

CHAPTER 1

GENERAL INTRODUCTION

1.1 Background

When the European hunters and explorers arrived in the region today known as Maputaland in the early eighteenth century, they found a sparsely inhabited area, known for disease and infested by tsetse fly. As the French explorer Delegorgue (1838–1844) expresses that periods' European sentiments for this region: "In addition to the insurmountable dangers to the health of explorers in the Makazanes (a reference to the Mabhudu-Tsonga people living south of Maputo Bay) country, must be added the treachery of these locals, whose reputation as poisoners is known far and wide and appears to be deserved" (Delegorgue 1990). The presence of the tsetse fly prevented the keeping of cattle and other domestic livestock. Tsetse flies in Maputaland were only reduced to a point where livestock could be kept after the spraying with insecticide and game eradication programmes in the 1940s and 1950s. Today Maputaland is an area with considerable ecotourism potential containing several major provincial and tribal conservation areas.

Historically the name Maputaland has been applied, in a broad sense, to the coastal plain stretching from Maputo in Mozambique southwards to near the Mkuzi River in northern KwaZulu-Natal (Bruton & Cooper 1980). In recent times the southern boundary of the region has, for convenience, been extended to the estuary of Lake St Lucia so as to include the greater part of a biogeographical region. In South Africa, politically Maputaland covers an area of approximately 10 000 km² in the north of KwaZulu-Natal. Until recently this portion of Maputaland was known as Tongaland, but this name has now fallen into disuse. A further 10 000 km² extends into southern Mozambique. The combined area has been referred to as the *Greater Maputaland* by Smith (2001). As a biogeographical region the boundaries of Maputaland are well defined, except in the north, where the line is arbitrary (Van Wyk & Smith 2001). Maputaland is extremely biodiverse and includes a large number of endemic/near-endemic plant and animal species.

Earliest biological inventories for Maputaland came from mariners, hunters, traders and settlers. The first systematic collections and scientific surveys were, however, only conducted around 1900, such as by the missionaries R.B. Woodward and J.D.S. Woodward. They collected birds in the Lebombo Mountains and discovered many tropical species, including what is today called

Woodward's Batis (*Batis fratrum*). The Maputaland region was first studied from a biological point of view by the botanists R.D. Aitken and G.W. Gale (Aitken & Gale 1921) and the first descriptions of the ecology of the area was done by the zoologist Austin Roberts (Roberts 1936). The first mammal survey of the region was carried out in 1914 by the then Transvaal Museum (Rautenbach *et al.* 1980).

1.2 Maputaland Centre of Endemism

Southern Mozambique and the northern part of KwaZulu-Natal are recognised as a Centre of Plant Endemism, namely the Maputaland Centre (Van Wyk 1994, 1996). The boundaries of the Maputaland Centre (MC) were defined by Van Wyk (1994), who also provided information on the rich biodiversity of the centre (Van Wyk 1996; Van Wyk & Smith 2001). Biogeographically the core area of the Maputaland Centre has been defined (Van Wyk 1994, 1996; Van Wyk & Smith 2001) as that part of southern Mozambique and northeastern KwaZulu-Natal bounded by the Inkomati and Limpopo Rivers in the north, by the Indian Ocean in the east, by the western foothills of the Lebombo Mountains in the west and by the St Lucia Estuary in the south, from where it extends further southwards along the coast to near Mtunzini (including the transitional Ngoye Range). Biogeographically the boundaries of the centre are clear except in the north, where the line is arbitrary. Maputaland is also known for its rich fauna and flora which includes the high levels of endemism. Current knowledge is that about 2 500 species (but probably more) of vascular plants occur in the Maputaland Centre; of these at least 230 species/infraspecific taxa are endemic or near-endemic to the region (Van Wyk 1996). Other endemics are one species and 14 subspecies of mammal, 23 reptile species, three frog species and eight fresh water fish species. The Maputaland centre also corresponds with the southern part of the south-eastern African coast Endemic Bird Area [EBA]. The Important Bird Areas [IBA] programme of southern Africa (Barnes 1998) identified seven areas for KwaZulu-Natal, which fall into the Maputaland region. Of the more than 472 taxa of birds in the Maputaland Centre (almost 60% of South Africa's total), five are endemic/near endemic to the centre.

The rich biodiversity of Maputaland is partly due to the large number of habitats found in the region, including internationally recognised wetlands. High levels of endemism are spread across virtually the whole taxonomic spectrum, involving both plant and animals. White (1983) treated the area geographically as part of his larger Tongaland-Pondoland Regional Mosaic. In addition to being a Regional Mosaic, this floristic region was considered a Transition Zone (Moll & White 1978; White 1983). However, for a long time this emphasis on Maputaland as a transition (tropical

subtraction) zone has obscured its status as a centre of endemism in its own right. The Maputaland Centre, as part of the Maputaland-Pondoland Region (Site Af59), is acknowledged as one of the important centres of plant diversity/endemism in Africa (Davies *et al.* 1994). Recently the Maputaland Centre was incorporated in the larger Maputaland-Pondoland-Albany Hotspot, one of the 36 such regions of global conservation significance (Steenkamp *et al.* 2004).

Maputaland is also of exceptional biogeographical interest because of the sharp biogeographical transformation of both plant and animal taxa in the region (Poynton 1961; Bruton & Cooper 1980). Maputaland is at the southern end of the tropics in Africa and many tropical organisms reach the southernmost limit of their range here. The flora and fauna of the Maputaland Centre are predominantly of Palaeotropical and Afrotropical derivation respectively. Cape floristic elements are very rare among the endemics of the region (e.g. *Restio zuluensis* and a form of *Aspalathus gerrardii* with minute flowers). Curiously, some of the coastal grasslands contain grass species usually associated with the Drakensberg-Afromontane region (e.g. *Monocymbium ceresiiforme*). However, these grasses are most probably distinct ecotypes.

Elephants have been recorded on the Maputaland coastal plain more or less continuously since 1840 (Harris 1852, Baldwin 1895; Bulpin 1966). Southern Mozambique and northern KwaZulu-Natal, Maputo Elephant Reserve [MER], Futi Corridor and Tembe Elephant Park [TEP] presently hold elephant populations separated from each other either through electric fences or social political barriers imposed by the presence of man. These subpopulations represent remaining fragments of the coastal plain population that, until 1855, roamed as far south as the White Umfolozi River (Klingelhoefer 1987). Both the MER and TEP elephant populations suffered from heavy poaching during the last 30 years. The last free roaming population of elephants in South Africa was fenced-in with the proclamation of Tembe Elephant Park in Maputaland in 1983. This protected area was established in response to the increasing levels of human-elephant conflict and the need to protect the biodiversity of the region, which was under-represented within the protected areas of KwaZulu-Natal. At present the elephant population in TEP comprises some 185 animals (Matthews 2004) while the MER harbours approximately 200 animals, which are essentially free roaming. At present an unknown number of elephants are resident in the Futi Corridor but they are under a constant man-induced threat (Ostrosky & Matthews 1995). The post-war (Mozambique Civil War) return of agricultural activity to the region resulted in elephants causing significant crop damage around the MER (De Boer & Baquete 1998). This is leading to renewed pressure on the local elephant population.

1.3 Sand Forest

Sand Forest (Licuáti Forest) only occurs in South Africa and Mozambique, and is a unique inland feature of Maputaland. It has over the years been referred to as:- Licuáti Forest (Myre 1964), Tongaland Sand Forest, Msinga Bush (Moll 1968), Sand Forest (Moll 1978, Mucina *et al.* 2005), *Artabotrys monteiroae-Dialium schlechteri* Forest (Matthews *et al.* 1999), Western Sand Forest (Kirkwood & Midgley 1999), Sand Thicket and Forest (Smith 2001); Eastern Sand Forest, and Licuati Sand Forest (Mucina & Geldenhuys 2004).

Sand Forest harbours many rare and unusual types of plant and animals, many of which are Maputaland Centre endemics taxa. Because of its restricted occurrence and unusual species complement, Sand Forest is one of the most important habitat types in Maputaland. The biggest stand of Sand Forest (perhaps best described as thicket in this area) is found in southern Mozambique (north of Tembe Elephant Park) it is ~ 25 km long and ~8 km wide.

Structurally Sand Forest is a relatively dense vegetation type with different strata. The forest is generally low-grown, 5 to 12 m tall, a closed canopy with few large emerging species and a noticeable lack of undergrowth including a low abundance of herbs. The emergent trees in most places are covered by epiphytic plants such as orchids and lichens. These forests have a relic character and do not regenerate actively. They also show floristic and faunistic links to the tropics further north. In most cases the forests are delimited by narrow zones of sparse grass-vegetated or bare-sand areas directly adjacent to the forest margin.

1.4 Rational and motivation

Maputaland, a region of great scenic beauty and rich biodiversity, shows considerable ecotourism potential, and this could be used as a basis for economic growth in the region. Several important conservation areas are to be found in the region, Tembe Elephant Park, Ndumo Game Reserve, Mkuzi Game Reserve and Maputo Elephant Reserve in Mozambique also including the Greater St Lucia Wetland Park, a World Heritage Site that includes Kosi Bay Coastal Forest Reserve. Currently initiatives for establishing a transfrontier conservation area and the so-called “peace parks” between northern KwaZulu-Natal, Swaziland and southern Mozambique are underway, effectively linking the northernmost KwaZulu-Natal parks (Tembe Elephant Park and Ndumo Game Reserve) and tribal conservation areas, with the southernmost Mozambican parks and conservation areas. Management of these areas will require a sound

understanding of the biological processes and intricacies of the region.

Efficient biological surveys are a fundamental requirement for the effective management of biological resources and constitute the most basic activity in the field of conservation biology (Margules & Austin 1991). Conservation priorities in Maputaland were identified after a series of reports, including surveys by Bruton & Cooper (1980), Tinley & Van Riet (1981) and Klingelhoef (1987), which discuss the natural biotic riches of the region and indicate the need to safeguard these attributes. In 1994, the Maputaland-Pondoland Region was recognised as an International Centre of Plant Diversity (Davis & Heywood 1994) and in 2005 was incorporated in the Maputaland-Pondoland-Albany Hotspot (Steenkamp *et al.* 2004). Van Wyk (1996) has shown that the Maputaland Centre is an area of high plant species diversity with relatively high numbers of endemic and near-endemic species. It harbours a rich and diverse mega fauna and also abounds in invertebrates, which at this stage are not well documented. Although many biological surveys have been carried out in the Maputaland region, most have not tried to define or identify critical sites of biodiversity for protection and/or conservation management. Recently conservation planning studies have been initiated and are currently in progress (Smith 2001, Goodman 2003). One method being employed is systematic conservation planning, which involves mapping the distribution of different conservation features and existing Protected Areas [PA], setting representation targets for each feature, measuring the effectiveness of the present PA system in meeting these targets and, using computer-based selection algorithms to identify additional sites (Margules & Pressey 2000). In addition, this process incorporates a range of socio-economic and threat data on threatened species to increase the relevance of the planning exercises (Smith 2001).

Because of the significant number of endemic plant species associated with Sand Forest, the latter is perhaps the most remarkable plant community in the Maputaland Centre (Wild & Barbosa 1968, Moll 1977, 1980, Moll & White 1978, Van Wyk 1996, Van Wyk & Smith 2001). Equally important in terms of endemism is the Woody Grassland (not to be confused with “wooded”) of the coastal plains (Matthews *et al.* 1999). Both Sand Forest and Woody Grassland are endemic to the Maputaland Centre. By better understanding the distribution and determinates of Sand Forest, Woody Grassland and associated habitats, appropriate management can be put in place in and outside reserves.

Key statements addressed in the present study include;

- i) *Maputaland Centre of Plant Endemism is characterised by plant communities*

specific to its heterogeneous environmental factors.

- ii) *Maputaland Centre of Plant Endemism exhibiting a specific relationship between habitats, species and the geomorphological history of the region.*
- iii) *Maputaland Centre of Plant Endemism has a high plant diversity (compared with surrounding areas), including endemic and near-endemic plant taxa, which exhibit relationships with specific habitats.*
- iv) *knowledge of the vegetation and flora of the Maputaland Centre of Plant Endemism, and the role of large herbivores (specifically elephant *Loxodonta africana*) and fire makes it possible to formulate management strategies.*

These statements were used to formulate specific objectives to test ideas/hypothesis, to contribute to ecology and vegetation science and to inform management options.

1.5 Objectives

The principle objectives of the present study are to:

- collate and make a synthesis of available information on the functioning of the terrestrial plant communities of Maputaland, with emphasis on Sand Forest;
- refine the classification and description of the vegetation of Maputaland as well as the environmental determinants of these habitats;
- record ecological and floristic data for the Sand Forest and associated woodland habitat of a part of Maputaland by identifying, characterising, interpreting, describing and mapping the major vegetation units and their variations that occur in the Tembe Elephant Park and surrounding areas;
- record ecological and floristic data for the Woody Grassland and associated vegetation of a part of Maputaland by identifying, characterising, interpreting, describing and mapping the major vegetation units and their variations that occur in the Sileza Nature Reserve and surrounding areas;
- identify primary determinants of community composition and distribution, with emphasis on Sand Forest;

- assess the floristic richness and the level of endemism in Maputaland in the context of the Maputaland Centre;
- record ecological and floristic data to construct a classification of woody species in terms of their abundance, their importance in the elephant diet, and the potential effect of feeding by elephant on the major vegetation types that occur in Tembe Elephant Park;
- propose and evaluate specific hypotheses on the dynamics, function and evolution of Sand Forest and its relationships and affinities with other plant communities in the region;
- propose and evaluate hypotheses regarding the origin and evolution of Sand Forest with respect to the geological and geomorphological evolution of the region; and
- propose and evaluate existing management directives for the region, be it for conservation of the biodiversity, for sustainable utilisation of the region's natural resources, or for ecotourism, with emphasis on Sand Forest and related communities.

1.6 Layout

This thesis consists of a collection of contributions on the phytosociology, vegetation dynamics, herbivore interactions and ideas and hypotheses on the evolution and dynamics of the vegetation of Maputaland. Contributions are in the form of manuscripts, of which some have been published, as well as contributions in preparation for possible publication in scientific journals. Although details of the study area, methods, results, discussion and references are presented in the individual contributions, brief descriptions of the study area (Chapter 2) and the methodological approach (Chapter 3) are supplied separately. References for all Chapters are grouped together under References at the end of the thesis. A synthesis of the principal findings, management implications of the work and conclusions are presented in Chapter 9, 10 and 11.

The reprints/manuscripts included in this thesis show some stylistic irregularities and repetitiveness. These are primarily due to differences in layout and style required by the various scientific journals and the fact that each manuscript is an entity in itself. To get manuscripts accepted for publication, conformation to some idiosyncrasies of referees and editors was

sometimes unavoidable.

Additional specific data, references and publications in which the author was involved, and that contribute to the subject matter dealt with in the thesis and that may assist in the understanding of specific topics, are presented as Annexures.