

Check list of the mammals of Tussen-die-Riviere Provincial Nature Reserve, Free State Province, South Africa

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Tussen-die-Riviere Nature Reserve falls within the Eastern Mixed Nama-Karoo Biome. The surface area is approximately 23 000 ha and it is located in a summer rainfall region. Sixty six different mammal species were recorded for the reserve over the past 13 years which constitutes 65 % of the indigenous mammals recorded for the Free State Province. The highest number of species for the rodents and insectivores were recorded in riverine habitat but the highest abundance were recorded in rocky habitat and was constituted by only one species, *Aethomys namaquensis*.

Key words: check list, distribution, mammals, conservation area, South Africa.

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Introduction

Species lists of occurrence or inventories of species on nature reserves, national parks or specific conservation areas have been published extensively in the past (Rautenbach 1976; Nel *et al.* 1980; Pienaar *et al.* 1980; Rautenbach 1982; Lynch 1983; Lynch 1989; Lynch & Watson 1990; Lynch 1994; Avenant 1997; Avenant 2000a). This refined the knowledge of the distribution of mammal species in South Africa. This information formed part of the reference base when the status of species and distribution delineations were determined for the biodiversity of South Africa. Very few provincial reserves in the Free State (FS) have published mammal inventories (Rautenbach 1976; Avenant 1997; Avenant 2000b; Avenant & Watson 2002; Wandrag *et al.* 2002). This is one of the reasons why the presence of some species in the FS were omitted or not properly documented during the compilation of the recent Red Data Book of the mammals of South Africa (Friedman & Daly 2004). Lynch (1983) conducted a survey of the mammals in the Free State but never sampled any of the provincial or national conservation areas during this survey. All the effort was focused on

private farms, although sampling did occur adjacent to some provincial reserves.

The intention of this paper is to publish data that has been collected over the past 13 years at Tussen-die-Riviere Nature Reserve (TDR) in the Free State and hopefully it will contribute to the distribution of information on mammals in central South Africa.

Study area

Tussen-die-Riviere Nature Reserve is situated in the southern Free State Province of South Africa, between the Caledon and Orange rivers, with the western boundary at the confluence of the two rivers (26°03'–26°20'E, 30°25'–30°35'S). The reserve was established in 1967 and proclaimed as a nature reserve in 1972 (Van Aarde 1984; Vrahimis 1991). Altitude varies between 1150–1480 m above sea level. The absolute maximum and minimum temperatures recorded are 38.3 °C and -9.3 °C respectively, with a mean annual precipitation of 441 mm (Vrahimis 1991).

Tussen-die-Riviere is about 23 000 ha in size, consisting of dolomite koppies with domi-

nant tree species being *Olea*, *Rhus*, *Celtis* and *Maytenus*. The grass plains consist of *Themeda*, *Aristida*, *Cymbopogon*, *Eragrostis*, *Chrysocoma*, *Lesertia*, *Osteospermum*, *Salsola* and *Nestlera* species. The two major rivers, the Orange and Caledon, that runs through the reserve are fringed by species such as *Diospyros*, *Phragmitis*, *Salix babalonica*, *Acacia karoo*, *Lycium* and *Celtis*. According to Acocks (1988), it falls within the False Upper Karoo (vegetation type 300), but Low & Rebelo (1996) relegates it to Eastern Mixed Nama-Karoo (vegetation type 52).

Originally TDR was utilised exclusively as a hunting venue but was also managed as a conservation area where a number of Artiodactyla and Perissodactyla were introduced into the reserve over the years. Hunting formed part of the game management actions of the reserve. Recently the function of TDR changed from primarily being a hunting venue to a conservation area and the management plan was adjusted accordingly.

Materials and methods

Recording of mammal occurrence data has been conducted since 1992. Small mammal surveys were carried out on various occasions utilising Sherman type live traps, snap traps (museum specials) and catching specimens by hand. A general bait, consisting of peanut butter, rolled oats, sunflower oil and beef extract (Bovril) was used to bait traps. Traps were checked and re-baited at sunrise and sunset and the specimens collected were either released after identification or in cases where animals were sampled the specimens were deposited in the mammal collection of the National Museum in Bloemfontein.

The trap success of rodents and insectivores caught in traps was calculated following the method described by Rowe-Rowe & Meester (1982).

The following habitat types were sampled: rocky ridges, riverine vegetation, grass/ shrub land, and old buildings. In the case of the latter, traps were set outside the buildings next to walls in vegetation.

Macro mist nets were used to collect bats at night. Likely sites were investigated during the day and bats were collected by hand or shot with .22 dust shot.

Sight records of various species were taken during game drives, night drives with a spotlight, and during culling operations. Other signs like quills, tracks, scats and burrows were also used to determine the presence of some species on the reserve. Sightings recorded by the reserve personnel were incorporated in the species lists.

The nomenclature followed in this manuscript is according to Bronner *et al.* (2003).

Results and discussion

According to Hilton-Taylor & Le Roux (1989) the Nama-Karoo and Succulent-Karoo are two of the most inadequately protected biomes in South Africa. The Nama-Karoo, in which TDR is located, is particularly inadequately protected and of concern (Gelderblom & Bronner 1995). Tussen-die-Riviere has grassland elements present which places it in the transitional zone between the Nama-Karoo and Grassland biomes. Gelderblom *et al.* (1995) are of the opinion that the southern Free State is an unprotected hotspot with high species richness, endemic and Red Data species and is a conservation priority area for carnivores. Augmentation of the conservation area network in this region will protect the maximum number of species within a minimum land surface (Gelderblom *et al.* 1995).

Apart from the alien invasive fallow deer *Cervus dama* (Nature Conservation Ordinance No. 8 of 1969) which entered the reserve by dispersal from neighbouring farms, only one species of the 66 recorded species for TDR, viz., impala *Aepyceros melampus*, occurs extralimitly in TDR (Plug & Badenhorst 2001). This species was originally introduced for hunting purposes. The species composition (Table 1) on TDR represents 65 % of the 101 indigenous mammals for the Free State (Lynch 1983; Watson 1990a; Watson 1990b; Watson 1998; Avenant & Watson 2002; Ferreira & Avenant 2003).

The Chacma baboon *Papio hamadryas ursinus* is shown as being introduced in Table 1, although this species did occur originally in the region. Baboons that were used in a behavioural study by a student were released

into the resident troop at TDR in the early 1970s after completion of the project. The study animals did not originate from this region but were animals captured at Loskop Dam Nature Reserve in Mpumalanga. There is evidence that two genetically different groups of baboons occur in South Africa, a northern and southern group (Friedman & Daly 2004; Bloomer *pers. comm.*). The result is that the troop on TDR might have been contaminated with animals from the northern group.

Fallow deer, an exotic or alien invasive species (Nature Conservation Ordinance No 8 of 1969), occasionally enter TDR from neighbouring farms. The TDR personnel cull these animals whenever this species is encountered. Re-entry from adjacent farms does, however, occur periodically and it is a continuous process to remove these animals, underlining the importance of regulating the importation of alien species into any area.

Ferreira & Avenant (2003) recorded *Otomys saundersiae* or Saunders' vlei rat, *Dendromys melanotis* the grey climbing mouse, *Tatera leucogaster* the bushveld gerbil, *Mystromys albicaudatus* the white tailed rat and *Crocidura cyanea* the reddish-grey musk shrew at the reserve. Four other species, *Crocidura fuscomurina* the tiny musk shrew (DD), *Desmodillus auricularis* the short tailed gerbil, *Ichneumia albicauda* the white-tailed mongoose and *Lutra maculicollis* the spotted necked otter (NT) were recorded by Lynch (1983) in close proximity to reserve but these species have not to date been recorded on the reserve. Of these four species, one is near threatened (NT) and one is data deficient (DD), resulting in two of the four species listed in a Red Data category as defined by Friedman & Daly (2004). It is important to establish whether these species occur on the reserve, and management practices should be of such a nature as to be able to accommodate these species.

Most of the above-mentioned four species are not common, occur in low numbers or are very secretive and difficult to observe or capture.

Rodentia

The rocky outcrop habitat offered the lowest variety of species. Only one species, *Aethomys namaquensis*, was trapped although sightings of the insectivores *Elephantulus myurus*, were made while working in the veld. None were successfully trapped. Even with the lowest species variety this habitat had the highest trap success (Table 2). *Aethomys namaquensis* is a common and abundant species in rocky habitat in the Free State. High trap success percentages are usually experienced when trapping in rocky habitat.

Old buildings gave the second highest trap success with only two species present, viz., *Mastomys (sensu lato)* and *Graphiurus murinus*. The *Mastomys (sensu lato)* was trapped in only two habitats; the other being riverine vegetation. This species is a generalist and its presence is also indicative of habitat disturbance. *Graphiurus murinus* was only captured next to an old building in the Spes Bona area of the reserve (Table 2). These animals are, to a large extent, arboreal and old buildings have shelter and food plants, such as *Diospyros lyciodes*, growing along the walls. Traps were set for this species where eaten fruits were detected at the old buildings. Factors such as shelter, food and signs of their presence enhanced the trappability of this species at the old buildings although they do mostly occur in rocky habitats, or in big trees with holes in the trunks and branches (Skinner & Smithers 1990).

Grass and shrub plains had the lowest trap success. Only two species were recorded, i.e., *Aethomys namaquensis* and *Saccostomys campestris* (Table 2). The former is usually confined to rocky areas and the inclusion of the species in this habitat is due to the fact that traplines were set too close to rocky areas and an ecotone effect manifested in this species being trapped in grass/ shrub plains. The pouched mouse, *Saccostomys campestris*, is catholic, occupying a variety of vegetation and climate types and is widely distributed (Skinner & Smithers 1990). Lynch (1983) shows this species to occur only in the

Table 1

Mammals recorded in Tussen-die-Riviere

¹ = Re-introduced, ² = Listed Red Data species (Friedman & Daly 2004). ³ = Exotic.

DD = Data Deficient; NT = Near Threatened; VU = Vulnerable.

Scientific and common names are according to Bronner et al. (2003)

Scientific name	Common name	Status	Observed in surveys	Signs/ TDR personnel
Insectivora				
² <i>Suncus varilla</i>	Lesser dwarf shrew	DD	X	
² <i>Atelerix frontalis</i>	South African hedgehog	NT	X	
² <i>Crocidura cyanea</i>	Reddish-grey musk shrew	DD		
Chiroptera				
<i>Rhinolophus clivosus</i>	Geoffroy's horseshoe bat		X	
<i>Neuromicia capensis</i>	Cape serotine bat		X	
<i>Tadarida aegyptiaca</i>	Egyptian free-tailed bat		X	
Primates				
¹ <i>Papio hamadryas ursinus</i>	Chacma baboon		X	
<i>Cercopithecus pygerythrus</i>	Vervet monkey		X	
Carnivora				
<i>Vulpes chama</i>	Cape fox			X
<i>Canis mesomelas</i>	Black-backed jackal		X	
<i>Aonyx capensis</i>	African clawless otter			X
<i>Ictonyx striatus</i>	Striped polecat		X	
² <i>Poecilogale albinucha</i>	Striped weasel	DD		X
<i>Genetta genetta</i>	Small-spotted genet		X	
<i>Suricata suricatta</i>	Suricate		X	
<i>Cynictis penicillata</i>	Yellow mongoose		X	
<i>Galerella pulverulenta</i>	Cape grey mongoose		X	
<i>Atilax paludinosus</i>	Marsh mongoose			X
<i>Proteles cristatus</i>	Aardwolf		X	
² <i>Parahyaena brunnea</i>	Brown hyaena	NT		X
<i>Caracal caracal</i>	Caracal		X	
<i>Felis silvestris</i>	African wild cat		X	
<i>Felis nigripes</i>	Black footed cat			X
<i>Otocyon megalotis</i>	Bat-eared fox		X	
<i>Panthera pardus</i>	Leopard			X
Perissodactyla				
¹ <i>Ceratotherium simum</i>	White rhinoceros		X	
^{2,1} <i>Diceros bicornis minor</i>	Black rhinoceros	VU	X	
¹ <i>Equus quagga</i>	Plains zebra		X	
Hyracoidea				
<i>Procavia capensis</i>	Rock hyrax		X	
Tubulidentata				
<i>Orycteropus afer</i>	Aardvark		X	
Artiodactyla				
¹ <i>Phacochoerus africanus</i>	Common warthog		X	
¹ <i>Connochaetus gnou</i>	Black wildebeest		X	
¹ <i>Alcelaphus buselaphus</i>	Red hartebeest		X	
¹ <i>Damaliscus pygargus phillipsi</i>	Blesbok		X	
<i>Sylvicapra grimmia</i>	Common duiker		X	
<i>Antidorcas marsupialis</i>	Springbok		X	
<i>Rhaphicerus campestris</i>	Steenbok		X	
¹ <i>Aepyceros melampus</i>	Impala		X	
¹ <i>Oryx gazella</i>	Gemsbok		X	
¹ <i>Syncerus caffer</i>	African buffalo		X	
¹ <i>Tragelaphus strepsiceros</i>	Greater kudu		X	

Table 1 (continued)

Scientific name	Common name	Status	Observed in surveys	Signs/ TDR personnel
¹ <i>Tragelaphus oryx</i>	Eland		X	
<i>Redunca fulvorifula</i>	Mountain reedbuck		X	
¹ <i>Redunca arundinum</i>	Southern (Common) reedbuck		X	
³ <i>Cervus dama</i>	Fallow Deer			X
Rodentia				
<i>Xerus inauris</i>	South African ground squirrel		X	
<i>Pedetes capensis</i>	Springhare		X	
<i>Hystrix africaeaustralis</i>	Cape porcupine		X	
<i>Cryptomys hottentotus</i>	African mole-rat		X	
<i>Otomys irroratus</i>	Vlei rat		X	
² <i>Otomys saundersiae</i>	Saunders' vlei rat			
<i>Mystromys albicaudatus</i>	White-tailed rat	EN		
<i>Saccostomus campestris</i>	Pouched mouse		X	
<i>Malacothrix typica</i>	Large eared mouse		X	
<i>Dendromus melanotis</i>	Gey climbing mouse			
<i>Rhabdomys pumilio</i>	Four-stripe grass mouse		X	
<i>Mus minutoides (sensu lato)</i>	Pygmy mouse		X	
<i>Mastomys (sensu lato)</i>	Multimammate mouse		X	
<i>Aethomys namaquensis</i>	Namaqua rock mouse		X	
<i>Grahiurus murinus</i>	Woodland dormouse		X	
<i>Tatera brantsii</i>	Highveld gerbil			X
<i>Tatera leucogaster</i>	Bushveld gerbil			
Lagomorpha				
<i>Lepus saxatilis</i>	Scrub hare		X	
<i>Lepus capensis</i>	Cape hare		X	
<i>Pronolagus rupestris</i>	Smith's red rock rabbit		X	
Macroscelidea				
<i>Elephantulus myurus</i>	Rock elephant shrew		X	

Species in bold are records from Ferreira & Avenant (2003).

extreme southern Free State Province and is of the opinion that they are absent from the rest of the province. This species has however been recorded at Sandveld Nature Reserve in the western Free State (Avenant & Watson 2002).

Next to the drainage lines where riverine vegetation was present, the highest number of species (5) were recorded. The two most common species were generalists, *Rhabdomys pumilio* and *Mastomys (sensu lato)*. These two species usually have wide habitat requirements and are catholic. The high species variety is probably due to the greater number of micro habitats that are available, more diverse food range and the denser veg-

etation cover in these areas. *Otomys irroratus*, a specialist and vegetarian, was only collected in the riverine areas as this species tends to keep to areas with firstly dense vegetation cover and secondly, areas associated with higher moisture which also promotes plant production (Table 2).

Conclusion

As mentioned above, Tussen-die-Riviere Nature Reserve has 66 recorded mammal species present. A number of these species are endemic to South Africa and some are listed in Red Data book categories (Fried-

Table 2

Species variety and trap success for the various habitats sampled in Tussen-die-Riviere Nature Reserve, Free State Province, South Africa

Habitat	Nights	Trap Number of individuals (Percentage trap-success)							Total no. individuals and trap-success
		<i>Aethomys namaquensis</i>	<i>Saccostomus campestris</i>	<i>Rhabdomys pumilio</i>	<i>Mastomys sensu lato</i>	<i>Otomys irroratus</i>	<i>Mus minitoides</i>	<i>Graphiurus murinus</i>	
Rocky outcrop	120	5 (4.2%)							5 (4.2%)
Grass/ Shrub plains	280	2 (0.7%)	4 (1.4%)						6 (2.1%)
Riverine	640		4 (0.6%)	7 (1.1%)	7 (1.1%)	1 (0.2%)	1 (0.2%)		20 (3.2%)
Old shed	140				3 (2.1%)			2 (1.4%)	5 (3.5%)
Total	1180	7 (0.6%)	8 (0.7%)	7 (0.6%)	10 (0.9%)	1 (0.08%)	1 (0.08%)	2 (0.2%)	36 (3.1%)

man & Daly 2004). Tussen-die-Riviere Nature Reserve falls within the transitional zone between the Nama-Karoo and Grassland biomes and is an important area for the conservation of South African mammals. The reserve supports a high species richness, including some endemics and is pointed out as a priority area for carnivores (Gelderblom *et al.* 1995). Furthermore, the reserve forms an integral part of the conservation network in this region. This also supports the recommendation by Gelderblom *et al.* (1995) that maximum conservation effort with minimum land surface can be achieved in this region. This should be investigated by the various adjoining provinces and an effort must be made to increase the surface area of the conservation areas in this biome. The formation of a trans-provincial park, linking all the nature reserves and having a jointly-managed management plan for the whole area will also enhance the biodiversity conservation effort in this biome.

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