

**Aspects of the ecology and conservation status of selected wildlife in and
around Tembe Elephant Park, KwaZulu-Natal, South Africa**

**by
Daniël Greyling van Eeden**

Submitted in partial fulfilment of the requirements for the degree

MAGISTER SCIENTIAE (WILDLIFE MANAGEMENT)

**Centre for Wildlife Management
Faculty of Natural and Agricultural Sciences
University of Pretoria
Pretoria**

Supervisor: Prof. Dr. J. du P. Bothma

November 2005

**Aspects of the ecology and conservation status of selected wildlife in and
around Tembe Elephant Park, KwaZulu-Natal, South Africa**

by

Daniël Greyling van Eeden

Supervisor: Prof. Dr. J. du P. Bothma

**Centre for Wildlife Management
Faculty of Natural and Agricultural Sciences
University of Pretoria**

Magister Scientiae (Wildlife Management)

ABSTRACT

The present study compared Sand Forest bird assemblages found in a communal land area with that of the Tembe Elephant Park, and determined the habitat preference and status of selected herbivore species within the park. The study forms part of the Maputaland Conservation-based and Integrated Rural Development Programme of the Centre for Wildlife Management from the University of Pretoria and is linked to the activities of the Lubombo Transfrontier Conservation Area (LTFCA). The main purpose of the study was to compare Sand Forest bird assemblages found in the Tshanini Community Conservation Area, which is characterised by low levels of human utilisation, with that of the Tembe Elephant Park, which is characterised by wildlife utilisation. This approach was used to determine the biological importance of this communal land area in contributing towards the conservation of the rare Sand Forest habitat. Visual and auditory bird surveys revealed that the communal land area contains unique Sand Forest bird assemblages, which demonstrated the biological importance of the communal land for Sand Forest conservation, especially from an avian perspective. The second purpose of the study was to identify possible competition between selected herbivore species within the Tembe Elephant Park and/or a decrease in numbers of rare species. Herbivores that might be adversely affected by the destruction of the Sand Forest, or who may themselves have a destructive effect on the Sand Forest were also identified. 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*. Road transects were used to record the spatial distribution of the target herbivores, and the vegetation types that were used more or less often than expected were subsequently determined. None of the target herbivores showed a preference for the Sand Forest or appeared to have a destructive effect on the Sand Forest. The suni, however, reached its highest density within the Sand Forest and the destruction of this habitat will therefore negatively affect the suni population. In several parks and reserves that aim to conserve a variety of species, it has been necessary to control the populations of highly competitive species. Both the nyala and the impala are highly competitive and occur in relatively high numbers within the Tembe Elephant Park, and consequently their population numbers should be kept sufficiently low in order not to have a negative influence on the vegetation or the survival of less competitive ungulates. Total aerial counts and transect distance sampling counts indicated an increase in the numbers of all the target herbivores. It is important to protect a viable portion of the preferred habitat of every target species within a reserve, and to keep competition with rare species to a minimum for the long-term survival of the regional biodiversity. Key aspects of wildlife and their habitat should be monitored so that trends are noted in time, and management adjustments can be made accordingly.

TABLE OF CONTENTS

ABSTRACT ii

TABLE OF CONTENTS iv

LIST OF FIGURES vii

LIST OF TABLES x

LIST OF APPENDICES xiii

ACKNOWLEDGEMENTS.....xiv

CHAPTER 1: INTRODUCTION 1

References 6

CHAPTER 2: THE STUDY AREA 10

Topography 13

Geology and soils 14

Climate 17

Vegetation..... 19

References..... 22

CHAPTER 3: GENERAL METHODS 24

Introduction 24

 Bird surveys 24

 Habitat preference..... 27

 Population status..... 30

References..... 32

CHAPTER 4: THE VALUE OF COMMUNITY-BASED CONSERVATION IN A HETEROGENEOUS LANDSCAPE: A CASE STUDY FROM THE MAPUTALAND CENTRE OF PLANT ENDEMISM, SOUTH AFRICA 34

Introduction 34

Methods 35

Results 37

Discussion 45

References..... 48

CHAPTER 5: HABITAT PREFERENCE AND STATUS OF THE NYALA IN TEMBE ELEPHANT PARK, SOUTH AFRICA.....	54
Introduction	54
Methods	55
Results	56
Discussion	58
References.....	64
CHAPTER 6: HABITAT PREFERENCE AND STATUS OF THE IMPALA IN TEMBE ELEPHANT PARK, SOUTH AFRICA.....	67
Introduction	67
Methods	68
Results	69
Discussion	71
References.....	76
CHAPTER 7: HABITAT PREFERENCE AND STATUS OF BURCHELL'S ZEBRA IN TEMBE ELEPHANT PARK, SOUTH AFRICA.....	79
Introduction	79
Methods	80
Results	81
Discussion	83
References.....	88
CHAPTER 8: HABITAT PREFERENCE AND STATUS OF THE GREATER KUDU IN TEMBE ELEPHANT PARK, SOUTH AFRICA.....	91
Introduction	91
Methods	92
Results	94
Discussion	100
References.....	102

CHAPTER 9: HABITAT PREFERENCE AND STATUS OF THE RED DUIKER IN TEMBE ELEPHANT PARK, SOUTH AFRICA	105
Introduction	105
Methods	106
Results	107
Discussion	111
References.....	114
CHAPTER 10: HABITAT PREFERENCE AND STATUS OF THE SUNI IN TEMBE ELEPHANT PARK, SOUTH AFRICA	116
Introduction	116
Methods	118
Results	119
Discussion	119
References.....	125
CHAPTER 11: CONCLUSIONS	127
REFERENCES.....	130

LIST OF FIGURES

FIGURE 1: The location of the Maputaland Centre of Plant Endemism (highlighted in light green) within South Africa and Mozambique as adapted from Van Wyk & Smith (2001). 11

FIGURE 2: The Maputaland Centre of Plant Endemism in South Africa, showing the location of the different geological formations. 15

FIGURE 3: Tembe Elephant Park, South Africa showing the location of the different land types. 16

FIGURE 4: Climatogram of Sihangwane Weather Station, Tembe Elephant Park, following Walter (Cox & Moore, 1994). 18

FIGURE 5: Tembe Elephant Park, South Africa showing the location of the different vegetation types based on Matthews *et al.* (2001) 20

FIGURE 6: Transects that were used to determine the spatial distribution of the target herbivores in the Tembe Elephant Park, South Africa from December 2002 to November 2003 28

FIGURE 7: Flight path used for the total aerial counts and the transect distance sampling counts in Tembe Elephant Park, South Africa during October 2003 (Matthews 2004). 31

FIGURE 8: The location of (1) the Maputaland Centre of Plant Endemism and (2) the study area within the Maputaland Centre of Plant Endemism in South Africa. 36

FIGURE 9: Species accumulation curve for bird assemblages in the Tshanini Community Conservation Area, South Africa from 1 July to 31 December 2002. 39

Figure 10: Non-metric ordination of four habitat sites in the Maputaland Centre of Plant Endemism, South Africa based on multidimensional scaling to indicate the degree of similarity of the abundances of bird species and subspecies in each assemblage where: A = Tshanini Mixed Woodland, B = Tembe Mixed Woodland, C = Tshanini Sand Forest and D = Tembe Sand Forest. 40

Figure 11: Bird indicator species value distributions for (a) Tshanini Sand Forest versus Tembe Sand Forest, (b) Tshanini Mixed Woodland versus Tembe Mixed Woodland and (c) the entire Tshanini versus the entire Tembe in the Maputaland Centre of Plant Endemism, South Africa. 44

Figure 12: Aerial survey of the nyala as based on total counts conducted in Tembe Elephant Park, South Africa from 1993 to 2003. Source: Matthews *et al.* (2004) 61

Figure 13: Aerial survey of the impala as based on total counts conducted in Tembe Elephant Park, South Africa from 1993 to 2003. Source: Matthews *et al.* (2004) 73

Figure 14: Aerial survey of the Burchell’s zebra as based on total counts conducted in Tembe Elephant Park, South Africa from 1993 to 2003. Source: Matthews *et al.* (2004) 85

Figure 15: Aerial survey of the greater kudu as based on total counts conducted in Tembe Elephant Park, South Africa from 1993 to 2003. Source: Matthews *et al.* (2004) 99

Figure 16: Aerial survey of the red duiker as based on total counts conducted in Tembe Elephant Park, South Africa from 1993 to 2003. Source: Matthews *et al.* (2004) 112

Figure 17: Aerial survey of the suni as based on total counts conducted in Tembe Elephant Park, South Africa from 1993 to 2003. Source: Matthews et al. (2004) 122

LIST OF TABLES

TABLE 1: Species richness and abundance values of birds surveyed in Tembe Elephant Park and the Tshanini Communal Area, South Africa between May 1995 to April 1996, and between July to December 2002 respectively. 38

TABLE 2: Percentage indicator values (*IndVal* > 70%) of bird species and subspecies for three different study area comparisons in the Maputaland Centre of Plant Endemism, South Africa from 1 July to 31 December 2002. 42

TABLE 3: Vegetation types in Tembe Elephant Park, South Africa, their respective sizes (km²), proportion of the available habitat, proportion of use by the nyala and preference index of use by the nyala from December 2002 to November 2003. 57

TABLE 4: The preference of use of the vegetation types in Tembe Elephant Park, South Africa by the nyala from December 2002 to November 2003 ($\alpha = 0.05$; $k = 9$; $Z_{1-\alpha/2k} = 2.75$). 59

TABLE 5: The percentage occurrence of various plant species in the diet of the nyala based on 102 feeding observations from December 2002 to November 2003 in Tembe Elephant Park, South Africa. 60

TABLE 6: Vegetation types in Tembe Elephant Park, South Africa, their respective sizes (km²), proportion of the available habitat, proportion of use by the impala and preference index of use by the impala from December 2002 to November 2003. 70

TABLE 7: The preference of use for the vegetation types in Tembe Elephant Park, South Africa by the impala from December 2002 to November 2003 ($\alpha = 0.05$; $k = 9$; $Z_{1-\alpha/2k} = 2.75$). 72

TABLE 8: Vegetation types in Tembe Elephant Park, South Africa, their respective sizes (km²), proportion of the available habitat, proportion of use by Burchell’s zebra and preference index of use by Burchell’s zebra from December 2002 to November 2003. 82

TABLE 9: The preference of use for the vegetation types in Tembe Elephant Park, South Africa by Burchell’s zebra from December 2002 to November 2003 ($\alpha = 0.05$; $k = 9$; $Z_{1-\alpha/2k} = 2.75$). 84

TABLE 10: Vegetation types in Tembe Elephant Park, South Africa, their respective sizes (km²), proportion of the available habitat, proportion of use by the greater kudu and preference index of use by the greater kudu from December 2002 to November 2003. 95

TABLE 11: The preference of use of the vegetation types in Tembe Elephant Park, South Africa by the greater kudu from December 2002 to November 2003 ($\alpha = 0.05$; $k = 9$; $Z_{1-\alpha/2k} = 2.75$). 96

TABLE 12: The percentage occurrence of various plant species in the diet of the greater kudu based on 86 feeding observations from December 2002 to November 2003 in Tembe Elephant Park, South Africa. 97

TABLE 13: Vegetation types in Tembe Elephant Park, South Africa, their respective sizes (km²), proportion of the available habitat, proportion of use by the red duiker and preference index of use by the red duiker from December 2002 to November 2003. 108

TABLE 14: The preference of use of the vegetation types in Tembe Elephant Park, South Africa by the red duiker from December 2002 to November 2003 ($\alpha = 0.05$; $k = 9$; $Z_{1-\alpha/2k} = 2.75$). 109

TABLE 15: The percentage occurrence of various plant species in the diet of the red duiker based on 37 feeding observations from December 2002 to November 2003 in Tembe Elephant Park, South Africa. 110

TABLE 16: Vegetation types in Tembe Elephant Park, South Africa, their respective sizes (km²), proportion of the available habitat, proportion of use by the suni and preference index of use by the suni from December 2002 to November 2003. 120

TABLE 17: The preference of use of the vegetation types in Tembe Elephant Park, South Africa by the suni from December 2002 to November 2003 ($\alpha = 0.05$; $k = 9$; $Z_{1-\alpha/2k} = 2.75$). 121

LIST OF APPENDICES

APPENDIX 1: The total number of individual birds, bird species and subspecies recorded in the Tembe Elephant Park and the Tshanini Community Conservation Area Sand Forest and Mixed Woodland habitats..... 51

ACKNOWLEDGEMENTS

I dedicate this thesis to my dad, who passed away before the completion of this work, for his love, inspiration and encouragement.

Although many people contributed to this thesis in different ways, the following people deserve special thanks:

My wife Lizl, thank you for your unconditional support and understanding during the lonely times at home while I was doing fieldwork and during the long hours in front of the computer while I was writing up. All my friends and family, you also deserve thanks for putting up with me throughout my study period.

My supervisor, Prof. J. du P. Bothma, thank you for your commitment, support and guidance and for critically examining my work. Enjoy the retirement!

Dr. H. Els and his wife Ronel, thank you for your friendship, support and dedication as well as for all the logistical support during my fieldwork. Roelie, Alison, Martie, Jason and Johan, thanks for the critical comments, advice, support, friendship and companionship around the fire in Tembe.

Liset Swanepoel, thank you for your invaluable assistance in general and for always listening and giving advise. Ben, LD, Haemish, Jerome, Jason and all the students at the Centre for Wildlife Management, thanks for your support and friendship.

Ezemvelo KwaZulu-Natal Wildlife, Wayne Matthews and the rest of the staff members in Tembe Elephant Park, and the people of Manqakulane, thank you for the logistical and other support during my fieldwork in and around Tembe and Tshanini.

This material is based upon work supported by the National Research Foundation under Grant Number 2047386.

