1. INTRODUCTION

1.1 Overview of wildlife conservation

Nature conservation through the establishment of National Parks (NP) and Protected Areas (PAs) have a long history that began in 18th century, but had its modern foundation when the Yellow Stone NP in the USA was set up (Hughes, 2000). During the last 30th years, the number and range of NPs and PAs have grown worldwide and currently numbers over 30,000 and occupy almost one third of the world's land surface. However, the continued transformation of landscapes surrounding these conservation areas and over-exploitation of natural resources by local communities has been reported to threaten their long-term viability (IUCN, 1990, Campbell & Hofer 1995, Hofer et al. 1996, 2000). The consequence of these devastations manifests by local extinction of some important wildlife species such as black rhino, eland, hartebeest, common reedbuck, mountain reedbuck, oribi and cheetah (Silkiluwasha, 1998) and threatens the survival of many other wild animals elsewhere (Mwamfupe, 1998, Noe, 2003).

Destruction, reduction or fragmentation of the sizes of corridors and buffer zones around the protected areas in the long term threatens the persistence and viability of many protected species due to reduction in mobility. Under such circumstances, the large bodied migratory species such as elephant, which require large home range, are prone to die off when part of their ranges is damaged or fragmented and their migratory corridors blocked. This is because barrier to dispersal limits species potential to colonization and foraging ability for food resources. Recent studies on population dynamics and population genetic model in stochastic environments show that animals of isolated wildlife populations may not be able to mate freely. This can lead to decrease in fitness, rapid genetic erosion, population decline and loss of biodiversity. This scenario explains the role of wildlife corridors and dispersal areas in protected area paradigm. The use of effective system of wildlife corridors is therefore useful in providing ecosystem connectivity, which is essential in avoiding the loss of species both within and outside PAs (Soule, 1987).

It is widely recognized that the decisions for allocation of land to PAs are based on three categories of reasons: pragmatic, ecological and socio-economical. Pragmatic reasons for the establishment of PAs are based on factors such as low productivity and availability; the

ecological reasons are based on naturalness, uniqueness, ecosystem diversity, integrity, and size while the socio-economical reasons are based on social and economical principles. The establishment of many NPs in eastern Africa followed pragmatic and economical criteria (Sarunday and Ruzika, 2000). Many parks were created due to the presence of large numbers of ungulates, which could attract tourists without regard to ecological requirements of the protected species. This approach is regarded to be wrong because many ecologically important habitats such as dispersal areas and corridors were left outside the PA networks (Sarunday and Ruzika, 2000). The regional system review by the IUCN (1986 and 1987) suggested evaluation and incorporation of these sites as additional PAs or wildlife corridors to strengthen the existing protections. Another promising approach in conserving wildlife outside of the core-protected areas is by involving the local community. Participation of local communities in wildlife management decisions, the sustainable utilization of natural resources, and the distribution of income generated by natural resources on a local level can help to limit over-exploitation and habitat degradation by local communities (Lewis & Alpert 1997). This aspect has been recognised by the Government of Tanzania in its Wildlife Policy published in March 1998, where it commits itself to (1) involving all stakeholders, particularly local communities, in the conservation and management of wildlife areas; (2) establishing Wildlife Management Areas (WMA) as a new category of protected areas with local people having a full mandate of managing and benefiting from conservation efforts; and (3) cooperating with neighbouring countries in the conservation of migratory species and trans-boundary ecosystems (Baldus and Siege, 2001). Dispersal areas, migratory routes and wildlife corridor will therefore be accorded a higher conservation status of protection (WPT, 1998). Since the focus of the wildlife policy of Tanzania is conservation and sustainable utilization of wildlife resources by the communities, monitoring of these resources in community land is necessary.

1.2 The Selous-Niassa Ecosystem

The Selous–Niassa ecosystem is one of the largest trans-boundary natural ecosystems in Africa, covering approximately 154,000 km^2 and extending across southern Tanzania and the border into neighbouring Mozambique (Figure 1). Currently, natural resources in this ecosystem are covered by some form of official protection in the Tanzanian (68,000 km^2) and Mozambiquan (42,400 km^2) sectors in terms of the Selous Game Reserve (SGR) in Tanzania (48,000 km^2), and the Niassa Game Reserve (NGR) in Mozambique (42,400 km^2).

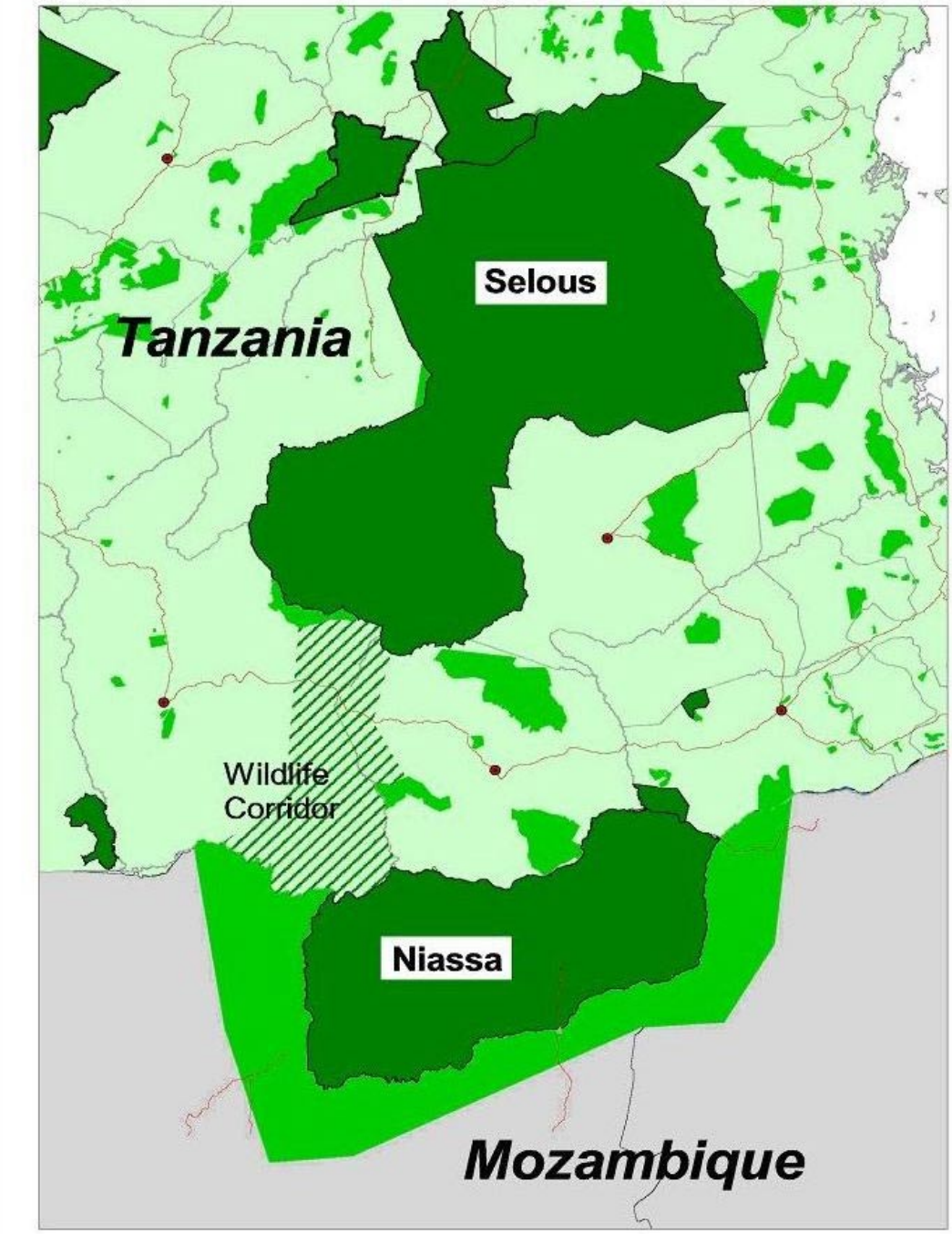

Figure 1: The Selous-Niassa ecosystem

The SGR is linked to the NGR by the Selous-Niassa Wildlife Corridor (SNWC), a currently sparsely settled area (population density about 4-people/ km^2) of approximately 6,000 - 8,000 km^2 covering a distance of approximately 200 km (Baldus et al., 2003). The corridor links the world's largest miombo woodland ecosystems, supposedly covers traditional movement routes for elephants between two of the biggest intact elephant populations in Africa (Said et

al. 1995) and links globally significant populations of Roosevelt's sable antelope, Liechtenstein's hartebeest, Niassa wildebeest, eland and greater kudu. The corridor also harbours a variety of large carnivores including African wild dog, lion and leopard, smaller mammals, and other rare Tanzanian fauna.

1.3 Conservation and development in the Selous-Niassa Wildlife Corridor

A long-term (1987 until 2003) development cooperation project, the Selous Conservation Programme (SCP), has been implemented by GTZ and the Wildlife Division of the Ministry of Natural Resources and Tourism in the SGR and the buffer zones surrounding the SGR. The work in buffer zone is being continued by another joint Tanzanian-Germany project, the "Community Wildlife Management" advisory project. This work has been extended into the northern part of the SNWC as a series of WMA that are managed by local villages as part of the SGR's buffer zone project guided by the Wildlife Division and the SCP/GTZ. These WMAs will complement the protection accorded to the area by the Muhuwesi Forest Reserve. However, the southern part of the Corridor (3,000-4,000 km^2) is currently not protected and threatened by:

Poaching for meat and ivory;

Habitat degradation due to uncontrolled and destructive wildfires and likely agricultural expansion in the form of tobacco farming;

Associated increased demand for charcoal for curing.

These processes will ultimately exterminate resident wildlife populations in the Corridor and prevent the movement of wildlife populations between the SGR and NGR, leading to

Habitat degradation within reserves by large herbivores such as the African elephant, because animals will no longer be able to move in response to changing levels of water and food supply;

The genetic isolation of wildlife populations (Soulé et al. 1979, Hudson 1991, Burkey 1994, Newmark 1996, Hanski & Gilpin 1997);

An increase in the potential for inbreeding and the chance of population extinctions in both reserves, particularly for wide-ranging endangered species such as the African wild dog (Burrows et al. 1994, Woodroffe et al. 1997);

An increase in conflicts between elephants and other wildlife with local people, particularly farmers.

A development cooperation project to protect and manage the southern part of the corridor through a network of village WMAs is currently being planned. The goal of this project is to protect the wildlife corridor by having the local communities participate and benefit from sustainable utilization, and to combat trans-boundary elephant poaching through an agreement of cooperation and law enforcement between the Governments of Tanzania and Mozambique. Benefits could include (1) legal supply of wildlife meat, obtained through annual hunting quotas for each participating village, (2) participating villages to be empowered to protect themselves and their property against problem and crop raiding wild animals, (3) generate income in terms of cash (for community projects) from sustainable utilization of wildlife (photo or hunting tourism), and (4) to provide employment, for example as village scouts or in the tourism sector.

1.4 Research objectives

1. Define the area that requires protection as a wildlife corridor in particular with respect to elephant movements, in order to assist the preservation of the genetic viability and persistence of two of the largest elephant populations in Africa and the implementation of attempts to minimize conflicts between wildlife and local communities.

Currently, the distribution, status and possible movement routes of the populations of key mammal species in the SNWC are unknown. Thus, for the setting up of the corridor and the identification of priority areas, it is vital to map the distribution and movement routes, and establish the status of populations of elephants and those of other large mammals. Conflicts between wildlife, particularly elephants, and local people are well known from elephant populations confined to small reserves. Whereas opinions abound as to why such conflicts occur and what to do about it, the scientific data basis is limited and does not include experience of elephant populations that originate from larger reserves. Even if there are currently few conflicts, systematic data collection on this aspect would contribute to a better understanding of the sources of these conflicts and improve attempts to minimize them.

2. Assess population size, health status and reproductive potential of key wildlife species, primarily elephants that are valuable in terms of hunting licences and non-consumptive photo-tourism to local communities and the Government, to provide appropriate background information.

- Assess aspects of the reproductive biology of those species that are most likely to be subjected to hunting quotas or other forms of exploitation. Currently, very little

is known about the reproductive potential of mammal populations in southern Tanzania.

- Assess the health status of the populations of key wildlife species and their contacts with livestock. Very little is known about the health status of elephant populations or those of other key herbivores around the country, although there have been several cases of unexplained elephant deaths in protected areas in northern Tanzania where some form of disease is suspected. The recently discovered endotheliotropic herpes viruses that can kill African elephants (Richman et al. 1999) may be important in this context; the extent to which they are distributed in natural populations of East African elephants or possibly in other host species is currently unknown. In recent years, the importance of maintaining "healthy" ecosystems has increasingly been recognised, as wildlife populations may be vulnerable to outbreaks of pathogen-related disease, particularly exotic diseases and new strains of established viral diseases (McCallum & Dobson 1995). Elephants and other wildlife species moving through wildlife corridors may be at greater risk from pathogens borne by domestic stock than those within protected areas, and thus may assist the spread of pathogens to uninfected populations (Hess 1996).