Fachgebiet Wildbiologie und Wildtiermanagement

Population Ecology of Impala (*Aepyceros melampus*) and Community-based Wildlife Conservation in Uganda

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„The survival of our wildlife is a matter of grave concern to all of us in Africa. ... In accepting the trusteeship of our wildlife we solemnly declare that we will do everything in our power to make sure that our children's grandchildren will be able to enjoy this rich and precious inheritance."

Julius Nyerere (Tanzania / Arusha Manifesto, 1961) in Bonner (1993)

"Nothing is kept for nothing"

The story of a Serval and a Mongoose

Long ago, there was a Mongoose. It was married to his wife and they lived together in their hut. The wife had a common habit of dozing (falling asleep) whenever fellow animals came to visit them. It could never look straight to other animals faces because of cowardice. It made it to doze any time.

Normally, it was always the husband to go out for food. But whenever he could come across a dead animal especially big ones such as leopards, lions, buffaloes, elephants and pythons, he could pick a piece of skin and take it home for security purposes.

In the village where the Mongoose lived, was another animal called a Serval. This animal was feeding on small animals. One day, it wanted to eat the Mongoose but failed to get it. So, it decided and promised to visit the Mongoose in order to find it at home and to be able to eat it. They fixed the date for the visit. When the date came, the Serval went to visit its friend. At the Mongoose's home, the Serval was welcomed and offered everything as a true visitor. The Serval was to stay for a night in order to get the small Mongoose during the night and eat it.

When it was coming to supper time, the wife resumed the habit of dozing. Immediately the husband realised that they were going to be eaten by the Serval. The Mongoose started threatening the Serval by telling it a funny story that whenever the wife starts dozing he kills his friend. The Mongoose went on to say that it has happened several times. While telling all this, he was also fearing that they might be killed by the Serval. As the head of the family, the male Mongoose had to think a lot on how it can save their lives from being killed by the Serval.

Lastly, it thought of the skins it was collecting from the dead fierce animals. It entered the room, where it had kept them. It picked a piece of a Leopard skin and showed it to the Serval saying: "Look here my friend!" This was my best friend who had visited me but when my wife started dozing, I killed him. So it seems she wants me to kill you also." "Haa! Haa!" laughed the Serval. "How can I be killed by a small creature like you?" The Mongoose entered the room again and picked the remaining pieces of the skins. It showed it to the Serval one by one while telling a story on how they were killed because of the wife's dozing behaviour.

When the Serval saw all those big animals killed by the Mongoose, it knew that it would not survive. It went out slowly as if it was going for a short call and run back to its home.

The Mongoose survived because of the small pieces of skins it was keeping. That is how the phrase 'nothing is kept for nothing' came up.

Narrated by:
Edward Bwaniaga,
from Nyabushozi, Uganda.
Translated by:
Gilbert Gumoshabe.

Contents

Preface

Parts of this thesis have been presented in the following papers:

AVERBECK, C., 2001. Integrating local communities and wildlife conservation in Uganda: sustainable use as a viable solution. TZ-Verlagsgesellschaft mbH, Roßdorf.

AVERBECK, C., 2001. Integrating rural communities and antelope and buffalo conservation in the Lake Mburo area, Uganda. Gnusletter, IUCN-Antelope Specialist Group, 20(1): 24-26.

AVERBECK, C., (in press). Integrating local communities and wildlife conservation in Nyabushozi, Uganda. Wildlife, Land and People: Priorities for the 21st Century, Proceedings of the 2nd International Wildlife Management Congress, Hungary.

AVERBECK, C., (in press). A park is not an island: combining different wildlife management strategies in the area of Lake Mburo National Park, Uganda. In: Landscape ecology and resource management. Making the match. Bissonette, J. and I. Storch (eds.). Island Press.

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Technical reports:

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1 Introduction

With a Gross Domestic Product (GDP) of US$ 6.7 M. in 1998 and a per capita Gross National Product (GNP) of US$ 320 in 1997, Uganda is one of the poorest countries in Africa (Stanbic Bank Africa 2000). Rural communities in Uganda, like in other parts of Africa, face substantial challenges. About 90% of the population of Uganda depend on the agricultural sector for their livelihood. Due to an annual population growth of 3.1%, land is becoming a scarce resource. In order to earn a living, the landowners feel the need to intensify and diversify their land use systems.

On the one hand, intensifying the land use system often leads to the unsustainable use of natural resources and to a loss of biodiversity. On the other hand, new, sustainable opportunities for the diversification of land use systems are not recognised or implemented (Child 1995).

The Ugandan economy is dominated by the agricultural sector. The single most important component of an appropriate strategy for reducing poverty and hunger in Uganda is therefore the promotion of sustainable agriculture. In Uganda, the poorest people are typically those, however, who have diversified least into forms of income other than agriculture; only the process of diversification will offer households the opportunity to lift themselves out of poverty (Mackinnon *et al.* 1997).

The people are trapped in an accelerating poverty vortex with devastating consequences for the natural environment, including the habitats essential to wild animals. There is an interdependence in densely populated countries between human well-being and environmental conservation. An increasing scarcity of resources is resulting in intensified competition between a growing human population and wild animals. The only solution for both human societies and the environment lies in improving the yield from the land without causing further degradation (Mackinnon *et al.* 1997).

Across the Ugandan savannas dramatic changes are occurring. Grasslands are being put under the plough, trees felled, and wildlife is decreasing. Pockets of wilderness survive or appear to survive as protected areas but even there species richness of large mammals is decreasing. The fate of Ugandan's rich communities of large herbivores and their associated predators rests in the hand of man (Lamprey & Michelmore 1996a).

Wildlife can occur in two different situations, those inside and those outside protected areas. Terborgh (1999) states that National Parks are the last bastions of nature but

"few are large enough to maintain healthy populations of top predators". Most areas with a protection status are too small to ensure the long-term survival of the majority of animal species that live in them (Soulé 1986). A majority of Parks exist only on paper, having no staff whatsoever. Most are poorly designed, the boundaries having been drawn in such a way as to make them indefensible against encroachment. A great many have people living in them. A significant number are already seriously degraded by illegal activity. Some no longer exist in a biological sense (Terborgh 1999). Moreover wildlife has no value outside the protected areas, it dwindles and disappears either through active persecution, loss of habitat, or competition with livestock (Prins & Grootenhuis 2000).

Sustainable game utilization outside protected areas could be a new form of land use system for Uganda. It may contribute to rural development and therefore to poverty reduction in the rural communities and help to redress environmental degradation. It furthermore may help to conserve biological diversity inside and outside protected areas. In order to survive wildlife and protected areas must be socio-politically acceptable, economically viable and ecologically sustainable (Child 1995).

1.1 Background and problem analysis

Lake Mburo National Park (LMNP) in Uganda is one of the Parks Terborgh (1999) is talking about: it is not large (260 km2) enough to maintain viable populations of top predators such as lions (*Panthera leo*), leopards (*Panthera pardus*) or hyenas (*Crocuta crocuta*), staffing is insufficient, the Park boundaries are arbitrarily drawn, fishermen are living in the Park, pastoralists graze illegally and hunters poach wild animals. The populations of most of the big mammals are already threatened, and Uganda's only impala population lives in the Lake Mburo area (Lamprey & Michelmore 1996a).

Impala conservation

Impala are the most common big game species in the Lake Mburo area. Results from aerial surveys, however, showed a dramatic decline in the impala population from 16.185 in 1992 (Olivier 1992) to 6.599 in 1995 (see Table 9, Lamprey & Michelmore 1996a). The rate at which impala and even other large herbivores declined in the rangelands surrounding LMNP indicated the importance of a timely response by the authorities.

Initiated by the Senior Warden in Charge of LMNP, A. Mugisha, two workshops on "Problems and opportunities of impala conservation" were organised (Uganda National Parks 1994, Game Department 1995) in 1994 and 1995. The aim of the workshops was to bring together different stakeholders, including landowners, wildlife managers, poachers, politicians, representatives of the District and researchers in order to

discuss conservation and opportunities for and problems of sustainable wildlife utilization in Nyabushozi. As a result of those workshops a pilot impala utilization scheme in the Lake Mburo area was proposed, involving landowners, local hunters and local authorities. A pilot project could help to determine whether legitimising and formalising controlled off-take of impala might result in impala populations stabilising and in time increasing. Intentionally the project was restricted to impala since they were the most common species in the ecosystem.

LMNP as a protected area is too small by itself and needs dispersal areas or buffer zones for especially big mammals occurring inside and adjacent to the Park. In these areas or zones land use management needs to integrate the way of life of people and their livestock and wildlife management. Wildlife in the dispersal areas has to become a natural resource of direct benefit to people, just like grass, trees and livestock (Prins & Grootenhuis 2000).

Sustainable wildlife utilization

Wise use of wild animal populations outside protected areas offers a means of conservation. In a well-designed scheme, the size of the total population (those inside and outside protected areas) will be larger than if there were no wild animals left outside the protected areas. For the long-term survival of populations and species, population size is the most critical factor (Soulé 1986). As a rule of thumb a minimum population size of 50 is required to preserve demographic viability and 500 to maintain genetic variation and genetic adaptability in mammals (Frankel 1983). Populations that are too small (endangered or vulnerable) should, of course, be preserved and not be used. Wise use of an animal assemblage means utilization of an animal population, that is neither endangered or vulnerable, in an optimum and wholly sustainable fashion for the benefit of the stakeholder; and in such a manner as to maintain ecological processes, to preserve genetic diversity and to accommodate the optimum sustainable utilization of all other non-vulnerable renewable natural resources in that area (Thomson 1992). Hunting is not necessary for the well-being of populations or individual animal, but if stakeholders and/or landholders can benefit financially from utilizing wildlife there will be a fair chance that, out of self interest alone, they want to conserve that population at a certain level.

Sustainable exploitation is to remove individuals at the rate at which the population would otherwise increase (Sutherland 2000). The aim of a sustainable game harvesting programme, whether utilized on a commercial basis to yield venison or as a source of hunting, is to remove a fixed annual quota from the population without causing a continual decline in the population. The maximum sustained number should be harvested without disrupting the age structure or sex ratio of the breeding population.

Information on the population structure and the population dynamics of the harvested species, the impala and other big mammals, are needed in order to calculate the growth rate from trends obtained from successive game counts (Bothma 1996).

Legal frame

At the time of the 'impala workshops' the law did not allow the consumptive utilization of wildlife as in 1978 all kind of game utilization was banned in Uganda (Fraser Stewart 1992). In 1996 a new agency responsible for wildlife in Uganda, Uganda Wildlife Authority (UWA), was created. Uganda adopted, furthermore, a new Wildlife Statute (The Uganda Wildlife Statute 1996). The statute vests ownership of wildlife with the state but makes provision for people to own wildlife that had been lawfully taken. Part VI of the statute provides for different categories of "use rights" like hunting, farming, ranching, general extraction of and trading with wildlife products. By implication, the assigning of use rights was intended to motivate communities and individual landowners to conserve wildlife through sustained extractive use. Mechanisms were being established to enable local communities to manage their wildlife, rather than having this control imposed from outside (Okua *et al.* 1997).

The change of the legal frame opened up the opportunity for consumptive wildlife utilization in the Lake Mburo area.

Institutional support

In 1996 the Gesellschaft für Technische Zusammenarbeit (GTZ) started to support the Ugandan Government within the frame of a development cooperation project, Integrated Pastoral Development Project (IPDP), in its efforts to improve and stabilise the social, economic and ecological situation of pastoral settlers mainly in Nyabushozi county, Mbarara Distrikt around LMNP (see Figure 1).

The purpose of the project was to help pastoral settler communities to introduce appropriate land use systems. The expected outputs of the project were the elaboration of recommendations regarding animal husbandry, pasture management, stocking rates and diversification of farm enterprises and cost effective disease control measures. A participatory extension concept was developed and introduced, pastoralists were assisted with valley tank construction and economic activities for women were initiated.

In the planning process of the GTZ / IPDP project, consumptive wildlife utilization was identified as a possible way to gain additional income. In collaboration with Uganda Wildlife Authority, the Tropical Ecology Support Programme (TOEB) of GTZ through

IPDP agreed to finance the present study in order to illustrate the opportunities and problems of utilization of especially impala and other big game mammals in general in the Lake Mburo area. The intention was to use the case study as a model and point the way ahead for other areas in Uganda in which wildlife utilization is an option.

1.2 State of the art

Historically, conservation strategies have been dominated by attempts to reserve places for nature, and to separate human and other species. Ideas about environmental management began to emerge in the British Empire in the mid-eighteenth century. The central strategy that arose from this environmental concern was the creation of reserves. The idea of conservation as something done on reserved land was common to both North America and Europe. A model which has been called 'conservation by protected areas', 'fortress conservation' or the 'fences and fines approach' (Wells *et al.* 1992) has dominated conservation thinking internationally, particularly the US idea of a National Park as a pristine or wilderness area, and the British notion of a nature reserve that is managed intensively (Adams & Hulme 2001).

Conservation by protected areas

'Conservation by protected areas' involved the creation of protected areas, the exclusion of people as residents, the prevention of consumptive use and minimization of other forms of human impact. This concept has been very influential in sub-Saharan Africa, and there is a long history of National Park creation. Conservation policy in Africa grew out of the imagination of expatriate European men about 'the wild', a place where manhood could be proved, civilized virtues demonstrated by the manner in which animals were hunted and killed, and European rituals of hunting could be lived out (MacKenzie 1989). Big game hunting is inter-woven with the history of colonialism. To the colonial society, hunting was acceptable only if done using certain methods (shooting for example, certainly not trapping or spearing), under certain rules, and by Europeans. As colonial territories enacted laws restricting or banning hunting, Africans who hunted for the pot or for trade were reclassified, using a medieval European concept, as 'poachers'. Most contemporary Government conservation departments in sub-Saharan Africa – even UWA in Uganda - have origins in agencies established to defend hunting reserves and suppress 'poaching' (Adams & Hulme 2001).

Africa had a special place in the rise of global conservation concern because of its exceptional endowment of large and charismatic species, high densities of wildlife and rapidly increasing pace of development and landscape change. By 1960 Africa had become 'the central problem overshadowing all else' for the International Union for the Conservation of Nature and Natural Resources (IUCN) and IUCN and the UN

Food and Agriculture Organization (FAO) launched a African Special Project in 1961. The 'Arusha Declaration on Conservation' came in the same year, stressing both a commitment to wildlife conservation and wider concerns about resource development. Africa was becoming independent, and political control was shifting (Fitter & Scott 1978).

Not only was Africa the prime target for global conservation concern and action, it also provided potent conservation images that in their turn fed into the global discourse of extinction. African independence coincided with the growth of mass audiences for television in the industrialized countries and a series of popular books, such as 'Serengeti shall not die' (Grzimek 1960). Africa was portrayed as Eden, humankind as its chief destroyer and conservation, through a protectionist strategy, its necessary salvation (Graham 1973). As in Europe and North America, the essence of conservation practice was the preservation of certain selected areas, their landscapes and species. People had little place in this vision of conservation (Adams & Hulme 2001).

It was not until the 1980s that the local community began to be taken seriously as a major actor in natural resource management as a flood of studies revealed the potential role of local collective action in irrigation, rural development, agriculture, forestry and other fields (Barrow & Murphree 2001). In the late 1980s the dominant paradigm of conservation by protected areas was challenged by conservation practitioners who stressed the need not to exclude local people, either physically from protected areas or politically from the conservation policy process, but to ensure their participation (Western & Wright 1994, Cortner & Moote 1999). This concept was labelled 'community conservation'.

Community conservation

Community conservation can be defined as "those principles and practices that argue that conservation goals should be pursued by strategies that emphasize the role of local residents in decision-making about natural resources" (Adams & Hulme 2001).

Community conservation concepts has two distinct elements. The first is the imperative to allow people living in and around protected areas, or others with property rights there (in land or living resources) or other claims on the land (e.g. spiritual claims) to participate in the management of natural resources. Thus 'people and Park' projects have been developed (Hannah 1992) such as the African Wildlife Foundation's 'Neighbours as Partners' programme and CARE's 'Development Through Conservation' project, begun in Uganda in 1988.

The second dimension of community conservation concept has integrated the linkage of conservation objectives to local development needs. These two dimensions of community conservation, participation and a concern for economic welfare, create a space within which a great variety of different kinds of conservation intervention have occurred.

The concept became generally accepted. Projects such as CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) in Zimbabwe, ADMADE (Administrative Management Design for Game Management Areas) in Zambia and similar initiatives on community wildlife utilization in other countries in South- and East Africa were established (Cumming 1990, Kiss 1990, Baldus 1991, Bond 1995, Child 1995, Bothma 1996, Child 1996, Lewis & Alpert 1997, Duffy 2000, Heath 2000, Prins *et al.* 2000, Hulme & Murphree 2001).

The community conservation concept has been generally accepted due to different reasons. First, community conservation equates conservation with sustainable development, and hence capture the huge up welling of policy commitment arising from the Brundtland Report (WCED 1987) and UN Conference on Environment and Development at Rio in 1992. Underlying this is the moral argument that conservation goals should contribute to and not conflict with basic human needs. This argument has led some commentators to argue that traditional management by conservation by protected areas must be abandoned because of its adverse impacts on the living conditions of the rural poor. Ideas about community conservation developed in tandem with ideas about the integration between preservationists goals and the consumptive and non-consumptive use of wildlife resources (Adams & Hulme 2001).

Second, community conservation draws on ideas about the 'community' and particularly about the need for local people to be more involved in designing and implementing public policies. In the late 1980s the idea that state power was too great and too centralized emerged in response to the rise of the new social movements and demands for improved local democracy in Europe and America (Shore 1993).

A third reason for the acceptance of community conservation concept was that it developed at a time of significant shifts in the dominant discourses of development. During the 1970s 'top down', 'technocratic', 'blueprint' approaches to development came under increasing scrutiny as they failed to deliver the economic growth and social benefits that had been promised (Turner & Hulme 1997).

A fourth reason for the acceptance lies in the renewed interest in the 1980s in the market as a means of delivering development (Toye 1993). To achieve public goals (including conservation, development or 'sustainable development') economic

incentives for all the main actors must be set correctly, and this was considered best by market mechanisms (Bromley 1994). Conservation bureaucracies should promote small enterprise development, rather than set up fences and levy fines. Wildlife must 'pay its way'.

The final reason for the acceptance of the community conservation concept was biological. It was clear, from research in conservation biology and the genetics of small populations, that conservation goals can often not be achieved within the boundaries of protected areas, even if they are quite large. Viable populations of many of Africa's most prized mobile wildlife species cannot be sustained on small preservation 'islands' (i.e. National Parks and buffer zones). Large dispersal areas are needed so that species can move from 'island' to 'island' to feed, to ensure healthy breeding stock and to respond to local extinctions and climatic change (Coe 1980, Frankel 1983, Soulé 1986, Terborgh 1999). Human beings, moreover, are considered integral parts of the ecosystems that they inhabit and use, because humans are both affected by, and affect ecosystem functions. Social and ecological sustainability are interdependent, in that the sustainability of human communities depends on the sustainability of the ecosystems in which they live (Cortner & Moote 1999).

But the community conservation concept is also problematic. First, there is no guarantee that a participatory approach will necessarily be effective in delivering conservation goals (Infield & Namara 2001). Second, a community conservation approach may not be cost-effective. A third risk inherent in community conservation is that by definition participation is a process not a project input: thus, it cannot necessarily be effective in delivering pre-selected conservation outcomes. Cortner & Moote (1999) emphasize policy paradoxes which occur, paradoxes of decision making between goals of flexibility and consistency, inclusiveness and accountability, expert and open decision making, bureaucracy and responsiveness, and conflict and collaboration. Paradoxes of scale include tensions between centralization and decentralization, managing more with less, and managing on both ecological and human time frames. Adams & Hulme (2001) conclude: "the achievement of the concept is not that is has proved that community conservation 'works': it is that it has created the space for a set of community conservation experiments that take forms and are achieving very different results".

Problems and short comings encountered in community conservation projects have led to the resurrection of conservation by protected areas by a coalition of biologists and conservation bureaucrats (Kramer *et al.* 1997, Struhsaker 1997).

Approaches to community conservation and some key characteristics

There are three main approaches to community conservation, protected area outreach, collaborative management and community-based conservation (Table 1). In brief, these may be summarised as follows:

Protected area outreach. This approach seeks to enhance the biological integrity of National Parks and reserves by working to educate and benefit local communities and enhance the role of protected areas in local plans. In East Africa this has been the predominant approach.

Table 1: Approaches to community conservation and some key characteristics (after Barrow & Murphree 2001).

	Protected area outreach	Collaborative management	Community-based conservation
Objectives	Conservation of ecosystems, biodiversity and species in the protected area.	Conservation with some rural livelihood benefit.	Sustainable rural livelihoods.
Ownership / tenure status	State owned land and resources (e.g. national Parks, forest and game reserves). Attempt to educate local population of benefits.	State-owned land with mechanism for collaborative management or certain resources with the community. Complex tenure and ownership arrangements.	Local resource users own land and resources either de jure or de facto. State may have some control of last resort.
Management characteristics	State determines all decisions about resource management	Agreement between state and user groups about managing some resources which are state owned. Management arrangement critical.	Conservation as an element of land use. An emphasis on developing the rural economy.
Focus in East and Southern Africa	Common in East Africa, with some in Southern Africa.	East Africa, with some in Southern Africa.	Predominant in Southern Africa, but increasing in East Africa.

Collaborative management. This approach seeks to create agreements between local communities or groups of resource users and conservation authorities for negotiated access to natural resources which are usually under some form of statutory authority. In Uganda some components of the UWA's community conservation programme take this form through negotiation of resource sharing agreements.

Community-based conservation. This approach has as its chief objective the sustainable

management of natural resources through the devolution of control over these resources to the community. This has been the predominant approach in Southern Africa (Barrow & Murphree 2001). In Uganda there are so far no community-based conservation programmes.

Community-based conservation programmes have the sustainable use of wildlife and wild land by rural people, under communal tenure conditions, as their major approach to achieve both nature and resource conservation and socio-economic goals. The emphasis is not on Park/people relations but on the incorporation of floral and faunal resources into the livelihood and development strategies of communities. Firstly, there is a focus on economic incentives, the assumption being that rural people will not sustainable manage wildlife or wild land unless these are perceived to yield greater returns than other forms of land use such as crop growing and cattle rearing. A second emphasis is on the devolution of authority and responsibility to communities, the assumption being that this creates an incentive framework favouring sustainable utilization. The third emphasis is on the development of communal institutions and structures for the management of these entitlements in a manner which allows communities to effectively control use, distribute benefits to their membership and efficiently exploit opportunities in the natural resource market (Barrow & Murphree 2001). For a project to be 'community-based' the whole community must participate in observing and analysing, looking for problems, potentials, resources and constraints.

1.3 Goals and aims

1.3.1 Overall goal

The goal of the study was to assess if community-based conservation through sustainable use of wildlife could become a viable solution for integrating rural communities and wildlife conservation in Nyabushozi, Uganda. For ecological as well as socio-economic reasons, the Park's existence and its potential to sustain its wildlife community depends heavily on its surroundings. It was assumed that if the indigenous Ugandan landowners living around Lake Mburo National Park were able to derive tangible and legitimate benefits from the wildlife on their land, they would have an incentive to protect it from poachers and might be more efficient than Government agencies. The integration of rural community development and wildlife conservation around LMNP might be the vital prerequisite for longer-term persistence of the Lake Mburo ecosystem.

1.3.2 Aim of the study

The study aimed to compile information and guidelines for the different stakeholders, i.e. landowners of Nyabushozi, UWA, technical advisors, local leaders, Mbarara

District, the Integrated Pastoral Development Project and GTZ on problems and opportunities of wildlife utilization in Nyabushozi, Uganda in order to sustain its wildlife community and the Park's existence. The results will help these stakeholders to decide whether a wildlife utilization project will be a feasible and real option for wildlife conservation, diversification of land use and poverty reduction. Furthermore, it provides guidelines on how to start a pilot project on consumptive wildlife utilization.

The planning of wildlife management projects as a measure of development cooperation in the rural sector can follow the concept of integrated rural development (Nuding 1996).

An integral part of planning is the consideration of the resource potential of the wildlife population, objectives and wishes of the target group, the landowners of Nyabushozi; possible impediments and resistance and socio-cultural problems with adoption of sustainable utilization by the target group.

1.3.3 Questions

The following main questions will be addressed:

1. **What is the resource potential of wildlife utilization in the Lake Mburo area?**

- Information on the population structure, -size and –distribution, habitat utilization and movements of impalas. The impala was mainly chosen for consumptive utilization, as it was the most common species in the area. The management of UWA, furthermore, after conducting the two impala workshops were especially interested in information on impala (see chapter 3).

2. **How can wild animals be utilized through hunting, processed and marketed in Uganda?**

- Calculations of sustainable quota and a pilot cropping scheme of 100 impala provided information on cropping, processing, and marketing of wild animals and on the opportunities for trophy hunting (see chapter 4).

3. **What are the attitudes of the local communities towards wildlife and wildlife utilization?**

- Focus group interviews revealed ideas of inhabitants of Nyabushozi on wildlife and wildlife utilization (see chapter 5).

4. **How can landowners from Uganda benefit from experiences made on wildlife utilization in other countries?**

- A study tour to Kenya to already existing wildlife utilization and conservation projects (see chapter 6).

5. **How could wildlife utilization be organised in the Lake Mburo area?**

- Development of ideas for a organisational structure of a "community wildlife utilization scheme" (see chapter 7).
- Development of an utilization plan for impala and probably other big mammals (see chapter 7).
- Development of a monitoring programme of wildlife species which can be utilized. Training of personal on monitoring programme (see chapter 7).

Institutional frame

The study was funded by the Tropical Ecology Support Programme (TOEB) / GTZ through the GTZ Integrated Pastoral Development Project (IPDP) and conducted within the framework of IPDP in Nyabushozi, Mbarara District, Uganda, under Dr. C. Musinguzi and Dr. W. Boehle from 1.1.1997 to 31.12.1999. In addition TOEB, IPDP, GTZ and the Uganda Wildlife Authority co-funded the study tour to Kenya in June 2000.

Prof. Dr. W. Schröder and Dr. I. Storch, Wildlife Research and Management Unit, Center for Life Sciences Weihenstephan, Technische Universität München, and Prof. Dr. H. Schliemann, Zoological Institute and Museum, University of Hamburg, supervised the research.

Dr. J. Okori, a student of Makerere University, Uganda, worked in the frame of the study as my counterpart and collected information for his Master degree in veterinary medicine. He was supervised by Prof. Dr. L. Ojok, and Dr. L. Siefert, Makerere University, Kampala.

I worked in close co-operation with Mbarara District, the local communities in Nyabushozi and the Uganda Wildlife Authority. While in the field I had my base camp in Lake Mburo National Park.

The study area comprised the Lake Mburo ecosystem (see Figure 1).

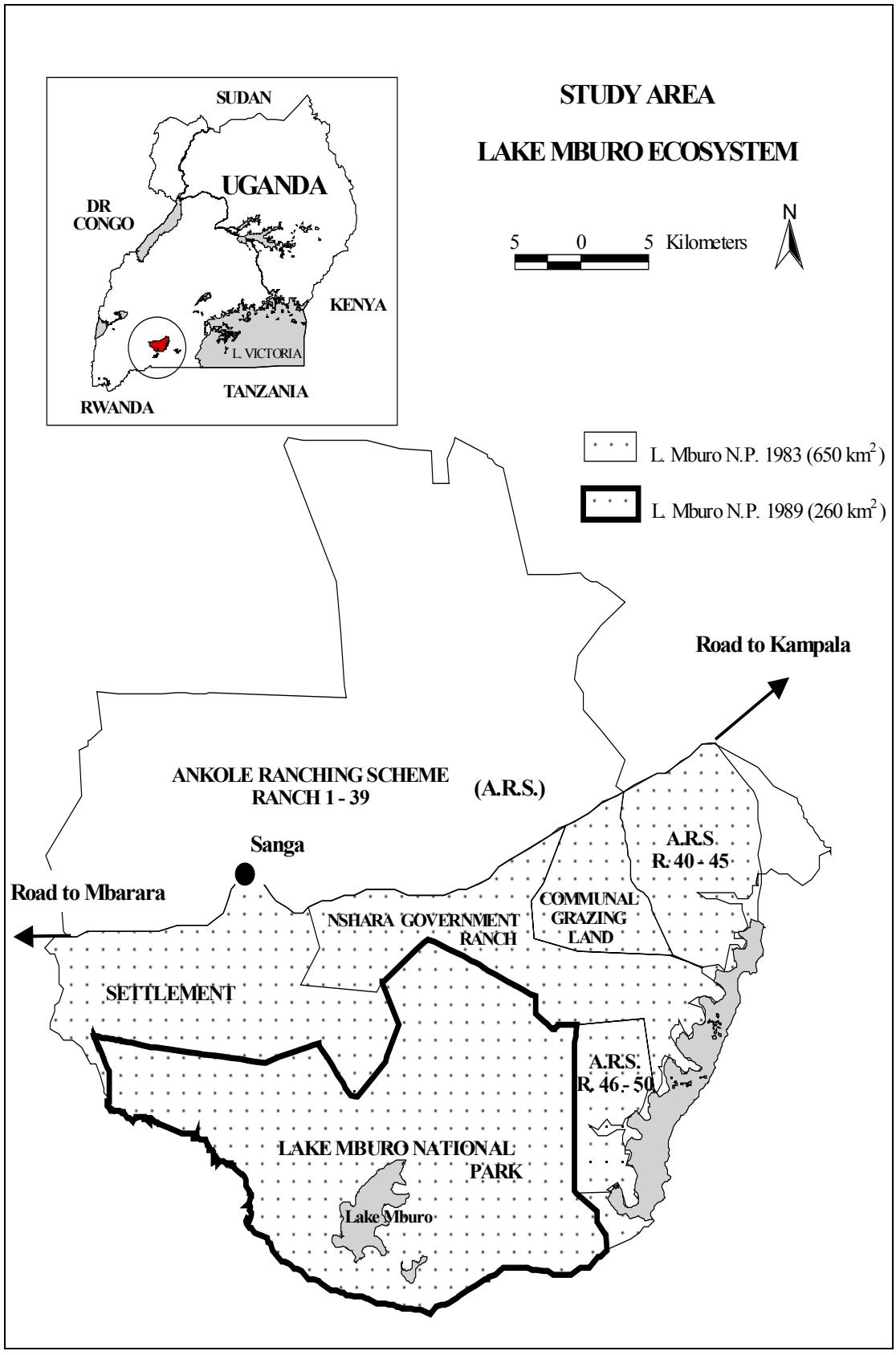


Figure 1: Study area: Lake Mburo ecosystem in Nybushozi County.

2 Study area: Nyabushozi, the land and the people

2.1 Location

Nyabushozi County is part of Mbarara District, located in the South-West of Uganda, near the Equator (see Figure 1). Sanga, one of the sub-county headquarters in Nyabushozi, is 35 km away from Mbarara Town (45,000 inhabitants) and 230 km from the capital Kampala along the Mbarara-Kampala highway.

2.2 Climate

Rainfall is typically bi-modal coming in March-May (short rains) and September-November (long rains) in 30–60 day periods and mean annual rainfall of 887 mm (ranging between 480–1270 mm annually) and within which there is local variation. Mean annual temperature is 20.2°C with a mean maximum at 27.5°C and mean minimum at 15.0°C in Mbarara Town (Department of Meteorology / Station Mbarara, 2000). Prior to 1966, the lowest annual rainfall was 825 mm with the 750 mm isohyet enclosing a small proportion of the South-East and the area being defined more or less by the 875 mm isohyet. However the mean annual rainfall between 1967-92 is between 600-800 mm with the 600 mm and below isohyet being characteristic. Compared with the climate before 1966, the area has become drier (Kamugisha 1993).

During this project (June 1997– December 1999) the mean minimum temperature was 16,0°C and mean maximum temperature 29,0°C in Lake Mburo National Park (own data). 1998 was an "El Nino" year and the annual rainfall reached 1110 mm. 1999 was drier than 1998 with an annual rainfall of 748 mm but still wtihin the expected range of the Lake Mburo area (see Figure 2, Figure 3).

Relative humidity is fairly high averaging at between 61-84% while mean wind speeds are of the order of 2.5-5m/s. Mean monthly evaporation is uniformly high throughout the year ranging between 110-130 mm while the corresponding annual figure varies between 1320-1560 mm (Kamugisha 1993).

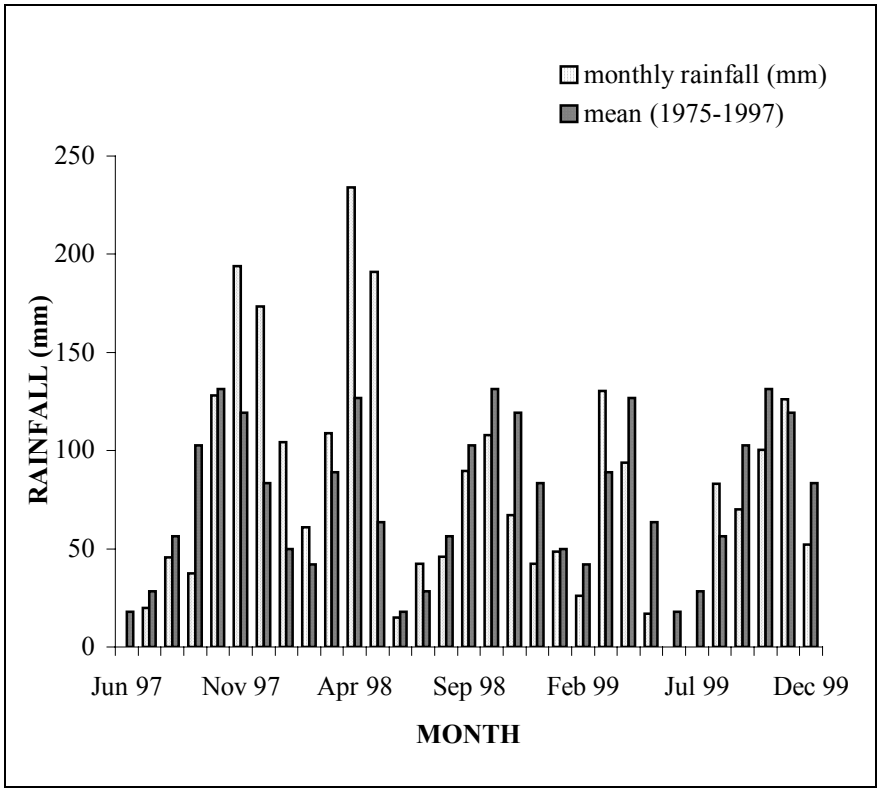


Figure 2: Monthly rainfall (6/1997 - 12/1999, own data) and mean rainfall (Dep. of Meteorology, Mbarara, 2000) in Lake Mburo area.

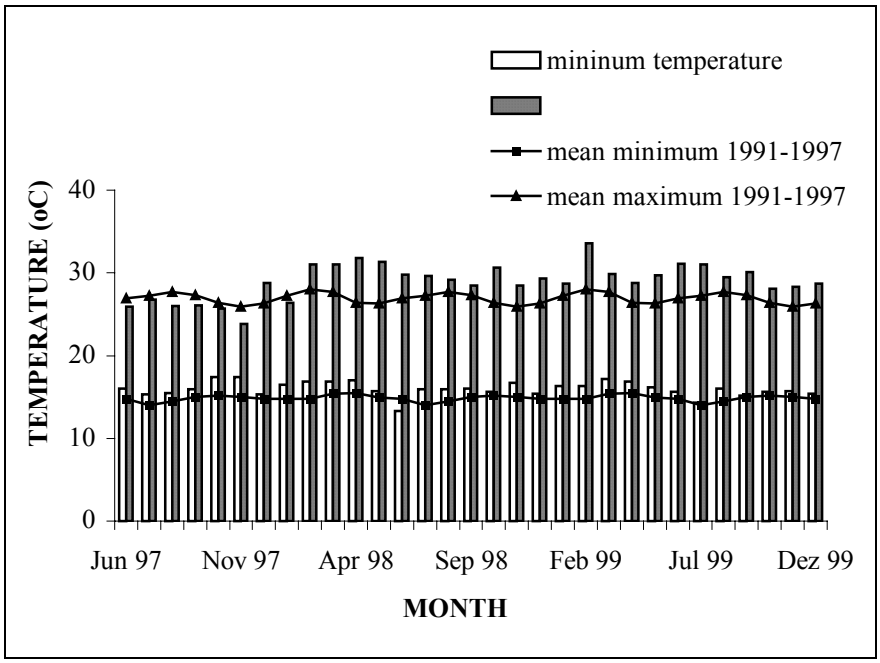


Figure 3: Minimum and maximum temperature (6/1997 - 12/1999, own data) and mean temp. (Dep. of Meteorology, Mbarara, 2000) in Lake Mburo area.

2.3 Landscape and soils

The average altitude of the area is about 1,200 m, with a relative relief at 30-400 m, and mean land slope estimated at 1%. The area is characterised by low, undulating hills and extensive system of permanent swamps and lakes. Most of the area is underlain by two major Precambrian Systems of rocks: the older Basement Complex and the younger Karagwe-Ankolean System which are in turn overlain by the late Pleistocene-Recent sediments, mainly swamp deposits and alluvium. The Precambrian System is comprised of highly metamorphosed acidic igneous rocks, principally granites and gneiss, while the Karagwe-Ankolean System is comprised of slightly metamorphosed sediments, dominated by dark-grey to black-slate, shale, sandstone and conglomerates, phyllite and mica schist interspersed with bands of reddish-brown quartzite. The Pleistocene-Recent deposits consist of mainly fine sandy sediments, peat and alluvial clays and are restricted to the valley bottoms.

The soils fall under the ferrallitic major classification of sandy loams and sandy clay loams predominating. The soils are quite permeable and will not allow excessive run-off that causes erosion provided sufficient vegetation cover is maintained. From the cultivation point of view, they are still virgin and hence moderately fertile, given the deficiency of some important nutrients (Kamugisha 1993).

2.4 Vegetation

The area is part of the Akagera ecosystem. With its acacia savannah (Figure 4), the Akagera ecosystem extends from Rwanda to North-West Tanzania into South-West Uganda.

There are currently several vegetation associations within the area including open grasslands, woodlands, thickets, swamps and gully and riverine forests. The vegetation depends on which of the stresses from overgrazing, seasonal fires, physical defoliation of trees and cultivation are predominant and the topographical features (Hoag *et al.* 1991).

Hilly areas: The hilly areas in the West were formerly dominated by grasses such as *Themeda triandra*, *Hyperrhenia filipendula* and *Loudetia spp*. Currently, only the latter is common, the other two species having been, to a large extent, replaced by other species including annual dicotyledonous plants (forbs) such as *Tagetes minuta* and *Sida cunelolium*. There are large patches of bare ground. The degradation of the grass savannah of the hilly areas has been attributed to overgrazing by livestock and frequent grass fires, hence leading to gradual invasion of *Digitaria scalarum* (Hoag *et al.* 1991).

Forest: The numerous truncated valleys along the hillside contained some forest patches with species such as *Euphorbia candelabra*, *Euphorbia cussonoide*s, *Acacia gerrardii*, *Acacia hockii*, *Combretum molle* and *Albizia maranquensis*.

Figure 4: Acacia savannah in Lake Mburo National Park

Lowland: Vegetation in the Eastern lowlands was originally an *Acacia/Cymbopogon/Themeda spp*. complex where *Themeda triandra* and *Acacia gerardii* were dominant species (Langdale-Brown *et al.* 1964). This has been altered in favour of *Acacia hockii* in many areas. *Themeda triandra* has been reduced and replaced mainly by *Bracharia decumbens*. The tufted and unpalatable *Cymbopon afronardus* has also become more prominent. The vegetation is largely an open woodland with *Acacia gerradii* dominating the tree species present. Other species include *Olea africana*, *Maytenus buxifolia*, *M. africana*, *Rhus natalensis*, *Euphorbia candelabra*, *Capparis erythrocarpus*, *Acalypha bipartia*, and *Hoslundia opposita.* As far back as the early 1960s, it was recognised that the rate of bush encroachment by *A. gerrardii* and *A. hockii* as well as invasions by *C. afronardus* was increasing. According to Pratt *et al.* (1966), the vegetation of the L. Mburo rangeland is notably sensitive to overgrazing. Incursions into the Park by large numbers of livestock at a time when food is limited certainly leads to a situation of overgrazing

Valleys: Valleys tend to have open grasslands which sometimes give way to woodlands. Where there is little or no flooding, *Themeda triandra* and *Hyperrhenia filipendula* used to be extensive but have now been reduced to remnants in some areas. Today, the

major grass species are *Sporobulus spp*., *Kylliga spp*., *Loudetia kagerensis*, *Chloris gayana* and *Cynodon dactylon*. *Digitaria scalarum* also occurs particularly in the partically overgrazed areas. Some of the valleys have heavy soils which seasonally get waterlogged. These support *Acacia imperata* tree savannah where a variety of grass species may co-dominate including *Bracharia decumbens*, *Leersia hexandra*, *Panicum maximum* and *S. pyramidalis*. The dominant associated trees include *Acacia gerradii* and *Securidacae oblongpendiculata*.

Swamps: The swamps are dominated by *Cyperus papyrus* and *Typha spp*. although areas covered by *Echinochloa pyramidalis* and *Aeschynomene spp.* also occur, particularly in areas that are prone to seasonal flooding. The outer edges of the permanent swamps are dominated by *Kylliga spp.* and *Mariscus spp*. These vegetation types seem to have been least affected by livestock. A 50 m-wide narrow strip of riparian forest occurs along the fringes of the water bodies. The dominant trees are *Markhamia platycalyx*, *Techla nobilis*, *Ficus spp*., *A. exanthophlaea* and *Phoenix reclinata* (Hoag *et al.* 1991).

About 80% of the rangeland (all vegetation types) shows signs of previous human presence and activity. Both previous and current human occupation of some parts of the Park and environs has particular plant species some of which are introduced and/or exotic. Introduced species include *Agave sisalina*, *Opuntia vulgans*, *Amaranthus spp*., *Achyranthes spp*. and *Eucalyptus spp*., *Mangifera indica*, *Bidens pilosa*, *B. grantii*, *Abutilon mauritiunum*, *Chenopodium appolifolium*, citura and several others (Busenene 1993). Where ant-hills occur, shrubs like *Grewia similes*, *Acalypha bipartia*, *Scutia mytina*, *Rhus natalensis*, *Euphorbia candelabra* and *Cissus quadrangularis* often appear.

2.5 Fauna

Some 68 species of mammals are currently known to occur in LMNP (Table 2).

Despite the fact that LMNP is still the most diverse savannah ecosystem in Uganda, several species that were known to occur in the area have been extirpated. Large mammals such as elephants (*Loxodonta africana*), giant forest hogs (*Hylochoerus meinertzhageni*), wild dogs (*Lycaon pictus*) and lions (*Felis leo*) became extinct already some decades ago. This has had an influence both on the vegetation and on the wildlife community (Guard 1993, Kingdon 1997). Lions have not been reported in the Park since 1984. The Lake Mburo area was among the areas previously well known for their large lion populations. Their disappearance from the ecosystem must have had a significant effect on animal populations. However, during the study period several lions were heard and observed in LMNP. Impala are found only in this area in Uganda. Furthermore significant populations of eland (*Taurotragus oryx*) and zebra (*Equus burchelli*) occur.

Table 2: Status of selected mammal species occurring in the Lake Mburo area, Uganda (Kingdon 1997, Lamprey *et al*. 1999a* and personal observation)

English	Scientific name	Status	National status of wildlife species*
Black-backed Jackal	*Canis mesomelas*	4	
African Wild Dog	*Lycaon pictus*	□	Endangered
Spotted Hyena	*Crocuta crocuta*	4	
Lion	*Felis leo*	4	
Leopard	*Felis pardus*	□	Indeterminate
Elephant	*Loxodonta africana*	□	Vulnerable
Burchell´s Zebra	*Equus burchelli*	□	Biggest population in Uganda
Warthog	*Phacochoerus aethiopicus*	□	
Giant Forest Hog	*Hylochoerus meinertzhageni*	□	
Bushpig	*Potamochoerus larvatus*	□	
Hippopotamus	*Hippopotamus amphibius*	□	
Topi	*Damaliscus lunatus*	□	Vulnerable
Impala	*Aepyceros melampus*	□	Rare: Uganda's population is confined to LMNP
African Buffalo	*Syncercus caffer*	□	
Common Eland	*Taurotragus oryx*	□	Indeterminate: biggest population in Uganda
Bushbuck	*Tragelaphus scriptus*	□	
Sitatunga	*Tragelaphus spekei*	?	Insufficiently known
Common Duiker	*Sylvicapra grimmia*	□	
Roan Antelope	*Hippotragus equines*	□	Rare
Klipspringer	*Oreotragus oreotragus*	4	Rare
Oribi	*Ourebia ourebia*	□	
Defassa Waterbuck	*Kobus ellipsiprymnus*	□	
Bahor Reedbuck	*Redunca redunca*	□	Vulnerable

□ significant population, 4 present in small numbers, □ present in the 1940s, now extinct, **?** unknown

Fourteen species of ichthyofauna have been identified in the lakes and wetlands including some that are locally endemic. Amphibians include *Xenopus and Rana spp.* and the several species of reptiles include blind, aquatic and arboreal snakes and *Crocodilus niloticus*. Some 312 bird species (accounting for over 30% of the national total) have been recorded in LMNP. Five species are forest specialists and 60 species are wetland specialists. Thirty species, including the Shoebill stork (*Balaeniceps rex*), the Papyrus Yellow warbler (*Chloropeta gracilirostris*) and the Saddle-billed stork (*Ephippiorhynchus*

senegalensis) have been identified as being of special conservation interest (Kamugisha & Ståhl 1997).

2.6 The people of the Lake Mburo area

Two main sub-ethnic groups of the Banyankole tribe predominate in Nyabushozi namely the cultivators, the Bawiru (about 45%) and cattle herdsmen, the Bahima (about 23%) (Figure 5). Other ethnic groups include: Baganda and Bakooki (14%), immigrants from South-Eastern Uganda, Bakiga (8%) from South-Western Uganda, Banyarwanda (6%), who are the offspring of refugees of the Rwanda civil war of the 1960s, and Bahoro (2%) who are essentially Banyankole from South-Eastern Uganda. About 80% of the inhabitants of Mbarara District work in the agricultural sector. While there are still some members of the population that remain pure cattle keepers or cultivators, the general tendency now is towards mixed farming (Ministry of Finance, Uganda 1992). Nowadays both the Bawiru and the Bahima grow crops such as bananas, beans, maize and cassava.

Figure 5: Mr. and Mrs. Riisi, 1999. Bahima in their house sitting in front of their milk pots.

The population figures for Nyabushozi county with its sub-counties Sanga, Nyakashashara, Kenschunga and Kinoni increased between 1969 (37,224) and 1980 (77,838) and decreased slightly between 1980-1991 (76,200) (Ministry of Finance, Uganda 1992). Population density generally decreases North and North-Eastwards

while the South and West are more densely populated. On average, the Lake Mburo rangeland is generally sparsely populated with average population densities of 19 persons/km^2. The least populated parish Rurambira bordering the Park to the East has 8 persons/km^2. Parishes to the North-West have population densities ranging from 140 to over 200 persons/km^2 while those to the South-West and the South range between 20-139 persons/km^2. Just over 50% of the people living around the National Park are recent immigrants having settled during the last ten years. The longer settled immigrants (over ten years) add up to 31% while about 17% were born in the area and 2% did not know the length of their residence (Kamugisha & Ståhl 1997).

Population movements into the area may be understood in terms of the different forms of "push" and "pull" factors that stimulate resettlement. A study by Kamugisha & Ståhl (1997) showed that the "push" factors are those conditions in the areas of origin which forced people to move out and they include land shortage (43%), deteriorating soil fertility/lack of earning opportunities (18%), prolonged drought and famine (17%). The "pull" factors, on the other hand, are those that have over time encouraged people to come and settle in the area rather than somewhere else and they include land availability and tenurial circumstances thereof (12%), fishing opportunities (9%), official settlement policy (11%), clan/family ties (3%), job opportunities (11%) and other miscellaneous causes (20%).

2.7 Conservation history of LMNP

At the beginning of the 20th century, Lake Mburo was known to a handful of naturalists as one of the premier wildlife areas in East Africa. The Lake Mburo ecosystem includes large areas that constitute the grazing land of the Banyankole people and their Ankole cattle. Traditionally the Bahima were pure pastoralists and never hunted wildlife, while the Bawiru were cultivators and occasionally hunted. The Lake Mburo area formed part of the Nkore Kingdom which was ruled over by the Omugabe, the king of the Banyankole. The Omugabe controlled access to the land around Lake Mburo, allowing his people to use it for grazing their cattle only in times of drought. He had to be a Muhima (singular for Bahima), and as hunting has not been part of the tradition of the Bahima, there was no hunting in the Lake Mburo area. In the early parts of the 20th century, an outbreak of the cattle disease rinderpest decimated the Bahima's herds. Livestock numbers took a long time to recover, and competition between wildlife and cattle was low during this time (Snelson & Wilson 1994).

In 1935, the area around Lake Mburo was declared "Controlled Hunting Area" by the British colonial Government. It permitted both regulated "big game" hunting and traditional human activities. As the professional hunter B. Herne (1979) put it: "Lake Mburo is a most interesting beautiful place with a wide variety of terrain from the short grass plains, lightly wooded hills and in the East the long narrow Lake Kachira.

…Lake Mburo is a natural game paradise for one reason only: the dreaded tsetse fly (*Glossina spec.*) The tsetse fly is a carrier of trypanosome that causes sleeping sickness. The tsetse fly which occurred at Lake Mburo was fatal to all domestic stock but inflicted painful bites on humans without proving fatal ….The natural barrier against man's exploitation of Lake Mburo accounted for the vast stocks of game found there, wild animals having developed immunity to trypanosomiasis".

In the 1940s, a severe outbreak of sleeping sickness carried by tsetse fly forced pastoralists out of the area. Many of the farmers and fishermen, however, remained. Tsetse flies require two basic resources to persist in an area – shade and blood. It was assumed that if all shade and wild animals were removed, then the tsetse fly would be eradicated. The United States funded a drastic tsetse eradication program of spraying, bush burning and cutting, and shooting which severely reduced game populations. They slaughtered everything they could, entire herds of eland, topi, buffalo. However, some animals survived (Herne 1979).

By the early 1960s, tsetse flies had been eradicated, once again opening up the area to pastoralists. The shortage of land in other parts of Ankole led to the immigration of other Banyankole and Bakiga subsistence cultivators from the South and South-East into the area (Kreuer 1979). To protect the remaining wildlife, the newly-independent Ugandan Government gazetted the Lake Mburo Game Reserve. All forms of use, except controlled hunting was banned, although resident farmers were permitted to remain. The Government of Uganda decided that ranching would be the best use to which this dry and sparsely populated land could be put. Plans were made and activities initiated with the main objective of ensuring a "rapid and radical" development through livestock husbandry on commercially productive and economically viable beef-cattle ranches (Kamugisha & Ståhl 1993). Establishment of the Ankole Ranching Scheme (ARS) to the North pushed more pastoralists into the Game Reserve and large blocks of land were excised from the Reserve to form more Government and private ranches (Snelson & Wilson 1994).

In 1983, the Government established the Lake Mburo National Park within the boundaries of the original Game Reserve. It comprised an area of 650 km^2 (Figure 1). Lake Mburo National Park was established without the consent of local people and it involved their forced removal. This was perceived as a major injustice and turned many people against the Park, and when subsequently the Government weakened they returned and destroyed the Park facilities. By 1986, the entire Park was again occupied by settlers. In order to resolve the conflict, a Government Task Force was established and it was decided that the Park should remain, but reduced in area by 60% to 260 km^2 (Snelson & Wilson 1994).

2.8 Ankole Ranching Scheme

In 1963, with financial assistance from foreign donors, the Government planned and designed the layout of 50 ranches, the Ankole Ranching Scheme (ARS), and allocated each ranch to a successful applicant upon signing a covenant committing the rancher to certain management prescriptions and terms (Figure 6). In 1987, having realised that ranches in Government sponsored ranching schemes were not being optimally utilized and in a bid to find a permanent solution to the problem of increasing numbers of herdsmen "squatting" in the ranching schemes and the accompanying environmental deterioration, the Uganda Government set up a commission with a view to affecting reforms and improving the efficiency of these. It was decided that all the ranches in the ARS be repossessed and be sub-divided into 7.8 km^2, 5.6 km^2 and 2.6 km^2 units for redistribution. The ARS has a size of 647 km^2 in 50 ranches and totals 72,500 ha, 29,976 ha of which belong to the ranchers while 42,518 ha belong to the 707 former squatters (Kamugisha & Ståhl 1993).

The official legal transfer of land titles is still an ongoing process due to unsolved property disputes, which might result in problems in future.

Figure 6: Munyankole (singular for Banyankole) cattle keeper and Ankole cattle.

2.9 LMNP today

The LMNP of today is directly bordered by farm- and ranch land; it has no buffer zone. Pastoralists and cultivators live at the periphery of the Park. Between 1969 - 1980 human population growth of 4.1% in Mbarara District has turned the area into a remnant of what was known to be a much more extensive wildlife area. The pastoral Bahima and their cattle have been roaming throughout the region for centuries, however the reduction in size and availability of communal range lands outside the Park due to privatisation and cultivation of land has confined them to an area that is too small to support the numbers of cattle they need to sustain their pastoral lifestyle. This has resulted in overstocking and environmental deterioration. The pressure on people to develop new and sustainable forms of land use is intense (Averbeck 2001a).

The prevalent approach of the conservation authorities towards local communities was simply to keep them out of the protected areas. Emphasis was on strict protection, and as a result hunting was banned even outside the Park in 1978. In the late 1980s and early 1990s this policy changed. With the support of foreign donors, protected area outreach programmes were established in parts of Uganda including LMNP. Wildlife managers realized that relationships between rural resource users and conservation agencies were a prerequisite for building sustainable community systems (Barrow *et al.* 1995a,b). Established community conservation units, which worked in areas adjacent to protected reserves, instituted a process of dialogue and problem solving. This approach was not as successful as hoped, however. Formal environmental education, capacity building, and support for community development have not stopped the local communities from utilizing wildlife in an unsustainable manner (Hulme 1997, Infield & Namara 2001).

A Population ecology and sustainable use

Figure 7: Adult male impala

3 Population ecology of impala

3.1 Introduction

The maintenance of biotic diversity is dependent on the maintenance of viable populations of the species in a community. Conservation managers should therefore monitor the populations and study their ecology to determine if they are meeting their management objectives (Van Hensbergen & White 1995). Caughley (1977) notes that there are essentially only three potential problems that require management of populations, conservation, control, and harvesting. In this case the aim of harvesting is to obtain a proportion of the population on a long-term basis, the sustainable yield. Naturally this proportion must be such that the population does not become extinct, or become so low that it is unprofitable to harvest (Beddington 1974, Sinclair & Grimsdell 1982, Barlow 1987, Martin 1993).

Sustainable use

The logic of sustainable use is simple: it is to remove individuals at the rate at which the population would otherwise increase (Caughley & Sinclair 1994). Thus if a population is increasing at 5% a year, then this 5% can be removed each year while keeping the population at the same density. This annual population increase is usually induced by reducing the population so that, as a result of density dependence, there is an increase in average survival or breeding output. Sustainable exploitation is usually only possible if the population is reduced below carrying capacity or equilibrium density (Sutherland 2000).

Exploitation models permit pre-management experimentation, allowing for a prediction of the outcome of different management actions. These models help to optimise the off-take from populations and the calculation of the maximum sustained yield (MSY), the largest possible sustained production of a population. Different models used for managing exploitation are described in the literature: the surplus yield models, yield per recruit models, Robinson and Redford models, Lotka-Volterra model, full population model, relating yield to recruitment and mortality model, and adjusting in relation to population changes model (Caughley 1977, Van Rooyen 1994, Hearne *et al.* 1996, Slade *et al.* 1998, Sutherland 2000).

Most of the models require information such as unexploited population size (Lotka-Volterra model), estimate of population increase, age-specific birth and mortality rates (Robinson and Redford model), annual catch and total effort or catch per unit (surplus yield models), mortality and economic value (yield per recruit model) which are not easily obtainable.

Only the concept of 'adjusting in relation to population changes' was applicable in the frame of this project. Adjusting in relation to population changes simply entails relaxing or tightening the exploitation in relation to evidence of population increases or decreases. This method is improved by adjusting the exploitation each year in relation to observed or predicted changes in breeding output or mortality. Although this is a simple method requiring little data it probably has, according to Sutherland (2000), a better track record of conserving populations, and providing sustainable yields, than any other. It has the advantage that it concentrates upon the population size which makes it easy to detect overexploitation.

Population structure

A study on the population ecology of impala was conducted as I was planning for a possible harvest of wild big mammals outside the LMNP. The aim of a impala utilization scheme was to remove a proportion of the population on a long-term basis. In order to be able to calculate a sustainable yield the population structure, age structure, birth rate and mortality rate were established.

Habitat utilization

According to Hall *et al.* (1997) a habitat is defined "as the resources and conditions present in an area that produce occupancy-including survival and reproduction-by a given organism. Habitat is organism-specific; it relates the presence of a species, population, or individual (animal or plant) to an area's physical and biological characteristics. Habitat implies more than vegetation or vegetation structure; it is the sum of the specific resources that are needed by organisms". It integrates the effects of parental material, soil, slope, elevation, and local hydrologic regime, and events such as fires and floods; provides food and hiding and thermal cover; serves as the biotic matrix for rock outcrops, standing water, snags, and other features that have value as elements of habitat (Stromberg 1995).

Jarman & Jarman (1974) showed that impalas in Tanzania feed on a variety of grasses and browse selectively, in different vegetation types within fairly large home ranges. The diet changes seasonally, as does their preference for vegetation types. Seasonal changes in habitat choice reinforce dietary changes, tending to place animals in vegetation types at times of optimal plant growth. As a result, impala concentrate in seasonally different areas. The size of individual home ranges is related to the availability of resources throughout the year. Wronski (1999) in his study on foraging behaviour of impala in the Lake Mburo area described seasonal changes in vegetation types used by impala. However, the duration of his study over five months and the size

of the study area allows only partly for a generalization over time and space. Van Horne (1983) suggests multi-annual surveys over a range of habitat types to study habitat use of a species. I therefore studied habitat utilization of impala over a period of 20 months, four rainy and three dry seasons and covered an area of 13.5 km^2 distributed in LMNP and its surroundings. My hypothesis was that impalas use different habitat types in the rainy than in the dry season. I assume that according to sex and age impalas use the same habitat types. My objective was to find out which habitat types impala prefer in the dry and rainy season?

Distribution and movements

Animals form a dynamic relationship with their environment. The basic environmental factors of an ecosystem set the overall pattern of the distribution of a species and the individuals of a species are able to respond to fluctuations in local environmental conditions by moving about within their local range (Norton-Griffiths 1978).

Many fundamental aspects of wildlife management within an area require information on the distribution and movement of animals within that area. The total range of migratory and resident species, especially the wet season dispersal areas and the dry season concentration areas, the density distribution of each species within its total range and the main environmental factors underlying the observed patterns of distribution and movement are all information required for planning the development of human activities such as ranching, cultivation, sport hunting and cropping in the country lying around existing Parks or other areas (Norton-Griffiths 1978).

Different authors stated based on their own ground counts that the ranch land near LMNP represents the rainy season dispersal area of impala while they move towards the water bodies of LMNP in the dry season (Tindigarukayo-Kashagire 1989, Guard 1991, Kamugisha & Ståhl 1993). However, Du Toit (1990) in South Africa and Jarman (1970) in Tanzania confirmed restricted home ranges of 5.8 km^2 and 5 km^2 respectively for impala. Due to the size of the Park and the ranches it is unlikely that impala would leave the Park in the rainy season and move back in the dry season if their home ranges cover some 5-6 km^2 only. As other aspects of impala ecology in South Africa, Zimbabwe, Kenya and Tanzania reported by Leuthold (1970), Jarman (1970), Murray (1982a) and Du Toit (1990) appeared to apply well of the Lake Mburo area, I hypothesize that impala stay in both seasons where they are. I assume that impalas do not move in the dry season from the ranches to the Park and in the rainy season in the opposite direction to areas adjacent to the Park. Furthermore the results of two tracking methods were compared used in the frame of this study, radio telemetry and observation of ear-tagged impalas. I expected, that the home ranges of impalas established by radio tracking and the observation of ear-tagged impalas are of the same size.

Furthermore, considering the findings of Tindigarukayo-Kashagire (1989), Guard (1991) and Kamugisha & Ståhl (1993) one would expect a higher density of impalas in the dry season inside the Park and in the rainy season outside the Park. However, I assume that no seasonal differences in impala distribution can be found between the Park and its surroundings.

Impala

Impalas are medium sized (males 60-65 kg, females 40-45 kg; Jarman & Jarman 1973) herbivores, an African bovid (Figure 7). Impala occur in the Southern savannah areas of Africa (Figure 8). Several impala subspecies have been suggested. Haltenroth (1963) originally included six, Meester & Setzer (1971), regarded only the common *Aepyceros melampus melampus* (common impala), *A. m. suara* (long-horned impala), presumably from Tanzania, Rwanda and South-Western Uganda, and *A. m. petersi* (black-faced impala) from Namibia and Angola as true subspecies. Recent authors describe only *A. m. melampus* and *A. m. petersi* as subspecies (Kingdon 1997, Grau Nersting & Arctander 2001).

The impala is an edge species, preferring light woodland with little undergrowth and grassland of low to medium height. While depending on free water, soils with good drainage, firm footing, and no more than moderate slope, its special requirements produce an irregular and clumped distribution (Estes 1991).

The impala is predominantly a grazer while grasses are green and growing and a browser of foliage, forbs, shoots, and seedpods at other times. If necessary it also eats fallen dry leaves. It not only changes its diet in a given area according to season, but can adapt to different habitats by being mainly grazer in one area and a browser in another. The impala's ability to utilize both monocotyledons and dicotyledons gives it an unusually varied, abundant, and reliable food supply enabling this antelope to lead a sedentary existence and reach densities of up to 214/km^2 in wooded savannahs of Rwanda's Akagera N.P. (Smithers 1983).

Impalas are seasonally or perennially territorial and gregarious. In Southern Africa males are only territorial for a few weeks around the time of the annual rut, and in East Africa, despite an extended breeding season, males loose territorial vigour in the dry season, when benefits in terms of mating opportunities are outweighed by the costs of herding females and excluding rival males (Fairall 1972).

Females conceive first at 1.5 years, whereas males, begin reproducing as they mature and gain territories in their fourth year. Gestation is 194 –200 days (Fairall 1972).

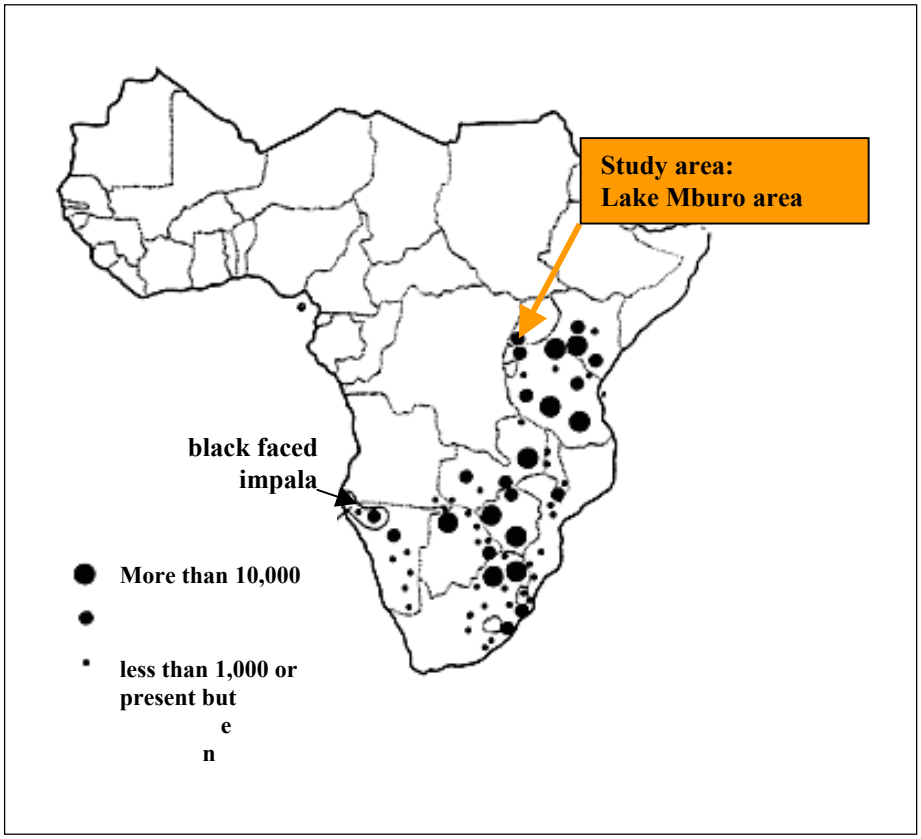


Figure 8: Occurrence of impala (after IUCN 1998).

3.2 Methods

In order to establish total population estimates and information on the population structure aerial surveys and ground counts were conducted. Aerial sample counting is now a very frequently used method of counting large mammals (Lamprey & Michelmore 1996a). With a light aircraft it is possible to assess the total numbers and seasonal distribution of animals. Ground counts are excellent for obtaining data in small to medium sized areas on population structures, on the seasonal pattern of distribution within different vegetation types and condition of the animals that can not be obtained from the aircraft. Ground counts are therefore ideal for detailed studies in small study areas, their use being only limited when ground access is difficult or when the area covered is very large (Norton-Griffiths 1978).

3.2.1 Ground counts

From July 1997 to December 1999 road counts of big mammals were carried out. Due to the nature of the country and of the vegetation, being hilly and partly inaccessible and characterized by thick bushes, the method of vehicle road counts was used. Trial counts revealed that in order to differentiate age classes and sexes one could not walk on foot. Animals were scared and run away before they could be counted. Road counts furthermore enabled us to cover a bigger area.

A total track length of 150 km was covered. All animals were counted according to the method of "variable fixed strip width" (Norton-Griffiths 1978). In open country it was possible to count all animals within 200 metres on either side of the vehicle, while in thicker country it was reduced to 30 metres either side of the vehicle. In both cases all animals within the specified distance were visible (Figure 9). The strip width was established along the tracks using a range finder for both the dry and the rainy season.

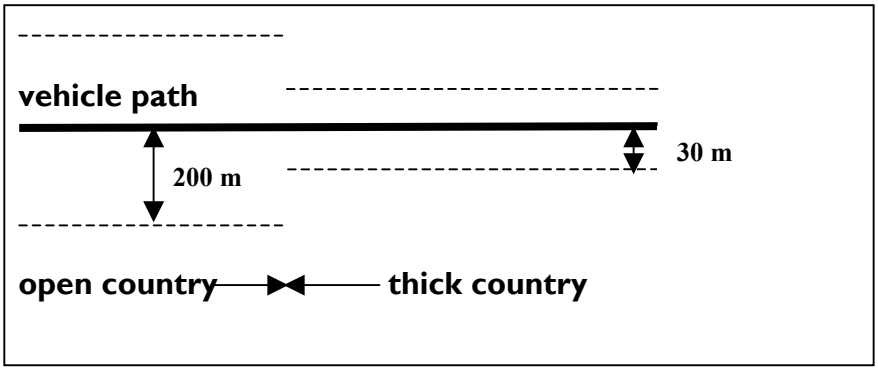


Figure 9: Variable fixed width.

In order to establish the seasonal pattern of the distribution of the animals a survey of all the big mammals was conducted over four days each month along four tracks (see Figure 10, Table 3), inside Lake Mburo National Park, on ranches of the Ankole Ranching Scheme North of the Park (Northern Ranches) and ranches East of the Park (Eastern Ranches). To establish the daily pattern the animals on each track were counted twice, in the morning and in the afternoon of one day. Three people participated in the counting exercise: one driver, one person for recording the data and counting and another person for counting the animals. All big mammals were counted, their sex and age classification and habitat data recorded (see 3.2.3). Impalas were counted from July 1997 to December 1999, all other mammals from October 1997 to December 1999. In July and August 1997 animals were counted only along the tracks in the Park, from September 1997 also on the Eastern Ranches and from January 1998 also on the Northern Ranches. In October 1997 all the species were counted on all the tracks. Only the results of impala were described in this chapter.

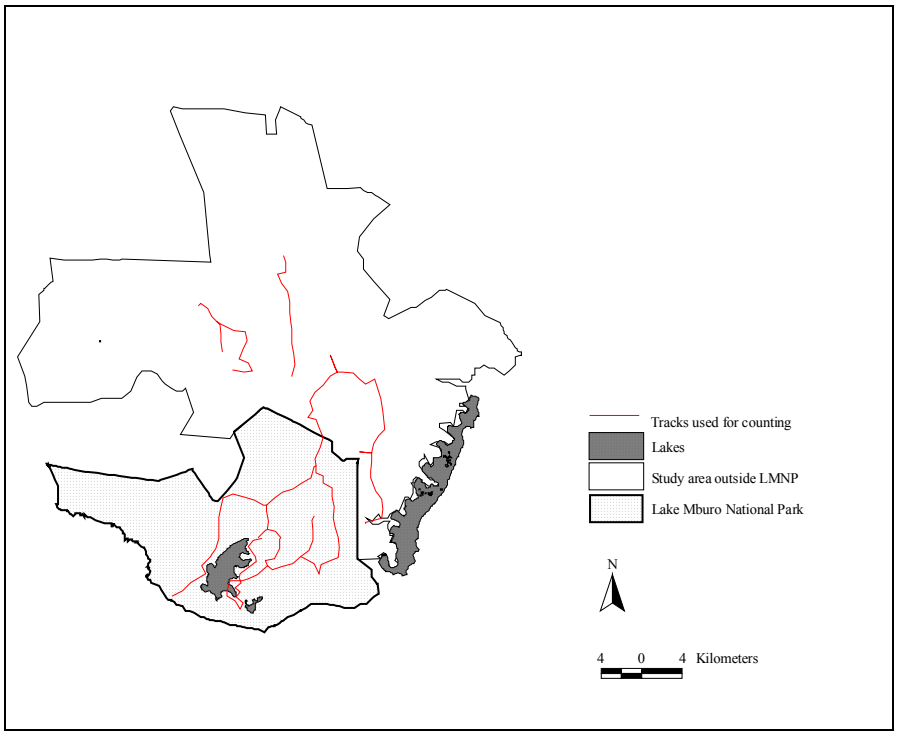


Figure 10: Distribution of tracks used for ground counts in the Lake Mburo area.

For the calculation of the densities the area covered (variable fixed width) during the census in the dry and rainy season were estimated as follows:

Table 3: Area covered during the ground counts in the Lake Mburo area

Tracks	Rainy Season area in km^2	Percentage of survey area covered	Dry Season area in km^2	Percentage of survey area covered
Park	5.5		5.7	
East	4.0		5.6	
North	2.0		2.2	
TOTAL	11.5	0.8	13.5	0.9

The density of the animals seen from each of the tracks were calculated: (= number of animals/area covered according to season and track). Note that the densities calculated are those along the tracks covered but are not necessarily representative for the Lake Mburo area. It was not possible to stratify the area according to different vegetation types as no vegetation map existed for the whole Lake Mburo area. Only a

map for LMNP is available (Hoag *et al.* 1991). UWA had planned to map the vegetation of the Lake Mburo area for 2000 but no study was conducted.

Criteria for establishing sex and age structure of big mammals

Male and female impalas were easy to distinguish as only males have horns. Following the criteria of Roettcher & Hofmann (1970), males were classified according to the shape and the length of their horns and females according to their body size and – shape and visibility of an udder. At the age of three months male impalas start to develop horns. Before the age of three months it was not possible to recognise the difference between male and female impalas in the field while counting. Males become sexually mature at the age of 4 years, while females can conceive at one year old and can have their first fawn at an age of 1.6 years (Table 4). Other criteria to determine the age like tooth eruption and the ossification of cranial structures (Roettcher & Hofmann 1970) were not used as they were not applicable in the field while counting animals.
Three age classes were used:

Table 4: Age classification of impala

Sex	Age class 1		Age class 2		Age class 3	
Males	< 1 year	Juvenile (M1)	1 ≤ x ≤ 4 years	Sub adult (M2)	≥ 4 years	Adult (M3)
Females	< 1 year	Juvenile (F1)	1 ≤ x ≤ 1.6 years	Sub adult (F2)	≥ 1.6 years	Adult (F3)
Unknown	< 3 months	Juvenile (U1)				

Criteria for establishing birth rate and mortality rate

The birth rate of the population was derived from the proportion of mature females that give birth during the year. It was only possible to record the reproductive history of one individually known female living in LMNP.

The mortality rate was estimated from the numbers of tagged impalas killed in 6 months. Furthermore possible influences of weather by correlating visual estimates of impalas with monthly rainfall, diseases and poaching were presented. However, they were not considered for calculating the mortality rate but considered when calculating the hunting quota in chapter 4.1.

3.2.2 Aerial surveys

Three aerial surveys were conducted during this study: October 1997, May 1998 and February 1999. A standard technique, the systematic reconnaissance flight (SRF) technique was used to assess the size and distribution of animal and livestock populations (Norton-Griffiths 1978). In this technique, wildlife and livestock were counted from the air within a systematic sample of the census zone. A Cessna 206 aircraft with a radar altimeter was used. Navigation was achieved using a Trimble Transpak II GPS unit coupled to a Skyforce Logger for recording the aircraft track (Lamprey *et al.* 1996a)

By knowing the size of the area sampled, an estimate of population size could be derived for the entire area. The sample was defined by markers mounted on the wing struts of the light aircraft. These markers were calibrated to accord the observers in the left and right rear seats of the aircraft a fixed strip width on the ground if the aircraft was flown at a constant height. The strip width was calibrated at 150-200m on each side of the aircraft when the aircraft was flown at a constant height of 350-400ft above ground level as indicated by the aircraft radar altimeter.

The flight transects were regularly spaced to provide a systematic coverage of the area, and thus indicate the distribution of species seen. This transect spacing was set at 2.5 km, to give more than 10% sample of the area (see Table 10). At fixed time intervals of 30 seconds, the front-seat-observer recorded the height of the aircraft above the ground from the radar altimeter; this was to derive the strip-width of each observer for the subunit. The distance intervals of 2.5 km formed the subunits for each transect, and the rear-seat-observers recorded their observations with respect to each subunit. Subunits were called by the pilot on the basis of the 'distance-to-waypoint' at the end of the transect. The observations for each subunit were recorded by the rear-seat-observers on tape recorders. For large herds, the observers took photos to cross-check their estimate (see Table 10).

3.2.3 Habitat utilization

In order to obtain information on the habitat utilization of impalas in the Lake Mburo area, habitat features were mapped along the ground count transects every km (300 'points', from the car up to the distance were all animals counted were visible). At each 'point', the habitat was described through three categories for each of the variables listed in Table 6 and Table 5: woody cover, slope, topographic location, and vegetation type. Availability of each habitat type was then established by estimating the categories found. During the ground counts notes were made on habitat types that animals were using. If the animals were scattered randomly, it would be proportional to the proportions of each habitat type in the survey. The habitat preferences, defined

as "the consequences of the process, resulting in the disproportional use of some resources over others" (Hall *et al.* 1997) were established.

Table 5: Common vegetation types in the Lake Mburo area.

No.	Tree association / Grass association (Hoag *et al*., 1991)	CSA (1956) Classificaton
1	Mixed woodland / *Bracharia*	Tree savannah with scattered thicket clumps including associations of *Bracharia decumbens* and *Bracharia decumbens/Themeda triandra*
2	Mixed Woodland / *Sporobulus spp.*	Tree savannah with scattered thicket clumps including associations of *Sporobulus pyramidalis* and *Sporobulus pyramidalis/Themeda triandra*
3	Mixed Woodland / *Loudetia spp.*	Tree savannah with scattered thicket clumps including associations of disturbed *Loudetia kagarensis,* and *Loudetia kagarensis*
4	*Acacia hockii / Bracharia spp.*	Tree savannah with *A. hockii* including associations of *Bracharia decumbens* and *Bracharia decumbens/Themeda triandra*
5	*Acacia hockii / Sporobulus spp.*	Tree savannah with *A. hockii* including associations of *Sporobulus pyramidalis* and *Sporobulus pyramidalis/Themeda triandra*
6	*Acacia hockii / Loudetia spp.*	Tree savannah with *A. hockii* including associations of disturbed *Loudetia kagarensis*
7	*Acacia geradii / Sporobulus spp.*	Tree savannah with *A. geradii* including associations of *Sporobulus pyramidalis* and *Sporobulus pyramidalis/Themeda triandra*
8	*Acacia geradii / Bracharia spp.*	Tree savannah with *A. geradii* including associations of *Bracharia decumbens* and *Bracharia decumbens/Themeda triandra*
9	Thicket / *Sporobulus spp.*	Thicket including associations of *Sporobulus pyramidalis* and *Sporobulus pyramidalis/Themeda triandra*
10	Thicket / *Bracharia spp.*	Thicket including associations of *Bracharia decumbens* and *Bracharia decumbens/Themeda triandra*
11	Hillside Woodland / *Loudetia spp.*	Gully forest, grass savannah including associations of disturbed *Loudetia kagarensis*
12	*A. hockii / Cymbopogon nardus*	Tree savannah with *A. hockii* including associations of *Cymbopogon nardus* and *Bracharia decumbens* and *Sporobulus pyramidalis*

The classifications of HOAG *et al.* (1991) can be interpreted in another more common classification system, the Scientific Council for Africa South of the Sahara (CSA) (1956) or Yangambi-classification.

Table 6: Categories and definitions of different habitat types in the Lake Mburo area

Habitat factor	Categories	Definition
Height of grass layer	1	Up to 0.25 m
	2	0.25 – 0.5 m
	3	Over 0.5 m
Woody cover	1	Up to 20% of the ground covered by woody plants
	2	20 – 80% of the ground covered by woody plants
	3	Over 80% of the ground covered by woody plants
Slope	1	0-10°
	2	10-30°
	3	More than 30°
Topographic location	1	Plain, flat land
	2	Slope of a hill
	3	Top of a hill
Site humidity	1	Wet, standing water, can be seen, sand is wet
	2	No standing water, grass is green
	3	Dry, grass is brown, sand is dry

3.2.4 Movements of impala

In order to collect information on the movements of impala a total of 233 impalas were marked with numbered ear-tags in 1997 and 1998. Twelve impalas (7 males and 5 females) were marked with radio collars in November 1998 and February 1999. For tagging, impalas were captured either by immobilization with a darting gun or by night capture with spotlights. As the process of chemical immobilization was very time-consuming and expensive, and the use of drugs was restricted to licensed veterinarians who were not always available, after some months I opted to catch impalas rather than darting them.

1. Immobilization (hyperkinesias) of impala

The animals were approached cautiously by a motor vehicle and a syringe was projected from the motor vehicle. The syringe filled with drugs was applied through a darting pistol with manometer including 16g CO_2 cartridges of DAN-INJECT. Various immobilizing drugs may be used to immobilize animals so that they are manageable (Grootenhuis *et al.* 1976). In this case a mixture of 0.35-0.45 ml Immobilon and 0.1-0.2 Rompun (adult male, 40-60 kg) was used to immobilise impalas. After the animals went down 0.1 ml Doxapram was given intravenous and the same volume intramuscularly in order to stimulate the respiration. At the end of the intervention (after 5-10 minutes) an antidote, 0.35 – 0.45 ml Diprenorphin (Revivon) was applied intravenously and intramuscularly or subcutaneously. Dr. Siefert, a veterinarian of Makerere University, Kampala and my counterpart, Dr. Okori, were responsible for darting the impalas.

2. Night capture with spot light

Impala can be temporarily blinded by strong spotlights in dark moonless nights and can be caught and handled. Our method involved a team of catchers standing on the back of a Toyota Hilux truck with one person operating the spotlight. We then moved into the area where we wanted to catch impala. When the impala were located in the beam of the vehicle's headlights, the lights were dimmed and the vehicle moved carefully through the bush towards and to the side of the animals. The vehicle driver tried to get as close as possible to the animals. When the vehicles were close enough, the spotlight was switched on. The animals were then blinded and confused. Members of the capture team then jumped off the vehicle, quickly stalked the animals and caught the closest ones by grabbing the hind leg, just above the hock joint. Two people were usually necessary to hold an impala. Big rams were controlled by two people: one person in front holding the horns firmly near the head and the second person holding the flanks. Adult ewes were held around the neck by a second person. Young animals and lambs could be handled by one person. If possible the animals were restrained in a lying position on their sternum with legs folded underneath it (Bothma 1996).

The animals were measured, blood-sampled by Dr. Okori for his veterinary research (Okori 1999), the tags were applied, and the animals were released into the darkness after switching off the spotlight.

3. Observation of movements of animals with ear-tags

The animals were tagged with ear-tags of three different colours. In total 119 impalas caught in the Park were marked with red tags, 99 on the Eastern Ranches with blue tags and 27 Northern Ranches with yellow tags (Table 7, Figure 11). Aerial surveys indicated that impala densities were low in the West and South of the Park. Therefore only impalas inside LMNP and in the East and North were considered.

Table 7: Number of impalas tracked, and number of sightings and locations obtained by sex and age in the Lake Mburo area.

Sex and Age	M 1	M2	M3	F 1	F2	F3
No. of impalas tagged with ear-tags / sightings	60/445	18/165	29/230	42/169	31/214	54/490
No. of impalas tagged with radio collars and ear-tags/ sightings and locations		2/153	5/359			5/519

Every week the area was screened by driving with the car through the area. The position of any marked impalas that were seen was noted using a Global Positioning System (GPS, GARMIN 12XL).

Data were collected from 1997 or 1998 (the time the impalas were caught) to December 1999.

Figure 11: Male impala with ear-tag No. 9.

4. Radio tracking

Radio tracking is an invaluable technique for studying species which are active at night or live in habitat which makes them difficult to see. It is then possible to study habitat choice, movement patterns and home range. Radio tracking also makes it easier to find the individual and collect observational data (Sutherland 2000).

Due to the dense vegetation of the study area and the limited time it was not possible to identify the daily movement patterns by following impalas marked with an ear-tag. Therefore in total 12 impalas were marked with 10 radio collars. Two impalas were therefore captured additionally and had radio collars fitted (Figure 12). The animals were tracked for 5 months, one rainy and one dry season, between 20th November 1998 to 15th April 1999 (Puszkarz 1999).

Figure 12: Marking captured impala with radio collar.

Radio transmitters with 10 different frequencies between 148,5 MHz and 149,5 MHz made by BIOTRACK were used. The radio collar weighed about 115g. The receiving unit comprised of a H-antenna (HB9CV) with an accuracy of ± 3 degrees connected to a TELEVIT- receiver type RX81. In order to locate the animals the signal directions were gathered from three locations and used to triangulate locations on a map.

3.2.5 Data analysis

I used EXCEL 2000 and SPSS 10 for windows for data analysis and statistical calculations. Spatial data were processed with the geographical information system ARCVIEW 3.1 and ANIMAL MOVEMENT ANALYSIS ARCVIEW EXTENSION 1.0. Additionally, aerial surveys were analysed using MIST (Monitoring Information System) of Uganda Wildlife Authority.

Ground counts

Explorative statistics was used to describe the data necessary for calculating the sustainable yield (ratio, mean, percentage).

Aerial survey

Jolly's Method 2 was used for analysing the aerial survey data for unequal sized sampling units, which is specifically designed to eliminate the effect of the difference in size between sampling units (Jolly 1969).

Each transect is treated as a sample of the population. If species occur in 'clumps', either in occupying part of the census zone, or by aggregating into a few large herds, there is a large difference in the numbers encountered in each transect, and the

variability, expressed statistically as the 'standard deviation' (SD), is high. If animals are scattered uniformly across the census zone, the estimate is more precise, and has lower variability. Standard errors are used to determine whether differences in populations between counts are statistically significant. The design of the census is important in minimising the variability of the estimate.

Population estimates of the aerial surveys were compared with a d-test (Norton – Griffiths 1978) by:

Y_1 = population total year 1
Y_2 = population total year 2
SD (Y) = population standard deviation
Var (Y) = SD^2 (Y) , population variance

If Y_1 with Var (Y_1) and Y_2 with Var (Y_2).
Then let $d = \frac{(Y_1 - Y_2)}{\sqrt{(Var(Y_1) + (Var(Y_2)}}$

If d is greater than 1.96 then the two estimates are significantly different from each other on the 5% level.

Linear regression analysis was used to establish the population trend.

Habitat utilization

I estimated the availability of the habitat by a set of 300 points along the counting tracks, and tested habitat preferences by comparing the abundance of the habitat type with the actually use of the habitat with χ^2 statistics. Differences between sexes and age-groups, rainy and dry season were tested using Mann-Whitney U-test.

Movements

When estimating seasonal home ranges the major interest lied in the total area cruised by an individual or group. Therefore, the minimum convex polygon home range (MCP) was calculated (Southwood 1966, Hooge & Eichenlaub 1997). The minimum convex polygon is the smallest convex polygon containing all the observed positions and the area within this polygon is estimated the home range size (Anderson 1982). In order to identify core areas, in which an animal spent most of its time, by excluding peripheral locations, the harmonic mean method (Dixon & Chapman 1980) was used. Exclusion of the area represented by the outermost 5% of fixes gave a 95% probability that the animal was in the rest of its range at any time during range recording (Kenward 2001).

Differences among sexes and age groups and between the two tracking methods used were tested using Students-t-test.

3.3 Results

3.3.1 Population structure

Aim of this chapter was to describe the data necessary for calculating the sustainable yield of a impala population in the Lake Mburo area (see calculation chapter 4). The information necessary comprise sex ratio, age structure, ratio adult females / less than one year old juveniles, mortality rate and population size of impala.

Sex ratio

Over a period of 30 months in total, 25,356 impalas were counted, 15,228 females and 10,128 males. The sex ratio of males to females averaged 1:1.5 (1997= 1:1.3, 1998= 1:1.4, 1999= 1:1.7) (Figure 13).

Age structure

In general the percentage of adult female impala (38% - 45%) in the population was greater than the one of males (21 – 27%). From 1997 to 1999 the percentage of adult males decreased from 27% to 21% while the proportion of adult females in the population increased from 38% to 45%. The proportion of juvenile and sub adult impalas remained almost at the same level between 5 and 10%. The changes were not significant.

The rate of sexually mature (66%) to sexually immature animals (34%) was 2:1. The ratio adult female: sub adult females was 1997 1:3.0, 1998 1: 2.8 and 1999 1:3.6 (Figure 13).

Birth rate

The birth rate of the population can be derived from the proportion of mature females that give birth during the year. If the number of animals born to the population is known and no twins are born, then the number of animals born to the population can be calculated, and further, if this was done over several years, then the variation in this number can be observed (Sinclair & Grimsdell 1982). In this study it was only possible to record the reproductive history of one individually known female living in LMNP. It was born in 10/1992 and died in 2/2000. It gave birth for the first time at the age of 1.6 years in April 1994. It produced one fawn every year, and two fawns in1996 and 1997.

In total it had eight fawns in six years, 3 males and 5 females. According to this example the individual annual birth rate was 1:1.3.

Once we consider that per female 1.3 fawns are born and the rate male : female was estimated at 1:1.5 then births per head in the impala population were 0.78 in average (1997= 0.73 , 1998= 0.76, 1999= 0.81).

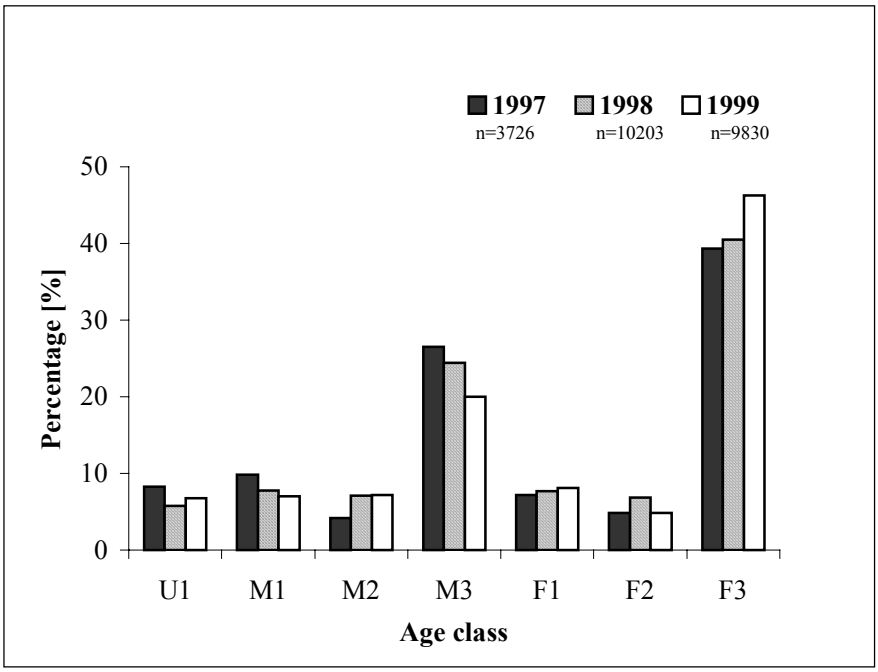


Figure 13: Sex and age structure of impalas (Table 4) in the Lake Mburo area (8/1997 – 12/1999).

Mortality rate

Different external factors contribute to the mortality rate of a population, which can be classified into biotic and abiotic factors. Biotic factors are direct influences of the biocoenosis on the population such as predation, anthropogenous, diseases and food. Abiotic factors include the influence of the climate and weather.

Predation

The influence of predation on the impala population could not be established but it was assumed that mainly leopards contribute to predation of impalas. Leopards were observed regularly in different areas of the Park. Out of 12 impalas marked with radio collars, leopards killed two in six months. The impalas were found hanging in a tree with the radio collar around the neck. If two out of 12 impalas are killed in six months, by extrapolating four, one third of all animals tagged would be killed per year. However it was not possible to verify whether the radio collar had increased the chance of the impala being killed by a leopard.

Wild dogs and lions became extinct in LMNP already some decades ago (Guard 1991). Spotted hyenas occur in small numbers. Even black-backed jackals (*Canis mesomelas*) and common jackals (*Canis aureus*) seem to play a minor role in predation due to their low numbers. Raptors, pythons (*Python sebea*) and olive baboons (*Papio cynocepalus anubis*) can feed on impala as well.

Poaching

It was not possible to reliably estimate the off-take of impalas through poaching. Hunted animals were either for home consumption, sold on the market in the nearby towns or brought to the capital Kampala. Unlike in Western Africa in Uganda, it was not possible to get information on bush meat sold on the markets by market surveys (Caspary 1999). People, especially those from nearby the Park, were highly suspicious as I was well known to them and I stayed and worked with staff of the Uganda Wildlife Authority.

Eight poachers volunteered to be interviewed. They gave information on the numbers of impalas and other species they take in a year. As it was impossible to estimate the concrete number of poachers it was not possible to get reliable information on the total off-take (Table 8).

Table 8: Off-take of wild animals in the East of LMNP (Nshara Government Ranch, ARS 40-50 (= 300 ha) in 1998 according to information from poachers.

Species / Hunting Method used	Gun	Spears and dazzling with a torch	Spears and dogs	Spears and nets	TOTAL
Buffalo	6				**6**
Bushbuck		30	10	60	**100**
Bushpig			120	150	**270**
Duiker		40	40	20	**100**
Eland	4				**4**
Hippopotamus	3				**3**
Impala	10	40	30	300	**380**
Oribi				10	**10**
Reedbuck		10	20	40	**70**
Warthog	10		60	20	**90**
Waterbuck			20	10	**30**
Zebra		1			**1**
TOTAL	**33**	**121**	**300**	**610**	**1064**

Interviews with communities in the North of ARS and arrests of poachers from that area indicate that many more animals were hunted. Without knowing the mortality rate caused by diseases or predation it can be stated that the impala population was not increasing but decreasing in the Lake Mburo area.

Diseases

A study on the 'health risk concerns associated with livestock-impala interactions and their consumptive utilization' (Okori 1999) revealed that impala encounter no major health problems in the Lake Mburo area. In a sample size of 160 animals only single cases of Tuberculosis and Foot and Mouth disease (FMD) occurred. Impalas might be reservoirs for certain diseases but under natural conditions the diseases do not break out in wildlife (Grootenhuis & Olubayo 1993).

Weather

It was assumed that with an average of 400-800 mm per year rainfall was the most important abiotic factor influencing wildlife populations in the Lake Mburo area (Kamugisha & Ståhl 1993). The temporal distribution of rainfall was bi-modal in March-May and September-November. No correlation was found between rainfall and the visual estimates of impalas of the ground counts. However in the rainy season ewes give birth and as a direct result more animals were found. The numbers of impalas counted in the peak season in August/September in each year did not vary much (Figure 14).

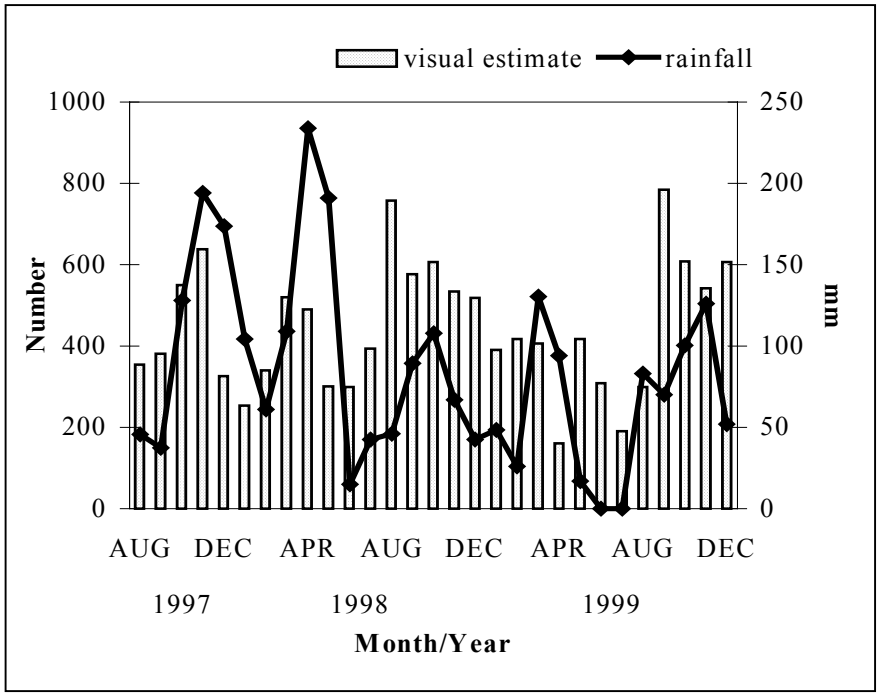


Figure 14: Visual estimate of impalas during ground counts and monthly rainfall in the Lake Mburo area from (8/1997 – 12/1999).

Size of impala population

In the last 18 years, several researchers have tried to estimate the population size of impala and other big mammals in the Lake Mburo area (Table 9). Differing methods were used and different areas covered. Only the results of the last five surveys can be compared as they were conducted by the same pilot, the same team of rear seat observers, the same method used, the same area covered and the same method used for analysing the data.

The numbers of impalas in the survey area were constantly decreasing over the last years. Data of 1995 to 1998 did not differ significantly. Only the results of 1999 indicated a significant decline (d-test, $P < 0.05$) of the population size, the differences between the last five years excluding 1999 were not significant (Table 10).

Table 9: Estimated numbers of impalas in the Lake Mburo area according to different surveys from 1982 - 1999.

Year	Researcher	Method	Size of survey area [km^2]	Area covered during survey [%]	Estimated numbers of impala	SD
1980	R. Malpas (1980)	SRF	650*	?	6,231	
1986	J. Tindigarukayo-Kashagire (1989)	Ground transect counts	650*	<1.5%	10,170	
1990	M. Guard (1991)	Ground transect counts	260**	2%	10,993	
1992 Dec.	R. Olivier (1992)	SRF	2010***	?	16,185	
1993	M. Guard (1993)	Ground block counts	260**	2%	13,267	
1995 Oct.	R. Lamprey & F. Michelmore (1996a)	SRF	1563***	15.8%	6,599	± 1,639
1996 May	R. Lamprey & F. Michelmore (1996b)	SRF	1573***	17.0%	7,442	± 1,673
1997 Oct.	this study	SRF	1594***	12.9%	6,817	± 1,339
1998 May	this study	SRF	1525***	11.5%	4,124	± 1,148
1999 Feb.	this study	SRF	1513***	12.6%	1,595	± 449

*LMNP borders 1983 to 1886, ** LMNP border from 1986 going on, ***LMNP, Nshara Government Ranch, Communal Grazing Land, ARS, LMNP Settlement Scheme.

It must be noted that ground counts in February 1999 showed that the size of the population based on the SRF was underestimated. Due to the extremely high temperatures during the survey, animals were standing in the shade of the trees and

were not visible to the observers. According to the experiences of R. Lamprey (biologist and pilot) only half of the population was observed. Therefore the population size of impala can be estimated at around 3000. However, for the calculations of the sustainable yield the results of the aerial survey were considered.

Table 10: Comparison of populations estimates of impala in the Lake Mburo area with d-test.

Years compared	1995/ 1996	1996/ 1997	1997/ 1998	1995/ 1997	1995/ 1998	1996/ 1998	1995 /1999	1996/ 1999	1997/ 1999	1998/ 1999
d-value*	0.36	-0.29	-1.53	-0.10	-1.24	-1.64	-2.9	-3.4	-3.7	-2.1

*If d is greater than 1.96 then the two estimates are significantly different from each other on the 5% level. If d is negative = decreasing, if d is positive = increasing.

There is no significant trend of population estimates of impala from 1995 to 1999 (Linear Regression Analysis, r^2= 0.73, P = 0.058) (Figure 15).

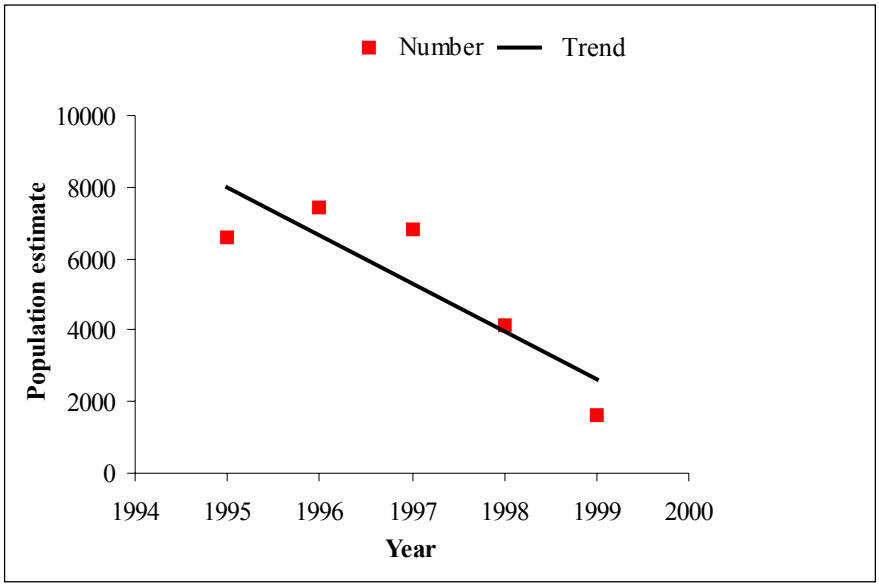


Figure 15: Population estimate of impala from 1995 to 1999 in the Lake Mburo area.

3.3.2 Habitat utilization of impala

The objective of this section was to document habitat preferences of impalas according to season, sex and age. In total 19,116 impalas (11,041 females and 6,886 males, 1,299 juveniles sex not identified) were observed from May 1998 to December 1999. The habitat variables included vegetation type, grass height, woody cover, slope, topographic location and humidity of the ground.

Vegetation

Impalas used significantly different vegetation types than expected (df = 11, χ^2= 10517 female, χ^2= 5449 male P < 0.001 for either sex and vegetation type). They preferred mixed woodland associations with *Bracharia spp.* (No.1) and *Sporobolus spp.* (No.2)

grass associations followed by *Acacia hockii* associations with *Bracharia spp.* (No.4) and *Acacia geradii* association with *Bracharia spp.* (No.8) rather than *Acacia hockii / Cymbopogon nardus* (No.12) and Thicket / *Bracharia spp.* (No.10) which were among the most abundant vegetation types (Figure 17).

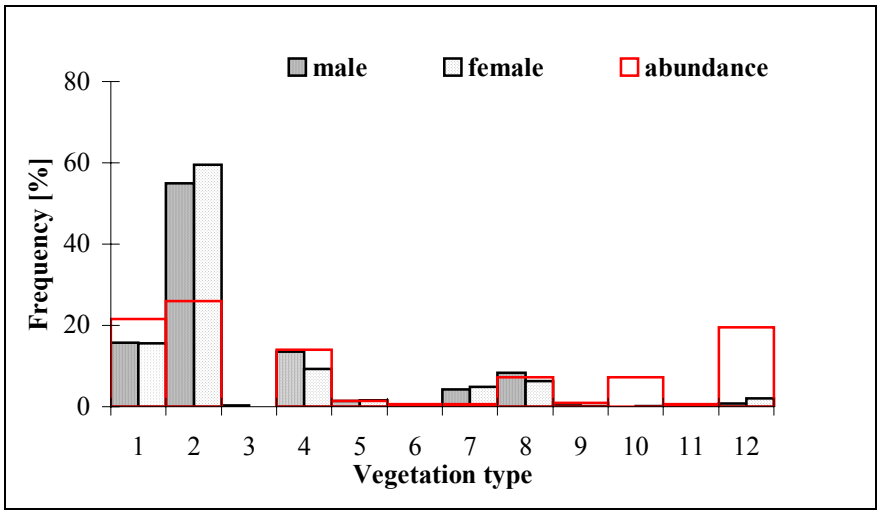


Figure 16: Abundance and use of different vegetation types (Table 5) by impalas according to seasons in the Lake Mburo area (5/1998-12/1999).

Impalas used significantly different vegetation types in the rainy season and dry season than expected (df = 11, χ^2= 7945 dry season, χ^2= 5631 rainy season, P < 0.001 for either season and vegetation type). While in the rainy season they preferred mixed woodland / *Sporobulus spp.* mainly in the dry season they used more mixed woodland / *Bracharia spp.* and *Acacia hockii / Bracharia spp.* (Figure 18). The differences between rainy season and dry season were not significant (U-test).

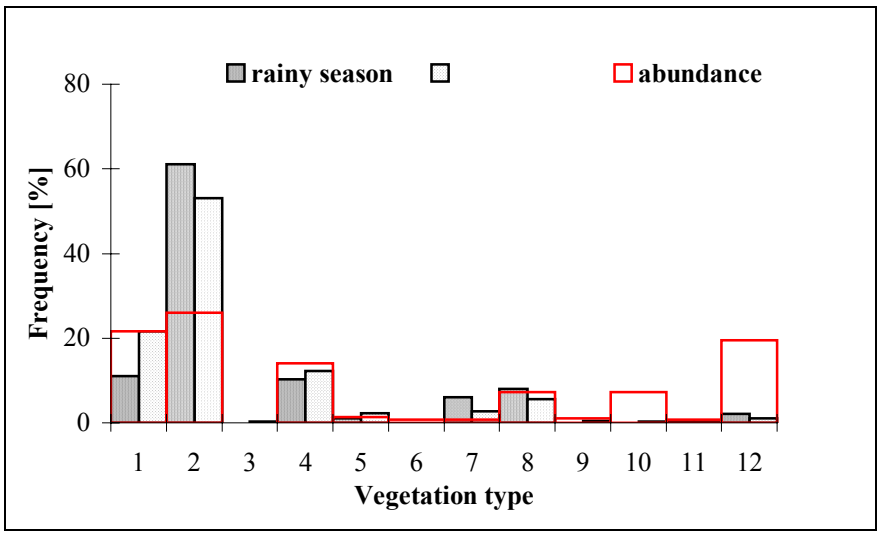


Figure 17: Abundance and use of different vegetation types (Table 5) by male and female impala in the Lake Mburo area (5/1998-12/1999).

Grass height

Impalas preferred a grass height of less than 0.25 m in the rainy season while they used a grass height of 0.25-0.5 m in the dry season (Figure 18, Figure 19).

Woody cover

Impalas used significantly different a categories of woody cover than expected (df = 2, female χ^2= 169962, male χ^2= 2804, P < 0.001 for either sex and categories). They preferred a woody cover of less than 80%. Even the differences between the used woody cover type and the expected in the rainy and dry season were significant. Impalas, however, preferred in the dry season areas with more dense woody cover (df = 2, rainy season χ^2= 2014, dry season χ^2= 7550, P < 0.001 for either season and woody cover type) (Figure 18, Figure 19).

Slope

Impalas preferred significantly different slope than expected (df = 2, female χ^2= 193, male χ^2= 58, P < 0.001) and used different slope categories as expected in the rainy (df = 2, rainy season χ^2= 980, dry season χ^2= 114, P < 0.001) and dry season. While they preferred a slope of 0-10° in the rainy season they were observed more frequently in areas at a slope of 10-30° in the dry season (Figure 18, Figure 19).

Topographic location

Impalas preferred significantly different topographic locations than expected (df = 2, female χ^2= 548, male χ^2= 189, P < 0.001) and they used different topographic locations as expected in the rainy (df = 2, rainy season χ^2= 1197, dry season χ^2= 513, P < 0.001) and dry season. They preferred the areas with slope more in the rainy season than the once in the valley bottoms (Figure 18, Figure 19).

Site humidity

Almost 100% of the impalas neither preferred areas with wet grounds with standing water or dry grounds with dry sand. Male and female impalas had the same preferences. Even the differences between dry and rainy season were not significant (U-test), although 15.8% of the impalas used dry areas.

No significant differences between sexes and age-groups (juvenile, sub-adult, adult) in their preferences of all habitat types studied could be established (U-test) (Figure 18, Figure 19).

Seasonal pattern

In the rainy season impalas preferred Mixed woodland / *Sporobolus spp*., a grass height of up to 0.25 m, a woody cover of less than 20%, a slope of 0-10° in the valley bottoms. The preferences changed in the dry season to a woody cover of 20-80%, slope of 10-30° up the hills. More Mixed woodland/ *Bracharia spp*. and *Acacia hockii* / *Sporobolus spp.* were preferred in the dry season. They utilized more grass between 0.25 to 0.5 m grass height. Impala neither used very wet nor dry grounds, but in the dry season they were also found at places were the ground was dry. According to these findings impala prefer in the rainy season the short grass in the valley bottoms with less woody cover and move up the hills in the dry season accepting longer grass and more woody cover (Figure 18, Figure 19).

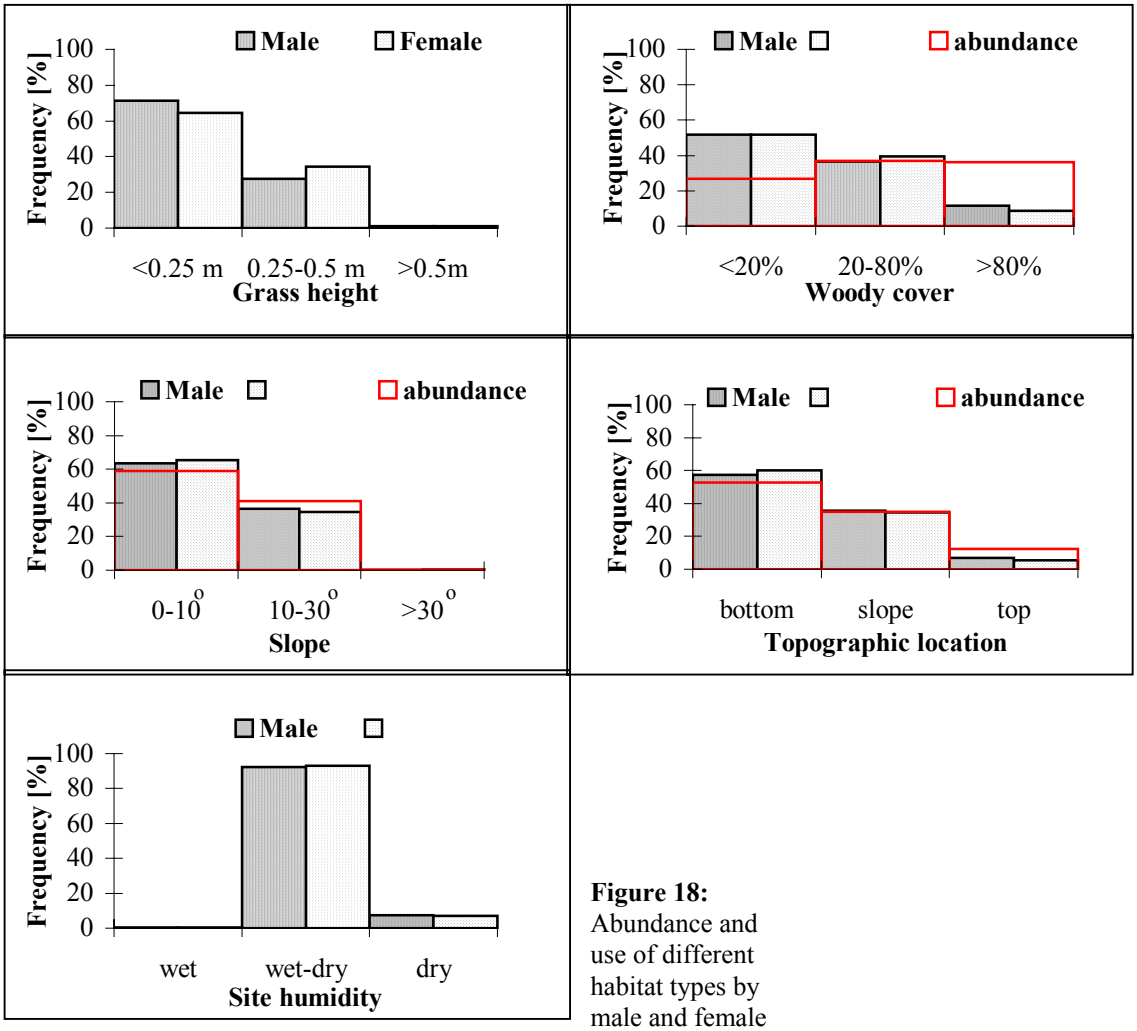


Figure 18: Abundance and use of different habitat types by male and female impalas in the Lake Mburo area (5/1998-12/1999).

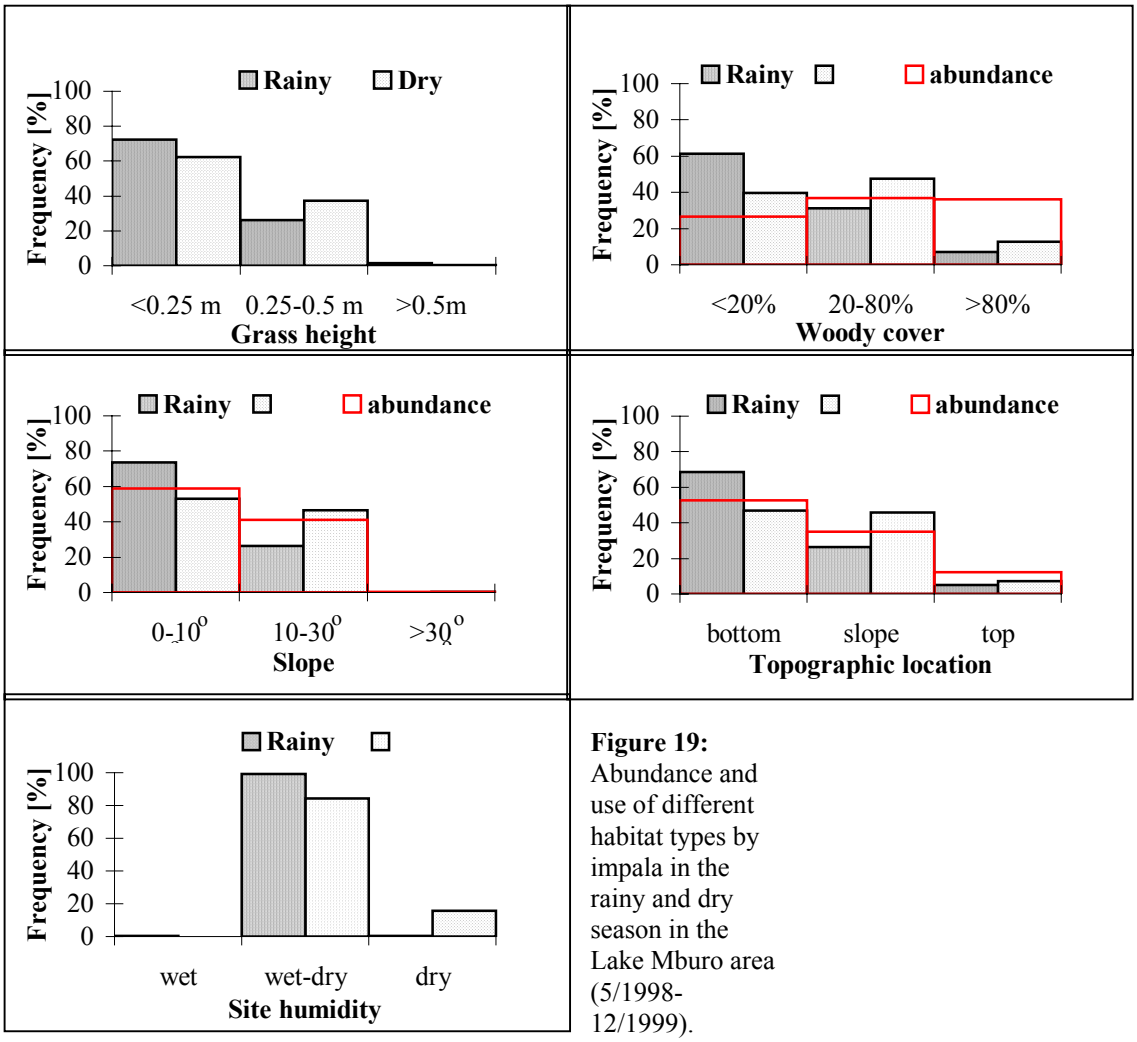


Figure 19: Abundance and use of different habitat types by impala in the rainy and dry season in the Lake Mburo area (5/1998-12/1999).

3.3.3 Movement and home ranges of impalas

I describe the home ranges of impalas in the Lake Mburo area according to sex, age and season and furthermore compare data collected through observations of impalas with ear-tags and by radio tracking.

Home range size according to sex and age

In Table 11 the MCPs (100%) of impalas according to different tracking methods were compared. While data on animals with ear-tags were collected over a period of 33 months, impalas with radio collars were observed for six months. The minimum home ranges of impalas recorded by telemetry were in average higher at 4.7 km^2 than the

home ranges recorded by observing ear-tagged impala. However, the maximum mean home range size of the animals with ear-tags was higher at 16.8 km^2, compared to 9.8 km^2 derived from data of impalas with radio collars (Table 11).

According to the ear-tagged impalas, mean home range size was greater for males (17.4 km^2) than females (16.3 km^2) while the home range size of males was smaller (9 km^2) than those of females (10.7 km^2) established by telemetry. Impalas tagged as juveniles had a bigger home range than older males and females. The biggest home ranges were calculated for a young female (No. 148, MCP 100% = 59.9 km^2) and a young male (No. 165, MCP 100%= 37.2 km^2) (Figure 20). However, the home ranges of males and females and age groups were not different in size (t-test).

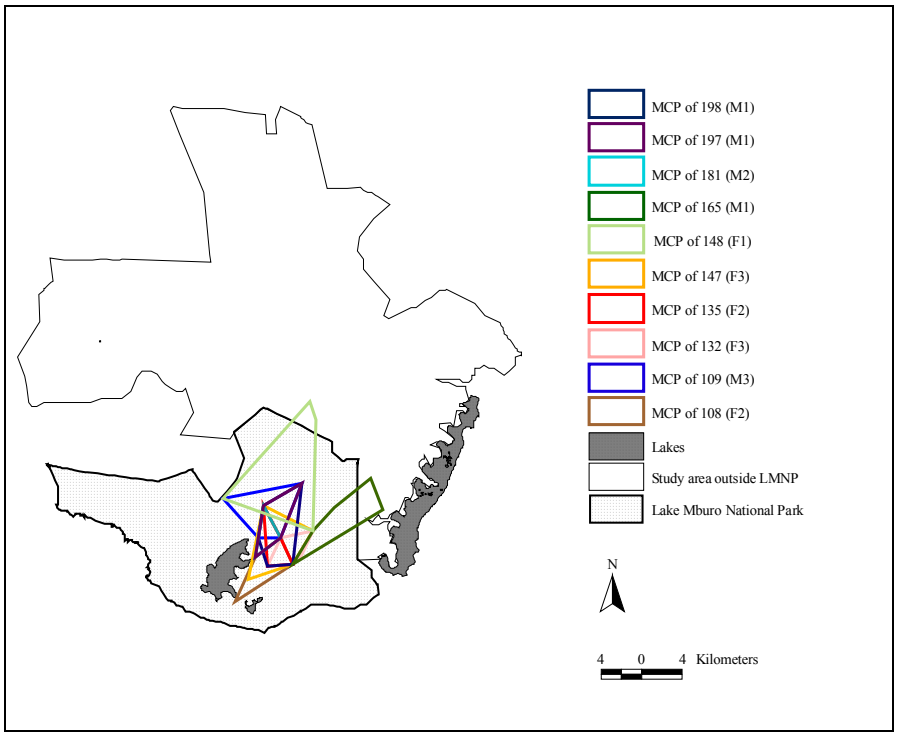


Figure 20: MCPs (100%) of 10 impalas marked with ear-tags in LMNP.

Home range sizes according to observations of ear-tagged impalas and telemetry

Home range sizes of animals with ear-tags were significantly (t-test, $P < 0.05$) bigger than those of animals tracked by telemetry (Table 11, Figure 21). The same applied for differences between males with ear-tags and radio collars (t-test, $P < 0.05$). However, the home ranges of females and different age groups did no vary significantly.

Table 11: MCP (100%) in km^2 of impalas according to sex, age and tracking method in the Lake Mburo area.

	Ear-tags (4/1997-12/1999)				Telemetry (Puszkarz 1999) (11/1998 – 4/1999)			
	Range	Mean	SD	n	Range	Mean	SD	n
Females	3.3 – 59.9	16.3	14.9	13	7.9 – 15.1	10.7	2.8	5
F1	13.3 – 59.9	36.6	33	2				
F2	5.0 – 20,1	11.3	6.0	5				
F3	3.3 – 25.2	13.6	9.2	6	7.9 – 15.1	10.7	2.8	5
Males	3.2 – 37.2	17.4	11.1	11	4.7 – 13.7	9.0	4.0	6
M1	5.2 – 37.2	19.3	11.0	5				
M2	5.5 – 31.0	16.2	13.2	3	5.7 – 6.2	6.0	0.4	2
M3	3.2 – 23.4	13.3	14.3	2	4.7 – 13.7	10.5	4.2	4
TOTAL	**3.2 – 59.9**	**16.8**	**13.0**	**25**	**4.7 – 15.1**	**9.8**	**3.5**	**11**

Two impalas, a sub-adult male (No. 125) and adult female (No. 135) were tagged for 33 months with an ear-tag and for six months with a radio-collar (Figure 21).

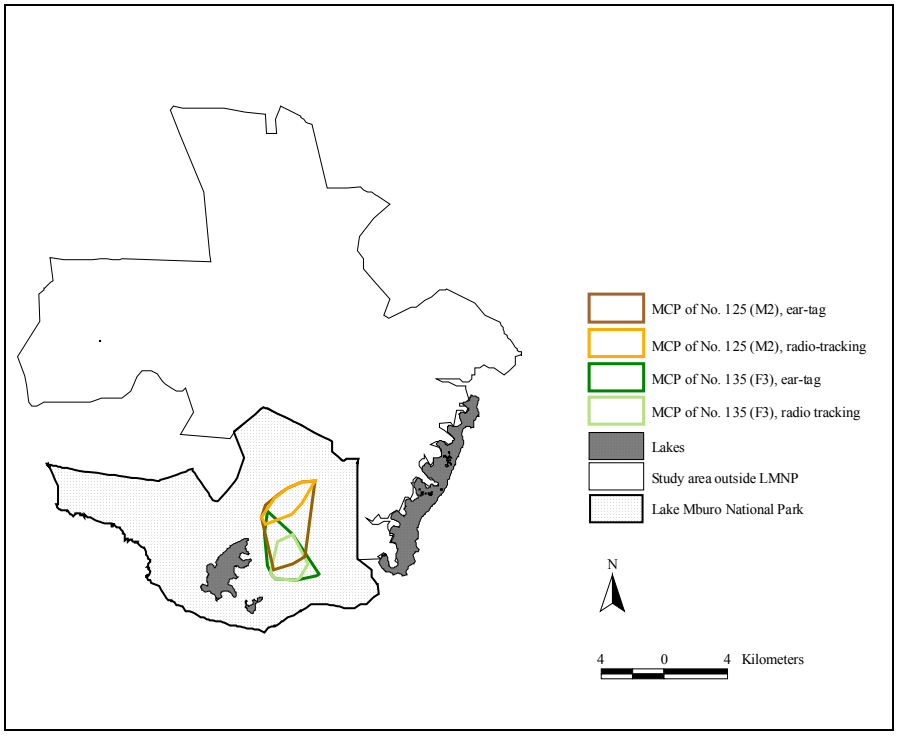


Figure 21: MCPs of impala No. 125 and No. 135 according to different observation periods (ear-tags 4/1997-12/1999, radio tracking 11/1998 – 4/1999) and methods used in LMNP.

The MCPs differed. After six months of telemetry a home range of 10 km^2 was established for the male, while after 33 months a home range of 31 km km^2 was

calculated with a mean annual home range of 25 km^2. The same applies to the young female. Radio telemetry confirmed a home range of 11.1 km^2 and the observation over 33 months one of 25 km^2. The average annual home range was 22.5 km^2.

Seasonal distribution of impalas

In the Lake Mburo area impalas marked in LMNP, North and East of LMNP, respectively, used home ranges covering areas inside and outside LMNP. Impalas from the North and East moved into the Park and back whilst animals from the Park moved to areas adjacent to the Park (MCP 100% Figure 22, Figure 23).

However, most animals do not utilize their entire home range area with equal intensity. They tend to occupy certain areas within their home range with greater frequency than other areas. The point of greatest activity has been termed the centre of activity (Dixon & Chapman 1980). Around 95% of activity of the marked impalas extended near the area where the animals were tagged (MCP 95%, Figure 24). This applies to animals tagged in either area not only to impalas tagged in the East as shown in Figure 24. According to the calculations of the centres of activity impalas marked in the Park remain mainly in the Park while impalas living outside the Park stay in the surrounding area.

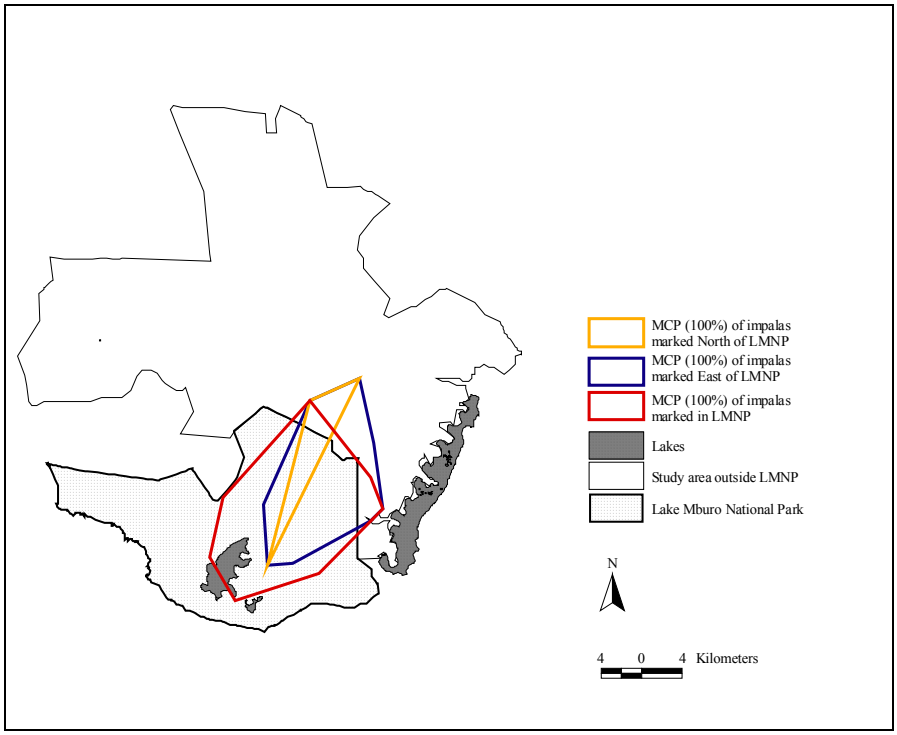


Figure 22: MCP (100%) of impalas marked with ear-tags inside LMNP (n=119), in the East (n=99), and the North (n=27) of LMNP (4/1997 – 12/1999).

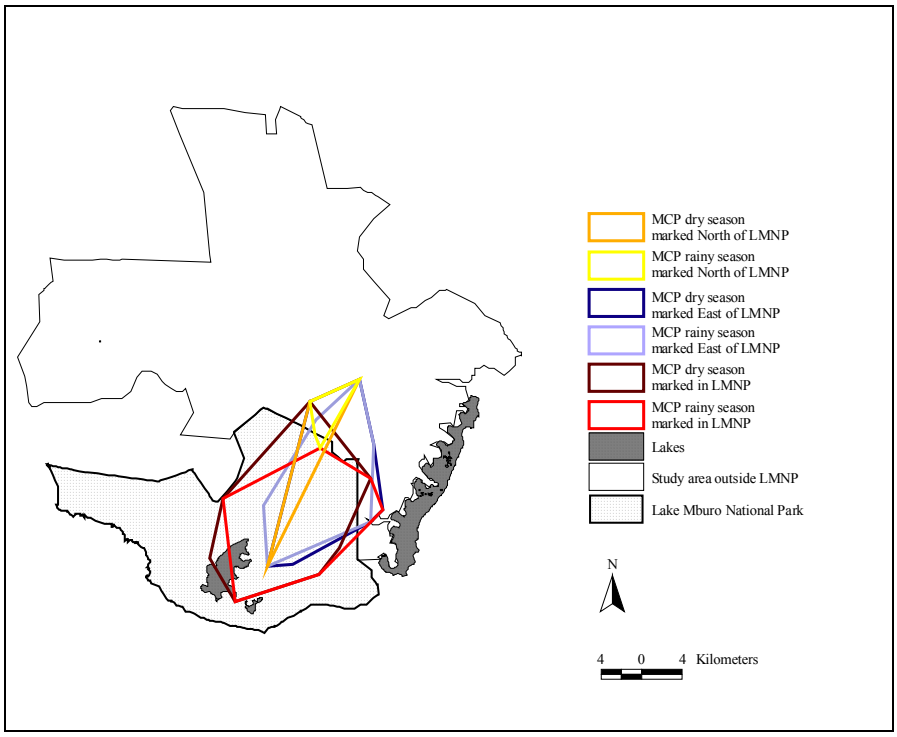


Figure 23: MCPs (100%) of impalas marked with ear-tags (n= 234) in different areas according to seasons in the Lake Mburo area.

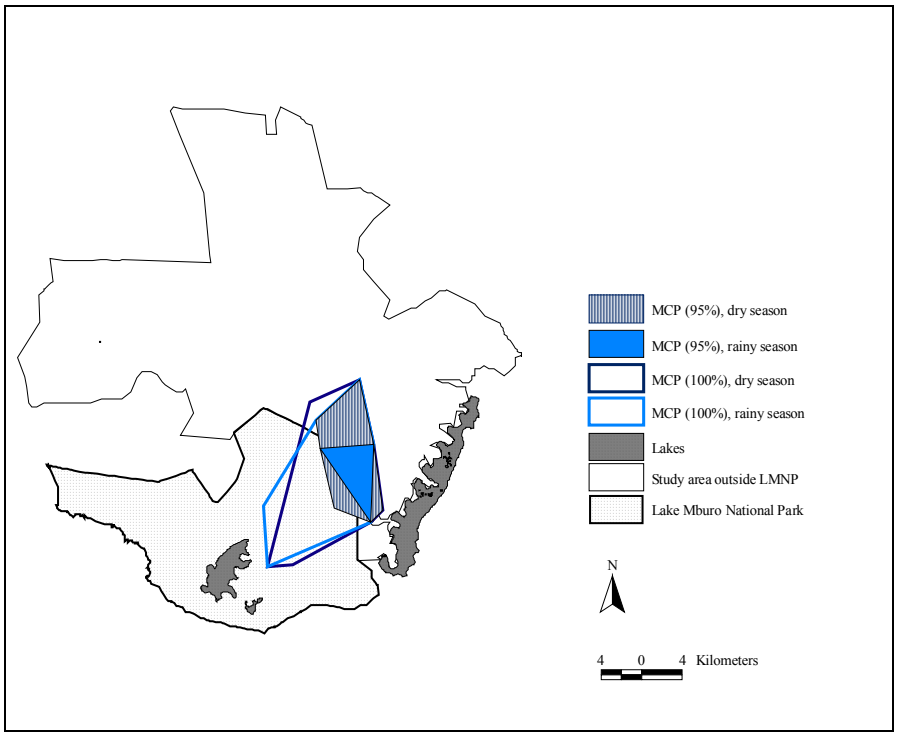


Figure 24: MCPs (100% and 95%) of impalas marked with ear-tags (n=99) East of LMNP according to seasons.

Radio tracking of impala in the Lake Mburo area furthermore showed that impalas moved shorter distances in the rainy season than in the dry season. The size of the core areas, in which the impala spent most of their time, was bigger during the dry

season than the rainy season. Impalas occupied different core areas in the rainy and dry season. The distances between core areas ranged between 0.1 km and 1.2 km, with a mean of 0.4 km. No sex related differences were observed. Three dominant males resided in a territory of a mean size of 1 km^2 (Puszkarz 1999).

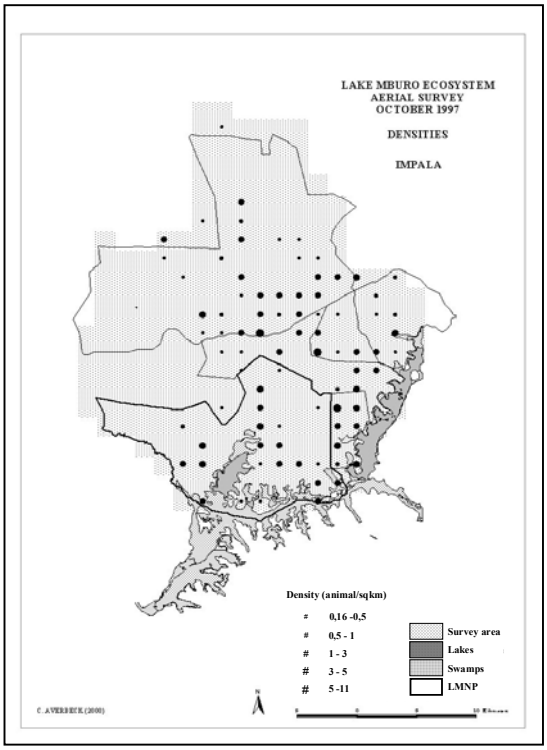
Distribution of impalas

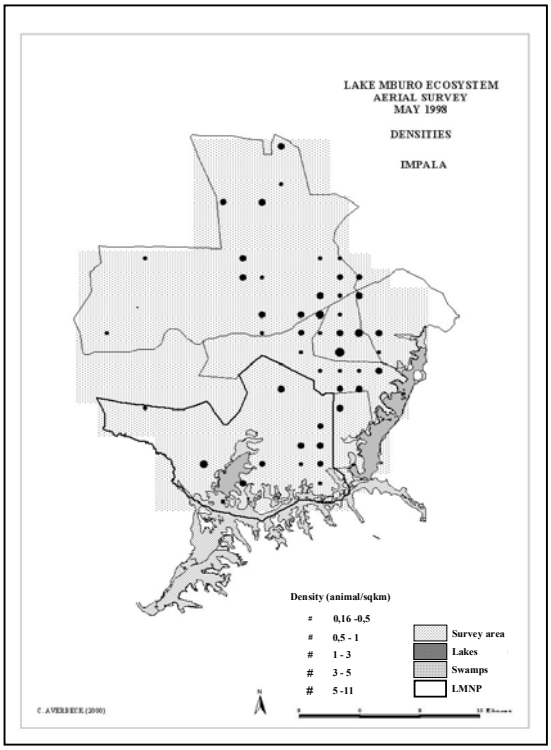
Aerial surveys showed that 2/3 of the impala population in the Lake Mburo area was living outside the LMNP on the ranches (Figure 25). Only 1/3 of the impala population is found inside LMNP on 17% of the survey area. The main concentrations of impalas were located on the ranches in the East (Ranch 41–50 and Nshara Government Ranch) and in the North (Ranch 13 – 29).

While in 1992 (Tindigarukayo-Kashagire & Turyatunga 1993) one could still find a good number of impalas in the West (Ranch 1-12, Western part of LMNP) the surveys from 1995 onwards indicated that hardly any animals were left in those areas. Even the densities of impalas further North (Ranch 29 – 40) were low (Figure 25).

From 1992 to 1999, in total six aerial surveys were conducted, two in the rainy season, May 1996 and 1998 and four in the dry season, December 1992, 1995, October 1997 and February 1999. The distribution maps of impalas showed no big difference between the dispersal in the wet and dry season. There was no obvious movement from one part of the study area to another (see chapter 3.3.3, movement and home ranges).

According to ground counts the mean population density of impalas was 32.8/km^2, whereby the highest densities were found in LMNP with 53.1/km^2, while East of LMNP 24.6 /km^2 and in the North 20.7/km^2 densities were observed.





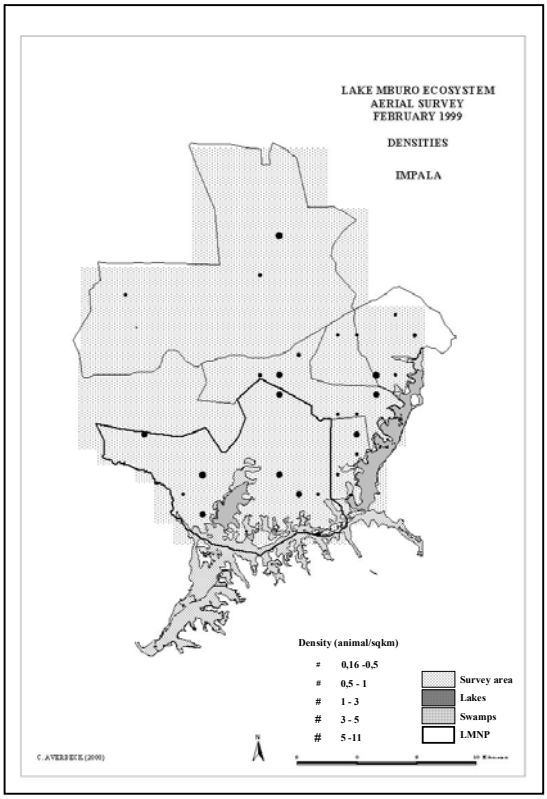


Figure 25: Aerial survey: densities of impalas in October 1997, May 1989 and February 1999 in the Lake Mburo area.

3.4 Discussion

Population size and -structure

The size of the impala population was decreasing from 1997 to 1999 in the Lake Mburo area, which correspondents to the findings of Lamprey & Michelmore (1996a). They observed a significant decline of the population in the years 1992 to 1995. In 1992 some 39% of the impala population was found north of the Mbarara-Kampala road, whilst in 1995 this had decreased to 24% (Lamprey & Michelmore 1996a). Therefore in accordance with the findings of this study they suggest that the high off-take from illegal hunting in the Ankole Ranching Scheme is responsible for this decline.

While in Southern Africa impalas have a single short breeding season Figure 14 indicated a protracted bi-modal pattern for the Lake Mburo area. As in Kenya (Kayanya 1969), impalas in the Lake Mburo area give birth mainly between February and April and August to September. But even in other months – November to January – fawns were born. Where ecological conditions maintain a large reservoir of well-fed males, as they do in Kenya or Uganda in two rainy seasons, there are always candidates to replace alpha males, as they become exhausted. The seasonal cycle in Southern Africa brings all the males into peak condition at the same time (Skinner *et al.* 1971). Males are incapable of breeding throughout the year. While in Southern Africa females deliver only once per year (Skinner *et al.* 1971), females can produce even twice in Uganda.

The sex ratio found in the impala population of the Lake Mburo area is in accordance with information from Bothma (1996). He documented a natural rate of 1.5 – 2.0 females to 1 male in impala populations. Although mortality rate and birth rate are parameters which differ between populations and it was not possible to verify the birth rate and mortality rate over the years for a greater number of impalas, examples from literature show, that the rate of births per head of 0.8 and a natural mortality rate of 30 % were in line with findings in other impala populations (Bothma 1996).

Habitat utilization

In accordance with Wronski (1999) impalas utilized different habitat types in the rainy and in the dry season in the Lake Mburo area. Impala preferred in the rainy season the short grass in the valley bottoms with less woody cover and moved up the hills in the dry season accepting longer grass and more woody cover. Both sexes preferred the same habitat types.

Impalas are mixed feeders. However the percentage of grazing and browsing varies in different areas were impala occur. In Zimbabwe 1,5% dicotyledonous plants, and in Zambia 95% were consumed by impala per year. Generally impala diets contain 45-75% grass, but the proportion of grass can be as high as 90% (Lamprey 1963, Owen-Smith 1979).

Wronski (1999) showed that impalas in LMNP were using the same time for browsing and grazing in the rainy and beginning of dry season. Only at the end of the dry season, beginning of rainy season, impalas consumed more browse than grass. They grazed mainly on *Bracharia spp.* (54%) followed by *Sporobolus spp. (*32%) In the dry season impalas browsed more on *Acacia hockii* compared to other *Acacia* species. At the beginning of the dry season the seedpods of *Acacia hockii* ripen and fall. The high protein content may be of importance in the animals' diet (Lamprey 1964). The findings of Wronski (1999) can partly be confirmed by this study. Although it was not possible to verify whether impalas were feeding on the grass species most abundant, they preferred the habitat type with *Bracharia spp*. and *Sporobulus spp.*. However, the vegetation type with *Sporobulus spp.* was even more frequently used than the one with *Bracharia spp.* Although impalas fed on *Bracharia spp.* (Wronski 1999) they did not use the vegetation type in combination with thicket. *Acacia hockii* was favoured by impala in the dry season (Wronski 1999), together with *Cymbopogon nardus.* impalas did not utilize the vegetation type.

The vegetation of the Lake Mburo area in the 1950s was primarily a *Acacia-Themeda* association which is noticeably sensitive to overgrazing (Pratt *et al.* 1966). Vegetation changes in form of extensive invasions of *Acacia hockii*, *Bracharia spp*. and *Cymbopogon nardus* due to overgrazing and burning were observed since the beginning of the 1990s (Hoag *et al.* 1991). *Acacia hockii* and *Cymbopogon nardus* are pasture weeds according to ranch land managers (Schwartz *et. al.* 1996). Pasture weeds reduce pasture productivity by limiting forage availability and/or accessibility for grazing livestock. *Cymbopogon nardus* is only palatable to cattle and even other large herbivores in a very young stage or as regrowth after burning. *Acacia hockii* thickets form closed stands and they are out of browsing reach of both domestic livestock and wild herbivores. In 1996 weed infestation had reached such a state that ranch land managers in the Lake Mburo area recommended to uproot *Cymbopogon nardus* and *Acacia hockii* in order to improve on pasture quality (Schwartz *et. al.* 1996). Therefore the quality of impala habitat is decreasing, especially outside LMNP, which might have a negative effect on the population size.

Van Horne (1983) is suggesting when evaluating a habitat use one should take into consideration that densities of animals may reflect conditions in the recent past or temporary present, rather than long-term habitat quality and social interaction may

prevent subdominant animals from entering what is actually the high-quality habitat. Aggregation behaviour and territoriality of males can influence the habitat use of impala. However, it was not possible to verify the influence of these factors on the habitat use of impala in the Lake Mburo area.

Distribution and movement

Impalas did not move in the dry season from the surrounding areas to LMNP and in the rainy season in the opposite direction. The distribution of impala did not vary according to season between LMNP and the adjacent ranches as stated by Tindigarukayo-Kashagire (1989), Guard (1991) and Kamugisha & Ståhl (1993). This observation is in accordance with Lamprey (1964) who is describing impala in the Tarangire Game Reserve as residents with partial dispersal in the dry season.

Home range and territory size vary with population density, location and habitat quality, individual prowess, and the seasons (Delany & Happold 1979, Estes 1991). Territories tend to be small at high population density during the peak rutting season, and large under the opposite conditions. However, in the case of large properties, the distinction between territories and home range is often indistinct, especially during reproductive off-season (Jarman 1979). With a density of 53 animals/km^2 and a mean territory size of 1 km^2 the results of impala in the Lake Mburo area are comparable to the findings of Murray (1982) in Zimbabwe. The territories were small while the density was high.

While the densities of impalas inside LMNP were in accordance with the densities found in other areas in Africa (Table 12), in the areas surrounding the Park they were much lower. However, even the density found inside LMNP was far below the density of 214/km^2 described for Rwanda's Akagera N. P. (Smithers 1983), which is part of the Akagera ecosystem such as LMNP.

Compared to results of other studies the home ranges of impala in LMNP were larger and long distance movements of young females and young males occurred (Table 12). The comparison of data from ear-tagged impalas with data of impalas with radio collars showed that the home ranges established over 2 ½ years were larger than those collected over a shorter period. Most of the studies conducted in other African countries took 6 to 12 months. However, even when we compare mean annual home range sizes, impalas in LMNP constituted larger home ranges. Multi-annual surveys are not only required to study habitat utilization as stated by Van Horne (1983), but also movements and home ranges of animals, as even the results on movements differ from year to year.

Table 12: Home ranges, population density and territory size of impala according to different studies.

Location	Home range [km^2]	Territory size of male impala	[km^2]	Population density/km^2	Author
		Mean	Range		
South Africa		5.2	5 - 8		Young (1972)
South Africa		6.6	5 - 8	80	Vincent (1979)
South Africa	5.8				Du Toit (1990)
Zimbabwe		1.1	0.9 - 1.3	50-68	Murray (1982b)
Tanzania		1.7	1.3 – > 5.0	32	Jarman (1979)
Kenya	2.7 (females) 3.4 (males)		1.1 - 7.3		Ables (1969)
Kenya		5.2	2 - 9	15-18	Leuthold (1970)
Uganda	16.8	1.0	0.7 – 1.1	53	This study / Puszkarz (1999)

In common with many other group-forming mammals, male impala dispersed while females remained in the area of their natal clan (Murray 1982a). Dispersal by one sex can arise from selection against inbreeding whenever individuals are closely related and dispersal costs are low (Packer 1979). Although most females had smaller home ranges of mean 16.3 km^2, home ranges of up to 59 km^2 of young females were found in the Lake Mburo area. Referring to similar findings in Zimbabwe, Murray (1982a) suggests that the movement to other areas may have constituted dispersal, with individuals responding to better conditions outside the clan range. In Zululand long distance movements by young male and female impala were associated with their colonization of a neighbouring reserve (Hitchings & Vincent 1972). Although seasonal migration was not found in the Lake Mburo area, in response to habitat degradation or population density inside LMNP impalas might move to surrounding areas where the conditions are better.

Much of the variation in home range sizes between areas relates to the seasonal cycling of food and water abundance in neighbouring habitats. However, in semi-captive impala, the daily intake of drinking water is directly related to the water content of the food. Decrease in the water content of the food is correlated with an increase in the consumption of free drinking water. In the dry season, impala do not drink each day as they are capable of drinking a large volume of water (more than one day's requirement) at each visit to a drinking place. Lamprey (1964) observed that impalas drink dew in the morning. In the Tarangire Game Reserve as they moved from the only source of water to areas with *Acacia* trees in the dry season (Lamprey 1964). Thus selection of suitable food, changes in the frequency of drinking and the amount

drunk, changes the pattern of activity as well as physiological aspects (Jarman 1973). The climatic conditions in Uganda with two rainy seasons per year are favourable enabling impalas to remain in water balance throughout the year without the need to migrate in the dry season.

According to these findings quota of impala can be calculated for the impalas staying in the surrounding areas of LMNP, for 2/3 of the impala population.

Comments on methodology

Aerial survey

During the aerial surveys impala and other large wild mammals were counted. Only data on impala and zebra were reliable as the animals were evenly distributed. while data on duiker, bushbuck, reedbuck, eland and buffalo were less reliable. Dense vegetation and the behaviour of the counted species made it difficult to count from the air. While bushbucks, duikers and reedbuck often rest in bushes and thickets, they can be hardly seen from the air, eland and buffalo are gregarious and most of the animals live in herds. As eland and buffaloes were not so common in the Lake Mburo area it was likely that the observer would either count a herd with many animals or no animals. An aerial survey covers only part of the whole area and by extrapolating from the percentage covered to 100% the population densities are either overestimated or underestimated. In order to monitor population trends in the Lake Mburo area regular ground counts are more cost effective and provide more accurate results for different species than aerial surveys in the Lake Mburo area.

Ground counts

Road counts are an adaptation from vehicle ground counts that are widely used, especially when access off the existing road system is difficult. The method was chosen because it was simple, can be repeated easily, it covered areas inside and outside the Park, was inexpensive and can therefore be used to monitor wildlife populations in the Lake Mburo area on the long run. A wildlife utilization scheme will require a monitoring system of the wildlife populations in the Lake Mburo area. A change of counting technique would temporarily prevent the determination of trends in the game population concerned.

Even the data obtained from road counts, must be treated cautiously, for the method is open to many types of bias. For example, the road system is unlikely to be representative of an area. Road edges tend to be 'habitat' for some species. It leads to consistent overestimate or underestimate of numbers and densities (Norton-Griffiths 1978). However, if the same method is used over a longer period and the cause for

bias is always the same it is possible to develop indicators. Densities were calculated for each species, month, season, sex and age (Averbeck 2000a). These densities can be compared from year to year and trends identified.

Habitat utilization

Jelinski (1990) points out that there are two critical assumption for the use of Chi square test. First, each observation must be independent of each other observation and second, that each individual has an equal probability of being observed and that habitat availability is the same for all individuals. This precludes the use of the test where animals non independently aggregate (e.g. mothers and fawns) or where movement by one individual affects the behaviour of another. Even Aebischer *et al.* (1993) point out "that an animal's avoidance of one habitat type will almost invariably lead to an apparent preference for other types, so the interpretation of absolute preference/avoidance of habitat types is fraught with difficulty". They therefore suggest a compositional analysis of habitat use for individual animals. However, in this case a compositional analysis was not possible as during ground counts all animals seen were considered. A explorative analysis would have been more appropriate.

4 Sustainable consumptive use

In Africa, as well as in many other parts of the world, wild animals have economic value that derives from their usefulness to man as a source of food and other products. This value is indeed so high that the future of many species is threatened by pressure from those who attempt to profit from the sale of their products. Despite the conservation problems that result from uncontrolled killing of wild animals, it is possible to realize the economic potential of wildlife in ways that do not threaten the species (Mossman & Mossman 1976).

The ways in which wildlife may be utilized are many. This variety allows for adaptations for the personal inclinations of the people involved and to the changing ecological and social circumstances (Mossman & Mossman 1976, Child 1995, Bothma 1996, Duffy 2000). Four main categories of commercial ungulate management have been distinguished on the basis of animal distribution and intensity of management: hunting, herding, ranching and farming (Figure 26, Figure 27). In hunting systems, distributions are unrestricted and technological innovation is limited largely to harvesting tools. Herding involves control of distribution by behavioural means and usually requires some degree of habituation. Ranching and farming are containment systems in which distributions are controlled by fences. Ranches are lightly stocked and animals may be harvested in the field. Farms are more intensively managed with at least seasonal supplemental feeding and delivery of stock to central slaughter facilities for ante-mortem inspection (Hudson 1989).

Hunting describes the harvest of essentially wild populations. Management involves little more than estimating maximum sustained yields whereas technological innovation revolves around improving methods for harvesting, handling carcases, and distributing products. Hunting is practised for subsistence, commercial, and recreational purposes (Hudson 1989). Subsistence hunting is practised by only a few hunter-gatherer societies but considerable quantities of bush meat still enter rural markets (Caspary 1999, Traffic 2000).

Commercial hunting is distinguished from subsistence hunting in that it serves formal markets. Generally, reduction cropping in which over-population is periodically corrected by commercial harvest is more profitable than sustained cropping in which lower animal densities and behavioural modification from repeated harvests reduce procurement efficiency (Child 1996, Child 2001).

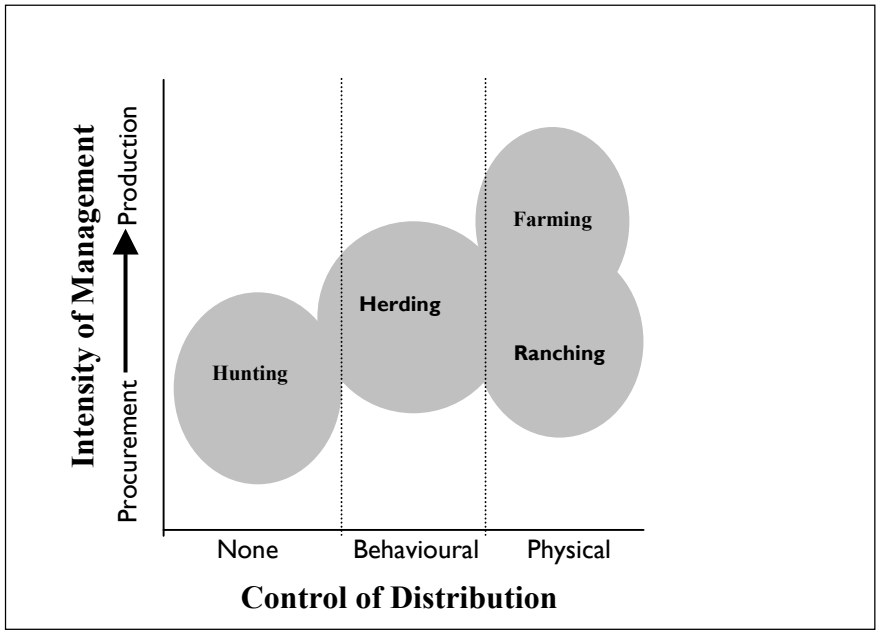


Figure 26: Ordination of wildlife production systems (Hudson 1989).

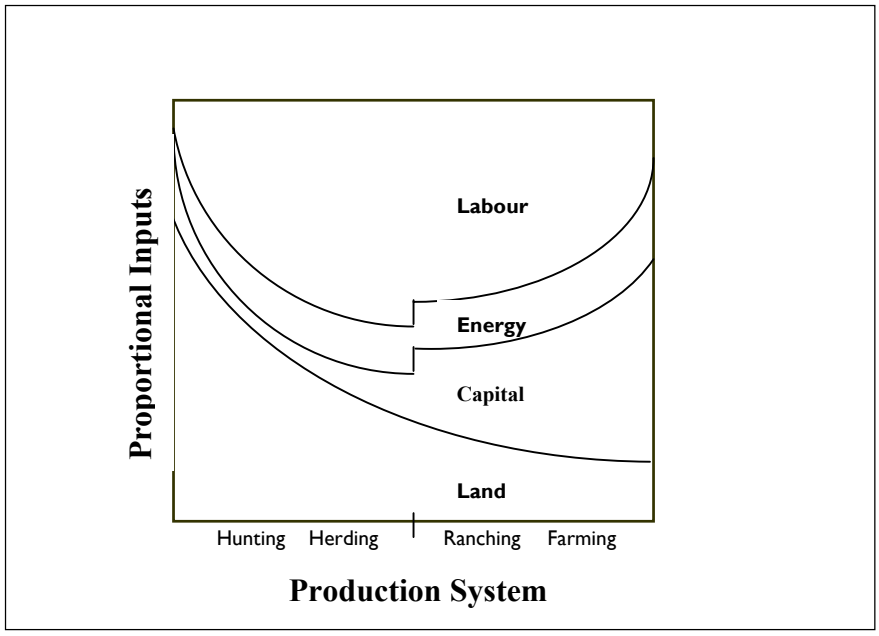


Figure 27: Substitution of land, labour, capital and energy in ungulate production systems (Hudson 1989).

Sport hunting is practised mainly for recreational reasons but nevertheless contributes significant quantities of meat. Sport hunting is organised in several ways. The simplest is licensed hunting in which harvests are regulated by issuing licenses specifying, sex, age, time and/or place. Safari hunting is based on provision of guiding and outfitting services by concessionaires to (usually) non-resident hunters (Hudson 1989, Bothma 1996, Child 1996, Nuding 1996).

For this study I looked at the opportunities for hunting in the Lake Mburo area, Uganda, both in the form of sustainable cropping and of safari hunting. Utilization of wildlife through hunting has several advantages compared to herding, ranching and

farming. Hunting requires less capital, energy and labour inputs and the intensity of management is also low compared to herding, ranching and farming. Moreover as the wild animals are not confined to a certain area, it is not necessary to control their distribution (Figure 26, Figure 27).

4.1 Sustainable yield of impala population

4.2

4.2.1 Introduction

The aim of a sustainable game harvesting programme, whether game is utilized on a commercial basis to yield venison or not, is to remove an annual quota, a sustainable yield (SY) from the population without causing a continual decline in the population. More than one level exists for sustainable yield for a given game population in a given environment and for the type of management practised. One possible management objective is to achieve a maximum sustainable yield, i.e. the largest possible sustainable production (Caughley 1977). The harvesting quota can be manipulated to stimulate population growth or to allow no growth, to merely repress growth or even reduce the population over a long time (Bothma 1996). In this chapter I answer the question of how many animals can be utilized in Nyabushozi without reducing the impala population.

4.2.2 Methods

The 'adjusting in relation to population changes model' was used for calculating a sustainable quota of the impala population in the Lake Mburo area (Table 13). "Adjusting in relation to population changes entails relaxing or tightening the exploitation in relation to evidence of population decreases or increases. It concentrates upon the population size which makes it easier to detect overexploitation" (Sutherland 2000). If one takes into consideration the different sex and age ratios and the population estimates established during the ground counts and aerial surveys, the calculations on impala added to the population can be made (Caughley 1977, Bothma 1996).

The data used for the calculation of the new number of impala just before next birth season were described in section 3.3.1 and calculated with the following formula (Table 13):

If:

A_1 = population estimate in the year 1
B = births per head per year 1
C = number born, A x B
D_1 = number after birth season, (A x B) + A
E = deaths during the
F_1 = natural mean mortality in year 1

G_1= number actually added during the year 1, C-F
I_1 = new number just before next birth season
H= harvesting rate
R = growth rate
Q_1 = quota

A, B and C were established during aerial surveys and ground counts. The other data were calculated:

Let
F_1 = $((A_1B)+A_1)E_1)$

I_1 = $A_1+(C_1-F_1)$

The growth rate 'r' of the impala population were calculated from the population estimate and the number of animals before the next birth season:

r = $\frac{I}{A}$

A population which grows at a certain instantaneous may be harvested at the same rate through H (annual harvesting rate); in other words the same number of animals that are added to the population are harvested over the whole year. The harvesting quota can be manipulated to stimulate population growth (positive r), or to allow no growth (r=0), to repress growth or even to reduce the population over a long time (negative r).

For calculating the harvesting quota (Table 14) I considered only impalas outside LMNP which comprise 2/3 (66%) of the population (Figure 25).
The harvesting quota:

Q = A x 0.66 x H.

4.2.3 Results

Harvesting quota

Using the data collected during the ground counts and aerial survey the number of impalas added during the years 1997, 1998 and 1999 were calculated (after Bothma 1996) (Table 13). For 1999 I considered the numbers added according to the results of the aerial survey and ground counts.

The growth rate 'r' was r = 0.21 in 1997, r = 0.23 in 1998 and r = 0.26 in 1999 (see calculation Table 13). A sustainable quota that allows growth was calculated for cropping and trophy hunting in the Lake Mburo area (Table 14) in 1999. Following experiences made in other countries the quota for trophy hunting should be relatively low at 3% as it will be extremely important to maintain good trophies in order to attract clients, while the quota for cropping can be higher at up to 20% (Booth 2000).

Table 13: Calculations of the number of impalas added during the years 1997, 1998 and 1999 to the population of that year in the Lake Mburo area.

Year	Population estimate	Births per head per year	Number born	Number after birth season	Natural mean mortality rate***	Deaths during the year	Number actually added during the year	New number just before next birth season
	A	B	C	D	E	F	G	H
1997	6817*	0.73	4976	11793	0.3	3538	1438	8255
1998	4124*	0.76	3134	7258	0.3	2177	957	5081
1999	1595*	0.81	1291	2886	0.3	866	425	2020
1999	3000**	0.81	2430	5430	0.3	1629	801	3801

* according to aerial surveys (Table 9), ** according to ground counts (section 3.3.1) *** effect of poaching not included

The growth rate of the impala population was calculated at 0.26, it therefore would have grown at 26% in 1999. By removing only 10% of the population 16% is left for growth although the population is utilized. Not more than 106 impalas could be utilized for cropping and 32 for trophy hunting.

Off-take

As a matter of fact the impala population did not increase, it decreased from 1997 to 1999. The calculations in Table 14 indicated how in addition to the natural mortality other influences such as poaching have caused a decline of the population. Around 4000 animals might have been killed every year. While the new number just before next birth season was in 1991 were calculated at 8255 impala only 4124 animals were counted in 1998. Considering the information of the poachers in the Eastern ranches of hunting 380 animals in 1998 (Table 8) only this group of hunters harvested already more than what the sustainable yield of the population allowed for in 1998

Table 14: Calculation of sustainable quota for cropping and trophy hunting of impala in 1997, 1998, 1999 in the Lake Mburo area.

Year	Population estimate	Estimated number of animals added outside LMNP	Harvesting quota 10% for cropping	Harvesting quota 3% for trophy hunting
1997	6817*	4499	450	135
1998	4124*	2722	272	82
1999	1595*	1063	106	32
1999	3000**	2000	200	60

* according to aerial surveys (Table 9), ** according to ground counts (section 3.3.1)

4.2.4 Discussion

When calculating the sustainable yield illegal hunting was not considered. Even while calculating possible returns for wildlife cropping and trophy hunting the impact of illegal hunting is not reflected. However, it is important to be conservative when fixing a quota. As poaching is still a problem in the Lake Mburo area, it is advisable to allow only for a smaller number of animals to be hunted. We do not know how effective control of illegal hunting will be once legal utilization of wildlife is introduced. Actually only if illegal hunting is controlled a sustainable utilization of wildlife in the Lake Mburo area is possible. Moreover habitat degradation might influence the size of the impala population negatively.

Until the effects of legal hunting and habitat degradation in the Lake Mburo area becomes clearer I suggest a relatively low quota of 2-3% of the population.

Selective harvesting of social, age and sex groups

Even the socio-sexual behaviour of impalas becomes relevant when fixing the off-take quota of impala. Selective harvesting of a few animals from a social group may influence the well being and behaviour of the survivors, especially when the dominant male is removed (Jarman & Jarman 1974). Therefore it is recommended that when the home ranges of impala herds overlap, especially at important grazing areas, it would be preferable to crop an entire herd at one time (Bothma 1996).

Selective harvesting of one sex group is more practical since impala have a natural surplus of males. Only 20% of adult males in a impala population have the chance of mating (Murray 1982b). Bothma (1996) is suggesting that the removal of surplus males will leave an improved environment for the survivors. This ought to bring about increased productivity among the females, and it even ought to improve the growth

and survival rates of the young males. However, one has to consider that even lone 'old' males, ideal targets for trophy hunters, are actively reproducing (Jarman & Jarman 1974). Enough males must always remain to mate successfully with all receptive females, and a single territorial male will often breed less well in the absence of at least a few competing mature males (Jarman 1979). Fairall (1985) and Van Rooyen (1994) showed with simulation models how manipulation of the sex ratio can increase the production of a impala population. While Van Rooyen (1994) is suggesting a ratio of male to female of 1:5, Fairall (1985) is recommending a male to female ratio of 1:10 which gave an increase of 30% in production.

When considering selective hunting of certain age groups those age groups, i.e. adult females, that contribute most to the addition of new progeny should be harvested least intensively. Furthermore Fairall (1985) suggested that if a population is biased towards the younger age classes it maximises recruitment, i.e. maintains a high fecundity and maximal survival, and the production can be even further increased. In the impala fecundity remains high, even in the older age classes. However, the mortality in the older age classes was eliminated by harvesting before it has an effect, i.e. animals older than three year, which increased productivity.

Manipulation of the sex ratio and especially management to increase survival of the younger age classes can be considered in order to increase production of the impala population in the Lake Mburo area.

Hunting season

Knowledge of the annual cycle of the socio-sexual behaviour of impala suggests that some times of the year are better than others for cropping or trophy hunting; obviously there should be no hunting during the calving season and the pre-weaning period, or the rut. While in Southern Africa impalas have a single short breeding season, a protracted bi-modal pattern for the Lake Mburo area could be observed. As in Kenya (Kayanya 1969), impalas in the Lake Mburo area gave birth mainly between February and April and August to September. But even in other months – November to January – fawns were born. Soon after the peak of the calving time rutting season starts. Disturbances can cause normal socialising within a herd, drives animals out of their home ranges and alters daily activity patterns (Jarman & Jarman 1974). These effects of disturbances may be caused by exploitation should be avoided However, in order to minimise disturbances, off-take should be well distributed throughout the area and should take place in the dry seasons between May and July and October to January in the Lake Mburo area.

4.3 Trial cropping of impala and financial viability of game utilization

4.3.1 Introduction

The objective of the trial cropping was to establish base line data in relation to health risks associated with consumption of impala products (Okori 1999). Furthermore, the trial cropping provided information on the procedures of cropping, handling, skinning of impalas and processing and marketing of game meat in Uganda. The aim was to assess the potential for adding value by further processing of impala meat into a high quality product without substantially diminishing the value of the remaining carcass to the local community (Hautzinger & Gafabusa 1999).

Financial viability will determine whether or not landholders will consider adopting a new land management strategy such as cropping or trophy hunting (Child 1995, Bos *et al.* 2000). In this chapter I therefore answer the question how much income can be generated from cropping and trophy hunting considering the quota calculated in chapter 4.1.

4.3.2 Methods

In 1998 after several meetings with staff of UWA, community members of the Lake Mburo area, representatives of the Uganda Industrial Research Institute (UIRI), Uganda Meat Technology Centre and researchers, the project was granted permission by UWA to crop 100 impalas for research purposes. As Uganda Meat Technology Centre based at UIRI was executing two regional projects on meat processing, they agreed to co-operate with UWA, in order to process and market impala meat (Hautzinger & Gafabusa 1999).

Cropping was done six times between 15.9.1998 and 5.12.1998. After prior discussion with the landowners, the cropping exercise took place on the Eastern ranches adjacent to LMNP starting at 10:00 p.m.. Rangers of LMNP together with Dr. J. Okori, veterinarian and Ugandan Counterpart in the project, carried out the cropping of impalas after being trained by a professional hunter from Kenya, Mr. Brian Heath. UWA loaned the .222 calibre rifle, ammunition was bought after authorisation by UWA and the Firearms Registry in Kampala. Following animal welfare considerations, Dr. J. Okori and his supervisor decided to crop only male impalas.

The impalas were dazzled and thereafter shot in the head. After shooting the animal, Islamic (Halal) cutting of animals for bleeding was used. After meat inspection by Dr. J. Okori and his supervisor, Dr. L. Siefert and a team of UIRI, at a small slaughterhouse built for this purpose, rangers dressed the carcasses and the dressed carcasses were

then transported from the slaughterhouse by UIRI to Kampala. UWA supervised the cropping of impalas and sold the dressed carcasses to UIRI at 20,000/= USh (US$ 13) each. UIRI processed the carcasses in Kampala including boning, making fillets and other high quality products like ham.

In collaboration with UIRI, UWA identified and issued authority letters to two butcheries and four selected hotels in Kampala. The authorisation specified the period during which impala meat was served at these hotels and sold at the butcheries. UIRI and UWA monitored the authorised restaurants and butcheries. While trophies were not utilized, Creations Ltd., a local tanner in Kampala, tanned 50 skins.

Money from the sale of meat remained with the meat project at UIRI to cover costs incurred by UIRI. The senior warden of LMNP received the money for 100 impalas cropped from the UIRI. Part of the amount raised was used to pay rangers who helped during the cropping and skinning of impalas and for the tanning of impala skins. Impala skins were sold to the public at a price of 40,000/= USh (US$ 26) at head office of UWA. UWA provided customers with export documents to enable them to export the skins from Uganda. Landowners on whose land the impalas were cropped derived benefits from the meat and skin sales.

The calculations of possible returns to wildlife cropping and trophy hunting were made on the basis of marketing strategies derived from the sustainable quota availabe in the Lake Mburo area combined with experiences and prizes in other African countries (Okua *et al.* 1997, Hurt & Ravn 2000).

4.3.3 Results

Meat processing

The average live weights of male impala cropped in the Lake Mburo area varied between 26.69 kg to 58.70 kg (Table 15).

The carcasses were deboned and cut into primal cuts like neck, shoulder, flank, brisket, chuck, loin and rib, rump and leg. Some of the primal cuts were further divided into choice (special) cuts. In order to find ways of optimising the return from the sales of the choice cuts the silverside was further processed into a high quality and price product. A dry fermented, slightly smoked ham was produced with fresh herbs from the Lake Mburo region. Furthermore, some dry-fermented sausages were produced out of trimmings, which were also dried, smoked and vacuum-packed for sale (Table 16).

Table 15: Average live weights of male impalas cropped in the Lake Mburo area.

Age	1 year	2 years	3 years	4 years	5 years and older
Average live weights	26.7 kg	31.5 kg	45.1 kg	53.5 kg	58.7 kg

Primal cuts, choice cuts and processed products were vacuum-packed and stored in the chillers at the temperature of 3-5 degrees. After two weeks of storage in the chiller, the meat cuts were transferred to the deep freezer and stored at a temperature of –18 degrees.

Health risks

Dr. Okori and his colleagues found that impala meat was in general safe for human consumption (Okori 1999). However, disease was found in liver and pluck. Some 12% of the livers and 100% of lungs were condemned as unfit for human consumption after meat inspection.

Marketing

Two selling outlets and four restaurants in different parts of Kampala were selected to reach differing groups of customers. The impala meat was marketed in different ways. The butcheries were allowed to purchase whole carcasses as well as parts and special cuts. The restaurants were restricted to special cuts. One restaurant only offered impala steaks. In this restaurant, customer demand has meant that such meat is now part of the daily menu. As a result imported game dishes are now being offered.

No problems were encountered in selling the meat, despite a lack of marketing. The best selling fresh meat cuts were sirloin, filet, top rump and topside. But shoulder, neck, brisket and flank, the ideal meats for many traditional Ugandan preparations and cooking methods, were not saleable in Kampala at any price and a big stock had to remain in the chillers.

Benefits for the community

The Community Conservation Unit of LMNP held meetings with the landowners on whose land the impalas were cropped beginning of 2000. Landowners in Rurambira

formed an interest group with a constitution and an elected steering committee and decided what to do with the money, roughly US$ 1100.

Table 16: Prices for impala cuts and impala delicatessen.

Prices for impala cuts and impala delicatessen	Price per kg
Carcasses	US$ 2
Sirloin and filet	US$ 6.7
Top rump and top side	US$ 5.3
Meat cubes and burgers	US$ 3.3
Osso-Bucco	US$ 3.3
Shoulder, brisket and flank	US$ 2
Smoked dry-fermented ham	US$ 26 retail price US$ 20 wholesale price
Smoked and fermented sausage	US$ 19.3 retail price US$ 13.3 wholesale price

Sustainable cropping in the Lake Mburo area

The primary objective of game cropping is to generate income through production of venison, hides and other wildlife products (Bos *et al.* 2000). Calculations based on three different ways of marketing impala meat of the Lake Mburo area (Table 17) show how a processed carcass can generate much more income than an unprocessed one.

Table 17: Calculations of possible returns for three different ways of marketing impala meat.

	Weight [kg]	Ush / kg	Ush	Total
Complete wholesale	26.5			79,630
Meat for sale	26.5	3000	79,630	(US$ 53)
Meat for community	0			
Partly wholesale	26.5			46,920
Meat for sale	15.6	3000	46,920	(US$ 31)
Meat for community	10.9		0	
Carcass processed	26.5			123,279
Sirloin	2.8	10,000	28,240	(US$ 82)
Filet	0.3	10,000	3,450	
Top rump	1.6	8,000	12,400	
Top side	2.2	8,000	17,242	
Silverside (dry ham)	1.0	30,000	31,107	
Trimmings (dry sausage)	1.5	20,000	30,840	
Meat for community	10.9	0	0	

Part of the meat can remain in the Lake Mburo area with the local people and the quality cuts could go for further processing to Kampala in order to generate more income. Customers in Kampala are willing to pay higher prices for quality cuts and other further processed products. After the trial cropping the products were sold without aggressive marketing. It can be assumed that a market for added value products exists.

First calculations on possible returns of impala cropping revealed that the impala quota are too small to make it a viable exercise, therefore even other wildlife species were considered for cropping in the Lake Mburo area. In the frame of this study during aerial surveys and ground counts the population size of other wildlife species than impala were established (population estimates see Table 18, Averbeck 2001a). However, even the calculation on the possible returns of seven species to wildlife cropping in the Lake Mburo area (Table 18) showed that the net revenue generated per year would be rather low at around US$ 5000. The calculations were based on the prices for game in Kenya. The present Kenyan policy does not allow trade in hides with hair on within Kenya. Therefore the prices for some species especially zebra could be increased by allowing for the trade in hides with hair in Uganda.

Warthogs were not considered for cropping as warthogs are pigs. According to Ugandan law pigs can not be processed together with cows, goats, sheep or other animals for human consumption in the same slaughterhouse (Hautzinger & Gafabusa 1999).

Around 12 core staff and 13 casual staff would be needed for game cropping in the Lake Mburo area (Okua *et al.* 1995).

Table 18: Returns to wildlife cropping in the Lake Mburo area

Species	Population	Off-take	Price [US$]**	Revenue [US$]
Buffalo	500	13	350	4,550
Bushbuck	500	15	60	900
Duiker	150	0	25	0
Eland	500	15	200	3,000
Impala	1,000	100	90*	9,000
Oribi	250	0	?	0
Reedbuck	150	8	60	480
Topi	400	0	?	0
Warthog	1,000	0	20	0
Waterbuck	500	15	75	1,125
Zebra	3,000	100	215	21,500
TOTAL / Gross revenue (US$ / year)		**266**		**40,555**
		Units	**Unit Costs**	**Depreciated cost******
Capital costs (US$ / year)				**24,700**
Slaughterhouse		1	60,000	7,500
Cold storage and generator		1	30,000	3,750
Vehicles***		2	33,000	13,200
Firearms		1	2,000	250
Fixed operating costs (US$ / year)				**2,530**
Core staff		12	80	960
Land rent			0	00
Office and accounts		1	300	3000
Firearms		1	10	10
Generator fuel		1,200	0.5	600
Skinning knifes		6	60	360
Uniforms		6	50	300
Variable operating costs (US$ / year)				**8,234**
Ammunition		365	4	1,458
Casual staff		12	1	6,000
Vehicle running		11	50	533
Meat inspection		243	1	243
Total costs (US$ / year)				**35,464**
Net revenue (US$ / year)				**5,091**

* Own data

** Prices in Kenya taken from Okua *et al.* 1997, incl. value of hides

*** Toyota Land Cruiser from Toyota, Uganda.

**** Years of depreciation – building 8 years, vehicles 5 years etc.

Sport hunting in the Lake Mburo area

By using experiences of sport hunting in Tanzania and Zimbabwe (Okua *et al.* 1997, Booth 2000, Hurt & Ravn 2000) ideas were developed on 'hunting bags' in the Lake Mburo area, the prices and costs of a trophy hunting scheme and the possible net revenue generated per year in the Lake Mburo area (Table 19, Table 20, Table 21).

Table 19: Estimated quota, and prices of a trophy hunting scheme in the Lake Mburo area, and status of game species according to IUCN and CITES.

Species	Population	% off-take	Quota	Price [US$]*	Gross revenue of landowner [US$]	IUCN Red List**	CITES**
1. Buffalo	500	3%	13	850	11,050	L. r. c. d.	N.l.
2. Bushbuck	500	3%	15	500	7,500	L. r. c. d.	N.l.
3. Eland	500	3%	15	840	12,600	L. r. c. d.	N.l.
4. Impala	1,000	3%	32	240	7,680	L. r. c. d.	N.l.
5. Leopard	?	?	2	2000	4,000	L. r. l. c.	A.I
6. Reedbuck	150	2%	8	290	2,320	L. r. c. d.	N.l.
7. Warthog	1,000	3%	30	300	9,000	N. r.	N.l.
8. Waterbuck	500	3%	15	500	7,500	L. r. c. d.	N.l.
9. Zebra	3,000	2%	45	590	26,550	L. r. c. d.	N.l.
TOTAL			**188**		**88,200**	L. r. c. d.	N.l.

* average Government licence fees in Tanzania (Hurt & Ravn 2000).

** L.r. c.d. / l.c.= Lower risk conservation dependent / least concern),
N.r. = Not ranked (Hilton-Taylor 2000),
N.l.= Not listed, AI: Appendix I (www.cites.org 2001)

It is supposed that females are normally not hunted. Some might only be shot as bait for leopards (see Table 20).

Table 19 is providing further information on the conservation status of the game species considered for hunting. According to the Red List of IUCN (World Conservation Union), which is providing a framework of classification of species according to their extinction risk, most of the animals that could be utilized in the Lake Mburo area are either at lower risk to become extinct or are not ranked (Hilton-Taylor 2000, www.redlist.org 2001). CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) "is an agreement between governments. It's aim is to ensure that international trade in specimens of wild animals does not threaten their survival". CITES has listed the leopard under Appendix I. Appendix I lists species that are the most endangered among CITES-listed animals and plants. These are threatened with extinction and CITES generally prohibits commercial trade in specimens of these

species. The other game species are not listed and therefore trade is not restricted by CITES (www.cites.org 2001).

Based on the quota, it is possible to generate up to 245 hunter days if the entire quota is sold and all animals taken (Table 20). One could think of marketing even a leopard quota. Despite the fact that we do not know the number of leopards in the area, people kill leopards on a regular basis in order to protect their livestock. These animals instead could be killed by sport hunters for more than US$ 2000 each. In addition, it may be possible to market a limited number of "Plains game" safaris (i.e. with no dangerous game such as buffalo or leopard). Here it is important to make the price right in order to attract this type of hunter.

Table 20: Possible marketing strategy of trophy hunting by the operator in the Lake Mburo area.

.Safari	Hunting Bag	Days	Number Safaris	Hunter Days	Rate per day*	TOTAL [US$]
Buffalo safari	Buffalo, impala (x2), zebra, warthog, bushbuck, eland or waterbuck or reedbuck	14	13	182	1500	273,000
Leopard safari	Leopard, impala (x2), impala female (x4 bait), zebra, warthog, bushbuck, eland or waterbuck or reedbuck	14	2	28	1500	42,000
Plains game safari	Impala (x3), impala female (x3), warthog (x2), zebra, bushbuck,	7	5	35	1500	52,500
TOTAL/ Gross revenue of operator (US$ / year)		**35**	**20**	**245**		**367,500**

* average safari fees in Tanzania (Hurt & Ravn 2000)

The landowners in Lake Mburo could make a profit of up to US$ 90,000 for the quota of the wild animals on their land, while the operators would receive an optimum net revenue of up to US$ 240,000 if the entire quota is sold. If an agent is involved (usually) taking 15%, the profit margin of the operator drops. When calculating potential returns one fee structure was used. The safari was calculated at US$ 1,500

per day. It might be necessary to offer Ugandan residents and less expensive overseas hunters who are interested in hunting of animals with no or not that strong trophies a fee of US$ 500 per day. This would reduce the net revenue of the operator even further. In total 160 staff can be employed and could benefit from a hunting scheme (Okua *et al.* 1997).

Table 21: Operators costs of trophy hunting operation (adapted after Okua *et al.* 1997).

	Units	Unit cost	Depreciated cost***
Capital costs (US$ / year)	1		**18,160**
Camp tentage*	1	12,000	2,400
Camp equipment	1	10,500	2,100
Own vehicles**	2	33,000	13,200
Generator	1	3,000	600
Firearms	1	2,000	400
Fixed operating costs (US$ / year)			**23,300**
Core staff	144	120	17,280
Land rent		0	0
Repairs and maintenance	1	800	800
Licence fees	1	500	500
Firearms	16	10	160
Fuel	3,600	1	3,600
Skinning knifes	6	60	360
Uniforms	12	50	600
Variable operating costs (US$ / year)			**83,764**
Hunter	245	200	49,600
Ammunition	376	4	1,504
Casual staff	16	50	800
Food	245	100	24,500
Trophy processing	368	20	7,360
Total costs per unit		**93,565**	
Total costs (US$ / year)****			**125,224**
Net revenue of operator (US$ / year)			**242,276**

* Tents and equipment – Beach and Bush, Ker and Downey Safaris, Kenya.

** Toyota Land Cruiser from Toyota, Uganda.

*** Years of depreciation – building 5 years, vehicles 5 years etc.

**** Income and expenditure from Robin Hurt Safaris, Tanzania.

4.3.4 Discussion

Cropping

The resource base in the Lake Mburo area is not only limited but small. Considering the investments, cropping for meat might generate a net income of about US$ 5000, which is financially not viable. Landowners would receive only little returns from the whole exercise.

Furthermore other problems might occur. Experiences from Zimbabwe show that impala can become gun-shy and thus the rate of return from cropping decreases with time (Booth 2000). If the terrain is rough, making approaches to animals may be difficult and slow and the number of animals taken per day will be limited (Parker & Graham 1973). Hunting operations become more costly and the price of meat then becomes uneconomic i.e. the higher catch-effort cost would be passed on to the consumer. Furthermore, one has to consider that game meat from the Lake Mburo area will be a speciality as long as it is the only game meat on the market and can fetch higher prices. As soon as venison from other areas in Uganda or imported from other countries is sold, the meat might become cheaper and the profit less.

Availability of staff can become problematic. The trial cropping showed how essential well trained staff, good shots, skinners and tanners are. In Zimbabwe the major cost of the community cropping programme has been for ammunition because the hunters could not shoot straight even after extensive training. Processing at a central slaughterhouse required a high level efficiency. As soon as standards dropped, there was an overall loss of meat through wastage, spoilage, dehydration and appropriation elsewhere (Booth 2000).

Once poaching is under control one could think of increasing the quota up to 25% of the impala population and 15% of the zebra population like in Kenya (Bos *et al.* 2000). But even when harvesting at ten times the rate of safari hunting, game meat production hardly breaks even financially (Child 2000b). On the other hand rainfall, droughts, food production and other ecological factors must be taken into consideration. Variations in these factors can affect the population negatively and thus the overall viability of the scheme even further.

If the whole exercise is not financially viable, like the first attempts at wildlife utilization for meat in Zimbabwe (Child 1988) wildlife utilization might fail right from the beginning. Experiences from Kenya (Elliott & Mwangi 1997b) show that cropping is only marginally viable, confirming a conclusion reached in Southern Africa some 30 years ago (Bos *et al.* 2000, Child 2000a). The only consumptive use of wildlife allowed in Kenya is meat cropping. Cropping is only viable were the scale of operation is viable,

the transportation costs are relatively low, the slaughterhouse, cropping vehicles and meat trucks are used in a efficient way and the competition between operators is low (Bos *et al.* 2000). According to Child (2000a) Kenyan policy allows only what has been a proven failure. Meat cropping is the most consumptive and least financially productive use of wildlife (Child 2000a).

Trophy hunting

Uganda should learn from mistakes made in other countries rather than repeating them according to this study. Sport hunting seemed to be a much more viable option than cropping. Sport hunting is economically because it can provide good financial returns with minimal investment. Safari hunting involves a low off-take of trophy animals from wild populations with greater financial returns per animal taken than is possible from cropping of meat. Safari hunting also can yield relatively high returns from wild lands and wildlife populations, which are not otherwise commercially exploitable (Cumming 1989).

Average game fees and safari fees vary from country to country. Prices might vary even in one country between different outfitters. A hunting safari of 21 days costs US$ 9,500 in South Africa, and US$ 31,000 in Tanzania. In Botswana clients have to pay US$ 1,250 for a buffalo, in Ethiopia US$ 1000 and in the Central African Republic US$ 668. Zebra fetch US$ 700 in Zimbabwe and US$ 600 in Tanzania (Hurt & Ravn 2000). The fees taken in Tanzania in 1996 were used to calculate the prices and costs of a hunting scheme in the Lake Mburo area. It might be possible to generate both more and even less income depending on the marketability of sport hunting in Uganda.

More income might be generated by expanding the quota by the addition of hippo (game fee US$ 2500 in Zimbabwe, Hurt & Ravn 2000, 2000 IUCN Red List: Lower risk conservation dependent, CITES: Appendix II), bushpig (game fee US$ 50 in Zimbabwe, Hurt & Ravn 2000, 2000 IUCN Red List: Not ranked, CITES: Not listed) and baboon (game fee US$ 100 in Botswana, Hurt & Ravn 2000, 2000 IUCN Red List: Lower risk conservation dependent, CITES: Not listed) and introducing bird shooting (Hilton-Taylor 2000, www.cites.org 2001). Bushpigs, baboons and even hippos are vermin to some of the landowners. The landowners might welcome the idea of sport hunters killing problem animals (see chapter 5).

Although wildlife can offer significant income to the landowner and operators from trophy fees alone in the Lake Mburo area the operators might be even interested to spread the overhead costs by hunting in two or three areas in Uganda. Some scope of hunters might be interested to collect otherwise unobtainable species such as Uganda kob (*Kobus kob thomasi*), a species found in Western and Eastern Uganda (2000 IUCN

Red List: Lower risk conservation dependent, CITES: Not listed) (Hilton-Taylor 2000, www.cites.org 2001).

While most of the countries do not ask for Government licence fees, Tanzania is collecting US$ 2,100 for Concession fees, US$ 2100 for Area fees and US$ 100 per gun for Firearm permits (Okua *et al.* 1997, Hurt & Ravn 2000). In the calculations Government licence fees were not included for the Lake Mburo area. The above returns have been calculated on the basis that the landowners derive the full benefit from the sale of their animals, this includes the trophy, meat or skin values. In order for the use rights programme to take off and assist UWA in its goal of wildlife and biodiversity conservation there should be no fee levied on use rights *per se*.

The fact that a trophy hunting scheme would offer more employment than a cropping scheme to residents of the Lake Mburo area is another advantage of a hunting scheme. A hunting scheme could even generate substantial tourist revenue, not only for the safari operators and his/her employees and the country as the landowner, but also for airlines, air charter companies, taxidermy companies, hotels, restaurants, firearms and ammunition dealers, curio sellers, camp equipment dealers, and vehicle dealers to mention a few (Hurt & Ravn 2000).

As the pros and cons of sport hunting and its effects on mammal populations were discussed in detail by different authors such as Robinson & Redford (1991), Child (1995), Fa *et al.* (1995), Fitzgibbon *et al.* (1995), and Slade *et al.* (1998) I will not go into this issue at this point. Even ethical concerns on trophy hunting raised by animal welfare organizations and others are not discussed (Cartmill 1993).

Conclusion

Sport hunting has a long history in Africa. East Africa (Tanzania, Kenya and Uganda) was the traditional home of safari hunting up until the early 1970s when hunting was banned, first in Tanzania in 1973, in Kenya in 1977, and Uganda in 1978. This made both safari hunting clients and professional hunters look for hunting fields elsewhere in Africa, in Sudan, Zaire and the Central African Republic, which were relatively new destinations; and Zambia, South Africa, Namibia, Ethiopia and Botswana which already had fledgling safari hunting industries, and which boomed following the ban in Kenya, Tanzania, and Uganda (Hurt & Ravn 2000).

Uganda could become again a destination for sport hunters. Only rebel activities in Uganda might put a damper on the potential of the tourism industry. Uganda has a good reputation as a hunting country from the old days (Herne 1979). It used to be one of the prime hunting areas with" beautiful sceneries and good trophies", especially

of buffaloes (Stigand 1913). Due to security problems and civil unrest some of the well established destinations for sport hunting such as Zimbabwe loose their attractiveness. Furthermore like other tourists sport hunters are always interested to visit new destinations and to experience hunting in different environments. The attractiveness is increased due to the fact that Uganda could offer two hunting seasons, December to March and May to July. The hunting seasons of most of the other African countries last from March to October. Safari hunting would therefore be an alternative form of land use and tourism in Uganda.

B

Human dimension of community-based wildlife conservation

Figure 28: Local leaders are interviewed in Sanga, Nyabushozi.

5 Attitudes of the community in Nyabushozi

5.1 Introduction

Recent growth in the number of National Parks in Uganda has made an important contribution to the preservation of its unique ecosystems and related biodiversity. However, the absorption of large areas containing valuable natural resources into strictly protected reserves has had varied social, economic, and environmental impacts. Conservation clashes with traditional land uses such as grazing and cultivation and wildlife is often perceived as directly competing with herding and cultivation (Marquardt *et al.* 1994, Infield & Namara 2001).

In 1983 LMNP was established without the consent of local people and it involved their forced removal. This was perceived as a major injustice and turned many people against LMNP, and when subsequently the Government weakened they returned and destroyed the Park facilities (Snelson & Wilson 1994) (see chapter 2.7). In the years to follow the prevalent approach of the conservation authorities was simply to keep the people living around LMNP out of the protected area. Emphasis was on strict protection, and as a result hunting was banned even outside the Park in 1978. In the late 1980s and early 1990s this policy changed. With the support from foreign donors, protected area outreach programmes were established around LMNP. However, formal environmental education, capacity building, and support for community development have not stopped the local communities from utilizing wildlife in an unsustainable manner inside and outside LMNP (Infield & Namara 2001) (Table 8).

UWA and other conservationists realized that the future of wildlife in the Lake Mburo area depends on whether the local people are willing to accept wildlife on their land and willing to come to an agreement with the conservation authorities on how to protect and utilize wildlife sustainably.

Human dimension in wildlife management

In the 1980s a paradigm shift from traditional management (conservation by protected areas) to ecosystem management took place appreciating human beings as integral parts of the ecosystem that they inhabit and use, because humans are both affected by and affect ecosystem functions (see section 1.2). Many scientists are of the opinion that just as the future of human populations depends on maintenance of ecological sustainability, ecological sustainability depends on human behaviour (Cortner & Moote 1999, Adams & Hulme 2001).

According to Decker *et al.* (1996) research on human dimensions can provide wildlife managers with information on political, economic, and socio-cultural factors, which when combined with biological and ecological information, comprise the body of knowledge necessary to direct wildlife management. Manfredo *et al.* (1996) see such research as "...an area of investigation which attempts to describe, predict, understand, and affect human thought and action toward natural environments".

In particular, "attitude" has been the focal point of studies attempting to understand human perception, response, and behaviour toward wildlife. Attitudes are broadly defined "…as a learnt predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object" (Lutz 1990). Attitudes are related to the way humans behave with respect to an issue and, just as importantly, they are learnt, and therefore can be influenced or changed to help promote desirable behaviour (Patterson *et al.* 2000).

Within human dimensions research, two distinct approaches to understanding attitude are apparent, first the attitude-based approach and second, the meaning-based approach. On the one hand Kellert (1980) emphasizes the distinction between attitude and behaviour, pointing out that attitudes are "..broadly integrated feelings, beliefs and values…" that are not necessarily consistent with an individual's behaviour (Patterson *et al.* 2000). On the other, Bright & Manfredo (1996) adopted an attitude model that provides a basis for empirically demonstrating the link between attitudes and behaviour. This theory also provides a basis for identifying factors that shape attitudes thought to be determined by underlying beliefs. If the salient beliefs can be identified, they provide an avenue for ultimately changing behaviour through persuasive communication. If attitudes have a strong influence on behaviour, the specific beliefs that lead to inappropriate attitudes can be identified and targeted for change (Patterson *et al.* 2000).

Conservation and development

Conservation and development have often been considered separately. Sometimes this has led to conflicting consequences, such as the numerous examples of conservation organizations trying to protect a forest while development organizations provide free sawmills. It is now widely accepted that development projects need to consider their environmental consequences and conservation projects are most likely to be effective if considering the human dimensions, the attitudes, values and needs of local people. There has been increased appreciation of the importance of local knowledge, cultural norms and social institutions, both for ethical reasons and to increase the likelihood of success of development projects (Adams 1998, Sutherland 2000).

In development aid programmes the emphasis is now on enabling people to do things for themselves rather than doing things for people. The people should have the right for "voice" (to express dissatisfaction) and the possibilities to "exit" (stop buying products or boycotting services) (Hirschmann 1970). Therefore the affected groups ('stakeholders') must be identified and incorporated in the process (Marks 1984, Sutherland 2000).

Behavioural studies indicated that for a society to accept a new resource or resource process, it must fit within that society's values and activities. Members of the recipient group of development aid play the major role in the acceptance or rejection of new ideas and technologies, which often undergo unanticipated changes as recipients fit innovations to their cultural circumstances (Marks 1984).

In order to find out whether sustainable wildlife utilization fits within the society's values and activities, and can be accepted as a new resource or resource process it was necessary to ascertain attitudes of local people in Nyabushozi. By using focus group interviews I tried to survey the attitudes and knowledge of pastoralists, cultivators, mixed farmers, opinion leaders and poachers on wildlife and wildlife utilization.

Aim of the interviews was:

I. To provide a situational analysis of the attitudes of local people on wildlife. By knowing the conflicts between wildlife and human beings it might be possible to develop ideas how sustainable wildlife utilization can resolve some of the conflicts that cause unsustainable exploitation of wild animals.
II. To gather information on the former and current hunting practise. The significance of hunting in Nyabushozi is influencing the attitudes of local people towards sustainable wildlife utilization in future and must therefore be considered when establishing a wildlife utilization scheme.
III. To stimulate local people to develop ideas on how illegal hunting can be controlled and legal hunting be organized.

I further expected:

IV. That regarding their different sources of income people around LMNP have different conflicts with wildlife.
V. That regarding their different sources of income and socio-economic position people around LMNP would have different ideas how to organise legal hunting and control illegal hunting.

These information should form the basis for the development of strategies, on how to control illegal hunting and organize legal hunting in the Lake Mburo area.

5.2 Methods

Focus group interviews

Focus group interviews were the ideal method for acquiring an orientation on attitudes towards wildlife, hunting, and the opportunities and challenges presented by wildlife utilization of the communities around LMNP. Focus groups in general are used very early in a research project in order to obtain general background information, stimulate new ideas and creative concepts, diagnose the potential for problems with a new programme, and to generate hypotheses rather than to provide solutions for problems (Green et al. 1988, Stewart & Shamdasani 1990). Group interviews generate a considerable quantity of data in a relatively short period from a larger number of people than would be possible by interviewing key informants only (Schensul *et al.* 1999).

Other techniques such as questionnaires or interviews with individuals do not allow for effects such as synergism, snowballing, stimulation, security and spontaneity. In focus group interviews the combined effort of the group will produce a wider range of information. Furthermore a comment by one individual often triggers a chain of responses from other participants. In an interviewer-interviewee situation, respondents may not be willing to expose their views for fear of having to defend these views, and since no individual is required to answer any question in a group interview, the individual's response can be more spontaneous and less conventional (Stewart & Shamdasani 1990, Krueger 1997, Schensul *et al.* 1999).

Participatory methods such as Rapid Rural Appraisals (RRA) and Participatory Rural Appraisal (PRA), the most frequently used methods to plan for the management of natural resources, were not used during this study. They would have raised the expectations of the people of Nyabushozi. Experiences show that participatory methods can be irresponsible exercises if a serious follow up is not guaranteed (Schönhuth & Kievelitz 1994) and should be applied once the project is entering or has reached the planning and implementation phase.

In general, the usefulness and validity of focus group data are affected by the extent to which participants feel comfortable about openly communicating their ideas, views or opinions. There are many variables that influence participants 'comfort zones' (Shaw 1981). Social research has shown that these influences can be categorized as intrapersonal, interpersonal and environmental and must be considered when designing the methodology for the focus group interview (Shaw 1981). Intrapersonal variables include demographic, physical, and personality characteristics, interpersonal variables group cohesiveness, group compatibility, homogeneity versus heterogeneity, social power and environmental influences, the material environment, territoriality,

spatial arrangements and interpersonal distance (Shaw 1981, Stewart & Shamdasani 1990).

Questions in focus group interviews should be relatively unstructured, because they allow respondents to refer to virtually any aspect of the general stimulus identified in the question. The goal of qualitative research is to understand and communicate, not to control or replicate a study (Krueger 1997). Although focus group research can produce quantitative data, they almost always are conducted with the collection of qualitative data as their primary purpose. This is the fundamental advantage of that method, because focus groups produce a very rich body of data expressed in the respondents own words and context. There is a minimum of artificiality of response unlike survey questionnaires that ask for responses expressed on rating scales or other constrained response categories. Participants can qualify their responses or identify important contingencies associated with their answers (Stewart & Shamdasani 1990).

Although focus groups are valuable research tools and offer a number of advantages, they have their limitations. Firstly, the small numbers of respondents limit generalization to a larger population. Secondly, the responses from members of the group are not independent of one another, which restricts the generalizability of results. Thirdly, the result obtained might be biased by a very dominant or opinionated member. However, this did not seem to be a major problem during the interviews in Nyabushozi. Fourthly, the open-ended nature of responses obtained in focus groups often makes summarization and interpretation of results difficult and the moderator may bias results by knowingly providing cues about what types of responses and answers are desirable (Stewart & Shamdasani 1990, Krueger 1997).

The most common purpose of a focus group interview is an in-depth exploration of a topic about which little is known. According to Stewart & Shamdasani (1990) for such exploratory research a simple descriptive narrative is quite appropriate. A brief summary may be all that is necessary and justifiable once the conclusions are rather straightforward. Therefore the most common analysis of focus group results involve transcript of the discussions and of the conclusions that can be drawn. I used the hermeneutical content analysis described by Mayring (1983) cited in Spöhring (1989) to conduct a qualitative analysis of the information.

Although it was neither possible nor desired to conduct a quantitative analysis of the information gathered during the interviews, symbols (🧍) were used to indicate frequencies and tendencies of answers (🧍 = less than 20%, 🧍🧍 = between 20-50%, 🧍🧍🧍 = more than 50%).

Questionnaire and interviews

A questionnaire with mainly open questions was developed in co-operation with members of the community, staff of UWA, and technical advisors of African Wildlife Foundation. The questions were initially phrased in English and thereafter translated independently by two interpreters. The two translations were compared and differences discussed in order to find the appropriate expressions in Runyankole. In a pre-test some members of the community were questioned and in cases the questions were not properly understood, they were revised accordingly. The two interpreters translated the answers from Runyankole into English.

During the pre-test it became also obvious that community members felt more relaxed in a group discussion than in individual interviews. Members were encouraged to express their opinions and to discuss them with one another. The questions were not answered individually; noted down by one recorder the answers rather reflected the consensus of group discussion. The consensus was usually the opinion of the majority of participants. During the interviews the interviewers asked participants to explain their views if it was not clearly understood what was said or the consensus not clearly expressed. We considered to record the interview with a tape recorder but the local people were irritated by the recorder as questions on illegal activities were asked.

The first set of questions on knowledge about wildlife on their land and legends, phrases, and sayings were used as an introduction into the topic, as a way to "warm up" the participants. As hunting is illegal the respondents were not directly asked if they were hunting. In the process of discussion some revealed frankly that they were hunting. Thereafter additional questions on hunting were asked.

One recorder asked questions while the other person took notes by hand. As I do not speak Runyankole, I acted as an observer of the group interactions. After the interviews the observations were discussed with the two interviewers. The interviews were conducted mainly in Runyankole. The poachers were questioned in Luganda due to their ethnic origin. The interviewers had worked with communities before, had fieldwork skills, group facilitation, and management skills, knowledge of interviewing, and were members of the ethnic groups of Bahima and Bawiru from Nyabushozi. The ethnic origin of the interviewers did not have any observable impact on the outcome of the interviews.

In addition to the results of the interviews exemplary observations and encounters with people in Nyabushozi relating to the interviews were presented in Box 1 to Box 5.

Target group

Target of the interviews were people living adjacent to LMNP in Nyabushozi County. This area was chosen as it was assumed that communities are directly affected by, and have the capacity to directly affect wildlife populations. The Banyankole people, divided into two ethnic groups, Bawiru (about 45%) and Bahima (about 23%) predominate in the area around LMNP. The Bawiru are traditionally cultivators while the Bahima are cattle keepers. About 80% of the inhabitants of Mbarara District work in the agricultural sector. While there are still some members of the population that remain pure cattle keepers or cultivators, the general tendency in earning a livelihood is mixed farming (Ministry of Finance, Uganda 1992). Therefore members from each sub-county were interviewed in homogeneous focus groups that included pastoralists, cultivators and mixed farmers. In order to avoid community leaders with a higher socio-economic status to dominate the interviews, they were interviewed in an additional session. The community leaders were asked a special set of questions relating to their position in the community (see Appendix: Questionnaire). These leaders were elected representatives of the communities and respected elders.

Local Councillors (LC) (elected representatives of the people) helped to organise focus group interviews in each sub-county. The LC was asked one week in advance to select and invite a representative sample, men and women, of the community to the focus group interviews. He recruited more individuals than required as some participants normally will not show up for the interview.

The influence of the composition of a group in terms of gender has been studied frequently and has consistently found differences in the interaction styles of men and women. While some researchers believe that heterogeneous groups generally are more effective than homogeneous groups because a variety of skills, perspectives, and knowledge can be brought to bear on the performance of tasks, others are of the opinion that the diversity of opinions expressed in a mixed-sex group may be smaller. I opted for mixed-gender groups as they are easier to control for the moderator (Stewart & Shamdasani 1990).

It was up to the LC to choose the venue, a convenient location for all the participants as some of them had to walk distances of up to 3 km to attend the interviews. The interviews were conducted in public rooms, schools or under a shade tree. As an incentive, the group members were invited to a bottle of soda after the interview.

In two sub-counties, mixed farmers and cultivators admitted during the interview that they were also hunting. People who exclusively live on pastoralism were found in only

two of the six sub-counties.

Through personal contacts in one sub-county it was possible to talk to a group of poachers. It was planned to carry out more interviews with other poachers. However activities of the Ugandan army and rangers in the Lake Mburo area made it impossible to organise further meetings as poachers feared to being arrested or being mistaken for rebels.

5.3 Results

We carried out 23 focus group interviews with an average of 15 participants (334 participants in total). Despite the fact that only 6-12 persons should have participated in the interviews sometimes more people took part. As more persons turned up we were advised by the LC to allow a larger number of interviewees to participate due to the group cohesion. The presence of more than a dozen participants did not afford enough opportunity for all individuals to participate actively which was a disadvantage.

Table 22: Demographic data of the interviewed focus groups

Ethnic group [%] n=334	**Settled in Nyabushozi [%] n=326***	**Capacity [%] n=23 groups, 334 persons**	**Gender [%] n=334 male / female**	**Education [%] n= 87 / 247 opinion leaders / average others**
Banyankole 96%	before 1980 60%	mixed farmers 37% n= 6 groups, 124 pers.	mixed farmers 76% / 24%	no formal education 9% / 24%
Baganda 3,0%	1980 to 1990 30%	cultivators 28% n= 5 groups, 93 pers.	cultivators 60% / 40%	Primary school 42% / 54%
Bakiga 1%	after 1990 10%	pastoralists 7% n= 3 groups, 22 pers.	pastoralists 68% / 32%	Sec. School – 0 level- 35% / 19%
		opinion leader 3% n= 7 groups, 87 pers.	opinion leaders 83% / 17%	Sec. School - A level – 9% / 2%
		poacher 2% n= 2 groups, 8 pers.	poachers 100% / 0%	University, Diploma 5% / 1%

* interviewed poachers did not live in Nyabushozi.

In general the discussions were very lively. No interview was dominated by an individual. People felt free to answer the questions. Women and men participated equally. At the beginning people seemed to be slightly stocky but relaxed increasingly during the interview. The average interview took 1.5 hours.

The majority of the respondents were Banyankole (96%) followed by Baganda (3.%) and Bakiga (1%). Only 7% of the interviewed persons were pure pastoralists. It seems that most of the former pastoralists have become mixed farmers. Therefore mixed farmers and cultivators were the majority of the respondents. The group of poachers (2%) interviewed in Luganda were fishermen. The Banyankole farmers who admitted during the interview that they were poaching are not included in this figure. More than 60% of the people had lived in the area for more than 20 years. About 40% settled in Nyabushozi in the last 20 years. In average less than 30% of the participants were women. The poachers were all men. The formal education status of the groups was rather low as 20% had no formal education and 50% had spent no more than 6 years in school. Opinion leaders had only a slightly better formal education than the average of the other interviewees (Table 22).

Knowledge about wildlife

Which are the wild mammals you have on your land?

According to their own information the questioned groups (n=14, pastoralists, mixed farmers and cultivators) had all (100%) impala, bushbuck, bushduiker, reedbuck, and bushpigs on their land. Waterbuck, warthog, and buffalo were present on the land of 13/14 (92%) of the group. Eland, zebra (78%), leopard (64%), oribi, vervet monkeys (*Cercopighecus aethiops*), and porcupine (*Hystrix spec.*) (57%) were less commonly named. Half of the groups claimed to have topi, hyena, hare (*Lepus spec.*) (50%), and less than half of the groups serval (*Felis serval*) (36%), aardvark (*Orycteropus afer*) (29%), lion, baboon (*Papio cynocephalus*), mongoose (*Herpestes spec.*), hippo, jackal (21%), tree hyrax (*Dendrohyrax arboreus*), African civet (*Civettictis civetta*), black-and white colobus monkeys (*Colobus guereza*) (7%) on their land. One group living in the West adjacent to the Park mentioned sitatunga but added that they were "no longer seen". Two groups, one in Sanga, West of the Park and one in Rurambira, East of the Park even listed roan antelopes, despite the fact that it is very likely that roan antelopes became extinct in the Lake Mburo area in the Lake Mburo area in the 1990s.

During the interviews children did not take part, however, the incidence described in Box 1 showed that children living further away from LMNP (40 km) hardly knew any of the wild animal species found in Nyabushozi. Unlike children herding cattle in the Lake Mburo area who see wild animals frequently, these children according to their

own information had not seen most species with their own eyes. The knowledge about wild animals among the children might decrease due to the extirpation of some species in certain areas of Nyabushozi.

Box 1:

Knowledge of children about wildlife:

While conducting the interviews and staying in the villages in Kikaatsi, the most Northern sub-county of Nyabushozi, we were invited by the head teacher to talk to children (age: 10 years) of his school about wildlife. We asked the children which wild animals they knew that occur in Nyabushozi.

Figure 29: Children herding cattle in the Lake Mburo area

The children answered freely. They hardly knew any of the wild animal species found in Nyabushozi or named species not found in Kikaatsi or Nyabushozi. They told us that they had not seen most of the species with their own eyes as most of the wild animal species were rare or became extinct in Kikaatsi. Most of the wildlife species are found in and around LMNP in Nyabushozi.

Are places on your land named after wild animals and do you know traditional hunting grounds?

The groups mentioned 13 different places named after 11 different wild animals (zebra and warthog were mentioned twice) and nine traditional hunting grounds in Nyabushozi (Table 23). While four places in LMNP were named after animals no traditional hunting ground is found inside the Park according to the interviewed

community members. Three traditional hunting grounds are placed in Kikaatsi and six in Sanga sub-county.

Table 23: Places named after wild animals and traditional hunting grounds in Nyabushozi

Name of the place in Runyankole	Animal	Location
Byembogo	Buffalo	Northern border of LMNP
Rwekishwaga	Eland	Northern part of LMNP
Keitanjojo	Elephant	Kanyanyeru sub-county
Agemphehe	Hyena	Kinoni sub-county
Akempala	Impala	Kanyanyeru sub-county
Akengwe	Leopard	in LMNP
Agebicuncu	Lion	Northern part of LMNP
Bwensirabo	Oribi	Near Sanga
Byengiri	Warthog	Nyakashashara, ARS Ranch 46
Rwengiri	Warthog	Kanyanyeru sub-county
Kyenshara	Waterbuck	Sanga, ARS Ranch 21
Keitanturegye	Zebra	Kinoni sub-county
Agenturegye	Zebra	Nshaara Government Ranch
Traditional hunting grounds	**Location**	
Rwanda	Kikatsi sub-county	
Kanyanga	Kikatsi sub-county	
Rwabigyemano	Kikatsi sub-county	
Bisharara	Sanga, ARS Ranch 6	
Kasharara	Sanga sub-county	
Kyamagundu	Sanga sub-county	
Akayanja	Sanga, ARS Ranch 20	
Nshaara	Nyakashashara, Nshaara Government Ranch	
Kanyanyeru	Kanyanyeru sub-county	

Do you know sayings, phrases, idioms, legends or ritual meanings of and with wild animals?

In general the younger people (under 30 years old) did not know many sayings, phrases or idioms and they referred us to older people. One old man (over 60 years old) who seemed to know many stories according to other members of the group refused to give us any details. He insisted that he was "saved" (member of a certain protestant religious group) and that the legends were "lies and bad" and therefore he would not tell us.

The legends, sayings, and phrases collected were compiled. Although it was not an

systematic collection of the 'oral tradition' on wildlife the compilation presents legends and sayings never recorded before. A publication of the collection in form of a school book for children in Runyankole and English under the title: "Akabikirwe tikaburwa mugasho - nothing is kept for nothing " and other phrases, legends and proverbs on human beings and wild creatures in the Lake Mburo Area is in preparation (Averbeck & Gumoshabe in press). One story is presented at the beginning of this thesis.

According to Schott (2001) legends refer to a "past" but are important for the "present" of the people concerned. The legends and sayings collected during the study were not systematically analysed at this point, their effects not studied, however one can assume that the mere fact that legends are still told indicates that they are still important value patterns.

Although the first set of questions was only meant to 'warm up' the participants and to introduce them to the topic by recalling traditional relationships, the answers showed that wildlife, places named after wild animals and 'oral traditions' concerning wild animals are still present in the life of the people of Nyabushozi. The answers are immediate responses to the questions. They do not reflect the actual frequency of wild animals on peoples land or the number of traditional hunting grounds. However, hunting had been banned in 1978, but most respondents knew many details about different species of wild animals, and remembered names and places which were named after wild animals in their area. Even places were mentioned named after animals such as elephant and lion that became extirpated already decades ago.

Attitude towards wildlife

While the community members did not object to the existence of wild animals in the protected area, everybody interviewed did not appreciate the existence of wild animals on his or her land (Table 24). Everybody was facing conflicts with wild animals as all the interview partners were subsistence farmers or pastoralists. Wild animals compete with livestock for pasture, salt, and watering grounds and destroy crops. It was mentioned that they do not like wild animals on their land as they do not benefit from wildlife.

The communities showed little interest in being the owners of wildlife. They did not understand how they should be able to manage wildlife on their land. Due to their experiences, most of the community members misinterpreted ownership and understood that management of wild animals implicates only 'problem animal' (=vermin) control. In their view wild animals were owned by Government and while Government was not benefiting from wildlife it had to solve the conflicts with problem animals. However, it was obvious to them that as animals were moving from one ranch

to the other and the pieces of land of each landowner were small (max. 5 km^2) apparently not one single individual can own the wildlife on his or her land. It was mentioned that UWA should be the owner of wildlife inside the Park, while the local people should be responsible outside.

Table 24: Attitude of community members in Nyabushozi towards wildlife (n= 14 groups).

Questions	Answers		Reasons given
What is your opinion about wildlife on your land?	Good	Bad 👤👤👤	▪ Wild animals compete with livestock for pasture, salt, and watering grounds. ▪ Wild animals transmit diseases, destroy crops, break fences. ▪ Wild animals are hazards to human lives and to livestock. ▪ There is no benefit from wildlife.
What is your opinion about wildlife in the Park?	Good 👤👤👤	Bad	▪ As long as they stay in the Park they do not destroy crops. ▪ Tourists come and pay money. ▪ Revenue for Uganda. ▪ Good for education of children. ▪ It is nice to look at the animals.
Do you think that wild animals are of any use?	Yes 👤👤👤	No	▪ Good for education. ▪ Good for prestige of Uganda. ▪ Good for revenue from tourists. ▪ Tourists can enjoy them. ▪ Meat of wild animals tastes good. ▪ Hunted animals generate income. ▪ Good as medicine and for skins.
Should wild animals be protected?	Yes 👤👤👤	No	▪ Only in protected areas. ▪ For future generations to admire.
Who should be the owner of wild animals?	UWA 👤👤👤	District 👤👤	▪ As their land is too small landowners can not be owners of wild animals. ▪ Local people can not manage. ▪ UWA should be responsible for the control of animals inside the Park and people should determine the fate of the animals outside.
	Every Ugandan 👤	UWA + District 👤	
	UWA + landowner 👤	UWA + District + Ugandans 👤	

The Park seemed to be accepted as the "home of the wild animals". Those questioned persons had no objections against wild animals inside the Park. As long as the animals are in the Park they are not on their land. They talked of tasks of UWA staff taking the

wild animals from the ranches to the Park or fencing off the wild animals in the Park. They even saw the advantages of keeping wild animals in the Park such as "being good for educational purposes, for tourism, a source of revenue for Uganda", and that it "is nice to look at them" (Table 24).

Although we were questioning the local people about conflicts with wild animals on their land, we did not know whether they actually hold land titles. While the interviews were conducted the official legal transfer of land titles was still an ongoing process (see chapter 2.8).

Box 2:

Landowners concern to loose land:

During ground counts I used to pass ridges owned by Mr. Risii, a pastoralist and landowner living in Rurambira East of the Park. I once stopped to make photos of the ridges. Mr. Risii approached me and asked me, why I am taking the photo. I told him, that I made the photos because of the beauty of the scenery.

Figure 30: Ridges in the Lake Mburo area

Mr. Risii told me, that he was suspicious. He feared that I would take away his land for the wild animals. He had experienced the eviction from land, his house and fields destroyed and his cattle driven away neither informing nor compensating him when LMNP was established in 1983.

Despite the fact that LMNP seemed to be accepted the example given in Box 2 indicates that fear is still existing among the people living adjacent to LMNP to "loose the land to the wild animals". Even after almost 20 years they remember the authorities evicting them from their land, their houses, and destroying their fields.

During the interviews nobody mentioned the opportunities of taming wild animals, an opportunity for benefiting from wildlife. Three examples (Box 3), however, show that animals were tamed and used as a pet and for meat production by herding them with cattle.

Box 3:

Tame impala and tame eland:

One landowner of Ranch 16 in the Ankole Ranching Scheme tamed an impala and marked it with an eartag. The impala used to follow the owner to Sanga, the next trading center. People in Sanga accepted the impala as the pet of the landowner and never harmed the animal. Finally the landowner felt honored when the impala was brought to Entebbe Wildlife Education Centre (Zoo).

Figure 31: Tame impala in Sanga

One landowner of Ranch 46 told me that he used to tame eland. They grazed the eland together with his cattle. The meat of the eland was sold to people who eat game meat.

On Ranch 10 a young buffalo calf was kept with the herd of cattle for meat production.

Hunting

Hunting was part of the tribal tradition of the majority of interviewed people in all sub-counties of Nyabushozi. However, the majority of the landowners directly bordering the Park never hunted and traditionally they do not eat game meat. Although hunting was not part of the tradition of the people, only a small number did not use wildlife products. Non-hunters bought skins and horns from hunters. The hunters were mainly members of communities living North, West, and East of the ARS and to the South of the Park.

One group of farmers informed us that they went out to hunt animals each Saturday. They got permission from the local authority to hunt problem animals. As some members of the community defined all animals as problem animals and they preferred to eat impala rather than bushpig meat, the hunters killed any species that they encountered. Hunters liked to go out hunting especially before public holidays such as Christmas and Easter in order to provide meat for their families.

Box 4:

Poachers arrested in the Ankole Ranching Scheme:

In 1997 the law enforcement unit of LMNP arrested poachers in the North of the ARS, in Sanga sub-county. The staff of LMNP had received a hint from a community member from the ARS.

Figure 32: Hunting with spears and nets.

In total 25 persons were arrested, spears and nets and 50 bicycles confiscated. The hunting party comprised of almost 100 participants being Bawiru by ethnic origin. The hunters originated from Kikaatsi sub-county North of the ARS.

The majority of the hunters hunted in groups of 15–20 persons and sometimes with dogs, spears and nets or used snares. The incidence of a hunting party of almost 100 participants described in Box 4 confirmed these information. Only a minority of the hunters used guns. Those questioned said that the wildlife products were partly for home consumption and partly for sale. Even if they did not hunt themselves, some landowners allowed hunters on their land because they killed problem animals and provided meat. The negative implications of poaching were therefore partly accepted as the landowners did not benefit from wildlife anyway. Some of the landowners allowed poachers on their land as a response to the bad collaboration between the communities and UWA (see Table 25). However, most resented the sense of insecurity the poachers introduced.

In addition to the local people from Nyabushozi who where interviewed a group of fishermen from the ethnic group of the Baganda were interviewed. They did not own land in the Ankole Ranching Scheme, but came from the neighbouring Rakai district to hunt wild animals on the ranches to the East of Lake Mburo National Park. They were willing to answer questions, as they were interested becoming legitimate hunters.

Poachers assumed that most of the species they were hunting were still increasing in numbers. They agreed that the number of impala in the Eastern Ranches decreased but they were of the opinion that the animals moved to other parts of the area. As poachers were only hunting in certain parts of the Lake Mburo area, they could not imagine that probably the high poaching pressure was causing any decrease in wild animal populations (see Table 26, Table 27).

Poachers stated that they were aware that animals can become extinct if poaching continues. Due to the fact that wild animals became almost extinct in Rakai District they started to hunt in the Lake Mburo area. They felt that the animals do not belong to the local people, they belong to the Park and the Government. Local people were not involved and their interests were not included. Therefore individual poachers were not concerned about the outcome of poaching as long as Government is not involving them. They were interested in controlling poaching themselves, as they do not trust the Government and in hunting in a legalised way.

One out of eight persons lived mainly on hunting. The others hunted in order to earn some additional money, for a share of meat, for traditional use of game products and "just for fun". Considerable amounts can be earned by selling game meat on the local markets. However the most valuable animals, eland and buffalo, are killed rarely.

They admit that landowners are only inviting them to kill certain problem animals such as buffaloes and bushpigs, while they are not called to hunt impala or waterbuck.

Table 25: Attitude of community members in Nyabushozi on hunting (n= 14 groups).

Question	Answers		
Was hunting part of your tradition?	Yes	No	
Did you use the wild animals in any way before killing them was forbidden?*	Skins	Meat	Horns
	No	Others	
How did you kill the animals?*	Dogs, spears, nets	Snares	Pits
	Poisoning of carnivores	Bow + arrow	Gun
How did the ban on hunting effect you?	Good: ▪ They never liked hunting and did not support the killing of animals.		
	Mixed feelings: ▪ They felt bad because they were not allowed to hunt but after reporting to the authorities they got permission to hunt problem animals.		
	Bad: ▪ People did not get any game meat any more. ▪ Conflict between wildlife and human beings increased as the number of wild animals increased and therefore the number of problem animals. ▪ People lost cultural ties with wild animals.		
What do you think about poachers?	Good: ▪ Poachers kill animals, which are destructive. ▪ Poachers provide meat.		
	Mixed feelings: ▪ Reasons given see: good and bad.		
	Bad: ▪ Poachers do not kill only problem animals or animals which are dangerous. ▪ Poachers spoil the image of people. ▪ Poachers can be mistaken for rebels. ▪ Poachers are like thieves who break into some ones house. ▪ Some poachers even steal cows and cause insecurity in general.		
Why do some people allow poachers to poach on their land?	▪ Poachers kill problem animals. ▪ Landowners do not benefit from wildlife. ▪ Collaboration between UWA and the community is poor. ▪ Some landowners share the meat with poachers.		
Do you know how poachers use wildlife products?*	Home consumption	Sell meat	
	Sell other products	No idea	

They confirmed the information given by the other hunters being cultivators or mixed farmers in the interview. The traditional method of hunting with spears, nets and dogs is still the most common method to hunt wild animals. Guns are not frequently used.

Table 26: Opinions of poachers on the status of wildlife populations and on their own hunting interests (n= 2 groups, 8 pers.).

Species	Increase (↑) Stable (-) Decrease (↓)	Question: Which species do you like to hunt and why?
Baboon	↑	▪ Not liked, but hunted baboons because they destroyed crops. Nobody ate baboons.
Buffalo	↑	▪ Large, so were not much hunted. A gun is needed to hunt a buffalo. Hunting a buffalo was dangerous but the taste of the meat was good.
Bushbuck	↓	▪ For three hunters killing of bushbucks was a taboo as they were members of the bushbuck clan of the Baganda. ▪ For the others the meat was very good.
Bushpig	↑	▪ Bushpigs were dangerous. It was exciting to manage to kill the animal. The meat was very good.
Duiker	↑	▪ Easy to kill and it had nice meat.
Eland	↑	▪ Large, so were not much hunted. Difficult to hunt. Traditionally trapped with snares and traps, which was not common any more.
Hyena	Few hyenas are left	▪ Never tried to hunt it.
Impala	↓	▪ Easy to kill and it had nice meat.
Leopard	Rarely seen	▪ Dangerous. Never killed.
Lion	Never seen	▪ Never seen.
Oribi	↓	▪ Easy to kill and it had nice meat.
Reedbuck	↓	▪ Easy to kill and it had nice meat.
Topi	↑	▪ Difficult to hunt.
Warthog	↑	▪ Warthogs were dangerous. It was exciting to manage to kill the animal. The meat was very good.
Waterbuck	↓	▪ They hunted waterbuck but the meat was not so nice.
Zebra	↑	▪ Some people killed zebra but the majority did not hunt it for traditional reasons: the private parts of a female zebra resemble those of a woman.

Table 27: Information on poaching in the Lake Mburo area (n=2 groups, 8 pers.)**.**

Questions	Answers
Why do you hunt?	▪ It is part of the tradition. ▪ Meat for home consumption. ▪ To earn money from meat sales. ▪ Parts of the wild animals are for rituals and for traditional medicine. ▪ Physical fitness.
How do you hunt?	▪ Warthogs: with dogs and spears (not more than 4 persons). ▪ Small antelopes: during daytime with nets and spears (15 - 20 pers.). ▪ Small antelopes: in the night with torches, spears, dogs (2 - 6 pers.). ▪ Buffalo, impala, topi, eland: gun (1 persons).
How much money do you get for one animal?	▪ Buffalo: 150,000/= USh US$ 100 ▪ Eland: 150,000/= USh US$ 100 ▪ Zebra: 40,000/= USh US$ 26 ▪ Topi: 20,000/= USh US$ 13 ▪ Impala: 10,000 – 12,000/= USh US$ 7 – 8 ▪ Warthog: 10,000/= USh US$ 7 ▪ Bushpig; 9,000/= USh US$ 6 (1500 Uganda Shilling = US$ 1).
Where do you sell the meat?	▪ In Kooki, Rakai District neighbouring Nyabushozi or directly in their own village.
Do you sell or use other wildlife products?	▪ Horns prepared with special herbs were used by witch doctors of the Baganda to bewitch people. While buffalo horns could be used for good and bad intentions, eland horns always implicate bad luck. ▪ No other products were used, as hunting was illegal. All evidence of hunting was destroyed.
How often do you go out for hunting?	▪ Net hunters: on Saturdays during the day in any season. ▪ Torches: daily, as long it is dark (moonless nights) ▪ Gun: monthly, during daytime. ▪ Dogs: weekly, in the rainy season, as tracking was easier.
Are you invited by landowners to hunt on their land?	▪ Landowners invited them to kill buffaloes, bushpigs and warthogs because these were problem animals. ▪ They did not invite them to hunt impala or waterbuck.

Differences between the attitudes of pastoralists, cultivators and mixed farmers

The main attitudes of pastoralists, cultivators, and mixed farmers are summarized in Table 28. Depending on their cultural background and their economic activities pastoralists, cultivators, and mixed farmers named different wildlife related problems and said how hunting played a different role in their life. Most of the landowners living adjacent to the Park were more interested in getting access to other resources in the Park and not so much in utilization of wildlife. While the hunting ban had no effect on them they would not mind other people to hunt on their land because they do not hunt themselves. Once a wildlife utilization scheme would be established different expectations and attitudes have to be appreciated and considered.

Table 28: Attitudes of pastoralists, cultivators and mixed farmers.

Occupation	Question	Attitude
Pastoralists n= 22 pers., 3 groups	Wildlife related conflicts	Competition with domestic animals for salt, water, and pasture, and transmission of diseases and breaking fences and dangerous animals
	Problem animals	All antelope species, zebra, buffalo
	Use of wild animals	No use to them as they do not hunt, do not eat game meat or use other wildlife products. Only the king, the Omugabe, used to have a leopard skin as a sign of power.
	Effect of hunting ban	No effect as they do not hunt.
	How can they benefit from hunting?	They assumed they could benefit from hunting by receiving money from other hunters. They did not want to hunt themselves.
	Interest in LMNP	If their cattle could have access to resources in the Park they would not mind wild animals outside the Park on their land. There is a conflict between wildlife and domestic animals due to land and therefore natural resource shortage.
Cultivators n= 93 pers., 5 groups	Wildlife related conflicts	Crop raiding
	Problem animals	Bushpig, porcupine, bushbuck, duiker, reedbuck and baboon.
	Use of wild animals	Wild animals were of multiple use to them as some of them hunt, and even if they did not hunt they ate game meat, and used other wildlife products.
	Effect of hunting ban	Due to the hunting ban people lost cultural ties to hunting, a legal source of income was denied, their was not so much legal game meat on the market and the number of problem animals increased.
	How can they benefit from hunting?	They assumed they could benefit from hunting by hunting themselves, would earn income through the sale of wildlife products, and would increase crop production by killing problem animals. As they preferred to hunt themselves they were not very interested in other people hunting on their land.
	Interest in LMNP	They were not so much interested in the natural resources of the Park as they crow their crops on their land.
Mixed farmers n= 124 pers., 6 groups	Some of the mixed farmers were Bahima. They did not like to hunt and eat game meat. Others were Bawiru and hunting was part of their tradition. The different cultural ties lead to different opinions. As mixed farmers, however, they own cattle and grow crops and their opinions were a combination of those of the pastoralists and cultivators.	

How can poaching be controlled and legal hunting be organized?

The majority of the local people were of the opinion that they should be allowed to hunt again. Due to their tribal tradition pastoralists had no interest in hunting. The participants had ideas as to how they could organise wildlife utilization. They mainly talked of forming a pilot committee to run a wildlife utilization process. However, their major concern was the control of problem animals. Some wanted to get meat for home consumption or for sale on the local market. In order to develop new ideas community members wanted to be better informed about options to utilize wildlife. The majority of the interviewees did not resent the idea of hunters who come from elsewhere to hunt on their land so long as they could share the benefits. However, a minority would prefer to hunt themselves.

Table 29: Attitudes of community members in Nyabushozi on control of poaching and legal hunting (n= 14 groups).

Question	Answers / Reasons given
Do you think you should be allowed to hunt again?	Yes: 🚹🚹🚹 ▪ Problem animals can be killed. ▪ To get more game meat. ▪ Because it was part of the tradition.
	No: 🚹 ▪ Pastoralists were not interested in hunting. ▪ The responsibility for problem animals might increase.
Do you think you could benefit from hunting?	Yes: 🚹🚹🚹 ▪ Problem animals are killed. ▪ Some people can sell meat. ▪ Game meat will be on the market.
	No: 🚹 ▪ Pastoralists could not imagine how they were able to benefit from hunting.
What do you think about people who come and pay for hunting on your land?	Good: 🚹🚹🚹 ▪ As long as hunters are authorised by Government and hunt in a sustainable way. ▪ As long as landowners directly benefit from hunting on their land. ▪ As long as problem animals are killed.
	Mixed feelings: 🚹🚹 ▪ Some want to enjoy and do the hunting themselves.
Do you have any ideas how people of the community could participate and benefit from wildlife utilization?	▪ Pilot committee/body should be put in place to run a wildlife utilization project. ▪ Government, UWA and LCs should work together. ▪ Problem animals should be killed first. ▪ Tourism outside the Park should be improved. ▪ Community members have to be educated first. ▪ Local people can organise themselves. ▪ Communities should be compensated with schools, roads etc.

They had few ideas on how to organise legal wildlife utilization. Government, UWA, and LCs should work together, a pilot committee should be put in place to run a wildlife utilization project and the local people should organise themselves.

The community leaders appreciated the need to control poaching as they realized the negative implications of poaching. Government/UWA was not able to control problem animals and poaching with all its negative implications. Therefore community leaders were willing to support hunting control and the organisation of legal hunting together with UWA in the area. Due to the ongoing process of decentralization of political power, they even claimed the responsibility for the wild animals. During the interview they thought only of already existing structures such as LC, LDU, and UWA working together. However, they developed ideas how poaching control can be more effective by improving the communication network among the stakeholders with radio calls, by establishing outposts of LMNP rangers on the ranches and a more effective information transfer between the stakeholders.

The majority of the community leaders were of the opinion that landowners together with their elected representatives and UWA should organise legal hunting. LCs seemed to be accepted not only by the local leaders themselves as some are the directly elected representatives of the community but also by the community members. Community members were proposing LCs as representatives of the communities in a wildlife utilization project. Although I expected differences between community members and local leaders who should organize wildlife utilization, the answers of the two groups resemble each other.

The political leaders and community members both wanted more training and education on hunting issues (see Table 25, Table 29, Table 30).

It was mentioned to increase tourism outside LMNP in order to make the local people benefit.

Although the participants of the interviews generated ideas answering these questions, the idea of sustainable legal wildlife utilization involving local people was new to them. They were never confronted with such questions before. The answers reflect therefore the first brain-storming on this topic among members of the community.

Table 30: Ideas of community leaders in Nyabushozi on control of poaching and legal hunting (n= 6 groups).

Question	Answers / Reasons given
Would you be interested in helping to control poaching?	Yes: 👥👥 ▪ Poachers destroy farms through trespassing. ▪ Poachers are like thieves or rebels. They bring insecurity. ▪ Poachers do not only kill wild animals, they also steal livestock and burn pasture. ▪ If poachers kill all the animals, no tourists will visit Uganda and Uganda will get no revenue. ▪ Poachers kill other animals than problem animals. ▪ Poachers get profit from hunting while the landowners don't benefit. ▪ There was no good co-operation between the National Park and the community at the moment. Hence the control of poachers could improve if collaboration was improving. ▪ Wild animals are good for education, meat. Is part of the heritage. ▪ Wildlife should be kept for future generations.
Do you think you should be allowed to decide what happens to the wild animals?	Yes: 👥👥 ▪ Government and UWA failed to address problems with wild animals. ▪ All problem animals should be killed first. ▪ Decentralisation gave power to people, even the responsibility for wild animals should be decentralised. ▪ While landowners face problems with animals on their land they do not benefit. No opinion: 👥 ▪ Community members need to be educated how to conserve and utilize animals.
Do you have any idea how poaching could be controlled?	▪ Animals should be taken to the Park. ▪ If community members benefit directly they will be able to control hunting. ▪ With the help of a good communication network, radio calls etc. the collaboration between the Park and the communities could improve. ▪ Park should establish outposts of rangers on the ranches. ▪ Community members should be educated on the impact of hunting. ▪ Community members need more training before they can control poachers.
Do you have any idea who could control poaching?	▪ UWA, landowners and local authorities should work together. ▪ In villages wildlife groups should be formed in order to control hunting. ▪ Uganda Wildlife Authority. ▪ Every Ugandan living with wild animals.
Do you have any ideas how legal hunting could be organised?	▪ Community members need to be educated on the opportunities of legal hunting and the way it can be organised. ▪ A wildlife committee with representatives of the community should be established. This committee should work together with UWA. ▪ It should be organised on parish level. ▪ Hunters should get a licence from UWA. ▪ Landowners, local Government and UWA could share the benefits. ▪ Hunting methods should be selected by UWA.
Who should organise legal hunting?	▪ UWA together with the landowners and the local authorities of the Local Council (LC) system (elected representative of the community). ▪ LC should be answerable to sub-county Chief (Governm. employee) ▪ Members of the Local Defence Units (LDU) (local paramilitary units)

The example of the fishermen described in Box 5 showed that their experiences with the officials of the local and central Government disillusioned them. Many members of the fishing community have recognized the problem of over-fishing and fear that soon they will not be able to make a livelihood from the fisheries anymore. The fishermen themselves started an initiative to reduce over-fishing on Lake Kakyeera. Despite the

Box 5:

Fishermen on sustainable use:

While talking about sustainable use the poachers being fishermen informed me about the following initiative they had started: The fishermen realized that they were over-fishing Lake Kakyeera. Too many boats were on the lake. The catch efforts were high, the catches declined.

Figure 33: Fishermen with their boats at Lake Mburo

The fishermen started to realize that on the long run they would finish the fish population in the lake. One fishermen, one of my informants, suggested to organize meetings and to discuss the problem with the other fishermen fishing in Lake Kakyeera. In these meetings they decided to reduce the number of boats on the lake in order to fish in a more sustainable way. The initiative came to a stand-still when the District Authorities of the Fisheries Department interfered. The officers used to receive a bribe from the fishermen for each licensed boat. They feared to loose this additional income and stopped the fishermen from reducing the number of boats on Lake Kakyeera.

fact that the goal of the Fisheries Department is to control over-fishing, the officers themselves promoted over-fishing by receiving bribes and not restricting the number of boats on the lake. Realizing that it is only possible to manage a common good once the users are working together and come to an agreement how to use the resource sustainable.

5.4 Discussion

Uganda has a long history of utilizing wildlife. The interviews reflected some of the old traditions that were regulating the use of the resources. Fables, legends and sayings explained why certain clans were not allowed to hunt certain species, and how human-beings and wild animals were relating to each other. There was a taboo against people eating the meat of their totem species and the traditional belief that zebras were not hunted as their 'private parts' resemble those of women. No traditional hunting grounds were mentioned for LMNP. The Omugabe, the king, had the exclusive right to utilize the resources around LMNP. Only in times of droughts the king allowed his peasants to graze and water their animals in the Lake Mburo area. Elaborate measures to regulate the use of resources seemed to be unnecessary, and the institutions relating to wildlife were weak customs and beliefs. Although weak, these mechanisms were sufficient to protect wildlife while it remained plentiful. Even today these traditional regulations are partly still obeyed.

According to their own perception people 'lost cultural ties with wild animals' through the implementation of the hunting ban. Some of the hunters neither comply with the traditional regulations nor with the laws of the modern nation-state. Mordi (1991) describes a similar development for the San (Bushmen), traditional hunter-gatherers of Botswana. The decline of tribal cultures has encouraged "the disintegration of traditional patterns of resource restraint and respect for nature. Feelings of intimacy and kinship with wildlife have been replaced for many tribal and hunter–gatherer peoples [-not only the San but also the Bawiru and Baganda-] by exploitative values associated with contemporary marketplace economies, modern technology, and commercialism. Many hunter-gatherers have responded to new cash incentives by engaging in excessive harvesting, succumbing to the temptation of overexploiting wildlife in exchange for receiving outside" (Kellert 1997).

Kellert (1997) argues that "the modern nation-state, by severing traditional dependencies on living diversity, often encourages indifference toward a natural world that no longer seems particularly relevant. Any developing nations with recent histories of tribal dependence on nature consequently appear suspended between two worlds. Traditional epistemologies emphasizing a basic connection between humans

and animals have lost much of their practical meaning, while new intellectual concepts of respect and affinity for nature have not yet fully and persuasively developed."

Child (1995) confirms for Zimbabwe "how aesthetic values have been insufficient to persuade most landholders to tolerate the costs of, or to invest in, the conservation of wild populations, while the nation's priceless wild animals had no demonstrable value".

Therefore, the involvement of local people in conservation has become a major feature of conservation policy, both in Africa and more widely (Adams & Hulme 2001). However, in Uganda local people were hardly involved or totally left out in conserving wildlife.

This was reflected in the interviews conducted in Nyabushozi. Although it can not directly derived from the interviews, as we did not ask for it explicitly, the comments of the questioned persons indicate the following wildlife related conflicts between the different stakeholders that were not or only partly addressed (Figure 34) and therefore might have lead to a unsustainable utilization of wildlife.

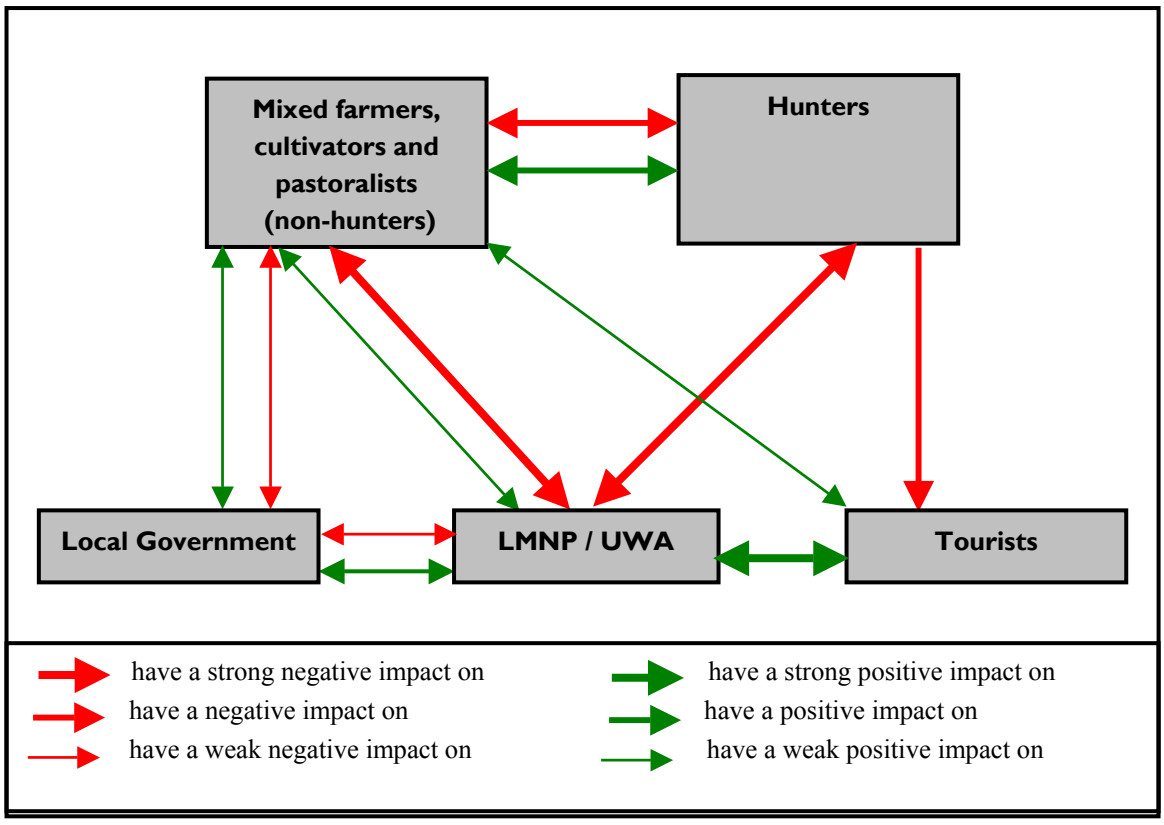


Figure 34: Situational analysis of relationships of stakeholders reflecting the opinions of the participants of the interviews in Nyabushozi

Firstly, conservation goals (implemented by LMNP/UWA) clashed with traditional land uses such as grazing and cultivation. Wildlife was perceived as competing with herding and cultivation of land. Some of the people still remembered that they were evicted from their land to give way to the wild animals in the 1980s. Only in reservation local people supported LMNP's efforts on poaching control. Communication between LMNP and the local people was perceived as 'not good'. Even Infield & Namara (2001) found out that active community support for law enforcement remains low. Park authorities receive only little support from community members, local leaders or even Local Government in controlling poaching. However some people appreciated that wild animals are protected for education and tourism.

Secondly, the Local Government/District, responsible for problem animal control in Nyabushozi, was not responding to the need of the local people to control certain animals perceived as vermin. However LCs in Kikaatsi supported the local people in their attempt to kill vermin by allowing them to solve the problem themselves.

Thirdly, some landowners welcomed poachers from other areas on their land because they reduced the numbers of problem animals and provided meat, but most resented the sense of insecurity they introduced. Some did not appreciate that the poachers kill not only problem animals. The poachers confirmed that they were only called to kill buffaloes, bushpigs, and warthogs and not impala or waterbuck. As some local people have an interest in controlling illegal hunting, they inform UWA about poachers in their areas.

Fourthly, hunting is illegal. However, illegal hunting was taking place and poachers were not concerned about the negative impact of the illegal activity as long as the animals belong to the Park and the Government. As they were not involved by Government they went out and hunted on a regular basis. UWA was not able to control illegal hunting outside the Park. The anti-poaching policy that attempted to enforce the separation of indigenous people and wildlife motivated poaching because illegal use of wildlife was the only value that wildlife retained for local people. Poachers profit from wildlife. An income of up to $100 for a buffalo is a reasonable amount of money in a country with a per capita GNP of US$ 320. The annual expense for a child in a Primary School can be paid with that amount.

Fifthly, poachers have an indirect negative impact on tourism. Once they hunt in an unsustainable manner, tourist will not be interested to come to LMNP and spent any money.

Sixthly, UWA is benefiting from tourism and tourism is benefiting from UWA.

These conflicts have to be addressed if one considers to promote wildlife conservation in the Lake Mburo area. The dilemma of increasing resource scarcity and the resultant intensifying competition between a growing human population and wildlife should be acknowledged. In general the situation could change in the following way aiming at involving local people in conservation in Nyabushozi:

Firstly, UWA could improve the communication with the local people living around the Park. They could involve them in conservation and control of the wild animals. However, some people see the solution in extirpating all wild animals on their land. The majority of the community members are of the opinion that they should be allowed to hunt again. Even pastoralists who normally did not hunt themselves saw the advantage of problem animal control by hunting. Only some of the pastoralists who never hunted, could not even imagine how they would benefit from hunting. The decentralization of political power from the central government to the districts had enhanced a process of participation by the local people in Uganda. In the light of these developments the leaders therefore even demanded the responsibility for wild animals.

Secondly, as a result local people might be willing to support UWA in its efforts to control poaching and accept wild animals on their land. Ideas were developed such as establishing a good communication net-work between the Park and the communities, outposts of rangers and training of community members who have the capacity to control poachers outside the Park. Already existing local structures such as Local Councils, Local Defence Units and sub-county chiefs should help to implement poaching control.

Thirdly, Local Government could actively be responsibility for problem animal control not only on paper but also by implementation. They could either implement problem animal control themselves or delegate the control of wild animals to somebody else who is doing it on behalf of them.

Fourthly, by involving poachers in legal consumptive utilization activities they might be more motivated in protecting wildlife than utilizing it in an unsustainable manner. On the other hand conflicts with the poachers might decrease on the long run as law enforcement would be more effective and more deterrent.

Fifthly, utilization of wildlife will be reduced once poaching is more under control.

Sixthly, local people could benefit much more from wildlife directly, by promoting consumptive, i.e. hunting, and non-consumptive utilization, i.e. tourism of wildlife outside the protected area. At the moment most of the local people neither benefit from consumptive utilization nor from non-consumptive utilization.

In general lack of communication, information and sensitisation seemed on either sides to be crucial to avoid conflicts. Therefore, the local leaders asked for training to be able to control poaching, for more information on the impact of hunting, and on the opportunities of legal hunting, and the way it can be organized. The concept of legal hunting in Nyabushozi was a new idea to them altogether.

Experiences from other African states show that one straightforward strategy to resolve these conflicts is to turn wildlife conservation into a source of local income that replaces resources use foregone. Gathered under the rubric of integrated conservation and development, dozens of projects have promoted this strategy in and around protected areas throughout Africa (Lewis & Alpert 1997).

According to Child (1996), wildlife was in serious decline in Zimbabwe 30 years ago. He argues that "the trend was reversed by simply abandoning conventional Western style centrally directed protectionism. Instead of the State attempting to manage the macrofauna, landholders were allowed progressively greater authority over how the animals on their land were managed and used, and they were encouraged to profit from using them sustainably". Wildlife utilization has become a significant form of land use outside protected areas in Zimbabwe, where it is earning more money with less strain on the local ecosystem.

In Uganda the hunting ban is not achieving its goals. The same applies to Kenya. Despite a hunting ban since 1977, wild herbivore populations declined by 40-60%, whereas livestock populations were stable over the same period (Ottichilo *et al.* 2000).

Nevertheless, up to now local people in Nyabushozi were considered by policy makers, academics, and development workers to be incapable of managing common property resources in a sustainable manner (Hesse & Trench 2000). They were hardly given the chance to proof that this assumption could be wrong. The lively discussion during the interviews and the active participation of the local people indicated that they had an interest in wildlife. They seemed to be concerned and motivated to participate in a legal process of utilizing wildlife.

Even the poachers felt encouraged to state openly their views as they were interested in legalizing hunting. They acknowledged that natural resources like fish and game are limited and had to be actively managed and their utilization controlled. Actually they realized the problem of common property resources, Hardin (1968) is calling the "tragedy of the commons". Market based theories assume that socially rational solutions arise when individuals are allowed to maximise their own self interest by exchanging freely with others. However, Hardin (1968) shows that where no property

rights exist, choices based on individual self interest must lead to overuse and produce a "tragedy of the commons" because each rational individual must behave in a way which destroys the asset to everyone's disadvantage. Sustainability therefore requires a collectively agreed allocation of rights of access, powers of exclusion, and payments for use. According to Hardin (1968) compliance can depend on force, or on creating a just system of mutual obligation. One of the solutions out of this dilemma is that community or cooperative control can limit access and guarantee long term maintenance. This localises monitoring and enforcement, and increases solidarity. It requires the ability to manage and reconcile potential conflicts of interest (Ostrom 1990).

Although it seems that people in the Lake Mburo area were interested in creating such a system of mutual obligation, however, they lacked the technical know how and the managerial excellence.

Empowerment and awareness strengthening

According to Chambers (1991), empowerment can be achieved through identifying the weak and enabling them to gain in skills, confidence and knowledge. They then analyse, monitor and evaluate, make presentations, become consultants and trainers, organize themselves, and negotiate resolution of conflicts. The interviewees with a rather low formal education status emphasized the need for more awareness and knowledge on the opportunities and challenges of a wildlife utilization scheme. There is a need for conveying information simply and accurately.

To increase the capacity of a community is to increase its ability to do things for itself. It means increased ability and strength, more skills, more confidence, and more efficient organization. It can be facilitated through action such as community-based projects, but only when all community members become involved from the beginning, to decide upon a community action, to identify hidden resources from within the community, and by developing a sense of ownership and responsibility of communal facilities from the start to the finish (Chambers 1991).

Participation

The information gathered provided a rich source of data on social behaviours, opinions, and attitudes, and cultural patterns of the community in Nyabushozi. However, focus group interviews allow to generate hypotheses only but rather do not provide solutions for the problem. They were used in conjunction with other information to provide a picture of the population and to develop ideas on a community-based wildlife utilization scheme in Nyabushozi. These ideas might help the stakeholders to decide how to proceed in establishing a wildlife utilization scheme.

However, as a next step when planning for a community-based wildlife utilization scheme in Nyabushozi, it would be necessary to involve the communities in the process.

Before a project is planned, the situation must be assessed. Participatory Rural Appraisal (PRA) is "a way of enabling people to analyse their living conditions, to share the outcomes and to plan their activities. 'It's a handing over the stick to the insider' in methods and action. The outsider's role is that of a catalyser, a facilitator and convenor of processes within a community, which is prepared to alter their situation" (Schönhuth & Kievelitz 1994). Those actually affected should assume an active role in conducting and analysing their own living conditions and evaluating the results. Priority is attached to having the outsiders learn from the residents of Nyabushozi in which the study is being performed, and on jointly perceiving the local living situation as the basis for cooperative planning and action (Schönhuth & Kievelitz 1994). PRA means learning from, with and through members of the local community.

Although PRA has certain methodological short-comings (Brett 1999) it seems to me the most appropriate and result-oriented way to involve rural stakeholders.

Cultural pattern

If trophy hunting would be introduced as discussed in chapter 4.3.4 the right to utilize wildlife should be granted to the landowners. Although the transfer of land titles is an ongoing process, some of the so called 'landowners' are as a matter of fact still 'proprietors'. The majority of landowners with the biggest portion of land living adjacent to the LMNP where sustainable utilization of wildlife is possible (see chapter 2.8) were Bahima. Traditionally they do not hunt and consume game meat. Their own interests do not interfere with the idea of foreign hunters hunting on their land. As the Bahima have no experiences with hunting they might welcome the idea to sell the hunting quota to a private operator. But they might also be the weakest link due to their ignorance as it is the private operator who will market the quota and deal with the customers.

Most of the Bawiru own only small patches of land adjacent to the Park and the majority lives further North of LMNP towards Kikaatsi and Kenshunga. Some Bawiru might be interested in hunting themselves but would have to hunt on the land of Bahima, where most of the wild animals occur. The same applies to the Baganda from neighbouring Rakai District. However, hunting by Bawiru and Baganda must be controlled. Unlike other African countries such as Tanzania and Zimbabwe (Child 1995, Lamprey 1995) were local people have the opportunity to buy hunting licences

the resource base is too small in the Lake Mburo area to allow for local hunting in addition to sport hunting (see chapter 4.3.4).

In order to make Bawiru, Baganda or people from other tribes benefit from a community-based wildlife utilization programme, some of them living in the project area could be employed by the private operator organizing trophy hunting.

Administrative and institutional structures

Experiences from other countries such as Zimbabwe (Alexander & McGregor 2000, Duffy 2000) show that administrative and institutional structures can undermine the efforts of community-based wildlife utilization projects to give substantial revenue to the landowners and to let them participate.

In some Districts in Zimbabwe local people were against CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) as they did not receive any benefits, their wishes were marginalized and people from outside the area, different officers and politicians gained in some way from the project but not the local people themselves (Alexander & McGregor 2000). Allegation of corruption and even the involvement of officials and the Zimbabwe National Army in poaching put consumptive wildlife utilization at stake (Duffy 2000).

During the interviews concerns were raised about the role of Government. The poachers gave an example of corruption in the Fisheries Department of Mbarara District. They were sceptical about the liability of Government. The same applies to the local people who were interviewed.

The administrative and institutional structures put in place have to be transparent. Accountability and monitoring would be crucial prerequisites of a community-based wildlife utilization scheme in Nyabushozi. They can only be achieved if member of the community in Nyabushozi participate in decisions face-to-face (Child 1995).

6 Awareness creation: study tour to community wildlife utilization projects

6.1 Introduction

Training is a process which helps individuals develop knowledge, skills and attitudes, based on principles of how adults learn best. Training is one of the most important factors which influence the way employees perform and carry out their duties. Effective training programmes approach behavioural change as a learnt process. But training is not only important to develop knowledge, skill and attitudes of employees. It can even help people in general to produce behaviour change, to help realise individuals personal potential and to produce change in the physical and mental effort put into achieving a certain task (Stone 1997).

When one looks at the principles of adult learning there are countless factors which influence the way people learn and there are many different ways to train adults. Conferences, distance learning courses, formal academic programmes, workshops and short courses are elements of training programmes. Although formal (academic) training is important, non-formal approaches might offer both a more flexible and affordable way to address the training needs. Retreats or study tours are non-formal approaches (Knowles 1996). A study tour is a visit, usually to another country or region, with defined objectives to learn or understand new practices relevant to the participants (Stone 1997).

In Uganda, due to the legal and political situation, there has been little interest in legal consumptive wildlife utilization. Therefore Ugandans in general have no experiences with or knowledge on community-based wildlife conservation. However, elsewhere in South and East Africa, many people have experienced community-based wildlife programmes such as CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) in Zimbabwe, ADMADE (Administrative Management Design for Game Management Areas) in Zambia and similar initiatives in other countries (e.g. Cumming 1990, Kiss 1990, Baldus 1991, Child 1995, Bond 1995, Bothma 1996, Child 1996, Heath 1996, Lewis & Alpert 1997, Duffy 2000, Prins *et al.* 2000, Hulme & Murphree 2001). Even Kenya, a country neighbouring Uganda, has community wildlife conservation projects.

Study tour

As part of this project a study tour was organised in June 2000 to Kenya. Attitudes ascertained during the interviews with the local communities in Nyabushozi (see chapter 5) and informal discussions with staff of UWA, veterinarians and meat

processors during the cropping exercise (see chapter 4) revealed a lack of knowledge and experience of the challenges and opportunities of community wildlife utilization projects.

As mentioned above (see chapter 5) a people's culture changes through interactions between its own members and with those from other cultures (Marks 1984, Kellert 1997). Resources which are not regarded as important at one point in time may become so or may become valued for a different reason. Activities and ideas not acceptable at one time may later become the basis for action (Marks 1984).

Therefore the objective of the study tour was to give the participants an opportunity to interact with members from another culture living in a similar situation, in order to increase the knowledge of the participants and potentially change their attitude on wildlife utilization projects. The visit and discussions exposed the participants to real problems with and the opportunities for wildlife utilization and conservation projects.

6.2 Methods

Eight landowners of the Ankole Ranching Scheme (ARS), five members of staff of UWA, an environmental journalist, two meat processing experts from Uganda Meat Technology Centre and one veterinarian from Makerere University, Kampala, Wildlife and Animal Resource Management (WARM) Department, went together on a study tour to Kenya. Existing community wildlife and conservation projects run by Maasai communities in Laikipia District in Kenya were visited. The Maasais such as the Bahima are pastoralists. Discussions were held with different stakeholders of the utilization scheme, the landowners, the organisation responsible for managing wildlife in Kenya, Kenya Wildlife Service (KWS), meat processors, restaurants and a research centre. We visited a lodge and a cultural village run by Maasai communities.

People learn from their experience in everyday life. Through interaction with other people, we gain new information and learn how to face challenges, solve problems and conduct ourselves in a variety of situations. The process of learning through training should be based on real experiences with interaction and practice. The concept of experience-based training is represented in a model called the Experiential Learning Cycle. The Experiential Learning Cycle is a model with four phases, experiences, reflection, drawing conclusions and applying lessons learnt (see Figure 35, Knowles 1996). The learning cycle begins with experience. After we experience something we tend to reflect on it. Following a period of reflection, we draw conclusions about the experience. Lastly, we apply the lessons learnt. Experience, reflection and the conclusions we draw make us better prepared for similar situations in the future (Stone 1997).

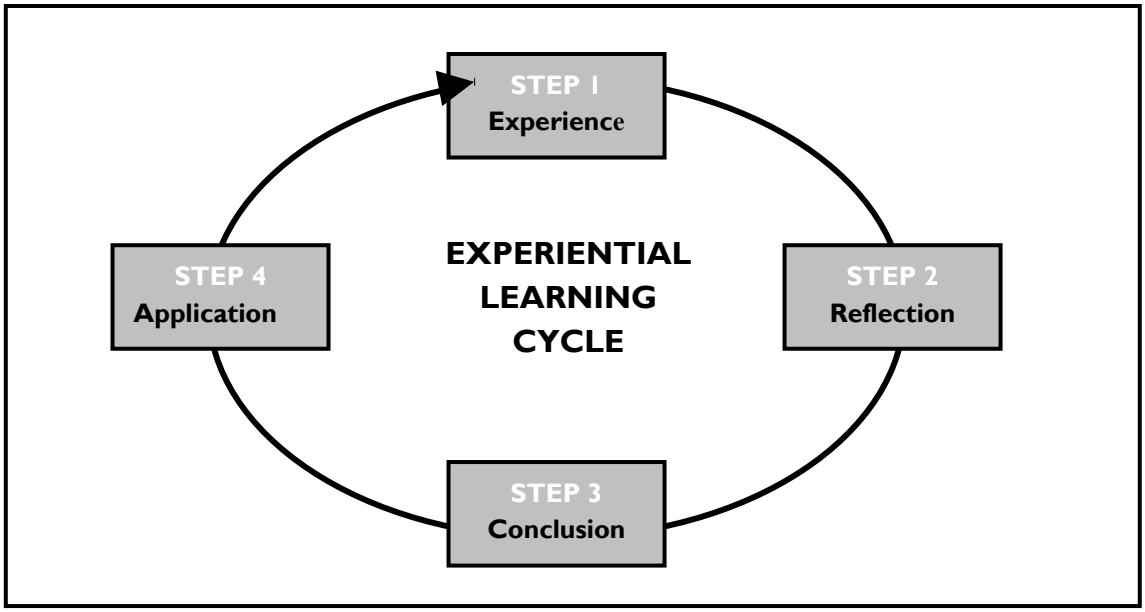


Figure 35: Experiential learning cycle (Knowles 1996)

The daily experiences of the tour were summarized in the form of short reports compiled in a joint effort by two to three participants each day. As a form of reflection on the total experience the reports were discussed at a final meeting of all the participants. In a brain-storming session the lessons learnt and the application of the lessons learnt were discussed and summarized on a flip chart (Averbeck 2000b). A summary of the experiences, reflections, the conclusion, lessons learnt and the planning for the application of the lessons learnt are presented here.

6.3 Results

The results reflected the experiences, reflections, conclusions and application of the experiential learning cycle (Knowles 1996).

Experiences/Reflections

We visited consumptive and non-consumptive utilization projects in Laikipia District, Kenya.

Consumptive utilization of wildlife in Laikipia District

As in Uganda in 1978 a Presidential Decree in 1977 banned hunting and effectively stopped consumptive utilization of wildlife in Kenya. Until 1990 only a handful of ranches were permitted to crop wildlife. In 1990 the Kenya Wildlife Service (KWS) introduced a limited pilot wildlife utilization programme across six districts. By 1996, 54 ranches in these districts had been authorised to crop wildlife within agreed quota, and 66 game farms had been licensed to rear ostrich, guinea fowl, crocodiles, frogs,

quails or butterflies for cropping. In Laikipia District wildlife cropping is licensed on 30 individual ranches and 11 community landholdings in 1997 (Wafula 1997).

In 1991 the Laikipia Wildlife Forum (LWF) was set up in order to bring together all the different stakeholder groups in the district that were involved in wildlife, including ranchers, pastoralists from group ranches, representatives from small farming communities, the Government, the Kenya Wildlife Service and NGOs. One of the aims of the LWF was "to manage wildlife and other resources at the 'ecosystem' level – encompassing an area far larger than any single property" (Elliott & Mwangi 1997a). Within the framework of the LWF, the Kenyan Government via the Kenya Wildlife Service allows the cropping of impala, zebra, buffalo, giraffe, Thomson's gazelle and others.

The study group visited one game ranch of LWF, Ol Pejeta Ranching, participated in cropping activities, watched the slaughtering, skinning and processing of carcasses of zebras and eland, held discussions with administrators about the economical aspects and community members about their experience with the cropping scheme. Furthermore the group talked to the district warden of KWS in Laikipia.

The following points which are reflected in discussion papers by Elliott & Mwangi (1997a, 1997b) were emphasised: Landowners have welcomed cropping. The transfer of property rights from KWS to the landowner, though limited, was seen as a step in the right direction in that it gives landowners some say in the use of wildlife on their land. It increases the opportunities for adjusting livestock and wildlife populations e.g. as a mean of managing the demand for fodder and water. Finally landowners hoped that cropping would yield direct commercial returns from the sale of meat and skins (Elliott & Mwangi 1997b).

Laikipia's wildlife is currently being protected by private landowners – both community and individual – for aesthetic and economic reasons. Despite the fact that the new policy has not allowed for hunting or trade in live animals, it has dramatically altered the landowners' perception of wildlife (Heath 1996).

Wildlife cropping in Laikipia is being pursued as an additional livelihood strategy to livestock ranching. Wildlife cropping has to date generated very low returns to landowners, estimated at US$ 0.20 – 0.40/ha p.a.. Furthermore, Laikipia landowners currently retain less than 5% of the final value of wildlife products. Elliott & Mwangi (1997b) concluded that, without significant change in the current framework of economic incentives, the trend will be for wildlife to be removed from all land in Laikipia except that supporting successful wildlife tourism ventures or where the landowner has non-economic reasons for conserving wildlife.

The low returns are due to a number of factors, including the restrictive regulatory framework, low cropping rates, and the low percentage of value added that accrues to the landholder. Because of its concerns about possible over-consumption and illegal harvesting, KWS maintains very tight control over the processing and sale of wildlife products.

In 2001 restrictions on wildlife utilization in Kenya include:

- No hunting except bird shooting.
- Wildlife cropping allowed only on approved ranches and within agreed quota.
- No processing of skins with hair on within Kenya, though export of whole unprocessed skins is permitted.
- No marketing or advertising of wildlife cropping products.

Other constraints to the development of the wildlife cropping industry within the regulatory environment include the:

- Lengthy process of setting quota annually. KWS is now considering changing the process to one where quota are agreed and set, changing only when monitoring programme indicates that adjustment is needed.
- Lengthy process for getting licenses for export of skins and bones compared with competing suppliers (Elliott & Mwangi 1997b).

Cropping is still a fairly new activity in Laikipia and the quality of a skin is very dependent on the selection and shooting skills of the hunter and the terrain in which the carcass falls (Elliott & Mwangi 1997a). An estimated 50% of Laikipia's zebra skins produced to date have been rejected due to poor quality skinning, salting and storage.

As tanning is not yet permitted for skins with hair, and no domestic sales are allowed, the only selling channel open to the abattoirs was export of whole, untanned zebra skins. A grade 1 (best quality) skin can fetch up to US$ 100-200 depending on the wholesaler, whereas grade 2 skins fetch as little as US$ 50, grade 3 skins were sometimes exported at very low value, or were sold locally, e.g. for shoe leather.

The main buyers of Kenyan zebra skins are wholesalers from South Africa, Zimbabwe, Botswana and Namibia who go on to sell the skins for up to US$ 1000 each.

In Laikipia District the processing and value added activities that are allowed tend to be concentrated in the hands of wealthier landowners who are able to fund the capital investment required and assess the skill and management expertise needed for success. For example, value added to game products during the abattoir process was significant, but it costs up to US$ 60,000 to build an abattoir from scratch. A landowner sells his

game directly to an abattoir was likely to receive less than US$ 70 per zebra, compared with the US$ 300 per head that he receives for his beef cattle. Yet the total value of the end products may be higher for game than cattle (Elliott & Mwangi 1997b).

Non-consumptive utilization of wildlife through ecotourism

Ecotourism "is understood to incorporate types of nature tourism which, in a responsible way, attempt to minimise environmental impacts and socio-cultural changes, contribute to the funding of protected areas and create earnings potential for the local inhabitants" (Ecotourism Working Group 1995). By visiting Il Ngwesi Lodge and Il Polei Cultural Village the participants saw one example of a tourist lodge and one of a cultural centre run by Maasai communities (Figure 36, Figure 37).

Figure 36: Study tour to Il Ngwesi community lodge in Laikipia, Kenya. Participants and Maasai hosts.

Il Ngwesi Lodge, operated by the Il Ngwesi Group Ranch, opened in December 1996. Il Ngwesi maintains traditional use of the land, whilst encouraging reintegration of wild animals on the land of the group ranches. They set aside an area of about 30% of the total communal land as a conservation area for wild animals only. Livestock is only allowed to this area in the critical dry season but even then under strict supervision. This has saved the wild animals and the environment in general from human disturbance. In the conservation area a lodge for tourists was established with financial support from USAID and the European Union.

Community members manage the lodge. The project is governed through a board of trustees and the members are deciding how to share the benefits. In 1999 the lodge was making profits of US$ 21,000 p.a.. It was decided to spent the money on: dip tanks for cattle, renovation and building of schools, purchase of vehicles, improvement of the radio communication system, roads, scholarships for students, funding of water projects.

Figure 37: Participants of the study tour are fascinated to touch a young Black rhino (*Diceros bicornis*) first time in their lives.

The success of Il Ngwesi lodge suggests that it was possible to bring communities into the higher return end of the market. High value wildlife viewing tourism yielded profits of between US$ 4.40 – US$ 32.50 per ha p.a. in 1997 in Kenya.

On Il Polei a Maasai community established a cultural centre. The cultural centre consists of nine Maasai huts, constructed with sticks and dung in the traditional way. It was completed in April 1997 through the community's own initiative as a result of mobilisation activities of neighbouring group ranches like Il Ngwesi.

The centre was formed as a way of creating alternative income. The Maasai wanted to market their culture themselves rather than having other people doing it for them. KWS and a travel agent helped in the formation of the centre by introducing them to the relevant authorities.

Il Polei receives income not only through the cultural village but also through a wildlife sanctuary they set aside and a campsite for tourists. The highest revenue raised was US$ 4000 p.a..

Conclusions / lessons learnt

The participants emphasised at the end of the study tour that they learnt:

- Livestock and wildlife can live together and both can be economically beneficial.
- Cultural centres and lodges on private land make money.
- There are different alternatives in income generation.
- You can make use of what you have on your land.
- How wild animals are cropped and processed.

- All things can be done through co-operation.
- Professional advice is very important in different aspects e.g. marketing, processing, public relations and technology.
- Different fencing systems.

Applying conclusions/ lessons learnt

The participants expressed their interest in establishing a wildlife utilization project in Nyabushozi. They realized that it is not possible to directly implement some of the lessons learnt but they concluded:

- **Landowners organisation:** at the end of the tour landowners from Nyabushozi formed an interim steering committee. They chose one participant as chairman while the other landowners and the Community Conservation Unit of Lake Mburo National Park, participants of the study tour, became members of the steering committee. Task of the committee was to organise follow up meetings in Nyabushozi with other community members in order to share with them what they had seen. They would decide together with other community members how to continue after presenting the experiences and the lessons learnt of the study tour to them.

- **Technical advice:** relationships were established between the landowners and technical advisors. LWF was willing to help the landowners in Uganda if they wished to start a wildlife utilization scheme or ecotourism site. Furthermore Uganda Meat Technology Centre, UIRI and Makerere University, Wildlife and Animal Resource Management Department agreed to give technical advice if needed by the communities. Even a meat processor in Kenya who was producing high quality game meat products was willing to support the landowners.

- **Wider awareness raising**: In order to raise awareness in the Ugandan public, the journalist has written several articles about the study tour and recorded a radio programme for the local radio stations. A documentary of the study tour will be used to raise awareness of the communities in Nyabushozi and the public in general on the challenges and opportunities of community wildlife projects.

All the problems and shortcomings emphasised in Laikipia District should be considered when establishing a wildlife-cropping scheme in Uganda. While creating their own system, Uganda can learn from mistakes made in Kenya.

6.4 Discussion

Wildlife, poaching, and conservation, all that had a negative connotation to the participants of the study tour. The actors on the conservation, ranching and poaching stage had constantly conflicts. The study tour could lead to initial ideas of conflict resolution rather than cementing the old patterns of conflict. While enjoying equal rights the common observations and discussions of the participants representing different groups of stakeholders started a process of communication and exchange of ideas. The study tour helped to give the people trust in their own abilities and potentials and to show possible solutions.

Landowners were able to capture new reproductive areas which were not known to them before. The study tour motivated them to found a landowners association in the East of LMNP. Wildlife managers, vets, and meat processors increased their management capacity as they knew community-based wildlife utilization projects only in theory. Staff of LMNP started to be instrumental in organizing meetings with different stakeholders after the study tour.

However, the experiences made in Kenya should not simplistically be transferred to Uganda. Calculations in chapter 4.2.3 showed that the returns from wildlife cropping would be small due to the limited resource base in the Lake Mburo area. If the returns are only marginal people in Nyabushozi might loose interest in conserving wildlife. On one hand Elliott & Mwangi (1998) observed that even the small income from cropping had a huge economic multiplier effect into the local economy of Laikipia as it was used to buy food and agricultural inputs and to pay for school fees and medicines. This income had the power to be one important element of change in local peoples' attitudes towards wildlife (Elliott & Mwangi 1998). On the other hand Child (2000a) assumes that safari hunting would allow an immediate five- to ten-fold improvement in the returns of wildlife in Laikipia. Child (2000) is of the opinion that Kenya banned sport hunting which is usually the highest valued use. The turnover is therefore significantly reduced. Less revenue is reaching the landowner. One has to be concerned that wildlife utilization will be only sustainable on the long run when its benefits outweigh both its maintenance costs and the benefits of alternative land use options (Ecotourism Working Group 1995).

The same situation is partly true in Tanzania where safari hunting allows for high income but where a disproportionately low share of these profits is reaching landholders (Hurt & Ravn 2000).

In the East African context Uganda could develop a third way of establishing community-based wildlife utilization projects. Firstly, the local landowners should be

involved from the initial planning phase of projects until the implementation, and should receive a proportional share of the profits. Secondly, in Uganda they should opt right from the beginning for trophy hunting due to its higher returns and the low ecological impact.

In addition more emphasis could be put in developing ecotourism sites in Uganda. Ecotourism, world-wide, is an expanding tourism segment which is expected to continue to exhibit high growth rates in future (Ecotourism Working Group 1995).

In many developing countries, nature tourism is the main income producer for National Parks and wildlife protection and conservation efforts, but this is not the case in Uganda. Rebel activities in Uganda have put a damper on the potential of the tourism industry to bring money into the country for protected area conservation. Whenever the news of a shooting in a National Parks gets global attention, foreign visitors look elsewhere for vacations. Until the unrest in Uganda can be settled and the situation made safe for visitors, tourism will continue to make a relatively small contribution to biodiversity conservation initiatives (Chemonics Int. Inc. & MUIENR 2001).

Moreover, the opportunities for ecotourism are limited in the Lake Mburo area. The lack of charismatic species such as elephants, Black or White rhinos (*Diceros bicornis, Ceratoherium simum*) in the area, makes it even more difficult not only for LMNP but also for the landowners living adjacent to LMNP to attract foreign tourists. LMNP faces severe financial challenges. Most parks and reserves in Uganda earn too little income to cover their recurrent costs (Barrow *et al.* 2001) In 1996 LMNP received only 1000 Foreign non-resident tourists and 1800 foreign residents of Uganda (Infield & Namara 2001). It remains up to donors to fill the financial gaps to preserve LMNP.

However, the landowners of Nyabushozi might opt to get involved in ecotourism by building their own lodge. The concept of Il Ngwesi to rent out the whole lodge (11 beds) to a group rather to individuals might be feasible. At the moment the number of high value lodges for visitors are limited in Uganda.

While a cultural village initially would not demand high investments, a lodge requires a major financial input from donors. Even Il Ngwesi was financed by the EU and USAID. However, it remains open if donors would be willing to support such a project. In 1995 a private investor, a landowner from ARS, had started a cultural village in Sanga. Due to lack of visitors and poor management she had to close her project two years later.

Despite the fact that ecotourism can provide access to additional and sometimes attractive sources of income one has to consider that the readiness on the part of the communities to support conservation measures can be achieved inasmuch as the relationship between the earnings and the existence of the protected area is apparent. After comparing ecotourism projects in different parts of the world the Ecotourism Working Group (1995) emphasized that economic impacts on local level very often are significantly limited by the centralised provision of tourist's requirements, the inadequate education of the population with consequent employment in unskilled jobs, the poor participatory and distribution structures as well as the insufficient entitlement of the local authorities to regionally accrued taxation revenues."

It needs intensive cooperation between external investors, and local stakeholders, a proper plan and a feasibility study to decide whether ecotourism would be a option for income generation.

Conclusion

Figure 38: Participants of the final presentation of study results: landowners from Nyabushozi, local leaders, GTZ-IPDP, LMNP, UWA, AWF and researchers.

7 Management recommendations

Most important natural resource issues ultimately are resolved in the political arena because they centre around conflicting value systems rather than more objective, fact-based questions. Wildlife managers have increasingly felt the weight of political pressures due to increasing public interest in issues such as nature conservation, endangered species and hunting (Patterson *et al.* 2000).

Conservation

Conceptually, a set of radical ideas of international provenance were introduced (and continue to be introduced) to the conservation agenda of Africa. There are three particular stands to these ideas and they are woven together in different ways by theorists, policy makers and managers of the African environment. The first is that conservation should involve the rural community rather than being purely state-centric. Secondly, the concept of 'sustainable development' has promoted the notion that the things to be conserved (species, habitats and biodiversity) should be viewed as exploitable natural resources that can be managed to achieve both development and conservation goals. Wildlife utilization, rather than wildlife preservation, might be best for conservation. Thirdly, and in keeping with the neo-liberal thinking that dominated the late twentieth century, are ideas that markets should play a greater role in shaping the structure of incentives for conservation. Following the dictum 'use it or loose it' these notions suggest that if species or habitats are to be conserved then they must not be isolated from the market: rather, they must be exposed to it as their uniqueness and scarcity lead to high valorisation and thus promote conservation (Hulme & Murphree 2001).

Sustainable development

According to the Brundtland report (WCED 1987) sustainable development is "development which meets the needs of the present without compromising the ability for future generations to meet their own needs". Some people assume that community development simply means getting richer - an increase in per capita wealth or income. It can be, but is more. It is social change, where a community becomes more complex, adding institutions, increasing its collective power, changing qualitatively in its organization. Development can be seen as a process of expanding the real freedoms that people enjoy (Sen 1999). The Nobel laureate Sen's (1999) developmental notions go beyond neo-liberal ideas: "Focusing on human freedoms contrasts with narrower views of development, such as identifying development with the growth of gross national product, or with the rise in personal incomes, or with industrialization, or

with technological advance, or with social modernization. Growth of GNP or of individual incomes can be very important as means to expanding the freedoms enjoyed by the members of the society. But freedoms depend also on other determinants, such as social and economic arrangements as well as political and civil rights (for example, the liberty to participate in public discussion and scrutiny). Development requires the removal of major sources of unfreedom: poverty as well as tyranny, neglect of public facilities as well as intolerance or over activity of repressive state" (Sen 1999).

"An adequate conception of development must go much beyond the accumulation of wealth and the growth of gross national products and other income-related variables. There are good reasons for seeing poverty as a deprivation of basic capabilities, rather than merely as low income. Political freedom, economic facilities, social opportunities, transparency guarantees and protective security are distinct types of rights and opportunities helping to advance the general capability of a person. They may also serve to complement each other. Public policy to foster human capabilities and substantive freedoms can in general work through the promotion of these distinct but interrelated instrumental freedoms" (ibid. 1999).

The tragedy of the commons

Local people have for many years been considered by policy makers, academics and development workers to be incapable of managing common property resources in a sustainable manner. Customary tenure systems with their communal forms of ownership and management were considered to be archaic, locking people into a 'tragedy of the commons' scenario. The community was considered unable to stop individual users from over-exploiting the resource (Hesse & Trench 2000).

Pastoralists were singled out as a case in point. By holding land in 'common', it was thought that individual herders had no incentive to limit the number of animals they grazed on that land. Without such limits, the conditions were set for land degradation and 'desertification' (Hardin 1968, Pratt & Gwynn 1977).

It was though that the way to avert an environmental disaster was for the state to take charge and impose an external solution, namely privatisation or nationalisation. Conventional wisdom, however, is now leaning the other way and decentralised management of natural resources is back on the agenda. International and national conventions are providing broad policy frameworks for the involvement of local people in natural resource management. Central Governments are trying to implement the rhetoric of local participation by reforming legislation and passing new laws to allow a greater involvement of civil society in the management of natural resources (Hesse & Trench 2000).

Lake Mburo Wildlife Forum

In 1996 Uganda adopted a new Wildlife Statute (The Uganda Wildlife Statute 1996). The statute vests ownership of wildlife with the state but makes provision for people to own wildlife that had been lawfully taken. Mechanisms were being established to enable local communities to manage their wildlife, rather than having this control imposed from outside (Okua *et al.* 1997). The change of the legal frame opened up the opportunity for consumptive wildlife utilization in the Lake Mburo area.

However, experiences show that the Ugandan Government is passing new legislation to devolve responsibility for managing natural resources to local communities, but despite growing awareness of the vital role of the commons in local livelihood systems, there is still some resistance to transferring full management of their use to the communities that depend on them. Some policy makers are doubtful as to whether these areas can be properly managed by community-based organisations, and it is still believed that privatisation or state control are the only means of preventing the degradation of resources that are customarily held in common. The alternatives, which range from full local control to joint management by the community and the state, are new and untested in Uganda (Hesse & Trench 2000). Therefore, even five years after the new Wildlife Statute was adopted no community-based consumptive wildlife utilization project is existing in Uganda.

In this final chapter of the thesis a model of a community-based wildlife conservation project, a sport hunting scheme, in the Lake Mburo area is described. Considering the different aspects of conservation requirements, sustainable development and further information gathered in the prior chapters, ideas on a pilot project in the Lake Mburo area are developed. I didn't have the official mandate in the frame of this study to involve all stakeholders in a participatory planning process of a wildlife utilization scheme (Figure 38). This step forward is still missing. Acknowledging the ideas of Sen (1999) it is important to enhance the freedom of people, to let people participate in public discussions and scrutiny. Therefore, the following ideas are suggestions which have to be secured or dismissed by a participatory planning process.

The target group orientation of any wildlife management project can only succeed through the formation of representative bodies, which builds capacity in disadvantage groups and enables them to identify and give voice to their own needs (Nuding 1996). A representative body could foster political freedom, improve on economic facilities and social opportunities in the project area. Like in other African countries local landowners could organise themselves in order to utilize and protect wildlife on their land. They could call themselves 'Lake Mburo Wildlife Forum'.

7.1 Possible institutional set-up

Following the ideas described by Cortner & Moote (1999) Lake Mburo Wildlife Forum (LMWF) (Figure 39) should be a civic association organized to determine societal as well as ecological needs and goals, resolve natural resource management disputes, and undertake environmental restoration and management projects that also address social needs. In order to be fully functional, this association will have to be integrated into the governance structure, particularly the regulation and management of natural resource and land use in Nyabushozi. The landowners of Nyabushozi will have to be motivated and empowered by being given opportunities to participate in making critical environmental and social choices that address their interests. The decision-making processes of UWA will have to be revised to accommodate new forms of knowledge and multiple sources of information, balancing both expert and lay input.

The initiative has to come from the community members, the landowners. If they are not interested in participating the project will fail. Landowners living adjacent to LMNP would represent the majority of LMWF. The participation of representatives of UWA, Mbarara District and a limited number of local leaders would make sure that information and opinions of different stakeholders are heard and considered in the frame of LMWF. From the beginning staff of LMNP / UWA should participate in the group forming process. The Ugandan Government owns the wildlife and the UWA is the lead agency for wildlife in Uganda, but theirs will be facilitatory and regulatory roles. Staff of the Community Conservation Unit can be catalysts in the establishment of the groups through organising and facilitating meetings.

UWA sets a hunting quota for the Lake Mburo area. LMWF will be the owner of the quota. The quota will be sold by LMWF to a private investor, a safari operator. The operator is marketing the quota and dealing directly with the client, the consumer. Most of the landowners living adjacent to LMNP never hunted and they do not have the experiences and the management capacity to deal with safari hunters and to organize the marketing of the quota. Therefore it will be easier to involve a private investor. LMWF, however, decides how to sell the hunting quota and to whom, how to spent the revenue, how to control illegal hunting in the area, how to organise problem animal control and probably how to monitor in cooperation with UWA and other stakeholders the wildlife populations.

Uganda Meat Technology Centre and Makerere University, Wildlife and Ranch Management Unit (WARM) could function as external advisors to LMWF. UIRI is interested to help in establishing means and ways to slaughter and process the game meat. They can be instrumental in establishing connections with private investors who

are interested in processing and marketing game meat. The WARM Unit of Makerere University could give advice on different aspects of ranch land management and veterinary medicine.

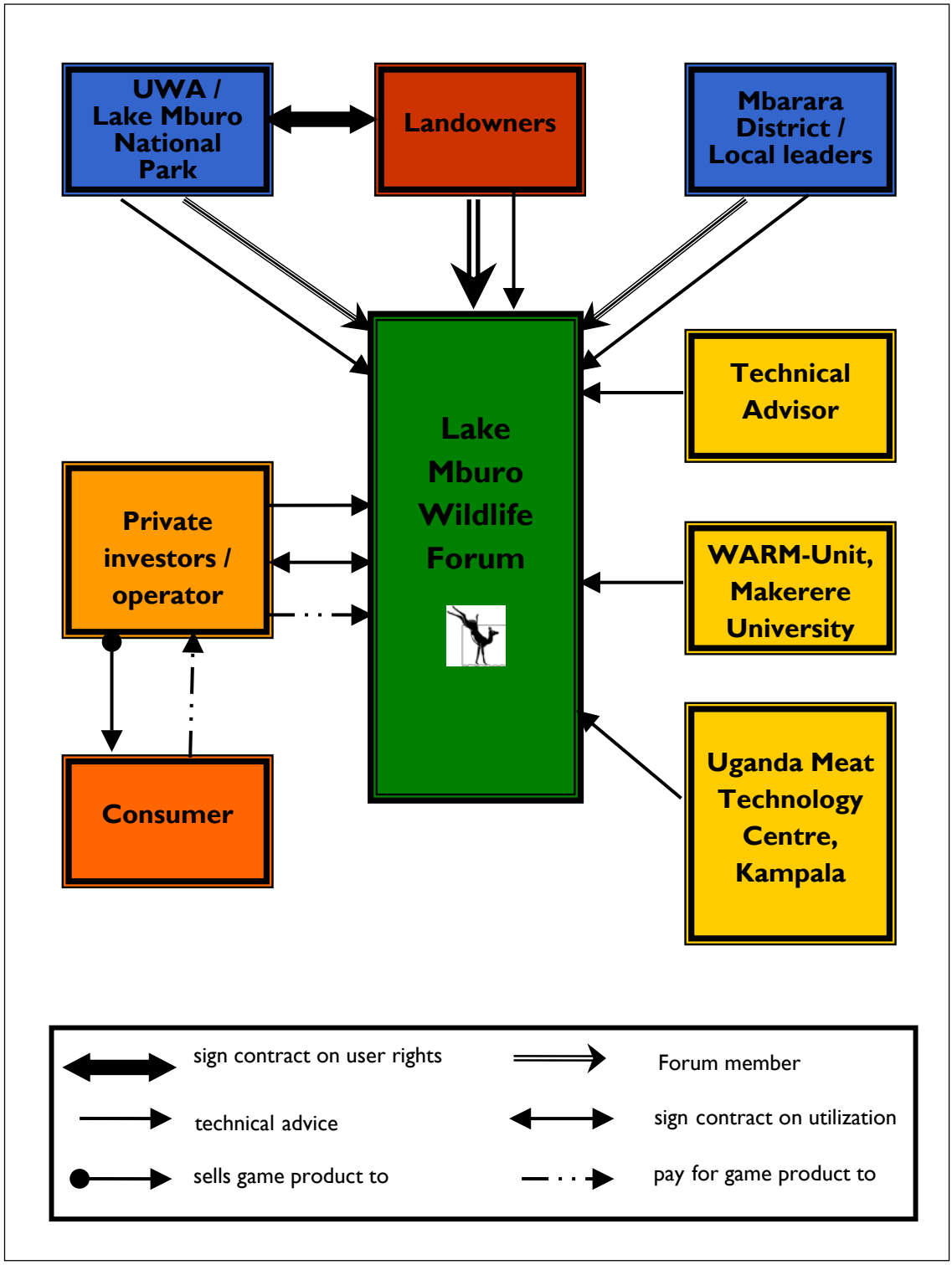


Figure 39: Possible institutional set-up of a wildlife utilization project

When starting the project a technical advisor could work in collaboration with LMWF. At the moment, nobody has the capacity, the time and money to be instrumental in starting the establishment of a wildlife utilization scheme. Staff of UWA have many other commitments, even the landowners do not have the time and resources to organise such a demanding project. A full-time officer is needed to support the process, to organise meetings and sensitise the communities further on opportunities and challenges of wildlife utilization.

7.2 Strategy: How to organize utilization of wildlife around LMNP?

Step 1: Sensitisation and Clearance

- In the initial phase sessions with local leaders, officials from Mbarara District and UWA have to be organised to sensitise them on the issue of community-based wildlife conservation. They have to give the clearance for further activities (Figure 40).

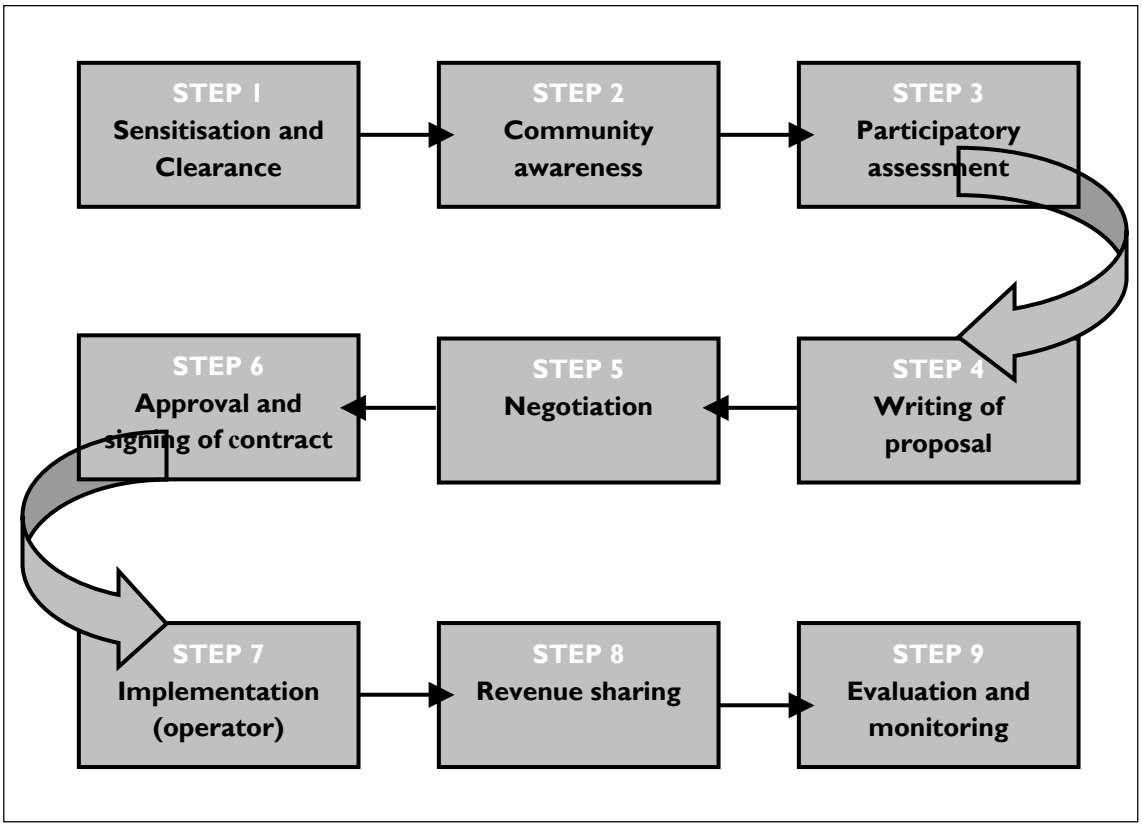


Figure 40: Strategy: How to organize community-based wildlife utilization around LMNP

Step 2: Community awareness

- Awareness meetings have to be organised with the target group. Most community members are still unaware of the implications of a wildlife utilization scheme. Meetings arranged by the participants of the study tour probably have already initiated an awareness process. The biggest concentration of wildlife was found in the East of the Park. As some of the community members from the East of the Park were already aware (they went on the study tour and formed a landowners association in 2001) this area would be the best place to start raising community awareness.

Step 3: Forum organization

- Different community factions have to come together and have to form a structure such as LMWF.

Step 3: Participatory assessment

- By using a PRA the priority of the problems, the priority goals as solutions have to be identified by the different stakeholders.

Step 4: Writing of proposal

- The LMWF with the help of the technical advisor will need to formulate a community project design proposal on how to utilize wildlife in the Lake Mburo area.

Step 5: Negotiation

- The proposal would be submitted by LMWF to UWA and discussed until it meets everyone's expectations.

Step 6: Approval and signing of contract

- If all sides approve the proposal the conditions for organizing wildlife utilization will be fixed in a contract signed by the community executive, district officers, local leaders and UWA. UWA would fix a quota of animals that can be utilized by LMWF.

Step 7: Implementation / operator

- The concessions could be marketed competitively using auctions, tenders or interviews. These will be not restricted to Ugandan citizens, because it is probable that the management capacity is not available after decades of a hunting ban. Also,

this would lead to maximum returns. Another important reason is that an outside operator may bring existing clientele thus saving on marketing costs.

- Every applicant must have a clean legal record, a good reputation and experience of at least five years operation as hunting company in other African countries and a proper financial background.
- The tender procedure should be aided by a consultant with respective experience in the field of safari hunting. This consultant could also work out the contracts incl. detailed regulations.
- The operator is allowed to sell all meat locally and elsewhere in Uganda subject to regulations by the UWA.
- The operator is required to buy and pay the full yearly quota in advance and without respect of the hunts he actually conducts. (Alternatively: 50% down payment when signing the contract and for 50% a bank guarantee is provided and payable not later than the end of the hunting season). The final price achieved will depend on the quality of the area as a safari block and the availability of the trophies
- The operator is free to determine how he sells his quota (e.g. number and type of animals per safari, duration per safari etc.).
- He is also free to determine how many animals of his animals he sells actually to hunting clients and how many he culls himself for meat and skins.

Step 8: Revenue sharing

- LMWF has to decide how to share the revenue of the wildlife utilization scheme. It would be important to introduce a system of 'checks and balances' that allows for the control of a transparent distribution of the money.

Step 9: Evaluation and monitoring

- Evaluation and monitoring is important to control whether the goals set in the proposal submitted to UWA are achieved. UWA together with LMWF should control the different stages of the utilization scheme. Regular visits by staff of LMNP are important to supervise the activities of the pilot project.

Other aspects that have to be considered:

Scale of the project

- Considering the wildlife distribution in the Lake Mburo area, it would be advisable to concentrate a wildlife utilization scheme on ranch 13 to 29 and ranch 40 to 50 including Nshara Government Ranch. It comprises a huntable area of 500 km^2. The wildlife numbers in the other parts of the Ankole Ranching Scheme are too small.

- Experiences from Zimbabwe show that scale is a critical issue in designing processes that are transparent, accountable and democratic. Scale is particularly important in semi-literate communities because transparency and accountability can only be achieved if members of the community participate in decisions face-to-face (Child 1996). As the number of landowners is quite high, it is advisable that landowners of Ranch 13 to 29 and Ranch 40 to 50 would form two sub-groups. These two sub-groups could work together under one umbrella organisation, the LMWF, but each group would organise the hunting and share the benefits of the utilization among the members of the sub-group.

Training

- The private investors would employ the technical professionals. It would be good if persons from the ranches work within the frame of the utilization scheme so that more people from the area benefit directly from wildlife. Some of those who are presently poachers could even be employed as hunters, guides or butchers or even as game scouts. They already have some of the basic skills.
- A Muslim butcher could ensure that animals are slaughtered according to legal requirements in Uganda in case the meat should be sold.
- Well trained professional hunters are needed to guide the sport hunters. Before hunting can start and as special skills are needed to slaughter and skin the animals, workers have to be sent for training to good training facilities inside Uganda or even other countries. Members of Laikipia Wildlife Forum might be willing to help in training people.

Control of poaching

- As the wildlife population is unsustainably utilized by poachers, the landowners will have to make sure that no more poaching takes place on their property. Experience shows that once wildlife is managed in a sustainable way, control of poaching will be achieved (Heath 2000). The community could think of either establishing closer connections with LMNP, the law enforcement unit, and/or could try to mobilise game scouts who screen the area and make sure that members of the Local Defence Unit help to control poaching. In Tanzania each village appoints an anti-poaching team of 6 to 8 persons who work in conjunction with a wildlife officer, thus giving the responsibility to the community. The team are paid basic salaries but substantial rewards are given for recovered snares, firearms, and poachers prosecuted. Typical rewards are: US$ 2.50 per small snare, US$ 5 large snare, US$ 100 per poacher arrested and prosecuted, US$ 100 per poachers camp destroyed and US$ 150 per firearm recovered (Hurt & Ravn 2000). Different methods to improve the control of poaching were discussed during the interviews

but the landowners with staff of LMNP need to decide together on how best to enforce control

Problem animals

- Due to decentralisation in Uganda, the Districts are responsible for problem animal or vermin control. Most of the inhabitants of Nyabushozi still think that it is the responsibility of UWA. In Nyabushozi, Mbarara District, vermin guards are recruited by the district and trained by LMNP. Up to now vermin guards are not effective as they are only covering small areas, their numbers are too small and they are not mobile enough (Turyaho & Enyagu 1998). In order to help people from the local community and to increase the acceptance of the wildlife utilization scheme it is crucial that the operator together with the trophy hunter also hunts problem animals. Problem animal control by trophy hunters could even generate some income.
- UWA together with the District has to define which animals are problem animals and can be probably killed without a licence.

Quota

- Hunting quota should be set by UWA on an annual basis and should be based on size of the area, density of specific species and off-take in previous years. Generally, the quota should be fairly set, in the event of over use, the quality drops off dramatically.
- As calculated in chapter 0, 2% to 3% of the large mammal population can be cropped. The quota should be low at the beginning of the hunting scheme. If hunting is introduced into this area, it will be extremely important to maintain good trophies in order to attract clients.
- Safari hunting should be started on the basis of a three years trial. Continuation and quota / hunting procedures will be evaluated in the third season. Quota and procedures will then be modified, if necessary.
- Experiences from Tanzania (Hurt & Ravn 2000) show that concessions contracted out over a longer period, more than 5 up to 15 years, make it worthwhile for the safari operator to develop and manage fully his/her areas for the long term rather than the short term. The safari operator is motivated to be a proper custodian and steward of his/her area just as much as the local communities.

Monitoring system

- If a quota for hunting is to be set, it will be necessary to get information on the population size and population structure for each year in the future. Without such information there would be a strong risk that hunting might become unsustainable.

Despite their short-comings and limitations, ground counts and aerial surveys should continue. Rangers of LMNP have been trained to count the big mammals as part of this study. The management of LMNP and the Monitoring and Research Unit of UWA, Kampala, have agreed to continue with the ground counts on a monthly basis in the coming years. LMNP and the Monitoring and Research Unit of UWA received a report compiling all the raw data of the ground counts in form of tables and figures of total numbers and densities for each species (Averbeck 2000a). In addition, they each received a floppy disk with all the data, tables and figures in order to be able to enter the new data sets.

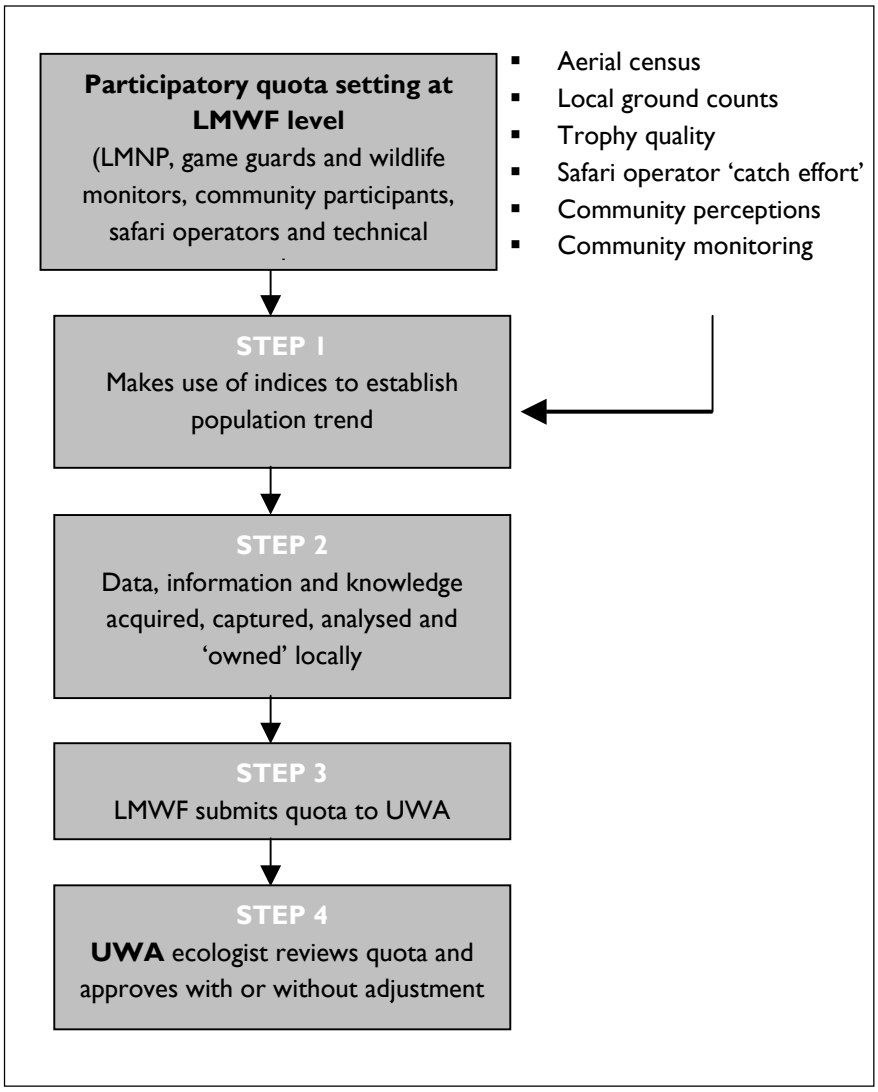


Figure 41: The participatory approach to establishing off-take quota for large mammals in LMWF scheme (modified after Taylor 2001).

- It might be possible in the long run to involve the landowners and other stakeholders in monitoring the wildlife populations. Taylor (2001) is giving the example of a participatory approach to establishing off-take quota for large mammals in Zimbabwe's CAMPFIRE programme. It can be even applied in the Ugandan situation. In this process information and knowledge gained is locally owned. Participatory quota setting could provide learning and develop confidence.

The development of a participatory quota setting scheme is commencing at the producer community level. It brings together, in a workshop setting, all the key stakeholders involved in establishment of the quota and its subsequent use, and recognizes the importance of data, information and knowledge that each stakeholder can offer to a decision-making process. Thus aerial census data, participatory ground counting results and trophy quality measurements, together with the local LMNP warden's opinion, safari operator's 'catch effort' and community perception (e.g. illegal off-takes) provide indices which are triangulated and combined in a matrix used to adapt the previous season's quota (Figure 41).

Regulations

- Revenue appropriation: As the landowners in the Lake Mburo area carry the full opportunity costs of wildlife on their land they should be the main beneficiaries of wildlife utilization. The landowners should derive the full benefit from the sale of the animals, this includes the trophy, meat and skin values. I agree with Okua *et. al* (1997) that in order for wildlife utilization programme to take off and assist UWA and the Districts in their goal of wildlife and biodiversity conservation and problem animal control there should be no or at least small fees levied on use rights *per se* by UWA or Mbarara District. Administrative and institutional structures must promote the idea of landowners benefiting from wildlife on their land. Landowners must have the feeling that they are consulted. UWA could generate income by taking licence fees for possession or export of wildlife and wildlife products and hunter's permits. Private sector operators might pay concession rights set by market forces for the privilege of using the area. The latter will ensure that a proportion of the money accruing to lodge operators and outfitters becomes available to both wildlife authorities and local people.
- In order to optimise the benefits of wildlife utilization Uganda should unlike in Kenya allow for the processing of skins with hairs and marketing and advertising of wildlife products in Uganda.
- Furthermore UWA should streamline the processes of setting quota and licenses in time as the delayed setting of quota might cause management problems.
- Other regulations on the species hunted, the hunter, the professional hunter, types of firearms for hunting, and health and veterinary standards of meat have to be considered but can not be discussed in detail at this point. Okua *et al.* (1997) and Okori (1999) already developed some ideas on guidelines for implementation of wildlife use rights in Uganda on these issues.

7.3 Adaptive management

Ecosystems are complex and dynamic. As a result, our understanding of ecosystems

and our ability to predict how they will respond to management actions is limited (chapter 3, chapter 4). Together with changing social values (chapter 5, chapter 6), these knowledge gaps lead to uncertainty over how best to manage a ecosystem.

Despite these uncertainties, in the frame of this study recommendations were developed how to manage community-based wildlife utilization in the Lake Mburo area, decisions might be taken and plans might be implemented following these recommendations. However, adaptive management is a way to proceed responsibility in the face of such uncertainties. It provides a sound alternative to either "charging ahead blind" or "being paralysed by indecision", both of which can foreclose management options, and have social, economic and ecological impacts (Nyberg 1999).

Kershner (1997) has described adaptive management as the following: "adaptive management is the process whereby management is initiated, evaluated and refined". It differs from traditional management by recognizing and preparing for the uncertainty that underlies resource management decisions. Adaptive management is typically incremental in that it uses information from monitoring and research to continually evaluate and modify management practices. It promotes long-term objectives for ecosystem management and recognizes that the ability to predict results is limited by knowledge of the system. Adaptive management uses information gained from past management experiences to evaluate both success and failure, and to explore new management options" (Holling 1978, Walters 1986).

At this point a detailed adaptive management plan for a community-based wildlife utilization project in Nyabushozi can not be developed as it would pre-empty the participatory planning process needed at the beginning of the project. However, right from the beginning it would be advisable to foster an organizational culture that emphasizes learning and responsiveness. Community-based wildlife utilization in the Lake Mburo area might be the first scheme of its kind in Uganda. Similar ideas for other parts of Uganda might develop. Therefore, close monitoring, evaluation, and lessons from wildlife utilization in the Lake Mburo area can foster the right implementation of further utilization schemes in Uganda.

During the participatory project planning phase the problems and opportunities of a wildlife utilization scheme would be assessed (Step 1) and the design (Step 2), a management plan, the set-up and regulations of LMWF utilization scheme be fixed (Figure 42).

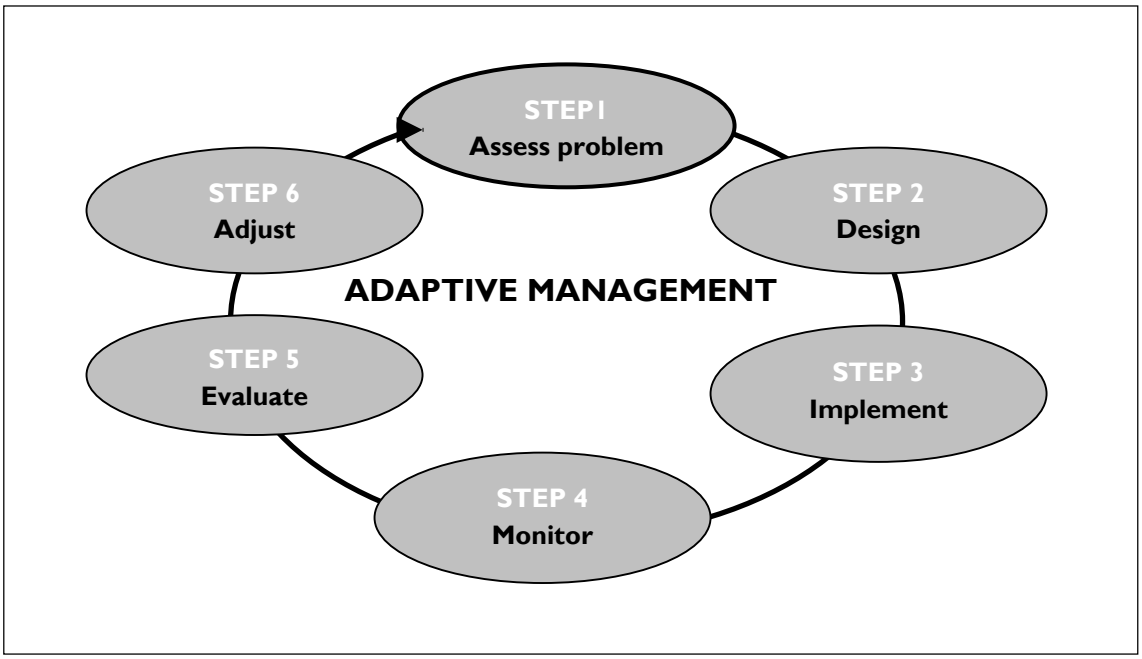


Figure 42: Adaptive management cycle (Nyberg 1999)

When starting the wildlife utilization scheme it is necessary to plan for a regularly monitoring on all levels of implementation (Step 3) i.e. administrative and organisational structure, communication between the different stakeholders, collection and distribution of revenue, control of poaching, response of large mammal population to trophy hunting, hunting procedures, processing of game products, and quota setting. Indicators would be monitored (Step 4) to determine how effective actions are in meeting management objectives, and to test the hypothesised relationships that formed the basis for Step 2. Step 5, the evaluation involves comparing the actual outcomes to assumptions and interpreting the reasons underlying any differences. Evaluation and reflection will help to gain a new understanding of the practices, objectives and the models used to make forecasts. These practices, objectives and models have to be adjusted, the problem have to be reassessed.

7.4 Final remarks

I agree with Adams & Hulme (2001) who state that "in an unpredictable world that is complex, diverse, and contingent and with goals that are refined and redefined, the idea that a single 'right policy' can be identified and then indefinitely pursued is not realistic. What is needed are broadly based enabling policies that promote the creation and strengthening of networks of institutions and organisations that have the flexibility to deal with contingency and complexity. The question is not of whether state action or community action is better: both are essential, along with private sector support, the challenge is how to develop effective mixes of state, community and private action in specific contexts". In Uganda, the resource wildlife is owned by the State and up to

now wildlife has had no official price. Parks like LMNP are under considerable threat because they do not serve the needs of the local communities. In theory the Park, along with the rest of the country's conservation estate, is for 'the people of Uganda' both present and future. In practise the local people place a high priority on environmental changes that UWA and conservationists would regard as environmental degradation. For ecological as well as socio-economic reasons, the Park's existence and its potential to sustain a wildlife community heavily depend on its surroundings.

An assessment of the impact of anthropogenic threats on 93 protected areas in 22 tropical countries including LMNP by Bruner *et al.* (2001) showed that Parks are more effective at mitigating some impacts than others. Parks are in a far better condition than their surroundings with respect to land clearing, with the majority of Parks being intact or only slightly cleared. Habitat loss by land alteration and clearing is arguably the most serious threat to biodiversity. Tropical Parks have been surprisingly effective at protecting the ecosystems and species within their borders in spite of chronic under-funding and significant land-use pressure. Even in the Lake Mburo area, the Park is in a better condition than the surrounding farm- and ranch land. LMNP is small but at least conservation works to a certain extent in the Park area.

However, Park authorities and managers should acknowledge that the Park is not an 'island'. If the area adjacent to LMNP can be managed actively by the communities, the LMNP might survive ecologically in the long run. Management should be an iterative process that is adaptable and flexible to suit the local condition. Law enforcement, community conservation in form of environmental education and community wildlife utilization as well as a combination of data-based management strategies, can help assure the maintenance of top predators and ungulates. Adaptive management is required. One has to plan for the uncertainties inherent in any management strategy, as well as for changes in value systems, policies and technical capabilities.

Community initiatives are strongly influenced by the constraints and opportunities created by the macro policy environment (Kramer *et al.* 1997). Lengthy preparations, detailed planning, and multimillion-dollar investments may be appropriate for large infrastructure projects but are less suited for conservation initiatives in which long delays in implementation can lead to disillusionment and loss of interest among affected communities and key stakeholders.

Experiences show that despite significant policy changes and practical actions the UWA retains a protectionist culture and ideas about a more proactive approach to the communities that neighbour protected areas have only recently begun to filter through to the majority of ranger and wardens (Kazoora & Victurine 1997).

Much UWA policy remains on paper: implementation capacity is low. Experiences made in the frame of the research project might have helped wildlife managers at UWA and in LMNP to realize that something can be done, how it can be done and has to be done in future. The question is not of whether law enforcement, community conservation in form of environmental education or community–based wildlife utilization is better. Even here all are essential, the challenge is how to develop effective mixes of these approaches. However, there are no blue print solutions available.

In the midst of the American depression of the 1930s, Franklin D. Roosevelt observed, "The country needs, and, unless I mistake its temper, the country demands bold, persistent experimentation. It is common sense to take a method and try it. If it fails, admit it frankly and try another. But above all, try something (as cited in Cortner & Moote 1999).

Uganda needs a new approach to ecosystem management in order to protect natural resources inside and outside of protected areas. A new approach to protect the natural resources, community-based wildlife management, is described and should be tried. If it fails, admit it frankly and try another. But above all, something should be tried before the natural resources with their ecological and economic value are gone forever.

In 2001 as a result of the study tour to Kenya, the landowners of Rurambira, East of LMNP, with assistance of the Community Conservation Unit of LMNP founded an organization called 'Rurambira Wildlife Utilization Association (RWUA)'. The senior management of UWA, on the basis of the findings of this study (Averbeck 2001a), agreed to a pilot utilization project in Nyabushozi. UWA signed a contract with RWUA and a private Ugandan operator for a period of one year from June 2001 to June 2002. The first clients for sport hunting were expected in Rurambira in September 2001 (Abaho pers. comm. 2001).

8 Summary / Zusammenfassung

All kinds of hunting are banned in Uganda. However, wild animals in and around Lake Mburo National Park (LMNP) are poached and Uganda Wildlife Authority (UWA), the agency responsible for wildlife in Uganda, is not in the position to control hunting. In a new approach to ecosystem management it is assumed that once landowners living around LMNP are able to derive tangible and legitimate benefits from wildlife on their land they would have an incentive to protect it from illegal hunting – particularly the most common impalas (*Aepyceros melampus*). This study describes the population ecology of the resource base and develops a concept for sustainable utilization, in order to integrate the interest of the local communities with nature conservation. UWA together with the landowners implemented already parts of the concept presented.

Compared to other protected areas in Africa, Lake Mburo National Park (LMNP) in Uganda is small (260 km^2), its wildlife community is incomplete (e.g. lions (*Panthera leo*) and elephants (*Loxodonta africana*) extirpated), and the surrounding landscape is heavily utilized for farming and herding by a growing human population. Illegal hunting and herding within the Park represent additional problems. For ecological as well as socio-economic reasons, the Park's existence and potential to sustain wildlife heavily depend on its surroundings.

In my thesis I illustrate the intricate network of ecological and socio-economic interrelationships between the Park and its surroundings, point out the problems that arise for wildlife preservation and develop a concept for a new approach to ecosystem management, community-based wildlife conservation, in Uganda.

After an introduction and a description of the study area in chapter 1 and 2, the following main questions were addressed in this study:

Chapter 3: Population ecology of impala

Question: What is the resource potential of wildlife utilization in the Lake Mburo area?

The maintenance of biotic diversity is dependent on the maintenance of viable populations of the species in a community. Conservation managers therefore monitor the populations and study their ecology to determine whether they are meeting their management objectives.

In order to be able to calculate the sustainable yield the sex ratio, age structure, birth rate and mortality rate were established. The following hypothesis were proofed: I) Impalas use different habitat types in the rainy than in the dry season. II) Impalas stay were they are in the dry and rainy season. They do not move in the dry season from the areas adjacent to the Park to the Park and in the rainy season in the opposite direction. III) The distribution of impala is the same in the rainy and in the dry season.

Methods: Monthly ground counts from July 1997 to December 1999 and three aerial surveys revealed information on the structure and size of the impala population. These information were used for calculating the sustainable yield by using the "adjusting in relation to population changes model" (see chapter 4). Furthermore data on the seasonal patterns of habitat type utilization, distribution and movements presented information important for demarcating possible areas of wildlife utilization.

The habitat preferences of impalas were established by comparing the abundance of habitat types with the actually utilization by impalas. Habitat types were characterised by vegetation type, grass height, woody cover, slope, topographic location and humidity of the ground. Aerial surveys provided information on the distribution of animals in the study area. In order to collect information on the movements of impala a total of 233 animals were marked with numbered ear-tags inside and outside LMNP. The study area was regularly screened by car from May 1997 to December 1999 and the position of the marked impalas noted down. In addition 12 impalas (seven males and five females) were marked with radio collars and tracked from November 1998 to April 1999.

Main results: The impala population decreased significantly from around 7.000 animals in 1997 to 1.600 in 1999. Poaching and habitat degradation seem to have the biggest impact on the population size of impala in the region.

Impalas used different habitat types in the rainy and the dry season. They preferred Mixed woodland / *Sporobolus spp*. associations, while the frequent vegetation type of *Acacia hockii* / *Cymbopogon nardus* was not used. *Acacia hockii* and *Cympobogon nardus*, which spread induced by regular fires in the Lake Mburo area, might on the long run decrease the abundance of vegetation preferred by impala especially outside LMNP and therefore contribute to further habitat degradation in the area. While impalas prefer the valley bottoms in the rainy season they move up the hills to a denser vegetation with more shade and vegetation types providing browse.

Impalas did not move in the rainy season from the Park to the surrounding areas and in the dry season in the opposite direction. According to this study impalas marked in

the Park remained mainly in the Park area, whilst impalas marked outside the Park stayed in the surrounding area.

Around 2/3 of the impala population was staying outside LMNP in the East and in the North, while 1/3 was found in the Park. Maps on impala densities in the study area indicated no differences in distribution between the dry and the rainy season. Therefore 2/3 of the total impala population can be considered for utilization outside LMNP.

Conclusion: The impala population decreased considerably from 1997 to 1999. Impalas were not moving in the rainy season from LMNP to the surrounding ranches and in the dry season back to LMNP. Around 2/3 of the impala population lives outside LMNP on the ranches, especially in the East and North.

Chapter 4: Sustainable consumptive use

Question: How can wild animals be utilized through hunting, processed, and marketed in Uganda?

I looked at the opportunities for hunting both in the form of sustainable cropping and of safari hunting. The aim of a trial cropping scheme was to assess the potential for adding value by further processing impala meat into a high quality product without substantially diminishing the value of the remaining carcass to the local community.

Methods: On the basis of the "adjusting in relation to population changes model" a sustainable quota for off-take was calculated. Additional information on the population size of other big wild mammals than impala were established in the frame of this study, published elsewhere and used for the calculations of quota. Calculations on financial returns from cropping and trophy hunting in other African countries were used to calculate the possible returns in Nyabushozi.

A trial cropping scheme of 100 impala provided information on cropping, processing, and marketing of wild animals in Uganda. Impalas were shot East of LMNP, the carcasses processed to high quality products and sold with permission of UWA

Main results: The resource base in the Lake Mburo area is not only limited but small. Considering the investments, cropping will be financially not viable. Landowners would receive only minor returns from the whole exercise. Sport hunting is economically more attractive because it can provide higher financial returns with minimal investment.

Conclusion: Trophy hunting is the most viable option for consumptive wildlife utilization in Nyabushozi.

Chapter 5: Attitudes of the community in Nyabushozi

Question: What are the attitudes of the local communities towards wildlife and wildlife utilization?

Appreciating human beings as integral parts of the ecosystem that they inhabit and use, research on human dimensions provides wildlife managers with information on political, economic and socio-cultural factors, which when combined with biological and ecological information, comprise the body of knowledge necessary to direct wildlife management. To find out whether sustainable utilization fits within the society's values and activities, and can be accepted as a new resource or resource process, attitudes of the local people in Nyabushozi were ascertained.

Methods: In 1998 and 1999 in total 28 focus group interviews with 344 persons were conducted. The homogenous groups consisted of cultivators, mixed farmers, pastoralists, poachers, and local leaders.

A qualitative analysis of the interviews provided a situational analysis of the attitudes of local people on wildlife, gathered information on the former and current hunting practise, and stimulated local people to develop ideas on how illegal hunting can be controlled and legal hunting be organized in the Lake Mburo area.

Main results: Depending on their cultural background and their economic activities pastoralists, cultivators, and mixed farmers faced different wildlife related problems and hunting played different roles in their lives. The majority of landowners with the biggest portion of land living adjacent to LMNP where sustainable utilization of wildlife is possible were pastoralists. According to the interviews their own interests did not interfere with the idea of foreign hunters hunting on their land. Local people and their opinion leaders developed ideas to control illegal hunting in collaboration with the local authorities and UWA.

Conclusion: Legal wildlife utilization in cooperation with different stakeholders is in the interest of community members and therefore an option for ecosystem management in the Lake Mburo area.

Chapter 6: Awareness creation: study tour to community wildlife utilization projects

Question: How can landowners from Uganda benefit from experiences made on wildlife utilization in other countries?

Methods: A study tour for eight landowners of Nyabushozi, five members of staff of UWA, an environmental journalist, two meat processing experts, and one wildlife veterinarian from Uganda to Laikipia Wildlife Forum, a community-based wildlife conservation project, in Kenya was organized in 2000. A training concept called 'Experiential Learning Cycle' was followed during the study tour.

Main results: Wildlife cropping generates only low returns to the landowners of Laikipia. However, despite the fact that the returns were low, consumptive wildlife utilization has altered landowner perception of wildlife. Sport hunting or trade in live animals is illegal in Kenya which would generate higher income returns. Two ecotourism projects showed how local communities can make profits from marketing their own culture and environment.

Participants of the study tour were able to capture new reproductive areas which were not known to them before. In order to apply the lessons learnt the participants formed an interim steering committee comprising the landowners and staff of UWA. They further planned to raise awareness on community wildlife utilization among the communities in Nyabushozi. The participants emphasized that while creating their own system, Uganda should learn from mistakes made in Kenya and opt for sport hunting with its higher returns.

Conclusion: Awareness creation initiated a group formation process by different stakeholders to organise wildlife utilization in Nyabushozi.

Chapter 7: Management recommendations

Question: How could wildlife utilization be organised in the Lake Mburo area?

Considering the different aspects of conservation requirements, sustainable development, and further information gathered in the prior chapters of the thesis, ideas on a model of a community-based wildlife conservation project, a sport hunting scheme, in the Lake Mburo area were described.

Main results: I proposed to form an representative body such as "Lake Mburo Wildlife Forum" (LMWF). LMWF should ideally be a civic association organized to

determine societal as well as ecological needs and goals, resolve natural resource management disputes, and undertake environmental restoration and management projects that also address social needs.

Final remarks

In 2001 as a result of the study tour to Kenya, the landowners of Rurambira, East of LMNP, with assistance of the Community Conservation Unit of LMNP founded an organization called 'Rurambira Wildlife Utilization Association (RWUA)'. The senior management of UWA, on the basis of the findings of this study published in a report, agreed to a pilot utilization project in Nyabushozi. UWA signed a contract with RWUA and a private Ugandan operator for a period of one year from June 2001 to June 2002. The first clients for sport hunting were expected in Rurambira in September 2001.

Only the integrated approach to the ecological, socio-economic and socio-cultural interrelationships between the Park and its surroundings and a process of awareness creation among the stakeholders, made the implementation of a new approach to ecosystem management possible in Uganda.

Zusammenfassung

Alle Formen der Jagd sind derzeit in Uganda verboten. Im und um den Lake Mburo Nationalpark (LMNP) werden Wildtiere gewildert. Die ugandische Wildschutzbehörde ist nicht in der Lage, die Wilderei zu kontrollieren. In einem neuen Ansatz von Ökosystemmanagement, geht man davon aus, dass die Bauern ein Interesse an der Erhaltung der Wildtiere haben werden, wenn sie von den Tieren profitieren könnten - insbesondere von den häufigen Impalas (*Aepyceros melampus*). Die Studie klärt die populationsökologischen Grundlagen und konzipiert eine nachhaltige Nutzung, um die Interessen der ländlichen Bevölkerung mit denen des Naturschutzes zu vereinen. Die UWA hat bereits in Ansätzen einige Ideen dieses Konzeptes umgesetzt.

Der LMNP in Uganda ist verglichen mit anderen Schutzgebieten in Afrika klein (260 km^2), seine Wildtiergemeinschaft unvollständig (Löwen (P*anthera leo*) und Elefanten (*Loxodonta africana*) sind ausgerottet) und das an den Park angrenzende Gebiet wird von einer wachsenden Bevölkerung intensiv für Ackerbau und Beweidung genutzt. Wilderei und illegale Beweidung im LMNP stellen zusätzliche Probleme dar. Die Existenz des Parks hängt aus ökologischen und sozioökonomischen Gründen von den an den Park angrenzenden Gebieten und seinen Bewohnern ab.

In meiner Arbeit beschriebe ich das Netzwerk der ökologischen und sozioökonomischen Beziehungen zwischen dem Park und seiner Umgebung und die sich daraus für den Naturschutz ergebenden Probleme. Zudem entwickele ich ein Konzept für einen neuen Ansatz von Ökosystemmanagement in Uganda, der kommunalen Wildtierbewirtschaftung (*community-based wildlife utilization*).

Nach einer Einführung und Beschreibung des Studiengebietes in Kapitel 1 und 2 der Arbeit, beantwortete ich in den folgenden Kapiteln diese Fragen:

Kapitel 3: Populationsökologie von Impalas

Fragestellung: Wie groß ist das Ressourcenpotential der Impalas für die Wildtierbewirtschaftung im Lake Mburo Gebiet?

Die Erhaltung der biologischen Diversität hängt von der Erhaltung überlebensfähiger Populationen einzelner Arten in einer Gemeinschaft ab. Manager im Naturschutz müssen aus diesem Grund die Entwicklungen von Populationen beobachten und ihre Ökologie studieren, um zu prüfen, ob die eigenen Managementziele erreicht worden sind. Zur Berechnung einer nachhaltigen Nutzungsquote von Impalas im Lake Mburo Gebiet wurden Daten folgender Parametern erhoben: Populationsgröße, Populationsstruktur, Geschlechtsrate, Altersstruktur, Geburtsrate und Mortalitätsrate.

Folgende Hypothesen wurden überprüft: I) Impalas nutzen in der Regen- und Trockenzeit unterschiedliche Habitattypen. II) Impalas bleiben sowohl in der Regen- als auch in der Trockenzeit in dem Gebiet, in dem sie sich schon vorher aufgehalten haben. Sie ziehen nicht in der Regenzeit aus dem LMNP in das umliegende Gebiet und in der Trockenzeit in die entgegengesetzte Richtung. III) Die Verbreitung der Impalas ist in der Regen- und Trockenzeit gleich. Es sind keine höheren Impaladichten in der Regenzeit außerhalb des Parks, und in der Trockenzeit außerhalb des Parks zu finden.

Methoden: Durch monatliche Zählungen am Boden von Juli 1997 bis Dezember 1999 und drei Flugzählungen wurden Daten zur Populationsstruktur und -grösse erhoben. Diese Informationen waren für die Festlegung der Jagdquoten mit dem „adjusting in relation to population changes model" notwendig (siehe Kapitel 4). Darüber hinaus bestimmte ich die saisonale Habitatnutzung, die Verbreitung und das Raum-Zeit Verhalten von Impalas, um Gebiete für eine mögliche Nutzung von Impalas festzulegen.

Durch den Vergleich von beobachteter Nutzung von Habitattypen durch Impalas und dem Vorkommen des Habitattypen konnte ich Habitatpräferenzen von Impalas feststellen. Zu den untersuchten Habitatfaktoren gehörten Vegetationstyp, Gehölzbedeckung, Grashöhe, Hangneigung, topographische Gegebenheiten und Feuchtigkeit des Bodens. Luftzählungen gaben Auskunft über die saisonale Verbreitung der Tiere im Untersuchungsgebiet. Um Informationen zum Raum-Zeit Verhalten von Impalas zu sammeln, wurden innerhalb und außerhalb des Parks insgesamt 233 Impalas individuell mit durchnummerierten und farbigen Ohrmarken markiert. Das Untersuchungsgebiet wurde regelmäßig mit dem Auto durchfahren und die Position identifizierter Tiere notiert. Zusätzlich wurden 12 Impalas (sieben Männchen und fünf Weibchen) mit Radiosendern versehen und ihre täglichen Wanderungen von November 1998 bis April 1999 beobachtet.

Wichtigste Ergebnisse: Die Größe der Impalapopulation in Nyabushozi hat von 7.000 im Jahre 1997 auf 1.600 Tiere im Jahre 1999 abgenommen hat. Wilderei und Habitatverschlechterung scheinen den größten Einfluss auf die Größe der Impalapopulation im Untersuchungsgebiet zu haben.

Das Geschlechterverhältnis, die Alterstruktur, die Rate adulter Weibchen zu weniger ein Jahr alten Jungtieren und die Mortalität wurde aus den während der Bodenzählungen gewonnen Daten errechnet. Ein- und Abwanderungen von Impalas in und aus dem Untersuchungsgebiet konnten ausgeschlossen werden.

Impalas nutzten in der Regenzeit anderere Habitate als in der Trockenzeit. Impalas bevorzugten Mixed woodland / *Sporobulus spp.* Assoziationen, während ein häufiger Vegetationstyp wie *Acacia hockii* / *Cympopogon nardus spp*. fast nicht genutzt wurde. Die

sich speziell durch häufige Brände vermehrende Baumart *Acacia hockii* und die Grasart *Cymbopogon nardus* führen auf lange Sicht zu einer Habitatverschlechterung für die Impalas speziell außerhalb des Parks. Während sich Impalas in der Regenzeit meistens in den Tälern aufhalten, wandern sie in der Trockenzeit zur dichteren Vegetation die Hügel hoch, wo sie Schatten finden und spezielle Bäume und Sträucher Nahrung bieten.

Impalas zogen nicht in der Regenzeit zu den Ranches angrenzend an den Park und in der Trockenzeit in den Park. Es wurde vielmehr gezeigt, dass im Park markierte Impalas sich fast ausschließlich im Park aufhielten, während außerhalb des Parks markierte Tiere auch außerhalb blieben. Saisonal bedingte Wanderungen über längere Strecken in bestimmte Gebiete konnten nicht nachgewiesen werden.

Es konnten keine Unterschied in der Verbreitung der Tiere zwischen der Regen- und Trockenzeiten festgestellt werden. Ergebnisse der Flugzählungen zeigten, dass 2/3 der Impalapopulation sich außerhalb vom LMNP im Osten und Norden aufhalten, während etwa 1/3 der Population sich im Park befindet. Aus diesem Grund können 2/3 der Gesamtpopulation der Impalas für eine Nutzung berücksichtigt werden.

Schlussfolgerungen: Die Impalapopulation hat in den Jahren 1997 bis 1999 stark abgenommen. Impalas nutzen unterschiedliche Habitattypen in der Regen- und Trockenzeit. Impalas wandern nicht in der Regenzeit aus dem Park in das umliegende Gebiet und in der Trockenzeit zurück in den Park. Etwa 2/3 der Impalapopulation befindet sich außerhalb des Parks im Osten und Norden.

Kapitel 4: Nachhaltige konsumtive Nutzung

Fragestellung: Wie können Wildtiere durch Jagd in Uganda genutzt, verarbeitet und vermarktet werden?

Ich betrachtete das ökonomischen Potential, das eine nachhaltige konsumtive Nutzung in Form von „Ernte"- (*cropping*) und Trophäenjagd in Nyabushozi bietet. Eine Erntejagd von 100 Impalas sollte zeigen, ob durch die Weiterverarbeitung von Impalafleisch zu hochwertigen Qualitätsprodukten ein zusätzlicher Gewinn erwirtschaftet werden kann und um Informationen zur praktischen Durchführung der Jagd, der Weiterverarbeitung und der Vermarktung von Wildtieren in Uganda zu gewinnen.

Methode: Quoten für die nachhaltige Nutzung von Impalas in Nyabushozi wurden mit dem „adjusting in relation to population changes model" errechnet. Auf der Grundlage von Erfahrungen und Preisen anderer afrikanischer Länder, stellte ich Berechnungen zu den möglichen Einnahmen durch Ernte- und Trophäenjagd an.

In einem Versuch wurden 100 Impalas im Osten außerhalb vom LMNP erlegt, die Tierkörper zu Qualitätsprodukten weiterverarbeitet und mit Erlaubnis der UWA verkauft. Impalafelle wurden gegerbt und ebenfalls verkauft.

Wichtigste Ergebnisse: Unter Berücksichtigung der möglichen Abschussquoten und der notwendigen Investitionen ist die nachhaltige „Erntejagd" in Nyabushozi nicht profitabel. Die Trophäenjagd ist ökonomisch sinnvoller, da durch sie bei nur geringen Investitionen höhere Gewinne erwirtschaftet werden können.

Schlussfolgerungen: Trophäenjagd stellt die ökonomisch sinnvollste Form der nachhaltigen Nutzung von Wildtieren in Nyabushozi dar.

Kapitel 5: Einstellungen der Bewohner Nyabushozis

Fragestellung: Wie sehen die Einstellungen der ländlichen Bevölkerung zu Wildtieren und zur Wildtiernutzung aus?

Im Bewusstsein, dass Menschen einen integralen Bestandteil des Ökosystems darstellen, das sie bewohnen und nutzen, liefert die Forschung im Bereich der *human dimension* (menschlichen Dimensionen) Wildtiermanagern Informationen über politische, ökonomische und soziokulturelle Faktoren. Diese Faktoren bilden, kombiniert mit biologischen und ökologischen Informationen, die notwendigen Grundlagen und sind richtungsweisend für das Ökosystemmanagement. Um herauszufinden, ob das Konzept der nachhaltigen Nutzung in die Wertewelt der Bevölkerung Nyabushozis passt, war es notwendig, ihre Einstellungen zu ermitteln.

Methoden: Insgesamt wurden 29 Fokusgruppeninterviews mit 344 Personen in den Jahren 1998 und 1999 durchgeführt. Die homogenen Gruppen setzten sich aus Pastoralisten, Ackerbauern, Wilderern und lokalen Führern zusammen.

Die qualitative Analyse der Interviews machten die Einstellungen der lokalen Bevölkerung zu Wildtieren, zur Jagdpraxis und zur Wilderei deutlich. Zudem wurden die Teilnehmer nach möglichen Ideen zur Kontrolle der Wilderei gefragt und wie legale Jagd organisiert werden könnte.

Wichtigste Ergebnisse: Auf Grund ihrer kulturellen Hintergründe und ökonomischen Aktivitäten, waren Pastoralisten und Ackerbauern mit unterschiedlichen durch Wildtiere ausgelöste Probleme konfrontiert und Jagd spielte eine unterschiedliche Wichtigkeit in ihrem Leben. Die Mehrheit der Landbesitzer mit dem größten Landbesitz auf dem Jagd möglich wäre, waren Pastoralisten. Jagen war nie Teil

ihrer Tradition und sie aßen kein Wildfleisch. Nach den Angaben der Bahima standen ihre Interessen nicht im Konflikt mit der Idee, Trophäenjagd auf ihrem Land zuzulassen. Die Befragten entwickelten Ideen, wie UWA gemeinsam mit anderen Behörden und den Gemeindemitgliedern die Wilderei kontrollieren und die legale Jagd organisieren könnten.

Schlussfolgerung: Die nachhaltige Nutzung von Wildtieren in Kooperation mit zuständigen Behörden und politischen Vertretern ist im Interesse der um den Park lebenden Bevölkerung.

Kapitel 6: Erfahrungsaustausch: Studienreise zu kommunalen Wildtier-nutzungsprojekten in Kenia.

Fragestellung: Wie können Landbesitzer aus Uganda von in anderen Ländern gemachten Erfahrungen mit kommunalen Wildtiernutzung profitieren?

Die während der Interviews gesammelten Informationen und informelle Diskussionen mit Mitarbeitern von UWA, Veterinären und Fleischverarbeitern während der Erntejagd machten große Wissenslücken bezüglich der Herausforderungen und Möglichkeiten eines Wildtiernutzungsprojektes deutlich. Ugander haben auf Grund der legalen und politischen Situation kaum Informationen über kommunale Wildtiernutzungsprojekte sammeln können. In anderen Teilen Afrikas gibt es dagegen reichhaltige Erfahrungen in diesem Bereich.

Methoden: Ich organisierte eine Studienreise für acht Landbesitzer aus Nyabushozi, fünf Mitarbeiter der UWA, einer Umweltjournalistin, zwei Lebensmittelfachkräften und einem Veterinär aus Uganda nach Kenia zum Laikipia Wildlife Forum, einem kommunalen Wildtiernutzungsprojekt. Während der Studienreise wurde das Trainingskonzept des *Experiential Learning Cycle* angewandt.

Wichtigste Ergebnisse: Die Erntejagd erwirtschaftet nur ein geringes Einkommen für die Landbesitzer in Laikipia. Trotzdem haben allein die Einnahmen aus der Erntejagd bewirkt, dass die Einstellungen der Bewohner Laikipias zu den Wildtieren sich positiv verändert haben. Trophäenjagd hingegen ist nicht gestattet und der Handel mit lebenden Tieren in Kenia nicht erlaubt, womit ein höheres Einkommen zu erwirtschaften wäre. Wilderei ist unter Kontrolle. Zwei Ökotourismusprojekte veranschaulichten, wie die lokalen Gemeinden Profite mit ihrer eigenen Kultur und ihrem Land machen können.

Die Landbesitzer waren in der Lage, neue Formen der Landnutzung für sich zu erkennen. Um Erfahrungen dieser Reise umzusetzen, formten die Landbesitzer und

Mitarbeiter von UWA ein vorläufiges Komitee, um weitere Aktivitäten zu planen. Die während der Studienreise gewonnen Einsichten sollten an andere Bewohner Nyabushozis weitergegeben werden, um eine Nutzung von Wildtieren in Nyabushozi zu organisieren.

Schlussfolgerungen: Der Erfahrungsaustausch hat einen Gruppenbildungsprozess initiiert, der richtungsweisend für die Organisation der nachhaltigen Nutzung von Wildtieren in Nyabushozi ist.

Kapitel: Managementempfehlungen

Fragestellung: Wie könnte die nachhaltige Nutzung von Wildtieren im Lake Mburo Gebiet organisiert werden?

Nach Berücksichtigung der Anforderungen des Naturschutzes, der nachhaltigen Entwicklung und der im Rahmen der Studie gesammelten Informationen, entwickelte ich ein Modell eines kommunalen Wildtierschutzprojektes in Form von Trophäenjagd im Lake Mburo Gebiet.

Wichtigste Ergebnisse: Ich schlug vor, eine repräsentative Institution zu gründen, das „Lake Mburo Wildlife Forum" (LMWF) genannt werden könnte. LMWF sollte eine zivilgesellschaftliche Vereinigung sein, die sich organisiert, um soziale wie auch ökologische Ziele zu bestimmen und Meinungsverschiedenheiten um natürliche Ressourcen zu lösen. Ausgehend von dieser Institution könnte eine nachhaltige Nutzung von Wildtieren in Form von Trophäenjagd in Nyabushozi organisiert werden.

Abschließende Bemerkungen

Als Ergebnis der Studienreise gründeten Landbesitzer in Rurambira, im Osten von LMNP, mit der Unterstützung von Mitarbeitern des LMNP eine Vereinigung, die sie ‚Rurambira Wildlife Utilization Association' (RWUA) nannten. UWA stimmte auf der Grundlage der vorliegenden Studie, veröffentlicht in einem Bericht, einem Wildtiernutzungsprojekt in Nyabushozi zu. UWA unterschrieb einen Vertrag mit RWUA und einem privaten ugandischen Investor für eine Periode von Juni 2001 bis Juni 2002. Die ersten Kunden für die Trophäenjagd wurden in Rurambira im September 2001 erwartet.

Erst eine integrierte Betrachtung der ökologischen, sozio-ökonomischen und sozio-kulturellen Beziehungen, kombiniert mit einem gezielten Dialog und verknüpft mit Informationsveranstaltungen für alle Beteiligten, machte die Implementierung eines neuen Ansatzes von Ökosystemmanagement in Uganda möglich.

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Appendix

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Film and video

BRITISH BROADCASTING COOPERATION (BBC), 1999. Film : BBC-Vet world.

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Presentations

Date	Audience
14.1.1997	Senior management of Uganda Wildlife Authority, Kampala.
2.11.1997	East African Natural History Society, LMNP.
8.4.1998	GTZ-Integrated Pastoral Development Programme (IPDP) and community members of Nyabushozi, Sanga.
28.5.1998	Staff of Lake Mburo National Park, LMNP.
16.9.1998	Community members of Nyabushozi, IPDP, Sanga.
25.11.1998	Senior management of Uganda Wildlife Authority, Kampala.
2.3.1999	GTZ-Uganda and GTZ- Germany, LMNP.
29.5.1999	Staff of Lake Mburo National Park, LMNP.
29.6.1999	2nd International Wildlife Management Congress, Hungary.
15.12.1999	Ugandan-German Cultural Society, Kampala.
5.2.2000	All stakeholders, Sanga.
5.11.2000	GTZ-Community-Based Natural Resource Management Meeting, Kenya
4.2.2001	Technische Universität München.

Figures

Tables

Abbreviations

ADMADE	Administrative Management Design for Game Management Areas
ARS	Ankole Ranching Scheme
AWF	African Wildlife Foundation
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
EU	European Union
FAO	Food and Agriculture Organization (UN)
FMD	Foot and mouth disease
GD	Game Department
GDP	Gross Domestic Product
GNP	Gross National Product
GPS	Global Positioning System
GR	Game Reserve
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
IPDP	Integrated Pastoral Development Project
IUCN	World Conservation Union
LC	Local Council
LDU	Local Defence Unit
LM	Lake Mburo
LMNP	Lake Mburo National Park
LMWF	Lake Mburo Wildlife Forum
LWF	Laikipia Wildlife Forum
NGO	Non Governmental Organisation
NP	National Park
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
RWUA	Rurambira Wildlife Utilization Association
SD	Standard deviation
SRF	Systematic reconnaissance flight
SY	Sustainable yield
UIRI	Uganda Industrial Research Institute
UN	United Nations
UNP	Uganda National Park
USAID	United States Agency for International Development
USH	Uganda Shilling
UWA	Uganda Wildlife Authority
WARM	Wildlife and Animal Resource Management Department
WCED	World Commission on Environment and Development

Questionnaire

Guideline for interviews

1. General information on the interview and the interview partner

Interviewer:	Secretary:
Others:	
Date: Time:	Place:
Type of interview partners:	Tribes:
Since when are they living in this area? Where did they live before? Why did you move to this place?	Education: Sex:
Remarks:	

2. What kind of attitude do the interview partners have towards wildlife?

2.1 Traditional relationship between men and wildlife

- Can you name species that occur on your land?

impala	bushbuck	oribi	bushduiker
eland	topi	zebra	reedbuck
waterbuck	warthog	hyena	hippo
buffalo	leopard	lion	bushpig
serval cat	vervet	baboon	

others .....

- Are places on the ranch named after wild animals?

- Do you know traditional hunting grounds in Nyabushozi?

- Do you know sayings, phrases, idioms, ritual meanings on wildlife?

2.2 Attitude towards wildlife

2.2.1 What is your opinion about wildlife

- on your land
- in the Park

2.2.2 Do you think the wild animals are of any use?

yes

no opinion

no

2.2.3 Should the wild animals be protected?

yes
no opinion
no

2.2.4 Who should be the owner of the wild animals?
UWA, Lake Mburo National Park
Government
land owners
every Ugandan
others

3. What do the people think about hunting/killing of wildlife?
3.1 Was hunting part of your tradition?
always hunted
never hunted
some did hunt

3.2 Did you use the wild animals in any way before killing them was forbidden?
meat
skins
horns
others:
no

3.3 If yes: How did you kill/hunt them?
spears & nets
snare
gun
poisoning

3.4 What do you think about illegal hunters?
good
mixed feelings
no opinion
bad

3.5 Why do some people allow illegal hunters to poach on their land?

3.6 Do you know how the illegal hunters use the wildlife products?
home consumption
sale
others

4. What do the people think about how to manage the future of wildlife?

4.1 Do you think you should be allowed to hunt again?

yes

no opinion

no

4.2 Do you think you could benefit from hunting?

yes: How?

no: What has to be changed for your benefit?

4.3 What do you think about people who come and pay for hunting on your land?

good

no opinion

mixed feelings

bad

4.4 Would you be interested in working together with the Government in the frame of a programme for wildlife management from which you could also benefit?

yes

no opinion

no

4.5 Do you have any ideas how the people could participate?

5. Questions for authorities

5.1 Would you be interested in helping to control illegal hunting?

yes

no opinion

no

5.2 Do you see any advantages in controlling illegal hunting?

yes

no opinion

no

5.3 Do you think you should be allowed to decide what happens to the wild animals?

yes

no opinion

no

5.4 Do you have any ideas <u>how</u> illegal hunting could be controlled?

no

if yes : How?

5.5 Do you have any ideas who could control the illegal hunting?

5.6 Do you have any ideas how legal hunting could be organised?

5.7 Who should organise it?

6. Questions for poachers

6.1 What do you thing, are the following wild animal populations decreasing, increasing or is their stable?

6.2 Which species do you like to hunt and why?

6.3 Why do you hunt?

6.4 How do you hunt?

6.5 How much money do you get for one animal?

6.6 Where do you sell the meat?

6.7 Do you sell or use other wildlife products?

6.8 How often do you go out for hunting?

6.9 Are you invited by landowners to hunt on their land?