CHAPTER 1

INTRODUCTION

Human activity has been changing ecosystems for thousands of years. The pace and extent of change, however, increased rapidly with the more recent period of agricultural and industrial development. Economic and industrial development has always been seen as the answer to the development of countries and no real attention was given to the environment and the renewable natural resource base (Hugo *et al*. 1997). As a result, vast numbers of species have become extinct prematurely, natural cycles have been disrupted, billions of tons of topsoil have been lost, genetic diversity has eroded, and the very climate of the planet may have been disrupted (Meffe & Carroll 1997). In addition to habitat loss and degradation, the overexploitation of certain species, the introduction of exotic species, and the pollution of the soil, water and atmosphere have had major effects on terrestrial, freshwater and marine biodiversity. The establishment of conservation areas is a widely used technique for reducing such human induced threats on the environment (Margules & Pressey 2000).

In South Africa, existing conservation areas were predominantly proclaimed on an *ad hoc* basis on land considered marginal for agriculture or undesirable for human settlement (Lombard 1995; Wynberg 2002). New reserves were often placed in areas that did not contribute to the increased protection of global biodiversity. Over the past two decades, however, systematic approaches to conservation planning were developed to guide the efficient allocation of funding and scarce resources for protecting biodiversity (Margules & Pressey 2000). Although many areas are identified as important for representing biodiversity, only a small number of these can be realistically protected in the immediate future (Reyers 2004). Biodiversity is, however, not distributed evenly across the globe (Gaston 2000), and efforts to expand the present conservation network should therefore be focused on regions that would contribute most to the global protected area network (Myers *et al*. 2000). Contrary to frequent recommendations, current protection levels within a given country or biome is a poor indicator of additional conservation needs, and areas most in need of conservation are often those with higher levels of endemism (Rodrigues *et al*. 2004).

The Maputaland Centre of Plant Endemism in the northern parts of the KwaZulu-Natal province, South Africa and extending into the southern parts of Mozambique, is an area that is well known for its conservation importance (Moll 1977; Everard *et al.* 1994; Van Wyk 1994; 1996; Kirkwood & Midgley 1999; Van Wyk

& Smith 2001). It is recognised by the International Union for the Conservation of Nature and Natural Resources (IUCN) as a Centre of Plant Diversity. Moreover, Conservation International (IC) recently added this area and the Pondoland Centre of Plant Endemism to a list of global hotspots of the world. These hotspots represent areas featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat (Myers *et al*. 2000). Consequently, when prioritising conservation efforts based on rational area selection principles, this region is invariably included for South Africa (Lombard 1995; Gaston *et al.* 2001).

The occurrence of spatial and temporal heterogeneity in local animal and/or plant populations further complicates conservation planning. Existing reserves are unable to adequately capture the regional diversity that is associated with habitats that are characterised by substantial between-patch heterogeneity in animals and plants. Typically, an assemblage consists of species with a range of different abundances and levels of spatial occurrence (Gaston 1994). Several investigations examining the nature of fine-scale spatial heterogeneity in communities or assemblages have shown a large degree of such heterogeneity in the Maputaland Centre of Plant Endemism (Van Rensburg *et al.* 1999; Van Rensburg *et al.* 2000; Matthews *et al.* 2001; Gaugris *et al.* 2004). This indicates that conservation efforts in a variety of habitat patches are necessary to ensure the long-term persistence of its associated biota. Consequently, conservation efforts often have to extend beyond the boundaries of formally protected areas (Bennett *et al*. 2004).

Efforts to stem the ongoing loss of biodiversity are additionally hampered by the escalating conflict between conservation and development (Balmford *et al*. 2001; Chown *et al*. 2003). Conservation is more difficult and expensive in areas with high human population densities (Huston 2001), but options for expanding the current conservation network to areas with low human densities are as limited across South Africa (Chown *et al*. 2003), as it is across other parts of the world (Newmark 1996; Harcourt *et al.* 2001; Hansen & Rotella 2002; Parks & Harcourt 2002). Moreover, species richness and human population density throughout Africa are positively correlated because both variables apparently respond similarly to increasing primary productivity (Cincotta *et al*. 2000; Balmford *et al*. 2001). Human population density also tends to be high in areas surrounding current reserves (Harcourt *et al*. 2001; Chown *et al*. 2003). In South Africa, nearly 90% of all officially protected areas border on communal rural communities or are situated close to them (Els 2002). As human populations increase, and the demand for renewable natural resources grow, the frequency and intensity of conflict between protected areas and local people will also increase. This is especially true for South Africa where the population growth rate

(2.2% yr^{-1}) is substantially higher than the corresponding growth rate for the rest of the world (1.3% yr^{-1}), and above that of most developing countries (1.6% yr^{-1})(Van Rensburg *et al*. 2004).

Future conflicts between conservation and development cannot readily be avoided and as a result maintaining reserves in high human population density areas will become increasingly difficult. Virtually all the major managerial problems facing conservation areas today have a human component. The most common of these problems relate to the increasing human settlement of adjacent lands and the unauthorized harvesting of resources within protected areas (Newmark 1996). Land transformation for human use is known to be responsible for the vast majority of habitat loss (Soulé 1991), and is furthermore widely accepted as a key component in the extinction of species (Brooks *et al*. 2002). The basic role of reserves is to separate elements of biodiversity from processes that threaten their existence in the wild (Margules & Pressey 2000). Unfortunately, many reserves are becoming increasingly isolated as a result of human activity (Newmark 1996). In addition, there is a significant decline in the size of newly proclaimed conservation areas (Chown *et al*. 2003), which increases the negative effects of external threats. An integrated approach incorporating both conservation and human development needs is required. Such an approach should emphasise the value of existing conservation areas and view parks as a central component of conservation strategies (Bruner *et al.* 2001; McKinney 2002). The sustainable development of rural communal areas surrounding conservation areas should be promoted from within (Editorial 2003), while establishing buffer zones around the protected areas.

Although several conservation activities have been, and currently still are, taking place in the Maputaland Centre of Plant Endemism, there are still several conservation concerns within the region. A case in point is the conservation of the Sand Forest habitat type, a distinctive habitat type in southern Africa. The Sand Forest is characterised by a unique combination of plant and animal species and has the highest diversity of woody plant species in the region, with a significant number of these being endemic to the Maputaland Centre of Plant Endemism (Everard *et al.* 1994; Matthews *et al.* 2001). Quantitative evidence suggests that most of the endemic vertebrate species in the Maputaland Centre of Plant Endemism are likewise restricted to this habitat type (Van Wyk 1996; Van Rensburg *et al.* 2000). Although Sand Forest is considered to be the smallest habitat type in South Africa, covering only 0.03% of the region's total land surface area, *circa* 45% of this habitat type has already been transformed due to anthropogenic activities and only small portions of the remainder are currently being formally protected (Low & Rebelo 1996).

One of the local communities who live adjacent to Tembe Elephant Park in the Maputaland Centre of Plant Endemism recently nominated a part of their ward, namely the Tshanini Community Conservation Area, as a community-based natural resource management project to serve as a possible conservation area in the region. The purpose of the area is to establish a nature reserve in the Manqakulani Ward of the Tembe Tribal Authority. The reserve is to be managed as an economic sustainable wildlife ranching and eco-culture tourism venture through the sustainable utilisation of renewable natural resources, but especially those resources that are associated with Sand Forest ecosystems. The key questions, however, are whether the Tshanini Community Conservation Area could be regarded as biologically important for conservation, and more specifically whether this area will contribute towards the conservation of the rare Sand Forest habitat type.

The first aim of the present study was therefore to determine the biological importance of this community area in contributing towards the conservation of the rare Sand Forest habitat type. This was done by comparing the Sand Forest bird assemblages that are found in areas characterised by low levels of human utilisation, such as the Tshanini Community Conservation Area with those characterised by primary wildlife utilisation, such as Tembe Elephant Park. This approach aimed to indicate the extent to which local human activities were having an effect on Sand Forest bird assemblages and it was used here as a point of departure to determine the feasibility of setting aside a part of the Manqakulani Ward as a wildlife resource use area. Birds were selected as a focal taxon because the Maputaland Centre of Plant Endemism has a rich avifauna, including a number of endemic species and subspecies (Clancy 1996; Harrison *et al.* 1997; Van Rensburg *et al.* 2000), the southern African birds are systematically well-known and well-surveyed (Harrison *et al.* 1997), and birds are relatively easy to sample quantitatively when compared with some other vertebrate taxa (Mac Nally 1997).

Even within some of the protected areas in the Maputaland Centre of Plant Endemism, Sand Forest conservation is also under pressure. For example, Tembe Elephant Park contains the largest protected portion of Sand Forest in South Africa (Van Rensburg *et al.* 1999, 2000; McGeoch *et al*. 2002), but although elephants *Loxodonta africana* prefer plant species from woodland habitats, they are increasingly impacting Sand Forest plant species within the park (Matthews *et al*. 2001). Heavy utilisation of Sand Forest by elephants is thought to lead to the opening up of these habitats, and the subsequent development of a Mixed Woodland structure. To date no reversion to the original habitat structure has been recorded for disturbed Sand Forest patches even after extensive protection (Van Rensburg *et al.* 1999). This could have an adverse effect on all the species associated with the Sand Forest habitat. Monitoring the impact of large herbivores on these forests and their associated species within current protected areas is therefore critical for future conservation.

The second objective of this study was to gather information on the habitat preference and conservation status of selected herbivore species within the Tembe Elephant Park. The maintenance of mixed ungulate populations in an area, without causing damage to the habitat or animals requires insight into the habitat needs, habitat use and potential competition within and between populations in the area (Scogings *et al*. 1990). The interactions between herbivore species can either be competitive or beneficial. Interference competition occurs when one species physically excludes another from resources, while exploitative competition occurs when the reduction of resources by one species adversely affects another (Begon *et al*. 1996). Facilitation on the other hand is the process by which one species benefits from the activities of another. Wildlife management can manipulate both competition and facilitation to increase the density of a preferred plant or animal species (Caughley & Sinclair 1994). Knowledge of the habitat preference, ecological requirements and conservation status of large herbivores is thus basic to any management programme for a conservation area and a pre-requisite to determine stocking densities and possible translocations (Dekker *et al*. 1996).

Current techniques for calculating stocking rates can only be justified if the ungulates display no separation by habitat. As more knowledge is gained on the habits of animals, it becomes clearer that they do not simply roam aimlessly through their habitat, but instead use it in a fixed and orderly manner (Joubert 2002). The degree of dependency of a ruminant on a certain habitat is determined by the availability of its preferred food, the minimum size of the area required for daily and seasonal activities, the absence of extreme competition, the availability of cover and free surface water, the freedom to escape unnatural climatic extremes and the opportunity for reproduction (Pienaar 1974). The fact that most species are linked to major vegetation types helps in understanding their distribution patterns. In conservation areas, one of the primary objectives is to maintain viable populations of all the animal species present. In several parks and reserves, which aim to conserve a variety of species, it has been necessary to control the populations of highly competitive species for some time to prevent the decline of rare species and/or the overutilisation of a number of plant communities. The present study therefore aimed to investigate the habitat preferences and status of selected herbivores to identify possible competition between species and/or a decrease in numbers of rare species. It was furthermore aimed to identify herbivores that might be adversely affected by the destruction of Sand Forest, or who may themselves have a destructive effect on Sand Forest. Target herbivores included the nyala *Tragelaphus angasii*, impala *Aepyceros melampus*, Burchell's zebra *Equus burchellii*, greater kudu *Tragelaphus strepsiceros*, red duiker *Cephalophus natalensis* and suni *Neotragus moschatus*.

A description of the study area is presented in chapter 2. In order to reduce the amount of repetition the detailed methods employed during this study are presented in chapter 3. The methods in the respective chapters are restricted to the broad outlines of the methods employed. The comparison of the Sand Forest bird assemblages that are found in the Tshanini Community Conservation Area, with those found in the Tembe Elephant Park is presented in chapter 4. Information on the habitat preference and status of the target herbivores is presented in chapter 5 to chapter 10. Literature cited in each chapter is referenced at the end of the relevant chapter and a complete list of references is given at the end of the thesis.

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