited the NWT. About 30,000 visited for pleasure and spent about 31 million Canadian dollars."

Arts and crafts represent an important aspect of the northern economy. Almost 25 million Canadian dollars of revenue is generated from this sector each year.

The GNWT receives approximately 85 per cent of its revenues through direct transfer payments from the federal government.

Of the Northwest Territories' billion dollars in annual exports, mining accounts for 73 per cent and oil for 26 per cent. The combined renewable resource exports account for the remaining one per cent.

Over the last two decades, people throughout the scattered communities have become aware of the influence brought to bear by the international community can exert on the use of wildlife in the NWT. This influence includes the forces of the marketplace, international agreements such as the Convention on International Trade in Endangered Species (CITES), the United States Marine Mammal Protection Act, and the Migratory Birds Convention; as well as the pressure which results from the media drawing attention to local situations. The value of wildlife to people in the NWT is very significant and the additional potential value is enormous. Whether this additional potential value can be realized will depend to a large extent on the terms and conditions which the international community decides will govern responsible trade in non-edible parts of wildlife.

The view expressed in this paper are those of the authors and are not necessarily the formal views of the GNWT.

RELATIONSHIP BETWEEN CO-MANAGEMENT MECHANISMS AND CONSERVATION

The comprehensive land claims represent the primary basis for the ongoing development of co-management mechanisms and the associated devolution and delegation of authority to the local level for a whole range of responsibilities including wildlife management. From the outset the negotiators representing the aboriginal people pushed for a prominent role in all renewable resource issues as one of the cornerstones of the claims agreements.

At the time of writing there are three main land claims that span all of the area of the NWT. These claims are in varying stages of development; the Inuvialuit of the Western Arctic have been implementing the final agreement since it was signed with the federal government in 1984, while the Inuit and the Dene/Metis are at the stage of Agreements-in-Principle.

Under the terms of the Inuvialuit Final Agreement, a number of resource management structures have been established. Each of the six communities in the Inuvialuit Settlement Area has a Hunters' and Trappers' Committee

(HTC) which is, for the most part, made up of hunters and trappers who are beneficiaries of the claim. These committees meet regularly to deal with wildlife issues *within* communities.

The presidents of these six HTC's, or their designates, make up a regional council of beneficiaries of the claim which is known as the Inuvialuit Game Council (IGC). This council meets regularly to deal with wildlife issues *among* communities.

Representatives of the IGC participate with representatives of the Government of Canada and representatives of the Government of the Northwest Territories on four co-management committees:the Wildlife Management Advisory Councils, the Fisheries Joint Management Committee, the Environmental Impact Screening Committee, and the Environmental Impact Review Board. The Wildlife Management Advisory Councils and the Fisheries Joint Management Committee have equal numbers of Inuvialuit and government members and they jointly choose a chairman, who votes only to break a tie (Stirling 1990). The resolutions of these boards are recommendations to the appropriate Minister. Taken together, these co-management structures have enormous influence on every aspect of the management of fish, wildlife, migratory birds and marine mammals, as well as the habitat of all of these groups of species.

Although the Inuit claim and the Dene/Metis claim are still under negotiation, there are parallel structures in these areas which mirror much of what is in place as part of the Inuvialuit Final Agreement. That is, there are local Hunters' and Trappers' Associations in most communities and Regional Councils in every region. A Wildlife Management Board has been established in each claim area to advise the governments in anticipation of final settlements which will have the constitutional stature of Acts of Canadian Parliament.
It is important to note that the representatives of the local communities that serve on the primary wildlife management boards are respected community elders or their designates. They are often chiefs or sub-chiefs and they typically have a deeply entrenched conservation ethic. These individuals are vitally concerned with the opportunities that will be available to their children and grandchildren. These community board members generally have a philosophy about humans and nature which is completely consistent with the principles of the World Conservation Strategy; which has been endorsed by the Government of Canada and the GNWT.

The Department of Renewable Resources of the GNWT has been discussing conservation with local people for more that three decades. These local people already have a rich history of conservation. The Department has worked with the local people to develop a common understanding of conservation principles and to codify these. Our research scientists and resource managers have paid serious attention to the development of conservation principles and the incorporation of local knowledge into research and management programmes. The monograph by Holt and Talbot (1978), and the report of the Bruntland Commission on Our Common Future, culminated in the formal adoption of the GNWT Sustainable Development Policy by the Ministers of the Executive Committee in November of 1990 (Appendix I).

THE CURRENT USE OF WILDLIFE

The most important use of wildlife in the NWT continues to be for food and clothing of the local people . There is every indication that this will always be the case. Although the value of this harvest of fish, terrestrial wildlife, migratory birds and marine mammals is, in the first instance, nutritional and economic, there are very significant social and cultural values associated with it. The harvest of wildlife in the NWT is carefully monitored through regional harvest surveys. More that half a million Canadian dollars are spent each year to support harvest surveys which consist of monthly interviews of hunters in each community (Gunn et al 1986, Donaldson 1988, Gamble 1988).

Although "country foods" are still preferred and are considered a delicacy by most native people in particular, there have been two significant reductions in the total harvest of wild animals and fish in the last 50 years. The first reduction was due to the establishment of permanent settlements and the availability of food from the store. Most of the adults in the community grew up in extended families whose diet approached a 100 per cent country food consumption. This situation has changed and all residents of the NWT now have access to food from stores although most of this is very expensive. The advent of the snowmobile resulted in the second and most significant

change in the consumption of country food since it meant that it was no longer necessary for every group of hunters to maintain dog teams. Prior to this revolution in transportation, individual hunters killed as many as 300 caribou (*Rangifer tarandus*) per year to add to the many trout, whitefish, pike and char that were needed to feed one dog team.

While the snowmobile meant a tremendous reduction in the harvest of caribou, muskox and fish; it also introduced very serious concerns about increased kill of polar bears. These concerns resulted in the establishment of community quotas for polar bears in the late 1960s. These quotas are strictly adhered to by the hunters who send in the lower jaw of each bear killed as well as other information on the kill. This information provides a comprehensive understanding of the age, sex and location of all kills which is then relayed back to the Hunters' and Trappers' Associations in the communities.

The Government of the Northwest Territories and the Government of Canada recognize that the domestic needs of local people are the most important use of wildlife; and both governments provide significant funding to sustain this economy which is too variable and seasonal to be sustained with no support. Recent discussions between land claim negotiators and the federal and territorial governments have focussed on the merits of a consolidated hunter income support programme that would recognize subsistence hunting, trapping and fishing as an occupation.

Fur trapping was once the primary economic activity of the aboriginal inhabitants of the NWT, but it now accounts for only a small fraction of the income received by native people (Stabler et al 1990). Many people continue to trap; 15 per cent of them have a substantial commitment to trapping and are motivated by the potential income, while 85 per cent participate because of the lifestyle involved and because there is a shortage of alternative employment (op cit, 1990). The total value of fur production in the NWT for the 1988/89 season was 4.4 million Canadian dollars. Trappers harvest beaver, Arctic and red fox, lynx, marten, mink, muskrat, wolf and wolverine. The number who are active on the traplines has now stabilized at 3,000 (NWT DataBook 1990). A very significant effort is being devoted to trapper education and to replacing the leghold trap with more humane traps.

The value of waterfowl to the people of the NWT is not completely understood, but it is clearly significant and approaches the situation in James Bay where twenty to thirty per cent of the food harvested is of waterfowl and their eggs, (James Bayand, Northern Quebec Native Harvesting and Research Committee, 1982). Conservation of waterfowl habitat is vital not just for the maintenance of opportunities for northerners, but also for the opportunities of other nations. The NWT produces 50 per cent of the continental goose and swan populations, 23 per cent of the continental diving ducks, and 56 per cent of the sea ducks (Cournoyea and Bromley, 1986).

The other uses of wildlife are similar to those in most other jurisdictions in North America; that is there is hunting and fishing by resident non-native people, guiding for hunters, fishermen and naturalists, and a modest amount of hunting for commercial sale of meat. The commercial harvest of red meat is almost entirely for trade within the borders of the NWT since some of the domestic demand remains unfulfilled. The current annual commercial quota for caribou and muskox is about 7,000 animals. Only about 18 per cent of this quota is harvested (NWT Data Book 1009). Guiding for naturalists and photographers is a growth industry which seems to have unlimited potential for growth.

The revenue from the trade in furs, non-edible parts of wildlife and arts and crafts is significant but constrained. The potential to increase the economic value of fish, wild plants, terrestrial wildlife and marine mammals is enormous. To a large extent the realization of this potential will depend on the terms and conditions which the international community decides will govern the responsible trade in non-edible parts of wildlife. None of the hunting, trapping or fishing in the NWT is endangering the survival of a species. In the past this was not always true. During the last century, the abundance of several species apparently declined dramatically, and though these declines are not historical facts they rather should be considered as reasonable hypotheses.

The abundance and range of muskoxen (*Ovibos moschatus*) were apparently reduced dramatically in the 19th and early 20th centuries. During the period 1860-1916, about 22,000 muskoxen were killed from mainland populations by Inuit and Indian hunters, to sell to traders who were serving the world demand for sleigh and carriage robes. It has been estimated that only 40,500 muskoxen survived on the mainland after these harvests (Barr, 1989). On

the Arctic islands during almost the same period, fewer than 2,000 muskoxen were harvested, mainly to supply meat to whaling ships. The island muskox populations were apparently large enough to withstand this hunting pressure, but they also declined in numbers around the turn of the century (Barr 1989). Climatic changes may have had an impact, as well as predation and disease, but no good data exist to determine the exact cause of the declines. It is likely that the major factor in the mainland population's decline was the level of harvest.

In 1917, the muskox was classified by the Canadian Government as endangered and all harvesting was to stop, although it was realized that some domestic meat hunting would still occur. Little monitoring was done to record changes in abundance, but numbers appeared to increase slowly until the second half of this century when dramatic population increases and range expansions were observed. Our most recent surveys suggest the total NWT population to be approximately 70,000 muskoxen, with about 16,000 on the mainland and 54,000 on the Arctic islands (Case, Gunn and Jackson, 1989; Graf and Shank, 1989). These animals represent more than 90 per cent of the world's population of muskoxen. Hunting under quota has been allowed since the late 1970s.

Many conservationists are familiar with the story of the dramatic decline of the plains bison (*Bison bison bison*) in North America during the late 1800s which almost led to the extinction of this species. Few were aware that a related subspecies, the wood bison (*B. b. athabascae*) followed the same ecologically precarious path over the same period. Soper (1941) estimated that population to be about 168,000 in 1800. Wood bison were found in the boreal forests in the northern parts of the western Canadian provinces as well as the NWT, the Yukon Territory and Alaska. By 1875, wood bison had been eliminated throughout most of its range. The only areas in which viable numbers remained were in the Slave River Lowlands of the NWT - an estimated total of only 250 in the period 1896-1900 (Soper, 1941).

In 1877, legislation was enacted to protect the wood bison, but effective enforcement did not take place until 1907 when the first police outpost was established in the area (Soper, 1941). In 1922, Wood Buffalo Park was established to further protect the subspecies which had already increased to 1500-2000 animals. Although this subspecies had been taken to the brink of extinction by hunting, perhaps in conjunction with severe winters, it subsequently recovered.

Unfortunately, this recovery was interrupted when the federal government released 6,673 diseased plains bison in wood bison range from 1925 to 1928. The result was hybridization and the introduction of brucellosis (*Brucella abortus*) and bovine tuberculosis (*Mycobacaterium bovis*) to this previously uninfected wild population of wood bison (EARP report 35).

In 1963, 200 were located in an area of Wood Buffalo National Park where pure wood bison had not come in contact with diseased, hybrid bison. Eighteen of these animals were moved to the northwest side of Great Slave Lake. This transplanted herd remains disease free and now numbers 2,000 animals. The threat of contact with diseased animals continues.

About three quarters of the world's population of polar bears (*Ursus maritimus*), some 11,000 animals, live in the NWT. Although obtaining good estimates of this large predator has always been difficult, it has been assumed that wherever whaling and sealing industries were located in the past, local populations of polar bears were reduced. Increased harvesting by native people to meet the demand of a hide market may also have contributed to what was considered a general decline in numbers. The Federal Government of Canada took steps in 1935 to conserve this species by reducing the length of the hunting season and then, in 1949, restricting hunting to indigenous peoples only. During the 1960s, the take of polar bears increased dramatically when the snowmobile replaced the dog team as the major transportation vehicle in the north. The government responded by instituting a system of community quotas and increasing the level of general research and management studies (Urquhart and Schweinsburg, 1984). The community quota system still operates. Besides the continuing domestic use of its meat and hide, polar bears now provide other economic opportunities. These range from guiding tourists who wish viewing or photographic opportunities, to guiding non-native hunters who have purchased a tag from the community, and to selling the hide.

Trapping of furbearers has been a major industry in the NWT since the Europeans first arrived in the area and began buying furs. Beaver (*Castor canadensis*) and marten (*Martes americana*) are the two species which are most

likely to be over-trapped and which have required management restrictions to prevent depletion. The beaver was the mainstay of the North American trapping industry for several centuries. In various parts of the NWT a combination of over-trapping and severe forest fires apparently led to low densities and even complete extirpation in some local areas. As a result, the government completely closed some areas to trapping (Dickenson and Herman, 1979). Most populations have completely recovered and many areas now have a high densities. Beaver are now trapped primarily for domestic use as value and demand for pelts have declined.

About the same time as beaver trapping was closed, large areas were closed to marten trapping. Other areas had strict quotas imposed. The causes for the decline of Marten were probably similar to beaver, that is over-trapping and severe forest fires. The marten populations recovered and are abundant in all areas where good habitat exists (Dickenson and Herman, 1979). However, in contrast to beaver, marten are now the mainstay of our trapping industry as their price seems to be holding on the world markets.

The species which are the main providers of red meat for the people of the NWT are barren-ground caribou, migratory birds, moose and seals. Although from time to time in the past there has been concern about some local populations of barren-ground caribou and moose, as species, there has never been any danger of extirpation. Current populations are healthy and cooperative management programmes have been established to prevent excessive harvesting (see Bathurst Caribou Management Plan, Porcupine Caribou Management Plan, Beverly and Kaminuriak Management Plan).

GENERAL PROBLEMS AND OPPORTUNITIES

In the last twenty years in the north, it is becoming increasingly difficult to maintain an economy based on the utilization of fish and wildlife. By analyzing what has happened in the recent past, perhaps we can prevent further harm to our smaller communities. We would like to start with the results, then examine the causes - proximate and ultimate.

The "result" which has had the most dramatic impact on northern communities in recent decades was the inability of our Inuit hunters to sell their seal pelts after the European Community banned their import. Although the Inuit harvest of seals had nothing to do with the white coat harvest of young seals on the east coast of Canada, nor with any species that was endangered, the ban imposed by the EC (the proximate cause) was so general that every Arctic community was devastated. Seal skin sales in the NWT dropped from 890,000 in 1980 to 76,000 in 1983 (Bourque, 1986). The ultimate cause of this disaster was the harvester or producer not having the opportunity to tell their story and influence the market. Although the demand for pelts had been high in the past, no other markets had developed because Europe was buying up most of the harvests. Additionally, little effort was expended to create local markets in Canada or the Orient which may have softened the blow when the over-action of the European market took place.

Trapping for arctic fox (*Alopex lagopus*) was the other major industry which provided cash to the Inuit communities. The market for all wild fox pelts has now almost disappeared and was the next result to affect our small Arctic communities. Within the treeline, the trapping of red fox (*Vulpes vulpes*) had also provided much needed cash income. The proximate cause this time was not a ban imposed by foreign countries but a dumping on the market of excessively high numbers of pelts from domestic fox farms in foreign countries, notably those from Scandinavia. Again, however, the ultimate cause was a lack of influence over the market and the lack of a northern or Canadian market to which our producers could fall back on.

One problem which runs throughout the above examples is the lack of influence on the market by the harvesters. All markets were based outside of Canada. Most markets were concentrated in one area and not diversified throughout the world. Therefore, local conditions on one continent would and did completely alter the whole industry. We had not developed markets in the north or even in the highly populated southern areas of Canada which could have acted as a buffer against changes in the foreign demand for our products.

A second generic problem which exists in our vulnerable renewable resource economy is our almost complete lack of product diversification. Many communities concentrate on harvesting only one resource because it is the one

which is most profitable at the time. A few communities have diversified and have entered into more than one area of the renewable resource economy, e.g., trapping or wood cutting in winter and operating fishing lodges in the summer. These communities will be better prepared to withstand market fluctuations.

As wildlife harvesters, we tend to harvest the resource and send out the raw product thereby losing opportunities for value-added benefits - as the forest industry has done for years in southern Canada. This is most prevalent in our fur industry but can be found even in some big-game outfitting areas or fishing lodge operations where the customers fly in and fly out of areas operated by people who are not residents of the NWT. Obviously there is little benefit to the northern economy.

In the NWT, managing renewable resources and developing the renewable resource economy requires the understanding of the traditions of several cultures, especially how those traditions affect the use and handling of wildlife. All cultures over the years have come to accept the selling of the pelts of furbearers but not all are, for example, willing to accept the export of red meat from large game animals to southern markets. Disturbance to wildlife, unless one is attempting to harvest the animal, is another practice which is generally not acceptable to most cultures in the NWT. Although the commercialization of
wildlife is viewed with different degrees of acceptance, there is unanimous agreement that wildlife and the land are the most important resources to all cultures in the NWT.

PROPOSALS FOR IMPROVING THE BENEFITS FROM THE RESOURCE

The major objective to improve the renewable resource economy in the NWT should be to gain some control over markets through expansion and diversification. Markets should be expanded in order to increase the demand for our products and spread the risk so that we will not again put all of our eggs in one basket. This can be accomplished (and a start has been made) by developing markets for our products not only in Canada but also in the Pacific Rim countries, while trying to retain or rejuvenate existing markets in Europe and the United States.

Diversification should extend not only outward, to develop markets, but also inward to the producers at the community level. Communities would benefit from more involvement in several wildlife related industries at the same time so that their own incomes originate from several different markets. Not only would this spread the risk, it would employ people with entirely different skills in the many spinoff operations which could take place. The "Campfire philosophy", as being promoted in Zimbabwe, has made advances in this area and we shall maintain close contact with that jurisdiction in order to learn from their experience.

Our people should move more into the manufacturing of wildlife products rather than just as harvesters or producers. Although some communities have made great strides in this area, there is much room for expansion. We must provide more finished wildlife products for the market rather than just raw pelts or meat. Again this would provide jobs of many different types for people with different skills and abilities. But, like all businesses, an expansion into manufacturing would have some inherent risks, especially if there is no market control or market diversification. Some examples of manufacturing support which could be considered are tanning facilities, taxidermy training and facilities, wild meat packing plants, and expansion of handicraft product lines. The Department of Renewable Resources is promoting demonstration projects along these lines.

In order to gain more control over our markets and not lose them again, as a result of some members of the public reacting in ways which are contrary to our objectives, we must keep the world aware of how we live and manage our resources. We cannot wait until a problem has developed to do this.

Over the past few years we have been increasing our international profile. We have prepared public relations materials which let people know how we live and that wildlife is as important to us as it is to them. For example, in the Arctic communities, almost everyone harvests and eats much more meat than other people in the world because they cannot grow vegetables or grains. We are working to inform others that our populations of muskoxen and caribou and polar bear are healthy and well-managed; before some well-meaning but misguided group restricts our opportunities.

PROSPECTS FOR CONSERVATION OF WILDLIFE AND WILDLIFE HABITAT

The Department of Renewable Resources recognizes that the key to management of wildlife in the long term is the conservation of habitat. To a large extent the conservation of habitat will depend on the value that wildlife has to the local people. The local people will have enormous influence over land and water management decisions largely because of the provisions of the three comprehensive land claims which span all of the NWT. If wildlife does not continue to hold a strong comparative value, then land and water use decisions will favour other opportunities, which may not be as friendly to the environment as renewable resource harvesting is.

The Department is fully aware of the global interest in wildlife conservation and that the eyes of the world are upon us. During the last decade, our programmes have been reviewed by visiting, independent scientists and we welcome further review. These scientists have included Dr Fred Bunnell, Dr Graeme Caughley, Dr Graham Child, Dr Doug Demaster, Dr Thor Larsen, Dr Wolfgang Schroeder and Dr Ian Stirling. The Department participates actively in CITES and has been a member of IUCN for 12 years.

CONCLUSION

Wildlife Management in the NWT is at a vital stage in its development (Stirling, 1990; Clancy, 1990). Although there is no shortage of obstacles to be overcome, the opportunities for the further refinement of wildlife research and management programmes are extensive, as are the opportunities to develop the renewable resource economy.

While the people of the NWT are relatively free to develop a renewable resource economy that is internal to the NWT, it is the conviction of the authors that the conservation interests of the international community would be best served if the NWT can develop diversified exports of products from the renewable resource economy. The international community will continue to develop standards which will influence the attitudes of consumer countries. Wildlife research and management programs of the NWT are already state of the art; as long as our people and our children can continue to benefit from the use and enjoyment of our renewable resources, we are prepared to continue to make adjustments to meet all reasonable and responsible demands.

ACKNOWLEDGEMENTS

We would like to thank the Deputy Minister, Mr. Jim Bourque and the Minister, the Honorable Taitus Allooloo for their approval to prepare this paper and present it to the IUCN General Assembly. We would like to thank Dr Stephen Edwards, Coordinator, IUCN Species Conservation Programme, and the IUCN Secretariat for the invitation to participate in this workshop. Susan Fleck provided editorial review and Reggie Gabert typed various drafts of the paper.

REFERENCES

Barr, W. 1989. A study of muskox populations in the NWT based on the historic record. A report prepared for Renewable Resources, GNWT.

Beverly and Kaminuriak Caribou Management Board. 1987 Management Plan for Beverly and Kaminuriak Caribou. 32 pp.

Bourque, J. 1986. Observation from the Trapline. Proc. Symp. Alta. Soc. Prof. Biol. 11 pp.

Brody, H. 1983. Maps and dreams: Indians and the British Columbia Frontier Hamondsworth: Penguin Books.

Calef, G.W. 1981. Caribou and the barrenlands. Canadian Arctic Resource Committee, Ottawa. 176 pp.

Case, R. A. Gunn and F. Jackson 1989. Status and management of muskoxen in the NWT. Can. J. Zool. 67(5): A16-A22.

Clancy, P. 1988. State policy and the native trapper: Post war policy toward fur in the NWT. Paper presented to the Conference on Aboriginal Resource Use in Canada: Historical and Legal Aspects. 38 pp.

Cournoyea, N. and R. Bromley 1986. The role of native people in waterfowl management in Canada. Trans. 51st. N. Am. Wildl. and Nat. Res. Conf. 507-510.

Dacks, G. 1981. A Choice of Futures: Politics in the Canadian North, Methuen. 226 pp. Department of Renewable Resource 1987 Bison Management Plan for the Mackenzie Wood Bison Herd, NWT. 20pp

Department of Renewable Resources 1988 Bathurst Caribou Management Plan. 28 pp.

Dickerson, D.M. and T.B. Herman. 1979. Management of Some terrestrial mammals in the NWT for sustained yields. A report prepared for the Science Advisory Board of the NWT, Yellowknife, NWT. 71 pp.

Donaldson, J.L. 1988. The economic ecology of hunting: a case study of the Canadian Inuit. Ph.D. thesis. Harvard University, Massachusetts x + 243 p.

EARP report 35. 1990. Northern Diseased Bison. Report of the Environmental Assessment Review Panel

Filion, F. 1987. National survey on the importance of wildlife to Canadians. Canadian Wildlife Service Report, Ottawa.

Gamble, R.L. 1988. Native harvest of wildlife in the Keewatin region, NWT for the period October 1985 to March 1986 and a summary for the entire period of the harvest study from October 1981 to March 1986. Canadian Data Report of Fisheries and Aquatic Sciences 688 v + 58 pp.

Graf, R. and C. Shank. 1989. Abundance and distribution of muskoxen near Artillery Lake, NWT, March 1989. Department of Renewable Resources, GNWT, File Report No. 80. 19 pp.

Gottesman, D. 1983. Native hunting and the Migratory Birds Convention Act. Journal of Canadian Studies. 18(3): 67-89.

Government of the Northwest Territories, GNWT 1990 Sustainable Development Policy and Directive. 8pp.

Gunn, A., K. Jingfors, and P. Evalik. 1986. The Kitikemeot harvest study as a successful example for the collection of wildlife harvest statistics in the NWT. Pages 249-259 in native people and renewable resource management. Proceedings of the 1986 Symp. of Alta. Soc. of reg. Biologists.

Herscovici, A. 1985 Second Nature: The Animal Rights Controversy, CBS Enterprises. 254 pp. Holt, S.J. and L.M. Talbot. 1978. New Principles for the Conservation of Wild Living Resources Wildlife Monograph 59. 35 pp.

James Bay and Northern Quebec Native Harvesting Research Committee 1982. The wealth of the land. Wildlife harvests by the James Bay Cree, 1972-73 to 1978-79. James Bay and Northern Quebec Harvesting Research Committee, Quebec City. 811 pp.

Lloyd, K. 1986. Cooperative management of polarbears on Northeast Baffin Island. Proc. Symp. Alta. Soc. Prof. Biol. 20 pp.

Monaghan, H. 1984. The Beverly-Kaminuriak Caribou Management Board and its early growth. 44-52.

Porcupine Caribou Management Board. 1989. Interim Management Plan. 24 pp.

RENEW 1989. Annual report of RENEW: Recovery of Nationally Endangered Wildlife in Canada. 15 pp.

Scone Report 1989. The report of the Special Committee on the Northern Economy Legislative Assembly of the NWT. 76 pp.

Soper, J.D. 1941. History, range and home life of the northern bison. Ecol. Monogr. 11:349-412.

Stabler, J.C., G. Tolley and E.C. Howe. 1990. Fur trappers in the NWT: An economic analysis of the factors influencing participation Arctic 43(1): 1-8.

Stirling, I. 1990. Guest Editorial: The future of wildlife management in the NWT. Arctic 43(3) 2 pp.

Usher, P. 1986. The devolution of wildlife management and the prospects for wildlife conservation in the NWT. Canadian Arctic Resources Committee Policy Paper Number 3.

Usher, P.J. 1976. Evaluating country food in the northern native economy. Arctic 29(2): 105-120.

Urquhart, D.R. and R.E. Schweinsburg. 1984. Life history and known distribution of polar bear in the NWT up to 1981. Dept. of Renewable Resources, GNWT. 1984.

Van Gelder, R. 1984. Animals and Man: Past, Present and Future. J Theilade and Company. Ringsted, Denmark. 68 pp.

WMAC and FJMC 1988. Inuvialuit Renewable Resource Conservation and Management Plan. Wildlife Management Advisory Council and Fisheries Joint Management Committee. 19 pp.

ANNEX I

NORTHWEST TERRITORIES SUSTAINABLE DEVELOPMENT POLICY

The Government of the Northwest Territories (G.N.W.T.) recognizes that environmental conservation is essential to long term economic prosperity while at the same time economic development can contribute significantly to the achievement of conservation goals. This interdependence between conservation and development will be officially recognized by the Government of the Northwest Territories through the application of the concept of sustainable development to all its decisions and actions related to natural and heritage resources in the Northwest Territories.

This policy is based on the following principles:

1. The G.N.W.T. shall promote economic development which maintains harvestable resources at sustainable levels, essential ecological processes and natural diversity.

2. The G.N.W.T. shall routinely combine and equally weigh conservation and development factors in decision-making processes for the use of resource.

3. Sustainable development of resources is essential to the long term economic, cultural and social well-being of northern residents.

4. Northern residents shall be assured meaningful input and participation in decisions related to conservation and resource development.

5. Initiatives associated with this policy shall be consistent with or complement, all agreements, policies and legislation related to the settlement of aboriginal claims as they relate to conservation and development of resources.

6. Conservation and development practices shall take into account the local knowledge, values and experience to be found among the regular users of the environment as well as the information developed in academic institutions, industry and government.

7. Natural resources should be managed so that opportunities for future resource uses are maximized and maintenance of ecosystems is ensured.

8. Conservation commitments in resource development proposals shall be a major consideration in determining the degree of G.N.W.T.'s political and financial support.

9. The G.N.W.T. recognizes the need for conservation areas to maintain special values related to wildlife and wildlife habitat, unique or representative ecosystems, prime forests, productive agricultural soils, and heritage, recreational, tourism, scientific, and aesthetic resources. The G.N.W.T. shall support human activities in such areas where they are compatible with the values being protected.

10. Enhanced cooperation with other circumpolar and neighboring jurisdictions is important in addressing transboundary concerns related to resource management and the maintenance of environmental quality.

11. As far as possible, implementation of this policy will rely primarily on existing mechanisms and processes of those already under development through land claims or other processes.

DIRECTIVE Sustainable Development

SCOPE

This policy applies to all decision and actions of the Government of the Northwest Territories related to resource development in the Northwest Territories.

DEFINITIONS

1. Conservation
   Means the wise use of renewable, non-renewable and heritage resources so that long term benefits can be enjoyed by present and future generations

2. Conservation Area
   Means an area of land or water that provides special management measures to maintain outstanding values related to wildlife habitat, unique or representative ecosystems, prime forests, productive agricultural soils, and heritage, recreational, tourism, scientific, and aesthetic resources.

3. Environment
   Means the air, water, ice, snow, land, animal and plant life, and heritage resources of the Northwest Territories.

4. Environmental Quality
   Means the environment's capability to support the well being of all life forms.

5. Heritage Resource
   Means the material remains of places of past human use or occupancy. They consist of sites and artifacts of historical, archaeological, ethnological and ongoing cultural or religious significance.

6. Integrated Resource Management
   Means a coordinated process in which all components of resource management (policy development, land and water use planning, environmental assessment, legislative and regulatory mechanisms) are formally linked and complementary. The process is characterized by the sharing of values, information and advice among various interests.

7. Natural Diversity
   Means the naturally occurring variety of living and nonliving elements in the environment.

8. Non-Renewable Resources
   Means resources which cannot be replaced or renewed following extraction including all minerals, aggregates, and fossil fuels.

9. Renewable Resource
   Means land and water resources, such as fisheries, wildlife and their habitat, forestry; and agriculture.

10. Resource Development
    Means those activities including the exploration, construction and operational phases of non-renewable resource extraction, and commercial renewable resource use activities, plus other supporting activities.

11. Round Table on Environment and Economy
    A multi-sectoral body providing the Government of the Northwest Territories with advice on sustainable development matters. Its membership includes representatives from government, native organizations, private industry, and public interest groups.

12. Sustainable Development

A way of managing natural resources and the economic, social and cultural needs are met while maintaining ecological processes and natural diversity.

PROVISIONS

1. Authority and Accountability

a) Executive Council

The Executive Council may approve plans and programs related to this Policy, its Action Plan and the activities of the NWT Round Table on Environment and Economy.

b) Ministers

The Minister responsible for the Department of Renewable Resources, in consultation with the Ministers of Economic Development and Tourism and Energy, Mines and Petroleum Resources, shall coordinate implementation and periodic review of this policy.

c) NWT Round Table on Environment and Economy

The NWT Round Table on Environment and Economy shall advise the Executive Council respecting sustainable development in the Northwest Territories.

2. Sustainability Guidelines

The G.N.W.T. shall promote conservation and resource development projects, or combinations of projects, which support the achievement of the following guidelines:

a) Ecological
- * maintain essential ecological processes
- * maintain or enhance natural diversity
- * maintain harvestable resources at sustainable levels

b) Economic
- * promote economic self-reliance at the local level
- * increase employment opportunities for the resident labor force through education, training and job creation
- * maximize opportunities for local retention and investment of profits
- * influence the pace of development to promote long term benefits from the use of resources

c) Social
- * maintain or strengthen community values and identity
- * build a sense of meaningful participation and responsibility into project development and implementation

d) Cultural
- * support and maintain traditional activities and relationships
- * maintain or enhance heritage resources.

3. Sustainable Development Objectives

The G.N.W.T. recognizes that sustainable development of resources is essential to the long term economic security, self-sufficiency and social well-being of northern residents. The G.N.W.T. shall therefore adopt the principles of sustainable development to guide all its decisions and actions related to resource use in the Northwest Territories.

Five main objectives shall provide the focus for pursuing this goal. These objectives shall be implemented through G.N.W.T.'s own programs and through collaboration with other governments and organizations.

a) Promote Integrated Resource Management

Recognizing that resource development decisions usually involve numerous management objectives and interest groups, the G.N.W.T. shall promote an integrated approach to managing the environment and its resources.

b) Maintain and Enhance Environmental Quality

Recognizing that the Northwest Territories' economy and cultures are deeply rooted in the environment, the G.N.W.T. shall ensure that environmental quality is maintained to support the long term stability of northern society.

c) Establish Conservation Areas

Whereas the G.N.W.T. will promote the consistent application of sustainable development principles to all lands and waters within the Northwest Territories, it recognizes the need for conservation areas to protect special values related to wildlife and wildlife habitat, unique or representative ecosystems, prime forests, productive agricultural soils, and heritage, recreational, tourism, scientific and aesthetic resources.

d) Develop Non-renewable Resources in Ways that Contribute to a Sustainable Economy

The G.N.W.T. will promote exploration, development and use of mineral, aggregate and fossil fuel resources in ways that provide lasting social and economic benefits while maintaining ecological processes and natural diversity.

e) Promote Cooperation in the Management of Transboundary Resources

The G.N.W.T. recognizes that bilateral or multilateral cooperation with other circumpolar and neighboring jurisdictions will greatly help to prevent or abate transboundary environmental or socio-economic impacts.

4. Action Plan

The Minister of Renewable Resources, in consultation with the Ministers of Economic Development and Tourism, and Energy, Mines and Petroleum Resources shall:

a) prepare an Action Plan outlining specific objectives and implementation strategies for achieving the G.N.W.T.'s Sustainable Development Objectives, and

b) present an annual report to the Executive Council on progress in implementing the Action Plan.

5. Implementation

The provisions of the Directive shall be implemented through:

a) Joint coordination by the Departments of Renewable Resources, Economic Development and Tourism and Energy, Mines and Petroleum Resources in implementing the Action Plan.

b) Collaboration on joint programs or projects, and regular consultation with:
* native organizations
* other governments
* industry and business organizations
* environmental organizations
* the public

c) Periodic reviews of G.N.W.T. programs, policies and legislation to ensure that they are consistent with the principles of sustainable development:

6. Prerogative of the Executive Council
Nothing in this Directive shall in any way be construed to limit the prerogative of the Executive Council to make decisions or take actions with respect to conservation and resource development in the Northwest Territories outside the provisions of this Directive.

THE POTENTIAL MODEL FOR THE FUTURE OF WILDLIFE CONSERVATION IN GUYANA

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INTRODUCTION

Guyana is located on the northern coast of South America, bounded to the west by Venezuela and Brazil, with Suriname to the east and Brazil to the south (Figure 1).

The name Guyana is derived from an Amerindian word meaning "Land of Many Waters" and the presence of extensive river systems supports this name (Figure 2). The country has a total area of 216,000 square kilometers. The total human population is about 800,000 people, with more than 90 per cent inhabiting the coastal plain. Guyanese may be any one (or more commonly mixtures) of six major racial origins - East Indian, African, Chinese, Amerindian, Portuguese and European.

The main industry is mining of bauxite. Much needed foreign currency is also earned from the export of sugar, rice, gold and, to a lesser extent, other agricultural crops and wildlife. The average Guyanese earns $50,000.00 Guyanese (US$5,000.00) per annum. There are about 750 known species of birds, 200 mammals, 150 reptiles, and 120 amphibians. Of these species, 100 birds, 30 mammals, and 35 reptiles are considered threatened or endangered.

There is natural protection of wildlife and all other natural resources in Guyana, by the almost complete inaccessibility of more than half of the country. There is an old trail along which cattle were driven from Lethem (in the south-western part of the country) to the coast. An "all-weather" road is now being constructed along this old trail. Until this road is completed, travel by car is possible only as far as Linden (about 100 kilometers from Georgetown) and by four-wheel drive vehicles to Kurupukari (a further 175 kilometers). As a result, habitat destruction, usually a major threat to the survival of wildlife, has been minimized.

In addition, the lack of industrial development and the limited number automobiles have led to little or no pollution.

HISTORY OF WILDLIFE UTILIZATION IN GUYANA

Guyana's wildlife has been utilized by humans for as long as they have inhabited the country. Petroglyphs (drawings on rocks, cliff walls etc) and pictograph elements indicate that inventories were kept of all wildlife specimens which were killed (Williams, 1985, drawing 1). In addition, faunal inventories deriving from archaeological investigations (Mentz Ribeiro, 1989) reveal the wide range of reptiles, birds, fishes and terrestrial and arboreal mammals that provided the basis of human subsistence in Guyana for at least 7,000 years. Even though population densities of the semi-nomadic bands of hunter-gatherers remained low (0.085 to 0.1 persons per sq. km. in coastal areas) elaborate measures were adopted for monitoring the harvesting of wildlife. The diversity of species and high population densities encountered by the first European explorers attest to the successful ecological balance achieved by the prehistoric Guyanese.

The indigenous inhabitants of Guyana, the Amerindians, still use wildlife for food, decoration and ceremonies. There is relatively little hunting of wildlife for meat by coastal-dwelling Guyanese. In fact the majority of those who live along the coastal plain are very conservative in their culinary tastes and are reluctant to eat "wild meat". However some amount of wild fauna is consumed; mainly labba (*Cuniculus paca*), deer (*Mazama* spp.) and tortoises (*Geochelone* spp.).

The attitude of Guyanese towards wildlife varies considerably - from the traditional innate Amerindian understanding of and respect for the symbiotic relationships that exist between all aspects of the environment, to the ignorant fear (which is unfortunately a common worldwide phenomenon) that causes some people to kill supposedly dangerous animals such as the jaguar (*Panthers onca*) on sight. This negative response is compounded by a belief that Guyana's wildlife resources are infinite.

While there are a few environmental or conservation activists, there are no organized non-governmental groups. Many Guyanese, however, have a basic love for animals and are receptive to the concept of conservation. Dr Peter Pritchard, for example, found it possible to convince sea turtle hunters to relinquish potential prey and even to assist the animals to return to the sea. The country's coat-of-arms bears two jaguars (*Panthera onca*) and a Canje

pheasant (*Opisthocomus hoazin*) while President Burnham's standard bears a caiman (*Caiman crocodilus crocodilus*).

THE COMMERCIAL WILDLIFE TRADE

General

There is no legal commercial trade in wild flora. Although dozens of species of orchids are known to be native to Guyana, and it is thought that there may be many more species that are as yet undiscovered, there has been only one unsubstantiated report of smuggling.

Commercial export of wild fauna from Guyana started about 30 years ago (figure 3). At that time there were three or four dealers who were mainly non-Guyanese. There are now 18 authorized exporters, all of whom have been in business for at least seven years and some for over 20 years. Apart from these, there are several hundred people of all ages involved at other levels of the trade; most of them being trappers.

Up to 1988 a little more than 50% of Guyana's wildlife exports were destined for the United States of America: approximately 40% to Europe, and the remainder to several Asian countries. In 1989 and 1990 exports to Europe have slowly but steadily increased due to the higher prices being paid by importers.

The wildlife trade, under the present quota system, can earn a maximum of about 1.5 million United States dollars per annum; with the government receiving the equivalent of about US$200,000 (figure 4).

Legal And Regulatory Control

The control of the wildlife trade comes under the Wildlife Services Division of the Ministry of Agriculture. Prior to 1986, the structure of what was then the "Wildlife Unit" was in a constant state of flux.

The creation of the present Wildlife Services Division, in 1985, was indicative of growing government awareness of the importance of more careful monitoring of the trade. Although the Division is still very much in its infancy (having only four technical staff members and three clerical) there are continual efforts to recruit additional staff. It is recognized that it is unlikely that trained persons will be found; but it is felt that, at this stage in our development, it may be more important to find people who display a genuine interest in conservation.

Guyana became a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on 25 August 1977. Since that time every effort has been made to adhere to the text of the Convention, as well as to the Resolutions arising from the Meetings of the Conference of the Parties. Printed export forms have been used for the exportation of all wildlife, including pets, since 1982, and the use of CITES Security Stamps started in 1984. New forms, printed by the CITES Secretariat on security paper, were introduced in September 1990.

Internally, the only legislation which impinges on the commercial wildlife trade is the "Wild Birds Protection Act" (Laws of Guyana, Chapter 71:07) which is outdated and inadequate. Under this law a "Close Season" (during which trapping and transportation of wild birds is prohibited) is imposed from January 1 to April 30 of each year. In the early 1980s a list of those species which could be commercially exported was prepared. Several species (mainly birds) have since been deleted from the original list (Appendix 1). Wild birds and mammals must be held for four-week and two-week quarantine periods respectively, at approved holding stations, before they are exported. Holding facilities are licensed.

In 1987, a nine-month ban was imposed on the export of wildlife from Guyana. This allowed time for a complete revision of the wildlife trade. The minimum prices to be paid by importers were revised, export quotas (Appendix 1) were established (based on average exports for the period 1981 through 1986), and a new "Conservation of Wildlife Bill" was drafted. This is now in its third draft and should be complete in 1991. It encompasses all types of wild fauna and allows for the establishment of protected areas. It will also allow for stricter regulation of the

methods of capture and transportation of wild fauna. In recognition of the paucity of information on the status of wildlife, all known species of native fauna will be protected under this law. Schedule 1 will list all CITES Appendix 1 species as well as native species which may either face the possibility of over-exploitation (e.g., the Giant Anteater - *Myrmecophaga tridactyla*), or are of particular importance to Guyana (e.g., the national bird, the Canje pheasant (*Opisthocomus hoazin*).

Institutional Interactions

There are several agencies which play a role in the conservation of Guyana's wildlife. These include:

The Ministry of Agriculture

Within this Ministry, the Wildlife Services Division attempts to monitor exports of all species of wildlife and either participates in, or supports, any legitimate effort to collect data on any species of wild fauna. It serves as Management Authority under CITES.

The Guyana Agency for Health Sciences Education, Environment and Food Policy (GAHEF)

This agency, as the name suggests, is responsible for the formulation and administration of environmental policy.

The Guyana Natural Resources Agency (GNRA)

This is the co-ordinating agency for the Guyana Forestry Commission and the Guyana Geology and Mines Commission.

The University of Guyana (UG)

The University is currently collaborating with several international institutions in the area of botanical research; for example TROPENBOS - the tropical forests project sponsored by the Government of The Netherlands - and the Flora of the Guyana project - a joint effort including the New York Botanical Gardens and the Smithsonian Institution.

THE FUTURE OF GUYANA'S WILDLIFE UTILIZATION

Conservation of Guyana's wildlife is virtually assured in the coming years as there is a burgeoning awareness, at all levels of the political and social strata, of the importance of preserving our natural heritage. It is perhaps fortunate that the present President of Guyana once served as Minister of Agriculture and has maintained a direct interest in, and support for, all of the Ministry's activities - including the conservation of wildlife. On the other hand, there have been several occasions when individuals have reported to the Wildlife Services Division what seemed to them to be a threat to one or several species of wildlife. The plans for the future conservation and utilization of Guyana's wildlife include the following:

Public Awareness

Possibly the most important project to be undertaken in Guyana is a multi-faceted public awareness campaign. Initial emphasis must be placed on officials involved in the wildlife trade - Police, Customs, and Wildlife Officers. This campaign would also include messages on the radio, television and in the newspapers, lectures for school children and university students (some of which could be carried out in the Guyana Zoological Park) and posters and brochures which can be placed at the Timehri International Airport and at travel agencies.

Recruitment of Staff

The staff of the Wildlife Services Division is currently inadequate, in both number and training, for the work that needs to be done. As public awareness increases it is possible that interested people will continue to visit the Division and it may become easier to recruit suitable new staff.

Scientific Studies

There have been several wildlife expeditions and scientific studies in Guyana over the past 50 or more years. These have been conducted by non-Guyanese (sometimes accompanied by Guyanese). The visiting scientists have almost always promised to return some of the specimens which they collected and copies of their reports.

Unfortunately these promises have rarely, if ever, been kept and there is virtually no information or documentation on Guyana's wild fauna within Guyana. In addition there have been several reports of scientists being involved in smuggling of wildlife. This has led to reluctance on the part of the Guyanese authorities to allow anyone to study wildlife and to carefully screen any applications for this purpose.

In the past two years there has been a sudden surge of interest in Guyana's wild fauna, manifested by dozens of requests for information on those species of wildlife which are commercially exported, applications (from both Guyanese and foreigners) for licenses to export wildlife, applications (again from both Guyanese and non-Guyanese) for permission to establish captive-breeding facilities, and submission of project proposals for the study of wildlife. No new applications for export licenses have been approved for almost 10 years.

Youth Groups

Operation Raleigh and Youth Challenge International (youth groups based in the United Kingdom and Canada respectively) both sent expeditions to Guyana during 1990. Both groups included a variety of scientists and have collected data as well as samples. Such groups are internationally respected and are being encouraged to return.

National Forestry Action Plan (1990-2000)

The National Forestry Action Plan (NFAP) was drafted in 1987, by a group of international forestry consultants (mostly Canadian) and their Guyanese counterparts. The project is based on the premise that, as stated in the Tropical Forestry Action Plan (the original Canadian International Development Agency project), ". . . properly used and managed, the tropical forests constitute a massive potential source of energy, a powerful tool in the fight to end hunger, a strong basis for generating economic wealth and social development, and a storehouse of genetic resources to meet future needs."

The plan attempts to address all aspects of utilization and protection of renewable forest resources and includes 37 recommendations for short term action. In the area of wildlife conservation the recommendations are to set up:

* A Protected Areas System - under which 15 protected areas would be established in various parts of the country;

* An International Centre for Applied Research on Tropical Forest Ecosystems - which will make available to foreign scientists facilities and access to the forest for the study of Guyana's forest ecosystems;

* Public Environmental Education Programmes - which will serve to make the public more aware of the value of the country's wildlife resources; and a

* Sustainable Wildlife Production and Utilization project designed "to conserve wildlife populations within the Rupununi region of Guyana to enable the use of indigenous animal protein sources on a sustainable basis and to reduce dependence on imported foodstuffs".

Caiman Survey

A preliminary survey of Guyana's caiman resources was carried out in 1989. This project was initiated when the Government of Guyana asked to be included in a series of surveys being organized in various South American countries, by the CITES Secretariat. The scientific work was conducted by scientists affiliated with the Secretariat and Sustained Management Systems (a private company) and covered a number of areas (figure 5). Its report was reviewed by the IUCN Crocodile Specialists Group and IUCN prepared management and conservation recommendations for the CITES Secretariat.

At the start of this survey, all hunting of caimans was banned. This ban will not be lifted until management systems and legislation can be put in place to prevent over-exploitation of this resource.

Since the preliminary survey, the Guyanese counterpart on the initial survey team has started follow-up work. This will include revisiting sites which were not adequately covered in the preliminary survey and working in probable caiman habitats that could not be surveyed previously.

Psittacine Survey

For the past two years, the CITES Secretariat has been trying to find a suitable international consultant to conduct a survey of the major species of psittacines found in Guyana. Initial emphasis will be placed on those species which are commercially exported. It is hoped that work will begin in 1991.

Captive-Breeding And Farming Of Wildlife

The importance of these production systems is fully appreciated by the government of Guyana. However, lack of technical expertise and prohibitive initial costs have so far curtailed such activities.

The sole exporter of caiman skins has, over the past two years, started the construction of a caiman farm. This facility is located 24 kilometers out of Georgetown and is easily accessible for monitoring and scientific study. Such accessibility will be a requirement for all similar projects.

Commonwealth-Government Of Guyana Programme For Sustainable Tropical Forestry

At the last meeting of Commonwealth Heads of Government (held in Malaysia in October 1989) the President of Guyana offered to set aside a portion of the country's rainforest for a project "to study utilization of tropical forests on a sustainable basis and the conservation of species."

Soon thereafter, an Interagency Committee was established in Guyana comprising those organizations whose responsibilities include some aspect of conservation/utilization of natural resources and environmental management. The first task of this group was to select a suitable location for this project and then to compile all information available on the proposed area.

The Commonwealth Secretary-General subsequently appointed a Commonwealth Group of Experts who visited Guyana in April and May 1990 and, in co-operation with the inter-Agency Committee, compiled a general project profile.

The project area is approximately 365,000 hectares in area and is located in the center of the country (figure 6). Several different types of terrain are found within the area, ranging from primary rain-forest to open savannah. There has been no development in the area primarily because of its inaccessibility. However this site was especially chosen because the new road will pass through its center.

Within the area, an Amazonian Rainforest Wilderness Preserve will remain undisturbed "to serve as nature's laboratory where evolutionary mechanisms can continue to work uninterrupted" and where various types of biological conservation studies can be carried out.

Project work will include:

* Sustainable Utilization of Tropical Rain-forests - which will allow for utilization of the natural resources within a designated area. Some amount of emphasis will be placed on less extractive (and so far unexplored) possibilities such as tourism and production of pharmaceuticals.

* Establishment of an International Centre for Research and Training - for which several core activity programmes have been suggested, e.g. ecological mining, restoration ecology, and studies of climate and water balance.

* Establishment of a Communications Centre - the primary function of which will be the compilation of a computerized environmental database.

* Future comparison of the Wilderness Preserve with the area in which utilization of forest products was allowed will demonstrate whether sustainable utilization is merely a theoretical concept or a practical solution to the problem of over-exploitation.

SUMMARY

In Guyana, both the utilization and active conservation of wildlife are just beginning. The country is thus in the unique position to learn from the mistakes of others before significant damage is done. The following initial steps must be taken:

* Strengthening of legislation and regulations
* Strengthening and co-ordination of relevant institutions
* Recruitment and training of staff
* Collection of scientific data and subsequent monitoring
* Encouragement of special projects related to conservation
* Encouragement of captive-breeding and ranching operations where applicable

One must, however, remember that Guyana is a poor country. Since conservation in its pure sense is a luxury, it is therefore difficult for a person (or, by extension, a country) to choose between conservation and starvation.

Obviously, given a clear choice between the two, conservation would be denied. Fortunately for Guyana and other developing countries the options are not as clearly defined. Indeed, we can still hope that a choice need not be made between these two extremes, but rather that our natural resources may be "sustainably utilized".

Appendix
WILDLIFE EXPORT QUOTAS - 1990

Scientific Name	Common Name	Annual Quota
ACOMYS RUSSATUS	SPINEY RAT	5
AMAZONA AMAZONICA	ORANGE-WINGED PARROT	15000
AMAZONA D. DUFRESNIANA	BLUE-CHEEKED PARROT	0
AMAZONA FARINOSA	MEALY PARROT	2300
AMAZONA FESTIVA	FESTIVE PARROT	0
AMAZONA OCHROCEPHALA	YELLOW-CROWNED PARROT	2000
AMEVIA AMEIVA	AMEVIA, LUBO LIZARD	24500
AMPHISBAENIA FULIGINOSA	LEGLESS LIZARD	420
ANOLES ROQUET	ANOLES LIZARD	24000
ARA MANILATA	RED-SHOULDERED MACAW	1500
ARA NOBILIS	RED-SHOULDERED MACAW	1000
ARA ARARAUNA	BLUE-AND-GOLD MACAW	2000
ARA CHLOROPTERA	RED-AND-GREEN-MACAW	1500
ARATINGA SOLSTITIALIS	SUPER PARAKEET	600
ARATINGA LEUCOPHTHALMIA	WHITE-EYED PARAKEET	300
ARATINGA PERTINAX	BROWN-THROATED PARAKEET	3000
AVICULARA AVICULARA	TARANTULA SPIDER	24500
BOA CONSTRIC CONSTRICTOR	BOA CONSTRICTOR, LAND	600
BOTHRAPS BILINEATUS	GREEN LABARYA	14
BOTHRAPS ATROX	BROWN LABARYA	21
BOTHRAPS JARARAOUSSU	LABARYA	42
BROTOGERIS CHRYSOPTERUS	GOLDEN-WINGED PARAKEET	180
BUFO MURINUS	LAND TOAD	700
BUFO LEPTODACTYLUS	LAND TOAD	17
BUFO GUTTATA	LAND TOAD	658
BUFO TYPHONIUS	LAND TOAD	63
CAIMIN C. CROCODILUS	SPECTACLED CAIMAN	20000
CEBUS APELLA	TUFTED CAPUCHIN	600
CEBUS ALBIFRONS	WHITE-FRONTED CAPUCHIN	240
CHAETOPHRACTUS VILLOSUS	SEVEN-BANDED ARMADILLO	12
CHELUS FIMBRIATUS	MATA MATA TURTLE	32
CHIROPOUS CARINATUS	BLACK RACER, FIRE SNAKE	0
CHOLOEPUS DIDACTYLUS	TWO-TOED SLOTH	110
CLELIA CLELIA	MUSURANA	11
CNEMIDOPHROS LEMNISCATUS	RAINBOW-COLOURED LIZARD	4200
COENDOU PREHENSILIS	TREE PORCUPINE	20
CORALLUS ENHYDRIS	COOKS TREE BOA	3000
CORALLUS CANINUS	EMERALD BOA	1000
CRAX ALECTOR	POWIS	46
CRISONIA VITTATA	GUYANA MARTIN	3
CROTALUS DURISSUS DRYHINUS	RATTLE SNAKE	42
CUNICULUS PACA	LABBA	20
CYCLOPES DIDACTYLUS	PIGMY ANTEATER	10
DASYPROCTA AGUTI	AGOUTI, JOHN ACCOURI	350
DASYPUS N. NOVEMCINTUS	NINE-BANDED ARMADILLO	50
DENDROBATES PUMILIO	POISON ARROW FROG	100
DEROPTYUS ACCIPITRINUS	HAWKED-HEADED PARROT	480
DIDELPHIS MARSUPIALIA	YAWARI, COMMON OPPOSSUM	25
DRYMAARDHON C. CORAIS	DRYMARCHON, YELLOW-TAIL	14
EIRA BARBARA	TAYRA	10
EPICRATES C.	RAINBOW BOA	200
EPICRATES C.	RAINBOW BOA	1000
ERYTHROLAMLPUS AESCULAPU	FALSE CORAL SNAKE	14
EUNECTES MURINUS	ANACONDA, WATER CAMUDIL	360
EUPHRACTUS SEXCINTUS	SIX- BANDED ARMADILLO	50
FORPUS PASSEINUS	GREEN-RUMPED PARROTLER	600
GEOCHELONE CARBONARIA	RED-FOOTED TORTOISE	480

Appendix
WILDLIFE EXPORT QUOTAS - 1990

Scientific Name	Common Name	Annual Quota
GEOGHELONE DENTICULATA	YELLOW-FOOTED TORTOISE	480
GRISON VIRRATUS	GRISON	5
HELICOPS ANGULATUS	GREEN WATER SNAKE	21
HYDROCHAEREIS HYROCHAERIS	WATRAS, WTR HAAS, CAPYBARA	10
HYLA CREPITANS	TREE FROG	112
HYLA FABER	TREE FROG	161
HYMENOCHIRUS CURTIPES	GREEN WATER FROG	1036
IGUANA IGUANA	IGUANA	8400
KINOSTERNON SCORPIOIDES	SCORPION MUD TURTLE	196
LACHESIS MUTA	BUSHMASTER	14
LEPTODACTYLUS P.DACTYLUS	MOUNTAIN CHICKEN	168
LEPTOPHIS AHUETULLA	VINE SNAKE	28
MABUYA MABOUYA	SKINK LIZARD	483
MEGOPHRYS NASUTA	LEAF TOAD	98
MICRURUS SURINAMENSIS	CORAL SNAKE	35
MORPHO MENELAUS	BLUE MORPHO BUTTERFLY	0
MASUA MASUS	KIBIHEE, COATIMUNDI	74
OXYBELIS FULGIDUS	OXYBELIS, PARROT SNAKE	42
PALESOUCHUS PALPEBROSUS	DWARF CAIMAN	240
PALEOSUCHUS TRIGONATUS	WEDGED-HEADED CAIMAN	360
PENELOPE GRANTII	MARUDI	18
PHILAMADUCA BICOLOUR	GREEN WATER FROG	27
PHILANDER NUDICAUDATUS	FOUR-EYED OPPOSSUM	83
PHRYNOPS TUBEROSUS	SIDE-NECKED TURTLE	7
PHRYNOPS GIBBA	SIDE-NECKED TURTLE	55
PHRYNOPS GEOFFROANUS	SIDE-NECKED TURTLE	587
PHRYNOPS RUFIPES	SIDE-NECKED TURTLE	7
PHRYNOPS NASUTA	SIDE-NECKED TURTLE	7
PIONITES MELANCEPHALA	BLACK-HEADED PARROT	600
PIONUS FUSCUS	DUSKY PARROT	300
PIONUS MENSTRUUS	BLUE-HEADED PARROT	900
PIPA PIPA	SURINAME TOAD	200
PLATEMYS PLTYCEPHALA	TWIST-NECKED TURTLE	350
PLICA UMBRA	PLICA LIZARD	1700
PLICA PLICA	PLICA LIZARD	2800
PODOCNEMIS UNIFILIS	SIDE-NECKED TURTLE	10
PODOCNEMIS ERYTHROCPHLA	SIDE-NECKED TURTLE	10
POLYCHRUS MRMORATUS	POLYCHRUS LIZARD	420
POTOS FLAVUS	KINKAJOU, NIGHT MONKEY	100
PROCYON CANCRIVORUS	RACCON, CRAB-DOG	35
PSEUDIS PARADOXIA	GREEN/BLACK WATER FROG	7200
PSEUTES SULPHUREUS	PSEUTES	14
PSOPHIA CREPITANS	GREY-TRUMPETER	90
PTEROGLOSSUS ARACARI	BLACK-NECKED ARACARI	300
PTEROGLOSSUS VIRIDS	GREEN ARACARI	50
PYRRHURA EGREGIA EGREGIA	FIERY-SHOULDERED CONURE	120
PYRRHURA PICTA PICTA	PAINTED PARAKEET	300
RAMPHASTOS VITELLINUS	CHANNEL-BILLED TOUCAN	120
RAMPHASTOS TOCO	TOCO TOUCAN	200
RAMOHASTOS TUCANUS	RED-BILLED TOUCAN	170
RHINOCHLEMMYS PUNCTULARIA	LABARYA TURTLE	350
SAGUINAS MIDAS	RED-HANDED TAMARIN	180
SAIMIRI SCIUREUS	SQUIRREL MONKEY, SAKIWINKI	3000
SPILOTES PULLATUS	SPILOTES, SALIPENTER	112
TAMANDUA TETRADACTYLA	LESSER ANTEATER	30
THECADACTYLUS TORQUATUS	COLLARED LIZARD	24500
TUPINAMBIS NEGROPUNCTATUS	TEGU, SALIPENTER LIZARD	7200
URANDSCONDON SILLARIS	BROWN TREE-CLIMBER	4200

REFERENCES

CITES Secretariat. IUCN 1990. *Crocodilian Resources in Guyana.*

Commonwealth Secretariat. 1990. *Commonwealth - Government of Guyana Programme for Sustainable Tropical Forestry.*

Guyana Forestry Commission, Canadian International Development Agency. 1989. *National Forestry Action Plan 1990 - 2000.*

Mentz Ribeiro, Pedro August, Catarina Torrano Ribeiro and Francisca Cira Bazerra Pinto. 1989. "Levantamentos arquelogicoa no Territorio Federal de Roaima" *Revista do Cepa* 16(19):5-46.

Wildlife Services Division, Ministry of Agriculture, Guyana. 1985 - 1989, unpublished. *Annual Reports.*

Williams, Denis. 1985. "Petroglyphs in the Prehistory of Northern Amazonia and the Antilles" *Advances in World Archaeology* vol. 4:335-387: New York: Academic Press.

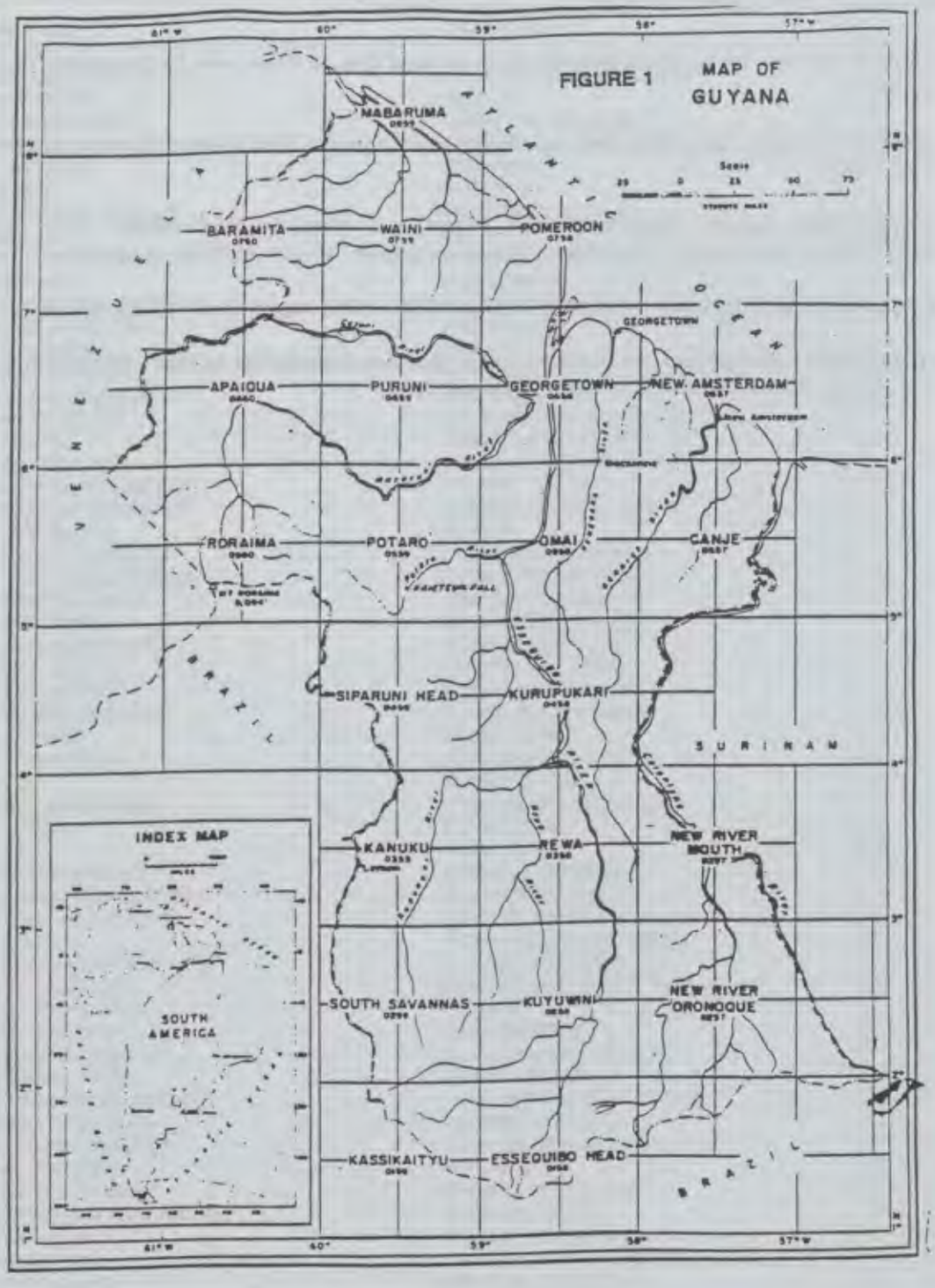


FIGURE 1
MAP OF GUYANA
MABARUMA
BARAMITA
WAINI
POMEROON
GEORGETOWN
APAIQUA
PURUNI
GEORGETOWN
NEW AMSTERDAM
RORAIMA
POTARO
OMAI
CANJE
SIPARUNI HEAD
KURUPUKARI
SURINAM
KANUKU
REWA
NEW RIVER MOUTH
SOUTH SAVANNAS
KUYUWINI
NEW RIVER ORONOQUE
KASSIKAITYU
ESSEQUIBO HEAD
INDEX MAP
SOUTH AMERICA
VENEZUELA
BRAZIL
ATLANTIC OCEAN


FIGURE 2
GUYANA RIVER SYSTEMS
VENEZUELA
DUTCH
GUIANA
BRAZIL

Drawing 1:
Faunal inventory in Ardiaic subsistence; from Amazonian Petroglyphs.

FIGURE 3

APPROX. QUANTITIES OF WILDLIFE EXPORTED

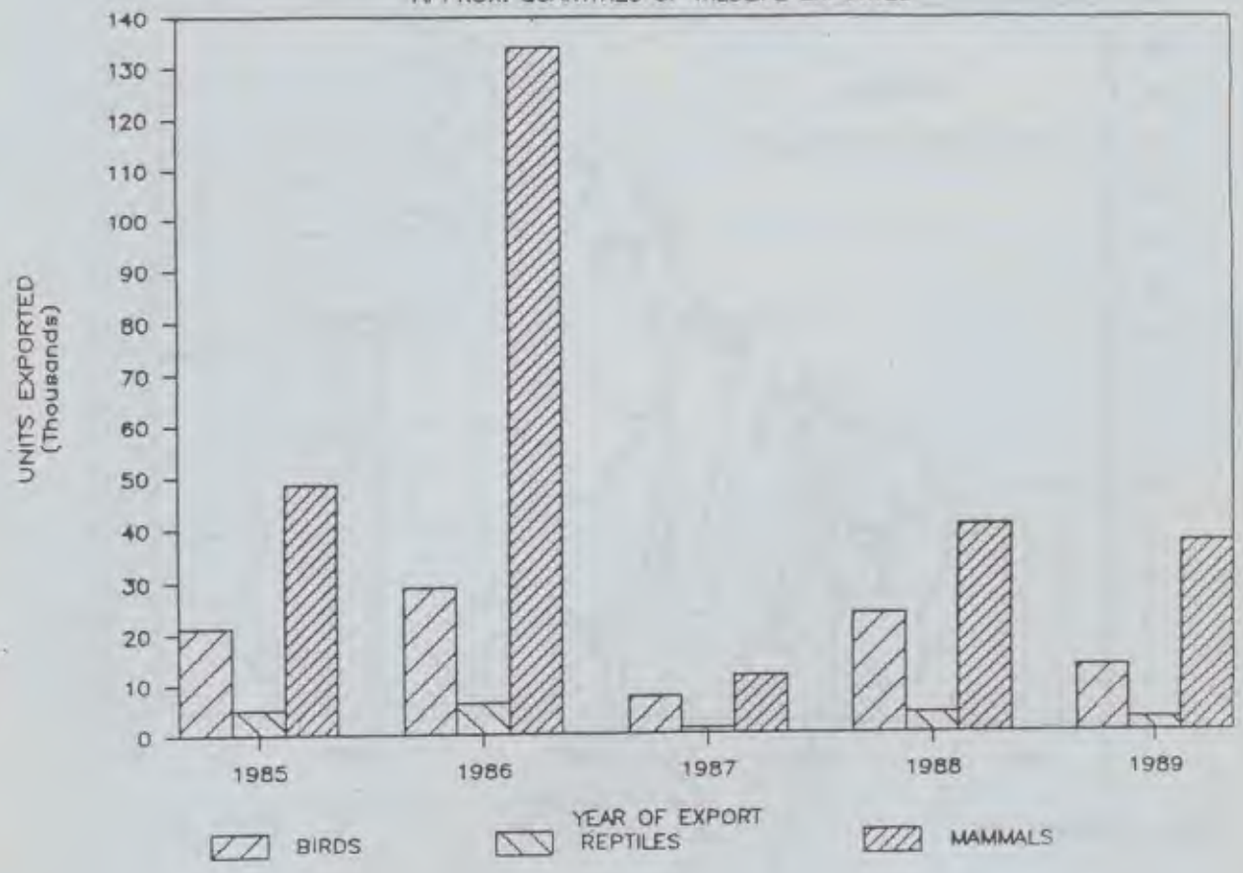
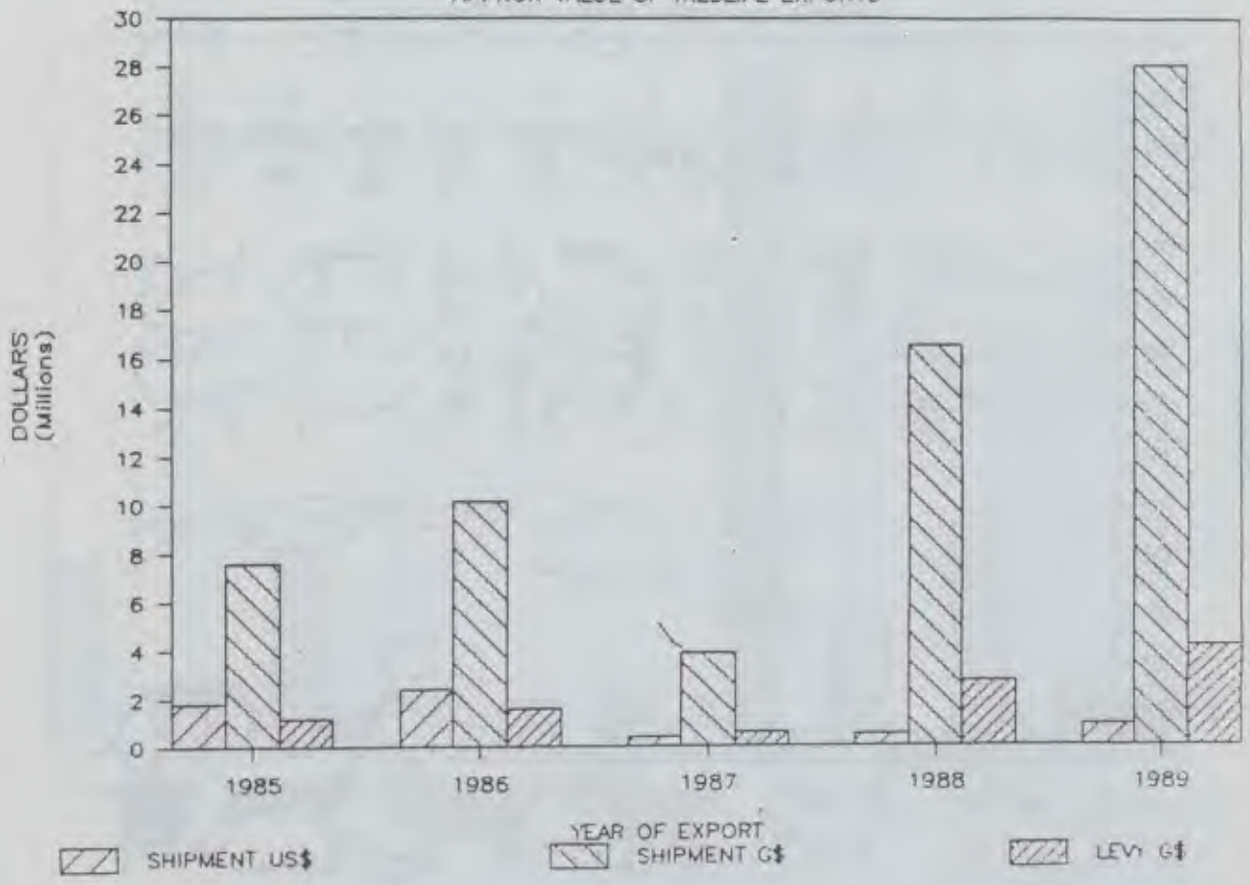


FIGURE 4

APPROX VALUE OF WILDLIFE EXPORTS



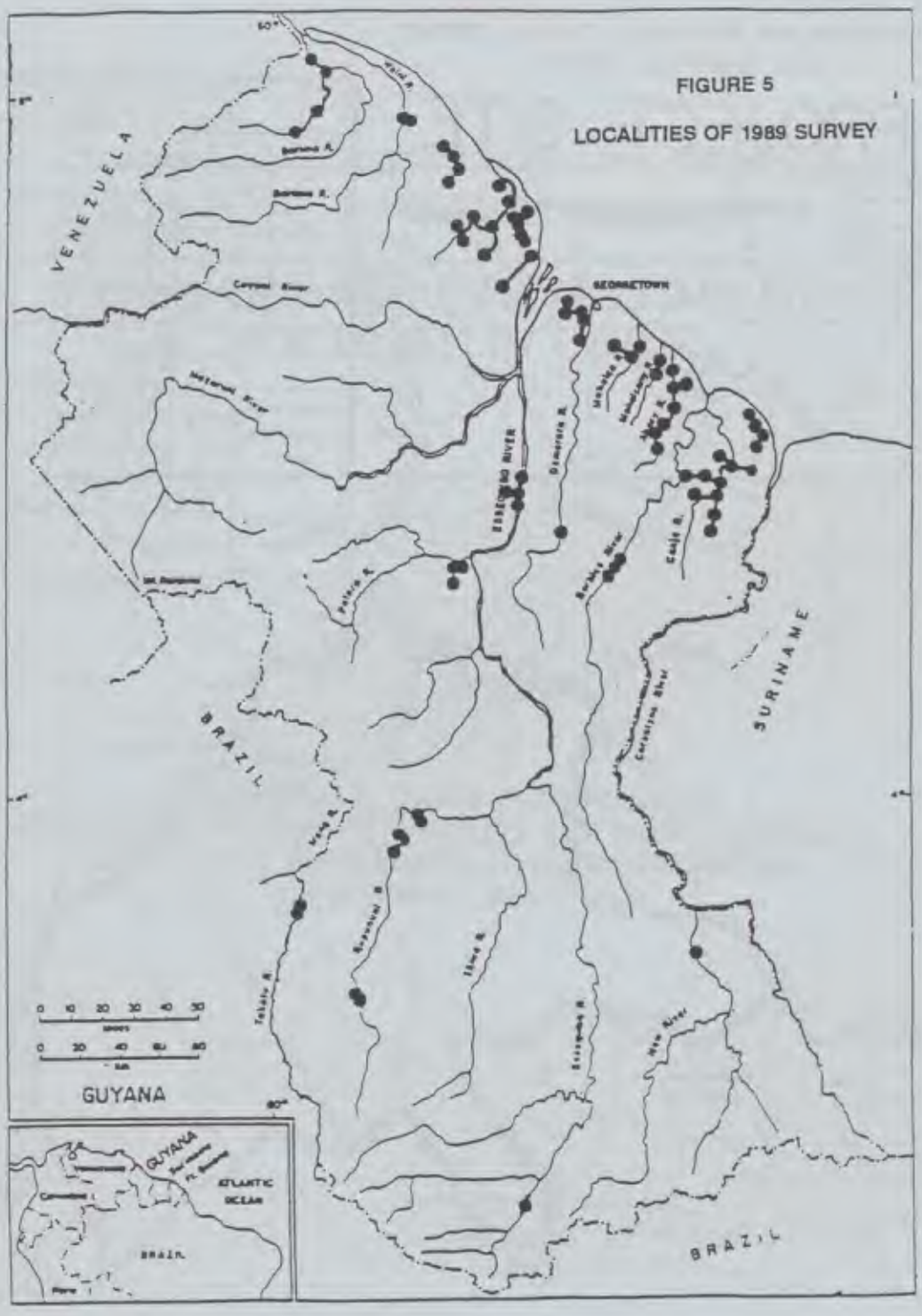


FIGURE 5
LOCALITIES OF 1989 SURVEY
VENEZUELA
BRAZIL
SURINAME
GEORGETOWN
GUYANA
ATLANTIC OCEAN

COMMONWEALTH - GOVERNMENT OF GUYANA

PROGRAMME FOR SUSTAINABLE TROPICAL FORESTRY

SITE DESCRIPTION REPORT

FIGURE 6

SUSTAINABLE UTILIZATION OF WILDLIFE IN CHILE

ALFONSO A. GLADE, VETERINARIAN
CONSULTANT ON WILDLIFE AND WILD LANDS
YACYRETA BIONATIONAL HYDROELECTRIC DAM
(ARGENTINA - PARAGUAY)

BRIEF DESCRIPTION OF CHILEAN TERRESTRIAL WILDLIFE

The different and unique geography of Chile conditions its wildlife; which is also different and unique, especially in the aquatic environment. The world's driest desert; the most productive coast in terms of biomass, due to Humboldt's cold current; the Andes mountains; and the extended area of archipelagos in the southern extreme of this country, which is 5,000 kilometers long with an average width of only 220 km, enable the existence of unique environments, of limited area, which contain a high percentage of endemism. Fifty seven per cent of the vascular flora is endemic (Benoit, 1989), and endemism is also high in the lower classes of terrestrial vertebrates and in fish.

Chile, compared with other Latin American nations, presents fewer wildlife species. Many families or species that are broadly distributed in the rest of the continent, are absent in Chile because they could not cross the country's natural barriers, such as the dry desert in the north and the cold and barren Andes mountains in the east.

Chile's terrestrial vertebrate fauna is composed of 648 species: 91 mammals, 432 birds, 78 reptiles, 39 amphibians, and 44 fish of continental waters (Glade, 1988).

The main natural environments where these species can be found are the Puna (highplateau), the coast (which is approximately 10,000 km long), the Evergreen forest, the Nothofagus forest, and the Magellanic steppe.

The endemism percentage varies conspicuously among classes. The continental waters fish present almost 100 per cent of endemism; reptiles, 74 per cent; amphibians, 59 per cent; mammals, 10 per cent; and birds, only two per cent (Núñez, com. pers).

HISTORICAL EXPLOITATION OF CHILEAN WILDLIFE

Available records are not exact, but three examples are reliable. It is known that the vicuna (*Vicugna vicugna*) population, which in precolombian years was 1-3 million animals in the South American Puna, began to decline rapidly due to indiscriminate hunting by the Spanish conquistadors. The Incas had established a sustainable management of the species by means of driving the vicunas into corrals. The animals were shorn of their fine wool and then released into their natural environment. This practice was not repeated in the same place until several years later. These jobs employed a lot of people and spared females in advanced stages of pregnancy, but they were also slow because of the caution and care used with each animal. There is no doubt whatsoever that the conquistadors' method of driving the animals and shooting with guns was more "efficient" than the one used by the natives (Torres, 1987), but it was certainly not sustainable.

In spite of several Royal Legal Provisions, which forbade vicuna killing in the 16th and subsequent centuries, the fact is that vicunas of both sexes and all ages and conditions were chased and hunted. This led to the destruction of the population. In 1964 the situation reached rock bottom when in all of South America only 25,000 vicunas survived (Torres, 1987).

More reliable records exist regarding the exploitation of the Juan Fernandez fur seal (*Arctocephalus philippii*), which inhabited the three islands of the archipelago of the same name, located 670 km from the Chilean coast. Between 1687 and 1898 (211 years), the shipment of 3,868,000 furs was documented. These furs were transported in North American and European vessels and sold in the Cantonese region of China. There are more records of vessels which transported furs but, unfortunately, there is no indication of their numbers. Back in 1797, a ship's captain wrote that he estimated that three million furs had been sent to the Cantonese region in the previous seven years and that he himself had carried more than 100,000 of them (Iriarte and Jaksic, 1986).

Thus, the millions of fur seals that the chroniclers said they had seen in the mid-17th and 18th centuries were reduced to 4,000 by 1970.

The best documented case relates to the Chilean chinchilla (*Chinchilla lanigera*), due to its more recent exploitation and to the fact that its commercialization was permitted until 1917. This is how we now know that, between 1828 and 1917, 8,110,000 furs of this Chilean endemic rodent, of very fine fur and which gives birth only once a year, were officially exported. Due to the methods of capturing them, it is estimated that only one of every three furs could have been exported, therefore, it can be stated that 24 million Chilean chinchillas died in a period of 88 years. At the same time, the semi-desert environment in which they lived was violently destroyed and transformed (Iriarte and Jaksic, 1986).

It is well known that the species was practically exterminated and that only in 1975 was it possible to locate areas where some of them still survived.

The three cases described above are the most dramatic over-exploitation cases concerning terrestrial vertebrates in Chile. Dozens of other species, mainly birds and mammals, have decreased in number, either because their habitats were reduced and broken or because they were subject to stress in several ways by humans. These cases have not been quantified, however, as precisely as the three described above.

LEGISLATION REGARDING WILDLIFE RESOURCES

According to Chilean law, based on Roman law, wild animals do not belong to anyone and their domain is acquired by means of hunting and fishing. Chilean and international laws establish that hunting and fishing cannot be practiced on protected species.

The specific law on wildlife, called hunting law, dates from 1929 and only considers mammals and birds from the industrial and sport hunting point of view.

Thus many other mammal and bird species are not subject to legal protection. The same is true for all the reptiles and amphibians. No laws exist that could lead to regulation of interference on natural environments in which wildlife lives. The extinction of a species due to a transformation or elimination of its natural habitat could occur without any of the regulations that protect these species being violated.

Chile has subscribed to the Convention on the Protection of Wild Flora, Fauna and Scenic Beauty of Latin America (Washington Convention), the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention), the Convention on Migratory Species (Bonn Convention), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Agreement on the Conservation and Management of the Vicuna (La Paz Agreement) (CONAF, 1986).

In summary, the legal norms that relate to wildlife and that are currently enforced in Chile are:

- those of national origin, enacted between 1929 and 1963, that report on hunting, fishing and plagues;

- those of international origin, promulgated between 1967 and 1981, that promote the conservation of wildlife and its habitat.

At present, there is a consensus among conservationists, researchers, and governmental technical organizations, on the need to transform the obsolete hunting law of 1929 into a wildlife law that can consider all the necessary aspects in order to give the country legislation in accordance to modern times.

Another inconvenience that affects wildlife resources is the variety of organizations on which it depends. The marine wildlife is bound to an agency, under the Ministry of Economy, which deals mainly with industrial and artisan fishing. This activity will export more than US$800 million in 1990.

The Ministry of Agriculture has two agencies that deal with terrestrial wildlife in Chile. One has the aim of enforcing the hunting law, that is, controlling sport hunting, stockfarms, and wildlife commercialization, including export and import of it. The other, CONAF, is in charge of conserving the natural environments, rehabilitating species with conservation problems, and fostering the sustainable management of valuable species for mankind.

Even though these agencies have to work coordinately, differences regarding the global focus on the subject exist between them. For example, there are no marine protected areas.

To centralize the wildlife's legal mandate in one organization is not seen as feasible in the medium term. Therefore, the coordination mechanisms must be maximized.

CONSERVATION STATUS OF TERRESTRIAL VERTEBRATE WILDLIFE

CONAF organized, in April 1987, in Santiago, a symposium that lasted four days, with the purpose of gathering first hand information, analyzing different points of view about this issue, and converting the participants to the cause of conserving wildlife and the environment. As a strategy, the purpose was to actively involve the Chilean scientific and conservation community, in the present and future of the country's wildlife (Glade, 1988).

This symposium was attended by 72 specialists from the entire country, representing 90 per cent of the Chilean experts in the subject. They established by consensus the conservation status of the 648 taxa of terrestrial vertebrates described in Chile.

The proceedings of the symposium, published under the title of "The Red List of Chilean Terrestrial Vertebrates," was widely distributed within the country and abroad. The overall countrywide condition of each species and the condition in each of the 13 Administrative Regions in the country, are stated in the document for the 5 classes studied.

Two taxa are in the category of "Extinct", 50 "Endangered", 92 "Vulnerable", 53 "Rare", two "Indeterminate", 46 "Insufficiently Known", and the rest, 439, under the category of "Out of Danger" (Glade, 1988).

For each Class, the percentage of taxa with conservation problems in relation to the total described for Chile, was: 100 per cent for continental water fish, 79 per cent for amphibians, 58 per cent for reptiles, 56 per cent for mammals, and 17 per cent for birds. From the total 648 taxa analyzed, 35 per cent have conservation problems (Glade, 1988).

This task has put an end to the subjective appreciations of the conservation condition of several taxa, and it has also allowed priority to the investigations and activities for the conservation of those taxa which are in the most delicate situations regarding their future survival. It was decided to review the Red List every five years, therefore the next meeting must take place in 1992.

CONSERVATION OF WILDLIFE AND ITS ENVIRONMENT

Chile has a National Protected Areas System (SNASPE), which consists of 30 National Parks, 37 National Reserves and 10 Nature Monuments that amount to 13,700,000 hectares of governmental property. This protected areas system covers 18 per cent of the country's territory (excluding the Antarctic Territory). SNASPE's first units date from 1907, and the protected areas system continues to create new areas in order to be more completely representative of the natural environment. Today, it protects 62 per cent of the vegetation units described for Chile. This is the main reason why government properties with relevant vegetation that are not represented in SNAPSE are being screened. The process also involve properties with vegetation insufficiently represented in the system; the overall goal is to include those properties within the boundaries of existing or new parks and reserves (CONAF, 1985).

There 350 rangers and more than 150 supporting staff who, among other tasks, must protect the units' flora and fauna, carry out environmental educational activities for 700,000 yearly visitors, and also accomplish planning and implementing duties in their protected areas.

The environments represented by the SNASPE offer habitats to 55 per cent of the Chilean terrestrial mammals and to 70 per cent of the country's bird species (Glade, 1989). From the wildlife point of view, those sites named "Wildlife Concentration Areas", which generally consist of lakes, ponds and estuaries, and which in many instances significantly depart from the particular vegetation unit where they are placed, have priority to be incorporated into the SNASPE. At present, the legal mechanisms which will allow the protection of these places, even though they might be private property, are being prepared. This is important because, as was mentioned before, the law protects the species but not its environment.

The objectives of National Parks are to preserve samples of natural environments, as well as cultural and scenic features related to them; to allow the continuation of the evolutionary processes; and, as long as it is compatible, to carry out educational, research, and recreational activities.

Because of this, the wildlife that inhabits these areas cannot be managed in any way, except in very qualified cases which may lead to re-establishing lost natural balance (CONAF, 1989).

Several National Reserves have been established in order to manage in a sustainable way the wildlife resources. The objectives of this management category are: to conserve and protect the wild flora and fauna species, and to develop and apply the sustainable utilization technologies on flora and fauna. The National Reserves established for the management of vicunas, chinchillas, Humboldt penguin, and flamingos are some examples of the management category (CONAF, 1988).

Since CONAF began to administer SNASPE, 18 years now, the process of numerical decrease of many wildlife species has been stopped and, in many cases, reversed. Important successes have been achieved with the vicuna (*Vicugna vicugna*); guanaco (*Lama guanicoe*); Andean deer (*Hippocamelus antisensis*); black necked swan (*Cygnus melancoryphus*); three flamingo species (*Phoenicoparrus andinus, Phoenicoptarus chilensis* and *Phoenicoparrus jamesi*); and Humboldt penguin (*Spheniscus humboldti*), and other species.

It must also be mentioned that there have been some difficulties. The huemul deer (*Hippocamelus bisulcus*), depicted in Chile's coat of arms, the Chilean chinchilla (*Chinchilla lanigera*), the Juan Fernandez hummingbird (*Sephanoides fernandensis*), and the tricahue parrot (*Cyanoliseus patagonus byroni*) are species which require a very complex management and which have a conservation status described as "Endangered". It has only been possible to reduce the rate of their decline.

It is necessary to explain that, due to the constant shortage of financial resources, specific wildlife projects have generally been developed giving priority to species which present conservation problems. For this reason, other species that are being utilized have not been covered. Most "valuable" species, from the human point of view, present without exception severely decreased populations. The tendency is to go for numerical recuperation of these species instead of planning their sustainable utilization.

A third group corresponds to all species which find in the SNASPE units the necessary environments to perpetuate themselves and do not present conservation problems. Fortunately, these species correspond to the largest percentage of the ones described for Chilean terrestrial environments.

PROJECTS ON SUSTAINABLE UTILIZATION OF WILDLIFE

Of the 18 specific projects that CONAF has with specific wildlife species, six aim for sustainable utilization. Three of the six are cage bird species, and the other three are furbearing mammals.

Although the ornamental interest has not been the only factor that has determined their population decreases, the projects with flamingos, black necked swans, and tricahue are trying to re-establish a sufficient population nucleus of each species in order to allow controlled individual extractions for ornamental purposes. This will be possible once the areas in which they reproduce are included within SNASPE units.

Regarding mammal projects, after particular populations recover, it is intended to shear live vicunas to obtain their fine wool; to hunt guanacos to produce cured meat, skins, and wool; and to hunt the Chilean chinchilla to obtain its valuable fur.

It is necessary to mention that, at present, several wildlife species are utilized for local consumption and for sales within the country as well as for export; but there are no policies to encourage their sustainable utilization.

The most hunted species in Chile are the rabbit (*Oryctolagus cuniculus*) and the hare (Lepus capensis), both introduced and declared as plagues due to the damage they cause. Rabbits are an important food source for many rural inhabitants, who capture them with traps. A share of what is hunted can be sold in the open market.

Hare hunting, with guns, is mainly confined to the southern part of the country, where hundreds of people practice this activity. The export of hare products, mainly to Europe, is the major objective. There are many private purchasing agents who assist in the international marketing of hare products.

The coypu (*Myocastor coypus*), an aquatic rodent with a pelt which is highly appreciated in furriers' shops, is the only mammal of economic importance that is legally hunted. In the central and
southern zones of Chile, there are thousands of rural inhabitants who hunt this species with artisanal methods. The products of this hunt supply the national market.

The rest of the mammal species are under permanent hunting prohibition. Even if adequate methods of census, control, and a promotion of the ban did exist, several fur species which in certain regions are evidently more abundant could be used.

Regarding birds, the species of interest are several ducks, doves, and an endemic tinamou. Hunting quotas are fixed without a real base. This is the reason why, at present, the authorities are being pressured by the national community to decrease the quotas.

Birds belonging to 20 passerine species are exported each year, despite the fact that studies regarding fundamental quotas do not exist. Three subantarctic penguin species are exported to zoos and aquariums in Japan and Europe, but the numbers do not exceed 1,000 individuals annually for the three species.

CONAF has an agreement with the exporting firms, because the colonies where these birds are captured are located within a National Reserve. The exporters contribute with US$50 for each captured bird and CONAF uses these funds to protect and study the penguin populations, which number over 70,000 birds during the reproductive season.

Until recently, thousands of these birds were hunted during their reproductive period by centolla (kingcrab) ship crews, who used penguin meat as trap baits for centollas and other crustacea. Because of CONAF's agreement with export firms, which has been applied for two years now, the main colonies, located in very remote islands in the extreme southern zone of Chile, are now effectively protected against illegal hunting.

Considerable numbers of reptiles, amphibians, and invertebrates are exported every year. Very weak control exists over them because, due to legal gaps, there is no a legal instrument which regulates their capture and marketing or which defines a governmental institution with responsibilities over these resources.

There are practically no wildlife breeders in Chile, with the sole exception of approximately twenty small establishments dedicated to the breeding and exportation of pudues (*Pudu pudu*), one of the smallest deer in the world, which is commercialized as an ornamental animal.

THE VICUNA CONSERVATION AND SUSTAINABLE UTILIZATION PROJECT

This project began in 1972 and covers the vicuna population of the Puna in the Regions of Tarapaca, Antofagasta and Atacama, in northern Chile. The most relevant features of the area are plains located between 4,000 and 4,600 metres above sea level; snow covered peaks between 6,000 and 6,500 meters; and an extremely severe climate with daily temperatures fluctuating between -20C and +20C, and relative humidity between 40 and 50 per cent. Rainfall is more abundant in the northern region of Tarapaca, where it reaches a total of 450 mm per year, while toward the south it is scarcer.

From the economic point of view, the area has a certain mining importance. On the other hand, it is absolutely marginal in terms of the traditional grazing of cattle and sheep due to problems in adapting to altitude. Agriculture simply does not exist, due to climate and soil limitations. What sustains the close to 4,800 Aymara inhabitants in this area is the breeding of 80,000 llamas and alpacas, South American domestic camelids. Many Aymaras have massively migrated to coastal cities, looking for better working opportunities and less harsh life conditions.

The "Vicuna Conservation and Sustainable Management" project is set in this context. The main objectives are to recover vicuna population numbers; to create and administer protected
areas in relevant vicuna habitat; to demonstrate the technical-economic feasibility of sustainable management; and to promote the participation of local communities in management activities and in the benefits generated from the project, thus stopping and, if possible, reversing rural emigration.

The project has reached a more advanced stage in the Region of Tarapaca, which is, coincidentally, the area with a better prospective for maintaining large populations of vicunas.

The regions of Antofagasta and Atacama have limitations regarding the natural availability of food and water, therefore the absolute numbers and the density of vicunas will be lower and protected areas will be oriented more to preservation than utilization, although a small number of areas will be devoted to sustainable management.

Environment Protection: In 1965 the Chilean Government created the Lauca Forest Reserve of 140,000 hectares in the Puna of northern Chile, with the purpose of protecting an outstanding sample of the highland ecosystem. In 1970 it was expanded to 520,000 hectares and was reclassified as a National Park. The process of establishing resident rangers in this remote region began only in 1972. Also in that year, the "Conservation and Sustainable Management of the Vicuna" project began. It was estimated that no more than 4,000 animals survived throughout the zone subject to protection; they had survived decades of hunting and poaching. The reclassified Lauca National Park provided excellent habitat for vicuna. These habitat had been empty, due to the pressures that humans had placed on wildlife populations.

Eighteen years have gone by since then. During this period there have been great efforts to maintain this area free from hunting, mining, hydropower generation, military training and other activities inimical to the traditional livestock practices. With the increase of personnel and infrastructure, the rangers have been able to manage and patrol this vast territory more effectively. Now the area has been divided into three management categories: the National Park itself, 140,000 hectares; the Vicunas National Reserve, 210,000 hectares; and Surire Salt Lake Nature Monument, 11,000 hectares, dedicated to the specific protection of three flamingo species. The Caquena Management Zone, with 160,000 hectares, corresponds to lands outside the boundaries of protected areas, but subject to strict law enforcement rules. In addition, the Park and the Reserve together encompass an area of 490,000 hectares. This constitutes the real habitat for the vicunas, whose population has increased from 4,000 to 27,000 animals (as shown by the census carried out in November 1990).

The Vicuna Agreement: In 1969 a 10 year agreement was signed by Bolivia and Peru, in which both countries committed themselves to protect the vicuna effectively. This agreement states the establishment of protected areas, the control of illegal hunting, and the commercialization of vicuna wool. Chile and Argentina joined them later. In 1979 a new permanent agreement was signed, which promotes the conservation and management of the vicuna by Bolivia, Chile, Ecuador, and Peru. Argentina remained as a an observer until 1990, when it finally joined.

This agreement establishes the need for a Technical-Administrative Committee to meet annually in order to review the progress in the agreement's objectives, standardize methodologies, and look for compatible technical policies. The committee has met every year and has been integrated by representatives of each country's governmental technical organization and Ministry of Foreign Affairs. During the 11 meetings that have already taken place, some remarkable advances have been noted, such as the increase of the vicuna's total population from approximately 25,000 animals to more than 130,000. The area under protection now totals 7,300,000 hectares, in 21 protected areas.

Several technical seminars have been held, which covered topics such as census methodologies, genetic characterization, and population dynamics. These seminars were attended by professionals from all the countries that subscribed to the agreement.

The Chilean government donated 100 vicunas to Ecuador in order to reintroduce the species into that country. The experience was successful, in spite of the fact that such a big group had never been moved to a distant place. Later, the Peruvian government made a similar donation with the same results.

As members of the agreement, Chile and Peru presented in 1987 a proposal to the CITES Secretariat, to move from Appendix I to Appendix II certain vicuna populations which were to be handled in the future with the Inca method of shearing live animals and then setting them free.

This proposal was accepted by the members of CITES and, therefore, Chile is allowed to commercialize internationally all fabric that comes from the sheared animals that inhabit the Vicunas National Reserve and Caquena Management Zone. Chile and Peru committed themselves to control this process effectively in order to avoid a renewal of illegal hunting.

At present, the countries that signed the Agreement are working on the definition of the features that the commercialized fabric should have and, internally, Chile and Peru are analyzing how to distribute the benefits of this sustainable utilization among the local inhabitants.

The Vicuna Utilization Plan In Chile: This plan will be ready in 1991. The general outlines have already been drawn through the implementation of the "Conservation and Sustainable Management of the Vicuna" project.

The management zones "Vicunas National Reserve" and "Caquena" will be the areas where the male vicunas will be shorn using funnel shaped traps. The animals will not be captive for more than six hours. Considering that the gestation period in the vicuna lasts 11 months, and that each day of the year the minimum temperature is below freezing or very close to it, the female shearing period should be carefully determined because it could be dangerous to shear them under the same procedure as for males, during spring time, when close to 70 per cent of the females are in their last gestation stage.

The animals will be shorn by hand with scissors, because our research has shown that the electric machines built to shear sheep do not adapt satisfactorily to the vicuna's nonfat wool, which is full of fine dust due to daily dustbaths. As a precaution against pathologies, due to stress and injuries, each animal will receive an adequate dose of antibiotics.

Shearing tasks will be carried out by CONAF personnel, at least during the initial years of the sustainable utilization project, due to the low volume of wool that will be obtained in that period (200 to 800 kgs of dirty wool). All the wool that is gathered will be processed once a year to produce the corresponding fabric. The feasibility of placing a textile mill in a village near the vicuna management zones, which could work with alpaca and llama wool during the rest of the year, is being analyzed. Otherwise, the wool could be sent to Santiago, Chile, or another place where textile facilities already exist.

Once the product is obtained, CONAF will call for tenders for the fabric. CITES certificates will be issued to the successful bidder, who could then export the products. CONAF profits will be distributed among the local inhabitants, in a way that still has not been determined.

A second way of utilizing the vicuna will be by means of establishing authorized vicuna breeders, anywhere in the country. To carry that out, CONAF will capture and call for bids for groups of vicunas, large enough to be economically and biologically viable, so that private companies can breed and shear them periodically. The government should outline the legal, administrative, and control mechanisms necessary to avoid vicuna hybridization with any other South American camelid species, as a means to guarantee that the brand "Vicunandes Chile" of the fabrics made of wool from this origin is equal to the one coming from wild animal wool.

The breeders must fulfil several requirements so that the government can certify that their facilities are appropriate to receive wild vicunas.

It still has not been determined if the price that will be paid for each vicuna will be a purchase price or a fee for the right of using the products generated from the animal. In any case, the products obtained will benefit the local inhabitants.

THE FUTURE OF CHILEAN WILDLIFE SUSTAINABLE UTILIZATION

The sustainable utilization of Chilean wildlife is seen as promissory, because conservation projects developed by CONAF have made it possible to gather valuable biological, ecological, and technological records, regarding some of the most coveted species. In the same way, CONAF has demonstrated that it is possible to reverse the process of numerical decrease in certain species or populations and that once a critical number of animals is reached again it could be possible to use them without danger.
Therefore, CONAF enjoys enough public support to think of taking on future projects for the benefit of the country's wildlife.

The authorities have the political will to give a strong impulse to rural development activities; and sustainable wildlife utilization is a basic aspect of rural development in several geographical areas.

The pioneer species are the vicunas, for their wool, and the guanacos, mainly for their meat. In the medium term, it could be possible to use several ornamental and furbearing species, mainly by means of breeders. It is very important for CONAF to begin in an adequate way the trade of products generated from the vicuna and guanaco projects, because the launching of new projects depends on popular support for those already carried out.

Therefore, the way in which the profits from the projects will be distributed among the local inhabitants is especially important in both cases. This distribution needs to be acceptable for the majority of them as well as for the national community, which is principally urban.

Many unsolved situations remain. Among the fundamental ones, a new legal text regarding wildlife is needed, one that can replace the obsolete hunting law. The Bill must consider the points of view of governmental organizations as well as the scientific community and non-governmental organizations.

An institution that could centralize government wildlife related functions seems difficult to accomplish in the medium term. This is why the agencies involved with wildlife must be strengthened; both to provide them with the economic and technical resources that can improve their working efficiency, and to increase their number of professional and specialized personnel in order for them to improve their territorial coverage and develop and effective field work capability.

National development strategies regarding the utilization of species producing meat and/or wool, and employ rural manual labor, intensively, must be promoted by pilot projects. These will certainly require the technical and economic assistance of international organizations because Chile does not have the resources.

In summary sustainable utilization of wildlife in Chile is seen as an effective tool to support rural development, a subject which is a priority for the highest national authorities.

REFERENCES

Benoit, I. (Ed.) 1989. Red Book of Chilean Terrestrial Flora (Part One). CONAF, Santiago, Chile. 151 pp.

CONAF. 1985. Análisis de la cobertura y representatividad ecológica y administrativa del Sistema Nacional de Areas Silvestres Protegidas del Estado. Santiago de Chile. 51 pp.

CONAF. 1986. Recopilación de disposiciones legales y materias afines, relativas a los recursos naturales renovables. Santiago de Chile. 245 pp.

CONAF. 1988. Políticas Técnicas para el Manejo de las Reservas Nacionales de Chile. Manual Téc. No 9. Santiago, Chile. 72 pp.

CONAF. 1989. Políticas Técnicas para el Manejo de los Parques Nacionales y Monumentos Naturales. Manual Téc. Nõ 12. Santiago, Chile. 74 pp.

Glade, A. (Ed.) 1988. Red List of Chilean Terrestrial Vertebrates. Santiago, Chile. 67 pp.

Glade, A. 1989. El Programa de Fauna Silvestre de CONAF: los desafíos de la década de los 90. In: Actas Reunión Nacional del Programa de Patrimonio Silvestre. Santiago, Chile. 149-193 pp.

Iriarte, A. and F. Jaksic. 1986. The fur trade in Chile: an overview of seventy-five years of export data (1910-1984). Biol. Cons. 38 (1986). 243-253 pp.

Torres, H. (Ed.) 1987. Técnicas para el manejo de la vicuña. Grupo Especialista en Camelidos Sudamericanos, Comisión de Supervivencia de Especies, UICN. Santiago, Chile. 139 pp.

WILDLIFE UTILIZATION UNDER GREENLAND HOME RULE

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THE HOME RULE NATURAL RESOURCE MANAGEMENT AND ENVIRONMENTAL PROTECTION PROGRAMME

Preliminary Remarks

Greenland is the world's largest island, covering almost 2.5 million square kilometers and stretching from 60° to 84° N, closer to the North Pole than any other northern latitude land mass.

Most of this area is uninhabitable because of the inland ice. The large inland glacier, covering more than three fourths of the country, consists of an estimated three million cubic kilometers of fresh water ice. Only the Antarctic contains more.

55,000 people live on the coastal fringe of this large land mass. About 20%, or approximately 11,000 people, depend on hunting for their livelihood. Not hunting and gathering, not hunting and fishing, but hunting alone. Where these people live, no other livelihood is possible.

The Greenland sub-soil contains many minerals, but for the time being, no mineral exploitation is taking place. More than 80 per cent of the GNP is based in fishing. Fishing, in turn, is based on shrimp, cod, capelin, salmon, Greenland halibut, redfish and Atlantic halibut. These resources represent the export value of the Greenland economy.

LIVING RESOURCES

The terrestrial mammals which play a role in people's economy are caribou, musk ox, snow hare and Arctic fox. The Arctic wolf exists, but is rare and fully protected.

Fish are predominant in the subsistence economy. Of land fowl, only the ptarmigan plays a role. What is really important is the role of the sea fowl. Here one should mention the guillemot, auk, kittiwake and various types of gulls, cormorant, loon, great northern diver and a number of different species of geese and ducks plus the common eider and the king eider.

Speaking of subsistence needs, the most important, of course, is the traditional consumptive use of sea mammals. We are a nation of sealers. Five different species of seals frequent our coasts, all abundant and non-threatened: the ringed, harp, harbor, bearded, and hooded seals. Also whales abound. We have the blue whale, the bowhead, humpback and sei. The fin and minke whales are subject to quotas established by the International Whaling Commission (IWC). The small cetaceans - beluga, narwhal and harbor porpoise are outside the scope of IWC, and not subject to quotas. To finish with the marine mammals, one should also mention the walrus, and the polar bear. The latter is covered by the Oslo Convention of 1973, which allows for aboriginal subsistence hunting.

Greenland was a colony of Denmark for about two and a half centuries. After a brief period of attempted integration into Denmark (1953-79), Greenland obtained local autonomy or home rule. The Greenland population has always been dependent upon the direct use of the wildlife resources, so it stands to reason that one of the first points on the agenda after the introduction of home rule was to ensure a whole functioning natural resource management programme.

CONSERVATION AND MANAGEMENT REGISTRATION

Greenalnd was a colony of Denmark for about two and a half centuries. After a brief period of attempted integration into Denmark (1953-79), Greenland obtained local autonomy or home rule. The Greenland population has always been dependent upon the direct use of the wildlife resources, so it stands to reason that one of the first points on the agenda after the introduction of home rule was to ensure a well functioning natural resource management programme.

The Home Rule Assembly adopted the Nature Conservation Act of 1980, which was followed up and completed by the Environment Protection Act of 1988. The law of 1980 builds upon the old traditions of local management

of fish and game which were prominent already in colonial times. These local traditions are now incorporated into legislation which is a mosaic of central Home Rule government edicts and the central municipal regulations. The legislation builds on:

a) Local experience (which, in our case, is equivalent to indigenous experience);

b) advice from Greenlandic researchers;

c) advice from Danish researchers (biologists and experts in various fields);

d) international advice from

   i. international fora like the Oslo Convention, CITES, Ramsar, IWC and, of course, the IUCN; and

   ii. bilaterally, through the Canada-Greenland agreement and consultations concerning the beluga and narwhal of the Baffin Bay and the Thule area, and others.

Pursuant to the Home Rule Act of 1978, international cooperation is always established on the basis of close relationship to Danish authorities.

ADMINISTRATION

Internally in Greenland, the relevant administration is organized as a twofold operation:

1) environmental administration, and

2) natural resource administration.

The environmental administration deals with the parks system, the Ramsar areas, mineral exploitation, pollution problems, CITES regulations, and international environmental cooperation. The environmental administration of the Greenland Home Rule works closely together with the Ministry for the Environment in Denmark.

The natural resource administration works together with the scientific community at various Danish university centers, as well as with international organizations. This administration deals with the regulation of fisheries and related biological research, hunting regulations and research dealing with the animals in question, development of data bases that facilitate the statistical work which is necessary, and the institutional cooperation in these fields.

CONTROL SYSTEMS

As far as the environment goes, the built-in central systems reside in:

- the National Park Committee under Home Rule authority;
- The Danish Polar Center in Copenhagen which among other things, licenses expeditions;
- the joint Greenland/Denmark Mineral Exploration Council;
- the police (which is under Danish jurisdiction).

As far as the natural resources go, controls reside in:

- the fisheries inspection, which in practice is taken care of by the Danish Navy;
- the police;
- a corps of wildlife conservation officers, newly established by the Greenland Home Rule Authority.

THE PARKS SYSTEM

The North East Greenland National Park is the world's largest, 972,000 sq km, an area larger than Great Britain and France put together. It was instituted by an act of the Danish parliament in 1974, and in 1988 further extended by an act of the Greenland Home Rule assembly.

Ramsar sites have been instituted along the coast of both east and west Greenland. They cover together 10,500 sq km and are open to subsistence hunting according to local municipal rules. The municipal councils have the power to lay out their own protected areas and enforce their own conservation measures. The Greenland coast line is one long mosaic of regulated areas, each with their own rules according to species and seasons.

THE LICENSING SYSTEM

There are three types of fishing licenses, plus a tourist sports license:

1. The green licenses given to the full time subsistence hunters.
2. The red license given to the part time subsistence hunters.
3. The blue license given to the free time (weekend, holiday) hunters/fishers.

The tourist sports license for fishing and hunting may not be used for polar bear hunting or whaling.

THE COMMERCIAL IMPORTANCE OF WILDLIFE HARVEST

Greenland is a fishing nation which to a very considerable extent relies on hunting for subsistence as well as for capital income, directly as well as indirectly.

Greenlanders are meat eaters. Nobody can grow potatoes on the icecap. People hunt for their daily food, which is meat. This is the subsistence life style.

The capital value is indirect in the sense that the protein/vitamin volume which is harvested is "bought" from Mother Nature for the price of some boat fuel and ammunition. If it were to be bought from foreign lands in the shape of southern countries' produce, it would be forbiddingly expensive. For example, the IWC subsistence quotas of 105 minke whales and 23 fin whales represents some 440 tons of meat. Society simply couldn't shoulder the expense of importing 440 tons of beef or pork -- apart from the fact that neither beef nor pork contain the nutritional value whale meat does, which is needed to live in the Arctic.

Capital value of wildlife harvest is direct when seal skins are exported. Seals are harvested at an annual rate of approximately 100,000 -- some 70,000 ringed seals, the rest spread out over the other four species. Seals are shot for food, and every single one is eaten. The skins are utilized locally for clothing and handicraft, and surplus skins are exported. This trade received a terrible blow, and a most unfair one, in the anti-seal skin campaigns, which were directed at something completely different. These campaigns had a near catastrophic effect for our seal hunter communities who became unable to support themselves economically from this non-resource-threatening and perfectly legitimate wildlife harvest.

THREE BASIC PRINCIPLES

A. IUCN must honor the right to harvest wildlife resources. Hunting for a livelihood has been *homo sapiens'* lifestyle for five hundred thousand years. It is an honourable occupation which demands respect.

B. IUCN must uphold the right to an economically sustainable activity derived from an ecologically sustainable exploitation of the wildlife resources in question.

C. IUCN should urge member countries to keep market regulations and trade policies in place which are respectful of this right.

These three principles build upon:

1. The Brundtland Commission Report, "Our Common Future", the chapter sub-section entitled "Empowering Vulnerable Groups".

2. The ILO Convention, doc. no 169 about the indigenous and tribal peoples rights.

3. The two UN covenants of 1966 concerning Civil and Political Rights, and on Economic, Social and Cultural Rights. In Part I, Article 7, No. 2, of both these covenants, it is said: "In no case may a people be deprived of its own means of subsistence".

POST SCRIPTUM

Since the meeting in Perth, and as of November 1992, the following two points should be added to the above 1-3:

4. The World Conservation Strategy of 1991, entitled "Caring for the Earth".

5. The Rio Declaration about the right to a reasonable and sustainable harvest of nature's wild resources.

CURRENT STATUS AND POLICIES OF WILDLIFE UTILIZATION IN INDIA

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INTRODUCTION

Humans have always used wildlife and wildlife products to meet their livelihood needs. The degree of dependence on these resources is however inversely proportional to the advance of economic development; the more developed, the less dependent. There is now a qualitative change in this dependence -- where it was previously aimed at assuring basic survival needs, in industrialized societies the dependence on wildlife and wilderness is more for its environmental, aesthetic, recreational or commercial values. The issue of sustainable use of wildlife therefore has to be examined not only in this context but also in the light of the rapidly changing demographic patterns. In developing countries like India, the growing demands of people and livestock have seriously vitiated the sustainability equation by jeopardizing the productivity of the natural resource base through overuse and abuse.

Most wildlife populations, of both plants and animals, are amenable to sustainable utilization given a set of favorable conditions. These conditions are available in a relatively undisturbed wilderness situation, through intensive management effort in free ranging populations, or through farming and ranching operations of captive populations i.e. through intensive *in situ* or *ex situ* management of wildlife. Such intensive management efforts however require institutional capacity and organizational capability of a very high order. Hence, apart from the scientific aspects, the sustainability issue has to be examined from practical considerations, with due regard to a country's cultural, social and economic conditions.

INDIA - A BRIEF PROFILE[1]

India is a Federal Republic of 25 states and six union territories. With a total land area of about 3.29 million square kilometers. India is the seventh largest country in the world, but in terms of its population estimated in 1989 to be 833 million, it is second only to China, and the population continues to grow at the annual growth rate of 2.25% in spite of a long standing nation wide family planning programme.

The Gross National Product (GNP) per capita in 1988 was estimated by the World Bank at US$330 and over 70% of the population live and work in the rural sector. The main industries are textiles, steel, processed food, cement, machinery, chemicals, fertilizers, consumer appliances and automobiles. The major items of export are textiles, gems and jewelry, engineering goods, leather and leather goods, agricultural produce, chemicals, ores and minerals, marine products, handicrafts, and sports goods. In 1988, 1.2 million foreign tourists visited India but the country's share in earnings from international tourism remained only a little over 1%.

CONSERVATION SCENARIO IN INDIA

Pluralism is strongly manifest in Indian society because of various religious, regional, cultural and economic differences. This is reflected even in attitudes related to wildlife conservation. There are communities such as the jains, buddhists and bishnois to whom the taking of animal life is anathema and there are tribes who regularly use wild animals as food. Gadgil and Malhotra (1983) describe in great detail the hunting practices of some tribes in the Western Ghats, Gadgil (1985 a and 1985 b) also draws attention to the cultural evolution of ecological prudence in Indian society which consisted of an elaborate system of social practices to ensure sustainable use of resources. However, most of these practices and the inherent checks and balances have broken down in the face of a burgeoning population and growing demand for land for agricultural production. Consequently wildlife and forests are victims of the tragedy of the commons.

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[1] Source:

- India 1988 - 89, Research and Reference Division, Ministry of Information and Broadcasting, Government of India, New Delhi.
- The World Almanac and Book of Facts, 1990, An Imprint of Pharos Books, New York.
- Manorama Year Book, 1990, Malayala Manorama, Kottayam, Kerala, India.

Administration: The Constitution of India gives the Central and the State Governments concurrent jurisdiction over forests and wildlife. It lays down the following duties for the state and citizens:

Article 48: The state shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.

Article 51-A: It shall be the duty of every citizen of India.... (g) to protect and improve the natural environment including forests, lakes, rivers, and wildlife, and to have compassion for living creatures.

Forest and wildlife conservation, therefore, requires no economic justification. All forest land, including national parks and sanctuaries (PAs), is owned and managed by the states. Wildlife management has traditionally been a function of the forest departments, within which distinct wildlife wings have been established for this purpose. The central government has overriding powers only in matters of legislation and policy. It also provides technical guidance and financial support to the states to better manage forest and wildlife resources.

Forest Conservation: The post independence (1947) era was witness to an accelerated decline of wilderness resources. With the departure of colonial controls and the acquisition of ex-princely and ex-proprietary forests, permissive and expedient use quickly displaced the earlier policy of strict controls and deprivation. There was a massive diversion of forests land for agriculture to feed a rapidly growing population, and for development projects for power, irrigation, industries, mining, railways and roads (Lal, 1989)[2]. The enactment of the Forest Conservation Act[3] in 1980 slowed the annual rate of diversion from 1,400 to 65 sq kms. Over 43,560 sq kms are subject to shifting cultivation and about 7,000 sq kms have been encroached for permanent cultivation. From about 0.20 ha in 1951 the per capita forest area declined to 0.11 ha in 1981.

The recorded forest area in the country is 75.18 million hectares, of which 66.65 million hectares are government controlled, and 8.53 million hectares community and privately owned. Nearly 40% of the former category are not "reserved" and their legal status (protected and unclassed forests) imposes only limited restrictions on their use by the people. Moreover, of the total recorded forest area, actual forest cover (with more than 20% tree canopy cover) extends only over 64.01 million hectares. There are heavy demands on India's forests to meet fuel and fodder needs. The estimated consumption of firewood in the country in 1987 was 157 million tons while the combined availability from forests and non-forest lands is only 58 million tons. The pressure of livestock grazing is high, and leads to forest degradation through loss of regeneration and soil erosion. Livestock population in the country today is well over 450 million animals, and it is estimated that nearly a fourth of these graze in forests.

Human habitations are interspersed throughout the country's forests thus fragmenting forest continuity. The population of tribals alone stands at 52 million, most of whom live within forest areas. It is estimated that about 33% of the livelihood of tribals is earned from forests. Earlier the brunt of these pressures was taken by the buffer of private and community forests, sparing the remoter 'reserved' forests. Such is the framework within which conservation programmes have to be planned and implemented in India.

Wildlife Conservation: Several initiatives have been implemented for wildlife and nature conservation in the country. In 1972 the Wildlife (Protection) Act (WPA) was enacted to deal with all aspects of wildlife conservation such as hunting and trade regulations, creation and management of national parks and sanctuaries, prevention and detection of offenses, and other miscellaneous provisions.

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2 Lal, 1989 is the main source of information on India's forests.

3 This Act requires prior approval of the Central Government before any forest land is put to non-forest use and compensatory afforestation is one of the stipulated safeguards while allowing such diversions, although this can never really compensate the functions and values of a natural forest.

Special projects were launched for endangered species and their habitats such as project tiger, a crocodile project, and the Gir lion project which have met with considerable success. State governments were supported in the development of national parks, tiger reserves, sanctuaries, zoological parks for captive breeding of endangered species, education and interpretation programmes, and so on. The National Wildlife Action Plan (NWAP) was adopted in 1983 which set out a charter of action to be taken on several important aspects of wildlife conservation including two relevant to utilization:

Components: 5.1 Support the management of captive propagation and breeding programmes for plants and animals, for re-introduction of threatened species to the wild and, *where appropriate, utilize species which are plentiful.* (emphasis added)

7.1 Develop research and monitoring facilities which will provide a scientific understanding of wildlife populations and habitats essential to their proper management and, *where appropriate, their utilization.* (emphasis added)

Hence, captive propagation and breeding programmes as well as a better scientific understanding of wildlife populations and habitats are recognized as essential prerequisites to the consideration of utilization proposals.

Trade in wildlife and wildlife products was brought under stricter control and matched with Export-Import Policy regulations. India also became a party to CITES and all other major international conventions on wildlife. Research and training activities have been stepped up with the establishment of the Wildlife Institute of India (WII) in 1982 which provides training and research support to state wildlife agencies.

In 1989 there were 47 national parks and 434 sanctuaries covering 151,340 sq kms and more are in the process of being established. Most protected areas (PAs) are small in size, with the average area being about 250-300 sq km, and are usually lacking in habitat contiguity to maintain viable movement corridors for wide ranging species and for genetic interchange. An agreed biogeographical classification was established for the country, based on the distribution of both plant and animal communities, and a rational network of protected areas suggested to the states for conserving the complete range of the country's biodiversity. With the implementation of these recommendations the number of protected areas would go up to 148 national parks and 503 sanctuaries with a total area of 1,15,000 sq kms. This will mean that 4.6% of the country's geographical area (nearly 15% of the forest area) will be covered (Rodgers and Panwar, 1989). National parks are PAs of a higher conservation status as compared to sanctuaries. However, a survey of the country's PAs to assess their management status (Kothari et al., 1989) revealed the high level of disturbance in them: 56% of the national parks and 72% of the sanctuaries have people living inside them; 67% of the national parks and 83% of the sanctuaries are subject to livestock grazing pressure; 36% of the national parks and 56% of the sanctuaries allow collection of a variety of non-wood forest products such as fruits, flowers, medicinal plants, resin, and fuelwood. Therefore, much of the wildlife habitat is disturbed, fragmented, or interspersed by human settlements, shifting cultivation in accelerating cycles, heavy domestic stock grazing, large scale hydel projects and so on. This pressure on wildlife habitats has also led to increased conflicts between people and wildlife.

The purpose of briefly describing the conservation of wildlife PAs in particular, and forests in general, is to highlight the prevailing level of biotic influence, which is crucial to a consideration of the sustainability question. India's population, going by the present growth rate of 2.25% per annum, is expected to reach 1,074 million by 2001. Nearly three fourths of the population inhabits rural India and by 2001 this is projected at 748 million (Tyagi, 1989). Obviously, under the circumstances, conservation of biodiversity can by no means be said to be secure.

WILDLIFE UTILIZATION

Use of wildlife and forest products, is regulated under two pieces of central legislation -- The Indian Forest Act, 1927 (IFA) and The Wildlife (Protection) Act, 1972 (WPA). Under the IFA a wide range of forest products are harvested through rights, concessions, and licenses. These products include trees, fruits, flowers, leaves, fuelwood, gums and resins, honey, small timber for construction and maintenance of houses, pasturage, rocks and minerals.

Lal (1989) estimates that nearly 25 million hectares of the 64 million with actual forest cover on it is used as "social forests" for obtaining small timber, firewood, fodder and other produce to meet people's needs.

Utilization of wild animals is governed by the provisions of WPA. The Act lists different species of mammals, birds, reptiles, amphibians, crustacea and insects under five different schedules, thus extending different legal levels of protection to them; those in schedule I being totally protected and those in schedule V the least. An important provision of the WPA is a recognition of the traditional hunting rights of certain tribes inhabiting the Andaman & Nicobar Islands. Although this exemption is very limited in its scope and application, the provision is important when it is considered from the point of view of the potential for its extension to other groups, if and when it is decided to allow such use in other parts of the country.

The Act provides for hunting of certain species under a license, and hunting under a permit system for special purposes such as research or collection. In addition, hunting is permitted when any wild animal becomes dangerous to human life or property or is diseased or disabled. Similarly, killing of any wild animal in self defence or in defence of another person is allowed. Currently, in 16 of the 31 states of India there is a complete ban on hunting through the grant of licenses and in the remaining a partial ban is in force (B.Majumdar, Pers. comm.). Where licensed hunting is allowed, the species generally hunted are wild boar, porcupine, partridge, quail and waterfowl. However, certain species can also be allowed to be freely hunted (by their inclusion in schedule V of the Act) in specific areas and for a specified duration. This measure is generally used for protecting agricultural crops in the vicinity of forest/wildlife areas. Therefore, adequate legal provision does currently exist to allow the regulated harvesting of certain species of wild animals by the people. Another aspect which is worthy of note in this respect is the fact that small mammals, birds and reptiles are regularly hunted by forest dwelling communities and tribals, principally for the pot or for medicinal applications. Although such hunting is in violation of the law (WPA) rarely are such cases prosecuted, unless there is a commercial angle to them, considering the benefits of such use.

Wildlife In Trade: Many species[4] of wild animals and plants and their derivatives are used for trade, both within the country and for export. This trade operates at three levels: one is the level where wildlife products are sold on a small scale and mainly for food and medicine. Collection of medicinal plants from the wild is reported to have assumed alarming proportions, even resulting in local extirpation of certain species (S.K.Mukherjee, Pres. comm.).

The second level of trade operates in the domestic market but the legal trade in wildlife and its products is virtually non-existent since the ban imposed in 1986 for certain over-exploited species. However there is a large trade in a variety of non-wood forest products such as seeds, flowers, resin, leaves, and bark commonly referred to as "minor forest produce (MTP)". Principal amongst these are leaves of the tendu (*Diospyros melanoxylon*) tree and seeds of the sal tree. The tendu leaf trade alone is said to generate revenues of over $300 million annually (Malhotra and Poffenberger, 1989). In the case of wild animal products there is also a very limited domestic trade in sale of reptile skin and fur skin articles made out of stocks declared by the traders prior to the imposition of the ban. Sea and fresh water turtles are sold in the markets of Calcutta in spite of legal restrictions because of the heavy demand from the local people.

The third level is the export trade which too is restricted both in volume and diversity. The only items now allowed for export (Anon. 1988) are articles manufactured out of peacock tail feathers (2,609,027 pieces + 320 kg in 1988), porcupine quill articles (75,100 in 1988), and shed antlers of deer (114,504 kg of articles in 1988), exotic birds bred in captivity, cantharidean beetles, venom of snakes, 14 species of cultivated orchids, and cultivated Kuth (Dostus sps.). In 1986, 68,699 orchid plants propagated in nurseries were exported (Anon. 1986) while 5,000 kg of cultivated Kuth roots were exported in 1988 (Anon. 1988).

Reptile Skins: Although export of snake skins from India was banned in 1978, export of manufactured articles was permitted to liquidate declared stocks of skins available with private traders and seized stocks. In 1987 and 1988 the agency exported articles manufactured using 153,328 and 63,388 skins respectively. Currently, even these

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[4] Timber and fish trade is being excluded from this discussion.

exports have been stopped under the new export policy. Monitor lizard skin is another favoured trade item of the reptile skin dealers. The stock position of skins held by some traders gives an idea of the volume of this trade:

	Snake		Monitor Lizard	
Place	Dealers	Stocks	Dealers	Stocks
Delhi	40	23,041 skins	4	2,248 skins
Bangalore	1	706,000 skins	1	66,364 skins
Calcutta	43	2,958,000 skins	38	2,768,000 skins
Madras	17	2,290,000 skins	7	1,930,000 skins

In November 1987, an illegal consignment of 60,000 monitor lizard skins was reported to have been intercepted near Delhi (Bisht, 1990).

Ivory: Ivory carving has long been a traditional industry. Both ivory of the Indian elephant and that imported from Africa was being used. Export of articles made from Indian ivory was banned in 1978 following India's joining CITIES, although domestic trade was allowed to continue. However, because of the problems in distinguishing between Indian and African ivory smuggling of Indian ivory also continued. The Indian elephant continued to be under heavy poaching pressure for its valuable ivory, and in 1986 even domestic trade was banned by amending the WPA. Since December 1989 the import of African ivory and re-export of articles fashioned out of it has also been banned, in concert with the CITES decision. Martin (1980, 1989) estimated that in 1978 there were 7,200 ivory craftsmen in India. By 1988 their number had fallen to an estimated 2,060 due to difficulties in getting raw ivory and restrictions on trade. Consequently, many carvers are said to have diverted either fully or partially to manufacturing items made of camel or buffalo bones (Bisht, 1989).

Fur Skins: The other major item of export was articles made of skins of furbearing animals such as jackal, jungle cat, desert cat, civet, hill fox, red fox and common fox. Although their export was banned in 1979, huge stocks were available with the traders, chiefly in Delhi and the states of Jammu & Kashmir, and exports continued until 1985. However, this exemption was being misused to replenish stocks from the wild thus severely endangering many of the species. While the stocks reported by the traders in 1979 was 883,000 skins, an inventory in 1984 revealed the stocks to be 1,083,000 skins even though a very large number of fur articles had already been exported in the interim. A complete ban on exports was therefore imposed in 1985. While illegal trade and smuggling of fur articles still continues it is known that many traders have shifted to dealing in other traditional items such as hand made woollen garments.

Frog Legs: Between the mid-1970s and mid-1980s, an average about 3,000 tons of frog legs were exported annually from India (Abdulali, 1985). Following agitations from the agricultural lobby that indiscriminate collection of frogs from paddy fields had resulted in increased insect pests requiring huge pesticide inputs, the export trade was discontinued in 1986. Although these exports were valued at about US$11 million annually, Fugler (1985) estimates that India may gain more in the reduced expenditures for insecticides and rodenticide, thus making the ban on harvesting economically advantageous. Efforts at captive breeding of the frogs used in the frog legs trade have not met with any success within the country and abroad (Fugler, 1985).

Rhesus Monkeys: The export of rhesus monkeys for drug testing in medical research in the west was suspended in 1978, following protests by animal rights organization. The other major reason was the serious decline in the rhesus monkey population throughout most of its range, largely due to habitat destruction. Lately reports have appeared in the Indian press that the export rhesus monkeys would be permitted again, but there is no confirmation about any policy decisions having been taken by the government in this connection.

Cage Birds: The bird trade in India, chiefly to support the export market, is quite significant. After a progressive reduction over the years, in 1989 22 species of birds were allowed for export. Between 1970 and 1975 the average annual export trade in cage birds from India was a staggering 1,859,000 birds (Inskipp and Wells, 1979), while in 1988 only 49,683 birds were exported (Anon. 1988). The current policy permits only captive bred exotic birds for export. Apprehensions of adverse impacts on wild populations have caused such restrictive policies to be

adopted. Yet domestic trade continues unabated. The main centre of bird trade is in the north (60 dealers). The average holdings of each dealer at any given time are over 25,000 birds, (S.S.Bisht, 1990). In addition to the licensed dealers a large number of people are involved in clandestine bird trade. Tribal cooperative efforts in raising hill mynas[5] in Meghalaya and Orissa (through removal of fledglings from nests and prompting the birds to lay a second clutch of eggs) is an example of how a sustainable trade could perhaps be organized to benefit the local economy (Sane, n.d.).

Illegal Trade: Illegal trade in wildlife and wildlife products continues, despite various controls and regulations, mainly for the export market. The extent and volume of this clandestine trade can only be estimated from the consignments which are periodically detected while they are attempted to be smuggled out of the country. The consignments encountered are mostly those of snake/reptile skins, fur skins, bear bile, musk of the musk deer, tiger bones, rhino horn, and ivory articles. The following table shows the number of snake skins seized by enforcement agencies in India between 1980 and 1987 (partial).

Year	Quantity	Year	Quantity
1980	856,745	1984	1,022,000
1981	713,956	1985	157,593
1982	746,564	1986	109,675
1983	706,440	1987 (till Oct.)	265,864

Source: Mukherjee, (1988).

The quantity which may have evaded detection and consequently smuggled out of India is anybody's guess.

Illegal Hunting: Between 50 and 100 rhinos are killed by poachers annually for their horn, even though the distribution of rhinos in the country is highly localized and intensive anti-poaching measures are being taken. Likewise, during the late 1970s and 1980s, it was estimated that over 100 elephants were being killed each year for ivory in South India alone (Sukumar, 1989). The poaching pressure on musk deer is difficult to estimate because of the difficult terrain and remoteness of the areas it inhabits and because of the relatively poor enforcement machinery in the Himalayan region. Nevertheless, reports of widespread snaring of the deer in this region are frequent. Green (1985) estimates that about 100-200 kg of musk originates from Pakistan, India, Nepal and Bhutan annually which when equated to musk deer means that 5,350-16,000 are killed every year in this region. The status of the lesser cats is also cause for serious concern as these species are mostly nocturnal and very little is known about their populations in the wild. Illegal consignments of their skins which are periodically intercepted while being smuggled out through Calcutta give an indication of the enormity of the trade pressure on these species (K. Chakraborty, Pers. Comm.). S.K. Mukherjee (Pers. Comm.) references a consignment containing 160,000 skins of jackal, jungle cat, desert cat, otter, fox etc. which was intercepted a few years ago in Delhi while on its way from Rajasthan to Jammu and Kashmir.

Therefore, in spite of several legal restrictions on trade and export there is still a disturbingly large volume of illegal trade in wildlife and their products which is deleterious to populations in the wild. This is also indicative of the inadequacies in enforcement, both against illegal hunting and against smuggling. Another aspect of this trade is that it is the dealers/exporters who corner all the profits rather than the local people and tribals who are employed as trappers and collectors and are paid a pittance.

WILDLIFE UTILIZATION PROPOSALS

The idea of wildlife farming in India grew out of a concern for the deleterious impact which illegal hunting and trade was having on certain species. In the 1980s feasibility studies were undertaken to explore the possibility of breeding selected species in captivity with a view to their sustainable commercial utilization. Three such studies

5: Song birds much preferred in the pet trade.

were undertaken under the aegis of an FAO-UNDP Wildlife Project. These investigations looked at the potential of Crocodile, Frogs, Fur and Butterfly Farming.

Crocodile Conservation: In 1975, the Government of India launched a Crocodile Breeding Project (CBP) with assistance from FAO-UNDP to rehabilitate the severely depleted populations of three crocodilian species in the country viz, Mugger or Marsh Crocodile (*Crocodylus palustris*), Salt-water or Estuarine Crocodile (*C. porosus*), and the Gharial (*Gavialis gangeticus*). Populations of these crocodilians had declined to alarmingly low levels due to heavy hunting pressure for their valuable skin and because of habitat destruction (Whitaker, 1989). One of the project objectives was that after crocodilian populations in the wild had been rehabilitated, captive breeding and rearing facilities developed under the project could support closed farming operations with a view to utilizing these commercially valuable species. Under the project 36 rearing centres were set up throughout the country. A centre was also set up to provide training in crocodile husbandry and sanctuary management (since integrated with the Wildlife Institute of India at Dehra Dun). By 1990 over 5,200 individuals of the three species had been re-introduced at 39 natural sites in the country (Choudhury, 1990). Re-introduced animals have been monitored to record their successful breeding and dispersal. They have also started breeding in captivity at over 25 centers (Chowdhury, 1985). As a result of the project the survival of the endangered Indian crocodiles has been assured (Chowdhury and Chowdhury, 1986). Currently 20,000-22,000 crocodiles are reported to be available in captive breeding facilities in the country, causing considerable concern as to their management and future.

Feasibility studies for crocodile farming were undertaken as part of the crocodile project (de Waard, 1975 and 1978) followed by a recommendation of the IBWL in 1982 that a pilot project should be taken up by the Tamil Nadu Forest Department (TNFD) in collaboration with WII, purely as an experimental operation, to establish the feasibility of crocodile farming in India. It was necessary to limit the scope of the project to an experimental level because the WPA does not provide for farming operations, while the pilot project could be taken up as a "scientific research" activity (Section 12(b) of WPA). Accordingly, a project document was developed by WII, for initiating the operation at Sathanur Dam in Tamil Nadu (Choudhury, 1985). However, due to several factors, including strong opposition from conservation groups and animal rights organizations, even the pilot project has not been started.

At the same time, Romulus Whitaker (1987, 1989) proposed crocodile farming as a tribal industry and the setting up of a commercial farm in Madras using initial breeding stocks of Mugger crocodile and the South American Caiman available in Tamil Nadu. The proposed farm was to employ Irula tribals, primitive hunter gathers of Tamil Nadu who used to hunt crocodile for food and skin and who now subsist mainly on gathered tubers, rats and grains obtained from rat burrows. Earlier, in 1978, Whitaker had successfully organized the Irulas into anti-venom drug units (Dravidamani, 1989). Captive breeding/rearing projects started recently for fresh water and sea turtles and appear to have high potential for the future. It could well become a test case for wild animal utilization schemes in India.

Frogs: The prospects for sustainable utilization of frogs have been investigated. A study (Fugler, 1985) commissioned by the Government of India looked at the feasibility of confined propagation of some commercially exploited frogs in India. Although noting that confined propagation of frogs of economic importance in sufficient quantities to meet commercial needs has not become feasible, the report recommends a two-pronged strategy: (i) restocking and artificial propagation and (ii) rearing in a closed facility. In the former strategy, frogs are cultured up to the post-metamorphosis stage and then released into their natural environment. Harvesting is done only after they attain maturity. Technical expertise is available within the country to take up this operation which requires minimal financial investments. The report therefore recommends that restocking should be considered as a prompt response to deter the continuing decline in population densities. Regarding intensive farming operations in a closed environment, the report recommends that it should be undertaken initially on an experimental (pilot project) scale and, after this has started at three suggested centres in Orissa, Kerala and Tamil Nadu, their commercial viability can be assessed in field trails.

An important issue to contend with in a harvesting operation is that of humane killing. It is reported that after the legs are cut off the front half of the frog is left to die a slow and painful death. Hence, public acceptability of farming and harvesting operations can be gained only after the cruelty aspect is accounted for satisfactorily.

Butterfly Farming: Looking to the experience of Papua New Guinea (PNG) in butterfly farming as a successful rural industry (Hutton, 1985a), the prospects of starting a similar activity in India were investigated. The report (Hutton, 1985b) strongly recommends the initiation of butterfly farming operations in India through the agency of tribals, to be preceded by pilot farms which could be used as training centres for potential farmers.

India has over 2,500 species and sub-species of butterflies and a long established but largely uncontrolled trade in collections from the wild. Although there is only one organized commercial collecting operation, butterflies are reportedly collected throughout the country for supply to research institutions, students, hobbyists and for the international trade through smuggling. Local and foreign traders usually employ tribals to collect butterflies, as they are very knowledgeable about their occurrence and habits. It is this potential and traditional knowledge which is suggested to be harnessed for farming operations.

The strategy suggested is that of "environmental enrichment" in which the natural habitat is made more suitable to butterfly breeding. It is a type of "ranching" operation where the density of nectar producing and larval food plants is increased, the undergrowth reduced of unwanted species, and predators controlled at various stages in the life cycle. The only prerequisites are: largely undisturbed habitat, naturally occurring butterflies, and a natural or artificial watercourse. The capital cost of establishing a facility such as this, presuming land is owned by the tribals, is as low as US$10 in the PNG example provided by Hutton.

However, in spite of the tremendous potential which butterfly farming has in enhancing the rural economy in forested regions in India, no effort has so far been made in this direction mainly due to a lack of initiative on the part of both government and non-government agencies. The overseas demand for butterfly specimens is said to be far in excess of the worldwide production and thus the economic feasibility of butterfly farming is beyond doubt.

Fur Farming: Farming of furbearing animals for the production of skins or pelts to supply to the traditional fur garment industry in the state of Jammu and Kashmir (J & K) was another area of interest in India in the early 1980s. Accordingly, the Government of India commissioned a feasibility study and a report was prepared by an international consultant who studied the trade and made specific recommendations (Cochrane, 1986). Cochrane estimated that 30,000 to 60,000 people in J & K were dependent on the fur trade for income. About 30-35 species and sub-species of wild furbearing animals were used in this trade but as a result of un-managed harvesting and demographic pressures on wilderness areas, many of these species had become extremely rare and categorized as endangered in India. It was on this consideration, as mentioned in an earlier section, that a complete ban on the export of wild furs and articles made from them was enforced in 1985. Fur farming was thought of as a viable alternative source of skins to sustain the fur industry in J & K and to mitigate the potential economic hardship to the large number of people involved in it.

The consultant's report suggests two possible solutions: i) finding a substitute for wild animal fur; and ii) intensive and scientific management of wild populations of selected fur animals for eventual sustainable utilization. Since the ban on exports, a large number of craftsmen and traders have shifted to working with alternative materials, and some have even started dealing in carpets and other handicrafts. Although some non-native fur was allowed to be imported in the past the economics as well as the problem of distinguishing between native and non-native skins made this an unviable alternative. The prospects of raising 11 native species (including the domestic rabbit) in farms for the production of pelts was examined in considerable detail in the report. The choice of species was narrowed down to ferrets, or Tibetan polecats (*Mustela putorius*) and the red or hill fox (*Vulpes vulpes montana*). The method of farming these two species, including designs of enclosures and other facilities in a farm, economics, harvesting, and marketing have all been discussed in Cochrane's report. Although capital investment of a very high order is called for in establishing a farm it is still considered a viable project. Non-native species (such as mink) are not suitable because of the environmental risk from escaped animals.

The fur farming proposal has not been implemented due to several factors. One is the high cost of the enterprise, but more important is the concern for safeguarding populations of fur bearing animals in the wild. With the available level of administrative and organizational infrastructure it is practically impossible to stop the movement of illegally harvested furs into legitimate trade channels. Moreover, the status of these species in the wild does not justify their use for commercial purposes. Another aspect is the growing international resentment against and

boycott of all fur articles, and India had already taken a lead in this regard by banning their exports in 1985. The problem of alternative livelihood to the artisans of the J & K fur trade has been substantially resolved by most taking to working with alternative materials or shifting to other handicraft items.

Other Examples: A large number of medicinal and aromatic plants are now being cultivated to ensure their sustained supply to drug manufacturers and to safeguard their wild gene pools. Rare orchids are now being raised through tissue culture process in eastern India for the export market. At the same time, wild orchids are being safeguarded through an area conservation strategy and a number of sanctuaries have been established. There are 14 private and three government owned orchid nurseries in the states of West Bengal (14), Sikkim (1), Meghalaya (1) and Arunachal Pradesh (1). Kuth is cultivated mainly in Himacahal Pradesh (HP) and Uttar Pradesh. In HP there are 592 farmers growing the crop in about 40 hectares producing annually between 400-500 tons (Mukherjee and Hajra, 1988).

The chital or spotted deer (*Axis axis*) and barking deer (*Muntiacus muntjak*) are among several species which were introduced into the Andaman & Nicobar Islands in the early part of this century. Given the island situation, ample food resources and lack of natural predators, their population increased rapidly to a level where it became necessary to control them. Initially bounty hunting was introduced to reduce chital populations, and in the 1970s licensed hunting was introduced. Licenses were also given to dealers who harvested the deer and sold the meat in the local market. Issue of licenses has currently been suspended to allow populations in the wild to build back to harvestable levels.

DISCUSSION AND CONCLUSION

Wildlife (and products therefrom) have been used in India, as indeed elsewhere, since time immemorial. However, unregulated consumptive commercial utilization is causing concern about the status and future of many species. In a vast, developing country like India where a mere one per cent of the national budget is allocated to the forestry sector and in turn one per cent of this for wildlife conservation, the infrastructure and organization available for effective conservation is highly inadequate. This includes not only the enforcement staff required to assure the physical integrity of wildlife and wilderness areas but also the technical capability required to plan and implement scientific management. This situation is compounded by the inexorable growth of human and livestock populations who make growing demands on forest resources. Consequently, a lot is left to be desired in the implementation of wildlife conservation plans and programmes and the resulting conservation effectiveness at the field level.

Programmes and projects for wildlife conservation in the India seek to redress this situation. One of the thrusts of this strategy is to look to the problems of rural people living in the vicinity of wildlife PAs. These people are adversely impacted by certain wildlife conservation policies which deny them access to traditional resources. Furthermore, wild animals damage their crops and instances of human and livestock killing are not uncommon. Conventional rural development strategies have proved ineffective in improving the welfare of such people, further increasing their dependence on wild biomass resources. The resulting forest degradation not only aggravates the marginalisation of these people but also undermines the conservation effort.

Projects are being planned, therefore, to integrate the development of such rural communities in the forested regions with that of the wildlife PAs. Area specific measures will be prepared and implemented to upgrade the productivity of private lands and common property resources. Alternatives and means of more efficient use of resources are to be provided. Restoration of degraded wastelands will not only make available fuel and fodder resources but also result in the creation of secondary wildlife habitat to be used by wildlife dispersing from adjacent core conservation areas. It is only through such integrated planning and management strategy, and with the support of local people, that the conservation status of PAs can succeed in the long term.

After the restoration of degraded habitats and recovery of depleted wild animal populations, wildlife utilization can be considered meaningfully and sustainably. Otherwise it would only mean adding yet another kind of pressure to an already beleaguered resource. The potential productivity, within the limits defined by environmental and other limiting factors in a particular area, should be realized before any offtake can be considered to be sustainable. While this is the *in situ* harvesting situation, in an intensive closed farming operation the above factors do not

operate. Here other considerations come into play. For instance, one of the major problems is to ensure that wild stock does not enter the legitimate trade channels. There is also the question of ethics raised in this connection. Further, a massive regulatory and enforcement machinery is required to oversee such operations.

An argument which is frequently put forth to justify commercial wildlife is that it generates resources for conservation. However this rarely happens, as the administrative and organizational infrastructure required to manage a countrywide programme of this kind would itself entail huge investments. Moreover, the revenues so generated can easily be diverted into other sectors depending upon the relative priority which the concerned government may assign to wildlife conservation. Therefore, the objectives of a wildlife conservation and utilization programme will have to be clearly defined at the very outset.

Another frequently used justification to press for commercial hunting in the Indian context is that populations of many species have grown as a result of wildlife and PA conservation measures and are causing depredations in adjacent village areas. Consequently there is growing resentment among local people who are demanding that these animals be eliminated or adequate protection provided to safeguard their lives and property. Such problems of local overabundance and resultant depredations are being regularly dealt with under the hunting provision of WPA described earlier. However, an across-the-board dispensation for all areas and all species is obviously fraught with dangers. In fact, such local over-abundance is often the result of incongruities in land use, encroachments into wildlife habitat and the loss of habitat quality (Chauhan and Sawarkar, 1989). Therefore, these problems must be investigated and rational and pragmatic strategies, including population regulation if necessary, devised and implemented to tackle them.

In a country such as India, where the pressures on wildlife are so great, the primary objective is to mitigate the pressures and enhance the protection of wildlife and habitat to enable their long-term viability. Only then can we hope to conserve our biodiversity, environmental values and natural life support systems, and assure a better quality of life for our people. In this context, the welfare of the rural communities who reside in the vicinity of wildlife areas assumes special significance. The strategy of improving the lot of such people through eco-development has been described earlier. A natural corollary would be giving people a stake in the conservation of wildlife and wildlife areas. One of the ways that this can be achieved is through a system of economic incentives and sharing of resources. Once the productivity of village, community, and wastelands is restored, the biomass resources generated in terms of fuel, small timber, fodder, pasturage fruits, fibre and some common wild animals should be available for harvest by the local people in a regulated and sustainable manner. Although initially the use of such resources may be for meeting bonafide local needs, at a later stage, when surplus productivity becomes available, its use for trade/commerce could be allowed. This would also include hunting rights on private lands which could be sold to sport hunters, for certain specified species. Organizing and conducting wildlife based tourism can be another attractive enterprise for the people. Farming or ranching of deer or other species in fenced forest patches can contribute to meeting their protein needs, particularly of tribals used to hunting traditionally (Panwar, et al. 1990).

As all this would require some regulation and discipline the responsibility for enforcement should also be transferred to the community itself. The role of the government agencies in such areas will then be limited to providing technical guidance. An advantage of such a cooperative management system is that revenues accrue to the people and it contributes directly to their socio-economic welfare. Once people derive economic benefits their support for conservation would be forthcoming more readily. It will then be in their own interest to safeguard the resource from misuse and ravage, thus in turn benefiting the overall conservation effort. Such a strategy accords well with the principles of PAs buffer zone management. However, the concept of buffer zones in the Indian context cannot be confined to the legal boundaries of PAs because of their generally small size. Buffer zones include the multiple use areas around PAs, such as rural ecosystems, forests managed for other objectives, and revenue wastelands. Therefore, an active buffer zone management strategy, including the eco-development component, must take into account all these areas for treatment.

That such a management system is possible and will yield successful results is borne out by the experience of cooperative forest management between forest departments and communities living on the edge of forested areas. A well known example of this comes from the state of West Bengal where beginning in the early 1970s the forest

department has involved the local people to protect degraded but viable sal (*Shorea robusta*) forests, allowing them to regenerate and increase their productivity for both communities and government (Malhotra and Poffenberger, 1989). The people are organized into Forest Protection Committees (FPC) which protect the assigned forest lands on a voluntary basis and in turn are given the exclusive rights to restrict access, use minor forest products, and a 25% share in the timber at the time of final harvest which may take 10-15 years. So far 1,684 villages have formed FPCs covering 200,000 hectares of degraded forest which is now regenerating.

The programme has yielded increases in household income between Rs2/- to Rs9/- per day, within two to three years after protection was initiated. Similar successes have been achieved in Orissa, Haryana, Gujarat and Himachal Pradesh and, nationally, it is estimated that over 500,000 hectares or forest land are already under community protection through joint management agreements (Poffenberger, 1990). Other examples of cooperative/community forest management are available in the form of the Van Panchayat System in the hills of Uttar Pradesh (Ballabh and Singh, 1988; Guha, 1989), Tree Growers' Cooperatives in Andhra Pradesh (Anand Mohan, Pers. comm.), and Interface Forestry in Tamil Nadu (S.Dutta, Pers. comm). Such movements toward community ownership and management of forests in the country are gaining ground and proving successful. The concept can be extended to the management of wildlife also in such multi-use habitats. However, the choice of species to be harvested has to be made carefully to safeguard endangered species.

There is also strong justification for promoting the non-consumptive utilization of wildlife in India. As of now wildlife tourism is restricted to a few well known protected areas and there is great potential for its extension to other areas (Panwar and Raoo, 1989). Allowing local communities to manage various tourism related services such as board, lodging, transportation, guide facilities and ancillary business opportunities will not only contribute to their socio-economic welfare and reduce their dependence on wild living resources, but will also provide an incentive to protect wildlife. Tribals have found employment as game trackers, guards and elephant mahouts in many PAs throughout the country (Singh, 1986). In this manner their valuable traditional knowledge and skills are also harnessed in the conservation effort.

Forest and wildlife resources are renewable and can be unhesitatingly utilized, provided resource productivity is sustainably ensured with due regard to multilateral environmental concerns. In India, unrelenting pressures over the past several decades have led to impoverishment of forest and wildlife resources. Inappropriate and inadequate rural development inputs in wilderness regions have exacerbated the problems, resulting in marginalisation of the people inhabiting such areas and increasing their dependence on forest resources. Because of these ecological and socio-economic problems field conservation has to take precedence over commercial wildlife utilization projects. The former would *inter alia* entail enhancing productivity of the resource through rehabilitation and restoration of degraded forests and common property resources with full involvement and direct economic benefits to local people. Traditional sustenance linked utilization practices will also have to be rationalized so as to be sustainable in the long term. It is only after such recovery of the resource base that commercial utilization of wildlife should be considered, primarily to benefit the local people. For this purpose a cooperative or community system of management regimes, needs to be adopted so that benefits flow directly to the people.

ACKNOWLEDGEMENTS

I am grateful to my colleagues in the Wildlife Institute of India – Messrs B.C. Choudhury, Ajith Kumar and S.K. Mukherjee for their assistance in the preparation of this paper. I am particularly grateful to Mr. S.S. Bisht, Deputy Director (N.R.) Wildlife Preservation, G.O.I. for providing me with a wealth of information on wildlife trade. I thank Mr. H.S. Panwar, Director WII and Dr. W.A. Rodgers, FAO Expert, for their comments on an earlier draft of this paper.

REFERENCES

Abdulali, H. 1985. On the Export of Frog Legs from India. Jour. Bombay Nat. Hist. Soc 82(2): 347-375.

Anon. 1970. The Indian Forest Act, 1927 (16 of 1927). Ministry of Law, Government of India.

___ 1972. The Wildlife (Protection) Act, 1972 (53 of 1972). Ministry of Law, Justice and Company Affairs, Government of India.

___ 1983. Annual Report: All India Coordinated Research Project on Ethnobiology. Department of Environment, Government of India.

___1983. National Wildlife Action Plan. Department of Environment, Government of India.

___1986. CITIES Annual Report. Ministry of Environment and Forests, Government of India, New Delhi.

___1988. CITIES Annual Report. Ministry of Environment and Forests, Government of India, New Delhi.

Ballabh, V. and Singh K. 1988. Van Panchayat in Uttar pradesh Hills: A Critical Analysis. Research Paper of Institute of Rural Management, Anand.

Bisht, S.S. 1989. Ivory - Pattern of Import and Utilization in India. Unpublished, 7 pp.

___1990. D.O.letter No.1-89/90-WN/1914, dated 23 June, 1990.

Chauhan, N.P.S. and Sawarkar, V.B. 1989. Problems of Locally Over-Abundant Populations of Nilgai and Blackbuck in Haryanan and Madhya Pradesh and their Management. Indian Forester, 115(7):488-493.

Choudhury, B.C. 1985. Feasibility Study of Mugger Crocodile Farming in 'Closed-Circuit' Farm at Sathanur Dam, Tamil Nadu. Crocodile Research Centre, W.I.I., Hyderabad 19 pp.

___1990. Indian Crocodile Conservation Situation Report: Action Plan for the 1990's. Paper presented IUCN/SSC/CSG Meeting Gainesville, USA, April 1990. 12pp.

___ and Chowdhury, S. 1986. Lessons from Crocodile Reintroduction Project in India. The Indian Forester, 112(10):881-890.

Cochrane, R.L. 1986. Fur Farming in Kashmir. UNDP/FAO Project IND/82/003. Establishment of the Wildlife Institute of India. 44 pp. plus appendices.

Deb, D.B. 1980. Edible wild plants of North East India. In: Report on International Consultation on Wildlife Resources for Rural Development, 7-11 July, 1980, Ilyderabad, India. Tiger Paper Vol.VII No.3

de Waard, J.M. 1975. Economic Potential of Gharial and Saltwater Crocodile Schemes in Orissa, with notes on the Sea Turtle Industry. Working Paper F.O. IND/71/033.

___1978. Economic Potential of Indian Mugger Crocodile Farming (Crocodylus palustris). Project Working Document. F.O: IND/74/046.

Dravidamani, S. 1989. A Statistical Report on the Irula Snake Catcher's Cooperative Society. Hamadryad, 14(1):20-22.

Eltringham, S.K. 1984. Wildlife Resources and Economic Development. John Wiley & Sons Ltd.

Fugler, Charles.M. 1985. The Distribution, Basic Biology, Ecology, Export and the Confined Propagation of the Commercially Exploited Frog. Rana Tigrina with comments on Other Species of Economic Importance. UNDP/FAO Project IND/82/003, Establishment of the Wildlife Institute of India. 32pp.

Gadgil, M. 1980. Wildlife Resources as Food. Tiger Paper, Vol.VII, No.3.

___1985. a. Cultural Evolution of Ecological Prudence. Landscape Planning. 12 (1985) 285-299.

___1985 b. Social Restraints on Resource Utilization: The Indian Experience. In: Mc Neely, J.A. and Pitt, D. (Eds.). Culture and Conservation: The Human Dimension in Environment Planning. Croom Helm Ltd., London.

___and Malhotra, K.C. 1983. Adaptive Significance of the Indian Caste System: an ecological perspective. Annals of Human Biology, 10:465-477.

Green, M.J.B. 1985. Too Many Himalayah Musk Deer Being Killed. Otyx, Vol. XIX, No.3. July. pp.130-132

Guha, Ramachandra. 1989. The Unquiet Woods: Ecological change and Peasant Resistance in the Himalaya. Oxford University Press, Delhi.

Hudson, Robert J., Drew, K.R, and Baskin, L.M. (eds) 1989. Wildlife Production Systems: Economic utilization of wild ungulates. Cambridge University Press.

Hutton, Angus, F. 1985 a. Butterfly Farming in Papua New Guinea. Oryx, Vol. XIX, No.3 July pp.158-162.

___ 1985 b. Butterfly Farming in India. UNDP/FAO Project IND/82/033. Established of the Wildlife Institute of India. 66pp. plus appendices.

Inskipp, Tim and Wells, Sue, 1979. International Trade in Wildlife. Earthscan, London.

Katti, M.V., N. Mukherjee, S., Sharma. D. 1990 Wildlife Survey in Arunachal Pradesh With Special Reference to Taking. Wildlife Institute of India. Dehra Dun, 104 pp.

Kothari, Ashish, Pande, P., Singh. S., Variava, D. 1989. Management of National Parks and Sanctuaries in India. A Status Report. Indian Institute of Public Administration, New Delhi.

Kyle, Russel. 1987. A Feast in the Wild. Kuda Publishing, Oxford, U.K.

Lal, J.B. 1989. India's Forests: Myth and Reality. Natraj Publishers, Dehra Dun, India.

Malhotra, K.C. and Poffenberger, M., editors. 1989. Proc. Working Group Meeting - Forest Regeneration Through Community Protection: The West Bengal Experience, West Bengal Forest Department, 53 pp.

Martin, E.B. 1980. The Craft, the Trade and The Elephants. Oryx, Vol.XV, No.4, August. pp 363-366.

___1989. The Decline and Fall of India's Ivory Industry/ Pachyderm. Vol.10. Newsletter of the African Elephant and Rhino Specialist Group of IUCN.

Mukherlee, S.D. 1988. Proposal to Include Rat Snake, Cobra and King Cobra in Appendix II of CITIES. Note submitted to Ministry of Environment and Forests, Govt. of India. 15 pp.

Panwar, H.S. 1989. Protected Areas in Conservation of Genetic Resources in India - Goals, problems and strategies for management. Paper presented at WWF-India Symp. on Biodiversity Conservation, New Delhi, November, 1989.

___Rao, K. 1988. Guidelines for Tourism Development in Protected Areas. Report prepared for the Ministry of Environment and Forest, Govt. of India, 17 pp.

___Rajvanishi, A., Guatam, P., Murlidharan, V.V., Rastogi, A. 1990. A study of Impacts of Bodhghat Hydel Project Upon Wildlife and Related Human Aspects With Special Reference to Wildlife Buffalo Conservation in Bastar. Wildlife Institute of India, Dehra Dun, India.

Poffenberger. M. 1990. Forest Management Partnership: Regenerating India's Forests. The Ford Foundation. New Delhi.

___1990. Joint Management of Forest Lands. The Ford Foundation, New Delhi.

Prescot-Allen, Robert and Christine 1986. What's Wildlife Worth: Economic contributions of wild plants and animals to developing countries. Earthscan and IIED.

Rao, V.V.R. 1980. Wild Plant and Animal Resources in Tribal Diets. In: Tiger Paper, Vol. VII No.3.

Rodgers, W.A. and Panwar, H.S. 1988. Planning A Wildlife Protected Area Network in India. 2 Vols. Wildlife Institute of India, Dehra Dun.

Sane, Sharad R. No date. Some Aspects of the Wildlife/Pet Trade in India. 41 pp Wildlife Institute of India Reprint Collection.

Singh, L.A.K. 1986. Public Involvement in the Indian Crocodile Conservation Programme. In: Webb, G.J.W., Manolis, C.S., and Whitehead, P.J. (eds.). Wildlife Management: Crocodiles and Alligators. Surrey Beatty and Sons Pty. Ltd.

Sukumar, R. 1989. The Asian Elephant: Ecology and Management. Cambridge University Press, U.K.Tyagi, R.P. 1989. Population Growth and Distribution in India. In: W.A. Rodgers et al., (eds.) Wildlife and People. Wildlife Institute of India, Dehra Dun (in press).

Whitaker, R. 1987. Crocodile Farming as a Reserved Tribal Occupation. Project Proposal submitted to the Department of Environment, Govt. of India and the Indian Board for Wildlife, 19th September, 1987. p

___1989. Crocodile Farming as a Tribal Industry, Herpeton, 2(1): 7-12.

WILDLIFE UTILIZATION IN INDONESIA

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INTRODUCTION

Indonesia covers an area of 580 millon hectares, about 200 millon of land area and 380 millon of sea. Approximately 74.8% of the terrestrial area (or about 143 millon hectares) is still forested (FAO, 1990). The land and seas of Indonesia form one of the world's greatest treasure houses for plants and animals. The country's tropical climate, vast extent, complex shape, wide range of altitudes and climates together with its geographical position spanning the gap between Asia and Australia have resulted in an area of incomparable faunal and floral richness. The Indonesian archipelago is home to more than 1,500 species of birds, 500 species of mammals, 3,000 species of fishes, 10,000 species of trees, and a correspondingly large number of other life forms. Indonesia is one of the major centres of biodiversity in the world and ranks first for species richness in mammals, first in swallowtail butterflies, third in reptiles, fourth in birds, fifth in amphibians and seventh in flowering plants. To protect this biodiversity and the range of ecosystems on which it depends, the Indonesian Government has established an extensive system of terrestrial conservation areas on all major islands and 10 million hectares of coastal and marine reserves.

Indonesia is also a country with a high human population, currently 165 million people and growing 2.3% annually. Almost seventy percent of the population makes a living as rural agriculturalists. As the population increases and demand for land becomes greater the areas of species-rich lowland forests is being eroded. Habitat loss is the main threat facing many wildlife species in Indonesia. Since earliest times the country's rich natural resources have been utilized by local people and wildlife utilization is still an important component of the daily lives of millions of Indonesians. Many small communities make a livelihood from marine and freshwater fisheries, while others such as the Dayaks of Kalimantan, the Mentawai islanders, and the tribal peoples of Irian Jaya, rely on hunting to meet their protein needs. The government's goals, through the Conservation Department of the PHPA, is to conserve the varied wildlife while allowing traditional use of natural resources and encouraging sustainable harvesting strategies.

Marine species which are traditionally utilized in Indonesia include coral reef fish and squid, marine fish, dugongs, whales (hunted from Lamalera in Nusa Tenggara), marine turtles, seabirds and algae. On land bats, squirrels, monkeys, deer, wild pig, forest rats and other small mammals as well as maleo eggs, swiftlet nests and freshwater fish are harvested for food. Many species such as wild pigs and deer are common, while others like marine turtles, exploited for their eggs and flesh, may become threatened by over exploitation. Indonesia has already taken measures to give total legal protection to many species of plants and animals and is attempting to regulate and control trade of other wildlife such as the green and hawksbill turtles.

The Indonesian government is also actively seeking ways to captive breed and ranch certain useful wildlife species so that these resources can be exploited sustainably in the long term without endangering wild populations.

A HISTORY OF WILDLIFE UTILIZATION

Archaeological remains show that early humans were hunter gathers, sometimes with significant impact on wildlife species. Indeed over hunting in the Pleistocene may have led to the extinction of tapir and orang utan on Java, just as poaching threatens the survival of the Sumatran rhino today. All communities, from subsistence hunters to sophisticated town dwellers, rely on wild-caught marine and freshwater fish. Hunting game for sustenance and sport has been important for centuries. Many species of wildlife have been caught for domestication, e.g., wild banteng and the productive Alabio ducks of southern Kalimantan. Animals have been kept, tamed, reared and bred for food, skins, work and war. In North Sumatra elephants were kept as status symbols by the sultans of Aceh in the past. Today marauding elephants are caught and trained at the elephant school at Way Kambas as circus performers and, more recently, to move timber in logging concessions.

Nature conservation also has a long history in Indonesia. The first nature reserve in the archipelago was established as early as 684 A.D. in the kingdom of Srivijaya in southern Sumatra, illustrating the early Hindu appreciation of the value of all animal life. The establishment of nature conservation areas, as we recognize them today, began in Dutch colonial times. In 1774 the Council of India members donated a six hectare parcel of land to the local community council as a reserve. In 1889 the first sizeable nature reserve was created at Cibodas in West Java by the Director of the Bogor botanic gardens to protect the montane forests - this is now part of the Gn. Gede national

park. Over a hundred more reserves were established prior to Independence, many as hunting reserves, allowing the regulated exploitation of wildlife. Since 1945 the Government of Indonesia has extended the protected area network with a planned goal of including 10% of all terrestrial areas within reserves.

Measures have also been taken to protect individual species of plants and animals, starting with a ban on exploitation of the birds-of-paradise in East Indonesia on 1890. In 1924 an ordinance was passed to protect eight species of mammals and 53 species of birds. Nevertheless export of protected species continued but permits limited such trade to no more than two live specimens of any kind of mammals and/or four species of birds at any one time and destination; ivory tusks weighing less than 5 kilos; and scales of pangolin. Reptiles were not protected and more than two million skins were exported annually.

In 1932 under a new Ordinance relating to Nature Monuments and Wildlife Reserves, habitat management for the benefit of wildlife populations was permitted within wildlife reserves. Grazing areas were cleared in some reserves such as Ujung Kulonand and contributed to an increase in population of such species as banteng in the park. Since Independence in 1945 two basic tenets of the Constitution (Pancasila) have influenced policy related to conservation and wildlife utilization, namely: "...shall protect the whole of Indonesian people and their entire native land, to advance the general welfare of the people".

Wildlife utilization guidelines in Indonesia stress the need to improve the productivity of the system so as to meet the needs of the people. In the 1960s and 1970s the Department of Forestry, the government body responsible for wildlife utilization, adopted a policy of managing habitats to enhance productivity of wildlife. It was therefore permitted to log in wildlife reserves to encourage secondary vegetation for grazing wildlife. Sport hunting and exploitation culling were also allowed within wildlife sanctuaries.

In the late 1970s and 1980s, under the influence of FAO and IUCN,there was a change in government policy to enhance protection of species and habitats. With the assistance of FAO, PHPA prepared a National Conservation Plan to rationalise and extend the protected area network in all seven major biogeographic regions of Indonesia. The Ministry of Forestry also accepted the concept of the National Park and today Indonesia has 24 national parks. In accordance with the World Conservation Strategy of IUCN the emphasis of conservation policy in Indonesia became "the wise use of natural resources".

REGULATION OF WILDLIFE UTILIZATION

Wildlife utilization in Indonesia has been regulated by several laws and regulations:

1) 1909 Dieren Bescherming Ordonantie (Law related to the Wildlife Protection).

2) 1916 Natuurmonumenten Ordonantie (Law related to Nature Reserve).

3) 1924 Jach Ordonantie (Law of Hunting).

4) 1931 Dieren beschermings Ordonantie (Improvement and replacement of Law related to Wildlife Protection, 1909).

5) 1941 Natuurmonumenten Ordonantie (Improvement and replacement of Law related to Nature Reserve and Game Reserve, 1916).

6) 1940 Jacht Ordonantie (Improvement and replacement of Law related to Hunting, 1924).

7) 1967 Basic Law of Forestry.

8) 1985 Government Regulation on Forest Protection.

9) Ministerial decrees on wildlife protection, trade and traffic.

10) 1990 Conservation of Living Resources and their Ecosystems. This law, enacted on 10 August 1990, supersedes all previous regulations.

WILDLIFE UTILIZATION AND TRADE

Wildlife utilization in Indonesia can be defined under several headings: collections, scientific purposes, subsistence needed (animal protein) and trade. Ninety per cent of registered wildlife trade is for export to other countries. At present wildlife utilization and trade involves at least 15 species of amphibians, 40 species of reptiles, 94 species of birds, 6 species of mammals, 34 species of coral and fishes. Wildlife utilization also continues for food, sport, rituals, and trade. Sponges and pearls, shellac, butterflies, crocodile skins, dugong teeth, swiftlet nests, turtle meat, sea shells, reptile skins, ornamental fish, and primates for medical research are all collected for trade. For many of these species PHPA is encouraging wildlife management practices to increase wild populations, by restocking (e.g. crocodiles), improving the habitat of captive breeding and ranching traded species. Many traded wildlife species are harvested directly from the wild e.g., monitor lizards, long-tailed macaques and others. Unless there is sound evidence of a decline in wild populations, the capture quota for non-protected wildlife is formulated according to the average numbers utilized during the previous three years.

TRADED WILDLIFE SPECIES

Primates

Of the 28 species of primates found in Indonesia, three are in demand for biomedical and pharmacological research: *Macaca fascicularis* (long-tailed macaque), *M. nemestrina* (pig-tailed macaque), and *Presbytis cristata* (silvered leaf-monkey). By far the largest demand is for the long tailed macaque. Another primate species with possible potential for research is the Sulawesi macaque *Macaca nigra*, a protected species, since it is the only monkey known to exhibit human diabetes spontaneously. The worldwide demand for *M. fascicularis* is in the region of 35,000 animals per year, of which Indonesia exported 15,866 (1989) and 9,234 (until September 1990). Exports of *M. nemestrina* were considerably less: 308 (1989), and 570 (1990). *P. cristata* is a useful model for the study of filariasis; only 36 leaf monkeys were exported in 1989 and 12 in 1990. To guarantee the long-term availability of primates for biomedical research it is necessary

a) to ensure that wild populations are adequately protected in their native habitats; and

b) to establish captive breeding programmes to provide clean animals for research and remove the necessity for capturing them from wild populations.

The low price for wild-caught macaques is one of the greatest threats to the security of long term supplies. Although most primate exports are wild-caught animals, Indonesia has already three captive breeding facilities for *M. fascicularis*. Long-tailed macaques for biomedical research are now being bred in semi-wild conditions on Pulau Tinjil and P. Deli off Java. The director of this facility, Dr Chuck Darsono, recently received the Senior Biology and Conservation Award from the American Society of Primatologists, in part in recognition of his work to reduce the trade of wild-caught primates.

Birds

Birds of 94 species were exported in recent years. Of the 10 most popular species, six are parrots (*Cacatua sulphures. C. alba, C. goffini, Lorius garrulus, Trichoglosus haematodus*, and *Eos bornes*). White-headed munia *Lonchura maja*), Spotted munis (*L. punctulata*), Java sparrow (*Pada orizivora*) and the parrot finch *Erythrura prasina*, are the others. The widely traded Zebra doves (*Geopelia striata*) are already bred in captive programmes. Indonesia has 85 species of parrots. Irian Jaya alone has 44, of which 39 are known to be traded. Of the parrots that occur in Irian Jaya only *Probosciqer atterumus* is listed on Appendix I of CITES while the rest are included

in Appendix II. All the species of parrots that are exported from Irian Jaya are wild-caught. Five of these are legally protected *Lorius lory, Eclectus roratus, Psittricas fulqidus, Probosciger aterrimus* and *Cacatua galerita*.

The parrot trade is a rural development as well as a conservation issue. The trade in parrots can be made sustainable if it is carefully monitored and controlled and PHPA is actively seeking ways to address these problems. Attempts are being made to captive breed some parrot species. The situation that can arise if wild bird populations are overexploited is well-illustrated by the case of the Bali myna. This species is now reduced to very low numbers, probably less than 20 birds, because of extensive trapping in its native habitat in Bali Barat N.P. There are many captive birds in both Indonesia and overseas and the myna breeds well in captivity. PHPA, in cooperation with ICBP, is engaged in a programme to reintroduce 20 pairs of captive-bred Bali Mynas (*Leucopsar rothschildii*) to Bali Barat N.P.

Reptiles

Forty species of reptiles are listed in the wildlife trade records in Indonesia. The ten species most in demand are:

Varanus salvator	1,342,725	1989	926,934	1990
Cerberus rynchops	543,991	1989	219,289	1990
Phthon reticulatus	559,556	1989	191,422	1990
Achrocordus javanicus	62,901	1989	109,619	1990
Naja sputatrix	127,872	1989	161,775	1990
Pyas mucosus	388,860	1989	98,626	1990
Tryonix cartilaquenus	19,547	1989	85,647	1990
Homalopsis buccata	62,901	1989	28,305	1990
Crocodylus novaequinae	17,542	1989	12,937	1990
Naja hannah	4,000	1989	10,000	1990

There are 11 species of monitor lizards *Varanus* in Indonesia. *Varanus salvator* skins are the most in demand for export to Singapore (1989), Japan, Taiwan and Europe. Most of the skins are derived from North and South Sumatra, West Kalimantan, South Kalimantan and East Kalimantan, and some form Java, Sulawesi and Nusa Tenggara (Luxmoore and Groombridge, 1989). To ensure that the harvest is sustainable the annual export quota will be kept at not more than 850,000 skins. Capture quotas for each province are distributed according to wild population size. The PHPA plans to issue export permits to closely match the quota recommended by CITES, and to establish monitoring programmes to determine the current population level of the *Varanus* in exploited as well as unexploited areas to assess the impact of hunting.

Concern has also been expressed over the decline of wild populations of crocodiles and marine turtles in Indonesia. In order to strengthen wild populations, restocking programmes have been implemented for *Crocodylus porosus*, *C. novaequinae*, and for green turtles *Chelonia mydas* and hawksbill turtles *Eretmochelys imbricata*. Captive breeding programmes relying on eggs or hatchlings from the wild have been established for crocodiles and hawksbill turtles.

The Asian Bonytongue

Many species of ornamental fish are traded in Indonesia but perhaps the most famous and most expensive is the Asian bonytongue (*Scleropages formosus*), or dragonfish. There are three varieties of this fish (red, yellow and green) of which the red variety is the most highly priced. Until recently all dragonfish were captured from the wild

but the expensive red variety is now successfully bred in captivity in West Kalimantan for export to Japan and Taiwan. 2,000 fish fry were produced in 1990 at one Kalimantan facility. Nevertheless many of the traded dragonfish are still wild-caught as are the females for the breeding programme. The Indonesian population of *S. formonsus* was transferred from Appendix I to Appendix II of CITES in 1989, subject to an annual quota of 1,250 (1990), 1,500 (1991) and 2,500 (1992). The annual world trade in red dragonfish is estimated to be between 6,000 and 13,000 of which up to 90% are bred in captivity. The trade in yellow and green forms is much greater but very few are bred in captivity. The fish are normally sold at a body length of 8-10 cm because they can be transported more easily at that size.

To minimize the threat to the wild population, it would be preferable if export were limited to only those fish that had been bred in captivity. In addition it is desirable to set a maximum size limit of 15 cm for the fish that are exported (Luxmoore, 1990). Following the successful breeding efforts of the two dragonfish breeders in West Kalimantan the PHPA plans to establish a monitoring system to make sure that exported fish are in fact captive-bred. This will involve periodic visits to the farms to check the number of the fry produced and checking the records kept. All exports of live fish will require CITES export permits. PHPA also plans to strengthen the procedure for prohibiting the illegal export. More field surveys will be carried out to determine the geographic distribution of the species within Indonesia and the size of viable populations of the three varieties.

CONTROL OF PEST SPECIES

Various animal species have become pests either due to loss of their natural habitat or due to rapid increase in numbers beyond the carrying capacity of the environment. In such cases PHPA has instituted culling or capture systems to reduce numbers. Feral buffalo (*Bos bubalis*) are believed to compete with banteng *Bos javanicus* in Baluran National Park in East Java; they may also transmit disease to the wild cattle. PHPA has implemented a culling programme. Wild elephants (*Elephas maximus sumatrensis*) have become a problem in Sumatra where loss of natural habitat has forced them to raid agricultural fields. PHPA staff round up problem animals which are then trained for work at the four elephant training schools.

Other pest species such as wild pigs raiding agricultural fields, various doves and other seed predators, may also be culled or captured. Many traded macaques are captured when raiding farmers fields and provide a small source of income to local communities.

INTERNATIONAL EFFORTS TO ASSIST REGULATION OF WILDLIFE TRADE

Indonesia has received considerable international criticism for some aspects of wildlife trade conducted. The conservation authorities in Indonesia recognize that the situation here is far from perfect and are already implementing new measures and legislation to control and monitor trade. Control of the trade, however, is not a matter for Indonesia alone. Most of the traded wildlife is exported overseas.

The Indonesian authorities would welcome international cooperation and support:

- to suppress the illegal trade through both domestic and foreign ports;
- to develop conservation and management programmes, involving wildlife utilization;
- to monitor species status, species trade and the sustainability of present levels of utilization;
- to provide input and expertise to the IUCN Species Survival Commission.

On behalf of PHPA I would like to invite all concerned conservation bodies - IUCN, WWF, Asian Wetland Bureau and other conservation NGOs - to assist Indonesia with our efforts to improve our conservation and wildlife utilization programmes so that harvests are sustainable.

REFERENCES

Luxmoore, R. and Groombridge, B. 1989. Asian monitor lizards, a review of status, distribution, exploitation and trade. CITES.

Luxmoore, R. 1990. Trade and captive breeding of Asian bonytongues in Indonesia. TRAFFIC Bulletin, 11 (4) : 73-75

MacKinnon, J. and Artha, B. 1981/1982. National Conservation Plan for Indonesia. (8 vols). F.A.O. Bogor.

WILDLIFE DEVELOPMENT IN NIGER
PROBLEMS AND POTENTIAL

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INTRODUCTION

The West African state of Niger belongs to what is now known as the SAHEL, a region subject to drought and desert encroachment. Meeting in Madrid in 1984, IUCN passed a motion expressing grave concern at the deterioration of this environment. Since then, there has been increasing IUCN concern for the SAHEL leading to the planning and launch of the SAHEL programme in 1988.

Niger has a surface area of 1,267,000 sq km and 7.2 million inhabitants. The population is mainly rural and increasing at an annual rate of 3.1%. Niger faces intractable economic problems which make it difficult to manage its slender renewable natural resources.

In view of this pressing need to improve the balance between the utilization of natural resources and their conservation, Niger has tried to conserve its wildlife by putting the emphasis on legal restrictions and regulations. Thus, since independence (1960), the authorities have taken great care to maintain the existing network of protected areas and to prevent unlawful inroads into the wildlife population. Accordingly, there has been an absolute ban on hunting since 1972. Unfortunately, contrary to expectation, wildlife has not developed enough for significant exploitation. Instead, progressive decline has been followed by total disappearance of wild animals in agricultural and grazing areas, which have spread in an unprecedented way over the past 30 years. Wildlife habitats are now occupied by crops or cattle as a response to the concern for survival of rural people facing problems of food. It is understandable why, today, wildlife only exists in protected areas and places where access is difficult.

Government action on behalf of wildlife has prevented it from making a contribution to the struggle for self-sufficiency in food. This strategy will have to be changed if wildlife is to form part of the country's development programme.

It is very fortunate that, despite these problems, recent counts under IUCN auspices are optimistic. For the decade ahead, we are sure that change for the better is still possible, bearing in mind the assets of sites like Koulbou, Bolsi, the Niger River valley, Ekrafane Ranch, cattle breeding centres where wildlife exists, the Termit Mountains and the protected area network. Here are some thoughts on policies and directives which would change the government's approach to wildlife:

- Diversification and broadening of the role of the state, with a change of general approach to issues such as research into self-sufficiency in food, the fight against desert encroachment and the role of protected areas;

- Highlighting the economic role of wildlife, emphasizing income enhancement for direct users of rural areas;

- Increasing education and availability of information to the public at large to respond to the need for national awareness of our environmental problems;

- Promotion of land management projects and development of natural features, including treatment of surface water.

Some feasible and desirable measures to promote wildlife utilization would be:

- Village hunts, for villages such as Koulbou, where small game are still a major source of protein for the human population. In such cases, a hunt with firearms could also be organized, but the inhabitants of the region would need to be closely involved so that some of the income came their way;

- In the Niger River Valley, bird hunting is possible to ensure a measure of protection for crops, provide income for surrounding villages, businesses and the state;

- At Ayorou and Kouré, villages which have the last remaining giraffes and hippopotami, promotion of sightseeing is desirable, with tours organized to channel income to the residents who have accepted certain restrictions on the exploitation of natural resources;

- Ekrafane ranch, the initial aim of which was to produce sheepmeat, beef and veal, can be reconverted after the liquidation of the company which ran the ranch. This 110,000-hectare ranch would be very suitable for semi-intensive ostrich rearing. This would produce a range of commercially viable products: meat and eggs for human consumption, leather for goods, feathers for traditional ceremonies and eyes for medicine.

To do this, the following would be necessary:

- The government would have to change the way Ekrafane was farmed;
- Families of former employees of the ranch would be reinstated;
- A strict plan for wildlife would be needed.

It should be noted that despite Ekrafane's many assets, ostrich rearing can only be economically viable if care is taken to resolve technical and administrative problems.

As for the protected areas, development of these should focus on the advantages they offer to the locals, the state and the authorities.

ANALYSIS OF THE PRESENT WILDLIFE SITUATION IN NIGER

Although wildlife in Niger has never been the subject of detailed research which could provide reasonably accurate and reliable statistics, it is no exaggeration that our wildlife currently numbers barely 10% of what existed 20 years ago. Moreover, the actual composition of this wildlife has changed for the worse with the disappearance from Niger of the leopard (*Panthera pardus*), the giant pangolin (*Manis gigantea*), the hunting dog (*Lycaon pictus*) and the African clawless otter (*Aonyx capensis*). Some species have become so rare that special attention will have to be given to the surviving populations in Niger if they are to survive. This is true for the Addax (*Addax nasomaculatus*), the cheetah (*Acinonyx jubatus*), the giraffe (*Giraffa camelopardalis*), the hippopotamus (*Hippopotamus amphibius*), the topi (*Damaliscus korrigum*) and certain reptile and bird species.

It is very fortunate that, despite this real threat, wildlife in Niger is still rich and varied, with more than 150 mammal species, approximately 400 bird species and at least 150 species of reptiles and amphibians.

It is also our duty to see that our programmes include measures to lessen these threats and put the survival and development of fauna on a realistic, achievable basis.

REASONS FOR THE DECLINE

As in most countries of the SAHEL, responsibility for environmental protection and natural resource management in Niger lies exclusively with the state. It is exercised through government involvement in conservation policies and depends on availability of human and financial resources. Thus, the Niger authorities have insisted since independence on maintaining protected areas established by the colonial authorities and to applying legislation they inherited from that time.

Since 1964, the authorities have been strengthening the legislation, including a temporary ban on hunting for a two-year period, extended several times up to 20 July 1972, since when there has been an absolute ban on hunting. Contrary to expectation, wildlife has not developed enough to make any appreciable utilization possible. Instead, progressive decline has ended in total disappearance of wild animals in areas recently used for farming and grazing purposes, which have spread in an unprecedented manner over the past 30 years.

Driven by drought and desert encroachment and attracted by the increase in permanent sources of water, the farmers have moved, on a more or less permanent basis, to very marginal areas where, despite the difficulties of

terrain, abundant wildlife had developed. Similarly, when farmers have encountered problems with arable land, their response has been to plant water-dependent crops north of the acceptable boundary, causing the disappearance of natural plant cover and wind erosion of soil. It is therefore understandable that wildlife today only exists in protected areas and places where access is difficult.

First of all, we need to consider the reasons for the shortcomings of government wildlife measures before considering various possible approaches to sustainable use of this resource.

SHORTCOMINGS OF GOVERNMENT INTERVENTION

Without overlooking the vital role which the state can and must play in natural resource management, it is evident that state action alone is not enough to shield natural areas from being spoiled. In Niger, we now acknowledge that state policies, though essential, are not enough. Once established, the regulations must be accepted by farmers, both arable and of livestock. We also recognize that, without a realistic appraisal of the rights and duties of these land users, no measures by the authorities will succeed in improving the quality of the environment. Indeed, it is already perfectly clear that, in order to be effective, government measures must offer more incentives.

If we do not provide any alternative solution for smallholders fighting for survival, the pressures on plant cover, surface water and wildlife will inevitably intensify with runaway population and economic problems. Wildlife in Niger has not been unaffected by this, and the present occupation of the best habitats by crops and cattle reflects the anxiety of rural inhabitants about their own food and survival. We have not given our wildlife the chance to show its usefulness and cease to be a mere burden on land users. To do so, we need to translate the interests of the nation into individual interests of the "grassroots" user of the land. We will need to develop systems allowing direct users of natural resources to profit from wildlife if we wish to ensure its survival.

As P.P. Vincke pointed out at the seminar on wildlife management in the SAHEL (P. Vincke, 1987), African governments have invested between 100 and 1000 times more money on promoting domestic livestock than on wildlife conservation and development of fishing. However, less than 10% of cattle feed the rural people. Niger has only been investing in wildlife for 10 years, and this has been limited to the recently protected areas of Aïr and Tenere. It is therefore hardly surprising that Niger's private investors are unaware of the possibility of wildlife management as an economic proposition. Due to sustained publicity over the past few years, some private investors in Niger have begun to plan ranching activities. However, the present state of the habitats and the lack of technical staff mean we have to be cautious about these operations, especially where there is doubt as to the suitability of the land destined for this kind of use.

In another context, wildlife development has failed to live up to expectations, as the measures concentrated on the protection of species rather than on agriculture and whole ecosystems. Thus, outside the protected areas, many habitats suitable for wildlife development have been systematically taken over by peripatetic intensive rearing, because the priority was for research into self-sufficiency in food. Self-sufficiency became the excuse for encouraging clearance of land, trees and scrub, well-boring and incursions into fragile environments, where only sound wildlife management could have made sustainable use possible.

Lack of public concern for environmental issues is also a major reason for the under-estimation of wildlife as a resource. This is due in part to the well-known shortage of the technical expertise which would bring these environmental problems to the public eye. The body responsible for wildlife management in Niger consists of generalist foresters with little concern for wildlife development. It is also not surprising that Niger still has no private, Nigerian organization practically involved in nature conservation. Efforts are being made to remedy this with the recent formation of ONVPE (Niger Volunteer Organization for the Protection of the Environment), an organization which is trying to get established and involved. The ANV (Niger Green Alliance) is also in the process of being set up. But Niger has nothing like countries such as Kenya, which has over 1,500 school, wildlife and nature clubs (World Commission for the Environment and Development, 1988).

Despite these factors, recent studies financed by IUCN are optimistic. It is not yet too late to give wildlife the resources it has hitherto lacked so that it develops and is capable of sustainable use by the people of Niger.

DESIRABLE APPROACHES

Turning to the coming decade, we are sure that positive changes are still possible, given the present state of wildlife and certain habitats. Where circumstances are favorable wildlife is still growing, despite the difficulties previously mentioned. This is true for areas such as Koulbou, Bolsi and the Niger Valley in the west of the country, and a certain number of locations which have enjoyed exceptional conditions such as the cattle breeding centres and the Termit mountains. Fortunately, we think there is still a certain base to build on. Policies and directives can focus on channelling resources into the following seven areas:

5.1 Diversify and broaden the role of the state, redefining approaches to aspects such as research into self-sufficiency in food, the general fight against desert encroachment, environmental protection, the system of land tenure, traffic and trade in wildlife products, care of natural plant and animal clusters, the role of protected areas and the rights and duties of direct users of the land and its resources.

We are glad to note that the rural code now being prepared in Niger pays careful attention to many of these points. However, certain aspects, such as the system of land tenure, can only be tackled very gradually, relying heavily on education and public awareness so that the people of Niger really understand the need for re-shaping certain policies and changing the approach in certain areas of involvement. The working party on rural development is already making a considerable contribution. It should be given careful attention in short and medium term decision making. Moreover, the revision of the national plan against the spread of the desert, started recently with the help of UNSO (the UN Sahel Office), will integrate all aspects of rural development, including wildlife appreciation. In addition to this, Niger has been in contact with the Environmental Law Department of IUCN for assistance to update our environmental legislation in the light of present and future concerns.

Finally, our concerns coincide with those of the IUCN SAHEL programme which plans to support the SAHEL countries in setting up national conservation strategies (SNCs).

This process involves a "critical analysis of present use of natural resources through evaluation of the present and potential state of those resources, the study of imbalances in resource utilization and causes of pressures" (General approaches of the SAHEL Programme, revised edition, February 1990, IUCN).

5.2 Highlight the economic role of wildlife by offering as many chances as possible to gain income for men and women "at the grassroots", while favoring the development of systems to prevent abuses.

This is the role of IUCN pilot projects. These projects aim to "show how more efficient natural resource management systems can improve opportunities for rural communities to develop sustainable use of these resources for their livelihoods." The assurance should be given, however, that the aspect of use of wildlife by the rural world is given sufficient emphasis by these projects.

5.3 Enhance education and public information to meet the need for national awareness of our environmental problems. IUCN and the CEC (Commission of the European Communities) have just started environmental education programmes aimed at schools. To consolidate the work of these programmes, it is important to go outside schools and encourage the establishment of private groups concerned with conservation.

5.4 Encourage "land management" and "plant life development" schemes and projects to include treatment of surface water, as this is an indispensable tool for the rejuvenation of natural areas in general and consequently of wildlife habitats.

5.5 Encourage training of wildlife development specialists and start research programmes on the subject. Without these preconditions, it would be unwise to consider ranching or intensive breeding of certain wildlife species.

5.6 Acknowledge the need for studies on environmental effects of certain development projects, and to take account of the findings.

5.7 Further integration of protected areas into regional and local development planning. This would lessen conflicts with people living in or near these areas.

POSSIBLE AND DESIRABLE EMPHASES

Obviously, if we want to move towards genuine appreciation of wildlife in Niger, we have to recognize the specific characteristics of areas which are still usable for the purpose, and the socio-economic features connected with people who live there. The IUCN-sponsored wildlife study identified nine cases for special analysis into the interdependence of physical sites and the economic factors typical of these parts of the country.

It is, however, clear that the anticipated payoff will not be immediately felt, especially if there are no changes to favour private investment.

In the hope that the present awakening to these issues in Niger will help us to persevere in research into better resource use, we suggest that specific actions be taken in the following areas to develop sustainable use of wildlife where forms of exploitation may vary according to the natural context and socio-economic conditions.

The Case Of Kolbou Village

At Koulbou, a small village in south-west Niger adjoining Burkina Faso, the state of plant and wildlife and the relationship between small game and the human population give a high profile to the productive role of wildlife. This is a site where natural and socio-economic conditions already favour the profitable exploitation of wildlife by direct land users. The preliminary conclusions of wildlife research have just confirmed that conditions favour the development of birdlife and small mammals and reptiles. The *Phasianidae* family would be particularly suitable, as three species are already common enough on fallow land to pose a certain threat to sorghum and millet seedlings. The *Francolinus bicalcaratus* (black partridge) is perfectly adapted to fallow land conditions and offers an important source of protein for the people, who continue to exploit it despite the ban on hunting. The *Francolinus clappertoni* (Clapperton's partridge) is also developing and forms another source of protein for the village dwellers. The *Numida Meleagris* (guinea fowl), also very common in the fallow land, is developing despite collection of its eggs in the rainy season.

In the *Anatidae* family, consisting mainly of aquatic birds, there is the *Plectopterus gambensis* (armed duck or Gambian goose) and the *Sarkidiornis melanota* (helmeted duck) which nest around the village ponds, using the plants around the water. These species often fall prey to children whose animal protein requirement is met mainly from birds and fish.

Large mammals used to be common in this area but for about ten years now large ungulates have only been to the area accidentally during the rainy season.

Despite the absence of large ungulates, it is interesting to note that Koulbou would be excellent for the organization of a controlled village hunt. It would allow assessment and identification of the not insignificant contribution of wildlife products to the population's basic needs. It would also be an opportunity to give scrubland owners responsibility for resource use avoiding such abuses as collection of eggs and fledglings.

It would be appropriate to revise the laws governing hunting in Niger to define the rights of rural populations before introducing hunting with firearms, where feasible. With hunting, plans should be made to involve villagers as land

managers and wildlife users, welcoming and escorting non-resident hunters. Revenue distribution systems between the state, owners of infrastructures, and villagers will be needed.

In this way, it will be possible to launch a new programme in Niger: one of scrubland development with involvement of land users in view of the urgent need for proper management of village land. Wildlife will then be able to recover its place in the village economy (which is not exclusively a market economy), in social rites, in nature appreciation, in scientific research and finally in the overall development of the country.

The Case Of The Village Of Bolsi

Natural conditions and the state of resources are comparable here to those of Koulbou with one essential difference: the surface water shortage in the dry season, the only bar to systematic occupation of all uncultivated natural spaces by extensive rearing. Partridge, guinea-fowl and small rodents are fairly common here. Antelopes have become scarce but the rainy season always sees a return of ungulates and carnivores. Exploitation could affect birdlife and small mammals, but account will have to be taken of the presence of breeders in any question of providing water sources to increase wildlife development.

The Niger River Valley

This is the favorite haunt of aquatic birds in the dry season after nesting around the pools. Hunting would be possible here, as well as trapping by traditional methods. Prior to any exploitation, hunting zones and sectors will need to be delineated. Licenses for exploitation will be assigned to private administrators who will have to install reception facilities for hunters and organize hunting under control of the authorities. The role of hunting in this area will be fourfold: to ensure a certain protection for rice growing along the river; to generate income for certain villages, businessmen and the state; contribute to the development of tourist attractions; and to encourage investment in wildlife development.

It is clear that strict measures will have to be taken to prevent exploitation in prescribed areas and to set a time limit to the hunting season.

The Case Of Ayorou And Kouré Villages

These two villages are known as the two sites where the last populations of hippopotamus (Ayorou) and of giraffe (Kouré) exist. The past few years have seen major efforts by the Government of Niger to save these species. Local tourism from Niamey has begun and it is comforting to note that the human populations of the villages are now very much in favour of the rehabilitation of hippopotami and giraffe.

Some families have even developed a system of sightseeing, which has been important to Ayorou and its Hotel Amenokal. The giraffe is now effectively in a refuge area after totally disappearing from around the Niger river upstream from Niamey. Fifteen years ago Ayorou was the principal attraction for tourists because of giraffes, but for about 10 years the species has totally disappeared there. Today, with the remarkable recovery of the giraffe's habitats, there could certainly be benefits in re-introduction, but special arrangements would be needed against poachers from a neighboring country, whose massacres of this species caused its total disappearance from the area.

Ekrafane Ranch

The ranch was created in 1966 to produce sheepmeat and beef for the Niamey market and for export. The 110,000 hectare ranch is certainly the largest in West Africa. SONERAN (the Niger Society for Exploitation of Animal Resources) was founded at the time to manage the ranch. After twenty years of normal operation, the company ran into huge difficulties and for some years now it has been in liquidation.

The natural conditions of the ranch are still very good and its infrastructure is in place. Perhaps the time has come to consider putting it to different use.

We would point out that, when the ranch was set up, Ekrafane had significant populations of *Oryx dammah* (Oryx algazel), *Gazella dama* (damas gazelle), *Gazella rufifrons* (red-fronted gazelle), *Gazella dorcas* (dorcas gazelle), *Struthio camelus* (ostrich), *Otis arabs* (great Arab bustard), *Neotis denhami* (Denham's bustard), *Eupodotis senegalensis* (white-bellied bustard), *Vulpes pallida* (pale fox), and *Canis aureus* (golden jackal). All that was needed was a little investment to develop such rich natural resources.

Today, the grazing land is in a very good state and the hydraulic facilities, roads and buildings only need bringing back into use. So wildlife development is still possible, despite all the measures to eliminate it. There are still two gazelle species (*Gazella rufifrons* and *Gazella dorcas*), many bird species including bustards (*Otis arabs* and *Neotis denhami*), vultures, eagles, kites, and the famous secretary bird (*Sagittarius serpentarius*). Finally the presence and activities of carnivores such as the pale fox and the golden jackal show that Ekrafane is doing well despite the difficulties of the beef-rearing management. There could be an oryx breeding centre to re-introduce it to the wild, a possibility which is being studied under the auspices of the London Zoological Society, the "IUCN Captive Breeding Specialist Group" (SSC) and other sponsors.

As well as this, Ekrafane could well take on a commercially oriented ostrich breeding programme. There are fair prospects for developing this kind of breeding, given the range of products with commercial potential: meat, eggs, leather, feathers, and eyes. It is, however, clear that such operations cannot be carried out without solving the following problems:

- Government decision on how to use Ekrafane.
- Reinstatement of families of former ranch employees.
- Establishment of a strict development plan (to include exploitation) of natural resources.

Ekrafane fortunately has sufficient assets to persuade decision makers to opt for development starting with wildlife:

- Habitats still in a very good state.
- Presence of wildlife despite all deliberate pressures.
- Hydraulic infrastructure, roads and buildings and protection available after some restoration.
- Fair distribution of hydraulic infrastructures over grazing land.
- Very wide natural area.
- Fairly near to national capital.
- "Specially protected area" status recognized by populations of Filingue district.

It will have to be acknowledged, however, that economic benefits from breeding say of ostriches cannot be significant unless precautions are taken to resolve all the technical and administrative problems of such a venture. It would not be wise to encourage private investment before extending minimum guarantees to technical staff.

Other Cattle Breeding Centres

As well as Ekrafane ranch, other areas have been designated and developed, especially as "cattle breeding centres". Despite the human presence and activities favoring cattle, some species of wildlife have stayed and adapted to the new conditions of exploitation. This applies particularly to the dorcas and red-fronted gazelles, the large Arab bustard and a large number of predators.

This wildlife has finally found refuge of a sort in these centres developed for cattle because grazing is generally good despite the bush fires which sometimes cause serious damage.

Use of this wildlife can therefore be considered. Good organization of hunting could provide wild animal protein which, at present, is only available to poachers. Trapping licenses could also be issued in answer to the many requests for authorization to breed wild animals made to the Ministry in charge of wildlife.

PROTECTED AREAS

Niger covers three bio-geographical areas: the Sudano-sahel, the Sahel area and the Sahara. Each biogeographical area has protected areas which, as a rule, are representative of the ecological units, typical habitats, and communities of the country. We thus have:

W National Park And Adjacent Reserves

These protected areas are representative of the plant and animal colonies of the Sudano-sahel area. This has the greatest biological diversity, and has become the only refuge of mammals in the Sudanian area, which amount to 57% of all wild animals in Niger.

Among the large mammals of these areas are the following:

Loxodonta africana (African Elephant)
Sincerus caffer (African buffalo)
Hippotragus equinus (roan antelope)
Alcelaphus buselaphus (haartebeest)
Damaliscus lunatus (Sassaby)
Tragelaphus scriptus (Bushbuck)
Trichechus senegalensis (West African manatee)
Panthera leo (lion)
Orycteropus afer (aardvark).

It is undeniably desirable to protect at least a few of the ecological units where these species live. It is also important that these reserves enjoy popular support and participation, especially from the neighboring residents.

Our experience of reserve management has unfortunately taken insufficient account of the need for real participation by local communities in conservation. This is why, since November 1990, we have started a partnership programme for residents adjacent to the W National Park and neighboring reserves, and to give them special treatment. A series of operations will therefore be carried out: protection against erosion and bush fires, gathering medicinal products, improvement of grazing, agriculture and tourism.

The Tamou reserve, next to W Park, could be gradually reoriented towards exploitation, bringing profit to the villages. It would not be impossible to plan for ranching in this reserve.

Gababegi Reserve

This is the typical example of Sahelian habitats. Created in 1955, it included such species as the oryx algazel, ostrich, domma gazelle, and abundant birdlife.

Today the only antelopes are the red-fronted gazelle and the dorcas gazelle. A rehabilitation programme is in progress and we hope, with the support of Netherlands Co-operation, to reconcile conservation with sustainable use. We are therefore planning to re-create ostrich habitats and to re-introduce the species from Aïr.

The reserve development plan must go outside the strict boundaries of the protected area to a sufficiently wide geographical zone to embrace all the neighboring communities. The experience of the Aïr-Tenere project will have to be used to induce residents to appoint local representatives as direct spokesmen with management. Jobs will be created, a top quality environment maintained, and agro-forestry and environmental education furthered, to strengthen relations with the people and local authorities. This will be the best way of incorporating the reserve in the district development plan for Dakoro, the regional capital.

Aïr And Ténére Reserves

The interest in this zone goes back to 1979 when IUCN and WWF sent a consultant to assess the state of Niger's arid habitats and the resources of flora and fauna. The reports from this mission revealed that there were many things to protect in Aïr and Ténére. IUCN and WWF support continued until a national nature reserve and an integral reserve were established to try to reverse the trend towards disappearance of certain animal species and their habitats. A natural resource conservation project in Aïr and Ténére was drawn up and implemented. The project has come a long way, and many lessons have been learned through it on natural resource management, involvement of people, and environmental education. Involving people in the project was one of the main aims of the programme, now in its second phase and covering such major and diverse areas as planning, research, motivation, education, nature protection, rural development and tourism development.

Although assessment of the first phase of the project revealed some deficiencies, the experience of Aïr and Ténére is unique in Niger and is worth trying elsewhere. It continues to improve as part of overall research into the preservation of the biodiversity of the Sahelo-saharan environment covering threatened species such as *Addax nasomaculatus* (addax), *Gazella dama* (damas gazelle), *Gazella leptaceros* (slender-horned gazelle), *Ammotragus lervia* (barbary sheep), *Acinonyx jubatus* (cheetah) and *Neotis nuba* (Nubian bustard).

The international importance of the Aïr and Ténére national nature reserve is heightened by the presence here in this arid land of plants on the IUCN red list such as *Olea lapperinei* (wild olive), *Pennisetum glaucum* (wild millet) and *Sorghum actiopicum*.

All this has earned us support from IUCN and WWF for a second phase of the Aïr and Tenere conservation project. This will concentrate on setting up a realistic development plan for the reserve including institutional aspects, planning of actions, review and processing of data obtained, and assessment of assets and drawbacks.

This plan will be the main co-ordinator of important activities affecting the human populations, rural development, resource development and protection, research and its follow up, and finally administration.

All this explains the size of the investments now being made in this project. IUCN and its supporters are fortunately aware that it is first necessary to invest in order to raise the level of production and conservation, and then to look for good and sustainable profits.

The Termit Mountains

This is the last outpost of "wildlife" in a hyper-arid environment. The presence of the addax in this region is sufficient in itself to justify actions favoring nature. A wildlife investigation project observed four individual *Addax nasomaculatus* (addax) on 22 July 1990, and tracks of five others, clear evidence that, in Niger, the addax still exists in its natural environment. This same mission observed addax in the Kasana region northeast of the Termit mountains, and were pleased to note the presence of habitats suitable for addax life. Over 120 individual dorcas Gazelles were counted.

According to information obtained, damas gazelle, barbary sheep, *Canis zerda* (fennec), golden jackal and other small mammals are still present in the area despite pressures from some herds of cattle and especially from the Paris-Dakar rally, the only negative effects to reach Termit. Fortunately, for two years the rally routes have heeded warnings from conservation institutions. Reptiles, birds and batrachia are also represented here, which

makes Termit an exceptional site for conservation of biodiversity in a hyper-arid region. Even the *Oryx dammah* still exists in this little known area.

There was a need for closer knowledge of the area, and our research into the wildlife will give special emphasis to evaluating the potential of and constraints to conservation of biological diversity in the area in the triangle Aïr/Tenere Reserve South - Kawar - Termit and neighboring areas. A better assessment can then be made of the migration needs of the addax, gazelles and birds which live in Niger's arid zone. Account can be taken of archeological finds, cultural and historical riches in developing the area for organized tourism.

The international importance of sites such as Termit could help find financial and technical support to save, while there is still time, traces of the unique wildlife of the Sahara desert as a whole.

CONCLUSION

Without deluding ourselves, it is our firm intention in Niger to save what is still there to be saved, to restore to our environment all its capacities for production and maintaining life. We are confident and think that, despite all the various depredations which our environment suffers today, Nature has still not totally lost its ability to recover.

Between two extremes, we choose that of hope, which encourages us and strengthens the desire to create, start, renovate, rehabilitate and develop. We know that the process of development is a long one and will have to be sustained to bear fruit. We also know that the approaches to development taken by our countries are not always compatible with the over-riding need to conserve the base of all life, Nature. We also know that the will is there and that Niger can, with the help of countries which have been able to "conserve and develop", benefit from their experience, the various forms of aid, and especially the growing awareness among its people.

Wildlife in Niger will survive and flourish if we prove its value by giving it the necessary investments for it to play a productive role and be used in a sustainable fashion.

This is why we hope that the Survival of Species Commission (SSC) of the IUCN will take note of the available potential and the will of Niger to make its wildlife a usable and useful resource in the long term.

EVOLUTION OF SUSTAINABLE UTILIZATION OF WILDLIFE IN AUSTRALIA - CURRENT POLICIES AND PROGRAMMES

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CANBERRA, AUSTRALIA

INTRODUCTION

Since our time on Earth humans have interfered with wild plants and animals either by using them for food, clothing, shelter, or as cultural items, or simply competing with them for space.

Interference with a population of a plant or animal impacts on that population in some way. The extent to which a population is altered as a result of interference by people may threaten the continued existence of that population.

As humans evolved and became the dominant species, both numerically and technologically, their impact on wildlife increased. There are unfortunately many examples where wild species of plants and animals have become extinct by excessive use of them. Furthermore our need for space has destroyed essential habitat and displaced wildlife. International concern for the rate at which many of the world's wildlife was becoming threatened with extinction through excessive international trade was expressed at a conference in Washington in 1973 which concluded the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The principles of sustainable use of wildlife were further advocated in the World Conservation Strategy in 1980.

Before addressing the subject of sustainable utilization of wildlife, it is necessary to define precisely what is meant by the expression.

* Utilization of living resources can be consumptive, either for subsistence or commercial purposes, or non-consumptive.

* Utilization can only be sustainable when it is practiced on a renewable resource and the harvest, or rate of off-take, is equal to or less than the recruitment rate for the population.

THE AUSTRALIAN SITUATION - PRINCIPLES AND PHILOSOPHIES

The colonization and development of Australia has been at a cost to the natural environment. Broad-acre clearing of vegetation has not only led to problems of increasing soil salinity and loss of topsoil which has severely impaired the productivity of some lands over time, but has significantly reduced the amount and variety of habitats available to support populations of wildlife.

The traditional approach of the developed world to address the issue of wildlife conservation, by acquiring suitable lands for dedication as national parks or nature reserves, is an option becoming less available in many parts of the world. There are economic and societal constraints on the extent to which a country's lands, rivers, wetlands, and territorial seas can be excluded from commercial or subsistence production in order to preserve habitats for native wildlife. The supply of land suitable for nature conservation purposes is limited. Areas that do become available are expensive to acquire and require continued public funding for management. The view may be held that the acquisition of land for general conservation purposes by governments is tacit admission that strategies for the integrated management of resources has failed and there is no option other than to "lock" land up for conservation purposes.

Furthermore, in many cases, there is doubt that areas set aside for conservation are not of sufficient size to sustain viable populations of particular wildlife or ecosystems for which they were initially dedicated. The conservation of wildlife threatened with extinction necessitates the acquisition, protection and management of suitable habitat. The exclusive use of this option for general conservation purposes tends, however, to polarize public attitudes towards nature conservation; it alienates landholders and they in turn are perceived by sections of the public as environmental vandals. The successful implementation of integrated sustainable land-use programmes will depend on them being acceptable to all interest groups. Divisions between communities over past attitudes and practices will only serve to disrupt programme formulation.

Effective long-term conservation of Australian wildlife ultimately depends on preserving adequate areas of suitable habitat. The retention and maintenance of suitable habitat on agricultural or pastoral land are dependent on the attitudes and practices of landholders. Many landholders, faced with competing economic land uses, may perceive such areas as unproductive or, in extreme cases, as refugia for plants and animals that are capable of inflicting economic damage and loss of income. The ability of land-holders to derive an income from the commercial use

of wildlife, either directly or indirectly, would ascribe a value to areas of natural habitat and thus enable areas of natural vegetation to compete with other forms of economic, and possibly more destructive, land-use.

It will be necessary for governments and industry to restructure traditional farming practices in Australia, to introduce greater flexibility in the financial administration of agriculture, during the research and development phases, in order to establish incentives to change attitudes. The use of this strategy in concert with programmes that provide incentives for the control of introduced plants and animals, and programmes to re-establish native vegetation, together with changes in land management practices, have the potential to maintain or enhance overall productivity in a manner that is environmentally sustainable. In this regard it is important to recognize that the lands, rivers, wetlands and territorial seas are a country's fundamental assets that provide the basic support systems for life, as well as economic assets that produce food and other valuable natural products.

Relatively few species of Australian native wildlife have biological characteristics that are compatible with sustainable commercial use. However those species which exhibit the necessary attributes can, if managed and marketed correctly, act as "umbrella" taxa and provide the economic vehicle by which a suite of other species that depend on the same habitat can effectively be conserved outside of protected areas. Properly managed, programmes for the sustainable commercial use of wildlife can ensure the conservation of species and genetic diversity. In the case of plants, commercial use can even enhance such diversity.

Utilization of wildlife may take many forms, ranging from the extreme of removing individuals from a population, to the more benign non-invasive form of observing and photographing wildlife. Regardless of the use to which wild populations of plants or animals are subjected, there is a need for the responsible government authority to regulate the intensity and manner of all uses of wildlife.

Under the Australian Constitution responsibility for the conservation and management of wildlife is vested in each State and Territory. However, in cases where management involves commercial export of parts and products derived from specimens taken in accordance with a State or Territory management programme the Commonwealth Government is able to influence strategies and the level of regulatory controls applied by the State or Territory authority. The legislative mechanism by which the Commonwealth Government is able to influence commercial use of wildlife is the Wildlife Protection (Regulation of Exports and Imports) Act 1982. Regulations under this Act specify the major elements that must be contained in a management programme in order to be approved by the Commonwealth Minister responsible for administration of the Act. These Regulations are designed to ensure that any commercial use of native wildlife that involves export is undertaken on a sustainable basis with no detriment to the species in question or the ecosystem of which it is a part.

There remains considerable opposition to the commercial use of wildlife - principally by animal welfare groups and some non-government conservation organizations who are morally and philosophically opposed to killing animals. Opposition to the sustainable commercial utilization of wildlife is most often directed from organizations based in the western hemisphere. Regardless of their geographic location, governments that advocate sustainable commercial use of wildlife must be aware that the conservation and animal welfare lobby, more so than before, is able to influence, to a significant degree, international decisions on wildlife management practices. Australia has not escaped this influence. The evolution of Australian wildlife conservation management programmes in recent times has involved extensive consultation with such groups which, although often in conflict with government, must on balance be regarded as having been beneficial in deriving more cohesive and publicly acceptable management regimes.

The formulation of invasive wildlife management programmes solely for commercial purposes is likely to be repugnant to conservation, animal welfare organizations, and sections of the general public. Commercial use by more benign methods such as shearing of wild vicuna and the extraction of musk from the glands of musk deer may be expected to be more publicly acceptable. However a problem inherent in such programmes is the difficulty of distinguishing between legal and illegal products which are morphologically identical. Governments approving the sustainable commercial use of wildlife must therefore demonstrate unequivocally to the international community that welfare concerns have been considered and some conservation benefit is derived from such use. The corollary to this lies in the ability of the general public, both in Australia and the western hemisphere, to understand and

support, through properly regulated international trade, the application of sustainable utilization programmes as a conservation tool. Such programmes have particular relevance in regions of the world where human populations and development pressures threaten the survival of vast tracts of natural habitat and the wildlife dependent on these areas.

WILDLIFE UTILIZATION IN AUSTRALIA - BACKGROUND

Historically, Australia has embraced the principles of sustainable use of wildlife, although until recently this has not been clearly enunciated. The management of wildlife in Australia, for conservation, has been a process that has evolved gradually, resulting in the policies and programmes of today.

In 1984 the Commonwealth Government consulted widely with State and Territory Governments, conservation groups, and industry representatives, to frame a National Conservation Strategy, modelled on the World Conservation Strategy to suit Australian conditions that prevailed at the time. Prior to this, in 1976, Australia ratified CITES after having played an important role in the 1973 Washington Plenipotentiary Conference which concluded the Convention. CITES was the first international attempt to address the issue of regulating international trade in certain endangered species of wildlife at levels that were sustainable.

The debate on ecologically sustainable development is still in its early stages in Australia. The concept of conservation as an opposing force to development will be basic to broad ranging discussions aimed at formulating policies and programmes that meet the aspirations of present and future generations of Australia and provide an ecologically viable foundation for the economic growth of Australia as we enter the twenty first century. The use of natural resources to sustain the future development of Australia will ultimately depend on changing public attitudes, to curb the present rate at which many renewable resources are being over-utilized and establish a conservation ethic that integrates resource consumption and economic growth as compatible factors rather than conflicting forces.

The first overt demonstration by Australian State and Territory Governments that use made of wildlife was based on the principles of sustainability, was legislation to declare an open season during which, under permit, it is legal to hunt or take specimens of a protected species. The timing and duration of open seasons are specific to a species or group of biologically similar species (e.g., waterfowl) and are based on the best available scientific data to coincide with a period during which the removal of components of a population will cause minimal adverse impact on the long term conservation of the wild population.

Subsistence Use Of Wildlife

Prior to European settlement, Australian Aboriginals utilized native wildlife that was important for survival and tribal cultures. As hunters and gatherers, they moved within clearly identified tribal custom and the seasonal cycle of fruiting plants and abundance of animals. The artificial aggregation of Aboriginal people in European styled communities disrupted, to a large extent, the formerly nomadic character of Aboriginal groups, with the concomitant adverse impact on local populations of food and culturally important native plants and animals that resulted from concentrated and sustained harvesting efforts. The "out-station" movement that was facilitated by government policies at the time, and commenced on tribal lands in the 1970s, resulted in groups of Aboriginals moving away from European-styled communities back to their tribal lands to lead a more traditional life. The benefit of this policy of decentralization to local populations of wildlife is not yet known and should be evaluated.

The use of wildlife for subsistence purposes by Australian Aboriginals has been recognized by modern Australia and is reflected by provisions in conservation legislation for non-urban Aboriginal to harvest native wildlife for traditional purposes without the requirement of a permit. Commercial use of protected wildlife is treated uniformly by Australian conservation legislation regardless of the race, color or creed of the applicant.

It is worth noting that an increasing number of Aboriginal communities in Australia are expressing interest to government in establishing wildlife farming or ranching operations. Under government guidelines, and scientifically

based management programmes, Aboriginal communities are becoming involved in emu farming in Western Australia and crocodile farming and ranching in Queensland and the Northern Territory.

Much of the current involvement of Aboriginals in wildlife farming and ranching had its genesis in the early 1970s, when the Commonwealth Government set up and funded the private company Applied Ecology Pty. Ltd. within the Department of Aboriginal Affairs. This company, which has since been dissolved, was charged with the responsibility of researching the sustainable commercial use of wildlife by Aboriginals as a means of providing an income and economic base for Aboriginal communities and was the precursor for some of the most successful wildlife farming operations in Australia today.

Current Wildlife Management For Utilization

The management of brush possums *Trichosurus vulpecula* in Tasmania, although ostensibly directed towards forestry damage mitigation, is in practice operated as a sustainable harvest program. The imposition of an annual harvest quota for the species is based on extensive population surveys designed to ensure that the brush possum is maintained throughout its range in Tasmania, albeit at population levels that are compatible with regional land use practices, and that the long term conservation of the species is not compromised by harvest strategies and intensity. Similarly, the management of certain species of kangaroo which are widespread and abundant in Australia (viz. Eastern and Western Grey Kangaroos, Red Kangaroo and Euro), although practiced primarily as agricultural damage mitigation operations, provide for the determination of annual harvest quotas and monitoring to ensure that the species are maintained throughout their natural distribution and the long term conservation of populations is not compromised by management.

Perhaps the longest operating Australian wildlife management program, based on sustainable harvesting of wild populations, is the annual muttonbird harvest in Tasmania. The muttonbird, *Puffinus tenuirostris*, migrates from the Palearctic Region to nest each summer in Australia. Commercial muttonbirding has been practiced by Tasmanians since the 1890s and is carried on today by operators licensed and controlled under Tasmanian legislation. The harvest is restricted to fledgling birds which are removed from the burrow and used for their flesh and down. Although there is some export of flesh and down, these products are in the main consumed within Australia. Annual censuses are taken of colonies of nesting birds by government biologists and safe harvest levels determined for each season.

An extensive and lucrative export industry has become established around the sustainable harvesting of commercially attractive native wild flowers for the cut flower trade. Regions in western Australia subject to harvest activities are regularly surveyed by government botanists to ensure that harvesting pressures do not impair the reproductive capacity of populations of plant species, to the extent that the structural character and conservation of plant communities is jeopardized. Considerable horticultural data derived from native plants are being invested in the development of genetic strains suitable for cultivation.

Crocodile farming and ranching is a relatively recent development. In the mid 1970s it became apparent to some wildlife managers that programmes for the long term conservation of crocodiles in Australia must be based on something more tangible than the esoteric motive of conserving crocodiles for their intrinsic biological value as a component of the native biota. Governments in those States and the Northern Territory where crocodiles occur naturally were faced with the problem of formulating pragmatic solutions to conserving a species such as the saltwater crocodile - a known predator of man, and is either rightly or wrongly held in some fear by the average Australian citizen and voter who is forced to share the same environment with the species. Ironically, the commercial value of the animal's skin, a feature which brought the species to the brink of extinction as a result of unregulated hunting in the past, was to be the key to its long term survival as a wild animal. Extensive and expensive scientific research by many Australian scientists provided the basis for pragmatic conservation of a living resource which is both dangerous and commercially valuable. From a conservation standpoint, commercial ranching confers greater conservation benefit on the wild population than closed-system captive breeding, because of its reliance on the regular removal of components of the wild population.

Annual harvest levels for eggs hatchling and other ages of crocodiles are confined to specifically designated harvest areas and are determined on the basis of analyzing the results of annual population surveys. The response of regional populations to previous harvest levels is assessed to ensure that harvest levels are sustainable with no detriment to the wild resource.

Waterfowl are managed in many parts of Australia as a renewable resource by providing for recreational hunting. Based on the results of population censuses to assess the breeding success of key game species of waterfowl in prevailing climatic conditions, an open season may or may not be declared by government. The timing and duration of the open season varies each year according to the condition of waterfowl populations. Community interest in recreational waterfowl hunting provides the necessary stimulus for governments to invest resources in managing wetland areas that are important for waterfowl. Properly regulated and practiced ethically, recreation hunting can be a powerful conservation incentive and tool.

The foregoing management practices all involve the removal of components of the population and disrupting the dynamic balance that exists between the population and its environment. It is essential therefore that management strategies contain provisions for monitoring the impact of harvest regimes on the wild population. This form of wildlife management stimulates an interest to retain natural habitat on lands outside protected areas in a manner which complements, rather than replaces, management of wildlife in such areas. In this respect commercial use of certain wildlife from reserves can, by providing the necessary incentive to retain habitat, enhance the viability of existing protected areas by maintaining corridors of habitat for dispersal from, and movement between, reserves by wildlife species.

However it must also be acknowledged that properly managed national parks and nature reserves bestow a value on the resident wildlife by the revenue derived from visitors to such areas to view and photograph the wildlife. Some national parks provide the economic base for entire communities established principally to service the needs of park visitors. Further examples of non-invasive sustainable use of wildlife which are well known in Australia are the ability for the public to feed and experience close association with wild dolphins at Monkey Mia, Western Australia, and the growing industry based on whale watching. In both cases it has been necessary to regulate the industries to ensure that activities are able to be sustained by the animals, that Humpback and Southern Right Whales migrating through Australian costal waters are not harassed, and the continued recovery of these important marine resources is not impaired.

Unfortunately Australia has an impressive record in the number of introduced animals which have become established in most parts of the continent. An increasing number of exotic species are the subject of commercial harvest programmes for both the domestic market and export. Ironically, commercial utilization of exotic animals in Australia has not led to the disappearance of any species and, despite the lack of regulatory controls, is in essence practiced on a sustainable basis. Real conflict exists between harvest practices for some species and effective control programmes for the species with the potential for further conflict in the event that an effective biological control agent is developed as in the case of rabbits. Conversely it may be preferable to farm or ranch feral species such as the camel which is likely to be environmentally compatible with the arid zone ecosystems than hard-hoofed animals like cattle.

Although a range of parts and derivatives of native wildlife taken in accordance with management programmes approved under the Wildlife Protection (Regulation of Exports and Imports) Act are exported, there remains a total ban on the export of live native animals except for scientific research, approved zoological exchanges, and as genuine household pets. The rationale for this policy, which is supported by the Council of Nature Conservation Ministers, is based on animal welfare concerns and the capability of recipients to adequately house and care for specimens exported.

FUTURE DIRECTIONS

What then of the future?

The value of managing native wildlife as a renewable resource was recognized by the last meeting of the Council of Nature Conservation Ministers. At this meeting the Ministers endorsed principles of sustainable utilization of wildlife as being a powerful tool for the conservation of certain native wildlife to complement conservation efforts by governments in protected areas. At the same meeting this theme was extended to apply specifically to national kangaroo management within the newly named "National Guidelines" on sustainable use management of kangaroos, as an additional objective.

In recent times Commonwealth, State, and Territory Governments have placed increasing emphasis on formulating policies and programmes that promote nature conservation outside of lands protected by the system of nature conservation reserves. This ideology has been manifested in an array of programmes designed to stimulate incentive to preserve areas of remnant native vegetation and repair widespread degradation in many parts of Australia. The National Soil Conservation and Save The Bush (Remnant Vegetation) programmes are two strategies established recently by the Commonwealth Government that involve community and pastoral groups in conservation orientated land management activities. Another example of the increasing level of concern for the natural environment and the manner in which it is managed is the successful liaison between the Australian Conservation Foundation and the National Farmers Federation, which resulted in the Commonwealth Government's Landcare programme. All these initiatives are designed to introduce management practices that stem continuing degradation of land systems and remedy damage caused by past management. Actions such as these will set the stage for the introduction of programmes for sustained management of renewable resources that is integrated with nature conservation.

Developed carefully and implemented strategically, sustainable use of wildlife management programmes can contribute significantly to the ecologically sensitive development of Australia. In recent times there has been considerable debate in Australia on the excessive size of the sheep flock. Without dealing with the process by which this situation occurred, there is little doubt that the grazing and trampling by 160-180 million sheep would have had a profoundly detrimental impact on the fragile Australian soils and native vegetation. The management of red and grey kangaroos as a renewable resource with a unit value increased substantially, by utilizing their flesh for human consumption and export, would enable kangaroos to compete directly on economic grounds with sleep. Commercial kangaroo ranching integrated with sheep and cattle grazing would enable the overall number of sheep in some pastoral districts to be reduced, without impairing the net income of individual farms. Such a management regime would be more environmentally friendly while allowing farmers to diversify their operations to offset market fluctuations in any one commodity.

Much has been spoken and written in recent times about the need to conserve biological diversity. Sustainable use of the world's wildlife resources is an intrinsic element of this philosophy and a major vehicle for which a global strategy is being promoted to the general community. The maintenance of maximum biological diversity is designed to fulfil the community's aesthetic needs for wildlife and to maximize the range of future options for commercially utilizing wildlife resources for a variety of purposes such as food and medicine. Implicit in this strategy is an acceptance that wildlife resources can and indeed should be available for management as renewable resources for commercial purposes. The acquisition of land for conservation purposes is a very narrow perception of conserving biological diversity. Such action, while being an important component of an overall strategy, is one of a suite of available tools by which a strategy can be implemented. Future research should be directed to providing information on which to base management of wildlife for commercial use.

IV: APPENDICES

Appendix I

Recommendation 18.24

Conservation of Wildlife through Wise Use of Renewable Natural Resources

RECOGNIZING that use of wildlife may be consumptive or non-consumptive;

NOTING that some member countries successfully conserve many species of their wildlife resources without using them consumptively, and that in many other countries the use of wildlife is necessary for the wellbeing of their people;

RECALLING that two fundamental aims of the World Conservation Strategy are to ensure the conservation of species and ecosystems both for their intrinsic value and for the benefit of humankind;

ACKNOWLEDGING that the mission of the 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 lands (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 toward the future economies of countries through wise use and conservation of their renewable natural resources;

CONCERNED that species' decline and 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 General Assembly;

The General Assembly of IUCN, 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. and including guidelines to be developed in accordance with paragraph 5a below.

2. **URGES** all countries to;

a. establish an adequate system of protected areas as a 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 the IUCN guidelines to be developed in accordance with paragraph 5a below, would create economic and other incentives for the retention, rehabilitation, and management of natural habitats and their biological assemblages outside of such protected areas;

c. review, where necessary and desirable, current programmes and practices involving the use of wildlife as a matter of urgency and modify them to ensure their sustainability and conformity with the IUCN guidelines to be developed in accordance with paragraph 5a 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 the guidelines and safeguards, as developed in accordance with paragraph 5a 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 through international agreements in the conservation of such populations;

5. **RESOLVES** that the Director General in consultaiton with the Chairman of the Species Survival Commission, coordinate its programme activities in collaboration with its members to:

a. develop guidelines based and implemented 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 following established procedures;

b. work to achieve the agreement of IUCN members to endorse 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, insofar as practicable, the equitable distribution of income and other benefits derived from the use of wildlife as set forth in this resolution.

Appendix II

Draft Guidelines for the Ecological Sustainability of Non-Consumptive and Consumptive Uses of Wild Species

(Approved by IUCN Council for submission to the 19th Session of the General Assembly)

PREFACE

Recommendation 18.24 adopted unanimously by the General Assembly of IUCN at its 18th session (Perth, Australia, December 1990) recognized that uses of wild species may be nonconsumptive or consumptive. It noted that some countries successfully conserve many wild species without using them consumptively, and that in many other countries the use of wild species is necessary for the well-being of their people. It requested 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 [for sustainable use] 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".

These guidelines have been prepared in response to that mandate and the target set by Caring for the Earth[1] for all countries to adopt guidelines for sustainable use of wild species by the year 2000.

Drafts of the guidelines were prepared by the IUCN/SSC Specialist Group on Sustainable Use of Wild Species (Co-Chairs, Christine and Robert Prescott-Allen) and the IUCN Sustainable Use of Wildlife Programme (Director, Stephen Edwards). Drafts were reviewed by a workshop held in conjunction with the World Parks Congress (Caracas, 17-20 February 1992), by several hundred reviewers throughout the IUCN network, and by the Steering Committee of the Species Survival Commission. The final draft of the Guidelines was revised and agreed by the IUCN Council on 28 May 1993 for submission by the Director General to the 19th Session of the IUCN General Assembly .....

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. Two fundamental aims of **Caring for the Earth** are to ensure the conservation of species and ecosystems for their intrinsic value and for the development of mankind.

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:

   * Development benefits——assuring the long term supply of valuable resources to people, and enabling species and populations depleted by overuse to recover; and

   * 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 ensure that such 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. In some cases, uses of wild species might be ecologically sustainable; however, it is recognized that ethical perceptions of uses and types of use vary between States, territories 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 following principles:

    * People should conduct any activity involving use of wild species within an ethical context that:

        1) includes respect for the viability of wild species and the integrity of natural systems;

        2) recognizes individual and collective responsibility for the commons of nature;

        3) reflects the need to seek equity of benefits among the present generation and between the present and future generations.

    * 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.

    * People have the responsibility to ensure that their uses of wild species are sustainable and non-wasteful.

    * 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 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 employing them. IUCN will also attempt to clarify the complex ethical issues arising from nonconsumptive and consumptive uses of wild species.

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.

CRITERIA FOR SUSTAINABLE USE

18. 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

19. 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 its ecosystem components. 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.

20. The use should be managed to ensure:

* 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 46-48).

* Low risk. Risk of seriously depleting the target population should be negligible.

* 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.

21. Loss of genetic diversity should be avoided by carefully monitoring and limiting harvests where the risk is greatest — in particular where harvesting:

* concentrates on particular sex, age or size classes;

* includes geographically distinct or genetically well differentiated or rare populations;

* includes populations at the latitudinal, elevational (including depth in the case of marine species) or other geographical extremes of a species' range; or

* includes endemic populations restricted to a small area.

22. The ecosystem components necessary for the survival of the target population may include habitats, predators, prey, pollinators, 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.

23. 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.

24. In the first case, impacts on the most sensitive species need to be considered. In the second case, the ecological role of the target species needs to be assessed and use levels adjusted to accommodate it. 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

25. The Criteria are challenging and are not likely to be immediately met 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.

26. 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.

27. 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 42).

REQUIREMENTS FOR FULFILLING THE CRITERIA

28. These requirements do not apply to uses whose impacts are obviously inconsequential.

29. The requirements for making uses sustainable are:

    * **Information** on the target population and its associated ecosystems, on current and proposed uses, and on social and economic factors affecting them.

    * A **management system** that can respond rapidly to changing conditions or better information.

* A supportive and effective **legal framework**.

* **Social or economic incentives** for the people living with the target population or its supporting ecosystems to conserve them.

* Acceptance of the **precautionary principle and safeguards** to ensure the survival of wild species, populations and supporting ecosystems.

INFORMATION

Interpretation

30. 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:

* 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.

* Habitats or other ecosystem components necessary for the survival of the target population.

* The relationships between the target population and associated species and communities (such as predators, parasites, prey, seed dispersers, pollinators, epiphytes, competitors, disease organisms).

* 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.

* 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.

* 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

31. 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.

32. 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.

33. 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.

34. 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

35. 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.

36. 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

37. Management involves a partnership between managers and users or other beneficiaries of the use. Common arrangements include:

* Government (manager) for the people (users/beneficiaries).

* Community (manager) for community members (users/beneficiaries).

* Private landholder (manager) for him/herself and dependents (users/beneficiaries).

38. 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 systems, and extension services.

39. A resource management plan should help the manager make scientifically and economically sound decisions. It is especially important in any of the following cases:

* Target populations are declining.

* Consumptive uses are on a large or increasing scale, relative to the target population or its supporting ecosystem.

* Consumptive uses have a significant impact on supporting ecosystems or other species.

* 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.

* Potential changes in land use or other conditions could have a significant impact on supporting ecosystems or the target or non-target species.

* Management requires coordination of a number of managers or users, because the species being used comes under more than one jurisdiction.

40. 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 comply with regulations.

41. 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. 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

42. 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 recognised in national legislation for the sustainable use of wild species.

43. 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

44. Governments' policies, laws and institutions should ensure that any use of wild species is ecologically sustainable. However, States' systems of governance and laws vary. Therefore, to provide effective management of wild species, States ought to adopt a legal framework that takes into account the following:

- 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;
- Identifying habitats necessary to maintain viable populations of species and reserve these areas by legislation to prevent inconsistent uses;
- Designating through law the corridors, transition zones and buffers to safeguard effectively the threatened wild species whose habitat or range includes unprotected as well as protected areas;
- Establishing wild species management norms as an integral part of land use regulations, such as town and country planning or zoning or coastal zone management regimes;
- Enabling local communities and/or individuals to manage, or participate as appropriate in the management of wild species, and when used, to derive legitimate benefits from its sustainable use;
- 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;
- 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, resting, and others;
- Establishing and enforcing administrative and criminal sanctions to deter and, where necessary, to punish illegal uses such as poaching or smuggling;
- 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 provide for administrative and judicial review to facilitate their consistent and lawful function;
- 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 wild species' viability;
- Ensuring by law that contracts or permits for tourism operations and other commercial interests, such as parks concessionaires, require adherence to these Criteria.

45. 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:

- 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

- 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

46. The social and economic benefits from sustainable use could provide powerful incentives to conserve wild species and their supporting ecosystems, provided:

* 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.

* There is a clear connection between the benefits and conservation. Fulfillment of the Criteria yields immediate and sustained net benefits for people, and a proportion of these benefits should be reinvested in maintaining target populations and their supporting ecosystems.

Application

47. 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:

* Respecting and encouraging rights and traditions of local communities that are compatible with conservation of wild species.

* Supporting traditional customs that are ecologically sound.

* Providing economic, institutional, biological and other technical assistance on request.

* Developing community-level education programmes on the uniqueness and importance of local wild species.

* Cooperating with rural communities to develop sustainable use projects that demonstrate the value of maintaining those populations and their supporting ecosystems.

* Cooperating in the creation of effective management systems for use by the local people living near or in a target population or ecosystem.

* 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.

* Investing in the creation of producers' organizations to assist in the efficient production, distribution and marketing of the resources concerned.

* Improving the price and profitability to local people of nonconsumptive and consumptive uses of wild species, and by helping local people.

* Developing and publicly identifying through labels or otherwise sustainable uses of wild species to replace unsustainable uses.

48. 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

49. 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 the integrity of the ecosystem affected. This may result in decisions not to use. This precautionary principle is especially important when estimating sustainable use levels. In any case, 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

50. 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).

51. 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:

* Accommodate potential negative effects of miscalculation, unforeseen factors or unpredictable events (such as disease, natural disasters, drought).

* 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.

52. 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 populations and ecosystems.

53. 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.

54. To promote use of wild species that is sustainable, States and conservation organizations should widely disseminate these Guidelines.

GLOSSARY

BIODIVERSITY: the variety among living organisms including, inter alia, 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.

ENDEMIC POPULATION: A population restricted to a particular geographic area, often 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 hereditary information from one generation to another.

GENETIC DIVERSITY: The variety and frequency of different genes and forms of genes (alleles) in a population or species.

HABITAT: a place or ecological community where a particular species occurs and that provides conditions for its survival (such as food and shelter).

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 Prokaryotae (bacteria), Protoctista (algae and other single-celled organisms that are not bacteria), Fungi (mushrooms, yeasts, lichens, etc.), Animalia (invertebrates, fishes, amphibians, reptiles, birds, mammals), or Plantae (mosses, ferns, conifers, flowering plants, etc.).

POPULATION: A group of interbreeding individuals of the same 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: A reproductively distinct, identifiable group of organisms within which effective gene flow occurs or could occur.

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 in the same sense as "viability" above.

WILD POPULATION: A population that reproduces without human assistance in naturally-regenerating habitats to which it is native.