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Trophic ecology of rusty-spotted genet *Genetta maculata* and slender mongoose *Herpestes sanguineus* in Telperion Nature Reserve, with a focus on dietary segregation as a possible mechanism of coexistence

By

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Declaration

I, Julia Zemouche (595534), hereby declare that this dissertation is my own unaided work. It is being submitted for the Degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

Signature: 

29/05/2018

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Abstract

The diets of the rusty-spotted genet *Genetta maculata* and slender mongoose *Herpestes sanguineus* were investigated in Telperion Nature Reserve. A total of 196 genet scats and 97 mongoose scats were collected from latrines between April 2016 and August 2017. Scats were washed, oven dried at 50°C for 24 hours and their contents separated. Diet was determined through the identification of undigested food remains in the scats and hair scale patterns were used to identify which specific mammal species were consumed. Arthropod and small mammal abundance in Telperion Nature Reserve was also determined. Small mammals and arthropods were found to be the dominant prey of *G. maculata*, with birds, reptiles, seeds/fruit pulp, plant material and amphibians serving as supplementary food sources. Intermediate-to-high diet diversity and diet breadth indices were obtained for all seasons and diet overlap between pairs of seasons was also intermediate-to-high. For *H. sanguineus*, arthropods were the dominant prey, with mammals, birds, reptiles, seeds/fruit pulp, plant material and amphibians acting as supplementary food sources. Low-to-intermediate diet diversity and low diet breadth indices were obtained for all seasons and diet overlap between pairs of seasons was very high. While no significant seasonal variation was observed for *H. sanguineus*, the seasonal peaks in availability of mammals and arthropods were found to coincide with peaks in the consumption of these two food categories by both species. The results therefore suggest that *G. maculata* is a generalist opportunist feeder and *H. sanguineus* is a generalist selector, with both species supplementing their diet when preferred food items become less abundant and varying diet according to season in response to seasonal changes in prey availability. Diet was fairly similar for these species, with dietary overlap being highest during spring and summer. Considering the dietary overlap observed, it is possible that trophic segregation on its own may not be enough to facilitate coexistence between *G. maculata* and *H. sanguineus*. However, the slight within-category differences that were noted may aid in decreasing trophic overlap. It is therefore possible that other factors such as temporal and spatial segregation, in conjunction with the slight trophic differences, aid in facilitating coexistence between *G. maculata* and *H. sanguineus* in Telperion Nature Reserve.

Key words: arthropods, coexistence, diet, diet breadth, diet diversity, diet overlap, generalist feeder, generalist opportunist, generalist selector, *Genetta maculata*, *Herpestes sanguineus*, prey availability, scat analysis, small mammals, specialist feeder, trophic segregation.

Table of Contents

Declaration ..... **i**

Acknowledgements ..... **ii**

Abstract ..... **iii**

Chapter 1: Introduction **1**

1.1 Rationale 1

1.2 Literature review 1

1.2.1 The importance of dietary studies 1

1.2.2 Methods of collecting dietary information 3

1.2.3 The importance of dietary studies in carnivores 4

1.2.4 Using diet analysis to understand coexistence 5

1.2.5 Background information on the rusty-spotted genet 7

1.2.6 Background information on the slender mongoose 9

1.3 Aim, objectives and predictions 10

1.4 Dissertation outline 11

Chapter 2: Food availability: small mammal and arthropod sampling **12**

2.1 Methods and materials 12

2.2 Results 13

Chapter 3: Trophic ecology of rusty-spotted genet *Genetta maculata* in Telperion Nature Reserve **19**

3.1 Abstract 19

3.2 Introduction 19

3.3 Methods and materials 21

3.3.1 Study site 21

3.3.2 Scat collection 22

3.3.3 Scat analysis 22

3.3.4 Expression of results 23

3.4 Results 25

3.4.1 Overall diet and seasonal variations in the diet of the rusty-spotted genet 25

3.5 Discussion 33

3.5.1 Overall diet of the rusty-spotted genet 33

3.5.2 Food availability and seasonal variations in the diet of the rusty-spotted genet 37

3.6 Conclusion 40

Chapter 4: Trophic ecology of slender mongoose *Herpestes sanguineus* in Telperion Nature Reserve 42
4.1 Abstract 42
4.2 Introduction 42
4.3 Methods and materials 45
4.3.1 Study site 45
4.3.2 Scat collection 45
4.3.3 Scat analysis 46
4.3.4 Expression of results 47
4.4 Results 48
4.4.1 Overall diet and seasonal variations in the diet of the slender mongoose 48
4.5 Discussion 55
4.5.1 Overall diet of the slender mongoose 55
4.6 Conclusion 62
Chapter 5: Species comparison – results and general discussion 64
5.1 Comparison of diet and dietary overlap between the rusty-spotted genet and slender mongoose with a focus on coexistence 64
5.2 Conclusion 68
References 69
Appendix A: A conservation assessment of *Genetta maculata* 78
Appendix B: A conservation assessment of *Herpestes sanguineus* 86
Appendix C: Raw data 92

Chapter 1: Introduction

1.1 Rationale

Within Telperion Nature Reserve, two small mammalian carnivores (order Carnivora) occur in sympatry and even syntopy. These are the rusty-spotted genet *Genetta maculata* and the slender mongoose *Herpestes sanguineus*. The co-occurrence of these two species within their overlapping distribution ranges is relatively common and therefore worthy of a study to determine how these species are able to survive in the same area. In addition to this, relatively little is known about the biology and ecology of both species. In order to determine what mechanisms make the coexistence of these small carnivores possible, I will be focusing on their diet. Two other studies are focusing on the spatio-temporal ecology of *G. maculata* (Roux 2018) and *H. sanguineus* (2017–2019; Moyo *in prep.*), respectively, in Telperion Nature Reserve. Together, these three studies will allow the evaluation of potential niche segregation between these two small carnivores in three dimensions (space, time, diet). Regarding the diet, a small number of studies have been carried out on *G. maculata* and these have either been based on small sample sizes or carried out elsewhere in Africa where conditions are different (Angelici and Luiselli 2005; Martinoli *et al.* 2006). Minor studies have also been conducted on *H. sanguineus* elsewhere in Africa (Maddock 1988; Martinoli *et al.* 2006). My study would therefore constitute the first comprehensive description of the diet of *G. maculata* and *H. sanguineus* in South Africa.

1.2 Literature review

1.2.1 The importance of dietary studies

The study of diets is vital to understanding how animals survive in and adapt to their specific environments. Diet studies can provide information not only on the diet composition of individual species, but on the degree of diet overlap between different species (Ashmole and Ashmole 1967). Information on diet composition can also tell us whether any commercially important plants or animals are being consumed (Schaefer 1970; Furness and Cooper 1982; Odden *et al.* 2006). Apart from information pertaining to the species whose diet is being studied, diet studies can tell us about the age, distribution, sex, body condition, reproductive state and stomach contents of the prey species that are being consumed (Sunada *et al*. 1981; Vermeer and Westrheim 1984; Duffy *et al*. 1985).

Dietary studies also inform us of which factors may influence diet composition. Dietary variations between different areas may indicate variations in prey assemblages or abundance due to differing environmental conditions (Bowen *et al.* 1993; Bowen and Harrison 1994). In species such as the grey seal *Halichoerus grypus*, which occurs in both inshore and offshore areas, geographic variations in diet have been observed (Benoit and Bowen 1990; Bowen *et al*. 1993). Bowen *et al*. (1993) found that the diet of grey seals in offshore locations mostly consisted of squid, northern sand lance, cod and silver hake while the diet of grey seals at inshore locations included pollock, squid, Atlantic mackerel, herring and cod. Dietary differences according to season are often due to short-term changes associated with prey migration and breeding, and the flowering, fruiting and leaf-out of plants (Bowen and Harrison 1994; Lundström *et al.* 2010). In a study by Lucherini and Crema (1994) involving the red fox *Vulpes vulpes*, varying weather conditions associated with changing seasons were linked to dietary shifts. While Alpine marmots *Marmota marmota* and insects were the dominant prey items of foxes during autumn and summer, these prey items were unavailable during winter, resulting in foxes having to make use of other food resources. During winter, there was an increase in the presence of ungulate remains in fox scats, which is linked to the winter-related peak in ungulate mortality (Festa-Bianchet 1989). The absence of preferred food items also led to the foxes exploiting difficult-to-catch prey such as the mountain hare *Lepus timidus* as well as less preferred items such as garbage left by tourists (Lucherini and Crema 1994). Diet is also likely to vary according to age and sex (Gales 1982; Simpfendorfer *et al*. 2001; Beck *et al*. 2007). Due to smaller stature and a possible lack of hunting experience, young individuals may be restricted in terms of the prey they can target (Lundström *et al.* 2010). In tiger sharks *Galeocerdo cuvier*, for example, an age-related shift in diet was observed with the occurrence of larger prey items increasing with an increase in body size (Simpfendorfer *et al*. 2001). This was linked to larger, mature individuals being more efficient hunters and therefore capable of targeting larger and faster prey (Simpfendorfer *et al*. 2001). Variation between males and females may stem from their differing energy requirements, differences in size and strength, as well as the trade-offs that take place between feeding and other activities that vary with sex (Lundström *et al.* 2010). In females that are pregnant or caring for young, diets are often adjusted in order to provide their young with the required nutrients (Harris and Hislop 1978; Montevecchi and Piatt 1984). Pregnant female rats *Rattus rattus*, for example, require more high quality protein in their diet in order to nourish developing embryos, and consequently increase the amount of animal matter in their diets in order to obtain the necessary protein (Gales 1982).

1.2.2 Methods of collecting dietary information

Numerous methods are available to analyse the diet of animals. In the past, many studies relied on killing animals in order to collect their stomach contents for dietary analysis (Duffy and Jackson 1986; Trites and Joy 2005). More recently, however, scientists have begun to focus on less destructive methods of obtaining dietary information, especially for long-term studies (Colgan *et al.* 1997; Trites and Joy 2005). When caught and handled, many bird species will spontaneously regurgitate stomach contents or, if they do not regurgitate, stomach pumps can be used to collect the contents of their stomachs (Duffy and Jackson 1986). While less destructive than killing, the use of certain stomach pumps has been found to cause suffering and can lead to the death of some individuals (Duffy and Jackson 1986). Direct observation of animals is another way to determine diet (Sanders *et al*. 1980; Duffy and Jackson 1986), however, this method is likely to be time consuming and unsuitable for shy or nocturnal species or environments where visibility is low. One method that has gained a great deal of popularity is scat or faecal analysis (Sanders *et al*. 1980; Pierce *et al*. 1991; Trites and Joy 2005). While scat analysis has been used for animals such as birds (Beckwith and Bull 1985; Ralph *et al*. 1985; Perez-Hurtado *et al*. 2010) and bats (Rydell 1989; Shiel *et al*. 1991), it has mostly been used to determine the diets of carnivores, including ursids (Hewitt and Robbins 1996), mustelids (Bartoszewicz and Zalewski 2003), canids (Krueger *et al*. 1999), felids (Malo *et al*. 2004) and viverrids (Amroun *et al*. 2014). This method involves the identification of remains found in scats, through comparison with reference collections and various identification guides (Trites and Joy 2005). Arthropods can be identified from wings and/or parts of the exoskeleton (Trites and Joy 2005). Small mammals are identified through fur and bones, including structures such as jaw bones and teeth (Trites and Joy 2005). Plants and fruits that have been consumed can be identified from seeds, fruit pulp and fibrous material (Trites and Joy 2005). According to Sanders *et al*. (1980), this method of analysis is ideal as it allows animals to move and feed freely and naturally, allows diet to be determined regardless of landscape, can be used for both wild and domestic animals, does not require animals to be killed, requires little to no animal care, is relatively objective, and allows us to identify individual plant or animal species that have been consumed. While this method has many advantages over other methods, there are still some drawbacks. Since this method relies on hard or indigestible parts being present in scats, soft-bodied prey items or items that are quickly and easily digested, such as soft-bodied insect larvae, may be difficult or impossible to detect (Pierce *et al*. 1991; Cleary *et al*. 2011). In addition to this, if hard parts such as bones or large seeds are not ingested, identification of these food items may not be possible (Pierce

et al. 1991). Despite these shortcomings, scat analysis is still the preferred method for many dietary studies.

1.2.3 The importance of dietary studies in carnivores

Carnivores play a complex and important role in the ecosystem (Roemer *et al*. 2009). A detailed knowledge of a carnivore's diet allows us to evaluate whether it is competing with other carnivore species, how it influences populations of prey species, and whether any agriculturally or commercially important species are being preyed-upon (Litvaitis 2000; Klare *et al.* 2011).

There are relatively few carnivores that are strictly carnivorous (Estes 1991). The majority tend to be omnivorous consuming various arthropods, fruits and berries to supplement their diet (Estes 1991). Carnivores can also be classified as either generalists or specialists. Generalists target a wide variety of prey that may range in size from small insects to animals much larger than themselves (Estes 1991). The composition of a generalist's diet will usually vary according to season, reflecting a change in the availability and abundance of prey species (Pyke *et al*. 1977). Other carnivores are highly specialised, such as the aardwolf *Proteles cristata,* which is an insectivore (Smithers 1971, Skinner and Chimimba 2005). In some instances, specialists are obligatory, feeding exclusively on a particular prey species, irrespective of abundance (Herbst and Mills 2010). Other specialists are facultative, changing their dominant prey if more profitable prey becomes available (Glasser 1982). Rosenzweig (1985) pointed out that "generalist" and "opportunist" have often been used interchangeably and suggested that a distinction should be made between the behaviour and ability of an animal in order to separate these terms. Thus, a generalist is described as an animal that is able to utilise a wide variety of resources while the term "opportunist" describes an animal's behaviour and refers to the use of a wide range of resources usually proportionate to their availability. Rosenzweig (1985) also described a specialist as an animal that is able to survive on a small portion of available resources and suggested a new term "selector" to define the use of a small range of resources, not necessarily proportionate to their availability. However, there has been some discussion on whether predators can be classified as either generalists or specialists (Futuyama and Moreno 1988) since predators are often generalists when prey availability is low, becoming increasingly specialised as the abundance of prey rises (Pyke *et al*. 1977).

Depending on the wide variety of food items a carnivore may consume, including vegetation, insects, fish and mammals, and the degree of diet specialisation, carnivores can have a large and cascading impact on the environment (Estes *et al*. 1998). The utilisation of one prey species by a carnivore may influence the abundance of that prey species or other prey species, which in turn can impact other carnivores. Since carnivores play such an important role in the ecosystem, knowledge of their diet and how their diet may influence other organisms is crucial in developing environmental management plans and conservation strategies, not only for the carnivore in question but for other organisms as well (Clemmons and Buchholz 1998).

1.2.4 Using diet analysis to understand coexistence

While diet analysis is useful for determining the diet of individual species, if we analyse the diets of multiple sympatric species we can gain information on how they coexist. If we observe differences in diet between species, we can then try to understand whether any of these differences are due to factors such as the species occupying slightly different spatial niches within the same habitat or having different patterns of diel activity, both of which could result in differences in diet composition (Schoener 1974; Pianka 1978; Lichstein *et al*. 2007). These differences in diet may be mild, i.e. different prey species from the same taxonomic group(s) with some overlap present, or extreme, i.e. completely different prey items with little to no diet overlap.

When an area is occupied by multiple species, competition is bound to occur over resources such as food or shelter. Thus, one of the greatest challenges encountered in the study of coexistence is to understand how multiple sympatric species are able to coexist without competitive exclusion occurring (Wilson 1990; Laird and Schamp 2006).

There are two ways in which competition can occur between sympatric species, i.e. exploitative and interference competition (Amarasekare 2002). Exploitative competition occurs when species have an indirect negative effect on each other through the use of a common resource (Case and Gilpin 1974). In this case, each species affects the other through reducing the abundance of shared resources (Vance 1984). Interference competition occurs when species experience direct negative interactions with each other, such as fighting (Schoener 1983). Species that are able to coexist despite this competition are often able to do so because one species is generally the superior resource exploiter while the other species is the superior interferer (Amarasekare 2002).

Interference competition, when it is classically defined, involves the interacting species only incurring costs, without any benefits (Amarasekare 2002). In this situation, coexistence is impossible even when a trade-off between exploitation and interference exists between the competing species (Amarasekare 2002). There are, however, some interference mechanisms, such as predation, which are considered beneficial (Amarasekare 2002). When beneficial interference occurs, coexistence is possible because the benefits of interference now outweigh the costs associated with the time and energy spent on aggressive encounters (Amarasekare 2002). In other words, competing species that engage in costly interference will be unable to coexist unless they also engage in some form of beneficial interference. An example of this is seen between the weasel *Mustela nivalis* and stoat *M. erminea,* which have overlapping ranges and diets (Erlinge and Sandell 1988). Due to its superior ability to exploit low-density rodent populations, the weasel is considered the superior exploiter while the scent marking and direct aggression engaged in by the stoat make it the superior interferer. Under these circumstances, the costs associated with scent marking and direct aggressive encounters would normally make coexistence impossible. However, the presence of weasel remains in stoat scats indicate that beneficial interference, in the form of intraguild predation, also occurs thus allowing for the two species to coexist.

There are also various coexistence mechanisms that allow sympatric species to survive together. Spatial heterogeneity/complexity is thought to play a major role in facilitating species coexistence (Chesson 2000) as it allows for habitat selection, one of the main mechanisms that promote coexistence (Rosenzweig 1981). Heterogeneous or complex environments allow sympatric species within the same trophic level to select and occupy different spatial niches or microhabitats, thereby reducing competition (Pianka 1978; Lichstein *et al*. 2007). The selection of different spatial niches or microhabitats by competing species is made possible when at least one of the interacting species is better able to exploit a particular environment or resource (Tilman 1982) or when it has superior colonising abilities (Tilman 1994). In addition to this spatial segregation, coexistence can also be made possible through temporal segregation when the competing species differ in their patterns of diel activity (Schoener 1974). Differences in diel activity patterns may allow species to exploit slightly different food resources (Schoener 1974) or avoid direct encounters with each other (Case and Gilpin 1974; Fedriani *et al*. 1999). Coexistence may be further facilitated when one of the species is more flexible in terms of the size or type of prey it captures or the habitats it can utilise (Crooks and Van Vuren 1995).

An example of some of these coexistence mechanisms at play can be seen in the interaction between the island spotted skunk *Spilogale gracilis amphiala* and the island fox *Urocyon littoralis* on Santa Cruz Island, USA. The coexistence of these two species on the island is rather unusual as very few oceanic islands are able to support two mammalian carnivores due to interspecific competition (Crooks and Van Vuren 1995). Crooks and Van Vuren (1995) observed that substantial overlap was present in the use of space, diet and diel activity pattern. The island spotted skunk and island fox are able to coexist due to differences in habitat use, activity and diet. First, skunks and foxes show partial resource segregation through the use of different habitats. Skunks tend to be more specialised than foxes when it comes to habitat selection and prefer ravines while foxes are more general in their use of habitat types. Second, skunks also appear to be more specialised in their diets. Skunks are strictly carnivorous, mostly eating deer mice, while foxes are omnivorous, eating deer mice, insects, berries and fruit. Although competition exists due to both species eating deer mice, the fact that foxes are able to make use of other food items lessens competition with skunks. Lastly, both species differ in their patterns of diel activity with foxes being active during both the day and night while skunks are exclusively nocturnal. This difference in periods of activity may allow both species to limit competition by utilising different resources (Schoener 1974) and reducing the chances of direct encounters with each other (Case and Gilpin 1974).

Knowledge of how the above-mentioned mechanisms of coexistence function is crucial as they help us understand how animals interact in biological communities (Cornell and Lawton 1992). In addition to this, the mechanisms that promote coexistence are of interest because they often have the potential to affect population growth (Linnell and Strand 2000). In the case of carnivores, for example, a change in the population of one species can have a cascading effect on the whole carnivore community as well as populations of prey species (Linnell and Strand 2000). This aspect needs to be taken into account if any of the predators or prey that could be affected are part of a conservation programme or are of management interest (Clemmons and Buchholz 1998; Linnell and Strand 2000).

1.2.5 Background information on the rusty-spotted genet

The rusty-spotted genet *Genetta maculata* belongs to the family Viverridae within the order Carnivora. There are 15 genera within this family (Wozencraft 2005), including the genus *Genetta*. While there has been much debate over the exact number of species within the genus (Gray 1864; Allen 1939; Coetzee 1977; Crawford-Cabral 1981; Wozencraft 1993; Gaubert *et al*. 2005; Wozencraft 2005; Angelici and Gaubert 2013), it is generally accepted that there are

14 *Genetta* species (Wozencraft 2005). *Genetta maculata* is part of the "large-spotted genet complex" which also includes the Cape genet *G. tigrina* and the Pardine genet *G. pardina* (Angelici and Gaubert 2013).

Genetta maculata is characterised by a pale body with large rust-coloured spots, pale legs, large rounded ears and a long ringed tail with a dark tip (Grobler *et al.* 1988; Angelici and Gaubert 2013). It also possesses white markings below its eyes and a facial mask consisting of dark markings between the nose and eyes (Grobler *et al.* 1988). Ground colouration may differ greatly between as well as within regions and varies between rufous-grey, grey-yellow, pale yellow and sandy-grey (Angelici and Gaubert 2013). There is little-to-no sexual dimorphism within this species in terms of colouration or body size (Angelici and Gaubert 2013). Individuals may range in weight from 1.0 to 2.2 kg with a head and body length of 42–58 cm and a tail length of 38–45 cm (Grobler *et al.* 1988).

This species has a wide distribution across sub-Saharan Africa, ranging from Nigeria to Eritrea and Somalia and south towards central Namibia and the KwaZulu-Natal Province in South Africa (Angelici and Gaubert 2013). Within South Africa, *G. maculata* occurs in parts of Limpopo, Mpumalanga and down into KwaZulu-Natal (Angelici *et al.* 2015). *Genetta maculata* occupies a wide variety of habitats including woodlands, swampy areas, thickets, forests, riverine vegetation and grassy savanna (Angelici and Gaubert 2013). It prefers habitats near water and will therefore avoid drier regions (Angelici and Gaubert 2013). It has also been observed on farms and in suburban areas. The rusty-spotted genet is mostly nocturnal and makes use of a variety of resting sites during the day including hollows in trees and logs, spaces under rock overhangs, disused burrows and man-made structures (Angelici and Gaubert 2013). Males can occupy ranges of up to 500 ha (Carpenter 1970) often overlapping the ranges of several females which tend to be smaller at approximately 25 ha (Estes 1991; Angelici and Gaubert 2013). Research conducted in Telperion Nature Reserve found that the average home range size for *G. maculata* was 333 ha (Roux 2018). Territorial marking within these ranges takes place using faeces, urine and secretions from the perineal glands (Estes 1991; Angelici and Gaubert 2013).

Although this species is mostly solitary, pairs are sometimes observed during the breeding season, which extends from August to March in southern Africa (Skinner and Chimimba 2005). Gestation lasts 70–77 days after which 2–5 kittens are born in nests made of leaves,

hollows in trees and spaces under roofs in urban areas (Estes 1991; Skinner and Chimimba 2005).

The rusty-spotted genet is an adept predator and may forage either on the ground or in trees (Estes 1991). While this species is mainly carnivorous, it will also consume fruits and seeds (Angelici and Gaubert 2013). The animal-based part of their diet may include various small mammals, lizards, snakes, amphibians, fish, spiders, centipedes, scorpions, birds, eggs and insects (Estes 1991; Angelici and Gaubert 2013).

1.2.6 Background information on the slender mongoose

The slender mongoose *Herpestes sanguineus* belongs to the family Herpestidae within the order Carnivora. The subfamily Herpestinae comprises 14 genera, one of which is *Herpestes*, represented by 14 species, of which five are found in Africa (Wozencraft 1993; Bininda-Emonds 2013; Taylor 2013). These include the slender mongoose, Cape grey mongoose *H. pulverulentus*, Egyptian mongoose *H. ichneumon*, Somali slender mongoose *H. ochraceus* and Kaokoveld slender mongoose *H. flavescens* (Taylor 2013). The taxonomy of *H. sanguineus* has involved some debate as it has been suggested that this species contains numerous subspecies (Coetzee 1977; Meester *et al.* 1986; Watson and Dippenaar 1987; Watson 1990; Taylor and Goldman 1993; Wozencraft 2005; Hoffmann and Taylor 2013). This debate has mainly been fuelled by the fact that there is a large amount of colour variation within the species, possibly linked to geographic variations or seasonal colour changes.

While there is a large amount of variation in the colouring of this species, ranging from almost black to reddish, the most common colours are brownish-grey and a grizzled brown (Taylor 1975; Hoffmann and Taylor 2013). Fur colour appears to be associated with factors such as the dryness of the environment or the colour of the substrate, with darker colours occurring in moister habitats (Hoffmann and Taylor 2013). *Herpestes sanguineus* is further characterised by a slender body, buff underparts and a long slender tail with a black tip (Taylor 1975; Hoffmann and Taylor 2013). Sexual dimorphism is minimal with males sometimes being slightly larger than females (Taylor 1971; Hoffmann and Taylor 2013). The slender mongoose ranges in weight from 0.35 to 0.9 kg with a head and body length of 27.5–40 cm and tail length of 23–33 cm (Taylor 1970).

Herpestes sanguineus is widespread across Africa ranging from Senegal in the west to the Red Sea coast in Sudan and southwards to the Northern Cape in South Africa (Taylor 1975; Skinner and Chimimba 2005). Within South Africa, the most southerly distribution limit of *H.*

sanguineus is the eastern parts of the Eastern Cape (Hoffmann and Taylor 2013). This species occurs in a wide variety of habitats ranging from semi-desert to thick woodland (Dücker 1965; Hoffmann and Taylor 2013). However, it is absent from true deserts such as the Namib Desert and the sub-desertic areas of the Sahara such as Aïr, Niger (Hoffmann and Taylor 2013). It is also absent from the karroid regions of the Eastern, Western and Northern Cape (Hoffmann and Taylor 2013). Slender mongooses are sometimes seen near villages and may inhabit forest fringes, penetrating into forests along roads (Hoffmann and Taylor 2013). Although commonly terrestrial, the slender mongoose is more arboreal than most other mongoose species (Taylor 1970; Hoffmann and Taylor 2013). Slender mongooses use dens for shelter and giving birth and while they are capable of digging their own burrows, they often make use of disused Aardvark (*Orycteropus afer*) holes (Hoffmann and Taylor 2013). They may also utilise termitaria, hollow logs, fallen trees or spaces under piles of rocks (Hoffmann and Taylor 2013). Males tend to occupy territories of approximately 50 ha and these frequently overlap with the territories of several females, which are closer to 25 ha in size (Rood and Waser 1978: Skinner and Chimimba 2005). However, territories may be larger in some areas, ranging up to 100 ha (Maddock 1988; Taylor 1970).

Herpestes sanguineus is primarily solitary, although pairs are often seen travelling together (Shortridge 1934; Skinner and Chimimba 2005). This species is a seasonal breeder with births coinciding with the wet, summer months (October–March) in southern Africa (Skinner and Chimimba 2005). Females often begin reproducing at 1 year of age (Waser *et al.* 1995) and after a gestation period of 60–70 days, 2–4 pups are born in a den (Taylor 1969, 1975).

Slender mongooses are diurnal hunters and while they mostly forage on the ground, their ability to climb trees may allow them to actively hunt birds (Bates 1905; Hinton and Dunn 1967). Their diet consists of various small rodents, insects, lizards, snakes, amphibians, birds and eggs (Shortridge 1934; Hoffmann and Taylor 2013). While mostly carnivorous, *H. sanguineus* will also eat wild fruits (Hoffmann and Taylor 2013).

1.3 Aim, objectives and predictions

The aim of this research was to study the trophic ecology and coexistence between *G. maculata* and *H. sanguineus* within the Telperion Nature Reserve. More specifically, the objectives were to:

1) determine the diet composition of *G. maculata* and *H. sanguineus* and assess whether there is dietary segregation between these two species, and

2) assess whether there are seasonal variations in the diet of both species, and whether these are correlated with the seasonal abundance or biomass of their dominant prey (small mammals and arthropods).

It was predicted that:

1) due to the differences in diel activity patterns exhibited by *G. maculata* and *H. sanguineus*, differences in the composition of their diets are expected,

2) seasonal changes in climatic conditions and vegetation will lead to variations in small mammal and arthropod abundance/biomass, and

3) *G. maculata* and *H. sanguineus* diet will vary seasonally according to variations in the abundance or biomass of their dominant prey.

1.4 Dissertation outline

Chapter 1 gives the introduction and describes the objectives of the study.

Chapter 2 describes how small mammals and arthropods were sampled in order to determine food availability. It also gives results of the sampling.

Chapter 3 examines the trophic ecology of the rusty-spotted genet with references to the results given in Chapter 2.

Chapter 4 examines the trophic ecology of the slender mongoose with references to the results given in Chapter 2.

Chapter 5 compares the diet of the rusty-spotted genet and slender mongoose and addresses the coexistence between these two species.

A list of the references used in this dissertation as well as appendices follows after Chapter 5.

Chapter 2: Food availability: small mammal and arthropod sampling

2.1 Methods and materials

To evaluate potential seasonal variations in rusty-spotted genet and slender mongoose prey availability, and to identify the dietary remains in the scat, reference collections were assembled. The following procedures were repeated during all four seasons of the study period.

Small mammals were caught using Sherman folding aluminium traps (H. B. Sherman Traps, Tallahassee, Florida, USA; breadth × height × length: 8 × 23 × 9 cm**)** as well as PVC traps (breadth × height × length: 6.5 × 29.5 × 7.7 cm; Willan, 1979). Three sampling sites representative of the diversity of habitats in the reserve were chosen, including a grassland site, rocky outcrop site and riverbank site. A total of 100 traps were divided across the three sampling sites. In both the grassland and rocky outcrop sites, 25 traps were set in a grid arrangement (5 × 5 traps) with a 10 m interval between each trap resulting in a total plot size of 1600 m^2 at each site. In the river bank site, 50 traps were set in a linear arrangement with 25 traps placed on the ground and 25 traps placed in trees. There was a space of roughly 10 m between each trap location. All traps were baited with a mixture of oats and sunflower oil. During the warmer months (October–April), the traps were covered with vegetation to provide shade and in the cooler months (May–September), the traps were insulated and lined with cotton wool to provide warmth to the trapped animals. The traps were set for a period of 5 days and nights during which they were checked early every morning to collect the nocturnal species that were trapped over-night and checked again in the afternoon to collect diurnal species that were trapped throughout the day. The traps were reset after each time they were emptied. Trapped animals were identified in the field and hair samples were taken. Animals were emptied from the trap into a Ziploc bag. In order to access the animal, I used gloved hands and a sterilised scissor was used to take a small sample of hair. These hair samples were used for species identification purposes as well as to mark individuals in order to determine biomass. No sedation was required and animals were released at their individual sites of capture immediately after hair samples were taken. Hair samples were stored in labelled vials until needed. The total number of captures was calculated for each study site. To investigate any possible seasonal and inter-site variations in the number of captures, chi-square tests of independence were used.

To collect arthropods, pitfall traps were set for 5 days using plastic containers. Four sets of 4 pitfall traps, arranged in 2 × 2 trap grids with 0.5–1 m between each trap, were set at each of the three sampling sites (16 traps at each site and 48 traps in total). Each trap contained a small amount of diluted dishwashing liquid to prevent the insects from escaping after falling into the traps. Each set of 4 pitfall traps had 2 traps designated for collecting diurnal species and 2 traps designated for collecting nocturnal species. Every morning, small plates were placed over the nocturnal traps and in the evening these plates were moved to cover the diurnal traps. After 5 days, the insects were removed from the traps and placed in labelled plastic storage tubes with ethanol for preservation. Insects were later dried and weighed. An index of relative biomass per site was calculated as the mean biomass per individual pitfall trap (n = 16) per site. Possible differences in biomass across the three sampling sites were tested for using a Kruskal–Wallis test since data were not normally distributed (Kolmogorov–Smirnov tests, $p < 0.05$). Related-samples Wilcoxon tests were conducted to identify inter-seasonal differences in arthropod biomass at each of the three sample sites.

2.2 Results

The number of captured small mammals varied significantly over the seasons in all three sites (Table 2.1). The number of captures peaked during winter for the river, during winter and spring for the grassland, and during autumn for the outcrop (Figure 2.1). When comparing pairs of seasons, inter-seasonal differences were revealed between all pairs of seasons, except between summer and autumn (Table 2.2). Significant variation between sites also existed for the number of captures, except during autumn (Table 2.3). When comparing pairs of sites, significant inter-site differences were revealed (Table 2.4).

Table 2.1: Results of chi-square tests of independence performed to identify potential significant seasonal variation in the number of captured small mammals sampled from the three study sites at TNR. Statistically significant differences ($p \leq 0.05$) are highlighted in grey.

Test	χ^2	***df***	***p***
Overall	31.41	6	<0.001
River	18.25	3	<0.001
Grassland	11.34	3	0.01
Outcrop	22.31	3	<0.001

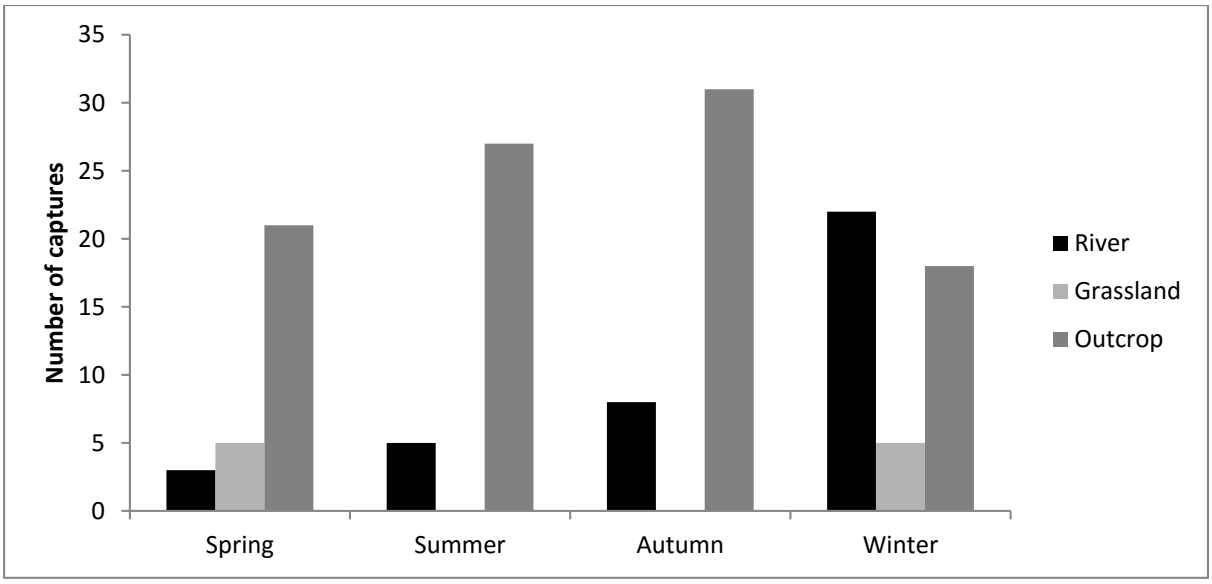


Figure 2.1: Seasonal distribution of the number of captures of small mammals trapped at TNR in the three study sites, *i.e.* River, Grassland and Outcrop from September 2016 to August 2017.

Table 2.2: Results of chi-square tests of independence performed to identify potential significant seasonal variation in the number of captured small mammals between pairs of seasons sampled from the three study sites at TNR. Statistically significant differences ($p \leq 0.05$) are highlighted in grey.

Dyadic comparisons	χ^2	***df***	***p***
Spring vs. Summer	6.12	2	0.047
Spring vs. Autumn	7.90	2	0.019
Spring vs. Winter	11.76	2	0.002
Summer vs. Autumn	0.28	2	0.869
Summer vs. Winter	15.76	2	<0.001
Autumn vs. Winter	14.63	2	<0.001

Table 2.3: Results of chi-square tests of independence performed to identify potential significant site variation in the number of captured small mammals sampled at TNR. Statistically significant differences ($p \leq 0.05$) are highlighted in grey.

Test	χ^2	***df***	***p***
Overall	31.41	6	<0.001
Spring	9.27	2	0.01
Summer	6.46	2	0.04
Autumn	5.60	2	0.061
Winter	21.55	2	<0.001

Table 2.4: Results of chi-square tests of independence performed to identify potential significant site variation in the number of captured small mammals between pairs of sites sampled at TNR. Statistically significant differences ($p \leq 0.05$) are highlighted in grey.

Dyadic comparisons	χ^2	***df***	***p***
River vs. Grassland	11.93	3	0.007
River vs. Outcrop	20.77	3	<0.001
Grassland vs. Outcrop	13.15	3	0.004

The distribution of small mammal biomass varied across seasons and sites and was similar to the distribution of the number of captures (Figure 2.2). Small mammal biomass was highest at the river in winter, in spring for the grassland, and in autumn at the outcrop.

A total of eight rodent species were caught at TNR, but not all recorded species were trapped at all sampling sites. The greatest number of species was caught at the river, with *Mastomys* sp. caught during summer, autumn and winter and contributing the most captures during winter (Figure 2.3a). Rodents were only captured during spring and summer in the grassland (Figure 2.3b). Three species were caught in the grassland and of these three species, two were present during spring and only one was caught during winter. The highest number of captures in the grassland was attributed to *Mus minutoides* during winter. Of the two species present at the outcrop, *Michaelemys namaquensis*/*Aethomys chrysophilus* was present in all seasons but was captured most often in autumn (Figure 2.3c).

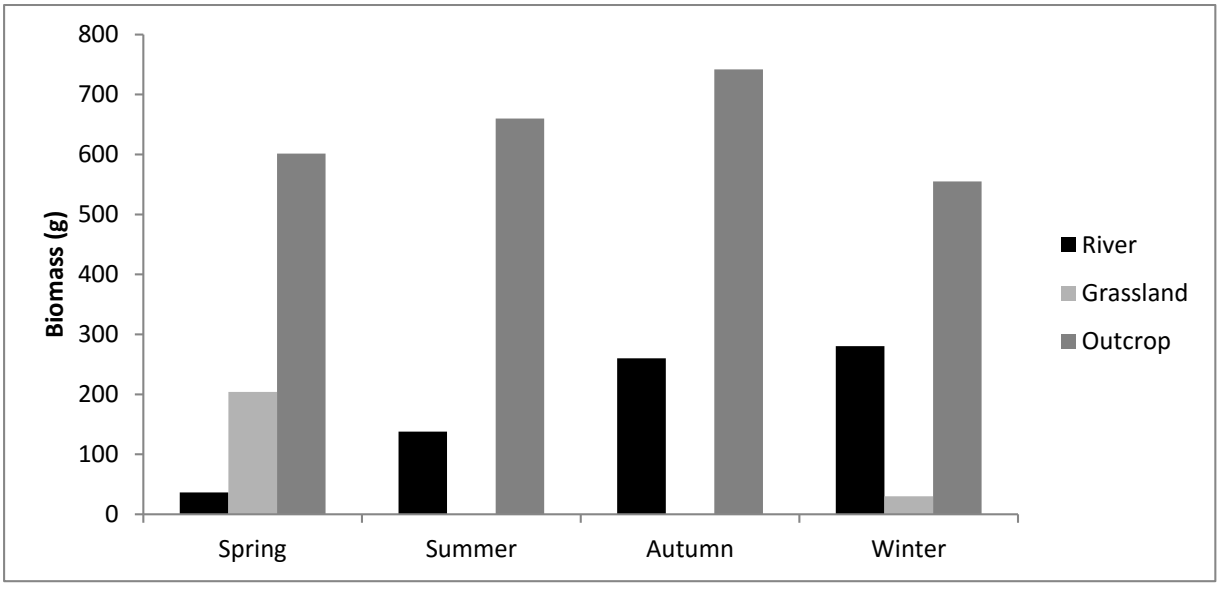


Figure 2.2: Distribution of small mammal biomass over the four seasons from 2016 to 2017 across three different sites at TNR.

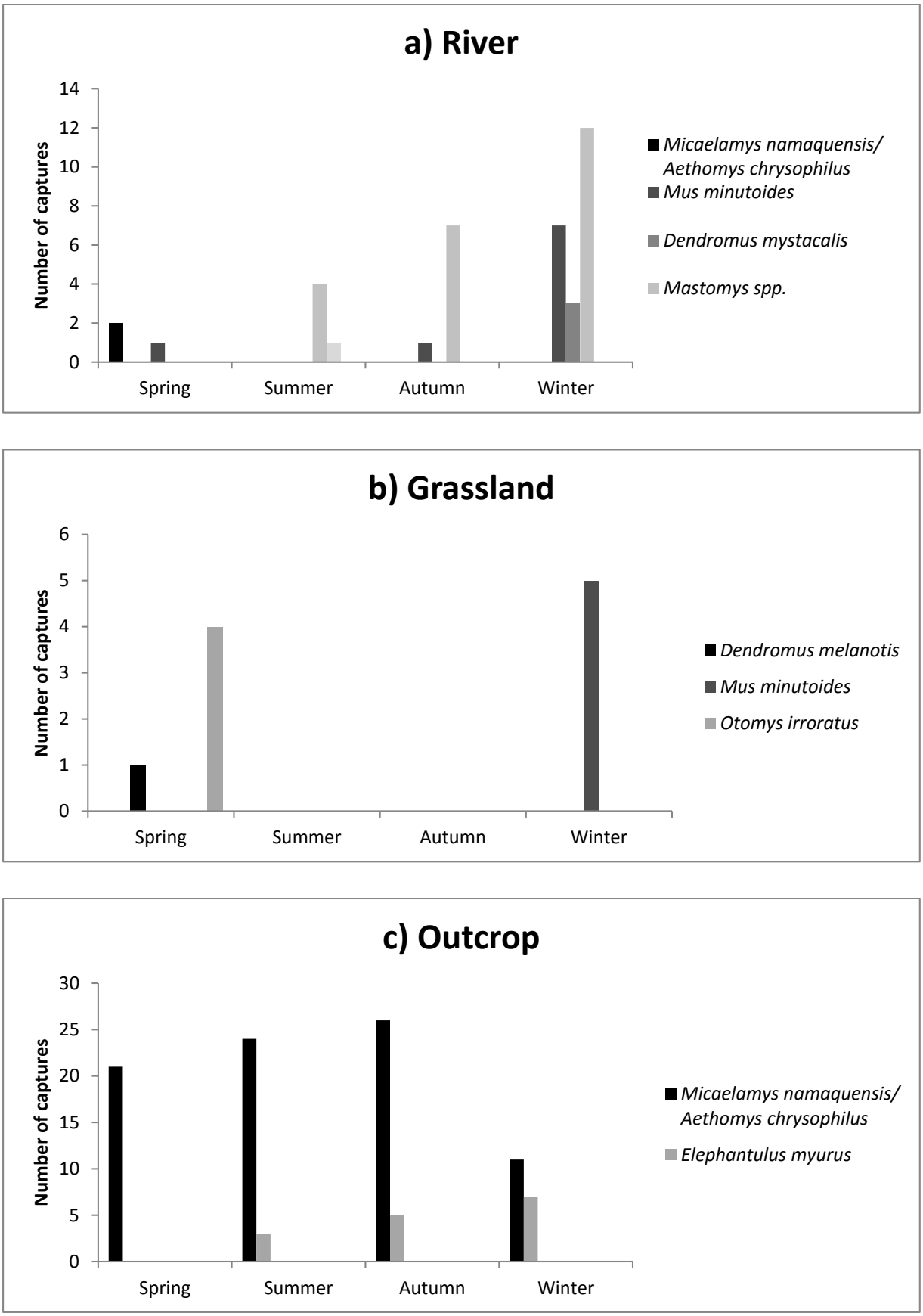


Figure 2.3: Seasonal abundance of small mammal species in the three study sites, presented as the number of captures over the sampling period; a) River, b) Grassland and c) Outcrop.

There were no differences in mean arthropod biomass between spring, summer and autumn, (Figure 2.4). Summer had the highest contribution with a mean biomass (± SD) of 0.09 ± 0.02 g per pitfall trap (n = 48), followed by autumn (0.08 ± 0.08 g) and spring (0.05 ± 0.02 g), while winter had the smallest arthropod biomass (0.02 ± 0.01 g). At the river, there were no significant differences in biomass between spring and summer, spring and autumn, or summer and autumn but biomass during spring, summer and autumn differed significantly from that recorded during winter (Table 2.5). The grassland showed no significant differences between pairs of seasons (Table 2.6). A significant inter-seasonal difference in arthropod biomass was revealed only between summer and winter for the outcrop (Table 2.7).

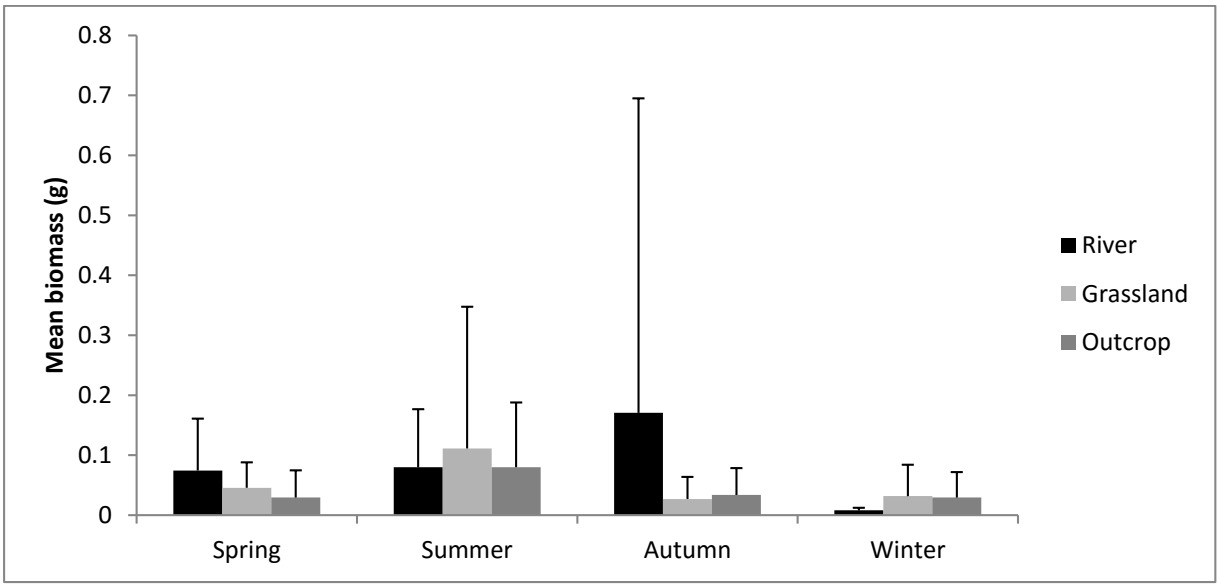


Figure 2.4: Seasonal variation in mean biomass (± SD) of terrestrial arthropods per pitfall trap at TNR over the sampling year from 2016 to 2017.

Table 2.5: Results of related-samples Wilcoxon signed rank tests performed to identify potential significant seasonal differences in arthropod biomass between pairs of seasons sampled from the river at TNR. Statistically significant differences ($p \leq 0.05$) are highlighted in grey.

Dyadic comparisons	**Z**	***p***
Spring vs. Summer	0.275	0.784
Spring vs. Autumn	-0.817	0.414
Spring vs. Winter	-2.938	0.003
Summer vs. Autumn	-0.867	0.386
Summer vs. Winter	-2.81	0.005
Autumn vs. Winter	-2.67	0.008

Table 2.6: Results of related-samples Wilcoxon signed rank tests performed to identify potential significant seasonal differences in arthropod biomass between pairs of seasons sampled from the grassland at TNR. None of the differences observed were statistically significant ($p > 0.05$).

Dyadic comparisons	**Z**	***p***
Spring vs. Summer	-0.179	0.858
Spring vs. Autumn	-1.186	0.236
Spring vs. Winter	-1.380	0.168
Summer vs. Autumn	-1.527	0.127
Summer vs. Winter	-0.700	0.484
Autumn vs. Winter	0	1.000

Table 2.7: Results of related-samples Wilcoxon signed rank tests performed to identify potential significant seasonal differences in arthropod biomass between pairs of seasons sampled from the outcrop at TNR. Statistically significant differences ($p \leq 0.05$) are highlighted in grey.

Dyadic comparisons	**Z**	***p***
Spring vs. Summer	1.68	0.93
Spring vs. Autumn	0.356	0.722
Spring vs. Winter	0.178	0.858
Summer vs. Autumn	-1.533	0.125
Summer vs. Winter	-2.155	0.031
Autumn vs. Winter	-0.358	0.72

Chapter 3: Trophic ecology of rusty-spotted genet *Genetta maculata* in Telperion Nature Reserve

3.1 Abstract

The diet of the rusty-spotted genet *Genetta maculata* was investigated in Telperion Nature Reserve, South Africa. A total of 196 scats were collected from eight latrines between spring 2016 and winter 2017. Scats were washed, oven dried at 50°C for 24 hours and their contents separated. Diet was determined through the identification of undigested food remains in the scats and hair scale patterns were used to identify which specific mammal species were consumed. The abundance of small mammals and arthropods in Telperion Nature Reserve was determined in order to assess whether rusty-spotted genets are generalist or specialist feeders and whether their diet varies according to the seasonal abundance of their predicted dominant prey. Results confirmed that small mammals and arthropods were the dominant prey, while other items such as birds, reptiles, fruits/seeds and amphibians acted as supplementary food sources. Intermediate-to-high diet diversity and diet breadth indices were obtained for all seasons and diet overlap between pairs of seasons was also intermediate-to-high. The seasonal peaks in availability of mammals and arthropods were found to coincide with peaks in the consumption of these two food categories. Seasonal changes in the consumption of supplementary food categories were also noted. These results suggest that *G. maculata* is a generalist opportunist feeder, supplementing its diet when preferred food items become less abundant and varying its diet according to season in response to seasonal changes in prey availability.

Key words: arthropods, diet, diet breadth, diet diversity, generalist feeder, generalist opportunist, *Genetta maculata*, prey availability, scat analysis, small mammals.

3.2 Introduction

Mammalian carnivores (order Carnivora) play an important role in the structure and function of communities and ecosystems (Roemer *et al*. 2009). Given their environmental importance, a thorough knowledge of a carnivore's diet may allow us to better understand its exact role in the ecosystem (Klare *et al.* 2011). Through diet studies, we can determine whether a carnivore is competing with other carnivores, the extent of its influence on populations of prey species, and whether any species of agricultural or commercial value are being preyed upon (Litvaitis 2000; Klare *et al.* 2011).

Large African carnivores have drawn a considerable amount of attention from researchers mostly due to their charisma and economic value in terms of tourism and hunting (Do Linh San *et al*. 2013). With so much attention on large carnivores, their smaller relatives are often over-looked. Small carnivores have greater species richness and are generally more common than large carnivores but their environmental impact is often underestimated (Roemer *et al*. 2009). The utilisation of one prey species by a small carnivore may influence the abundance of that prey species or other prey species, which in turn can impact other carnivores, both large and small (Linnell and Strand 2000). This cascading effect needs to be taken into account if any of the potentially effected species are part of a conservation programme or are of management interest (Clemmons and Buchholz 1998; Linnell and Strand 2000). With the exception of some social species such as meerkat *Suricata suricatta* and banded mongoose *Mungos mungo*, few small carnivores in Africa have been comprehensively studied (Do Linh San *et al*. 2013). One such species is the rusty-spotted genet *Genetta maculata* (family Viverridae).

The rusty-spotted genet has a wide distribution across sub-Saharan Africa, ranging from Nigeria to Eritrea and Somalia and south towards central Namibia and the KwaZulu-Natal province in South Africa (Angelici and Gaubert 2013). Within South Africa, *G. maculata* occurs in parts of Limpopo, Mpumalanga and down into KwaZulu-Natal (Angelici *et al.* 2015). *Genetta maculata* occupies a wide variety of habitats including woodlands, swampy areas, thickets, forests, riverine vegetation and grassy savanna (Angelici and Gaubert 2013). The rusty-spotted genet tends to avoid drier regions due to its preference for habitats near water (Angelici and Gaubert 2013).

With the wide range of habitats occupied by *G. maculata*, it is no surprise that its diet is often equally as varied. The rusty-spotted genet is an expert predator and its semi-arboreal lifestyle allows it to forage both in trees and on the ground (Estes 1991). This species is predominantly carnivorous but will consume fruits and seeds when they are available (Angelici and Gaubert 2013). The animal-based component of their diet may include various small mammals, lizards, snakes, amphibians, fish, spiders, centipedes, scorpions, birds, eggs and insects (Estes 1991; Angelici and Gaubert 2013). While rodents are generally a main food source, *G. maculata* is able to adjust its diet according to the availability of prey (Angelici and Gaubert 2013). In Zimbabwe, murids had a 68% occurrence in the diet of *G. maculata* compared to 40% for insects (Smithers and Wilson 1979) while in Botswana insects had a 90% occurrence followed by 47% for rodents (Smithers 1971). However, in Kenya the rusty-spotted genet was

found to be particularly frugivorous with seeds and fruit having a relative occurrence of 74% (Engel 1998, 2000).

A small number of studies have looked at the diet of *G. maculata* in Africa using both stomach contents (see Azzaroli and Simonetta 1966; Rautenbach 1982; Smithers 1971; Smithers and Wilson 1979; Angelici and Luiselli 2005) and scats (see Engel 1998, 2000; Stuart and Stuart 2003; Martinoli *et al.* 2006). These studies were undertaken in southern Africa (Botswana, Zimbabwe and Transvaal) as well as western and eastern Africa with sample sizes ranging from 17–515. The largest southern African study involved the contents of 136 stomachs from *G. maculata* in Botswana (Smithers 1971). My study would therefore constitute the first to properly describe the diet of *G. maculata* using scat analysis in South Africa. This study also contributes towards furthering our knowledge of how the diet of the rusty-spotted genet varies across the wide variety of habitats it inhabits in Africa.

The aim of this research was to study the diet of *G. maculata* within the Telperion Nature Reserve, South Africa. More specifically, the objectives were: 1) to determine the overall diet composition of *G. maculata* in the study area, and 2) to assess whether there are seasonal variations in the diet of *G. maculata*, and whether these are correlated with the seasonal abundance or biomass of their dominant prey (small mammals and arthropods). It was hypothesised that: 1) *G. maculata* is a generalist feeder, and 2) the diet of *G. maculata* varies seasonally. Furthermore, it was predicted that: 1) seasonal changes in climatic conditions and vegetation will lead to variations in small mammal and arthropod abundance/biomass and 2) *G. maculata* diet will vary seasonally according to variations in the abundance or biomass of their dominant prey.

3.3 Methods and materials

3.3.1 Study site

Telperion Nature Reserve forms part of the larger Ezemvelo Nature Reserve located in Mpumalanga, 120 km east of Pretoria and 24 km north-east of Bronkhorstspruit. The reserve is mostly comprised of Rand Highveld Grassland and Loskop Mountain Bushveld (Mucina and Rutherford 2006). Telperion is dominated by flat and gently sloped grasslands (*Aristida* spp., *Eragrostis* spp., and *Hyparrhenia* spp.), interspersed with rocky outcrops dominated by woody vegetation (MacFadyen 2013). Bushveld vegetation dominated by *Acacia caffra, Protea caffra, Burkea africana* and *Ochna pulchra* occurs along the rocky ridges and hills (MacFadyen 2013). Areas of rocky woodland are found in more steeply-sloped areas (Grobler

1999). The Wilge River borders Telperion and three streams originating from higher lying wetlands also run through the reserve (Grobler 1999). The area experiences cold, dry winters and warm summers with rainfall peaking from October to March (Mucina and Rutherford 2006).

Aside from large game species such as the Plains zebra *Equus quagga*, black wildebeest *Connochaetes gnou*, blue wildebeest *Connochaetes taurinus* and eland *Tragelaphus oryx*, the reserve is also home to a number of carnivores including brown hyaena *Parahyaena brunnea*, aardwolf *P. cristatus*, leopard *Panthera pardus*, serval *Felis serval*, caracal *Caracal caracal*, black-backed jackal *Canis mesomelas*, meerkat, yellow mongoose *Cynictis penicillata*, slender mongoose *Herpestes sanguineus* and rusty-spotted genet.

3.3.2 Scat collection

Latrines were located in the reserve by focusing on areas known to be used by radio-tracked genets (Roux 2018). In total, eight genet latrines were located along the Wilge River. Scats were collected from latrines on a monthly basis throughout all four seasons, commencing in September 2016 (spring) and ending in August 2017 (winter). A total of 196 rusty-spotted genet scats were collected from the identified latrines. Identification of scats was achieved using species specific characteristics such as deposition site, scat shape, size and odour (Walker 1996; Murray 2011; Gutteridge and Liebenberg 2013; Stuart and Stuart 2013). The collected scats were placed individually in Ziploc bags and labelled according to the date they were collected, their GPS location, and season. All scats were stored in a freezer until needed for analysis.

3.3.3 Scat analysis

For analysis, the frozen scats were removed from the freezer, thawed in Petri dishes and oven-dried at 50°C for 24 hours. All non-dietary materials, such as small stones and twigs, were removed from the dried scats before the scats were weighed using a digital balance.

The dried scats were then soaked overnight in Petri dishes filled with water before being placed in a 1 mm sieve above two stacked 0.4 mm sieves and washed under running water to partially separate contents. Subsequently, the contents were dried in an oven at 50°C for 24 hours. Forceps were used to tease apart the contents, which were then spread over grid paper with grid cells of 1 × 1 cm to allow for the proportion of each prey category to be estimated. A dissecting microscope was used to identify food items that were not easily identifiable with the naked eye.

The identification of mammalian prey species was achieved by examining bones found in the scats as well as hair scale patterns. Hair samples (at least 10 hairs) were taken from scats containing hair in order to identify the mammalian prey within them. The hair samples were soaked in ethanol to clean them, rinsed with distilled water, and allowed to dry in a Petri dish. Impressions of hair were made on slides using a 5% solution of gelatine. The solution was heated to 100°C and then allowed to cool down to 50°C before a small quantity was spread evenly on a clean slide. Making use of forceps, the clean strands of hair were placed on the slide with the gelatine film. After allowing the slides to dry, the strands of hair were removed from the slides, leaving behind an impression of hair scale patterns on the gelatine film. These patterns were identified under a compound microscope using a collection of scale patterns of hairs of small mammals collected from live animals as a reference. Pictures of hair scale patterns from Keogh (1975) were also used as a reference.

Arthropod remains were identified to order level based on external morphological features such as elytra, legs and wings. The presence of bird remains was confirmed based on feathers, bones, eggshells and nails found in scats. Bones and scales were used to identify the presence of reptile remains and the presence of amphibian remains was confirmed using bones found in the scats. Undigested seeds and plant matter were used to identify vegetation.

3.3.4 Expression of results

Diet was expressed using the following descriptors:

1. Percentage occurrence (PO), i.e. [the number of scats in which a prey item or category occurred/total number of scats] × 100.

2. Relative percentage occurrence (RPO), i.e. [the number of occurrences of a prey item or category/total number of occurrences of all categories] × 100.

3. The percentage volume (PV) of the remains of each prey item or category in the scats.

4. The percentage weight (PW) of the remains of each prey item or category in the scats.

PO and PW were plotted against PO on paired axes to indicate the percentage overall importance (POI) of the various food categories in the diet of the rusty-spotted genet. Primary food categories were considered to lie above the 25% isopleth, secondary categories between the 6% and 25% isopleths and supplementary categories between the 1% and 5% isopleths

(Kruuk and Parish 1981). Categories lying below the 1% isopleth were considered as “trace” food categories.

To explore any potential similarities or variations in diet from season to season or between different sampling sites, the broad prey categories of mammals, arthropods, amphibians, birds, reptiles, plant material, fruit seeds/pulp and other material were taken into account. The category of “other” includes items of carrion, human food and unidentifiable material. This classification was chosen because the last 6 categories might not be identifiable to order (like arthropods) or species level (like mammals). Seasonal differences in the overall diet and for each food category were tested with chi-square tests of independence, referring to the absolute occurrences of the diverse food categories. Due to small expected values, the categories of amphibians and “other” were merged to meet the conditions required to perform the tests. These statistical analyses were performed in Excel 2010 (Microsoft Inc.).

To investigate seasonal variation in the number of food categories and items found in scats, as well as in the percentage volume and percentage weight of dominant items and food categories, a Kruskal–Wallis test was done since data were not normally distributed (Kolmogorov–Smirnov tests, $p < 0.05$). Dyadic comparisons were made with Mann–Whitney U tests. These analyses were done using SPSS 25.0 (SPSS Inc.).

Based on formulas given in Krebs (1999), further comparative analyses were done using RPO for each food category (for comparison with other studies), but also PV and PW, all expressed as mathematical frequencies (i.e. values varying between 0 and 1), in calculating:

1) The Shannon–Wiener diversity index (H'), ranging from 0 to $\log_2 n$, with n being the number of food categories;

2) The evenness measure of representation (J'), ranging from 0–1;

3) Levin’s standardised diet breadth (B_A), ranging from 0–1; and

4) Pianka’s overlap index for diet (α) where α is the overlap between two seasons or two species. The α-index varies between 0 (diets are totally different between the two seasons/species) and 1 (identical diets).

3.4 Results

3.4.1 Overall diet and seasonal variations in the diet of the rusty-spotted genet

A total of 196 rusty-spotted genet scats were collected between spring 2016 and winter 2017 (Table 3.1). The mean number (± SD) of food categories per scat was 2.93 ± 0.95 and the mean number of food items per scat was 3.78 ± 1.59 for the year. The mean percentage volume of dominant items per scat was 83.10 ± 14.51% (Table 3.1). Statistical analyses revealed significant seasonal differences in the number of food categories (Kruskal–Wallis test, $H = 21.34$, $df = 3$, $p < 0.001$), number of food items ($H = 43.83$, $df = 3$, $p < 0.001$) and percentage volume of dominant items per scat ($H = 25.56$, $df = 3$, $p < 0.001$).

The diversity index and evenness of representation were intermediate-to-high, with standardised diet breadth being low-to-intermediate for all seasons (Table 3.1).

The diet of the rusty-spotted genet varied in composition but the main food categories consumed, in terms of percentage occurrence (PO), were mammals, arthropods and plant material (Figure 3.1). Reptiles, birds and seeds/fruit pulp were also consumed, but to a slightly lesser extent. The consumption of amphibians and other items was marginal in the diet of the rusty-spotted genet. All food categories were consumed throughout all seasons, except for amphibians, which were not consumed in spring, and other items that were only consumed in autumn and winter. Mammal consumption was very high for all seasons (≥ 80%) but clearly peaked in winter (96%). Arthropod consumption was very high for spring, summer and autumn (≥ 90%) but peaked in summer (97%) and was lowest in winter when it dropped below 60%. Plant material consumption peaked in autumn (70%) and was at its lowest in spring (50%).

A chi-square test of independence comparing the different food categories revealed significant seasonal differences (Table 3.2). Further statistical tests performed with each food category (vs. remaining categories) showed that only the consumption of mammals, reptiles and seeds/fruit pulp varied with season. Chi-square tests of independence carried out between pairs of seasons indicated inter-seasonal differences in diet composition between spring and winter, summer and autumn, and summer and winter (Table 3.3).

Table 3.1: Number of scats collected in Telperion Nature Reserve (TNR) from 2016 to 2017 and results for the diet indices, calculated using relative percentage occurrence (RPO), percentage volume (PV) and percentage weight (PW) (expressed as mathematical frequencies) for the seasonal, average and yearly data in the diet of the rusty-spotted genet *Genetta maculata*.

Variables	**Spring**	**Summer**	**Autumn**	**Winter**	**Year**
Number of scats	20	37	60	79	196
Mean number of food categories per scat	3.10 ± 1.02	3.11 ± 0.84	3.27 ± 0.90	2.54 ± 0.90	2.93 ± 0.95
Mean number of food items per scat	5.00 ± 1.59	4.35 ± 1.23	4.17 ± 1.57	2.91 ± 1.33	3.78 ± 1.59
Mean percentage volume of dominant items per scat	80.20 ± 15.29%	77.54 ± 13.24%	80.78 ± 14.49%	88.19 ± 13.50%	83.10 ± 14.51%
Shannon–Wiener Diversity index (H')					
With RPO	2.36	2.33	2.52	2.24	2.44
With PV	1.96	1.90	1.80	1.10	1.86
With PW	1.95	1.85	1.71	0.98	1.83
Evenness of Representation (J')					
With RPO	0.79	0.78	0.84	0.75	0.81
With PV	0.65	0.63	0.60	0.37	0.62
With PW	0.65	0.62	0.57	0.33	0.61
Standardised diet breadth (B_A)					
With RPO	0.52	0.49	0.54	0.41	0.50
With PV	0.30	0.30	0.20	0.07	0.22
With PW	0.28	0.30	0.18	0.06	0.21

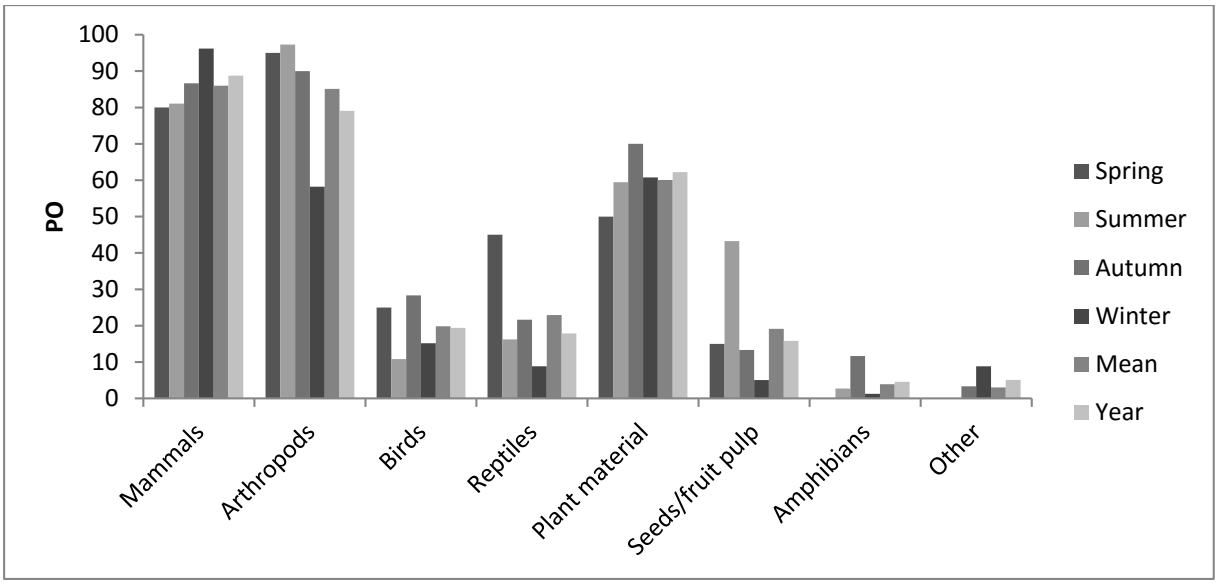


Figure 3.1: Seasonal percentages of occurrence (PO) of various food categories in the diet of the rusty-spotted genet *Genetta maculata* in TNR.

Table 3.2: Results of chi-square tests of independence performed to identify potential significant seasonal differences in the diet of the rusty-spotted genet at TNR, as determined from scat analysis and evaluated based on absolute occurrence. Statistically significant differences ($p \leq 0.05$) are highlighted in grey.

Test	χ^2	***df***	***p***
Overall diet	49.50	18	<0.001
Mammals	8.25	3	0.04
Arthropods	3.26	3	0.35
Birds	3.52	3	0.32
Reptiles	10.33	3	0.016
Plant material	2.11	3	0.55
Seeds/fruit pulp	21.59	3	<0.001
Amphibians & Other	6.51	3	0.09

Table 3.3: Results of chi-square tests of independence performed to identify potential significant differences in the diet of the rusty-spotted genet between pairs of seasons at TNR, as determined from scat analysis and evaluated based on absolute occurrence. Statistically significant differences ($p \leq 0.05$) are highlighted in grey.

Dyadic comparisons	χ^2	***df***	***p***
Spring vs. Summer	9.1	6	0.17
Spring vs. Autumn	7.5	6	0.28
Spring vs. Winter	18.1	6	0.01
Summer vs. Autumn	16.4	6	0.012
Summer vs. Winter	26.1	6	<0.001
Autumn vs. Winter	9.7	6	0.138

Of the 88% of rusty-spotted genet scats that contained mammal hairs, 27% of these hairs were from *Micaelamys namaquensis/Aethomys chrysophilus*. *Crocidura* sp. was the least consumed species, present in less than 1% of scats (Table 3.4). Other mammal hairs were also present (30%) but unidentifiable. These unidentified hairs were from rodent species not included in my reference collection or Keogh's (1975) descriptions or I was unable to identify them based solely on the descriptions provided by Keogh. Some scats contained hairs from more than one species, thus the need to calculate RPO in addition to PO.

When considering both PO and RPO, Orthoptera was the most consumed arthropod order, followed by Coleoptera and Scorpiones, with Mantodea being the least consumed arthropod order in the diet of the rusty-spotted genet (Table 3.5).

While the values of RPO were lower than PO, as expected, the overall results were similar with mammals contributing the most to diet during winter (RPO: 37%) and arthropods contributing the most during summer (RPO: 31%) (Figure 3.2). However, when considering RPO, plant material contributed the most to the rusty-spotted genet's diet during winter (RPO: 23%) compared to autumn when PO of plant material peaked (Figure 3.1).

Table 3.4: Percentages of occurrence (PO), relative percentages of occurrence (RPO) and activity pattern of different small mammal species that were consumed by the rusty-spotted genet (*n* = 173 scats with mammalian hair remains) at TNR.

Common name	Scientific name	PO	RPO	Activity
Namaqua rock mouse/ Red veld rat	*Micaelamys namaquensis/ Aethomys chrysophilus*	26.59	21.70	Nocturnal
Vlei rat	*Otomys irroratus*	14.45	11.79	Diurnal
Climbing mouse sp.	*Dendromus* sp.	12.14	9.91	Nocturnal
Multimammate mouse	*Mastomys* sp.	11.56	9.43	Nocturnal
Eastern rock sengi	*Elephantulus myurus*	6.36	5.19	Diurnal
Pygmy mouse	*Mus minutoides*	6.36	5.19	Nocturnal, partly diurnal
Fat mouse	*Steatomys pratensis*	5.78	4.72	Nocturnal
Gerbil sp.	*Gerbilliscus* sp.	5.78	4.72	Nocturnal
Four-striped grass mouse	*Rhabdomys pumilio*	2.89	2.36	Diurnal and crepuscular, some nocturnal activity
Musk shrew sp.	*Crocidura* sp.	0.58	0.47	Sporadically active throughout the day and night
Other mammal species	?	30.06	24.53	?

Table 3.5: Percentages of occurrence (PO) and relative percentages of occurrence (RPO) of arthropod taxa consumed by the rusty-spotted genet at TNR. Orders are ranked based on descending importance in the diet.

Arthropod taxa	PO	RPO
Orthoptera	69.06	37.62
Coleoptera	45.37	23.73
Scorpiones	22.01	12.17
Isoptera	13.86	6.41
Lepidoptera	9.80	5.08
Hymenoptera	9.50	5.77
Decapoda	8.03	4.47
Chilopoda	2.76	1.26
Ixodida	1.58	1.92
Odonata	1.25	0.72
Araneae	1.25	0.46
Mantodea	0.32	0.39

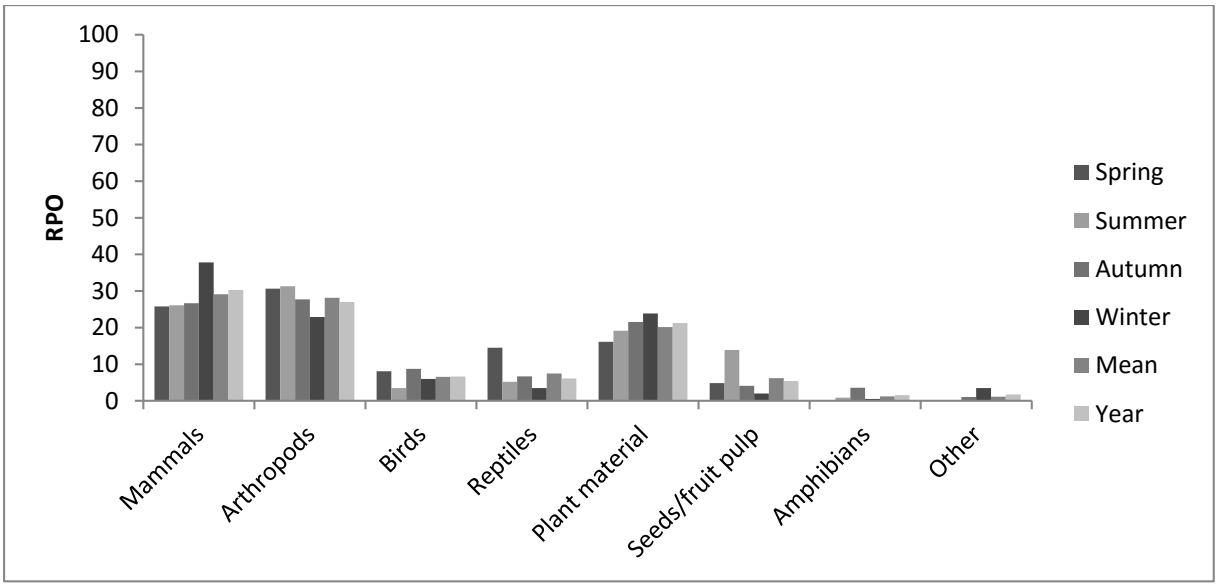


Figure 3.2: Seasonal relative percentages of occurrence (RPO) of various food categories in the diet of the rusty-spotted genet at TNR.

When PV and PW were considered, the most important food categories in the diet of the rusty-spotted genet were again mammals and arthropods (Table 3.6). There was a significant seasonal difference in the percentage volume of mammal (Kruskal–Wallis test, $H = 79.76$, $df = 3$, $p < 0.001$), arthropod ($H = 91.06$, $df = 3$, $p < 0.001$), reptile ($H = 14.60$, $df = 3$, $p < 0.05$), seed/fruit pulp ($H = 36.75$, $df = 3$, $p < 0.001$) and amphibian ($H = 9.78$, $df = 3$, $p < 0.05$) remains in the scats of rusty-spotted genets. No seasonal difference was found for birds ($H = 5.63$, $df = 3$, $p = 0.131$), plant material ($H = 3.48$, $df = 3$, $p = 0.323$) and other ($H = 5.48$, $df = 3$, $p = 0.142$). Moreover, a significant seasonal difference was found in the relative weight of mammal (Kruskal–Wallis test, $H = 78.44$, $df = 3$, $p < 0.001$), arthropod ($H = 76.40$, $df = 3$, $p < 0.001$), reptile ($H = 15.77$, $df = 3$, $p < 0.001$), seed/fruit pulp ($H = 35.42$, $df = 3$, $p < 0.001$) and amphibian ($H = 9.91$, $df = 3$, $p < 0.05$) remains within rusty-spotted genet scats. The relative weights of bird ($H = 5.88$, $df = 3$, $p = 0.117$), plant material ($H = 3.66$, $df = 3$, $p = 0.301$) and other ($H = 5.45$, $df = 3$, $p = 0.142$) remains did not differ seasonally.

Table 3.6: Mean percentage volume (PV) and percentage weight (PW) of the remains of various food categories identified from the scats of rusty-spotted genet at TNR.

Category	PV	PW
Mammals	48.08	48.18
Arthropods	27.24	27.21
Birds	6.32	7.36
Reptiles	1.45	1.17
Plant material	9.62	5.37
Seeds/fruit pulp	5.97	9.51
Amphibians	0.13	0.10
Other	1.20	1.10

Similar to PO, RPO, PV and PW, mammals and arthropods were shown to be the most important food categories in the diet of the rusty-spotted genet when considering percentage overall importance (POI) (Figure 3.3).

The diet overlaps for pairs of seasons were very high (>0.9) when calculated with RPO and did not differ (Table 3.7). Seasonal overlaps calculated with PV and PW were high (>0.9) between spring and summer, and autumn and winter but intermediate (0.4–0.6) for the other pairs of seasons.

Table 3.7: Pianka's index for diet overlap between pairs of seasons evaluated using RPO, PV and PW (expressed as mathematical frequencies) in the diet of the rusty-spotted genet (Sp = spring, Su = summer, Au = autumn, Wi = winter).

	Sp vs. Su	Sp vs. Au	Sp vs. Wi	Su vs. Au	Su vs. Wi	Au vs. Wi
RPO	0.95	0.97	0.92	0.97	0.92	0.97
PV	0.94	0.61	0.47	0.60	0.49	0.98
PW	0.95	0.55	0.45	0.51	0.42	0.98

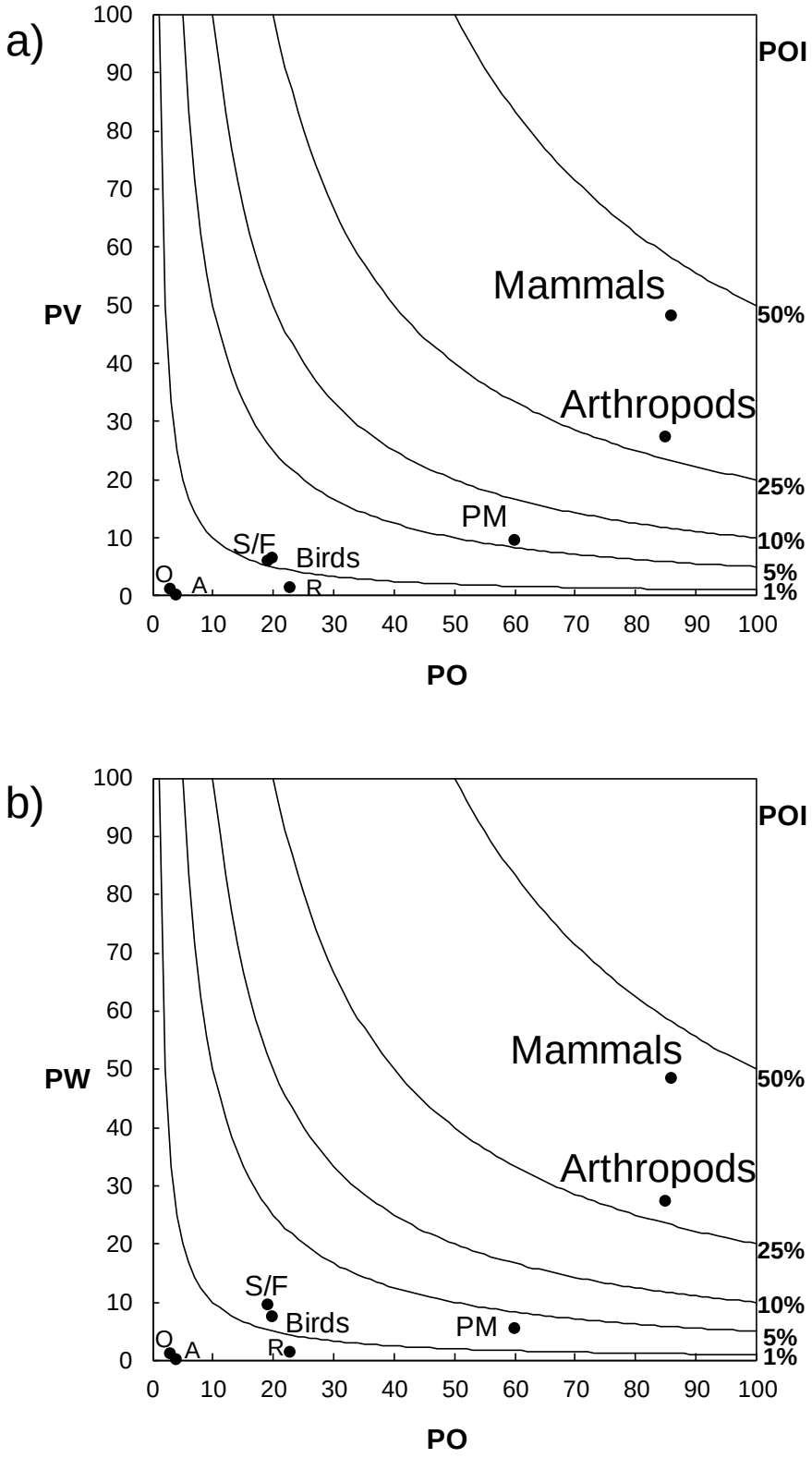


Figure 3.3: Graphical representation of the percentage overall importance (POI) of the broad food categories in the diet of the rusty-spotted genet with a) percentage volume (PV) plotted against percentage occurrence (PO) and b) percentage weight (PW) plotted against PO. Font size used to represent food categories is proportional to their overall importance. B, Birds; R, Reptiles; PM, Plant material; S/F, Seeds/fruit pulp; A, Amphibians; O, Other.

3.5 Discussion

3.5.1 Overall diet of the rusty-spotted genet

Based on the results of this study, it appears that rusty-spotted genets in Telperion Nature Reserve feed mostly on mammals and arthropods. In general, these results are in line with what has been observed for *G. maculata* as well as other species belonging to the *Genetta* genus (Smithers and Wilson 1979; Rosalino and Santos-Reis 2002; Stuart and Stuart 2003; Angelici and Luiselli 2005; Amroun *et al*. 2006; Martinoli *et al.* 2006). An analysis of stomach contents from rusty-spotted genets in Zimbabwe revealed that rodents accounted for 68% of the genet's diet, followed by an occurrence of 40% for insects (Smithers and Wilson 1979). Stuart and Stuart (2003) noted a 100% occurrence for mammal remains compared to 67% for insects in *G. maculata* scats in Zambia. In scats analysed from *G. maculata* in Kenya, insects were found to have a percentage occurrence of 33%, followed by mammals with 27% (Martinoli *et al.* 2006). However, when considering mean volume, mammals accounted for 38% of scat volume compared to insects with 16% (Martinoli *et al.* 2006). Another study in Kenya, this time using stomach contents, also found that arthropods appeared to be the dominant prey when considering the total number of prey items recorded and the number of stomachs in which a given prey type was found, but when considering biomass, mammals were shown to be the main food resource (Angelici and Luiselli 2005). Other studies, such as one in Botswana, indicated that insects were the most frequent prey with an occurrence of 90% followed by 47% for rodents (Smithers 1971). These results have also been observed with other genet species such as the common genet *G. genetta* in northern Algeria where arthropods were consumed more frequently (33%) than mammals (25%) (Amroun *et al*. 2014). However, it is important to note that in studies where arthropods were found to be the most consumed prey, their importance may have been overestimated if only PO and RPO were considered, as these measures can only tell us how often a particular prey item has been consumed and do not take into account the size or quantity of the prey item ingested. In these cases, the use of PV may provide a slightly better measure of the importance of a prey type as it gives a rough idea of the volume ingested. This is likely why in some studies where arthropods initially appear to be the dominant food source when considering measures such as PO, mammals are later revealed to be the dominant prey category when PV or biomass is used (e.g. Angelici and Luiselli 2005; Martinoli *et al.* 2006). In my study, PO, RPO, PV and PW were considered and all descriptors yielded similar results, although PO and RPO also tended to overestimate the importance of arthropods.

From all rodent species present in the rusty-spotted genet's diet, *M. namaquensis/A. chrysophilus* was consumed most frequently, followed by *O. irroratus*, *Dendromus* sp. and *Mastomys* sp. Other studies have found somewhat similar results, although there were obvious differences in species composition owing to the different locations of these studies. Stuart and Stuart (2003) observed that *Mastomys* sp. was consumed frequently (44%) by *G. maculata*, followed by *Otomys* sp., *M. minutoides* and *Crocidura* sp. (each 6%). In Nigeria (Angelici and Luiselli 2005), *Dendromus* sp. was less important (2%) while various *Crocidura* sp. were found to be more important (13% when combined). However, in general, various species of *Crocidura*, *Mus*, *Dendromus*, *Otomys*, *Mastomys*, *Aethomys* and *Rhabdomys* were present in most diet studies for *G. maculata* as well as other *Genetta* species (Stuart and Stuart 2003; Angelici and Luiselli 2005; Roberts *et al*. 2007; Amroun *et al*. 2014; Widdows and Downs 2015; Camps and van den Broek 2016). Of the 10 species identified in the rusty-spotted genet's diet, eight of these are nocturnal or at least display some nocturnal activity. The nocturnal behaviour of these species probably explains the high occurrence of mammals in the diet of *G. maculata*. While *O. irroratus* and *Elephantulus myurus* are classed as diurnal species, they were often found when traps were checked in the morning suggesting that they were either trapped over-night or very early in the morning before the traps were checked. The possibility of some nocturnal or early morning activity for these otherwise diurnal species would explain their presence in the diet of the rusty-spotted genet. It is also possible that these species were hunted while resting in their burrows at night. Apart from rodents, one incidence of a bat being consumed was confirmed through the presence of bones. The consumption of bats by genets has been noted in other cases (Azzaroli and Simonetta 1966; Carpenter 1970; Rautenbach 1982; Amroun *et al*. 2014).

Of the arthropod taxa found in scats, Orthoptera (locusts, grasshoppers and crickets) were most frequently consumed, followed by Coleoptera (beetles) and Scorpiones (scorpions). This is similar to what has been observed in some studies looking at the diet of *G. maculata* and other *Genetta* species, although Coleoptera were often consumed more than Orthoptera in certain areas (Smithers 1971; Smithers and Wilson 1979; Angelici and Luiselli 2005; Martinoli *et al.* 2006; Sánchez *et al*. 2008; Amroun *et al*. 2014). In Nigeria and Zambia for example, the remains of Orthoptera were recorded more often than remains of Coleoptera (Stuart and Stuart 2003; Angelici and Luiselli 2005). On the other hand, studies in Zimbabwe, Botswana and Tanzania observed that Coleoptera occurred more frequently in the diet of *G. maculata* than Orthoptera (Smithers 1971; Smithers and Wilson 1979; Martinoli *et al.* 2006).

For the closely related *G. genetta*, Coleoptera was preyed upon more than Orthoptera in studies undertaken in Algeria and Spain (Sánchez *et al*. 2008; Amroun *et al*. 2014). Irrespective of which of the two orders was consumed more often, my study as well as others have shown that Orthoptera and Coleoptera are important in the diet of *G. maculata*. Interestingly, insects present in the diet of *G. maculata* were not restricted to nocturnal species, despite the nocturnal habits of the rusty-spotted genet. While the remains of crickets and African king crickets (*Libanasidus vittatus*) were frequently found in genet scats, the presence of grasshoppers and locusts was also frequently noted. A nocturnal species of longhorn beetle, possibly *Macrotoma palmata*, was consumed as well as a species of diurnal fruit chafer from the *Dischista* genus. The presence of both nocturnal and diurnal insects in the diet of a nocturnal animal like the genet may be explained through the fact that insects can be eaten whether they are active or inactive (Huey and Pianka 1983), thus the activity pattern of insects does not necessarily dictate whether or not they will be hunted by predators. My study also indicated that scorpions are an important part of the rusty-spotted genet's diet, at least in Telperion Nature Reserve. The literature on *G. maculata* does not provide another case in which scorpions were consumed. However, a study on the Cape genet *G. tigrina* in the Dwesa Nature Reserve in the Eastern Cape observed a RPO of 2% for scorpion remains in scats (Roberts *et al*. 2007). While the identification of scorpion species in the genet's diet was not part of my objectives, I was able to determine that the majority of scorpion remains belonged to *Opistophthalmus glabrifrons* with minor occurrences of *Uroplectes triangulifer*. These identifications were based on the presence of intact stingers and pincers, which were compared to pictures of scorpions known to be present in Telperion Nature Reserve, as well as a live specimen of *O. glabrifrons* caught in a pitfall trap. Roberts *et al*. (2007) also noted the presence of unmasticated pincers and stingers in the scats of *G. tigrina* and surmised that genets may disarm scorpions by biting-off and swallowing these parts whole before consuming the rest. The scorpion species identified in scats from Telperion Nature Reserve were nocturnal, meaning that genets are quite likely to encounter them while foraging. Martinoli *et al.* (2006) acknowledged that insects were consumed frequently by *G. maculata* but suggested that they were not actively searched for. Sánchez *et al*. (2008) also suggested for *G. genetta* that insects were consumed by chance instead of through active searching and used the absence of cryptic larvae in the genet's diet to support this idea. The remains of cryptic beetle larvae in scats of *G. maculata* from Telperion Nature Reserve could therefore suggest that it actively searches for these larvae, as well as other insects, as opposed to consuming them by chance. However, it is also possible that the frequently consumed

arthropod orders such as Orthoptera and Coleoptera are actively hunted while the less frequently consumed orders are only eaten when encountered by chance. Irrespective of whether arthropods were actively sought-out or not, they remain an important source of food for *G. maculata*.

Plant material was the third most consumed food category when considering PO, RPO and PV. However, in terms of PW, plant material was revealed to contribute less overall towards the weight of remains found in scats. It moved to fifth place behind seeds/fruit pulp and birds, which were ranked third and fourth, respectively in terms of the degree to which they contributed to diet when considering PW. In general, grass was the main type of plant material ingested and usually occurred at the distal end of scats. The presence of grass in the diet of *G. maculata* has also been observed with an occurrence of 40% by Stuart and Stuart (2003) and 14% by Martinoli *et al.* (2006). Since it appears undigested and unaltered in terms of colour or structure, it is likely that grass is not eaten as a source of nutrition (Sánchez *et al*. 2008). Instead, it is suggested that carnivores consume grass to aid removal of hair from the intestines, induce vomiting to purge ingested toxins, aid in digestion, relieve stomach and throat inflammation and provide a possible source of folic acid (Morris 1996). It is for this reason that other diet studies focusing on *G. maculata* as well as other genet species may not include the presence of grass in their results (Roberts *et al*. 2007).

Birds, reptiles and seeds/fruit pulp were other items consumed by the rusty-spotted genet, although to a lesser degree than mammals and arthropods. The presence of large feathers and whole or partially chewed bird feet as well as egg shells and pin feathers indicate that *G. maculata* targets both adult birds and chicks and also consumes eggs. The ability of *G. maculata* to easily climb trees probably enables this species to raid nests for eggs and young birds and may also allow it to target roosting birds. In general, the PO and RPO of birds in the diet of the rusty-spotted genet is relatively similar to what has been observed in other diet studies on *Genetta* spp., although some studies show birds to be more or less important than in this study (Smithers 1971; Smithers and Wilson 1979; Rosalino and Santos-Reis 2002; Martinoli *et al.* 2006; Roberts *et al*. 2007; Amroun *et al*. 2014; Camps and van den Broek 2016). Reptile remains included the scales, vertebrae, ribs and jaw bones of snakes and the feet and jaw bones of lizards, although snake remains occurred far more frequently than those of lizards (pers. obs.). The PO of reptiles in this study (23%) was similar to the results of one study where reptiles had an occurrence of 21% (Angelici and Luiselli 2005) but was higher than in other studies where occurrences of 8% (Smithers and Wilson 1979) and 1% (Smithers

1971) were observed. The presence of seeds/fruit pulp in the scats of *G. maculata* was mostly attributed to fruit from *Diospyros lycoides*. Most scats containing these seeds contained little else and appeared to have a looser structure than other scats. In Kenya, *G. maculata* was found to be quite frugivorous and therefore played an important role in seed dispersal (Engel 1998, 2000). The presence of a *D. lycoides* bush almost exactly below a latrine suggests that the rusty-spotted genet could also contribute to seed dispersal in Telperion Nature Reserve.

The least consumed categories were amphibians and "other" which included carrion, human food and unidentifiable material. The low occurrence of amphibians in the rusty-spotted genet's diet has also been noted in other studies (Smithers 1971; Smithers and Wilson 1979). It was suggested that the absence of amphibians in the diet of *G. tigrina* could be due to its reluctance to enter water (Roberts *et al*. 2007) and the same could hold true for *G. maculata* as well. Evidence of scavenging by *G. maculata* included the occurrence of a monkey's fingernail and piece of skin showing fingerprint ridges. The upper and lower sections of a small carnivore's jaw were also found in a scat. While it is possible that this was another case of scavenging, the jaw bones appeared to belong to a juvenile which makes it a possibility that the animal was killed by a genet as carnivore species have been observed to kill each other's young (Palomares and Caro 1999). The presence of rice, carrots and raw chicken skin in scats also suggests that genets visit human residences within Telperion Nature Reserve.

Even though mammals and arthropods appeared to be the dominant prey of *G. maculata*, the consumption of an assortment of other food items in varying quantities and an intermediate-to-high diet diversity and diet breadth indicates that the rusty-spotted genet is a generalist rather than a specialist in terms of its feeding habits. This is supported by other studies for this species and other members of the *Genetta* genus (Smithers and Wilson 1979; Virgós *et al*. 1999; Rosalino and Santos-Reis 2002; Amroun *et al*. 2006; Martinoli *et al*. 2006; Roberts *et al*. 2007; Sánchez *et al*. 2008).

3.5.2 Food availability and seasonal variations in the diet of the rusty-spotted genet

The overall diet of the rusty-spotted genet was found to vary seasonally. The mean number of food categories per scat and the mean number of food items per scat were lowest during winter while the mean percentage volume of dominant items per scat was highest. The relatively small number of food categories and items consumed and the fact that dominant items accounted for a large proportion of total volume during winter indicate that this was the lean season. On the other hand, scats from spring and summer contained more food items per

scat and dominant items accounted for less of total volume, indicating that food availability was probably higher and that *G. maculata* took advantage of this by broadening and varying its diet.

There was a definite seasonal variation in both the number of small mammals captured and small mammal biomass at Telperion Nature Reserve (Chapter 2). Seasonal maximums and minimums were different for each trapping site but when data were combined, peaks in the number of captures and biomass were observed in winter and autumn, respectively (Chapter 2). The seasonal variations in small mammal captures and biomass were reflected in the diet of *G. maculata* where the consumption of mammalian prey was at its highest in autumn and winter, reaching a maximum in winter, and lower in spring and summer. This is similar to what has been observed in other genet diet studies where mammals contributed the most towards diet during autumn and winter (Calviño *et al*. 1984; Rosalino and Santos-Reis 2002; Sánchez *et al*. 2008; Amroun *et al*. 2014). The most likely explanation for this is that the intake of mammalian prey increases when the availability of other prey items such as arthropods and fruit/seeds decreases during the cold season (Sánchez *et al*. 2008). Conversely, the contribution of mammals to the diet of the rusty-spotted genet was highest when the contribution of arthropods and seeds/fruit were at their lowest. Regarding specific species, *M. namaquensis/A. chrysophilus*, *E. myurus*, *Dendromus* sp. and *O. irroratus* were consumed mostly in autumn and winter. On the other hand, *Steatomys pratensis*, *Mastomys* sp. and *Gerbilliscus* sp. occurred most frequently in scats in spring, summer and autumn and seldom in winter. Amroun *et al*. (2014) also observed that the occurrence of particular mammal species in diet varied with season and Roberts *et al*. (2007) noted that some species, such as *Mastomys* sp., were more common during summer while others, such as *Crocidura* sp., were more common in autumn. Interestingly, captures of *Mastomys* sp. peaked in winter (Figure 2.3a, Chapter 2) yet hairs of this species were only found on one occasion in a scat collected during this season. Similarly, *O. irroratus* was not caught during autumn or winter (Figure 2.3b, Chapter 2) but appeared in scats most frequently during this time. However, during the winter trapping session in the grassland, the occurrence of *O. irroratus* scats in a number of empty traps suggests that it was present. According to Maddock (1988) *Otomys* is known to be trap shy, which can lead to its abundance being underestimated (Maddock 1988).

Arthropod biomass also varied seasonally with mean biomass at a maximum in summer and a minimum in winter (Chapter 2). The occurrence of arthropods in the diet of *G. maculata* mirrored the availability of arthropod prey with this food category contributing the most

towards diet in spring and summer, and the least during autumn and winter. These results are supported by other studies where an increase in arthropod consumption was observed during summer (Calviño *et al*. 1984; Rosalino and Santos-Reis 2002; Sánchez *et al*. 2008; Amroun *et al*. 2014). This peak in arthropod remains in scats is linked to the increase in arthropod reproduction and activity during the warmer seasons (Pielou 1948). In terms of specific arthropod orders, grasshoppers, locusts and crickets (Orthoptera) were the most frequently eaten insects and were consumed year-round, although their presence in scats did dwindle slightly in winter probably due to the general decrease in arthropod availability. Beetles (Coleoptera) were frequently consumed during the warmer months but the occurrence of their remains in scats decreased considerably in winter, again linked to the decline in arthropod abundance for the season. Other arthropod orders that were consumed less often were mostly consumed in spring, summer and part of autumn. These orders were likely consumed only when encountered by chance and the chances of coming across them would have been greater in the warmer months when arthropod abundance was higher. Butterfly larvae (Lepidoptera) for example, were mostly observed in scats during spring, summer and autumn. "Flying-ants" (Isoptera) were also only eaten during the wet season and provided a particularly ephemeral resource as they only emerge after heavy rains (Picker *et al*.2004). Interestingly, crab (Decapoda) remains occurred more frequently in scats during autumn and early winter. Telperion Nature Reserve experienced high rainfall in autumn, which led to raised water levels in rivers and streams. The elevated water levels resulted in a widening of the rivers and streams, creating shallow pools along their banks and possibly allowing genets to capture crabs more easily. Genets may have made use of this opportunity to supplement their diet with crabs due to other food resources such as arthropods and fruits/seeds being less abundant in autumn and winter.

Some of the less important food categories also showed seasonal variation in occurrence in the rusty-spotted genet's diet. The presence of seeds/fruit pulp varied significantly with season and was highest during summer. *Diospyros lycoides* only bears fruit between January and March and the occurrence of its seeds in *G. maculata* scats was mainly in February (summer). The seasonality of fruit consumption by genets has been observed elsewhere where the intake of fruit increases during summer when availability is higher (Rosalino and Santos-Reis 2002; Amroun *et al*. 2014). In Algeria for example, the ripening of figs at the end of August is followed by the presence of figs in the diet of *G. genetta* during September and October (Amroun *et al*. 2014). Reptiles also showed significant seasonal variation, occurring

in scats more frequently in spring. This was found for *G. genetta* in Portugal where reptile consumption was highest in spring and summer (Rosalino and Santos-Reis 2002) and explained by the increase in reptile activity at higher temperatures (Bellairs 1969). The occurrence of birds in the diet of the rusty-spotted genet did not vary significantly with season but was highest in spring and autumn, peaking in autumn. The increase in consumption of avian prey in spring has been observed in other genet studies and is linked to the breeding season when nesting adults and juveniles are vulnerable to predators (Calviño *et al*. 1984; Virgós *et al.* 1996; Roberts *et al*. 2007; Sánchez *et al*. 2008). While other studies noted that predation on birds also occurs frequently in winter, coinciding with the start of the mating season (Calviño *et al*. 1984; Virgós *et al.* 1996; Roberts *et al*. 2007; Sánchez *et al*. 2008), my study saw a peak in the consumption of birds in autumn. This peak occurred in mid-to-late autumn so there is a possibility that the mating season had already begun. On the other hand, the more likely explanation for the increase in bird consumption during autumn is that preferred food resources had become less abundant. The supplementation of its diet with seasonally available food items further suggests that *G. maculata* is a generalist in terms of diet.

Dietary overlap between seasons calculated with PV and PW indicated that overlap was highest between spring–summer and autumn–winter. Overlap was lower between spring–autumn and summer–autumn and lowest between spring–winter and summer–winter. In other words, diet overlap was highest between similar seasons, i.e. the warmer/wetter seasons of spring and summer and the cooler/drier seasons of autumn and winter, and lowest between seasons with considerably different conditions. This suggests that *G. maculata* experiences a seasonal shift in diet, at least to a certain degree. The results of the analysis of seasonal diet overlap along with the observed seasonal changes in diet composition and frequency of particular food items in scats indicates that *G. maculata* does vary its diet according to season. Furthermore, the fact that the peaks in mammal and arthropod consumption coincide with the peaks in the availability of these food sources indicates that the seasonal changes seen in the rusty-spotted genet's diet are most likely linked to the seasonal variation in prey availability.

3.6 Conclusion

This study revealed that while mammals and arthropods are the dominant prey of *G. maculata* in Telperion Nature Reserve, its diet is generally quite broad and diverse including a variety of other food items such as reptiles, birds and seeds/fruit. The peak availability of mammals and arthropods coincided with peaks in the consumption of these two food categories

indicating that the diet of the rusty-spotted genet varies according to seasonal variations in the abundance or biomass of prey. Seasonal changes in the consumption of less important food categories and specific food items were also noted. These results confirm both of my hypotheses and show that *G. maculata* is a generalist opportunist feeder, supplementing its diet when preferred food items become less abundant and varying its diet according to season in response to seasonal changes in prey availability.

I am reasonably confident that the results I obtained are representative of the actual diet of the rusty-spotted genet as they are similar to what has previously been observed and reported for this species as well as other species in the *Genetta* genus. However, the scat analysis techniques used here provided some challenges. In addition to the common draw-back of soft-bodied or easily digested prey items being difficult to detect, it was impossible to determine whether remains found in scats were from items ingested directly by genets or from items ingested by prey. This was an issue mostly encountered when the occurrence of only 1 or 2 seeds coincided with the consumption of birds. As it is fairly unlikely that genets would only ingest 1 seed from a particular fruit, it is more likely that these solitary seeds were ingested by birds which were subsequently eaten by genets. It was also difficult to discern whether fine plant material was ingested accidentally while consuming prey or through the stomach contents of consumed rodents, as suggested for other carnivore species (Cavallini and Nel 1990). In the case of mammalian remains, it was sometimes difficult to discriminate between items caught by genets and carrion. In these cases, remains were entered under “Mammals” as it was the safer option. Luckily the incidences of these uncertainties were low and therefore unlikely to have severely impacted my results.

For future studies, digestibility coefficients for the different prey items could be determined in order to allow the biomass of ingested prey to be estimated. This method has been shown to offer the best estimate of true diet as it provides a better indication of the contribution of particular prey items to diet (Klare *et al.* 2011). The developing field of isotope analysis could also be explored. I would also recommend that future studies consider a longer study period as prey availability and diet composition could vary inter-annually.

Chapter 4: Trophic ecology of slender mongoose *Herpestes sanguineus* in Telperion Nature Reserve

4.1 Abstract

The diet of the slender mongoose *Herpestes sanguineus* was investigated in Telperion Nature Reserve, South Africa. A total of 97 scats were collected from 19 latrines between spring 2016 and winter 2017. Scats were washed, oven dried at 50°C for 24 hours and their contents separated. Diet was determined through the identification of undigested food remains in the scats and hair scale patterns were used to identify which specific mammal species were consumed. The abundance of small mammals and arthropods in Telperion Nature Reserve was determined in order to assess whether slender mongooses are generalist or specialist feeders and whether their diet varies according to the seasonal abundance of prey. Results indicated that arthropods were the dominant prey, with other items such as mammals, birds, reptiles, fruits/seeds and amphibians acting as supplementary food sources. Low-to-intermediate diet diversity and low diet breadth indices were obtained for all seasons and diet overlap between pairs of seasons was very high. Despite the lack of significant seasonal variation, some seasonal changes were still observed such as the increased consumption of arthropods and mammals during the seasons when the availability of these food items was highest. These results suggest that *H. sanguineus* is more of a specialised feeder than previously thought, specialising in arthropod prey. However, its ability to supplement its diet when preferred food items become less abundant, and vary its diet, albeit marginally, in response to seasonal changes in prey availability, suggests that it is a generalist selector instead of a true specialist.

Key words: arthropods, diet, diet breadth, diet diversity, generalist selector, *Herpestes sanguineus*, prey availability, scat analysis, small mammals, specialised feeder.

4.2 Introduction

Mammalian carnivores play a vital role in the organising and functioning of communities and ecosystems (Roemer *et al*. 2009) and a comprehensive knowledge of a carnivore's diet often allows us to gain a better understanding of its exact role in the ecosystem (Klare *et al.* 2011). By means of diet studies, we can conclude whether competition exists between carnivores, how carnivores impact populations of prey species, and whether any agriculturally or commercially valuable species are being consumed (Litvaitis 2000; Klare *et al.* 2011).

Large African carnivores tend to attract a great deal of attention from researchers largely because of their charisma and economic value (tourism and hunting) (Do Linh San *et al*. 2013). With so much attention on large carnivores, their smaller relatives are often over-looked. While small carnivores are generally more abundant and species rich compared to large carnivores, their impact on the environment is often underestimated (Roemer *et al*. 2009). The consumption of a single prey species by a small carnivore may influence the abundance of that prey species or other prey species, which in turn can have an effect on multiple carnivores (Linnell and Strand 2000). This cascading effect needs to be taken into account if any of the potentially effected species are part of a conservation programme or are of management interest (Clemmons and Buchholz 1998; Linnell and Strand 2000). Amongst small African mammals, mongoose species such as the dwarf mongoose *Helogale parvula*, yellow mongoose *Cynictis penicillata*, banded mongoose *Mungos mungo* and meerkat *Suricata suricatta* have been comprehensively studied while others have received little-to-no attention (Do Linh San *et al*. 2013; Graw and Manser 2017). A mongoose species that has not received much consideration is the slender mongoose *Herpestes sanguineus* (Carnivora: Herpestidae).

The slender mongoose is widespread across Africa ranging from Senegal in the west to the Red Sea coast in Sudan and southwards to the Northern Cape in South Africa (Taylor 1975; Skinner and Chimimba 2005). Within South Africa the most southerly distribution limit of *H. sanguineus* is the eastern parts of the Eastern Cape (Hoffmann and Taylor 2013). This species occurs in a wide variety of habitats ranging from semi-desert to thick woodland (Dücker 1965; Hoffmann and Taylor 2013). However, it is absent from true deserts such as the Namib Desert and the sub-desertic areas of the Sahara such as Aïr, Niger (Hoffmann and Taylor 2013). *Herpestes sanguineus* is also absent from the karroid regions of the Eastern, Western and Northern Cape in South Africa (Hoffmann and Taylor 2013).

The slender mongoose is commonly described as a generalist or opportunist when discussing its diet (Takata 2002; Martinoli *et al.* 2006; Hoffmann and Taylor 2013; Graw and Manser 2017). The diet of *H. sanguineus* is relatively varied, possibly owing to the fact that it occurs in a wide range of habitats. While it mostly forages on the ground, the slender mongoose's ability to climb trees may allow it to actively hunt birds and access nests to eat eggs and chicks (Bates 1905; Hinton and Dunn 1967; Graw and Manser 2017). *Herpestes sanguineus* is mostly carnivorous and will consume various small rodents, insects, lizards, snakes, amphibians, birds and eggs (Shortridge 1934; Hoffmann and Taylor 2013). When available, it

will also eat wild fruits (Hoffmann and Taylor 2013). In Botswana and Zimbabwe, an analysis of stomach contents indicated that insects had a 73% occurrence in the diet of the slender mongoose compared to 27% for reptiles and 25% for rodents (Smithers 1971; Smithers and Wilson 1979). In the Kalahari Desert, insects occurred in 100% of scats collected while mammals and fruit and seeds had an occurrence of 13% and 20%, respectively (Graw and Manser 2017). A study in Kwa-Zulu Natal found that insects had an occurrence of 85%, followed by 54% for mammals and 32% for plants (Maddock 1988).

A small number of studies have looked at the diet of the slender mongoose, using both stomach contents (see Smithers 1971; Smithers and Wilson 1979) and scats (see Maddock 1988; Takata 2002; Martinoli *et al.* 2006; Graw and Manser 2017). Only two of these studies were undertaken in South Africa, both using scat analysis with sample sizes of 30 and 123 scats from the Kalahari Desert and Kwa-Zulu Natal, respectively (Maddock 1988; Graw and Manser 2017). My study is therefore the first to properly describe the diet of *H. sanguineus* in Mpumalanga. Due to the likely differences in habitat between my study site and the location of other research projects in southern and eastern Africa, the present work also contributes towards our knowledge of how the slender mongoose's diet varies across the variety of habitats in which it occurs in Africa.

The general aim of this research was to study the diet of *H. sanguineus* within Telperion Nature Reserve, South Africa. More specifically, the objectives were: 1) to determine the overall diet composition of *H. sanguineus* in the study area, 2) to assess whether there are seasonal variations in the diet of *H. sanguineus*, and whether these are correlated with the seasonal abundance or biomass of their predicted dominant prey (arthropods and small mammals), and 3) based on the high consumption of insects noted in other studies, to assess whether *H. sanguineus* is in fact a generalist as previously described. It was hypothesised that: 1) *H. sanguineus* is more of a specialised feeder than previously thought, and 2) the diet of *H. sanguineus* varies seasonally. Furthermore, it was predicted that: 1) seasonal changes in climatic conditions and vegetation will lead to variations in arthropod and small mammal abundance/biomass and 2) *H. sanguineus* diet will vary seasonally according to variations in the abundance or biomass of their dominant prey.

4.3 Methods and materials

4.3.1 Study site

Telperion Nature Reserve forms part of the larger Ezemvelo Nature Reserve located in Mpumalanga, 120 km east of Pretoria and 24 km north-east of Bronkhorstspruit. The reserve is mostly comprised of Rand Highveld Grassland and Loskop Mountain Bushveld (Mucina and Rutherford 2006). Telperion is dominated by flat and gently sloped grasslands (*Aristida* spp., *Eragrostis* spp., and *Hyparrhenia* spp.), interspersed with rocky outcrops dominated by woody vegetation (MacFadyen 2013). Bushveld vegetation dominated by *Acacia caffra, Protea caffra*, *Burkea africana* and *Ochna pulchra* occurs along the rocky ridges and hills (MacFadyen 2013). Areas of rocky woodland are found in more steeply-sloped areas (Grobler 1999). The Wilge River borders Telperion and three streams originating from higher lying wetlands also run through the reserve (Grobler 1999). The area experiences cold, dry winters and warm summers with rainfall peaking from October to March (Mucina and Rutherford 2006).

Aside from large game species such as Plains zebra *Equus quagga*, black wildebeest *Connochaetes gnou*, blue wildebeest *Connochaetes taurinus* and eland *Tragelaphus oryx*, the reserve is also home to a number of carnivores including brown hyaena *Parahyaena brunnea*, aardwolf *P. cristatus*, leopard *Panthera pardus*, serval *Felis serval*, caracal *Caracal caracal*, black-backed jackal *Canis mesomelas*, rusty-spotted genet *Genetta maculata*, yellow mongoose, meerkat and slender mongoose.

4.3.2 Scat collection

Latrines were located in the reserve by focusing on areas known to be used by slender mongooses through ongoing camera-trapping work and trapping sessions (Roux 2018). A total of 19 slender mongoose latrines were located near the Wilge River, along smaller streams and in rocky outcrops, although many of these latrines were only used for short periods. A number of slender mongoose scats were also collected as isolated samples. Scats were collected from latrines on a monthly basis throughout all four seasons, commencing in September 2016 (spring) and ending in August 2017 (winter). A total of 97 scats were collected from the identified latrines. Identification of scats was achieved using species specific characteristics such as deposition site and scat shape, size and odour (Walker 1996; Murray 2011; Gutteridge and Liebenberg 2013; Stuart and Stuart 2013). The collected scats were placed individually in Ziploc bags and labelled according to the date they were

collected, their GPS location and the season. All scats were stored in a freezer until needed for analysis.

4.3.3 Scat analysis

For analysis, the frozen scats were removed from the freezer, thawed in Petri dishes, and oven-dried at 50°C for 24 hours. All non-dietary materials, such as small stones and twigs, were removed from the dried scats before the scats were weighed using a digital balance.

The dried scats were then soaked overnight in Petri dishes filled with water before being placed in a 1 mm sieve above two stacked 0.4 mm sieves and washed under running water in order to partially separate contents. Subsequently, the contents were dried in an oven at 50°C for 24 hours. Forceps were used to tease apart the contents, which were then spread over grid paper with grid cells of 1 × 1 cm to allow for the proportion of each prey category to be estimated. A dissecting microscope was used to identify food items that were not easily identifiable with the naked eye.

The identification of mammalian prey species was achieved by examining bones found in the scats as well as hair scale patterns. Hair samples (at least 10 hairs) were taken from scats containing hair in order to identify the mammalian prey within them. The hair samples were soaked in ethanol to clean them, rinsed with distilled water, and allowed to dry in a Petri dish. Impressions of hair were made on slides using a 5% solution of gelatine. The solution was heated to 100°C and then allowed to cool down to 50°C before a small quantity was spread evenly on a clean slide. Making use of forceps, the clean strands of hair were placed on the slide with the gelatine film. After allowing the slides to dry, the strands of hair were removed from the slides, leaving behind an impression of hair scale patterns on the gelatine film. These patterns were identified under a compound microscope using a collection of scale patterns of hairs of small mammals collected from live animals as a reference. Pictures of hair scale patterns from Keogh (1975) were also used as a reference.

Arthropod remains were identified to order level based on external morphological features such as elytra, legs and wings. The presence of bird remains was confirmed based on feathers, bones, eggshells and nails found in scats. Bones and scales were used to identify the presence of reptile remains and the presence of amphibian remains was confirmed using bones found in the scats. Undigested seeds and plant matter were used to identify vegetation.

4.3.4 Expression of results

The diets of both species were expressed using the following descriptors:

1. Percentage occurrence (PO), i.e. [the number of scats in which a prey item or category occurred/total number of scats] × 100.

2. Relative percentage occurrence (RPO), i.e. [the number of occurrences of a prey item or category/total number of occurrences of all categories] × 100.

3. The percentage volume (PV) of the remains of each prey item or category in the scats.

4. The percentage weight (PW) of the remains of each prey item or category in the scats.

PV and PW were plotted against PO on paired axes to indicate the percentage overall importance (POI) of the various food categories in the diet of the slender mongoose. Primary food categories were considered to lie above the 25% isopleth, secondary categories between the 6% and 25% isopleths and supplementary categories between the 1% and 5% isopleths. Categories lying below the 1% isopleth were considered as "trace" food categories.

To explore any potential similarities or variations in diet from season to season or between different sampling sites, the broad prey categories of mammals, arthropods, amphibians, birds, reptiles, plant material, fruit seeds/pulp and other material were taken into account. The category of "other" includes items of carrion, human food and unidentifiable material. This classification was chosen because the last 6 categories were not identifiable to order (like arthropods) or species level (like mammals). Seasonal differences in the overall diet and for each food category were tested with chi-square tests of independence, referring to the absolute occurrences of the diverse food categories. Due to small expected values, the categories of mammals and birds, reptiles and amphibians, and plant material, fruit seeds/pulp and "other" were merged in order to meet the conditions required to perform the tests. These statistical analyses were performed in Excel 2010 (Microsoft Inc.).

To investigate seasonal variations in the number of food categories and items found in scats, as well as in the percentage weight and percentage volume of dominant items and food categories, a Kruskal–Wallis test was done since data were not normally distributed (Kolmogorov–Smirnov tests, $p < 0.05$). Dyadic comparisons were made with Mann–Whitney U tests. These analyses were done using SPSS 25.0 (SPSS Inc.).

Based on formulas given in Krebs (1999), further comparative analyses were done using RPO for each food category (for comparison with other studies), but also PV and PW, all expressed as mathematical frequencies (i.e. values varying between 0 and 1), in calculating:

1) The Shannon–Wiener diversity index (H'), ranging from 0 to $\log_2 n$, with n being the number of food categories;

2) The evenness measure of representation (J'), ranging from 0–1;

3) Levin's standardised diet breadth (B_A), ranging from 0–1; and

4) Pianka's overlap index for diet (α) where α is the overlap between two seasons or two species. The α index varies between 0 (diets are totally different between the two seasons/species) and 1 (identical diets).

4.4 Results

4.4.1 Overall diet and seasonal variations in the diet of the slender mongoose

A total of 97 scats were collected between spring 2016 and winter 2017 (Table 4.1). The mean number (± SD) of food categories per scat was 1.92 ± 0.83 and the mean number of food items per scat was 3.07 ± 1.26. The mean percentage volume of dominant items per scat was 89.34 ± 13.06% (Table 3.1). Statistical analyses revealed a significant seasonal difference in the number of food categories (Kruskal–Wallis test, $H = 11.97$, $df = 3$, $p < 0.05$) but not for the number of food items ($H = 2.63$, $df = 3$, $p = 0.452$) or the percentage volume of dominant items per scat ($H = 4.59$, $df = 3$, $p = 0.204$).

The diversity index and evenness of representation were low-to-intermediate, with standardised diet breadth being low for all seasons (Table 4.1).

Table 4.1: Number of scats collected in Telperion Nature Reserve (TNR) from 2016 to 2017 and results for the diet indices, calculated using relative percentage occurrence (RPO), percentage volume (PV) and percentage weight (PW) (expressed as mathematical frequencies) for the seasonal, average and yearly data in the diet of the slender mongoose *Herpestes sanguineus.*

Variables	**Spring**	**Summer**	**Autumn**	**Winter**	**Year**
Number of scats	19	15	36	27	97
Mean number of food categories per scat	2.11 ± 0.88	1.47 ± 0.64	1.75 ± 0.69	2.26 ± 0.90	1.92 ± 0.83
Mean number of food items per scat	3.42 ± 1.89	2.60 ± 0.83	2.97 ± 0.97	3.22 ± 1.22	3.07 ± 1.26
Mean percentage volume of dominant items per scat	84.95 ± 15.60%	93.80 ± 8.18%	90 ± 12.53%	89.07 ± 13.70%	89.34 ± 13.06%
Shannon–Wiener Diversity index (*H'*)					
With RPO	2.01	1.40	1.93	2.09	2.07
With PV	1.38	0.43	1.06	1.61	1.26
With PW	1.12	0.26	0.89	1.59	1.12
Evenness of Representation (*J'*)					
With RPO	0.67	0.47	0.64	0.70	0.69
With PV	0.46	0.14	0.35	0.54	0.42
With PW	0.37	0.09	0.30	0.53	0.37
Standardised diet breadth (B_A)					
With RPO	0.31	0.14	0.24	0.34	0.29
With PV	0.12	0.02	0.07	0.18	0.10
With PW	0.08	0.01	0.05	0.17	0.08

The diet of the slender mongoose was fairly varied but the main food categories consumed, in terms of percentage occurrence (PO), were arthropods, plant material and mammals (Figure 4.1). Reptiles and birds were also consumed, but to a slightly lesser extent. The consumption of amphibians, seeds/fruit pulp and other items was relatively minor and occasional. Most food categories were consumed throughout all seasons, except for seeds/fruit pulp and other items, which were only consumed in autumn and winter, and amphibians which were only consumed in spring. Arthropod consumption was very high for all seasons (> 90%) but clearly peaked in spring, summer and autumn (100%). The consumption of plant material was highest in winter (> 70%) and lowest in summer when it dropped to 20%. Mammal consumption peaked in winter (26%) and was at its lowest in spring (11%).

Chi-square tests of independence comparing the different food categories as well as tests performed with each food category (vs. remaining categories) revealed no significant seasonal differences (Table 4.2). Chi-square tests of independence carried out between pairs of seasons indicated no inter-seasonal differences in diet composition (Table 4.3).

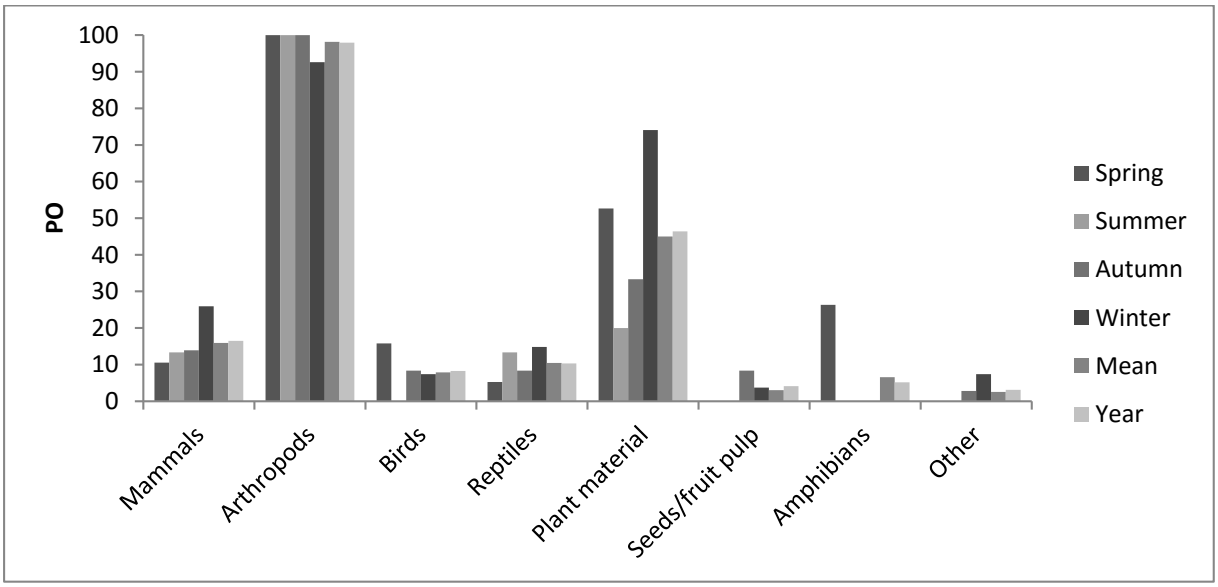


Figure 4.1: Seasonal percentages of occurrence (PO) of various food categories in the diet of the slender mongoose *Herpestes sanguineus* in TNR.

Table 4.2: Results of chi-square tests of independence performed to identify potential significant seasonal differences in the diet of the slender mongoose at TNR, as determined from scat analysis and evaluated based on absolute occurrence. None of the differences observed were statistically significant ($p > 0.05$).

Test	χ^2	***df***	***p***
Overall diet	10.8	9	0.286
Mammals & Birds	0.48	3	0.92
Arthropods	6.2	3	0.1
Reptiles & Amphibians	3.74	3	0.291
Plants, Fruits & Other	5.5	3	0.14

Table 4.3: Results of chi-square tests of independence performed to identify potential significant differences in the diet of the slender mongoose between pairs of seasons at TNR, as determined from scat analysis and evaluated based on absolute occurrence.

Dyadic comparisons	χ^2	***df***	***p***
Spring vs. Summer	2.5	3	0.473
Spring vs. Autumn	3.4	3	0.34
Spring vs. Winter	3.3	3	0.35
Summer vs. Autumn	2	3	0.564
Summer vs. Winter	6	3	0.111
Autumn vs. Winter	3.4	3	0.333

Of the 16% of slender mongoose scats that contained mammal hairs, 38% of these hairs were from *Otomys irroratus* (Table 4.4). Both *Mus minutoides* and *Micaelamys namaquensis/Aethomys chrysophilus* were the least consumed species, only present in 6% of scats. Other mammal hairs were also present (38%) but unidentifiable. The unidentifiable hairs appeared to come from only two species.

When considering both PO and RPO, Orthoptera was the most consumed arthropod order, followed by Coleoptera and Hymenoptera, with millipedes and ticks being the least consumed arthropods in the diet of the slender mongoose (Table 4.5).

Table 4.4: Percentages of occurrence (PO) and activity pattern of different small mammal species that were consumed by the slender mongoose (*n* = 16 scats with mammalian hair remains) at TNR.

Common name	Scientific name	PO	Activity
Vlei rat	*Otomys irroratus*	37.5	Diurnal
Musk shrew sp.	*Crocidura* sp.	12.5	Sporadically active throughout the day and night
Namaqua rock mouse/ Red veld rat	*Micaelamys namaquensis/ Aethomys chrysophilus*	6.25	Nocturnal
Pygmy mouse	*Mus minutoides*	6.25	Nocturnal, partly diurnal
Other mammal species	?	37.5	?

Table 4.5: Percentages of occurrence (PO) and relative percentages of occurrence (RPO) of arthropod taxa consumed by the slender mongoose at TNR. Taxa are ranked based on descending importance in the diet.

Arthropod taxa	PO	RPO
Orthoptera	81.30	40.80
Coleoptera	66.58	33.06
Hymenoptera	21.23	10.33
Lepidoptera	8.52	4.29
Isoptera	8.04	3.98
Mantodea	5.37	2.71
Araneae	3.95	1.79
Hemiptera	1.67	0.81
Decapoda	1.32	0.60
Chilopoda	1.32	0.60
Diplopoda	0.93	0.53
Ixodida	0.93	0.53

While the values of RPO were lower than PO, as expected, the overall results were similar with arthropods contributing the most towards diet during summer (RPO: 68%) and plant material (RPO: 33%) and mammals (RPO: 11%) contributing the most during winter (Figure 4.2). However, when considering RPO, the contribution of arthropods was highest during only one season (summer) versus PO (Figure 4.1) where contribution was equally high for spring, summer and autumn.

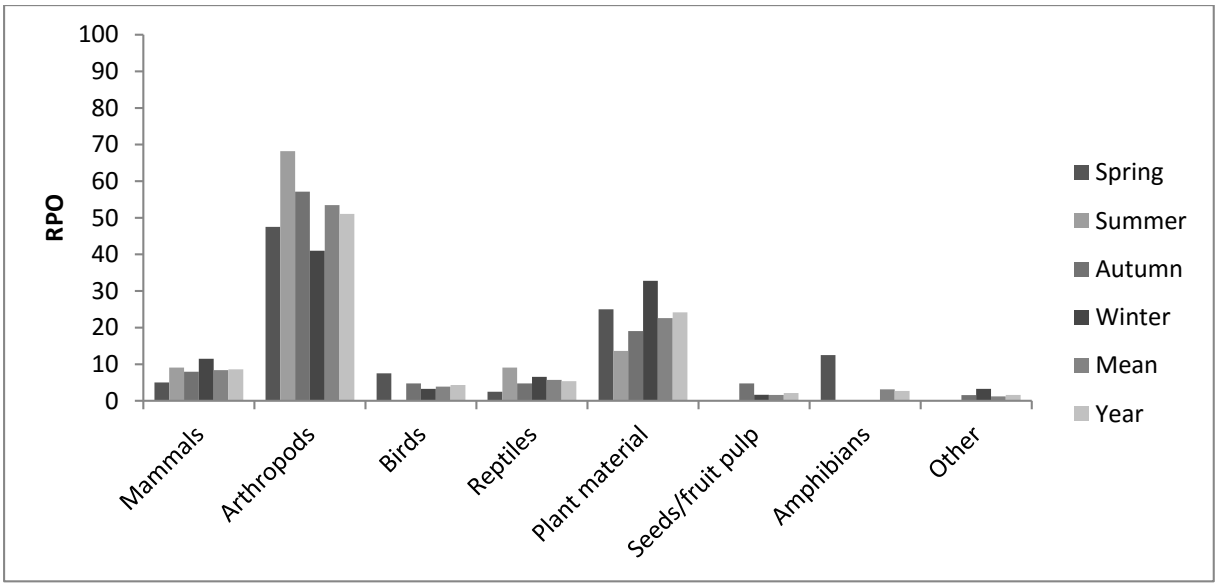


Figure 4.2: Seasonal relative percentages of occurrence (RPO) of various food categories in the diet of the slender mongoose at TNR.

When the percentage volume (PV) and percentage weight (PW) were considered, the most important food category in the diet of the slender mongoose was again arthropods (Table 4.6). However, when considering PV and PW, mammals contributed more to diet than plant material compared to PO (Figure 4.1) and RPO (Figure 4.2) where plant material contributed more than mammals. There was a significant seasonal difference in the percentage volume of arthropod (Kruskal–Wallis test, $H = 8.71$, $df = 3$, $p < 0.05$), plant material ($H = 7.84$, $df = 3$, $p < 0.05$) and amphibian ($H = 21.40$, $df = 3$, $p < 0.001$) remains in scats, but not for mammals ($H = 2.82$, $df = 3$, $p = 0.420$), birds ($H = 2.88$, $df = 3$, $p = 0.411$), reptiles ($H = 1.42$, $df = 3$, $p = 0.700$), seeds/fruit pulp ($H = 3.03$, $df = 3$, $p = 0.387$) and other ($H = 2.81$, $df = 3$, $p = 0.422$). There was also a significant seasonal difference in the percentage weight of arthropod (Kruskal–Wallis test, $H = 10.79$, $df = 3$, $p < 0.05$), plant material ($H = 11.65$, $df = 3$, $p < 0.05$) and amphibian ($H = 21.40$, $df = 3$, $p < 0.001$) remains in scats, but not for mammals ($H = 2.65$, $df = 3$, $p = 0.449$), birds ($H = 2.92$, $df = 3$, $p = 0.405$), reptiles ($H = 1.52$, $df = 3$, $p = 0.677$), seeds/fruit pulp ($H = 2.98$, $df = 3$, $p = 0.394$) and other ($H = 2.75$, $df = 3$, $p = 0.433$).

Similar to PO, RPO, PV and PW, arthropods were shown to be the most important food categories in the diet of the slender mongoose when considering percentage overall importance (POI) (Figure 4.3).

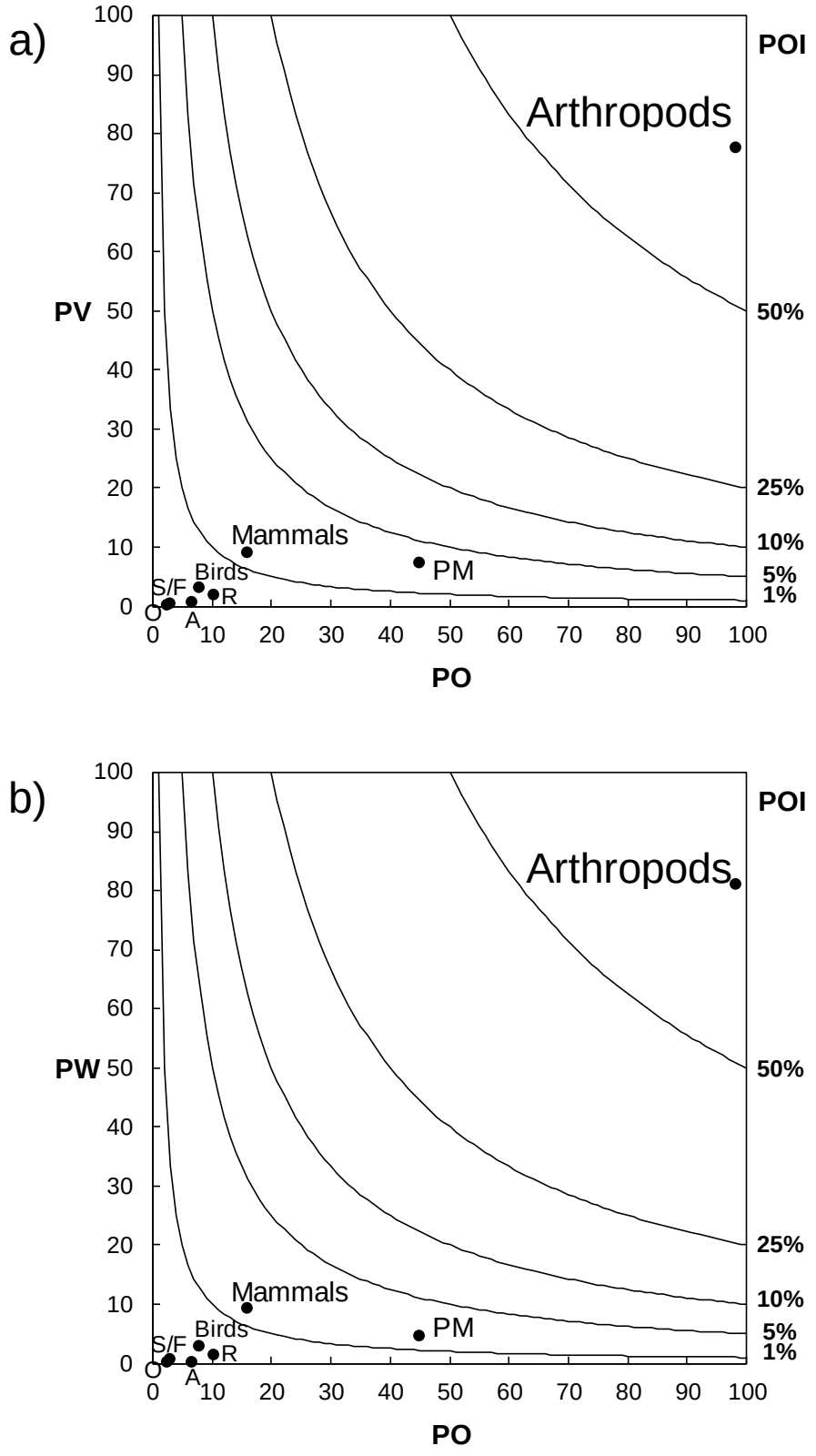


Figure 4.3: Graphical representation of the percentage overall importance (POI) of the broad food categories in the diet of the slender mongoose with a) percentage volume (PV) plotted against percentage occurrence (PO) and b) percentage weight (PW) plotted against PO. Font size used to represent food categories is proportional to their overall importance. B, Birds; R, Reptiles; PM, Plant material; S/F, Seeds/fruit pulp; A, Amphibians; O, Other.

Table 4.6: Mean percentage volume (PV) and percentage weight (PW) of the remains of various food categories identified from the scats of rusty-spotted genet at TNR.

CATEGORY	PV	PW
Mammals	9.02	9.27
Arthropods	77.61	81.13
Birds	3.12	2.80
Reptiles	1.88	1.31
Plant material	7.34	4.51
Seeds/fruit pulp	0.33	0.64
Amphibians	0.53	0.21
Other	0.18	0.13

The diet overlaps for pairs of seasons calculated with RPO, PV and PW were very high and did not differ considerably (Table 4.7).

Table 4.7: Pianka's index for diet overlap between pairs of seasons evaluated using RPO, PV and PW (expressed as mathematical frequencies) the diet of the slender mongoose (Sp = spring, Su = summer, Au = autumn, Wi = winter).

	Sp vs. Su	Sp vs. Au	Sp vs. Wi	Su vs. Au	Su vs. Wi	Au vs. Wi
RPO	0.92	0.96	0.94	0.98	0.89	0.94
PV	0.99	1.00	0.97	0.99	0.95	0.97
PW	0.99	1.00	0.97	1.00	0.95	0.97

4.5 Discussion

4.5.1 Overall diet of the slender mongoose

The results of this study show a clear preference for arthropods in the diet of *H. sanguineus* in Telperion Nature Reserve, with mammals used as a supplementary food source. This is similar to what has been observed for this species in other studies (Smithers 1971; Smithers and Wilson 1979; Maddock 1988; Takata 2002; Martinoli *et al.* 2006; Graw and Manser 2017). Other mongoose species such as Cape grey mongoose *Galerella pulverulenta* (Mbatyoti 2010), meerkat (Doolan and Macdonald 1996), banded mongoose (Maddock *et al.* 2016) and Selous' mongoose *Paracynictis selousi* (Smithers 1983; Skinner and Chimimba

2005; Gilchrist *et al.* 2009) also feed primarily on arthropods. An analysis of stomach contents from slender mongooses in Botswana and Zimbabwe showed that insects had a percentage occurrence of 73% while rodents only occurred in 25% of stomachs (Smithers 1971; Smithers and Wilson 1979). Scats collected from mongooses in the Kalahari Desert revealed that insects occurred in 100% of scats whereas mammals had an occurrence of 13% (Graw and Manser 2017). Martinoli *et al.* (2006) observed a 37% occurrence for insects compared to 24% for mammals. However, it is important to note that some studies found that while arthropods occur more frequently than mammals, their contribution to volume was less than that contributed by mammals (Maddock 1988; Takata 2002). This is due to the fact that the importance of prey categories is often overestimated when PO and RPO are considered as these measures only indicate how often a particular prey item has been consumed and do not take into account the size or quantity of the prey ingested. In these cases, the use of volume measurements may provide a slightly better indication of the importance of a prey type as it gives a rough idea of the quantity ingested. In Maddock (1988) for example, insects had a frequency of occurrence of 85% compared to mammals with 54%. However, when the percentage of total mass was considered, 85% was attributed to mammals and only 1% to insects. In my study PO, RPO, RV and RW all indicated that arthropods were preferred over mammals.

A closer look at arthropods showed that Orthoptera (locusts, grasshoppers and crickets) were most frequently consumed, followed by Coleoptera (beetles) and Hymenoptera (ants, wasps and bees). The higher occurrence of Orthoptera compared to Coleoptera has been noted in some studies (Smithers 1971; Smithers and Wilson 1979; Graw and Manser 2017). Graw and Manser (2017) for example, observed an occurrence of 57% for Orthoptera in slender mongoose scats compared to 37% for Coleoptera. On the other hand, some studies found that Coleoptera were present more often than Orthoptera (Maddock 1988; Martinoli *et al.* 2006). One study found that Coleoptera occurred in 29% of scats while Orthoptera had an occurrence of 5% (Martinoli *et al.* 2006) and another study noted that Coleoptera were present in 76% of scats compared to 66% for Orthoptera (Maddock 1988). In addition to this, Hymenoptera was either not present in other studies, or if present, its importance was less than suggested in this study (Smithers 1971; Smithers and Wilson 1979). Instead, other studies indicated that Isoptera (termites) was an important arthropod order in the diet of *H. sanguineus* (Smithers 1971; Smithers and Wilson 1979; Maddock 1988; Graw and Manser 2017). In general, the majority of insects eaten by the slender mongoose were diurnal, including grasshoppers,

locusts and beetles such as *Dischista* sp., reflecting the diurnal habits of the mongoose. In studies where insects were frequently consumed but accounted for very little mass in the diet of the slender mongoose, it was suggested that insects are only eaten opportunistically (Maddock 1988; Takata 2002). However, with all of the diet descriptors pointing towards the importance of arthropods in the diet of the slender mongoose in Telperion Nature Reserve, it is possible that arthropod orders such as Orthoptera and Coleoptera are actively sought-out while the less frequently consumed orders are only eaten when encountered by chance.

The diet of the slender mongoose was supplemented with small mammals, specifically rodents. The most commonly consumed species was *O. irroratus*, followed by *Crocidura* sp., *M. minutoides* and *M. namaquensis*/*A. chrysophilus*. The importance of *Otomys* sp. and shrews in the diet of the slender mongoose was noted by Maddock (1988), with occurrences of 28% and 12%, respectively. Of the species eaten by *H. sanguineus*, all except *M. namaquensis*/*A. chrysophilus* were either completely diurnal or displayed some diurnal behaviour. In addition to its diurnal nature, *O. irroratus* is also fairly slow which may make it easier to capture than other rodent species present in the reserve (Maddock 1988). The presence of nocturnal rodents in the diet of diurnal mongooses has been noted for the slender mongoose, Egyptian mongoose *H. ichneumon* and *C. penicillata* (Rood and Wozencraft 1984; Avenant and Nel 1992; Takata 2002). Slender mongooses probably encounter nocturnal rodents during brief periods of overlap in their activity at sunrise and sunset, or while rodents are in their burrows during the day (Takata 2002).

When considering PO and RPO, plant material appeared to contribute more than mammals towards the diet of the slender mongoose. However, PV and PW revealed that plant material is the third most important food category after arthropods and mammals. This category was mostly represented by grass. The presence of plant material, including grass, in the diet of *H. sanguineus* has been noted in other studies where it had occurrences of 32% (Maddock 1988), 20% (Graw and Manser 2017) and 14% (Martinoli *et al.* 2006). Similar to what has been observed by Maddock (1988) for *H. ichneumon* and water mongoose *Atilax paludinosus*, the grass found in slender mongoose scats was dead, dry and very finely masticated as opposed to occurring undigested and unchanged in terms of structure or colour. It is suggested that the consumption of grass by carnivores does not to provide a source of nutrition, but rather aids removal of hair from the intestines, induces vomiting to purge ingested toxins, aids in digestion, relieves stomach and throat inflammation and provides a possible source of folic acid (Morris 1996). The dry and finely ground state of the grass in slender mongoose scats

also strongly suggests that it may have been ingested accidentally while handling other prey or through the stomach contents of rodents that were fed upon, as has been suggested for other mongoose species such as *G. pulverulenta*, *H. ichneumon* and *A. paludinosus* (Maddock 1988; Cavallini and Nel 1990).

Birds and reptiles were other items consumed by the slender mongoose, although only occasionally. With its ability to climb trees, the slender mongoose is able to actively hunt birds and access eggs and chicks in nests (Bates 1905; Hinton and Dunn 1967; Graw and Manser 2017). The occurrence of birds in this study is very similar to what has been observed in other studies for this species (Maddock 1988; Martinoli *et al.* 2006). Martinoli *et al.* (2006) noted an occurrence of 10% for birds, including chickens, and Maddock (1988) found that birds occurred in 7% of scats. Graw and Manser (2017) observed *H. sanguineus* hunting small birds in trees and shrubs on two occasions and noted that a number of bird species would react with alarm calls and mobbing when slender mongooses were nearby, suggesting that they are viewed as a threat to chicks and eggs. Reptile remains were mostly in the form of scales, vertebrae and ribs from snakes. Only Maddock (1988) obtained a similar percentage occurrence for reptiles in scats (13%) while other studies obtained higher percentages of 67% (Graw and Manser 2017) and 27% (Smithers 1971; Smithers and Wilson 1979).

The categories of seeds/fruit pulp, amphibians and “other” were consumed infrequently and contributed very little towards the volume and weight of scats (less than 1% each). Martinoli *et al.* (2006) found fruit to be slightly more important in the diet of the slender mongoose in Tanzania where it had an occurrence of 10% and a mean volume estimate of 3%. In my study, it is possible that the presence of seeds in scats came-about through the consumption of birds since very few seeds were found and three out of five occurrences of seeds coincided with the presence of bird remains. A similar percentage occurrence was noted for amphibians in Kwa-Zulu Natal (9%) but they accounted for a higher percentage of total mass (2%) compared to my results (Maddock 1988). Although amphibians are present during the day and slender mongooses are often found near bodies of water where they are likely to encounter frogs and toads, amphibians are mostly active at night, which could explain why they do not contribute much to the diet of the slender mongoose. There was no confirmed evidence of scavenging from scats collected at Telperion Nature Reserve although the presence of small white worms (possibly maggots) and bone fragments could perhaps indicate that carrion was ingested. In these two separate cases, due to uncertainty, the worms were classified as unidentified arthropods and the bone fragments were assigned to the category of mammals. The

occurrence of a piece of string in one scat indicates that *H. sanguineus* may visit human residences within Telperion Nature Reserve.

Arthropods appear to be the dominant prey of the slender mongoose with mammals and other food items supplementing its diet. Despite the fact that a variety of food items are consumed, the preference for arthropods and the intermediate-to-low diet diversity and low diet breadth suggest that the slender mongoose is more specialised in terms of its feeding habits than previously described. That being said, *H. sanguineus* is not a true specialist. The ability of mongooses to use a wide variety of food resources has been noted on numerous occasions (Kingdon 1977; Smithers 1983; Baker 1987; Maddock 1988), classifying them as generalists according to the terminology of Rosenzweig (1985). However, the preference for arthropod prey by the slender mongoose, even in winter when availability was low, would suggest it is more selective. Rosenzweig (1985) suggests that because the availability of prey is likely to vary seasonally, some selective mongooses have retained the ability to exploit additional prey and can therefore be described as generalist selectors. The tendency of the slender mongoose to utilise arthropods as a preferred food item, irrespective of availability, and its ability to supplement its diet with other prey when necessary would thus make it a generalist selector.

4.5.2 Food availability and seasonal variations in the diet of the slender mongoose

Arthropod biomass within Telperion Nature Reserve varied seasonally with mean biomass at a maximum in summer and a minimum in winter (Chapter 2). The occurrence of arthropods in the diet of the slender mongoose was consistently high for all seasons. While there was no significant seasonal variation in arthropod consumption, it peaked in summer and was at its lowest in winter, corresponding with the observed trends in arthropod biomass. Similar results have been observed where insects had an occurrence of 68% during the warm, wet months compared to 30% for the cold, dry months (Taylor 1969; Skinner and Chimimba 2005). Takata (2002) also noted that the consumption of arthropods is at its highest during and shortly after peaks in rainfall. The rise in arthropod consumption is linked to the increase in arthropod activity and reproduction during warmer seasons (Pielou 1948; Takata 2002; Hoffmann and Taylor 2013). Other studies showed varied results. Maddock (1988) also observed a decrease in the consumption of insects in winter but noted an additional drop in summer and Graw and Manser (2017) found that insects had a 100% occurrence for both summer and winter, but contributed more towards volume in winter (77%) than in summer (34%). Regarding specific arthropod orders, Orthopterans were eaten frequently and year-round. Beetles (Coleoptera) were also eaten year-round, with only a slight decrease observed

in winter. Other arthropods were consumed during specific seasons. The third most important order, Hymenoptera, mostly occurred in scats during spring and autumn, termites (Isoptera) and crabs (Decapoda) were consumed in spring and winter, the remains of spiders (Araneae) were only noted during spring and butterfly larvae (Lepidoptera) were mostly eaten in summer. The orders that were eaten less frequently and sporadically during the year were probably consumed opportunistically. The fact that arthropod intake was high throughout the year suggests that the slender mongoose specialises in arthropods. Additionally, the preferred orders (Orthoptera and Coleoptera) were consumed frequently in winter, despite the drop in arthropod biomass for this season, suggesting that *H. sanguineus* actively searches for arthropod prey even in times of low abundance.

There was clear seasonal variation in both the number of small mammals captured and small mammal biomass (Chapter 2). While the seasonal maximums and minimums were different for each trapping site, when data were combined there were peaks in the number of captures and biomass in winter and autumn, respectively (Chapter 2). Three out of the four identifiable rodent species in the slender mongoose's diet were consumed during winter, making it the season with the most consumed species. The seasonal variations in small mammal captures and biomass were reflected in the diet of *H. sanguineus* where the consumption of mammalian prey was at its highest in winter and slightly lower in spring and summer, although none of these differences were significant. Similar results have been observed in other studies as well (Taylor 1969, Skinner and Chimimba 2005). For example, Graw and Manser (2017) found that mammal remains occurred in 20% of scats in winter, dropping to 8% in summer. On the other hand, Maddock (1988) observed a similar decrease in rodent consumption in early spring, but found that slender mongooses generally ate fewer rodents in March, May and June (early autumn and winter) with the consumption of mice only peaking at the very end of winter. In terms of individual rodent species, *O. irroratus* hairs were found in scats from spring, autumn and winter. However, this species was only trapped during spring at the grassland site (Figure 2.3b, Chapter 2). During the winter trapping session in the grassland, *O. irroratus* scats were found in a number of traps that had either not closed, or not closed fast enough to trap the animal. According to Maddock (1988), *Otomys* sp. was consumed by the slender mongoose in numbers that were not proportionate to their abundance as it was the most consumed species, yet it was trapped very rarely. *Otomys* is known to be trap shy and this can lead to its abundance being underestimated (Maddock 1988). Compared to results from Maddock (1988), *Crocidura* sp. had a similar percentage occurrence in scats

and *M. minutoides* and *M. namaquensis*/*A. chrysophilus* occurring slightly more frequently. *Mus minutoides* only occurred in the diet of *H. sanguineus* in winter, coinciding with the highest number of captures for this species in the grassland and along the river (Figure 2.3a and b, Chapter 2). The occurrence of *M. namaquensis*/*A. chrysophilus* in the diet of the slender mongoose indicates that it also hunts on outcrops where these species are typically found (Figure 2.3c, Chapter 2). The contribution of mammals to the diet of the slender mongoose in Telperion Nature Reserve was always lower than that of arthropods, but it was noted that mammal consumption was highest when arthropod consumption was at its lowest. This suggests that mammals are eaten to supplement the mongoose's diet when arthropod abundance drops in winter.

Similar to arthropods and mammals, there was no significant seasonal variation in the consumption of the remaining food categories. The consumption of birds was highest in spring which is similar to observations made in other studies where the occurrence of bird remains peaked between September and February (Takata 2002) and from October to December (Maddock 1988). The increase in consumption of avian prey in spring, as noted in other small carnivore studies, has been associated with the breeding season when nesting adults and chicks are most vulnerable to predators (Calviño *et al*. 1984; Virgós *et al.* 1996; Roberts *et al*. 2007; Sánchez *et al*. 2008). Depending on the descriptors considered, reptiles contributed the most towards diet in either summer (RPO) or winter (PO, PV and PW). Takata (2002) did not observe any seasonal pattern in reptile consumption while Maddock (1988) found that more were consumed in January (summer). A rise in reptile consumption in summer is usually explained through the increase in reptile activity at higher temperatures (Bellairs 1969). However, the peak observed in winter is probably linked to a decrease in the abundance of dominant prey (arthropods) and the associated increase in consumption of supplementary food items.

The categories of seeds/fruit pulp, amphibians and "other" contributed especially little towards the diet of the slender mongoose. The consumption of seeds and fruit only occurred in autumn and winter and while the seeds could not be identified, they likely came from fruits that ripened during this particular period. Maddock (1988) noted that fruits were eaten throughout the year as they ripened. Amphibians were only consumed during spring. The breeding period for frogs and toads usually coincides with the rainy season and the increase in amphibian activity during this time may have allowed *H. sanguineus* to capture them more easily. It has also previously been observed that amphibians are consumed infrequently by

slender mongooses and contribute very little towards overall diet (Maddock 1988). Finally, the category of "other" which includes carrion and human food was only represented in autumn and winter. A piece of string found in a scat collected in winter suggests that slender mongooses may visit human residences in order to scavenge through garbage when preferred food items become less abundant. The presence of small white worms (possibly maggots) and fragments of bone in two separate scats collected in winter may be evidence of the utilisation of carrion. Maggots have previously been found in the stomachs of slender mongooses (Rautenbach 1982) and slender mongooses are known to visit animal carcasses to either feed on them directly (Bates 1990; M. Manser, pers. obs. *in* Graw and Manser 2017) or to feed on fly larvae (Vaughan 1976). The utilisation of the above three food categories during periods when arthropods decrease in availability indicates that *H. sanguineus* supplements its diet when preferred food items become less available.

Dietary overlap between seasons calculated with RPO, PV and PW indicated that overlap was very high between all seasons. The lowest overlap was between summer and winter, which may reflect the shifts in arthropod and mammal consumption related to the peaks and drops in their abundance during these two seasons. The results of the analysis of seasonal diet overlap and the lack of significant seasonal differences in the consumption of various food categories suggests that the slender mongoose does not vary its diet according to season. However, despite the lack of significant seasonal variation, some seasonal changes were still observed. The most noteworthy being that the peaks in arthropod and mammal availability coincided with the peaks in consumption of these two food sources indicating that the slender mongoose may vary its diet according to the seasonal variations in abundance or biomass of its dominant prey, at least to a certain degree.

4.6 Conclusion

The results of this study revealed that arthropods are the dominant prey of the slender mongoose in Telperion Nature Reserve, with mammals used to supplement its diet, particularly when arthropod availability decreases. Although *H. sanguineus* consumed various other food items, its diet appears to be rather narrow and not overly diverse. Despite the lack of significant seasonal variation in diet, the increased consumption of arthropods and mammals during the seasons when the availability of these food categories was highest indicates that the slender mongoose varies its diet, albeit marginally, in relation to seasonal changes in the availability of its dominant prey. These results confirm both of my hypotheses and show that the slender mongoose is more of a specialised feeder than previously thought,

specialising in arthropod prey and supplementing its diet sporadically throughout the year and when preferred food items become less abundant (i.e. a generalist selector), and varying its diet seasonally in response to seasonal changes in prey availability.

While I am reasonably confident that the results I obtained are representative of the actual diet of the slender mongoose, as they are similar to what has been observed in other studies for this species, a larger sample size may have revealed more significant results. Despite their popularity, the scat analysis techniques used here provided some minor challenges. In addition to the common draw-back of soft-bodied or easily digested prey items being difficult to detect, it was impossible to determine whether remains found in scats were from items ingested directly by mongooses or from items ingested by prey. Due to the dry, fine state of grass found in scats, I was unable to determine whether it was ingested accidentally while consuming prey or through the stomach contents of consumed rodents, as suggested in other studies (Maddock 1988; Cavallini and Nel 1990). Similarly, it was also difficult to discern whether the small white worms found in a scat were eaten intentionally or ingested while consuming carrion.

With the use of measures such as PO and RPO, which measure only how often a prey item occurs, it is possible that the importance of mammalian prey in the diet of *H. sanguineus* was underestimated. This is because PO and RPO do not give any indication of the quantity of food ingested and the consumption of a single rodent would certainly provide more food than a single insect. The use of PV and PW alleviated this problem to a certain degree, but not entirely. I would therefore suggest that for future studies, digestibility coefficients for the different prey items be determined in order to allow the biomass of ingested prey to be estimated. This method offers the best estimate of true diet as it provides a better indication of the contribution of particular prey items to diet (Klare *et al.* 2011). The developing field of isotope analysis could also be explored. Due to the exposed nature of slender mongoose latrines, many scats were washed away during the rainy season. I would therefore suggest that latrines be checked more frequently than once per month during this period to avoid the loss of potential samples. Future studies should also consider a longer study period to determine whether prey availability and diet composition vary inter-annually.

Chapter 5: Species comparison – results and general discussion

5.1 Comparison of diet and dietary overlap between the rusty-spotted genet and slender mongoose with a focus on coexistence

Rusty-spotted genets consumed more mammals, birds, reptiles, fruit/seeds and plant material than slender mongooses, while slender mongooses consumed more arthropods (Table 5.1). Martinoli *et al.* (2006) also observed that *G. maculata* consumed more birds and fruit and *H. sanguineus* ate more insects. The high frequency of small mammals in the diet of the rusty-spotted genet is probably linked to the fact that the majority of rodent species in Telperion Nature Reserve are nocturnal. With birds and fruit generally having to be respectively hunted and collected on trees, and *G. maculata* being more arboreal than *H. sanguineus*, it is also no surprise that these items featured more prominently in the diet of the rusty-spotted genet. Plant material occurred more frequently in genet scats than in those of mongooses. The grass found in *G. maculata* scats was green, mostly unmasticated, and occurred in the distal ends of scats whereas grass in *H. sanguineus* scats was dead, dry and very fine. It is quite possible that *G. maculata* intentionally ingested grass in order to aid in digestion and the removal of hair from the intestines (Morris 1996) whereas the ingestion of grass by *H. sanguineus* may have occurred accidentally when handling prey or through the stomach contents of consumed rodents (Maddock 1988; Cavallini and Nel 1990).

Regarding the small mammals consumed by both species, *M. namaquensis/A. chrysophilus* occurred more frequently in the diet of *G. maculata* while *O. irroratus* and *Crocidura* sp. were consumed more often by *H. sanguineus* (Table 5.1). The nocturnal habits of *M. namaquensis/A. chrysophilus* are likely why it appears more frequently in the diet of the rusty-spotted genet than in the diet of *H. sanguineus*. Similarly, the diurnal nature of *O. irroratus* is perhaps why it is consumed more often by slender mongooses. The presence of more rodent species in the diet of the rusty-spotted genet is also probably linked to the temporal overlap between the genet and its prey.

Many arthropod taxa were shared between *G. maculata* and *H. sanguineus* (Table 5.1). For both species, Orthoptera and Coleoptera were the most important orders although these orders featured more prominently in the diet of slender mongooses. Despite this overlap, it appears as though *G. maculata* and *H. sanguineus* consumed slightly different species within these orders. Orthopterans in the diet of the slender mongoose were mostly in the form of grasshoppers and locusts whereas the rusty-spotted genet ate crickets, in addition to

grasshoppers and locusts. A slight difference in beetle species composition was also noted. Some arthropod orders were only present in the diet of one species. Scorpions, for example, were only consumed by genets, likely due to the nocturnal behaviour of this prey item.

Table 5.1: Percentage occurrence (PO) of various food categories and items in the diet of the rusty-spotted genet *Genetta maculata* and slender mongoose *Herpestes sanguineus* from spring 2016 to winter 2017 in TNR.

Category	Rusty-spotted genet	Slender mongoose
Mammals	**88.78**	**16.49**
Micaelamys namaquensis/ Aethomys chrysophilus	26.59	6.25
Otomys irroratus	14.45	37.5
Dendromus sp.	12.14	-
Mastomys sp.	11.56	-
Elephantulus myurus	6.36	-
Mus minutoides	6.36	6.25
Steatomys pratensis	5.78	-
Gerbilliscus sp.	5.78	-
Rhabdomys pumilio	2.89	-
Crocidura sp.	0.58	12.5
Unidentified	30.06	37.5
Arthropods	**79.08**	**97.94**
Orthoptera	58.67	85.57
Coleoptera	37.76	64.95
Hymenoptera	8.67	20.62
Isoptera	9.18	7.22
Lepidoptera	7.65	6.19
Decapoda	7.14	1.03
Chilopoda	2.04	1.03
Araneae	0.51	3.09
Mantodea	0.51	6.19
Ixodida	2.55	1.03
Scorpiones	17.86	-
Odonata	1.53	-
Hemiptera	-	1.03
Diplopoda	-	1.03
Birds	**19.39**	**8.25**
Reptiles	**17.86**	**10.31**
Plant material	**62.24**	**46.39**
Seeds/fruit pulp	**15.82**	**4.12**
Amphibians	**4.59**	**5.15**
Other	**5.10**	**3.09**

The values obtained for the mean number of categories per scat and the mean number of items per scat were lower for the slender mongoose than for the rusty-spotted genet and values for the mean percentage volume of dominant items per scat were higher for the slender mongoose (Tables 3.1 and 4.1). In other words, the slender mongoose utilised fewer food categories and consumed fewer items and this limited number of items contributed heavily towards scat volume. This indicates that *H. sanguineus* is more specialised than *G. maculata* in terms of diet.

When considering RPO, dietary overlap using Pianka's index (Chapters 3 and 4) between the rusty-spotted genet and slender mongoose was high for all seasons (Table 5.2). However, when considering PV and PW, diet overlap was high in spring and summer, low in autumn and winter and moderate for the year. During spring and summer there is a general peak in food availability as reptiles become more active, fruit ripens, birds nest and have chicks and insect abundance increases (Pielou 1948; Bellairs 1969; Sánchez *et al*. 2008; Amroun *et al*. 2014). Genets and mongooses appear to take advantage of this peak, especially in terms of arthropod consumption. The high overlap for spring and summer is probably strongly linked to the fact that both species experience a peak in arthropod consumption during these seasons. During autumn and winter the availability of small mammals increases. While the intake of small mammals by *H. sanguineus* peaks between autumn and winter, its consumption of arthropods remains higher than its consumption of mammals. On the other hand, *G. maculata* consumes more small mammals than arthropods in winter. This discrepancy in dominant prey for autumn and winter is probably the cause of the low dietary overlap between species during these seasons. That being said, the overlap during winter is still slightly higher than the overlap for autumn, hence reflecting the increase in small mammal consumption by both species in winter.

Table 5.2: Pianka's index for seasonal and yearly diet overlap in the diet of the rusty-spotted genet and slender mongoose evaluated using RPO, PV and PW (expressed as mathematical frequencies).

	Spring	**Summer**	**Autumn**	**Winter**	**Year**
RPO	0.80	0.80	0.82	0.80	0.82
PV	0.92	0.84	0.27	0.35	0.43
PW	0.93	0.81	0.23	0.35	0.41

A certain degree of diet overlap appears to exist between rusty-spotted genets and slender mongooses. They also seem to occupy similar areas as their latrines were commonly found along the Wilge River and slender mongooses were recorded by camera traps situated in trees with genet latrines. However, there are a few factors that may allow these species to coexist despite the apparent dietary and spatial overlap.

While the slender mongoose is more arboreal than other mongooses, it is not as arboreal as the rusty-spotted genet Genets may therefore be better able to exploit arboreal food sources such as birds, eggs and fruit. The temporal segregation (nocturnal vs. diurnal) between these species is also likely to allow them to access slightly different food resources and avoid direct encounters with each other, further reducing competition.

Maddock (1988) studied the partitioning of resources among *H. ichneumon, M. mungo, A. paludinosus, G. tigrina* and *H.* s*anguineus* in Kwa-Zulu Natal. It was noted that *G. tigrina* and *H.* s*anguineus* were very similar in terms of the prey species consumed, the size of prey, seasonal trends in prey consumption, the habitats they occupied, their foraging behaviour and social structure. Various explanations were given to explain the coexistence of these two species. Firstly, with having the least specialised diets out of all species considered in Maddock's study, it was suggested that their wider and less selective diets could allow them to tolerate high overlap. Second, since slender mongooses are diurnal, the chances of encountering *G. tigrina* would have been small. As suggested by Taylor (1986), trophic and spatial overlap can be reduced when different activity patterns and foraging times are exhibited. Lastly, segregation at the microhabitat level may also have facilitated coexistence. With genets being partially arboreal (Taylor 1974, 1979; Stuart 1981; Rautenbach 1982), they may be able to separate themselves from other non-arboreal species through making use of the spatial niche in a vertical dimension.

In my study, dietary overlap was present but not as large as the overlap observed by Maddock (1988) between *G. tigrina* and *H.* s*anguineus*. In Telperion Nature Reserve, the rusty-spotted genet appears to be a generalist opportunist whereas the slender mongoose is a generalist selector. According to Maddock (1988), the competition that would exist between an obligate generalist and facultative strategist would normally lead to high niche overlap. However, the constant renewal of resources in nature may lower trophic overlap and result in a more stable relationship (Maddock 1988). This, in conjunction with factors such as temporal and spatial

segregation as well as segregation at the microhabitat or niche level may facilitate coexistence between the rusty-spotted genet and slender mongoose.

5.2 Conclusion

Rusty-spotted genets in Telperion Nature Reserve were found to be generalist opportunists whereas slender mongooses were generalist selectors. Both species showed seasonal variations in diet correlated with the seasonal availability of their dominant prey. Diet was fairly similar for these species with dietary overlap being highest during spring and summer when the general peak in most food sources was exploited. In general, it appears as though trophic segregation on its own may not be enough to facilitate coexistence between *G. maculata* and *H. sanguineus*. However, differences were noted in the consumption of items within the broad food categories, which could go towards minimising the observed trophic overlap. It is therefore possible that other factors, in conjunction with the slight dietary differences observed, aid in facilitating coexistence between the rusty-spotted genet and slender mongoose.

To better understand what allows the rusty-spotted genet and slender mongoose to coexist within Telperion Nature Reserve, the spatial and temporal ecology of both species would need to be considered. The spatio-temporal ecology of *G. maculata* in the reserve has been determined (Roux 2018) and similar research for *H. sanguineus* is currently underway (MSc study of Diana Moyo, University of Fort Hare). The combination of these data with my trophic ecology data would allow for the coexistence between the rusty-spotted genet and slender mongoose to be better understood. In addition to this, establishing the specific species consumed by both small carnivores would possibly reveal a greater degree of trophic segregation than highlighted in the present study.

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Appendix A: A conservation assessment of *Genetta maculata*

Roux, R., **Zemouche, J.**, Blomsterberg, S.E., Strauss, W.M., Swanepoel, L.H., Madikiza, Z.J.K., Somers, M.J., Gaubert, P. and Do Linh San, E. (2016). A conservation assessment of *Genetta maculata*. *In* Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D. and Davies-Mostert, H.T. *The Red List of Mammals of South Africa, Swaziland and Lesotho.* South African National Biodiversity Institute and Endangered Wildlife Trust, Johannesburg, South Africa.

Genetta maculata – Rusty-spotted Genet



Joe Grosel

Regional Red List status (2016)	Least Concern
National Red List status (2004)	Least Concern (but assessed with *G. tigrina*)
Reasons for change	No change
Global Red List status (2016)	Least Concern
TOPS listing (NEMBA) (2007)	None
CITES listing	None
Endemic	No

The Rusty-spotted Genet was previously considered conspecific with the Cape Genet, and both were regrouped under the name "Large-spotted Genet". Morphometric and molecular analyses suggest that *G. maculata* is probably a species complex, although it is likely that only one of such possible species is present in the assessment region.

Taxonomy

Genetta maculata (Gray 1830)

ANIMALIA - CHORDATA - MAMMALIA - CARNIVORA - VIVERRIDAE - *Genetta* - *maculata*

Synonyms: *aequatorialis* Heuglin 1866; *albiventris* Roberts 1932; *deorum* Funaioli and Simonetta 1960; *erlangeri* Matschie 1902; *fieldiana* Du Chaillu 1860; *gleimi* Matschie 1902; *insularis* Cabrera 1921; *matschiei* Neumann 1902; *pumila* Hollister 1916; *schraderi* Matschie 1902; *soror* Schwarz 1929; *stuhlmanni* Matschie 1902; *zambesiana* Matschie 1902

Common names: Rusty-spotted Genet, Blotched Genet, Central African Large-spotted Genet, Large-spotted Genet (English), Grootkolmuskeljaatkat (Afrikaans), Insimba (Ndebele, Swati, Zulu), Thsipa-thoko (Sepedi), Thsipa, T'sipa, Tsipa e Matheba a Maholo (Sesotho), Thokolo (Tswana), Msimba-mangovo, Nsimba (Tsonga), Tshipathokolo, Tsimba (Venda), Inyhwagi (Xhosa)

Taxonomic status: Species complex (but probably only one species in the assessment region).

Taxonomic notes: Previously considered part of *Genetta tigrina*. The species epithet "*maculata*" is no longer valid according to the International Commission on Zoological Nomenclature, and thus should only be used as a provisional naming (ICZN 2007). *Genetta* "*maculata*" is part of the large-spotted genet complex, also including *G. pardina* (western Africa), *G. tigrina* (South Africa) and other forest forms with uncertain taxonomic status (Gaubert 2003). For discussion on the complex taxonomic history of this taxon see Gaubert (2003), Gaubert et al. (2005a,b), Wozencraft (2005) and Angelici and Gaubert (2013). Through a naked eye, Rusty-spotted Genet differs from Cape Genet by the presence of rusty spots and the absence of "black socks" on both the front and hind legs (Photo 1). In addition, it does not possess a mid-dorsal crest (i.e. longer hairs along the spine), and it has shorter tail hairs (2–3 cm vs 4–4.5 cm) than the Cape Genet, but these differences cannot always be recognised during fleeting encounters in the field or even on pictures. Although both species present additional morphological and genetic differences, further molecular studies are required to solve the taxonomic status of *G. maculata* relative to *G. tigrina*; and to establish how many species are in fact present in the *G. maculata* complex.

Assessment Rationale

The Rusty-spotted Genet is listed as Least Concern as, although it is possible that this species may be undergoing some localised declines in a few areas due to road collisions, direct or accidental persecution by farmers, hunting for skins, meat and trophies, and predation by feral/domestic cats and dogs, it has a wide distribution range, occurring in a variety of habitats, and it is present in many protected areas within the assessment region.

Regional population effects: This species' range within the assessment region is continuous with the rest of its African range, and we suspect that there is dispersal across regional boundaries.



Photo 1. The Rusty-spotted Genet (*Genetta maculata*) does not have "black socks" like the Cape Genet (*Genetta tigrina*). The spots, dorsal band and dark tail rings are noticeably rusty (Ryan Tippett).

Recommended citation: Roux R, Zemouche J, Blomsterberg SE, Strauss WM, Madikiza ZJK, Somers MJ, Gaubert P, Do Linh San E. 2016. A conservation assessment of *Genetta maculata*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

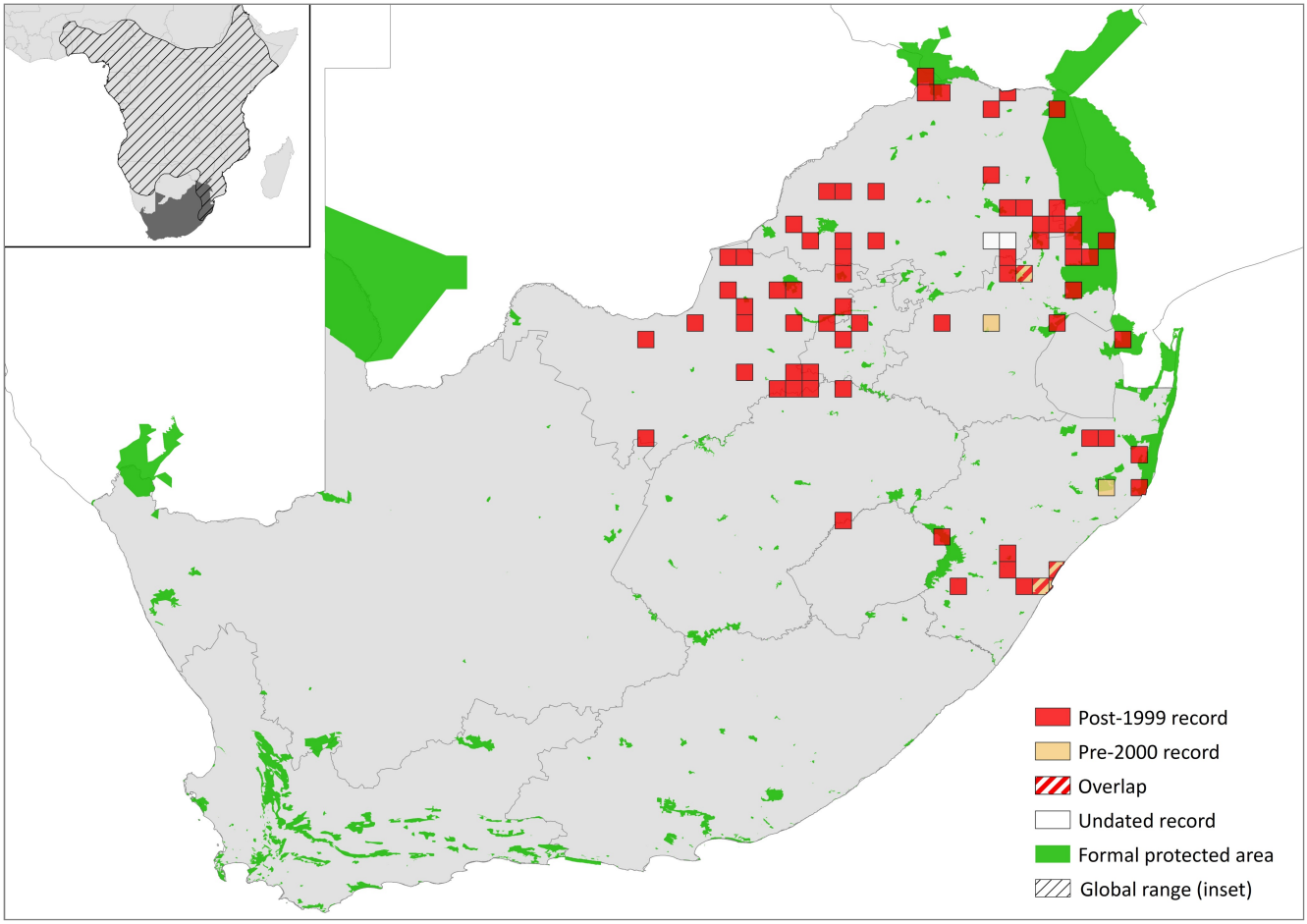


Figure 1. Distribution records for Rusty-spotted Genet (*Genetta maculata*) within the assessment region

Table 1. Countries of occurrence within southern Africa

Country	Presence	Origin
Botswana	Extant	Native
Lesotho	Possibly extant	-
Mozambique	Extant	Native
Namibia	Extant	Native
South Africa	Extant	Native
Swaziland	Extant	Native
Zimbabwe	Extant	Native

Distribution

This species is widely distributed in sub-Saharan Africa, ranging from east of the Volta River (Ghana) to east of Eritrea and Somalia (its presence in Djibouti is uncertain) and southwards to central Namibia and KwaZulu-Natal Province in South Africa (Angelici & Gaubert 2013). It occurs to high elevations, up to 3,400 m in the Simien Mountains of Ethiopia (Yalden et al. 1996). As recently argued by Hoffmann et al. (2015), it is unlikely that this species is present on Bioko Island, Equatorial Guinea.

Within the assessment region, this species occurs across Limpopo, eastern Mpumalanga, Swaziland, KwaZulu-Natal (up to Durban), as well as Gauteng and North West provinces (mostly in the west). The species seems to be largely absent from the Free State Province (Figure 1). It has not been recorded in Lesotho, but extra-limital records (see Figure 1) suggest that it might be present.

The Rusty-spotted Genet is considered sympatric with at least two other genet species (*G. tigrina* and *G. genetta*), and this may result in a hybridisation zone in areas where ranges overlap. *Genetta maculata* naturally crosses with *G. tigrina* in a restricted hybridisation zone within KwaZulu-Natal (Pringle 1977; Gaubert et al. 2005a).

Population

This species is relatively common, though its nocturnal and elusive habits mean that it may be infrequently recorded. For example, in southeastern Nigeria, sightings are rare, but Rusty-spotted Genets are commonly recorded in bushmeat markets and frequently trapped by local hunters (Angelici et al. 1999a,b).

Within the assessment region, we suspect that the species is widespread and fairly common, and is often recorded as being commensal with humans and adapting to human-modified landscapes. We suspect that there are > 10,000 mature individuals. It is widespread and common in Swaziland, both inside and outside of protected areas (Ara Monadjem pers. comm. 2016).

Current population trend: Unknown, but probably stable based on wide habitat tolerance and lack of significant threats.

Continuing decline in mature individuals: Unknown, but probably not.

Number of mature individuals in population: Unknown, but probably > 10,000.

Number of mature individuals in largest subpopulation: Unknown

Number of subpopulations: It is not currently possible to determine the extent or number of subpopulations.

Severely fragmented: No. Rusty-spotted Genets have a broad habitat tolerance and can exist in agricultural and rural landscapes.

Habitats and Ecology

The Rusty-spotted Genet is present in a variety of habitats, including rainforest, swampy areas, riverine vegetation, open and closed woodlands, moist forests, savannah–forest mosaics, thickets and even grassy savannah, but avoids extremely dry savannah and truly arid regions (Angelici & Gaubert 2013). It also occurs in cultivated areas (plantations), farmlands and suburban areas. An ecological study found that the presence of this species in Nigeria is positively correlated with "derived savannah", "oil palm plantations" and other altered habitats, but negatively correlated with various types of forests (Angelici & Luiselli 2005), suggesting that the species adapts well to human–modified habitats. Resting sites are often located in trees, but also in dense shrubs, disused burrows of other animals such as Aardvark (*Orycteropus afer*) or Springhare (*Pedetes* spp.), rock crevices and overhangs, and even inhabited or abandoned man-made structures (Angelici & Gaubert 2013; R. Roux et al. unpubl. data). Rusty-spotted Genets are both terrestrial (Photo 1) and arboreal (Photo 2) and can sometimes be seen taking shelter in trees or other elevated areas (Angelici & Gaubert 2013).

This species is mainly carnivorous, but will also eat vegetable matter such as fruits, seeds and berries (Angelici & Gaubert 2013). Mainly mammals and insects are caught, but centipedes and millipedes, spiders, scorpions, amphibians and reptiles (including lizards and snakes) as well as small birds and eggs are also hunted (Angelici & Luiselli 2005; Martinoli et al. 2006; Angelici & Gaubert 2013). These genets will catch mammals up to the size of a hare and even aquatic animals such as gastropods and fish (Angelici & Gaubert 2013). They will also scavenge on human leftovers. The Rusty-spotted Genet is an opportunistic feeder and will eat whatever is mostly available in its area during the season. In Tanzania, fruits were an important food source (Martinoli et al. 2006), probably due to their availability being higher than in South Africa. The percentage occurrence of a range of food items in the stomachs of 136 Rusty-spotted Genets in Zimbabwe (Smithers & Wilson 1979) and 30 in Botswana (Smithers 1971) was assessed. Results showed that, in Zimbabwe, 68% of the stomach contents consisted of murids, followed by 40% insects and 15% birds (Smithers & Wilson 1979). In Botswana, insects were the main food source comprising 90% of the diet followed by 47% murids, 27% arachnids and 17% fruits (Smithers 1971). Here only 7% birds occurred (Smithers 1971). Insects that are eaten are usually Coleoptera, Orthoptera and Isoptera (Angelici & Gaubert 2013). A first scat analysis study for the species in South Africa is currently being carried out on Telperion Nature Reserve, Mpumalanga, South Africa (J. Zemouche et al. unpubl. data).

Rusty-spotted Genets are mainly nocturnal and spend the day in their resting sites (Angelici & Gaubert 2013). They are more active during the first half of the night and often have a short resting bout halfway through their active period (R. Roux et al. unpubl. data). Activity usually starts with sunset and ends before sunrise (R. Roux et al. unpubl. data). Males are more active than females



Photo 2. Rusty-spotted Genet (*Genetta maculata*) resting on a tree branch (Len de Beer)

(R. Roux et al. unpubl. data), possibly due to higher metabolic requirements and/or different reproductive strategies. During winter nights in Telperion Nature Reserve, the Rusty-spotted Genet terminated its activity earlier than in summer due to the cold temperatures (R. Roux et al. unpubl. data). Predation risk may play an important role in the spatial ecology, as Rusty-spotted Genets select areas with enough vegetation cover and often in proximity of safe refuges while they are out hunting (R. Roux pers. obs. 2015–2016).

The Rusty-spotted Genet is solitary and territorial although home ranges can sometimes overlap (Carpenter 1970). In Kenya, the home ranges of five radio-tracked genets varied between 0.1 and 1.0 km^2 (Angelici & Gaubert 2013). In Telperion Nature Reserve, the home ranges of 15 individuals were found to be on average 2.7 km^2 (range 2.1–7.0 km^2) in size (R. Roux et al. unpubl. data; Photo 3). Carpenter (1970) reported that male home ranges are usually larger than that of females, but no difference or even the opposite tendency was observed in Telperion. It is not clear to what extent these genets defend their territories, but they do mark them with secretions from the perineal glands, urine and faeces (Angelici & Gaubert 2013). Rusty-spotted Genets share latrine sites with other individuals (Blomsterberg 2016) and possibly also with other species such as African Civets (*Civettictis civetta*) and several mongoose species (Engel 2000). They could use these latrine sites for olfactory communication although specific scent-marking behaviour was not observed by Blomsterberg (2016). The breeding peak is from October to December, but a second peak can occur between March and May (Angelici & Gaubert 2013). Two to five kittens are generally born (Skinner & Chimimba 2005). Males may produce grumbling and coughing calls when courting a female and meowing has been recorded during mating (Dücker 1965). Soft growls and hissing were observed when wild Rusty-spotted Genets were captured in Telperion Nature Reserve (R. Roux pers. obs. 2015–2016).



Photo 3. Researchers releasing a radio-collared Rusty-spotted Genet (*Genetta maculata*) to study its spatio-temporal behaviour in Telperion Nature Reserve, Mpumalanga (Emmanuel Do Linh San)

Ecosystem and cultural services: None have been described specifically. However, it is likely that, together with other small carnivores, this species plays a role in controlling rodent and arthropod populations, notably in agricultural areas. Rusty-spotted Genets, together with the two other genet species occurring in the assessment region, have the potential to become a symbol/indicator of urban wildlife and integration of development with natural landscapes.

Use and Trade

There are a few reports mentioning that this species can be utilised as bushmeat, especially in western Africa (Angelici et al. 1999b). In southern Africa, body parts may also be used for medicinal purposes, with pieces of genet skin used as stick-fight charms and parts of the body are used to treat eye ailments (Cunningham & Zondi 1991). Genet hides and tails are sometimes used in Zulu culture as traditional adornments. Such practices, however, are localised and limited, and thus should not have a negative impact on the population.

It is becoming increasingly popular to keep several genet species as pets, specifically in the USA. In southern Africa, it is not common, however, and since it is expected that such animals originate from captive bred populations and not from the wild, it should not influence wild population numbers excessively. The number and proportion of Rusty-spotted Genets kept as pets both globally and in the assessment region is unknown.

Threats

There are no major threats to the species. Rusty-spotted Genets have been recorded in the Endangered Wildlife Trust's road collision database (W. Collinson unpubl. data), but the extent of road mortality on this species within the assessment region is unknown. There appear to be hotspots where this species frequently falls victim to road traffic (A. Halijian pers. comm. 2015–2016), and this

Table `2. Use and trade summary for the Rusty-spotted Genet (*Genetta maculata*)

Category	Applicable?	Rationale	Proportion of total harvest	Trend
Subsistence use	Yes	Used as bushmeat, medicine or for their skins.	Limited	Unknown, probably stable
Commercial use	Yes	Selling of individuals as pets (or breeding stock).	Unknown	Increasing (mostly in the USA).
		Local commercial use in traditional medicine trade and trophy hunting.	Limited	Probably stable
Harvest from wild population	Yes	Localised and opportunistic harvest for the traditional medicine trade. Trophy hunting.	Limited	Traditional medicine probably stable; trophy hunting predicted to increase.
Harvest from ranched population	No	-	-	-
Harvest from captive population	Yes	Production of offspring to be sold as pets (or breeding stock).	Unknown	Increasing (mostly in the USA).

Table 3. Threats to the Rusty-spotted Genet (*Genetta maculata*) ranked in order of severity with corresponding evidence (based on IUCN threat categories, with regional context)

Rank	Threat description	Evidence in the scientific literature	Data quality	Scale of study	Current trend
1	*4.1 Roads & Railroads*: road collisions.	W. Collinson unpubl. data	Empirical	National	Increasing with road construction and habitat fragmentation.
		A. Halijian pers. comm. 2015–2016	Anecdotal	Local	
2	*5.1.1 Hunting & Collecting Terrestrial Animals:* hunting for food, fur and cultural purposes; collecting animals for the pet trade; trophy hunting.	Angelici et al. 1999b; Cunningham & Zondi 1991	Empirical	Local	Stable due to cultural use being localised.
		-	Anecdotal	-	Pet trade unknown.
		A. de Klerk pers. comm. 2016	Empirical	Local	Very low but increasing trophy hunting incidences.
3	*5.1.2* and *5.1.3 Persecution/Control:* persecution (hunting, trapping, and poisoning) either directly or as bycatch.	L.H. Swanepoel pers. comm. 2016	Anecdotal	Local	Probably limited and stable.
4	*8.1.2 Invasive Non-Native/Alien Species/Diseases:* predation by feral and domestic cats and dogs.	Angelici & Gaubert 2013; L.H. Swanepoel pers. comm. 2016	Anecdotal	Local	Increasing with increasing populations of feral/domestic cats and dogs.

might be related to both habitat features and higher local abundance. Rusty-spotted Genets have been recorded in bushmeat markets; are locally used for traditional medicine and cultural purposes; and are locally hunted for their trophy, notably in Limpopo (A. de Klerk pers. comm. 2016; see e.g. https://www.discountafricanhunts.com/hunts/honey-badger-civet-and-genet-hunt-in-south-africa.html). Since they do have a reputation as poultry thieves, farmers sometimes poison or trap them (L.H. Swanepoel pers. comm. 2016). Finally, they are occasionally killed by domestic cats and dogs in both peri-urban and rural areas (Angelici & Gaubert 2013; L.H. Swanepoel pers. comm. 2016).

Current habitat trend: Stable. This species is present in a wide range of habitats and can even adapt to human-modified habitats and thrive in peri-urban areas.

Conservation

This species is present in a large number of protected areas. Within the assessment region, no major and urgent conservation interventions are necessary. However, education should be used to raise the profile of this species and encourage farmers to live with rather than against genets. Marketing and awareness campaigns can also be used to position the presence of this species as a point of pride for urban and rural landowners, and conservationists should encourage better land management to facilitate genet conservation.

Recommendations for land managers and practitioners:

- To reduce collisions with vehicles, mitigation measures such as road fencing and improvement of habitat near road crossing structures (for example, underpasses) should be implemented whenever possible (Collinson et al. 2015).
- Due to the reported predation or killing of Rusty-spotted Genets by feral and domestic dogs and cats (Angelici & Gaubert 2013; L.H. Swanepoel pers. comm. 2016), it might be necessary to control the number of feral dogs and cats in both urban and rural areas, and encourage dog and cat owners to put collar-mounted bells, sonic bleepers or "pounce protectors" on their pets (Nelson et al. 2005; Calver et al. 2007).

Research priorities:

- Taxonomic status of *G. maculata* versus *G. tigrina*.
- Competition and hybridisation patterns with sympatric species of genets (*G. genetta* and *G. tigrina*).
- Population estimates, demographic parameters and possible barriers to dispersal across the species' distribution range.
- Home range and habitat use of Rusty-spotted Genets in a variety of landscapes (protected areas, agricultural areas and urban landscapes).
- Determine genetic health and diversity of both rural and urban populations.
- Testing of rabies in Rusty-spotted Genets and their potential role as vectors of the disease.
- Effect – if any – of commercial hunting on local populations.

A team of researchers from the University of Fort Hare, University of South Africa, University of the Witwatersrand and University of Pretoria is currently studying the ecology and behaviour of Rusty-spotted Genets in Telperion Nature Reserve (Mpumalanga). The project aims to describe the spatial behaviour, habitat use, activity patterns, diet and use of latrines by this largely unstudied species. Contact details of the research coordinator: Prof. Emmanuel Do Linh San, Department of Zoology and Entomology, University of Fort Hare, Alice, 5700, South Africa. Email: edolinhsan@ufh.ac.za. Website: https://www.ascaris.org.

Encouraged citizen actions:

- Report sightings of any genet species on virtual museum/social platforms (for example, iSpot and MammalMAP), especially outside protected areas, as well as to Emmanuel Do Linh San (emmanuel.dolinhsan@gmail.com). GPS locations and photographs would be of great assistance.

Table 4. Conservation interventions for the Rusty-spotted Genet (*Genetta maculata*) *species*) ranked in order of effectiveness with corresponding evidence (based on IUCN action categories, with regional context)

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	*2.1 Site/Area Management*: install road-crossing structures in key habitats at road collision hotspots.	Collinson et al. 2015	Anecdotal	-	-	-
2	*4.3 Awareness & Communications*: establish local campaigns in urban and rural landscapes to educate farmers, landowners and public about the key role played by genets (in general) in controlling rodent populations and potential vectors of zoonosis.	-	Anecdotal	-	-	-
3	*2.1 Site/Area Management*: the promotion of the "holistic" approach to the management of damage-causing animals.	-	Anecdotal	-	-	-
4	*2.2. Invasive/Problematic Species Control*: put mammal and bird friendly devices on domestic cats and dogs.	Nelson et al. 2005; Calver et al. 2007	Empirical	Local	No study focusing specifically on pets and genets yet. Reduction of up to 38% of small mammals preyed upon by domestic cats.	-
5	*2.2. Invasive/Problematic Species Control*: neuter or spay feral cats and dogs on game farms, ranches, conservancies, rural, peri-urban and urban areas.	-	Anecdotal	-	-	-
6	*4.3 Awareness & Communications*: establish a national campaign to educate the public about responsible domestic cat and dog ownership.	-	Anecdotal	-	-	-

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Data Sources and Quality

Table 5. Information and interpretation qualifiers for the Rusty-spotted Genet (*Genetta maculata*) assessment

Data sources	Field study (literature, unpublished), indirect information (literature, expert knowledge), museum records
Data quality (max)	Inferred
Data quality (min)	Suspected
Uncertainty resolution	Author consensus
Risk tolerance	Evidentiary

Cunningham AB, Zondi AS. 1991. Use of Animal Parts for the Commercial Trade in Traditional Medicines. Institute of Natural Resources, University of Natal, Pietermaritzburg, South Africa.

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Details of the methods used to make this assessment can be found in *Mammal Red List 2016: Introduction and Methodology.*

Appendix B: A conservation assessment of *Herpestes sanguineus*

Do Linh San, E., **Zemouche, J.**, Madikiza, Z.J.K., Maddock, A.H., Perrin, M.R. & Mills, M.G.L. (2016). A conservation assessment of *Herpestes sanguineus*. *In* Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D. and Davies-Mostert, H.T. *The Red List of Mammals of South Africa, Swaziland and Lesotho.* South African National Biodiversity Institute and Endangered Wildlife Trust, Johannesburg, South Africa.

Herpestes sanguineus – Slender Mongoose


Emmanuel Do Linh San

Regional Red List status (2016)	Least Concern
National Red List status (2004)	Least Concern
Reasons for change	No change
Global Red List status (2016)	Least Concern
TOPS listing (NEMBA) (2007)	None
CITES listing	None
Endemic	No

In the northwestern parts of the North West Province and the Northern Cape, a "red", hairy form (Photo 1) of this species is present, and it is referred to by the locals as the "Kalahari Muishond"; while in the eastern, mesic areas, and elsewhere in the distribution range, a grizzled brown form (see picture above) is present (Power 2014).

Taxonomy

Herpestes sanguineus (Rüppell 1835)

ANIMALIA - CHORDATA - MAMMALIA - CARNIVORA - HERPESTIDAE - *Herpestes* - *sanguineus*

Synonyms: *Galerella sanguinea* (Rüppell 1836)

Common names: Slender Mongoose, Black-tipped Mongoose, Common Slender Mongoose (English), Rooimuishond, Swartkwasmuishond (Afrikaans), Iwobo (Ndebele), Kgano (Sesotho, Setswana), Kganwe, Khano, Ramotsibodi (Setswana), Chakidze (Swati), Mangovo (Tsonga), Khohe, Khoke (Venda), Uchakide (Zulu)

Taxonomic status: Species

Taxonomic notes: This species is sometimes included in the genus *Galerella* (e.g. Meester et al. 1986; Wozencraft 1993, 2005; Veron et al. in press). In accordance with Hoffman and Taylor (2013) this assessment does not include *Herpestes ochraceus*, which is regarded as a separate species by many authors, notably Taylor (2013).

Assessment Rationale

The Slender Mongoose is listed as Least Concern as it is common and widespread in a variety of habitats (including human modified landscapes), there are no major threats that could cause rapid population decline, and it is present in several protected areas (notably Kruger National Park and the Kgalagadi Transfrontier Park) across its distribution range within the assessment region.

Regional population effects: Dispersal is likely between regions, as this species' range is continuous across southern Africa from northern South Africa to Botswana, Namibia, Zimbabwe and Mozambique south of the Zambezi River. The Slender Mongoose is not limited by fences, and is also present within a number of transfrontier reserves, including the Greater Mapungubwe Transfrontier Conservation Area.

Distribution

One of the most widely distributed African mongooses, ranging from Senegal in the west to the Red Sea coast of Sudan in the east and south to the Northern Cape in South Africa (Hoffmann & Taylor 2013). Bahaa-el-din et al. (2013) recently obtained the first records of Slender Mongoose in Gabon, > 350 km outside of its previous known range. Past records of this species on the Cape Verde archipelago are an error (Masseti 2010; Hazevoet & Masseti 2011) and are in fact based on confusion with occurrence on the mainland Cape Verde itself. Stuart (1981) mentions a museum record of this species from Mountain Zebra National Park, but this specimen is not mentioned in the studies of Watson and Dippenaar (1987) and Watson (1990), and the most southerly distribution limit is probably the far eastern part of the Eastern Cape in South Africa (Hoffmann & Taylor 2013). This species also occurs in Zanzibar (Stuart & Stuart 1998; Goldman & Winther-Hansen 2003). It ranges from sea level to 2,700 m asl in the Ethiopian Highlands (Yalden et al. 1996).

Within the assessment region, the Slender Mongoose occurs across all savannah habitats north of the Orange River, but is absent from montane grassland. This includes Limpopo, North West, Gauteng and Mpumalanga provinces, much of eastern KwaZulu-Natal Province, the central and northwestern areas of the Free State Province, along part of the east coast of the Eastern Cape Province, as well as Swaziland (Skinner & Chimimba 2005). In the Kalahari, it occurs especially amongst calcrete outcrops and not in the dunes (Mills et al. 1984).

Population

Slender Mongooses are among the most common mongooses in Africa. In the Serengeti National Park, Tanzania, population densities between 1975 and 1990 ranged from 3–6 individuals / km^2 (Waser et al. 1995). In the Kalahari, South Africa, based on data collected between 2007 and 2011, population density was around 1.6–2.0 adults / km^2 (B. Graw et al. unpubl. data). In Vernon Crookes Nature Reserve, KwaZulu-Natal,

Recommended citation: Do Linh San E, Zemouche J, Madikiza ZJK, Maddock AH, Perrin MR, Mills MGL. 2016. A conservation assessment of *Herpestes sanguineus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

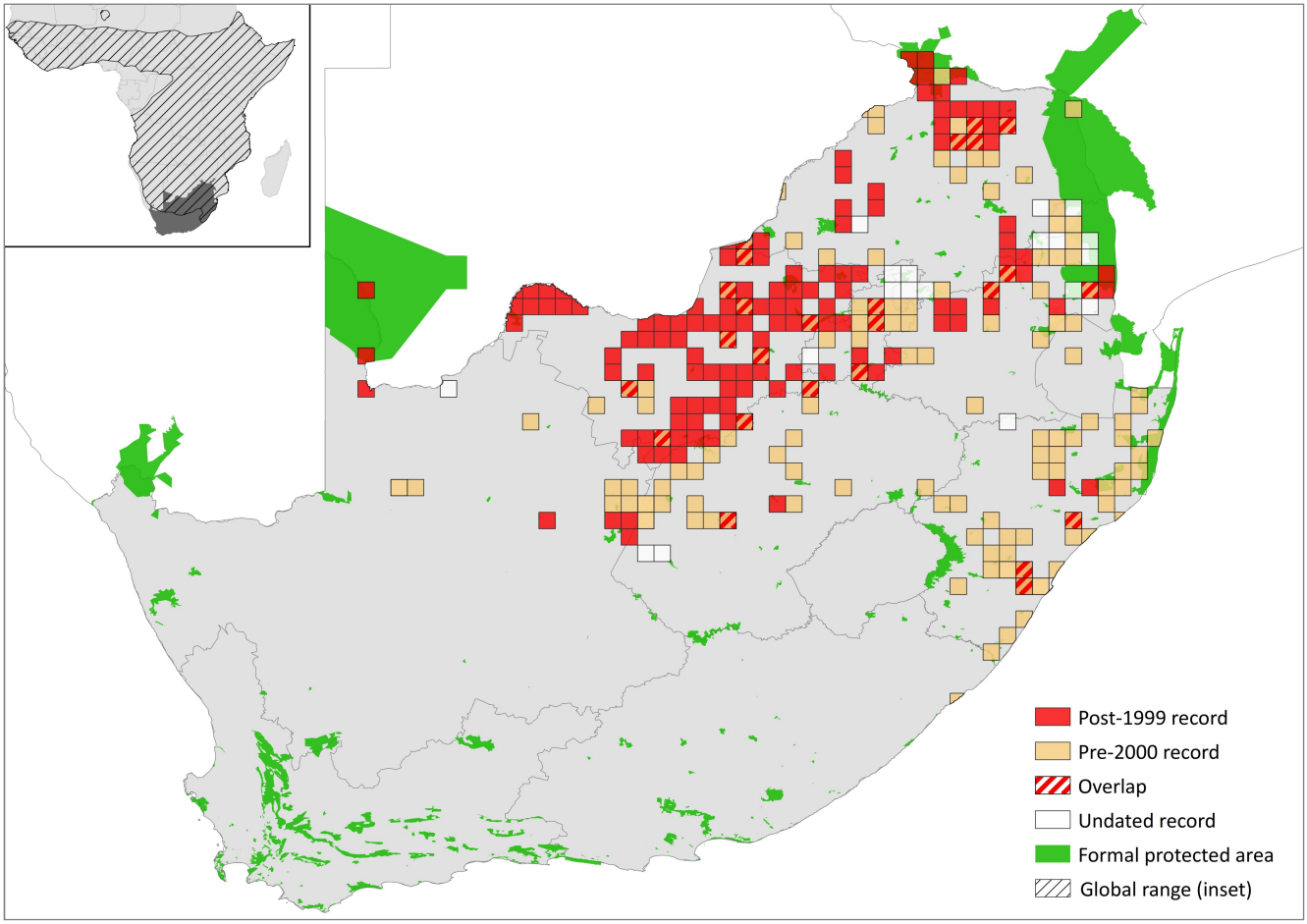


Figure 1. Distribution records for Slender Mongoose (*Herpestes sanguineus*) within the assessment region

Table 1. Countries of occurrence within southern Africa

Country	Presence	Origin
Botswana	Extant	Native
Lesotho	Absent	-
Mozambique	Extant	Native
Namibia	Extant	Native
South Africa	Extant	Native
Swaziland	Extant	Native
Zimbabwe	Extant	Native

Maddock (1988) estimated a density of 7.3 individuals / km^2. Considering the wide distribution of this species and a minimum average density of at least 0.1 individual / km^2, we estimate that there are well over 10,000 individuals in the assessment region.

Current population trend: Stable, based on wide habitat tolerance and extent of occurrence.

Continuing decline in mature individuals: Unknown, but probably not.

Number of mature individuals in population: Probably > 10,000

Number of mature individuals in largest subpopulation: Unknown

Number of subpopulations: It is not currently possible to determine the extent or number of subpopulations.

Severely fragmented: No. Favourable habitat is largely connected across the species' range.

Habitats and Ecology

Slender Mongooses are present in a wide variety of habitats, but absent from true deserts, such as the Namib Desert, and in sub-desertic parts of the Sahara such as Aïr, Niger. They occur on forest fringes, and may penetrate into forests along roads and are sometimes found around villages (Hoffmann & Taylor 2013). They are also absent from the greater parts of the karroid regions of the Northern, Western and Eastern Cape. This is speculated to be as a result of competitive exclusion by the Cape Grey Mongoose (*H. pulverulentus*; Skinner & Chimimba 2005). There is, however, some range overlap between these species at the perimeter of the Slender Mongoose's range (Skinner & Chimimba 2005). They occur in open habitats, as long as there is some cover (Ramesh & Downs 2014), such as hollow logs, rocks, fallen trees or disused Aardvark (*Orycteropus afer*) holes. They have also been recorded among rocky outcrops (Rautenbach 1982; Rood 1989; E. Do Linh San pers. obs. 2015–2016). In farmland landscapes within the Drakensberg Midlands, KwaZulu-Natal, the detection likelihood of this species with camera-traps was positively correlated with bushland cover and human abundance; possibly due to a reduction in natural predator density and increased food and water resources (Ramesh & Downs 2014).

Slender Mongooses are diurnal, and as generalist carnivores, their diet comprises small vertebrates (rodents, insectivores, reptiles, amphibians, birds), invertebrates



Photo 1. "Red", hairy form of the Slender Mongoose (*Herpestes sanguineus*) photographed in the South African section of the Kgalagadi Transfrontier Park (Emmanuel Do Linh San)

(insects, spiders, millipedes) and fruit (Maddock 1988; Graw & Manser 2017). While this species is largely terrestrial, it is more arboreal than most other mongoose species (Hoffmann & Taylor 2013). Although individuals are predominantly solitary, occasionally up to four – related and unrelated – males form loose coalitions within the same home range, which overlaps with the home ranges of several females (Rood 1989; Waser et al. 1994; Graw et al. 2016). In the Serengeti, male home ranges vary from 70–80 ha, while females occupy smaller ranges of 30–50 ha (Rood & Waser 1978). However, home range sizes are larger in the Kalahari (South Africa), with 183 ha on average for males and 106 ha for females (B. Graw & M.B. Manser unpubl. data).

Young are born during the wet, summer months (October–March), which coincides with a peak in the abundance of insectivorous prey. Females regularly begin reproducing at 1 year of age (Waser et al. 1995) and after a gestation period of 60–70 days, one to four pups are born (Taylor 1969, 1975; Graw & Manser 2017). One to two litters are produced per reproductive season, with on average 130 days between the birth of each litter (Graw & Manser 2017). Pups are born in hollow trees or rock crevices, emerge for the first time between 4–6 weeks, and start foraging with their mother 6–9 weeks after their birth. Weaning likely takes place at the age of 7–12 weeks, and juveniles become independent when 3–5 months old (Graw & Manser 2017). Dispersing sex and dispersal age and distances vary greatly. In the Serengeti, juveniles typically disperse within their first 6 months with males dispersing earlier and further than females (Rood & Waser 1978; Waser et al. 1994). In contrast, in a study conducted in the Kalahari, none of the females remained in their natal range past the age of 10 months, while genetic analyses demonstrated that 93% of males were philopatric, and anecdotal field evidence suggested that males disperse less often and possibly later but further than females (Graw et al. 2016). In the Tanzanian study juveniles had a survival rate of 0.63, whereas adults of both sexes had higher survival rates, namely 0.82 for males and 0.79 for females (Waser et al. 1995). Similar results were obtained in the Kalahari (Graw & Manser 2017). In the wild, both male and female Slender Mongooses have a maximum lifespan of 8–10 years (Waser et al. 1995; Graw & Manser 2017).

Ecosystem and cultural services: This species may be a valuable predator of agricultural pest species, such as grasshoppers, termites, beetles and possibly rodents. Further research is required to quantify this effect.

Use and Trade

Slender Mongooses have been recorded in bushmeat markets in West Africa (e.g. Colyn et al. 2004) and Cunningham and Zondi (1991) listed this species among those used in traditional medicine in KwaZulu-Natal, South Africa.

Threats

There are no major threats to this species. As stated above, Slender Mongooses are locally used as bushmeat and in traditional medicine. Although wildlife ranching and the private sector have possibly had a positive effect on this species due to the conservation and connection of suitable habitats (e.g. in the Waterberg), this small carnivore may be accidentally caught as bycatch in

Table 2. Use and trade summary for the Slender Mongoose (*Herpestes sanguineus*)

Category	Applicable?	Rationale	Proportion of total harvest	Trend
Subsistence use	Yes	Used as bushmeat and for traditional medicine.	Unknown	Unknown, but probably stable.
Commercial use	No	-	-	-
Harvest from wild population	No	-	-	-
Harvest from ranched population	No	-	-	-
Harvest from captive population	No	-	-	-

Table 3. Threats to the Slender Mongoose (*Herpestes sanguineus*) ranked in order of severity with corresponding evidence (based on IUCN threat categories, with regional context)

Rank	Threat description	Evidence in the scientific literature	Data quality	Scale of study	Current trend
1	*5.1.1 Hunting & Collecting Terrestrial Animals*: bushmeat hunting and use in traditional medicine.	Colyn et al. 2004	Indirect	National	Unknown
		Cunningham & Zondi 1991	Indirect	National	Unknown
2	*5.1.2 Hunting & Collecting Terrestrial Animals*: species poisoned accidently as bycatch in predator and rodent control programmes.	-	Anecdotal	-	Probably minimal and stable.

predator and rodent control programmes using poisons. It is however unlikely that these consumptive uses and accidental mortalities have a substantial effect on the population.

Current habitat trend: Stable

Conservation

This species is present in numerous protected areas across its range, notably in Kruger National Park and the Kgalagadi Transfrontier Park. No conservation interventions are currently deemed necessary within the assessment region; however, this species is likely to benefit from the expansion of protected areas to connect suitable habitat patches.

Recommendations for land managers and practitioners:

- Create conservancies to protect and connect habitat.

Research priorities:

- Monitoring subpopulations to detect trends across various land uses.
- General studies on the biology and ecology of this species in different habitat types.

A team of researchers at the University of Fort Hare, University of South Africa and University of the Witwatersrand is currently studying the ecology and behaviour of the Slender Mongoose in Telperion Nature Reserve (Mpumalanga). The project aims to describe the spatial behaviour, habitat use, activity patterns, diet and use of latrines by this relatively unstudied mongoose. Contact details of the research coordinator: Prof. Emmanuel Do Linh San, Department of Zoology and Entomology, University of Fort Hare, Alice, 5700, South Africa. Email: Edolinhsan@ufh.ac.za. Website: http://www.ascaris.org.

Encouraged citizen actions:

- Report sightings on virtual museum platforms (for example, iSpot and MammalMAP), especially outside protected areas.

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Table 4. Conservation interventions for the Slender Mongoose (*Herpestes sanguineus*) ranked in order of effectiveness with corresponding evidence (based on IUCN action categories, with regional context)

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	*1.1 Site/Area Protection*: protected area expansion to connect suitable habitat patches.	-	Anecdotal	-	-	-

Data Sources and Quality

Table 5. Information and interpretation qualifiers for the Slender Mongoose (*Herpestes sanguineus*) assessment

Data sources	Field study (literature), indirect information (literature, expert knowledge, unpublished)
Data quality (max)	Estimated
Data quality (min)	Inferred
Uncertainty resolution	Best estimate
Risk tolerance	Evidentiary

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Details of the methods used to make this assessment can be found in *Mammal Red List 2016: Introduction and Methodology.*

Appendix C: Raw data

Table C1: Raw data for rusty-spotted genet scat analysis indicating date of collection, dry weight and percentage volume of prey remains in the scats. Code = scat identification number; #Cat = number of food categories per scat; #Items = number of food items per scat; PV = percentage volume of food remains in scats, M = mammals, A = arthropods, B = birds, R = reptiles; P = plant material, S/F = seeds/fruit pulp, Am = amphibians, O = other; - = no data was available for that scat in that specific category.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG48	2016/09/11	Spring	12.68	2	5	3	97	0	0	0	0	0	0	*Dendromus* sp.
RSG64	2016/09/30	Spring	6	3	6	79	16	0	0	5	0	0	0	Unidentified
RSG65	2016/10/01	Spring	4.57	4	5	12	5	75	0	8	0	0	0	Unidentified
RSG66	2016/10/01	Spring	4.69	3	6	19	78	0	0	0	3	0	0	*Dendromus* sp.
RSG67	2016/10/01	Spring	10.13	3	8	23	17	0	0	60	0	0	0	*Dendromus* sp.; *Mastomys* sp.
RSG68	2016/10/01	Spring	11.8	3	7	83	12	0	5	0	0	0	0	*Mastomys* sp.
RSG69	2016/10/01	Spring	1.69	2	2	12.5	0	0	0	87.5	0	0	0	*Dendromus* sp.
RSG70	2016/10/11	Spring	13.27	4	5	8	6	0	11	0	75	0	0	*Mastomys* sp.
RSG71	2016/10/11	Spring	8.05	3	6	0	40	22	0	38	0	0	0	
RSG72	2016/10/31	Spring	10.42	2	2	0	91	0	9	0	0	0	0	
RSG73	2016/10/31	Spring	5.58	2	4	3	97	0	0	0	0	0	0	*Steatomys pratensis*
RSG74	2016/10/31	Spring	4.65	2	3	0.5	99.5	0	0	0	0	0	0	No hair in scat
RSG75	2016/11/01	Spring	1.42	2	4	0	5	0	0	95	0	0	0	
RSG76	2016/11/01	Spring	6.94	4	6	15	66	0	5	14	0	0	0	*Mus minutoides*
RSG77	2016/12/03	Spring	12.4	4	5	66	28	3	0	3	0	0	0	*Mastomys* sp.; Unidentified
RSG78	2016/12/03	Spring	6.3	3	6	1	98	0	1	0	0	0	0	Unidentified
RSG79	2016/12/03	Spring	3.86	5	6	74	15	6	1	4	0	0	0	*Gerbilliscus* sp.
RSG80	2016/12/03	Spring	4.96	5	6	72	24	2	0.5	1.5	0	0	0	*Elephantulus myurus*
RSG83	2017/01/15	Spring	6.09	4	5	1	77	0	3	19	0	0	0	Unidentified
RSG99	2017/01/20	Spring	1.66	2	3	0	94	0	6	0	0	0	0	
RSG81	2016/12/03	Summer	11.65	3	6	62	30	0	0	8	0	0	0	*Gerbilliscus* sp.
RSG82	2017/01/15	Summer	2.34	2	3	6	94	0	0	0	0	0	0	Unidentified
RSG84	2017/01/15	Summer	3.68	3	4	9	72	19	0	0	0	0	0	*Steatomys pratensis*

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG85	2017/01/15	Summer	7.85	3	4	6	91	0	0	3	0	0	0	*Steatomys pratensis; Micaelamys namaquensis/ Aethomys chrysophilus*
RSG86	2017/01/15	Summer	0.75	3	3	45	22	0	0	33	0	0	0	*Unidentified*
RSG87	2017/01/15	Summer	9.67	3	5	0	58	40	0	2	0	0	0	
RSG88	2017/01/15	Summer	6.18	3	5	6	69	0	0	25	0	0	0	*Unidentified*
RSG89	2017/01/15	Summer	3.72	2	3	1	99	0	0	0	0	0	0	*Mus minutoides*
RSG90	2017/01/15	Summer	7.12	3	4	0	88	10	0	2	0	0	0	
RSG85	2017/01/15	Summer	7.85	3	4	6	91	0	0	3	0	0	0	*Steatomys pratensis; Micaelamys namaquensis/ Aethomys chrysophilus*
RSG86	2017/01/15	Summer	0.75	3	3	45	22	0	0	33	0	0	0	*Unidentified*
RSG87	2017/01/15	Summer	9.67	3	5	0	58	40	0	2	0	0	0	
RSG88	2017/01/15	Summer	6.18	3	5	6	69	0	0	25	0	0	0	*Unidentified*
RSG89	2017/01/15	Summer	3.72	2	3	1	99	0	0	0	0	0	0	*Mus minutoides*
RSG90	2017/01/15	Summer	7.12	3	4	0	88	10	0	2	0	0	0	
RSG85	2017/01/15	Summer	7.85	3	4	6	91	0	0	3	0	0	0	*Steatomys pratensis; Micaelamys namaquensis/ Aethomys chrysophilus*
RSG86	2017/01/15	Summer	0.75	3	3	45	22	0	0	33	0	0	0	*Unidentified*
RSG87	2017/01/15	Summer	9.67	3	5	0	58	40	0	2	0	0	0	
RSG88	2017/01/15	Summer	6.18	3	5	6	69	0	0	25	0	0	0	*Unidentified*
RSG89	2017/01/15	Summer	3.72	2	3	1	99	0	0	0	0	0	0	*Mus minutoides*
RSG90	2017/01/15	Summer	7.12	3	4	0	88	10	0	2	0	0	0	

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG85	2017/01/15	Summer	7.85	3	4	6	91	0	0	3	0	0	0	*Steatomys pratensis; Micaelamys namaquensis/ Aethomys chrysophilus*
RSG86	2017/01/15	Summer	0.75	3	3	45	22	0	0	33	0	0	0	Unidentified
RSG87	2017/01/15	Summer	9.67	3	5	0	58	40	0	2	0	0	0	
RSG88	2017/01/15	Summer	6.18	3	5	6	69	0	0	25	0	0	0	Unidentified
RSG89	2017/01/15	Summer	3.72	2	3	1	99	0	0	0	0	0	0	*Mus minutoides*
RSG90	2017/01/15	Summer	7.12	3	4	0	88	10	0	2	0	0	0	
RSG91	2017/01/15	Summer	6.29	3	4	13	77	0	0	10	0	0	0	*Dendromus* sp.
RSG92	2017/01/20	Summer	8.7	3	6	70	24	0	0	6	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG93	2017/01/20	Summer	2.49	3	5	70	15	0	0	15	0	0	0	*Otomys irroratus*
RSG94	2017/01/20	Summer	4.46	2	5	0	91	0	0	9	0	0	0	
RSG95	2017/01/20	Summer	3.76	3	3	55	43	0	0	2	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG96	2017/01/20	Summer	5.69	3	4	19	80	0	0	1	0	0	0	*Elephantulus myurus*
RSG97	2017/01/20	Summer	8.72	4	6	17	77	0	1	5	0	0	0	*Steatomys pratensis*
RSG98	2017/01/20	Summer	4.23	3	3	28	71	0	0	1	0	0	0	*Mastomys* sp.
RSG100	2017/02/10	Summer	8.72	3	4	10	69	0	0	0	21	0	0	*Mus minutoides*
RSG101	2017/02/10	Summer	13.09	3	5	30	69	0	0	0	1	0	0	*Mastomys* sp.
RSG102	2017/02/10	Summer	4.3	2	4	18	82	0	0	0	0	0	0	*Steatomys pratensis*
RSG103	2017/02/10	Summer	2.77	4	5	8	72	0	0	1	19	0	0	*Steatomys pratensis*
RSG104	2017/02/11	Summer	4.64	5	7	8	81	0	2	5	4	0	0	*Mus minutoides*
RSG105	2017/02/11	Summer	17.78	2	3	0	3	0	0	0	97	0	0	
RSG106	2017/02/11	Summer	1.88	4	4	84	3	0	0	12	1	0	0	*Mastomys* sp.

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG107	2017/02/11	Summer	30.87	2	4	0	9	0	0	0	91	0	0	
RSG108	2017/02/11	Summer	25.62	3	4	12	6	0	0	2	80	0	0	*Elephantulus myurus*
RSG109	2017/02/11	Summer	10.62	3	5	4	11	0	0	0	85	0	0	*Mus minutoides*
RSG110	2017/02/11	Summer	3.2	3	5	1	97	0	0	0	2	0	0	Unidentified
RSG111	2017/02/11	Summer	10.48	4	5	2	2	0	0	3	93	0	0	*Mastomys* sp.; *Otomys irroratus*
RSG112	2017/02/11	Summer	9.07	4	5	52	4	0	1	0	43	0	0	*Otomys irroratus*
RSG113	2017/03/04	Summer	5.8	3	4	0	7	91	0	0	0	2	0	
RSG114	2017/03/04	Summer	6.67	4	4	80	9	0	1	0	10	0	0	*Crocidura* sp.
RSG116	2017/03/06	Summer	14.49	5	6	65	6	0	5	2	22	0	0	*Mastomys* sp.
RSG117	2017/03/06	Summer	3.75	5	7	74	10	0	2	6	8	0	0	*Mastomys* sp.
RSG119	2017/03/06	Summer	0.99	3	3	70	10	0	0	20	0	0	0	*Elephantulus myurus*
RSG120	2017/03/06	Summer	0.5	2	2	0	86	0	0	0	14	0	0	
RSG122	2017/03/06	Summer	1.07	2	2	18	0	0	0	0	82	0	0	Unidentified
RSG115	2017/03/04	Autumn	6.46	4	7	75	20	0	0	0	4	1	0	*Rhabdomys* sp.
RSG118	2017/03/06	Autumn	40.21	3	3	3	1	0	0	0	96	0	0	*Mastomys* sp.
RSG121	2017/03/06	Autumn	13.97	5	7	45	18	36	0.5	0	0.5	0	0	*Mastomys* sp.
RSG123	2017/03/06	Autumn	0.72	3	3	77.5	22	0	0.5	0	0	0	0	*Gerbilliscus* sp.
RSG124	2017/04/04	Autumn	1.94	3	3	55	8	0	0	37	0	0	0	*Mastomys* sp.
RSG125	2017/04/04	Autumn	10.48	3	5	30.5	69	0	0	0.5	0	0	0	*Elephantulus myurus*
RSG127	2017/04/06	Autumn	1.81	3	6	44	55.5	0	0	0	0	0.5	0	*Elephantulus myurus*
RSG128	2017/04/06	Autumn	3.22	3	4	95	2	0	0	3	0	0	0	*Otomys irroratus*
RSG129	2017/04/06	Autumn	12.14	3	6	91	4	5	0	0	0	0	0	*Mastomys* sp.
RSG130	2017/04/06	Autumn	5.64	4	4	75	6	0	18	1	0	0	0	*Mastomys* sp.; *Dendromus* sp.
RSG131	2017/05/06	Autumn	7.04	3	4	76	12	0	0	12	0	0	0	*Dendromus* sp.
RSG132	2017/05/06	Autumn	2.05	3	3	76	2	0	22	0	0	0	0	*Dendromus* sp.; *Rhabdomys* sp.

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG133	2017/05/06	Autumn	14.9	6	9	25	7	60	1	6	1	0	0	*Dendromus* sp.
RSG134	2017/05/07	Autumn	3.98	2	3	94	6	0	0	0	0	0	0	*Steatomys pratensis*; *Mastomys* sp.
RSG135	2017/05/07	Autumn	10.22	3	3	0.5	99	0	0	0.5	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG136	2017/05/07	Autumn	6.27	2	2	98	0	0	2	0	0	0	0	*Steatomys pratensis*; *Mastomys* sp.
RSG137	2017/05/07	Autumn	4.37	3	4	78	1	0	0	21	0	0	0	*Dendromus* sp.
RSG138	2017/05/07	Autumn	4.95	2	5	80	20	0	0	0	0	0	0	*Mus minutoides*
RSG139	2017/05/07	Autumn	4.06	3	4	85	3	0	0	12	0	0	0	*Mus minutoides*
RSG140	2017/05/07	Autumn	4.81	4	4	79	0.5	18.5	0	2	0	0	0	*Steatomys pratensis*
RSG141	2017/05/07	Autumn	4.71	3	3	90	4.5	0	0	5.5	0	0	0	Unidentified
RSG142	2017/05/07	Autumn	3.45	3	4	80	2	0	0	18	0	0	0	Unidentified
RSG143	2017/05/07	Autumn	10.46	4	5	65	4	0	15	16	0	0	0	Unidentified
RSG144	2017/05/07	Autumn	4.58	3	3	96	0	0	3	1	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG145	2017/05/07	Autumn	13.5	3	4	90	5	0	0	5	0	0	0	*Otomys irroratus*
RSG146	2017/05/07	Autumn	1.94	3	4	77	3	0	0	20	0	0	0	Unidentified
RSG147	2017/05/07	Autumn	6.7	3	5	82	8	0	0	10	0	0	0	*Gerbilliscus* sp.; Unidentified
RSG148	2017/05/07	Autumn	2.96	3	5	39	11	0	0	50	0	0	0	*Steatomys pratensis*
RSG149	2017/05/07	Autumn	10.21	5	6	76.5	11	9	0	3	0.5	0	0	*Micaelamys namaquensis*/*Aethomys chrysophilus*; *Mus minutoides*, *Gerbilliscus* sp.
RSG150	2017/05/07	Autumn	5.76	3	3	68	4.5	0	0	27.5	0	0	0	*Gerbilliscus* sp.

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG151	2017/05/07	Autumn	9.06	4	4	70	1	24	0	5	0	0	0	*Rhabdomys* sp.; Unidentified
RSG152	2017/05/07	Autumn	7.39	3	3	99.7	0.2	0	0	0	0.1	0	0	*Dendromus* sp.
RSG153	2017/05/07	Autumn	9.93	4	5	86	8	5	0	0	1	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; *Gerbilliscus* sp.
RSG154	2017/05/07	Autumn	12.02	3	3	0	6	93	0	1	0	0	0	
RSG155	2017/05/07	Autumn	18.8	5	7	27	68	2.5	0	1	0	1.5	0	*Steatomys pratensis*
RSG156	2017/05/07	Autumn	12.56	2	2	0	0.5	99.5	0	0	0	0	0	
RSG158	2017/05/07	Autumn	18.93	4	5	0	3	95	0	1	0	1	0	
RSG159	2017/05/07	Autumn	12.39	3	4	0	16	49	0	35	0	0	0	
RSG160	2017/05/07	Autumn	13.29	3	4	0	17	76	0	7	0	0	0	
RSG161	2017/06/01	Autumn	8.17	3	3	88	1	11	0	0	0	0	0	*Otomys irroratus*
RSG162	2017/06/01	Autumn	14.89	4	6	24	21	5	0	50	0	0	0	*Otomys irroratus*
RSG163	2017/06/01	Autumn	16.23	1	1	0	0	0	0	100	0	0	0	
RSG166	2017/06/01	Autumn	13.05	3	3	0	11	0	0	88	0	0	1	
RSG168	2017/06/02	Autumn	7.48	3	3	12	1	0	0	87	0	0	0	Unidentified
RSG169	2017/06/02	Autumn	7.12	3	3	82	3	0	0	15	0	0	0	*Otomys irroratus*
RSG170	2017/06/02	Autumn	5.81	5	7	95	3	0	0.5	1	0	0.5	0	*Mastomys* sp.; *Gerbilliscus* sp.
RSG171	2017/06/02	Autumn	12.88	3	3	90	1	0	0	9	0	0	0	*Otomys irroratus*
RSG172	2017/06/02	Autumn	5.14	4	5	89	4	5	0	2	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG173	2017/06/02	Autumn	13.44	3	3	82.9	0	17	0	0	0.1	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG174	2017/06/02	Autumn	5.02	3	5	91	6	0	0	3	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG175	2017/06/02	Autumn	5.96	2	2	0	0	0	0	48	0	0	52	
RSG177	2017/06/02	Autumn	5.85	2	3	99.5	0.5	0	0	0	0	0	0	*Mastomys* sp.
RSG178	2017/06/02	Autumn	5.24	3	3	84	1	0	0	15	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG179	2017/06/02	Autumn	2.23	4	6	3	15	0	79	0	0	3	0	Unidentified
RSG180	2017/06/02	Autumn	12.1	3	3	89	3	0	0	8	0	0	0	*Otomys irroratus*
RSG181	2017/06/02	Autumn	5.45	2	2	94	0	0	0	6	0	0	0	*Dendromus* sp.
RSG182	2017/06/02	Autumn	8.42	4	4	92	1	0	1	6	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified
RSG183	2017/06/02	Autumn	7.36	4	5	87.5	2	0	0	7.5	0	0	3	Unidentified
RSG184	2017/06/02	Autumn	13.19	4	7	77	14	0	8	0	0	1	0	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified
RSG185	2017/06/02	Autumn	9.77	4	5	80	2	0	12	6	0	0	0	*Mus minutoides*
RSG176	2017/06/02	Winter	5.49	2	2	99	0	0	0	1	0	0	0	
RSG186	2017/07/03	Winter	4.48	1	1	100	0	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; *Dendromus* sp.
RSG187	2017/07/03	Winter	5.54	3	3	92.5	0.5	0	0	7	0	0	0	*Otomys irroratus*
RSG188	2017/07/03	Winter	6.95	2	2	99	0	0	0	1	0	0	0	*Dendromus* sp.

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG189	2017/07/03	Winter	8.62	2	2	96	0	0	0	4	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG190	2017/07/03	Winter	4.9	3	3	97	0.5	0	0	2.5	0	0	0	Unidentified
RSG191	2017/07/03	Winter	14.7	4	5	0	10	87	0	2	1	0	0	
RSG192	2017/07/03	Winter	5.41	3	3	96	0	0	0	3	1	0	0	*Elephantulus myurus; Otomys irroratus*
RSG193	2017/07/04	Winter	5.44	3	3	84	0.5	0	0	15.5	0	0	0	*Otomys irroratus*
RSG194	2017/07/04	Winter	3.4	2	2	99	0	0	0	1	0	0	0	Unidentified
RSG195	2017/07/04	Winter	6.14	2	2	93	0	0	0	7	0	0	0	*Micaelamys namaquensis*/*Aethomys chrysophilus*; Unidentified
RSG196	2017/07/04	Winter	6.44	3	4	95	1	0	4	0	0	0	0	*Mus minutoides*
RSG197	2017/07/04	Winter	8.51	4	4	86.5	0.05	0	0	7.45	0	0	6	Unidentified
RSG198	2017/07/04	Winter	7.53	4	4	0	28	6	0	4	0	0	62	
RSG199	2017/07/04	Winter	5.26	4	5	12	73	0	0	6	0	0	9	*Elephantulus myurus; Otomys irroratus*
RSG200	2017/07/04	Winter	15.49	3	5	89	2	0	0	9	0	0	0	Unidentified
RSG201	2017/07/04	Winter	8.22	2	2	93	0	0	0	7	0	0	0	*Rhabdomys* sp.
RSG202	2017/07/04	Winter	10.59	4	4	6	1	0	0	0	1	0	92	*Otomys irroratus*
RSG203	2017/07/04	Winter	6.88	1	1	100	0	0	0	0	0	0	0	*Micaelamys namaquensis*/*Aethomys chrysophilus*; *Dendromus* sp.
RSG204	2017/07/04	Winter	9.15	2	2	86	0	0	0	14	0	0	0	*Otomys irroratus*
RSG205	2017/07/04	Winter	3	1	1	100	0	0	0	0	0	0	0	*Mastomys* sp.

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG206	2017/07/04	Winter	8.1	3	3	89	0	2	0	9	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; *Elephantulus myurus*; *Dendromus* sp.
RSG207	2017/07/04	Winter	6.22	1	1	100	0	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus; Elephantulus myurus*
RSG208	2017/07/04	Winter	6.3	3	3	84	0	13	0	3	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified
RSG209	2017/07/04	Winter	6.58	3	3	93	1	0	0	6	0	0	0	*Mus minutoides*; Unidentified
RSG210	2017/07/04	Winter	4.64	3	3	25	2.5	0	0	0	0	0	72.5	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified
RSG211	2017/07/04	Winter	11.2	2	2	86	0	0	0	14	0	0	0	*Elephantulus myurus*; Unidentified
RSG212	2017/07/04	Winter	4.08	1	1	100	0	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG213	2017/07/04	Winter	3.13	3	3	80	2	0	0	18	0	0	0	Unidentified
RSG214	2017/07/04	Winter	10.6	2	2	37	0	63	0	0	0	0	0	Unidentified
RSG215	2017/07/21	Winter	10.16	2	3	94	6	0	0	0	0	0	0	*Otomys irroratus*
RSG216	2017/09/12	Winter	8.75	2	2	14	0	86	0	0	0	0	0	Unidentified
RSG217	2017/09/12	Winter	8.47	4	5	78	11	0	10	1	0	0	0	Unidentified
RSG218	2017/09/12	Winter	14.34	3	3	91	0.5	0	0	8.5	0	0	0	*Otomys irroratus*

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG219	2017/09/12	Winter	9.28	4	4	54.5	1	39.5	0	5	0	0	0	Unidentified
RSG220	2017/09/12	Winter	7.61	2	2	97	3	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified
RSG221	2017/09/12	Winter	12.34	4	5	75	5	0	15	5	0	0	0	Unidentified
RSG222	2017/09/12	Winter	10.88	2	2	84	0	16	0	0	0	0	0	Unidentified
RSG223	2017/09/12	Winter	4.64	2	2	97	0	0	0	3	0	0	0	Unidentified
RSG224	2017/09/12	Winter	5.81	4	6	90	1.5	7	0	1.5	0	0	0	Unidentified
RSG225	2017/09/12	Winter	3.11	2	2	92	0	0	0	8	0	0	0	Unidentified
RSG226	2017/09/12	Winter	5.04	3	5	83	9	0	0	8	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG227	2017/09/12	Winter	5.56	4	4	0	4	0	0	19	0	26	51	
RSG228	2017/09/13	Winter	5.79	3	5	54	5	41	0	0	0	0	0	Unidentified
RSG229	2017/09/13	Winter	11.93	2	2	99.5	0.5	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG230	2017/09/13	Winter	10.9	3	4	91	3	0	0	6	0	0	0	Unidentified
RSG231	2017/09/13	Winter	7.89	3	4	98	0.5	0	0	1.5	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG232	2017/09/13	Winter	7.27	3	3	95	1	0	0	4	0	0	0	*Gerbilliscus* sp.
RSG233	2017/09/13	Winter	10.6	2	2	99.5	0.5	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified
RSG234	2017/09/13	Winter	14.15	3	4	90	6	0	4	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG235	2017/09/13	Winter	8.62	1	1	100	0	0	0	0	0	0	0	*Dendromus* sp.; *Otomys irroratus*
RSG236	2017/09/13	Winter	6.87	3	5	89	1	0	0	10	0	0	0	*Dendromus* sp.; *Otomys irroratus*
RSG237	2017/09/13	Winter	10.23	3	4	87	10	0	3	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG238	2017/09/13	Winter	5.77	3	4	83	0.5	0	0	16.5	0	0	0	*Dendromus* sp.
RSG239	2017/09/13	Winter	6.13	2	2	85	0	0	0	15	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG240	2017/09/13	Winter	5.37	3	5	94	4.5	0	0	0	1.5	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG241	2017/09/13	Winter	5.74	2	2	98	0	0	0	2	0	0	0	Micaelamys namaquensis/Aethomys chrysophilus; Unidentified
RSG242	2017/09/13	Winter	2.96	1	1	100	0	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG243	2017/09/13	Winter	10.23	2	2	99.95	0.05	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG244	2017/09/13	Winter	11.79	2	2	95	5	0	0	0	0	0	0	*Otomys irroratus*
RSG245	2017/09/13	Winter	7.49	2	2	85	0	0	0	15	0	0	0	*Gerbilliscus* sp.; *Otomys irroratus*
RSG246	2017/09/13	Winter	6.5	2	2	96	0	0	0	4	0	0	0	*Dendromus* sp.; Unidentified
RSG247	2017/09/13	Winter	4.5	2	2	99	0	0	0	1	0	0	0	*Otomys irroratus*

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG248	2017/09/13	Winter	4.66	1	1	100	0	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG249	2017/09/13	Winter	4.79	2	2	77	0	0	0	23	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG250	2017/09/13	Winter	8.46	3	3	96	0.5	0	0	3.5	0	0	0	*Dendromus* sp.
RSG251	2017/09/13	Winter	6.64	2	2	99	0	0	0	1	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified
RSG252	2017/09/13	Winter	9.88	2	2	94	0	0	0	6	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG253	2017/09/13	Winter	6.89	4	4	98.5	0.8	0	0.5	0.2	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG254	2017/09/13	Winter	8.69	3	4	82	1	0	17	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*; Unidentified
RSG255	2017/09/13	Winter	10.06	3	4	81	1	18	0	0	0	0	0	Unidentified
RSG256	2017/09/13	Winter	11.58	1	1	100	0	0	0	0	0	0	0	*Otomys irroratus*; Unidentified
RSG257	2017/09/13	Winter	9.97	2	2	99.8	0.2	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG258	2017/09/13	Winter	8.46	2	2	96	4	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*

Table C1: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
RSG259	2017/09/13	Winter	4.76	2	2	95	0	0	0	5	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG260	2017/09/13	Winter	8.48	4	5	55	12	0	0	19	0	0	14	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG261	2017/09/13	Winter	7.96	2	2	99.98	0.02	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
RSG262	2017/09/13	Winter	10.12	4	4	48	1	47	0	4	0	0	0	Unidentified
RSG263	2017/09/13	Winter	4.66	3	6	33	49	0	0	18	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*

Table C2: Raw data for slender mongoose scat analysis indicating date of collection, dry weight and percentage volume of prey remains in the scats. Code = scat identification number; #Cat = number of food categories per scat; #Items = number of food items per scat; PV = percentage volume of food remains in scats, M = mammals, A = arthropods, B = birds, R = reptiles; P = plant material, S/F = seeds/fruit pulp, Am = amphibians, O = other; - = no data was available for that scat in that specific category.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
SM53	2016/09/30	Spring	1.36	2	4	0	92	0	0	8	0	0	0	
SM55	2016/09/30	Spring	0.68	2	3	0	83	0	0	17	0	0	0	
SM56	2016/09/30	Spring	1.07	2	2	0	77	0	0	23	0	0	0	
SM57	2016/10/01	Spring	3.32	2	3	0	99	0	0	1	0	0	0	
SM58	2016/10/01	Spring	1.88	1	2	0	100	0	0	0	0	0	0	
SM59	2016/10/01	Spring	0.35	2	2	0	30	0	0	70	0	0	0	
SM60	2016/10/01	Spring	0.49	2	2	0	90	0	0	10	0	0	0	
SM61	2016/10/01	Spring	0.79	2	2	0	75	25	0	0	0	0	0	
SM62	2016/10/08	Spring	0.66	2	3	0	80	0	20	0	0	0	0	
SM63	2016/10/11	Spring	0.91	1	1	0	100	0	0	0	0	0	0	
SM66	2016/10/13	Spring	2.29	4	7	0	9	85	0	4	0	2	0	
SM67	2016/10/13	Spring	1	3	6	0	70	0	0	10	0	20	0	
SM68	2016/10/13	Spring	1.65	4	8	0	61	26	0	6.5	0	6.5	0	
SM72	2016/10/13	Spring	1.56	2	3	99	1	0	0	0	0	0	0	*Otomys irroratus*
SM73	2016/10/13	Spring	0.96	2	5	0	90	0	0	0	0	10	0	
SM75	2016/10/13	Spring	0.84	3	4	22	33	0	0	45	0	0	0	Unidentified
SM76	2016/10/13	Spring	0.57	2	4	0	98	0	0	0	0	2	0	
SM78	2016/10/31	Spring	0.25	1	2	0	100	0	0	0	0	0	0	
SM82	2016/12/03	Spring	0.19	1	2	0	100	0	0	0	0	0	0	
SM85	2017/01/21	Summer	0.22	1	2	0	100	0	0	0	0	0	0	
SM86	2017/02/10	Summer	1.25	2	4	0	90	0	0	10	0	0	0	
SM87	2017/02/11	Summer	0.3	2	2	0	84	0	0	16	0	0	0	
SM88	2017/02/11	Summer	0.22	1	2	0	100	0	0	0	0	0	0	
SM89	2017/02/11	Summer	0.49	3	4	0	82	0	9	9	0	0	0	

Table C2: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
SM90	2017/02/11	Summer	0.23	1	2	0	100	0	0	0	0	0	0	
SM91	2017/02/11	Summer	0.42	2	3	0	80	0	20	0	0	0	0	
SM92	2017/02/11	Summer	0.26	1	3	0	100	0	0	0	0	0	0	
SM93	2017/02/11	Summer	0.47	2	3	17	83	0	0	0	0	0	0	*Crocidura* sp.
SM94	2017/02/11	Summer	1.29	1	3	0	100	0	0	0	0	0	0	
SM95	2017/02/11	Summer	0.38	2	3	12	88	0	0	0	0	0	0	Unidentified
SM96	2017/02/11	Summer	0.7	1	2	0	100	0	0	0	0	0	0	
SM97	2017/03/04	Summer	0.79	1	2	0	100	0	0	0	0	0	0	
SM98	2017/03/04	Summer	0.27	1	1	0	100	0	0	0	0	0	0	
SM100	2017/03/05	Summer	0.4	1	3	0	100	0	0	0	0	0	0	
SM101	2017/03/05	Autumn	2.1	2	3	0	94	0	6	0	0	0	0	
SM102	2017/03/05	Autumn	0.45	1	2	0	100	0	0	0	0	0	0	
SM103	2017/03/05	Autumn	0.96	2	3	0	94	0	0	6	0	0	0	
SM104	2017/04/04	Autumn	0.83	3	4	8	54	0	0	38	0	0	0	Unidentified
SM105	2017/04/04	Autumn	0.69	2	3	0	86	0	14	0	0	0	0	
SM106	2017/04/04	Autumn	0.89	2	3	0	94	0	6	0	0	0	0	
SM107	2017/04/04	Autumn	0.59	1	3	0	100	0	0	0	0	0	0	
SM108	2017/04/05	Autumn	0.76	2	3	5	95	0	0	0	0	0	0	Unidentified
SM109	2017/04/05	Autumn	0.46	1	3	0	100	0	0	0	0	0	0	
SM110	2017/04/05	Autumn	0.65	2	4	0	94	0	0	6	0	0	0	
SM111	2017/04/05	Autumn	0.69	2	4	0	83	0	0	17	0	0	0	
SM112	2017/04/05	Autumn	1.49	2	3	94	6	0	0	0	0	0	0	*Otomys irroratus*
SM113	2017/04/05	Autumn	0.66	1	1	0	100	0	0	0	0	0	0	
SM114	2017/04/05	Autumn	1.1	2	3	0	12.5	87.5	0	0	0	0	0	
SM115	2017/04/06	Autumn	0.52	1	3	0	100	0	0	0	0	0	0	
SM116	2017/05/06	Autumn	0.52	1	2	0	100	0	0	0	0	0	0	

Table C2: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
SM117	2017/05/06	Autumn	0.28	3	5	0	73	9	0	0	18	0	0	
SM118	2017/05/06	Autumn	0.69	2	4	0	89	0	0	0	11	0	0	
SM119	2017/05/07	Autumn	1.15	1	4	0	100	0	0	0	0	0	0	
SM120	2017/05/07	Autumn	0.39	1	1	0	100	0	0	0	0	0	0	
SM121	2017/05/07	Autumn	1.12	1	2	0	100	0	0	0	0	0	0	
SM122	2017/05/07	Autumn	0.97	2	3	0	97	0	0	0	0	0	3	
SM123	2017/05/07	Autumn	0.39	1	2	0	100	0	0	0	0	0	0	
SM124	2017/05/07	Autumn	0.91	2	4	0	69	0	0	31	0	0	0	
SM125	2017/05/07	Autumn	0.84	4	4	76	19	4.5	0	0	0.5	0	0	*Crocidura* sp.
SM126	2017/05/07	Autumn	1.13	2	2	0	40	0	0	60	0	0	0	
SM127	2017/05/07	Autumn	1.21	1	2	0	100	0	0	0	0	0	0	
SM128	2017/05/07	Autumn	0.99	2	2	0	68	0	0	32	0	0	0	
SM129	2017/05/07	Autumn	1.3	2	5	0	72	0	0	28	0	0	0	
SM130	2017/06/01	Autumn	1.22	2	4	0	95	0	0	5	0	0	0	
SM131	2017/06/01	Autumn	0.33	2	3	0	89	0	0	11	0	0	0	
SM132	2017/06/01	Autumn	1.68	2	3	0	92.5	0	0	7.5	0	0	0	
SM133	2017/06/01	Autumn	0.96	2	2	93	7	0	0	0	0	0	0	*Otomys irroratus*
SM134	2017/06/01	Autumn	0.79	1	3	0	100	0	0	0	0	0	0	
SM135	2017/06/01	Autumn	0.19	1	2	0	100	0	0	0	0	0	0	
SM136	2017/06/02	Autumn	0.44	2	3.00	0	91	0	0	9	0	0	0	
SM137	2017/07/03	Winter	1.6	2	4.0	0	97	0	0	3	0	0	0	
SM138	2017/07/03	Winter	1.64	4	4.00	87	9	0	2	2	0	0	0	*Mus minutoides*
SM139	2017/07/03	Winter	0.53	2	4.0	0	95	0	0	5	0	0	0	
SM140	2017/07/04	Winter	1.22	2	3	0	97	0	0	3	0	0	0	
SM141	2017/07/04	Winter	0.96	2	3	0	98	0	0	2	0	0	0	
SM142	2017/07/04	Winter	1.77	2	2	0	94	0	0	6	0	0	0	

Table C2: Continued.

Code	Date	Season	Weight (g)	#Cat	#Items	PV M	PV A	PV B	PV R	PV P	PV S/F	PV Am	PV O	Mammal species
SM143	2017/07/04	Winter	0.54	1	2	0	100	0	0	0	0	0	0	
SM144	2017/08/20	Winter	-	3	4	0	16	0	72	0	0	0	12	
SM145	2017/08/21	Winter	-	2	2	94	6	0	0	0	0	0	0	*Micaelamys namaquensis/Aethomys chrysophilus*
SM146	2017/08/21	Winter	-	1	1	0	100	0	0	0	0	0	0	
SM147	2017/09/12	Winter	4.59	1	3	0	100	0	0	0	0	0	0	
SM148	2017/09/12	Winter	4.05	2	3	0	97	0	0	3	0	0	0	
SM149	2017/09/12	Winter	1.79	3	5	3	92	0	0	5	0	0	0	Unidentified
SM150	2017/09/12	Winter	2.31	1	5	0	100	0	0	0	0	0	0	
SM151	2017/09/12	Winter	1.24	4	6	0	58	0	16	21	0	0	5	
SM152	2017/09/12	Winter	0.39	2	2	0	96	0	0	4	0	0	0	
SM153	2017/09/12	Winter	0.91	2	2	0	75	0	0	25	0	0	0	
SM154	2017/09/12	Winter	1.31	3	4	76	20	0	0	4	0	0	0	*Otomys irroratus*
SM155	2017/09/12	Winter	1.01	4	4	0	7	67	13	0	13	0	0	
SM156	2017/09/13	Winter	0.48	2	3	0	87.5	0	0	12.5	0	0	0	
SM157	2017/09/13	Winter	0.63	2	3	0	50	0	0	50	0	0	0	
SM158	2017/09/13	Winter	0.52	2	2	97	0	0	0	3	0	0	0	*Otomys irroratus*
SM159	2017/09/13	Winter	0.36	2	2	99	0	0	0	1	0	0	0	*Otomys irroratus*
SM160	2017/09/13	Winter	1.02	2	3	0	96	0	0	4	0	0	0	
SM161	2017/09/13	Winter	1.3	4	5	87	6	1	0	6	0	0	0	Unidentified
SM162	2017/09/13	Winter	1.36	2	4	0	94	0	0	6	0	0	0	
SM163	2017/09/13	Winter	2.59	2	2	0	0.5	0	0	99.5	0	0	0	

Table C3: Raw data for small mammal trapping sessions from October 2016 to July 2017 in the three sites (Grassland, Outcrop, Grassland) at Telperion Nature Reserve.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
09/10/2016	4G	River	Spring	Morning	*A. chrysophyllus/ M. namaquensis*	M	Non scrotal	No	30.5 g	Dry	Slight	Overcast	18°C	Right clip
09/10/2016	15G	River	Spring	Morning	*M. minutoides*	F	Non reproductive	No	6 g	Dry	Slight	Overcast	18°C	Right clip
09/10/2016	28	Outcrop	Spring	Morning	*M. namaquensis/ A. chrysophilus*	F	Non reproductive	No	34.5 g	Dry	Slight	Overcast	25°C	Right clip
09/10/2016	30	Outcrop	Spring	Morning	*M. namaquensis/ A. chrysophilus*	-	-	-	-	Dry	Slight	Overcast	25°C	*Micaelamys/Aethomys* tail found in trap, 6 cm
09/10/2016	32	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	No	47 g	Dry	Slight	Overcast	25°C	Right clip
09/10/2016	33	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Overcast	25°C	Closed, no scats
09/10/2016	39	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Overcast	25°C	Closed, no scats
09/10/2016	41	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Overcast	25°C	Closed, no scats
09/10/2016	42	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Overcast	25°C	Closed, no scats
09/10/2016	43	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	No	44.5 g	Dry	Slight	Overcast	25°C	2 small notches in left ear
09/10/2016	45	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Overcast	25°C	Open, no bait
09/10/2016	47	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Overcast	25°C	Closed, no scats
09/10/2016	48	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	No	44 g	Dry	Slight	Overcast	25°C	Escaped before clip was taken
09/10/2016	17	Grassland	Spring	Morning	*Otomys irrotatus*	F	Non reproductive	No	94.5 g	Dry	None	Drizzle	18°C	Right clip
10/10/2016	22G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	30°C	Closed, no scats
10/10/2016	27	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	18°C	Closed, scats, bait gone
10/10/2016	28	Outcrop	Spring	Morning	*M. namaquensis/ A. chrysophilus*	F	Non reproductive	Yes	-	Dry	Slight	Clear	18°C	

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
10/10/2016	38	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	18°C	Closed, no scats
10/10/2016	39	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	Yes	-	Dry	Slight	Clear	18°C	
10/10/2016	41	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	18°C	Closed, no scats
10/10/2016	42	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	18°C	Closed, no scats
10/10/2016	44	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	18°C	Closed, no scats
10/10/2016	47	Outcrop	Spring	Morning	*M. namaquensis*	M	Non scrotal	No	56.5 g	Dry	Slight	Clear	18°C	Right clip
10/10/2016	48	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	No	41.5 g	Dry	Slight	Clear	18°C	3 shallow notches in ear, right clip
11/10/2016	9G	River	Spring	Morning	-	-	-	-	-	Dry	None	Clear	12°C	Closed, no scats
11/10/2016	11G	River	Spring	Morning	-	-	-	-	-	Dry	None	Clear	12°C	Closed, no scats
11/10/2016	15G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	31°C	Closed, no scats
11/10/2016	19G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	31°C	Closed, no scats
11/10/2016	22G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	31°C	Closed, no scats
11/10/2016	27	Outcrop	Spring	Morning	*M. namaquensis*	M	Non scrotal	No	48.5 g	Dry	Windy	Clear	17°C	Right clip
11/10/2016	28	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Windy	Clear	17°C	Closed, bait gone
11/10/2016	30	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Windy	Clear	17°C	Open, no bait
11/10/2016	32	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Windy	Clear	17°C	Open, no bait
11/10/2016	36	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Windy	Clear	17°C	Closed, bait gone
11/10/2016	40	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	No	43.5 g	Dry	Windy	Clear	17°C	Right clip
11/10/2016	41	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Windy	Clear	17°C	Closed, bait gone
11/10/2016	42	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Windy	Clear	17°C	Closed, scats
11/10/2016	47	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Windy	Clear	17°C	Closed, scats
11/10/2016	48	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Windy	Clear	17°C	Closed, scats
11/10/2016	3	Grassland	Spring	Morning	*Otomys irrotatus*	F	Lactating	No	-	Dry	None	Clear	12°C	1 suckling baby, did not weigh or mark

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
11/10/2016	16	Grassland	Spring	Morning	*Otomys irrotatus*	M	Non scrotal	No	101 g	Dry	None	Clear	12°C	-
11/10/2016	3	Grassland	Spring	Afternoon	Otomys irrotatus	F	Non reproductive	Yes	-	Dry	Slight	Clear	31°C	-
12/10/2016	3G	River	Spring	Morning	*A. chrysophyllus/ M. namaquensis*	M	Non scrotal	Yes	-	Dry	Slight	Clear	13°C	-
12/10/2016	14G	River	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	13°C	Closed, no scats
12/10/2016	15G	River	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	13°C	Closed, no scats
12/10/2016	19G	River	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	13°C	Closed, no scats
12/10/2016	21G	River	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	13°C	Closed, no bait
12/10/2016	39T	River	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	13°C	Closed, no bait
12/10/2016	40T	River	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	13°C	Closed, no bait
12/10/2016	46T	River	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	13°C	Closed, no bait
12/10/2016	14G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	17G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	19G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	21G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	23G	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	36T	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	37T	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	38T	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	39T	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	40T	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	49T	River	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Disturbed
12/10/2016	28	Outcrop	Spring	Morning	*M. namaquensis*	M	Non scrotal	Yes	53.5 g	Dry	Slight	Clear	17°C	-
12/10/2016	29	Outcrop	Spring	Morning	*M. namaquensis/ A. chrysophilus*	F	Non reproductive	Yes	38.5 g	Dry	Slight	Clear	17°C	-

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
12/10/2016	30	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	No	41.5 g	Dry	Slight	Clear	17°C	Right clip
12/10/2016	32	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	17°C	Bait gone
12/10/2016	41	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	17°C	Closed, no scats
12/10/2016	42	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	17°C	Closed, no scats
12/10/2016	43	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	Yes	45 g	Dry	Slight	Clear	17°C	2 small notches on left ear
12/10/2016	47	Outcrop	Spring	Morning	*M. namaquensis*	M	Non scrotal	No	50.5 g	Dry	Slight	Clear	17°C	Right clip
12/10/2016	16	Grassland	Spring	Morning	-	-	-	-	-	Dry	None	Clear	13°C	Open, scats
12/10/2016	21	Grassland	Spring	Afternoon	-	-	-	-	-	Dry	Slight	Clear	37°C	Closed, no scats
13/10/2016	9G	River	Spring	Morning	-	-	-	-	-	Dry	None	Clear	15°C	Disturbed
13/10/2016	11G	River	Spring	Morning	-	-	-	-	-	Dry	None	Clear	15°C	Disturbed
13/10/2016	19G	River	Spring	Morning	-	-	-	-	-	Dry	None	Clear	15°C	Disturbed
13/10/2016	42T	River	Spring	Morning	-	-	-	-	-	Dry	None	Clear	15°C	Disturbed
13/10/2016	45T	River	Spring	Morning	-	-	-	-	-	Dry	None	Clear	15°C	Closed, no scats
13/10/2016	27	Outcrop	Spring	Morning	*M. namaquensis*	M	Non scrotal	Yes	47.5 g	Dry	Slight	Clear	18°C	-
13/10/2016	28	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	18°C	Closed, no scats
13/10/2016	37	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	18°C	Closed, no scats
13/10/2016	38	Outcrop	Spring	Morning	*M. namaquensis*	M	Non scrotal	No	51 g	Dry	Slight	Clear	18°C	Right clip
13/10/2016	41	Outcrop	Spring	Morning	-	-	-	-	-	Dry	Slight	Clear	18°C	Closed, no scats
13/10/2016	42	Outcrop	Spring	Morning	*M. namaquensis*	M	Non scrotal	Yes	47.5 g	Dry	Slight	Clear	18°C	-
13/10/2016	44	Outcrop	Spring	Morning	*M. namaquensis*	F	Non reproductive	Yes	43.5 g	Dry	Slight	Clear	18°C	2 small notches in left ear
13/10/2016	47	Outcrop	Spring	Morning	*M. namaquensis*	M	Non scrotal	No	57 g	Dry	Slight	Clear	18°C	Right clip
13/10/2016	2	Grassland	Spring	Morning	*Dendromus* sp.	M	Non reproductive	No	8.5 g	Dry	None	Clear	15°C	-

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
17/01/2017	15G	River	Summer	Morning	*Mastomys* sp.	M	Non scrotal	No	47.5 g	Damp	Slight	Cloudy	16°C	Non scrotal but abdominal, testes clearly apparent, left clip
17/01/2017	A2 N2	River	Summer	Morning	*Crocidura* sp.	F	Non reproductive	No	10.5 g	Damp	Slight	Cloudy	16°C	In pitfall trap, left clip
17/01/2017	9G	River	Summer	Afternoon	-	-	-	-	-	Dry	Windy	Clear	25°C	Closed, no scats
17/01/2017	11G	River	Summer	Afternoon	-	-	-	-	-	Dry	Windy	Clear	25°C	Closed, no scats
17/01/2017	22G	River	Summer	Afternoon	-	-	-	-	-	Dry	Windy	Clear	25°C	Closed, no bait
17/01/2017	36T	River	Summer	Afternoon	-	-	-	-	-	Dry	Windy	Clear	25°C	Closed, no bait
17/01/2017	27	Outcrop	Summer	Morning	*M. namaquensis*	F	Reproductive	No	45 g	Dry	Slight	Clear	20°C	2 nipples (back), left clip
17/01/2017	28	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, no scats
17/01/2017	29	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, scats
17/01/2017	31	Outcrop	Summer	Morning	*Elephantulus myurus*	M	Non scrotal	No	34 g	Dry	Slight	Clear	20°C	Juvenile, left clip
17/01/2017	32	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, scats
17/01/2017	33	Outcrop	Summer	Morning	*M. namaquensis*	F	Reproductive	No	51 g	Dry	Slight	Clear	20°C	2 nipples, cut on left ear, left clip
17/01/2017	38	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	No	32 g	Dry	Slight	Clear	20°C	Juvenile, left clip
17/01/2017	43	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, scats
17/01/2017	47	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, scats
17/01/2017	49	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, scats
17/01/2017	14	Grassland	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Clear	25°C	Snake in trap
17/01/2017	17	Grassland	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Clear	25°C	Closed, no scats
18/01/2017	15G	River	Summer	Morning	*Mastomys* sp.	F	Non reproductive	No	24.5 g	Dry	Slight	Clear	12°C	Left clip
18/01/2017	15G	River	Summer	Afternoon	-	-	-	-	-	Dry	None	Clear	31°C	Closed, scats

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
18/01/2017	20G	River	Summer	Afternoon	-	-	-	-	-	Dry	None	Clear	31°C	Closed, scats
18/01/2017	21G	River	Summer	Afternoon	-	-	-	-	-	Dry	None	Clear	31°C	Bait gone
18/01/2017	46T	River	Summer	Afternoon	-	-	-	-	-	Dry	None	Clear	31°C	Bait gone
18/01/2017	27	Outcrop	Summer	Morning	*M. namaquensis*	F	Reproductive	Yes	48.5 g	Dry	Slight	Clear	23°C	-
18/01/2017	30	Outcrop	Summer	Morning	*M. namaquensis*	F	Reproductive	No	55.5 g	Dry	Slight	Clear	23°C	4 nipples, cut on left ear, left clip
18/01/2017	38	Outcrop	Summer	Morning	*M. namaquensis/ A. chrysophilus*	M	Non scrotal	No	29.5 g	Dry	Slight	Clear	23°C	Tail short (4–5 cm), juvenile, no clip
18/01/2017	41	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	23°C	Closed, no scats
18/01/2017	43	Outcrop	Summer	Morning	*M. namaquensis*	-	-	-	-	Dry	Slight	Clear	23°C	Escaped
18/01/2017	48	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	23°C	Closed, scats
18/01/2017	49	Outcrop	Summer	Morning	*M. namaquensis/ A. chrysophilus*	M	Non scrotal	No	36 g	Dry	Slight	Clear	23°C	Juvenile, left clip
19/01/2017	4G	River	Summer	Morning	-	-	-	-	-	Dry	None	Clear	15°C	Closed, no scats
19/01/2017	39T	River	Summer	Morning	-	-	-	-	-	Dry	None	Clear	15°C	Closed, no scats
19/01/2017	22G	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	32°C	Closed, bait gone
19/01/2017	24G	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	32°C	Disturbed
19/01/2017	39T	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	32°C	Closed, bait gone
19/01/2017	46T	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	32°C	Closed, bait gone
19/01/2017	49T	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	32°C	Disturbed
19/01/2017	27	Outcrop	Summer	Morning	*M. namaquensis*	F	Non reproductive	No	38 g	Dry	Slight	Clear	20°C	4 nipples, vagina closed, left clip
19/01/2017	32	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, no scats
19/01/2017	33	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	No	46 g	Dry	Slight	Clear	20°C	Large testes but abdominal, left clip
19/01/2017	34	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	Yes	35 g	Dry	Slight	Clear	20°C	Small notch in ear
19/01/2017	37	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, no scats

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
19/01/2017	40	Outcrop	Summer	Morning	*M. namaquensis/ A. chrysophilus*	M	Non scrotal	Yes	29.5 g	Dry	Slight	Clear	20°C	Juvenile, short tail
19/01/2017	42	Outcrop	Summer	Morning	*Elephantulus myurus*	F	Non reproductive	No	88 g	Dry	Slight	Clear	20°C	Large individual, left clip
19/01/2017	47	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	No	52 g	Dry	Slight	Clear	20°C	Large testes but abdominal, big notch in ear, left clip
19/01/2017	49	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, scats, bait gone
19/01/2017	50	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	20°C	Closed, scats, bait gone
20/01/2017	9G	River	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	28°C	Trap squashed by ungulate
20/01/2017	10G	River	Summer	Morning	-	-	-	-	-	Dry	Slight	Clear	28°C	Closed, no scats
20/01/2017	19G	River	Summer	Morning	*Mastomys* sp.	F	Non reproductive	Yes	26.5 g	Dry	Slight	Clear	28°C	-
20/01/2017	11G	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Overcast	29°C	Closed, no bait
20/01/2017	12G	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Overcast	29°C	Closed, no scats
20/01/2017	14G	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Overcast	29°C	Closed, no scats
20/01/2017	20G	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Overcast	29°C	Open, no bait
20/01/2017	24G	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Overcast	29°C	Closed, no bait
20/01/2017	39T	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Overcast	29°C	Closed, no bait
20/01/2017	49T	River	Summer	Afternoon	-	-	-	-	-	Dry	Slight	Overcast	29°C	Open, no bait
20/01/2017	27	Outcrop	Summer	Morning	*M. namaquensis*	F	Reproductive	Yes	45 g	Dry	Slight	Cloudy	25°C	2 nipples
20/01/2017	28	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	No	12 g	Dry	Slight	Cloudy	25°C	Left clip
20/01/2017	34	Outcrop	Summer	Morning	*M. namaquensis*	F	Reproductive	Yes	54 g	Dry	Slight	Cloudy	25°C	-
20/01/2017	37	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Cloudy	25°C	Closed, no scats

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
20/01/2017	42	Outcrop	Summer	Morning	*Elephantulus myurus*	M	Non scrotal	No	43.5 g	Dry	Slight	Cloudy	25°C	Left clip
20/01/2017	43	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	Yes	45 g	Dry	Slight	Cloudy	25°C	-
20/01/2017	49	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Cloudy	25°C	Closed, 2 cm of tail inside
20/01/2017	50	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Cloudy	25°C	Closed, no scats
20/01/2017	38	Outcrop	Summer	Afternoon	*M. namaquensis*	M	Non scrotal	Yes	36.5 g	Dry	Slight	Overcast	29°C	-
21/01/2017	14G	River	Summer	Morning	*Mastomys* sp.	M	Non scrotal	No	55.5 g	Dry	Slight	Overcast	26°C	Left clip
21/01/2017	17G	River	Summer	Morning	-	-	-	-	-	Dry	Slight	Overcast	26°C	Closed, no scats
21/01/2017	41T	River	Summer	Morning	-	-	-	-	-	Dry	Slight	Overcast	26°C	Disturbed
21/01/2017	44T	River	Summer	Morning	-	-	-	-	-	Dry	Slight	Overcast	26°C	Disturbed
21/01/2017	27	Outcrop	Summer	Morning	*M. namaquensis*	F	Reproductive	Yes	39 g	Dry	Slight	Cloudy	27°C	4 nipples, vagina closed
21/01/2017	28	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	Yes	46 g	Dry	Slight	Cloudy	27°C	-
21/01/2017	29	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Closed, no scats
21/01/2017	32	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	No	57 g	Dry	Slight	Cloudy	27°C	-
21/01/2017	33	Outcrop	Summer	Morning	*M. namaquensis*	F	Reproductive	Yes	47 g	Dry	Slight	Cloudy	27°C	2 nipples, ear notch
21/01/2017	35	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	Yes	29.5 g	Dry	Slight	Cloudy	27°C	Short tail
21/01/2017	37	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Closed, no scats
21/01/2017	38	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Closed, no scats
21/01/2017	40	Outcrop	Summer	Morning	*M. namaquensis*	M	Non scrotal	No	41.5 g	Dry	Slight	Cloudy	27°C	Small notch in left hair
21/01/2017	41	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Closed, scats, bait gone
21/01/2017	44	Outcrop	Summer	Morning	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Closed, scats, bait gone
09/04/2017	1G	River	Autumn	Morning	*Mastomys* sp.	M	Non scrotal	No	-	Damp	None	Clear	14°C	Juvenile, right clip
09/04/2017	3G	River	Autumn	Morning	*Mastomys* sp.	M	Non scrotal	No	-	Damp	None	Clear	14°C	-

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
09/04/2017	43	Outcrop	Autumn	Afternoon	*Elephantulus myurus*	F	Non reproductive	No	-	Damp	Slight	Cloudy	27°C	-
09/04/2017	10	Grassland	Autumn	Morning	-	-	-	-	-	Damp	None	Clear	14°C	Closed, no bait
09/04/2017	18	Grassland	Autumn	Morning	-	-	-	-	-	Damp	None	Clear	14°C	Closed, no bait
09/04/2017	25	Grassland	Autumn	Morning	-	-	-	-	-	Damp	None	Clear	14°C	Closed
10/04/2017	12G	River	Autumn	Morning	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Disturbed
10/04/2017	17G	River	Autumn	Morning	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Disturbed
10/04/2017	49T	River	Autumn	Morning	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Disturbed
10/04/2017	13G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Disturbed
10/04/2017	22G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Disturbed
10/04/2017	39T	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	27°C	Disturbed
10/04/2017	27	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	No	40.5 g	Dry	Slight	Clear	21°C	Right clip
10/04/2017	28	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	No	50.5 g	Dry	Slight	Clear	21°C	Right clip
10/04/2017	29	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Clear	21°C	Open, no bait
10/04/2017	30	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Clear	21°C	Open, no bait
10/04/2017	33	Outcrop	Autumn	Morning	*Elephantulus myurus*	M	Non scrotal	No	65 g	Dry	Slight	Clear	21°C	Tail tip missing fur and hair, right clip
10/04/2017	40	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	No	49 g	Dry	Slight	Clear	21°C	Right clip, white fur behind right ear
10/04/2017	42	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Clear	21°C	One scat, bait
10/04/2017	43	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Clear	21°C	Closed
10/04/2017	50	Outcrop	Autumn	Morning	*M. namaquensis/ A. chrysophilus*	M	Non scrotal	No	23.5 g	Dry	Slight	Clear	21°C	Part of tail missing, right clip
10/04/2017	29	Outcrop	Autumn	Afternoon	*M. namaquensis*	F	Non reproductive	Yes	50.5 g	Dry	None	Cloudy	25°C	-

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
10/04/2017	50	Outcrop	Autumn	Afternoon	*Elephantulus myurus*	M	Non scrotal	Yes	65.5 g	Dry	None	Cloudy	25°C	-
11/04/2017	4G	River	Autumn	Morning	*Mastomys* sp.	M	Non scrotal	Yes	60.5 g	Dry	Slight	Cloudy	27°C	-
11/04/2017	10G	River	Autumn	Morning	*Mastomys* sp.	M	Non scrotal	No	60.5 g	Dry	Slight	Cloudy	27°C	Right hind foot swollen, right clip
11/04/2017	A3 N2	River	Autumn	Morning	*Mus minutoides*	-	-	No	5.5 g	Dry	Slight	Cloudy	27°C	Dead in pitfall trap
11/04/2017	19G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	26°C	Disturbed
11/04/2017	20G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	26°C	Disturbed
11/04/2017	22G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	26°C	Disturbed
11/04/2017	28	Outcrop	Autumn	Morning	*M. namaquensis*	M	Non scrotal	No	42 g	Damp	None	Overcast	22°C	Right clip
11/04/2017	29	Outcrop	Autumn	Morning	*M. namaquensis/ A. chrysophilus*	F	Non reproductive	No	27.5 g	Damp	None	Overcast	22°C	Juvenile, right clip
11/04/2017	30	Outcrop	Autumn	Morning	*M. namaquensis*	M	Non scrotal	No	49 g	Damp	None	Overcast	22°C	Right clip
11/04/2017	33	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	No	42 g	Damp	None	Overcast	22°C	Right clip
11/04/2017	34	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	Yes	-	Damp	None	Overcast	22°C	-
11/04/2017	42	Outcrop	Autumn	Morning	-	-	-	-	-	Damp	None	Overcast	22°C	Open, scats
11/04/2017	43	Outcrop	Autumn	Morning	*Elephantulus myurus*	F	Non reproductive	No	55.5 g	Damp	None	Overcast	22°C	Right clip
11/04/2017	44	Outcrop	Autumn	Morning	*Elephantulus myurus*	M	Non scrotal	Yes	68 g	Damp	None	Overcast	22°C	-
11/04/2017	47	Outcrop	Autumn	Morning	-	-	-	-	-	Damp	None	Overcast	22°C	Open, scats
11/04/2017	49	Outcrop	Autumn	Morning	-	-	-	-	-	Damp	None	Overcast	22°C	Closed, scat, 1 cm tail in trap
11/04/2017	50	Outcrop	Autumn	Morning	*M. namaquensis/ A. chrysophilus*	M	Non scrotal	Yes	-	Damp	None	Overcast	22°C	-

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
11/04/2017	20	Grassland	Autumn	Morning	-	-	-	-	-	Damp	None	Overcast	15°C	Closed, scats
12/04/2017	1G	River	Autumn	Morning	*Mastomys* sp.	M	Non scrotal	Yes	51.5 g	Dry	None	Clear	17°C	-
12/04/2017	10G	River	Autumn	Morning	*Mastomys* sp.	M	Non scrotal	No	39.5 g	Dry	None	Clear	17°C	Right clip
12/04/2017	19G	River	Autumn	Morning	*Mastomys* sp.	M	Non scrotal	No	42.5 g	Dry	None	Clear	17°C	White patch on tail, right clip
12/04/2017	8G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	25°C	Closed
12/04/2017	9G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	25°C	Closed
12/04/2017	16G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	25°C	Dead bird
12/04/2017	33T	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	25°C	Closed
12/04/2017	28	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	Yes	46 g	Damp	Windy	Cloudy	24°C	2 small notches in left ear
12/04/2017	33	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	No	55.5 g	Damp	Windy	Cloudy	24°C	Cut on left ear
12/04/2017	34	Outcrop	Autumn	Morning	*M. namaquensis*	M	Non scrotal	Yes	42 g	Damp	Windy	Cloudy	24°C	-
12/04/2017	39	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	Yes	49.5 g	Damp	Windy	Cloudy	24°C	-
12/04/2017	42	Outcrop	Autumn	Morning	-	-	-	-	-	Damp	Windy	Cloudy	24°C	Closed
12/04/2017	43	Outcrop	Autumn	Morning	-	-	-	-	-	Damp	Windy	Cloudy	24°C	Closed
12/04/2017	44	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	No	45.5 g	Damp	Windy	Cloudy	24°C	Right clip
12/04/2017	46	Outcrop	Autumn	Morning	-	-	-	-	-	Damp	Windy	Cloudy	24°C	Open, scats
12/04/2017	47	Outcrop	Autumn	Morning	-	-	-	-	-	Damp	Windy	Cloudy	24°C	Closed, scats
12/04/2017	48	Outcrop	Autumn	Morning	-	-	-	-	-	Damp	Windy	Cloudy	24°C	Closed
13/04/2017	3G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	18°C	Open, scats
13/04/2017	6G	River	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	18°C	Open, scats
13/04/2017	30	Outcrop	Autumn	Morning	*M. namaquensis*	M	Non scrotal	No	44.5 g	Dry	Slight	Cloudy	18°C	Short tail
13/04/2017	39	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	Yes	43 g	Dry	Slight	Cloudy	18°C	-

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
13/04/2017	40	Outcrop	Autumn	Morning	*M. namaquensis*	M	Non scrotal	No	40 g	Dry	Slight	Cloudy	18°C	Right clip
13/04/2017	43	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	No	52 g	Dry	Slight	Cloudy	18°C	Tip of tail missing
13/04/2017	41	Outcrop	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	18°C	Open, scats
13/04/2017	47	Outcrop	Autumn	Afternoon	-	-	-	-	-	Dry	Slight	Cloudy	18°C	Open, scats
14/04/2017	28	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Overcast	18°C	Open, no bait
14/04/2017	29	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Overcast	18°C	Open, no bait
14/04/2017	30	Outcrop	Autumn	Morning	*M. namaquensis*	M	Non scrotal	Yes	44 g	Dry	Slight	Overcast	18°C	-
14/04/2017	32	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Overcast	18°C	Open, no bait
14/04/2017	34	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	Yes	55.5 g	Dry	Slight	Overcast	18°C	-
14/04/2017	35	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	Yes	49 g	Dry	Slight	Overcast	18°C	-
14/04/2017	39	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	No	30.9 g	Dry	Slight	Overcast	18°C	Juvenile, right clip
14/04/2017	41	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Overcast	18°C	Closed
14/04/2017	43	Outcrop	Autumn	Morning	*M. namaquensis*	F	Non reproductive	Yes	52 g	Dry	Slight	Overcast	18°C	Tip of tail missing
14/04/2017	44	Outcrop	Autumn	Morning	*M. namaquensis*	M	Non scrotal	No	29 g	Dry	Slight	Overcast	18°C	Juvenile, tip of tail missing, right clip
14/04/2017	48	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Overcast	18°C	Open, scats
14/04/2017	49	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Overcast	18°C	Closed, scats
14/04/2017	50	Outcrop	Autumn	Morning	-	-	-	-	-	Dry	Slight	Overcast	18°C	Open, no bait
22/07/2017	19G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	No	52.5 g	Dry	None	Clear	-	2 notches in right ear, left clip
22/07/2017	24G	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Dead bird
22/07/2017	39T	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed
22/07/2017	40T	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
22/07/2017	43T	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed
22/07/2017	46T	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed
22/07/2017	48T	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	No	39	Dry	None	Clear	-	Left clip
22/07/2017	21G	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Dead bird
22/07/2017	30T	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
22/07/2017	32T	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
22/07/2017	40T	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
22/07/2017	46T	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
22/07/2017	43	Outcrop	Winter	Morning	*Elephantulus myurus*	F	Non reproductive	No	57.5 g	Dry	Slight	Clear	-	Left clip
22/07/2017	49	Outcrop	Winter	Morning	*M. namaquensis*	F	Non reproductive	No	40.5 g	Dry	Slight	Clear	-	Left clip
22/07/2017	35	Outcrop	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
22/07/2017	48	Outcrop	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
22/07/2017	49	Outcrop	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
22/07/2017	8	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed, scats
23/07/2017	10G	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed
23/07/2017	23G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	No	35.5 g	Dry	None	Clear	-	Bent right ear, left clip
23/07/2017	28T	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed
23/07/2017	36T	River	Winter	Morning	*Dendromus* sp.	F	Non reproductive	No	12 g	Dry	None	Clear	-	Left clip
23/07/2017	30T	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
23/07/2017	32T	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
23/07/2017	37T	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
23/07/2017	40T	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
23/07/2017	26	Outcrop	Winter	Morning	*Elephantulus myurus*	F	Non reproductive	No	65.5 g	Dry	Slight	Clear	-	Left clip
23/07/2017	30	Outcrop	Winter	Morning	*M. namaquensis*	M	Non scrotal	No	46 g	Dry	Slight	Clear	-	Left clip
23/07/2017	39	Outcrop	Winter	Morning	*M. namaquensis*	M	Non scrotal	No	42.5 g	Dry	Slight	Clear	-	Left clip
23/07/2017	42	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Open, scats
23/07/2017	43	Outcrop	Winter	Morning	*Elephantulus myurus*	F	Non reproductive	No	65.5 g	Dry	Slight	Clear	-	Left clip
23/07/2017	47	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed, bait gone
23/07/2017	48	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed, scats
23/07/2017	3	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed, scats, bait gone
23/07/2017	4	Grassland	Winter	Morning	*Mus minutoides*	M	Non scrotal	No	8 g	Dry	None	Clear	-	Died while handling
23/07/2017	8	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed, scats
23/07/2017	14	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed
23/07/2017	24	Grassland	Winter	Morning	*Mus minutoides*	F	Non reproductive	No	7.5 g	Dry	None	Clear	-	Left clip
23/07/2017	8	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed, scats, small piece of tail
23/07/2017	18	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Open, scats
23/07/2017	24	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed, scats
24/07/2017	19G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	Yes	51.5 g	Dry	None	Clear	-	-
24/07/2017	21G	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Disturbed
24/07/2017	23G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	Yes	42 g	Dry	None	Clear	-	-
24/07/2017	37T	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Disturbed
24/07/2017	38T	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Disturbed
24/07/2017	40T	River	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Disturbed
24/07/2017	7G	River	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
24/07/2017	9G	River	Winter	Afternoon	*Mus minutoides*	F	Non reproductive	No	7 g	Dry	Slight	Clear	-	Left clip
24/07/2017	10G	River	Winter	Afternoon	*Mus minutoides*	M	Non scrotal	No	5.5 g	Dry	Slight	Clear	-	Left clip
24/07/2017	27	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed
24/07/2017	30	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Open, bait gone
24/07/2017	34	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed
24/07/2017	38	Outcrop	Winter	Morning	*M. namaquensis*	M	Non scrotal	Yes	41.5 g	Dry	Slight	Clear	-	-
24/07/2017	43	Outcrop	Winter	Morning	*M. namaquensis*	F	Non reproductive	No	47.5 g	Dry	Slight	Clear	-	Left clip
24/07/2017	47	Outcrop	Winter	Morning	*Elephantulus myurus*	F	Non reproductive	Yes	55.5 g	Dry	Slight	Clear	-	-
24/07/2017	3	Grassland	Winter	Morning	*Mus minutoides*	F	Non reproductive	No	8 g	Dry	None	Misty	-	Left clip
24/07/2017	4	Grassland	Winter	Morning	*Mus minutoides*	F	Non reproductive	No	6.5 g	Dry	None	Misty	-	Left clip
24/07/2017	8	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Misty	-	Closed
24/07/2017	12	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Misty	-	Closed
24/07/2017	14	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Misty	-	Closed
24/07/2017	24	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Misty	-	Closed
24/07/2017	3	Grassland	Winter	Afternoon	*Mus minutoides*	F	Non reproductive	Yes	7.5 g	Dry	Slight	Clear	-	Small notch in right ear
24/07/2017	8	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed, scats
24/07/2017	12	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed, bait gone
24/07/2017	14	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed, bait gone
24/07/2017	18	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
25/07/2017	9G	River	Winter	Morning	*Mus minutoides*	M	Non scrotal	No	7 g	Dry	Slight	Clear	-	Left clip
25/07/2017	9G	River	Winter	Morning	*Mus minutoides*	M	Non scrotal	No	5.5 g	Dry	Slight	Clear	-	Left clip

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
25/07/2017	10G	River	Winter	Morning	*Mastomys* sp.	F	Non reproductive	No	20.5 g	Dry	Slight	Clear	-	Juvenile, left clip
25/07/2017	18G	River	Winter	Morning	*Mastomys* sp.	F	Non reproductive	No	20.5 g	Dry	Slight	Clear	-	Juvenile, left clip
25/07/2017	23G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	Yes	43 g	Dry	Slight	Clear	-	-
25/07/2017	23G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	Yes	31.5 g	Dry	Slight	Clear	-	-
25/07/2017	24G	River	Winter	Morning	*Mus minutoides*	M	Non scrotal	No	8 g	Dry	Slight	Clear	-	Left clip
25/07/2017	36T	River	Winter	Morning	*Dendromus* sp.	M	Non scrotal	No	9.5 g	Dry	Slight	Clear	-	Left clip
25/07/2017	5G	River	Winter	Afternoon	-	-	-	-	-	Dry	None	Clear	-	Closed
25/07/2017	27	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed, scats
25/07/2017	34	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed
25/07/2017	47	Outcrop	Winter	Morning	*Elephantulus myurus*	F	Non reproductive	Yes	55.5 g	Dry	Slight	Clear	-	-
25/07/2017	49	Outcrop	Winter	Morning	*M. namaquensis*	-	-	Yes	-	Dry	Slight	Clear	-	Escaped
25/07/2017	3	Grassland	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Open, something nested overnight
25/07/2017	4	Grassland	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Open, scats
25/07/2017	8	Grassland	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Open, cotton missing
25/07/2017	12	Grassland	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed, scats
25/07/2017	24	Grassland	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed
25/07/2017	3	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
25/07/2017	8	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
25/07/2017	12	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
25/07/2017	18	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
26/07/2017	9G	River	Winter	Morning	*Mus minutoides*	M	Non scrotal	No	6.5 g	Dry	None	Clear	-	Left clip
26/07/2017	10G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	No	20.5 g	Dry	None	Clear	-	Dead
26/07/2017	19G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	Yes	49.5 g	Dry	None	Clear	-	-

Table C3: Continued.

Date	Trap code	Site	Season	Time	Species	Sex	Condition	Retrap	Weight	Soil	Wind	Weather	Temp.	Remarks
26/07/2017	20G	River	Winter	Morning	*Mastomys* sp.	M	Non scrotal	No	25.5 g	Dry	None	Clear	-	Left clip
26/07/2017	33T	River	Winter	Morning	*Dendromus* sp.	M	Non scrotal	Yes	11 g	Dry	None	Clear	-	-
26/07/2017	18G	River	Winter	Afternoon	*Mus minutoides*	F	Non reproductive	No	5.5 g	Dry	None	Clear	-	-
26/07/2017	33T	River	Winter	Afternoon	-	-	-	-	-	Dry	None	Clear	-	Closed
26/07/2017	27	Outcrop	Winter	Morning	*M. namaquensis*	F	Non reproductive	No	40.5 g	Dry	Slight	Clear	-	Left clip
26/07/2017	34	Outcrop	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed
26/07/2017	38	Outcrop	Winter	Morning	*M. namaquensis*	F	Non reproductive	No	42.5 g	Dry	Slight	Clear	-	Left clip
26/07/2017	39	Outcrop	Winter	Morning	*M. namaquensis*	M	Non scrotal	Yes	41.5 g	Dry	Slight	Clear	-	-
26/07/2017	43	Outcrop	Winter	Morning	*M. namaquensis*	M	Non scrotal	No	41.5 g	Dry	Slight	Clear	-	Left clip
26/07/2017	47	Outcrop	Winter	Morning	*Elephantulus myurus*	F	Non reproductive	Yes	55.5 g	Dry	Slight	Clear	-	-
26/07/2017	50	Outcrop	Winter	Morning	*M. namaquensis*	F	Non reproductive	Yes	41.5 g	Dry	Slight	Clear	-	-
26/07/2017	37	Outcrop	Winter	Afternoon	*Elephantulus myurus*	M	Non scrotal	No	65.5 g	Dry	None	Clear	-	-
26/07/2017	3	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed, scats, bait gone
26/07/2017	8	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed
26/07/2017	12	Grassland	Winter	Morning	-	-	-	-	-	Dry	None	Clear	-	Closed, scats, bait gone
26/07/2017	18	Grassland	Winter	Morning	-	-	-	-	-	Dry	Slight	Clear	-	Closed
26/07/2017	3	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
26/07/2017	8	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed
26/07/2017	12	Grassland	Winter	Afternoon	-	-	-	-	-	Dry	Slight	Clear	-	Closed

Table C4: Raw data for terrestrial arthropods collected from pitfall traps from all three sites (Grasslands, Outcrop and Grassland) at Telperion Nature Reserve.

Trap	Date	Site	Season	Weight (g)
A1 D1	13/10/2016	River	Spring	0.01
A1 D2	13/10/2017	River	Spring	0.01
A1 N1	13/10/2018	River	Spring	0.27
A1 N2	13/10/2016	River	Spring	0.29
A2 D1	13/10/2016	River	Spring	0.10
A2 D2	13/10/2016	River	Spring	0.05
A2 N1	13/10/2016	River	Spring	0.09
A2 N2	13/10/2016	River	Spring	0.01
A3 D1	13/10/2016	River	Spring	0.09
A3 D2	13/10/2016	River	Spring	0.07
A3 N1	13/10/2016	River	Spring	0.01
A3 N2	13/10/2016	River	Spring	0.05
A4 D1	13/10/2016	River	Spring	0.01
A4 D2	13/10/2016	River	Spring	0.01
A4 N1	13/10/2016	River	Spring	0.06
A4 N2	13/10/2016	River	Spring	0.06
A5 D1	13/10/2016	Grassland	Spring	0.10
A5 D2	13/10/2016	Grassland	Spring	0.01
A5 N1	13/10/2016	Grassland	Spring	0.01
A5 N2	13/10/2016	Grassland	Spring	0.01
A6 D1	13/10/2016	Grassland	Spring	0.01
A6 D2	13/10/2016	Grassland	Spring	0.08
A6 N1	13/10/2016	Grassland	Spring	0.05
A6 N2	13/10/2016	Grassland	Spring	0.06
A7 D1	13/10/2016	Grassland	Spring	0.14
A7 D2	13/10/2016	Grassland	Spring	0.10
A7 N1	13/10/2016	Grassland	Spring	0.01
A7 N2	13/10/2016	Grassland	Spring	0.07
A8 D1	13/10/2016	Grassland	Spring	0.01
A8 D2	13/10/2016	Grassland	Spring	0.05
A8 N1	13/10/2016	Grassland	Spring	0.01
A8 N2	13/10/2016	Grassland	Spring	0.01
A9 D1	13/10/2016	Outcrop	Spring	0.01
A9 D2	13/10/2016	Outcrop	Spring	0.09
A9 N1	13/10/2016	Outcrop	Spring	0.01
A9 N2	13/10/2016	Outcrop	Spring	0.08
A10 D1	13/10/2016	Outcrop	Spring	0.01
A10 D2	13/10/2016	Outcrop	Spring	0.01
A10 N1	13/10/2016	Outcrop	Spring	0.01
A10 N2	13/10/2016	Outcrop	Spring	0.01
A11 D1	13/10/2016	Outcrop	Spring	0.17
A11 D2	13/10/2016	Outcrop	Spring	0.01

Table C4: Continued.

Trap	Date	Site	Season	Weight (g)
A11 N1	13/10/2016	Outcrop	Spring	0.01
A11 N2	13/10/2016	Outcrop	Spring	0.01
A12 D1	13/10/2016	Outcrop	Spring	0.01
A12 D2	13/10/2016	Outcrop	Spring	0.01
A12 N1	13/10/2016	Outcrop	Spring	0.01
A12 N2	13/10/2016	Outcrop	Spring	0.01
A1 D1	21/01/2017	River	Summer	0.07
A1 D2	21/01/2017	River	Summer	0.01
A1 N1	21/01/2017	River	Summer	0.01
A1 N2	21/01/2017	River	Summer	0.01
A2 D1	21/01/2017	River	Summer	0.11
A2 D2	21/01/2017	River	Summer	0.01
A2 N1	21/01/2017	River	Summer	0.01
A2 N2	21/01/2017	River	Summer	0.01
A3 D1	21/01/2017	River	Summer	0.14
A3 D2	21/01/2017	River	Summer	0.31
A3 N1	21/01/2017	River	Summer	0.22
A3 N2	21/01/2017	River	Summer	0.21
A4 D1	21/01/2017	River	Summer	0.01
A4 D2	21/01/2017	River	Summer	0.01
A4 N1	21/01/2017	River	Summer	0.01
A4 N2	21/01/2017	River	Summer	0.13
A5 D1	21/01/2017	Grassland	Summer	0.01
A5 D2	21/01/2017	Grassland	Summer	0.01
A5 N1	21/01/2017	Grassland	Summer	0.01
A5 N2	21/01/2017	Grassland	Summer	0.01
A6 D1	21/01/2017	Grassland	Summer	0.75
A6 D2	21/01/2017	Grassland	Summer	0.01
A6 N1	21/01/2017	Grassland	Summer	0.01
A6 N2	21/01/2017	Grassland	Summer	0.01
A7 D1	21/01/2017	Grassland	Summer	0.10
A7 D2	21/01/2017	Grassland	Summer	0.01
A7 N1	21/01/2017	Grassland	Summer	0.01
A7 N2	21/01/2017	Grassland	Summer	0.01
A8 D1	21/01/2017	Grassland	Summer	0.05
A8 D2	21/01/2017	Grassland	Summer	0.67
A8 N1	21/01/2017	Grassland	Summer	0.01
A8 N2	21/01/2017	Grassland	Summer	0.10
A9 D1	21/01/2017	Outcrop	Summer	0.29
A9 D2	21/01/2017	Outcrop	Summer	0.12
A9 N1	21/01/2017	Outcrop	Summer	0.01
A9 N2	21/01/2017	Outcrop	Summer	0.01
A10 D1	21/01/2017	Outcrop	Summer	0.34

Table C4: Continued.

Trap	Date	Site	Season	Weight (g)
A10 D2	21/01/2017	Outcrop	Summer	0.16
A10 N1	21/01/2017	Outcrop	Summer	0.01
A10 N2	21/01/2017	Outcrop	Summer	0.01
A11 D1	21/01/2017	Outcrop	Summer	0.17
A11 D2	21/01/2017	Outcrop	Summer	0.07
A11 N1	21/01/2017	Outcrop	Summer	0.00
A11 N2	21/01/2017	Outcrop	Summer	0.01
A12 D1	21/01/2017	Outcrop	Summer	0.01
A12 D2	21/01/2017	Outcrop	Summer	0.05
A12 N1	21/01/2017	Outcrop	Summer	0.01
A12 N2	21/01/2017	Outcrop	Summer	0.01
A1 D1	13/04/2017	River	Autumn	0.05
A1 D2	13/04/2017	River	Autumn	0.01
A1 N1	13/04/2017	River	Autumn	0.07
A1 N2	13/04/2017	River	Autumn	0.01
A2 D1	13/04/2017	River	Autumn	0.01
A2 D2	13/04/2017	River	Autumn	0.01
A2 N1	13/04/2017	River	Autumn	0.01
A2 N2	13/04/2017	River	Autumn	2.13
A3 D1	13/04/2017	River	Autumn	0.06
A3 D2	13/04/2017	River	Autumn	0.01
A3 N1	13/04/2017	River	Autumn	0.05
A3 N2	13/04/2017	River	Autumn	0.13
A4 D1	13/04/2017	River	Autumn	0.15
A4 D2	13/04/2017	River	Autumn	0.01
A4 N1	13/04/2017	River	Autumn	0.01
A4 N2	13/04/2017	River	Autumn	0.01
A5 D1	13/04/2017	Grassland	Autumn	0.09
A5 D2	13/04/2017	Grassland	Autumn	0.09
A5 N1	13/04/2017	Grassland	Autumn	0.01
A5 N2	13/04/2017	Grassland	Autumn	0.01
A6 D1	13/04/2017	Grassland	Autumn	0.01
A6 D2	13/04/2017	Grassland	Autumn	0.01
A6 N1	13/04/2017	Grassland	Autumn	0.01
A6 N2	13/04/2017	Grassland	Autumn	0.01
A7 D1	13/04/2017	Grassland	Autumn	0.01
A7 D2	13/04/2017	Grassland	Autumn	0.01
A7 N1	13/04/2017	Grassland	Autumn	0.01
A7 N2	13/04/2017	Grassland	Autumn	0.01
A8 D1	13/04/2017	Grassland	Autumn	0.01
A8 D2	13/04/2017	Grassland	Autumn	0.12
A8 N1	13/04/2017	Grassland	Autumn	0.01
A8 N2	13/04/2017	Grassland	Autumn	0.01

Table C4: Continued.

Trap	Date	Site	Season	Weight (g)
A9 D1	13/04/2017	Outcrop	Autumn	0.01
A9 D2	13/04/2017	Outcrop	Autumn	0.00
A9 N1	13/04/2017	Outcrop	Autumn	0.01
A9 N2	13/04/2017	Outcrop	Autumn	0.00
A10 D1	13/04/2017	Outcrop	Autumn	0.13
A10 D2	13/04/2017	Outcrop	Autumn	0.06
A10 N1	13/04/2017	Outcrop	Autumn	0.01
A10 N2	13/04/2017	Outcrop	Autumn	0.05
A11 D1	13/04/2017	Outcrop	Autumn	0.01
A11 D2	13/04/2017	Outcrop	Autumn	0.12
A11 N1	13/04/2017	Outcrop	Autumn	0.01
A11 N2	13/04/2017	Outcrop	Autumn	0.01
A12 D1	13/04/2017	Outcrop	Autumn	0.10
A12 D2	13/04/2017	Outcrop	Autumn	0.01
A12 N1	13/04/2017	Outcrop	Autumn	0.01
A12 N2	13/04/2017	Outcrop	Autumn	0.00
A1 D1	26/07/2017	River	Winter	0.01
A1 D2	26/07/2017	River	Winter	0.01
A1 N1	26/07/2017	River	Winter	0.01
A1 N2	26/07/2017	River	Winter	0.01
A2 D1	26/07/2017	River	Winter	0.01
A2 D2	26/07/2017	River	Winter	0.01
A2 N1	26/07/2017	River	Winter	0.00
A2 N2	26/07/2017	River	Winter	0.00
A3 D1	26/07/2017	River	Winter	0.01
A3 D2	26/07/2017	River	Winter	0.01
A3 N1	26/07/2017	River	Winter	0.01
A3 N2	26/07/2017	River	Winter	0.01
A4 D1	26/07/2017	River	Winter	0.01
A4 D2	26/07/2017	River	Winter	0.01
A4 N1	26/07/2017	River	Winter	0.00
A4 N2	26/07/2017	River	Winter	0.01
A5 D1	26/07/2017	Grassland	Winter	0.01
A5 D2	26/07/2017	Grassland	Winter	0.07
A5 N1	26/07/2017	Grassland	Winter	0.00
A5 N2	26/07/2017	Grassland	Winter	0.01
A6 D1	26/07/2017	Grassland	Winter	0.01
A6 D2	26/07/2017	Grassland	Winter	0.06
A6 N1	26/07/2017	Grassland	Winter	0.01
A6 N2	26/07/2017	Grassland	Winter	0.01
A7 D1	26/07/2017	Grassland	Winter	0.06
A7 D2	26/07/2017	Grassland	Winter	0.01
A7 N1	26/07/2017	Grassland	Winter	0.01

Table C4: Continued.

Trap	Date	Site	Season	Weight (g)
A7 N2	26/07/2017	Grassland	Winter	0.01
A8 D1	26/07/2017	Grassland	Winter	0.21
A8 D2	26/07/2017	Grassland	Winter	0.01
A8 N1	26/07/2017	Grassland	Winter	0.01
A8 N2	26/07/2017	Grassland	Winter	0.01
A9 D1	26/07/2017	Outcrop	Winter	0.11
A9 D2	26/07/2017	Outcrop	Winter	0.12
A9 N1	26/07/2017	Outcrop	Winter	0.00
A9 N2	26/07/2017	Outcrop	Winter	0.00
A10 D1	26/07/2017	Outcrop	Winter	0.01
A10 D2	26/07/2017	Outcrop	Winter	0.06
A10 N1	26/07/2017	Outcrop	Winter	0.01
A10 N2	26/07/2017	Outcrop	Winter	0.00
A11 D1	26/07/2017	Outcrop	Winter	0.01
A11 D2	26/07/2017	Outcrop	Winter	0.01
A11 N1	26/07/2017	Outcrop	Winter	0.01
A11 N2	26/07/2017	Outcrop	Winter	0.00
A12 D1	26/07/2017	Outcrop	Winter	0.01
A12 D2	26/07/2017	Outcrop	Winter	0.10
A12 N1	26/07/2017	Outcrop	Winter	0.01
A12 N2	26/07/2017	Outcrop	Winter	0.01

Table C5: Percentage volume (PV) of the remains of various food categories identified from the scats of rusty-spotted genet at TNR. Seasonal maxima for dominant food categories are highlighted in grey.

Category	Stats	Spring	Summer	Autumn	Winter	Mean	Year
Mammals	MEAN	23.60	25.49	61.48	81.76	48.08	58.99
	SD	31.21	28.46	35.30	27.10	30.52	38.32
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	83.00	84.00	99.70	100.00	91.68	100.00
Arthropods	MEAN	48.28	46.95	10.30	3.42	27.24	18.32
	SD	39.17	36.32	18.41	10.37	26.07	29.93
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	99.50	99.00	99.00	73.00	92.63	99.50
Birds	MEAN	5.40	4.32	10.18	5.39	6.32	6.65
	SD	17.13	16.37	24.68	17.15	18.83	19.64
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	75.00	91.00	99.50	87.00	88.13	99.50
Reptiles	MEAN	2.08	0.32	2.71	0.68	1.45	1.38
	SD	3.35	0.94	10.94	2.82	4.51	6.45
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	11.00	5.00	79.00	17.00	28.00	79.00
Plant material	MEAN	16.75	4.68	12.54	4.50	9.62	8.24
	SD	29.72	7.61	22.29	5.87	16.37	16.79
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	95.00	33.00	100.00	23.00	62.75	100.00
Seeds/fruit pulp	MEAN	3.90	18.19	1.72	0.06	5.97	4.38
	SD	16.75	32.47	12.39	0.25	15.47	17.73
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	75.00	97.00	96.00	1.50	67.38	97.00
Amphibians	MEAN	0.00	0.05	0.14	0.33	0.13	0.19
	SD	0.00	0.33	0.48	2.93	0.93	1.88
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	0.00	2.00	3.00	26.00	7.75	26.00
Other	MEAN	0.00	0.00	0.93	3.88	1.20	1.85
	SD	0.00	0.00	6.72	15.73	5.61	10.75
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	0.00	0.00	52.00	92.00	36.00	92.00

Table C6: Percentage weight (PW) of the remains of various food categories identified from the scats of rusty-spotted genet at TNR. Seasonal maxima for dominant food categories are highlighted in grey.

Category	Stats	Spring	Summer	Autumn	Winter	Mean	Year
Mammals	MEAN	22.96	21.35	64.37	84.03	48.18	59.95
	SD	34.04	30.81	39.03	29.66	33.38	42.01
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	91.57	93.10	99.73	100.00	96.10	100.00
Arthropods	MEAN	51.15	45.15	8.80	3.72	27.21	17.94
	SD	41.38	40.74	19.86	14.50	29.12	32.22
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	99.41	99.60	91.83	87.92	94.69	99.60
Birds	MEAN	7.92	4.71	11.23	5.58	7.36	7.38
	SD	23.62	17.44	27.20	19.23	21.87	22.12
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	93.22	96.45	99.87	96.95	96.62	99.87
Reptiles	MEAN	1.59	0.06	2.44	0.59	1.17	1.16
	SD	3.52	0.16	11.62	3.11	4.60	6.84
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	14.77	0.74	86.81	19.51	30.46	86.81
Plant material	MEAN	6.69	2.62	10.33	1.84	5.37	5.08
	SD	18.66	5.51	23.28	3.20	12.66	14.89
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	81.25	25.49	100.00	12.92	54.92	100.00
Seeds/fruit pulp	MEAN	9.69	26.09	2.25	0.02	9.51	6.61
	SD	29.74	38.49	13.52	0.11	20.47	22.62
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	98.94	99.64	99.58	0.82	74.75	99.64
Amphibians	MEAN	0.00	0.01	0.05	0.36	0.10	0.16
	SD	0.00	0.06	0.17	3.18	0.85	2.02
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	0.00	0.35	0.86	28.30	7.38	28.30
Other	MEAN	0.00	0.00	0.53	3.87	1.10	1.72
	SD	0.00	0.00	3.06	15.79	4.71	10.28
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	0.00	0.00	22.63	86.94	27.39	86.94

Table C7: Percentage volume (PV) of the remains of various food categories identified from the scats of slender mongoose at TNR. Seasonal maxima for dominant food categories are highlighted in grey.

Category	Stats	Spring	Summer	Autumn	Winter	Mean	Year
Mammals	MEAN	6.37	1.93	7.67	20.11	9.02	9.99
	SD	22.99	5.19	24.63	38.25	22.77	27.64
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	99.00	17.00	94.00	99.00	77.25	99.00
Arthropods	MEAN	73.05	93.80	80.94	62.63	77.61	76.29
	SD	31.80	8.18	28.74	41.84	27.64	32.94
	MIN	1.00	80.00	6.00	0.00	21.75	0.00
	MAX	100.00	100.00	100.00	100.00	100.00	100.00
Birds	MEAN	7.16	0.00	2.81	2.52	3.12	3.14
	SD	20.48	0.00	14.61	12.89	12.00	14.37
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	85.00	0.00	87.50	67.00	59.88	87.50
Reptiles	MEAN	1.05	1.93	0.72	3.81	1.88	1.84
	SD	4.59	5.51	2.67	14.17	6.73	8.19
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	20.00	20.00	14.00	72.00	31.50	72.00
Plant material	MEAN	10.24	2.33	6.96	9.81	7.34	7.68
	SD	18.37	5.04	13.85	20.82	14.52	16.17
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	70.00	16.00	60.00	99.50	61.38	99.50
Seeds/fruit pulp	MEAN	0.00	0.00	0.82	0.48	0.33	0.44
	SD	0.00	0.00	3.47	2.50	1.49	2.49
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	0.00	0.00	18.00	13.00	7.75	18.00
Amphibians	MEAN	2.13	0.00	0.00	0.00	0.53	0.42
	SD	5.08	0.00	0.00	0.00	1.27	2.36
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	20.00	0.00	0.00	0.00	5.00	20.00
Other	MEAN	0.00	0.00	0.08	0.63	0.18	0.21
	SD	0.00	0.00	0.50	2.47	0.74	1.35
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	0.00	0.00	3.00	12.00	3.75	12.00

Table C8: Percentage weight (PW) of the remains of various food categories identified from the scats of slender mongoose at TNR. Seasonal maxima for dominant food categories are highlighted in grey.

Category	Stats	Spring	Summer	Autumn	Winter	Mean	Year
Mammals	MEAN	6.16	2.42	7.72	20.78	9.27	10.23
	SD	22.84	8.59	25.74	39.50	24.17	28.62
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	98.89	33.33	98.86	98.11	82.30	98.89
Arthropods	MEAN	79.29	96.44	84.75	64.01	81.13	79.72
	SD	32.07	8.48	29.81	44.42	28.70	34.41
	MIN	1.11	66.67	1.14	0.00	17.23	0.00
	MAX	100.00	100.00	100.00	100.00	100.00	100.00
Birds	MEAN	6.71	0.00	2.59	1.92	2.80	2.81
	SD	22.20	0.00	14.04	9.31	11.39	13.86
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	96.10	0.00	84.21	48.39	57.18	96.10
Reptiles	MEAN	0.22	0.49	0.21	4.34	1.31	1.40
	SD	0.96	1.33	0.78	18.67	5.43	9.92
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	4.17	4.55	4.00	96.36	27.27	96.36
Plant material	MEAN	6.77	0.65	3.76	6.85	4.51	4.73
	SD	15.38	1.39	11.67	19.14	11.89	14.09
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	64.71	4.35	58.62	95.00	55.67	95.00
Seeds/fruit pulp	MEAN	0.00	0.00	0.89	1.67	0.64	0.80
	SD	0.00	0.00	3.93	8.69	3.16	5.15
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	0.00	0.00	22.86	45.16	17.00	45.16
Amphibians	MEAN	0.85	0.00	0.00	0.00	0.21	0.17
	SD	1.60	0.00	0.00	0.00	0.40	0.77
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	4.76	0.00	0.00	0.00	1.19	4.76
Other	MEAN	0.00	0.00	0.08	0.43	0.13	0.15
	SD	0.00	0.00	0.46	1.91	0.59	1.05
	MIN	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	0.00	0.00	2.78	9.84	3.15	9.84