

SPATIO-TEMPORAL ECOLOGY OF THE RUSTY-SPOTTED GENET, *GENETTA MACULATA*, IN
TELPERION NATURE RESERVE (MPUMALANGA, SOUTH AFRICA)

by

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Declaration

I declare that SPATIO-TEMPORAL ECOLOGY OF THE RUSTY-SPOTTED GENET, *GENETTA MACULATA*, IN TELPERION NATURE RESERVE (MPUMALANGA, SOUTH AFRICA) is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I have not previously submitted this work, or part of it, for examination at UNISA for another qualification or at any other higher education institution.

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Summary

Very little is known about the spatio-temporal ecology of the rusty-spotted genet, *Genetta maculata*. With this study I aimed to describe the activity patterns, resting site use and spatial ecology of *G. maculata* in Telperion Nature Reserve. I particularly looked at the activity profile and the activity period. I wanted to determine the spatial distribution of resting sites, the number of sites used per individual as well as the index of resting site reuse. I also calculated the distance between resting sites on consecutive days and tested for differences between sexes and seasons. I determined the size of home ranges, as well as that of core areas and compared space use between sexes and seasons as well as vegetation types.

A total of six males and nine females were trapped, radio-collared and tracked during continuous night and daytime sessions between September 2015 and August 2016. Rusty-spotted genets were primarily nocturnal (nocturnality index: 0.84) and therefore made use of the darkness for cover when hunting. Overall, male effective activity duration (586 ± 172 min) was greater than for females (564 ± 175 min) possibly because they search for females to mate with as well as due to their larger body size. Seasonal changes in activity were evident – specifically in winter – and were probably a function of both food availability and temperature.

Areas with a denser vegetation structure seemed to be more suitable for rusty-spotted genet resting sites. Neither the number of resting sites nor the reuse rate of these resting sites differed between sexes or seasons. The inter-resting site distance on consecutive days was higher for males (938 ± 848 m) than females (707 ± 661 m). This was possibly caused by males travelling larger distances when searching for females to mate with. The inter-resting site distance was higher during autumn, likely due to the decrease in food availability, which made it necessary for genets to increase their hunting efforts. However, a similar increase in hunting effort was not evident during winter as genets decreased their overall activity, possibly in order to avoid colder temperatures.

No sexual or seasonal differences in home range size were found. This was attributed to a well-spread and consistent availability of food sources. Core areas only covered on

average 7% of the total individual home range which further supports the hypothesis that food was readily available. Both intra- and intersexual home range overlaps were recorded. This was not unusual for carnivores and due to a combination of reproductive and social actions. Home ranges mainly included bushveld vegetation (78%) rather than grassland as these areas provided better cover and likely more abundant food sources.

As this was the first exhaustive study of its kind on this species over a full annual cycle, the information gathered is important for the development of conservation strategies for this species, but also for other *Genetta* species in the rest of Africa.

Keywords

Central African large-spotted genet, Viverridae, activity patterns, activity profile, resting sites, inter-resting site distance, home range, kernel method, small carnivores, nocturnal animals, behaviour.

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Chapter 1

Introduction

1.1 Objectives and predictions

With this study I aimed to describe the activity patterns, resting site use and spatial ecology of the rusty-spotted genet, *Genetta maculata*. As this was the first exhaustive study of its kind on this species over a full annual cycle, the information gathered is important for the development of conservation strategies for the species (Gittleman *et al.*, 2001).

I particularly looked at the activity profile, the activity period and resting bouts of the species. This information describes the ecological role of the animals which allows us as conservationists to depict the importance of the species (Gittleman *et al.*, 2001). I expected the activity period of males to be longer than that of females, due to their larger body size. Differences should be even more pronounced during the mating seasons because males spend more time looking for females to mate with. I also expected the activity period to be spread over the whole night during summer as night length is shorter. The photoperiod was expected to influence the length of the activity period, through an inverse relationship. Resting bouts should be longer during winter due to the longer nights and colder temperatures.

My main objectives regarding the resting site use of the rusty-spotted genet were to determine the spatial distribution of resting sites, the number of sites used per individual as well as the index of resting site reuse. I also calculated the distance between resting sites on consecutive days and tested for differences between sexes and seasons. The importance of this information lies in being able to predict resting site locations (Camps, 2011). This allows us to manage habitats in which the species can survive (Camps, 2011). I expected resting sites of males to be situated along the border of their home ranges as they are territorial. This was found for other carnivore species (Doncaster & Woodroffe, 1993; Palomares & Delibes, 1993). Males should also use more resting sites than females while the resting site re-use rate of females should be higher. These expected differences are attributed to the males actively looking for females, while females have to look after

young and cannot move around that much (Carvalho *et al.*, 2015). These expected differences should however only be during the mating season for males and the rearing period for females (Carvalho *et al.*, 2015).

With regard to spatial ecology, my objectives were to determine the size of home ranges of the rusty-spotted genet in Telperion Nature Reserve, as well as that of core areas and to compare space use between sexes and seasons. Such information on the habitat use of the species is important for the correct management of the species (Gittleman *et al.*, 2001). Home range size was expected to be larger for males due to their higher activity levels (Sandell, 1989; Camps Munuera & Llimona Llobet, 2004; Zschille *et al.*, 2010). Home range size should also be larger during winter when food is less available (Sandell, 1989; Camps Munuera & Llimona Llobet, 2004; Zschille *et al.*, 2010). I also looked at the spatial overlap between individuals of the same and different sexes and considered the selection of specific vegetation types within a home range. Telperion Nature Reserve consists of two major vegetation types, Rand Highveld Grassland and Loskop Mountain Bushveld (Mucina & Rutherford, 2006) and I expected the rusty-spotted genet to prefer the latter as it provides better cover (Camps & Alldredge, 2013; Palomares & Delibes, 1991b; Virgós & Casanovas, 1997; Larivière & Calzada, 2001; Virgós, 2001; Santos-Reis *et al.*, 2004; Zuberogoitia & Zabala, 2004; Calzada, 2007; Espírito-Santo *et al.*, 2007; Sarmiento *et al.*, 2009). Furthermore, I calculated the daily movement distance and travel speed, which I compared between sexes and seasons. Males should have a larger movement distance and higher travel speed as they are more active (Camps, 2008). Movement distance should be larger during winter as nights are longer which leaves more time for travel. I did not expect to observe a difference in travel speed between the seasons.

1.2 Description

Genets are cat-like (Roberts, 2006), which can be noted in the sounds (mewing, growling, hissing and purring) that they make (Wemmer, 1977), as well as the fact that they possess retractable claws (Roberts, 2006). They have a body length of 85–110 cm, weigh 1.5–3.2 kg (Stuart & Stuart, 2008) and have a 40–50 cm long tail (Roberts, 2006). The colours of genets are especially adapted for night-living (Roberts, 2006). Their tail has alternating white/grey and black rings and their pelage are grey with black to rusty-red

spots (Roberts, 2006; Stuart & Stuart, 2008). The rusty-spotted genet can be positively identified by a combination of its light grey hind legs and black tail-tip.

Genets have terrestrial and arboreal characteristics and are thus comfortable on the ground but also while climbing trees (Taylor, 1976; Kingdon, 1977; Wemmer, 1977; Taylor, 1989; Delibes & Gaubert, 2013).

1.3 Taxonomy and status

The rusty-spotted genet (or Central African large-spotted genet), is a member of the Viverridae family (Carnivora) and is endemic to Africa. The family is poorly studied in Africa, and the genus *Genetta* even more so (Kingdon *et al.*, 2013). The rusty-spotted genet is one of three *Genetta* species occurring in South Africa (Stuart & Stuart, 2008). The other two are the Cape genet (*G. tigrina*) and the common or small-spotted genet (*G. genetta*).

The rusty-spotted genet has a status of Least Concern on the IUCN Red List due to its wide distribution (Angelici *et al.*, 2016; Roux *et al.*, 2017) (see Appendix 7). This species is however often hunted by poultry farmers as they tend to kill and eat chickens (Stuart & Stuart, 2008). They are also a common victim of the bushmeat trade (Angelici *et al.*, 2016; Roux *et al.*, 2017) (see Appendix 7).

To manage the species adequately, information on its habitat use is needed (Gittleman *et al.*, 2001). Such information also describes the ecological role of the animals and can thus be used in the development of conservation strategies for the species (Gittleman *et al.*, 2001).

1.4 Ecology and distribution

The rusty-spotted genet is common all over central Africa and its expected range extends downwards from Mozambique and Botswana into the Gauteng and Mpumalanga provinces of South Africa (Stuart & Stuart, 2008; Figure 1). In contrast, the Cape genet occurs mainly in the Western Cape Province of South Africa up towards the Kwazulu-Natal Province and is endemic to the country (Crawford-Cabral & Pachecho, 1992; Stuart & Stuart, 2008). The common genet is widespread throughout South Africa (Gaubert *et al.*, 2005; Stuart & Stuart, 2008).

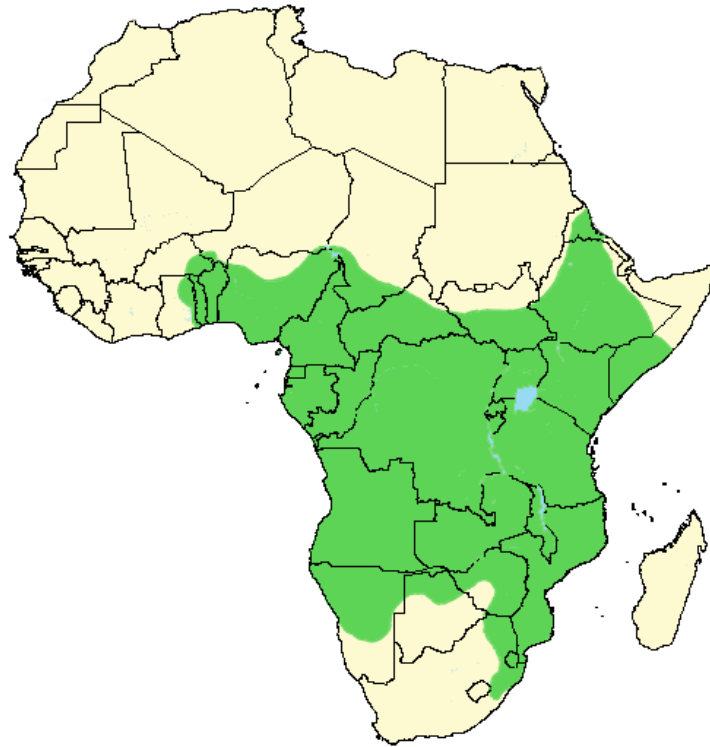


Figure 1: Distribution map of the rusty-spotted genet (Rosenlund, 2015).

Genets (*Genetta* spp.) prefer areas with a high vegetative diversity (Espírito-Santo *et al.*, 2007; Galantinho & Mira, 2009; Carvalho *et al.*, 2011) and do not occur in very cold climates (Virgós *et al.*, 2001). Denser bushes provide better cover and safer resting sites as well as a habitat for their main food source – rodents and insects – and genets normally prefer such areas (Delibes, 1974; 1977; Palomares & Delibes 1988; Hamdine *et al.*, 1993; Palomares & Delibes, 1994; Clevenger, 1996; Zuberogoitia *et al.*, 2002; Skinner & Chimimba, 2005). Preferred areas for genets often include riverine vegetation which is generally very thick (Palomares & Delibes, 1994; Virgós & Casanovas, 1997; Larivière & Calzada, 2001; Virgós *et al.*, 2001; Zuberogoitia *et al.*, 2002; Santos-Reis *et al.*, 2004; Matos *et al.*, 2009; Camps, 2011;). On the other hand, it was found that bush-encroachment leads to a decrease in the abundance of rodents and insects such as beetles and grasshoppers, which are important food items for genets (Seymour & Dean, 1999). A range of factors therefore influences the distribution of genet species (Blaum *et al.*, 2007), including shelter that the animals use to rest in.

Genet species use specific resting sites when they are not active. Common genets use their resting sites on average for 72% of the 24-h daily period (Palomares & Delibes,

1994; Camps, 2011). All genet species use resting sites, not only to rest in, but also for the rearing of young (Livet & Roeder, 1987, Palomares & Delibes, 1994), as well as for protection against predators and fluctuating environmental conditions such as temperature, rain and wind (Camps, 2011). Individuals are not specific to one resting site but have several which are reused (Camps, 2011) possibly to reduce the risks of a parasite outbreak as suggested for several animal species (McCord & Cardoza, 1982; Palomares & Delibes, 1993; Butler & Roper, 1996; Zalewski, 1997b). The availability of resting sites is thus important and it can determine the presence or absence of a specific species in an area (Reichman & Smith 1990; Palomares & Delibes, 1994; Beja, 1996; Haliwell & Macdonald, 1996; Fernández & Palomares, 2000; Carvalho *et al.*, 2015). Camps (2011) described the resting sites of common genets as the most sensitive areas of their habitat. It is thus also an important aspect of conservation strategies (Reichman & Smith 1990; Beja, 1996; Haliwell & Macdonald, 1996; Fernández & Palomares, 2000; Carvalho *et al.*, 2015).

Despite the importance of resting sites for conservation, little information is available on the resting site ecology of rusty-spotted genets, but the common genet in Europe is fond of tree hollows during the cold or wet season (Carvalho *et al.*, 2014). Besides tree hollows, they also make use of dense thickets, branches, boulders and even man-made structures as resting sites and thus include such areas in their home ranges (Livet & Roeder, 1987; Palomares & Delibes, 1988; Palomares & Delibes 1994; Zuberogoitia *et al.*, 2002; López-Martín, 2003). Palomares and Delibes (1994) also found that the selection of resting sites by common genets mainly depends on the availability of dense bushes for shelter.

The spatial distribution of resting sites, as well as the distance between resting sites on consecutive days, can depend on a number of factors, including foraging success and social behaviour, as well as reproduction success and thus the population size of small carnivores (Banks *et al.*, 2011; Weir *et al.*, 2012; Carvalho *et al.*, 2014). Male pine martens, *Martes martes*, selected resting sites close to the home ranges of females during the mating season (Zalewski, 1997b). During the rest of the year, the distance between their resting sites on consecutive days was further for animals with a larger body mass (Zalewski, 1997b). Small territorial carnivores might also position their resting

sites along the border of their home range (Doncaster & Woodroffe, 1993; Palomares & Delibes, 1993). For common genets it was found that resting sites might be shared where home ranges overlap, although two individuals will very rarely use the same site simultaneously (Carvalho *et al.*, 2014). Also for common genets, the number of resting sites used are likely to increase with an increase in home range size (Camps, 2011).

Home range sizes for genet species have been reported to range from 0.20 km² up to 10.16 km² (Palomares & Delibes, 1988; Powell, 2000; Zuberogitia *et al.*, 2002). The home ranges of male and female genets do occasionally overlap (Palomares & Delibes, 1994; Camps Munuera & Llimona Llobet, 2004; Fuller *et al.*, 1990). It is however not expected as these animals are solitary (Sandell, 1989). The home ranges of male genets are often larger than that of females because males have to search for females to mate with (Erlinge & Sandell, 1986; Sandell, 1989; Genovesi *et al.*, 1997; Johnson *et al.*, 2000; Camps Munuera & Llimona Llobet, 2004; Manfredi *et al.*, 2011). Males also have a higher energy requirement because of their larger body size and thus require a larger home range to fulfil their metabolic needs (McNab, 1963; Gittleman & Harvey, 1982; Palomares & Delibes, 1994; Avenant & Nel, 1998). In addition, during the breeding season females need to remain close to their den as they need to return regularly to feed their young (Humphries & Boutin, 1996).

Home range size is therefore elastic and the location of the home ranges may even shift depending on food availability (McNab, 1963; Harestad & Bunnell, 1979; Lindstedt *et al.*, 1986; Geffen *et al.*, 1992; Palomares & Delibes, 1994; Jędrzejewski *et al.*, 1995; Ferguson *et al.*, 1999; Colón, 2002). Although most studies investigating the spatial ecology of genets were conducted in Europe (Palomares & Delibes, 1994; Virgós & Casanovas, 1997; Virgós *et al.*, 2001; Camps Munuera & Llimona Llobet, 2004; Galantinho & Mira, 2009), changes in home range size and location may be expected on a seasonal basis also for the rusty-spotted genet in South Africa.

1.5 Behaviour

Although the activity patterns of common genets have been well-studied in Europe (Palomares & Delibes, 1988; 1994; Camps, 2008), very little is known about the activity of southern African genets, especially the rusty-spotted genet. Activity patterns are often

shaped through years of adaptation but can also be influenced by other factors such as climate, competition and the presence of predators (Monterroso *et al.*, 2013).

All genet species are solitary (Gaubert *et al.*, 2008), but home ranges might occasionally overlap (Ikeda *et al.*, 1983) and even if they do have resting sites close together, they will still forage alone (Fuller *et al.*, 1990). Despite being solitary, interaction between individuals includes grooming and using the same latrine sites (Roberts, 2006; Stuart & Stuart, 2008).

Genet species are nocturnal or at least crepuscular (Palomares & Delibes, 1994; Santos-Reis *et al.*, 2004; Skinner & Chimimba, 2005; Camps, 2008; Stuart & Stuart, 2008), but some younger females are active during daylight (Ikeda *et al.*, 1982; Palomares & Delibes, 1988; Fuller *et al.*, 1990; Maddock & Perrin, 1993), with genets potentially becoming more nocturnal as they grow older (Palomares & Delibes, 1988). Vegetation cover can also have an influence on their time of activity as a thicker cover will provide better protection against predators, which would make it less necessary to use the darkness of night for cover (Palomares & Delibes, 1988). Kingdon (1977) suggested that the rusty-spotted genet might be more active during the day in the rainy season. Camps (2008) found that diurnal activity in common genets is only observed during the early mornings and late afternoons of the summer months. He suggested that this is merely to make up for the fact that the total hours of darkness are less during summer, especially in southwestern Europe (Camps, 2008).

The activity period of an animal can be described as the time between its first emergence from its resting site until its final return to a resting site (Mbatyoti, 2012). Between these two events the animal can take a number of short resting bouts. The daily photoperiod has an influence on the length of the activity period of most nocturnal animals (Kowalczyk *et al.*, 2003; Camps, 2008). Depending on where the animal lives, the activities of humans can also play a role (Gese *et al.*, 1989; Phelan & Sliwa, 2006). As in pine martens (Zalewski, 2001), the general activity of genets may also be influenced by individual characteristics such as sex, mass and the species' biological cycle (Camps, 2008). Furthermore, as seen in other small carnivores, the activity patterns of the predators and competitors of genets such as slender mongoose, *Galerella sanguinea*,

(Monterroso *et al.*, 2013; Bischof *et al.*, 2014), as well as other social interactions between individuals such as mating behaviour (Mbatyoti, 2012) may also influence their activity. Environmental conditions such as temperature and other weather conditions could alter activity patterns of small mammals if animals need to thermoregulate (Chappell, 1980; Geffen & Macdonald, 1993; Beltrán & Delibes, 1994; Zalewski, 2000; Zalewski, 2001; Kolbe & Squires, 2007; Manfredi *et al.*, 2011). Male mammals generally have a longer activity period than females due to their larger body size and home range that needs to be maintained (Peters, 1983; Bunnell & Harestad, 1990; Camps Munuera & Llimona Llobet, 2004; Camps, 2008). One of the most important factors influencing the activity patterns of small carnivores such as genets, is however thought to be food availability (Zielinski *et al.*, 1983; Ferguson *et al.*, 1988; Geffen & Macdonald, 1993; Kolbe & Squires, 2007; Mbatyoti, 2012) through the activity patterns of their rodent prey (Curio, 1976).

Being generalists, genet species tend to eat whatever is seasonally available (Palomares & Delibes, 1991a; Virgós *et al.*, 1999; Rosalino & Santos-Reis, 2002; Amroun *et al.*, 2006; Melero *et al.*, 2008; Amroun *et al.*, 2014). However, rodents, which they ambush (Roberts, 2006) seem to be the main food source, with insects being second to that (Carvalho & Gomes, 2001; Palomares & Delibes, 1991a; Stuart & Stuart, 2008). Genet species also feed on wild fruits and seeds, fish, reptiles and even garbage where it is available (Rosalino & Santos-Reis, 2002; Roberts *et al.*, 2007; Melero *et al.*, 2008; Stuart & Stuart, 2008). Seasonal variations in diet occur and depends on the availability of different food sources during the different seasons (Delibes *et al.*, 1989; Virgós *et al.*, 1996; Rosalino & Santos-Reis, 2002; Sánchez *et al.*, 2008; Amroun *et al.*, 2014).

1.6 Dissertation outline

Chapter 1 describes the objectives of the study. It also gives an introduction to the biology and ecology of the rusty-spotted genet.

Chapter 2 describes the study site, its climate, vegetation and other animals present.

Chapter 3 is a description of the materials and methods used to complete this project.

Chapter 4 describes the results found in this study.

Chapter 5 provides the discussion of all the results given in Chapter 4.

Chapter 6 provides the general conclusion of the dissertation.

A list of the references used in this dissertation as well as appendices follow on Chapter 6.

Chapter 2

Study site

2.1 Telperion Nature Reserve

Telperion Nature Reserve is situated along the border of the Gauteng and Mpumalanga provinces, in South Africa (Figure 2). It is 7 349.71 ha in size and was developed with the aim to promote biodiversity conservation. The reserve serves as a research site for various universities.

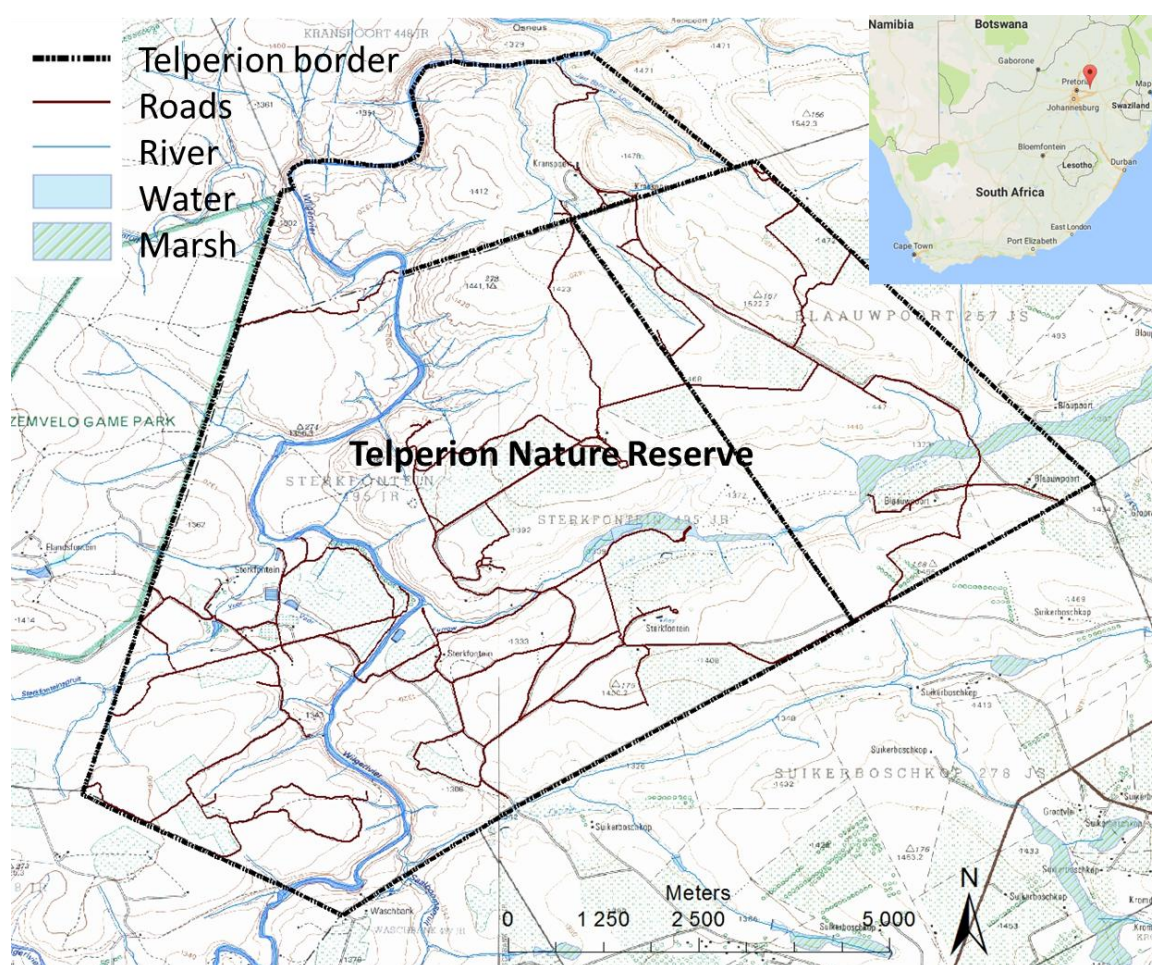


Figure 2: Telperion Nature Reserve is located in the Mpumalanga Province, South Africa (the red pointer on the inset-map shows the location in South Africa).

The reserve is holistically run indicating that all management actions and decisions are made to keep the reserve in the most natural state possible. No culling or game capturing are practiced as it is believed that 'a balance will be achieved' when 'nature takes its course' (E. Bosch, pers. comm. 2015). The reserve has increased in size over the past 40

years as different farms were bought and incorporated into the reserve. Some areas are thus in pristine condition while others were fairly recently still used as farmland.

2.2 Climate

The area is a strictly summer-rainfall area with extremely dry winters (Mucina & Rutherford, 2006; Figure 3). Temperatures are mildly warm although frost occasionally occurs on winter nights (Mucina & Rutherford, 2006; Figure 3). Figure 4 shows the climate of Telperion Nature Reserve specifically for my study period.

For the purpose of the study, spring is defined as the period from 1 September until 30 November, summer is from 1 December until 29 February, autumn is from 1 March until 31 May and winter is from 1 June until 31 August. The times of sunrise and sunset were downloaded from a local weather station in Emalahleni (Redwoods, 2016).

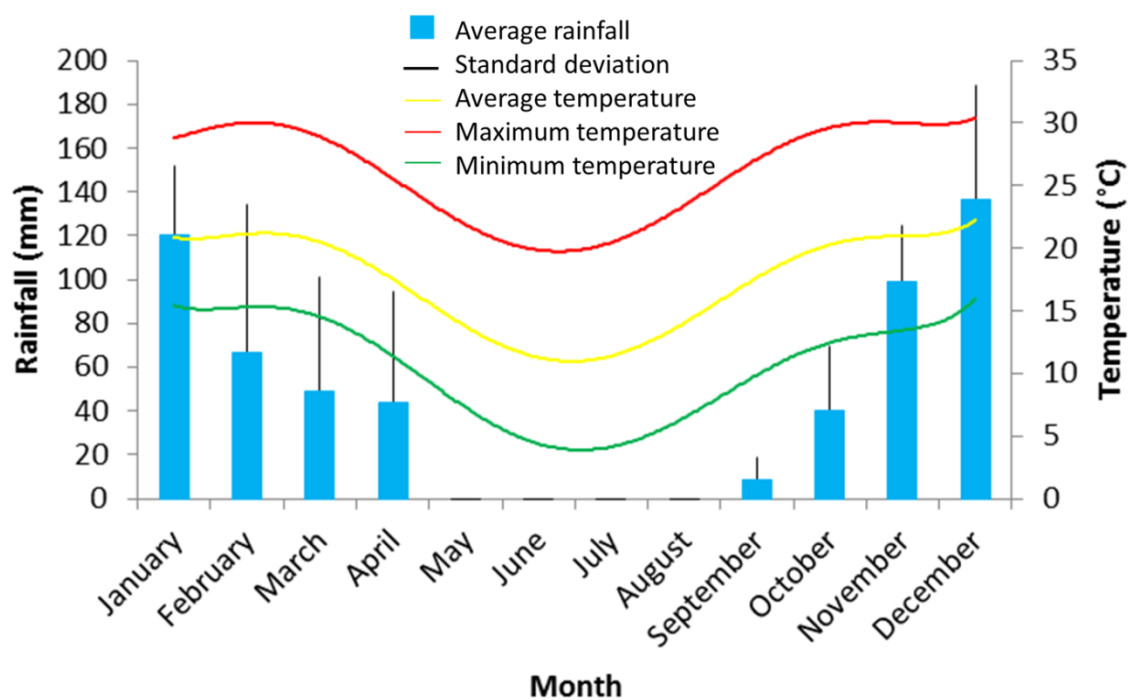


Figure 3: Long-term climatogram for Telperion Nature Reserve.

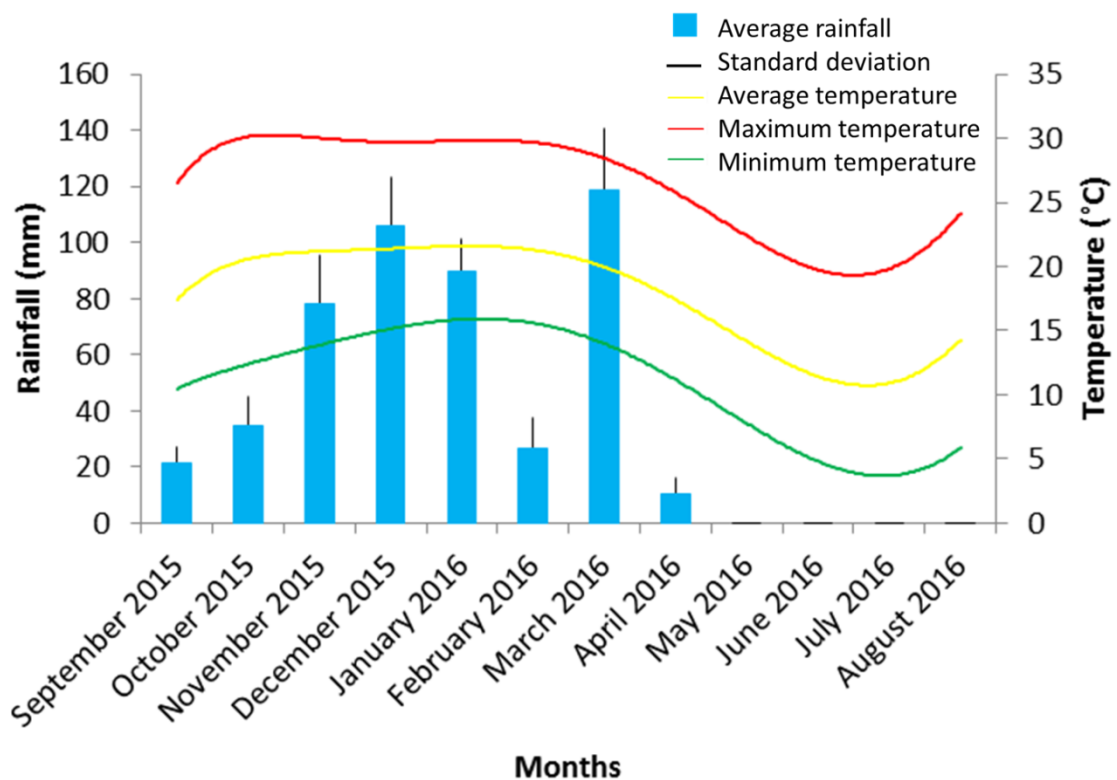


Figure 4: Climatogram for Telperion Nature Reserve during the study period (September 2015–August 2016).

2.3 Vegetation and geology

The vegetation types in Telperion Nature Reserve are the Rand Highveld Grasslands with Loskop Mountain Bushveld occurring on the mountain ridges (Mucina & Rutherford, 2006). The grasslands consist mainly of *Themeda triandra*, *Elionurus muticus* and *Diheteropogon amplexans* while the main trees on mountain ridges are *Burkea africana* and *Protea caffra* (Mucina & Rutherford, 2006).

The Wilge River flows for approximately 15 km through the reserve and Red sandstone from the Transvaal Supergroup is the main soil type (Mucina & Rutherford, 2006). The reserve is situated between 1 278 m and 1 500 m above sea level.

2.4 Other animals present

Predators of genets in Telperion Nature Reserve include leopard (*Panthera pardus*), black-backed jackal (*Canis mesomelas*), brown hyena (*Hyaena brunnea*) and caracal (*Caracal caracal*) as well as large birds of prey such as Wahlberg's eagle (*Aquila*

wahlbergi) as well as Verreaux's eagle (*Aquila verreauxii*). Other animals using similar niches as genets include the yellow (*Cynictis penicillata*), slender (*Galerella sanguinea*) and water mongoose (*Atilax paludinosus*), as well as meerkats (*Suricata suricatta*), although these animals are mainly diurnal.

Apart from these, the reserve also houses a large variety of herbivores including giraffe (*Giraffa camelopardalis*), blesbok (*Damaliscus pygargus phillipsi*), blue (*Connochaetes taurinus*) and black wildebeest (*Connochaetes gnou*), waterbuck (*Kobus ellipsiprymnus*), eland (*Tragelaphus oryx*), gemsbok (*Oryx gazella*), kudu (*Tragelaphus strepsiceros*), red hartebeest (*Alcelaphus buselaphus*), impala (*Aepyceros melampus*), springbok (*Antidorcas marsupialis*), plains zebra (*Equus quagga*), as well as warthog (*Phacochoerus africanus*) and bushpig (*Potamochoerus larvatus*). Baboons (*Papio ursinus*) are also a common sight. Furthermore the insect and specifically bird diversity are significant due to the variety of habitats available on the reserve.

Chapter 3

Materials and methods

General methods

Rusty-spotted genets were live-trapped in cage traps of $80 \times 29 \times 33$ cm in size (Model AHATSD, Animal Handling Support Systems, Johannesburg, South Africa). Traps were placed in areas with dense vegetation cover, where genets were more likely to be caught. They were camouflaged using the surrounding vegetation and baited with pieces of cow liver. The traps were set late afternoon and checked and open-locked early morning. Cages with captured genets were covered with a blanket to keep the animals calm and were then moved to a secure room in the research house within Telperion Nature Reserve. Here they were immobilized by a veterinarian using a mixture of ketamine hydrochloride (*ca.* 22 mg/kg) and medetomidine (*ca.* 0.05 mg/kg; Lion Bridge, Pretoria, South Africa). After anaesthesia each genet was weighed in a cotton bag using a hanging scale. In order to avoid inter-observer measurement bias, body dimensions were consistently taken by the same person. These included the head and body length (from the tip of the nose to the base of the tail) as well as the tail length (Rodriguez-Refojos *et al.*, 2011; Figure 5). A complete list of measurements taken can be found in Table 2.

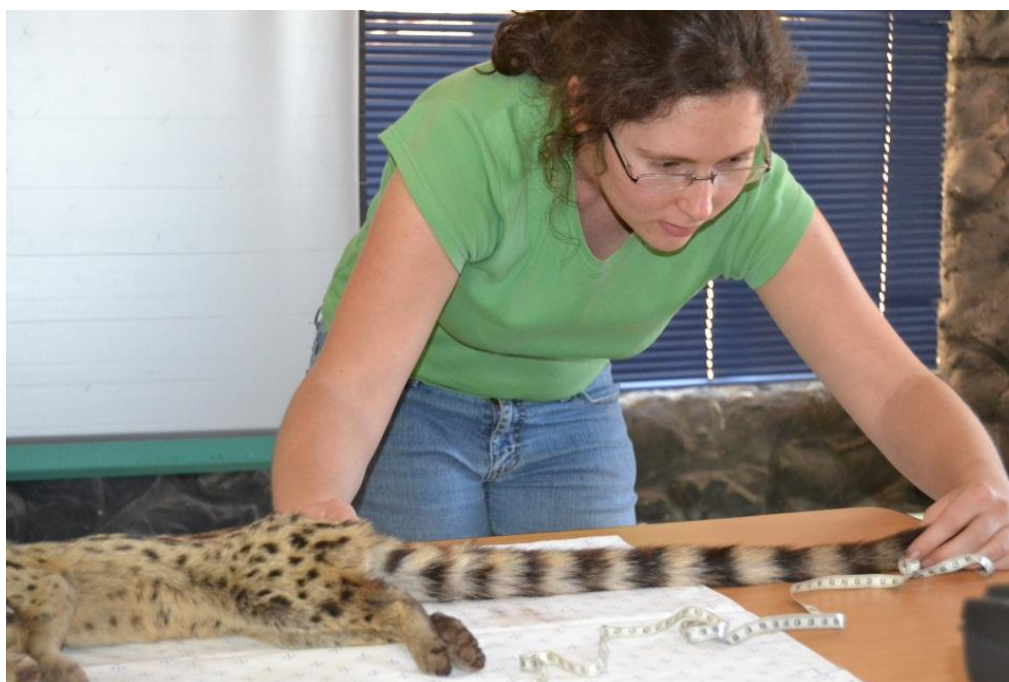


Figure 5: The author taking body measurements on an immobilized rusty-spotted genet in Telperion Nature Reserve.

The sex of each genet was determined and noted. Photos were taken of all trapped individuals to assist with identification and condition assessment during potential recaptures. Nine male and six female genets were fitted with motion-sensor radio-collars (Model M1940B, Advanced Telemetry Systems, USA) weighing 38 g, i.e. about 2–2.5% of the body mass (1.5–2 kg) of an adult genet. Study animals fitted with radio-collars were kept under supervision in the cage trap until the anaesthetic had been completely metabolised, and were thereafter released at their respective capture sites. Genets were tracked using a 3-element Yagi-antenna and, with biangulation, the location were drawn on a field map (see Appendix 3). To do this, two bearings were taken within a 5-min time period. To reduce locational error, I ensured that the angle between the bearing directions were as near as possible to 90°. I attempted to get as near as any road would allow me to the animal leaving a distance of at least 100 metres to spare so as not to interfere with the behaviour of the tracked animal. The locations were later transferred to ArcGIS for analysis.

Environmental variables were recorded every 30 minutes. These included the soil conditions (dry, humid, wet or sodden), wind conditions (no, light, medium, strong or very strong), weather conditions (% cloud cover, mist, light, medium or heavy rain) as well as the temperature. Soil was classified as dry when no particles stayed stuck together; humid when it felt cold; wet when water can be squeezed out; and sodden when it is clearly saturated with water (E. Do Linh San, pers. comm. 2015). Wind was classified as no wind when no plants moved; light when grass could be seen moving, but nothing was felt; medium when it could be felt; strong when it became difficult to control hats and paper sheets; and very strong when old trees were in danger of being uprooted (E. Do Linh San, pers. comm. 2015).

All manipulations were done following the approval of the CAES Animal Research Ethics Review Committee from UNISA with reference number: 2015/CAES/069.

3.1 Trapping success

The total trapping success was calculated as the total number of animals captured divided by the total number of trapping nights. Genet trapping success was then calculated as the total number of genets trapped divided by the total number of trapping

nights. Traps were set in three different habitat types. These include woodland, rocky outcrops and riverine vegetation. Traps were not set in grassland areas as genets generally avoid these areas (Palomares & Delibes, 1994; Zuberogitia *et al.*, 2002; Blaum *et al.*, 2007; Sarmiento *et al.*, 2009; Galantinho & Mira, 2009; Camps & Alldredge, 2013). The success rate of individual traps (number of genet captures divided by the number of nights deployed) were compared between these three habitat types using a Kruskal-Wallis test (Kruskal & Wallis, 1952). The success rate of individual traps was also correlated with height above sea-level (recorded whenever a trap was set) using a Spearman's rank-order correlation. This correlation was done as an additional component to the habitat types as woody areas are often found on ridges while grasslands are generally located in the lowland areas of Telperion Nature Reserve.

3.2 Morphometrics

The percentage sexual dimorphism based on the mass of the animals was calculated with the following formula: $[(mass\ of\ males \div mass\ of\ females) - 1] \times 100$ (E. Do Linh San, pers. comm. 2017). All morphometric data were tested for differences between males and females using Mann-Whitney U tests (Mann & Whitney, 1947). The approximate age for all the animals were determined by looking at a combination of tooth wear, size and mass of the animals. The age (in years) was then correlated with the morphometric data using Spearman's rank-order correlations.

3.3 Activity patterns

Activity patterns were determined based on both continuous night time (three to seven nights per individual per season) and daytime (one day per individual per season) monitoring sessions. During such nights (and days), a genet was located before sunset (or sunrise) and tracked until after sunrise (or sunset). While tracking them it could be determined whether the animal was active or not with the number of pulsations per minute, which were higher during activity than during resting periods. The signal was listened to continuously and activity was then classified into 5-minute blocks and noted on a yes/no basis. A total of 11 478 activity records were collected for all animals combined. With these data the onset and offset of the activity period can be determined.

The activity records taken every 5 minutes were pooled together for every hourly period and then used to calculate the percentage activity per hour. The percentage activity per hour was then averaged for males and females and an activity profile was drawn up per sex for each season using the percentage activity per hour (Palomares & Delibes, 1994; Camps, 2008). A nocturnality index (I_n) was calculated as $I_n = \frac{2N_a/N}{(N_a/N)+(D_a/D)} - 1$ where N_a is the total duration of nocturnal activity; D_a is the total duration of diurnal activity; N is the night length and D is the day length (Zalewski, 2000). A value of 1 would mean that the animal is completely nocturnal while a value of -1 would mean that the animal is completely diurnal (Zalewski, 2000).

Different activity parameters (Table 1) were calculated and tested for differences between sexes (using Mann-Whitney U tests) and seasons (using Kruskal-Wallis tests) (Mann & Whitney, 1947; Kruskal & Wallis, 1952).

Activity parameters were tested for correlations with environmental variables. Spearman's rank-order correlation was used to determine the influence of night length (time elapsed between sunset and sunrise) on the activity period. Similarly the potential influence of sunset and sunrise times on activity onset and offset, respectively, was tested (Mbatyoti, 2012). The duration of effective activity was tested for differences between sexes and seasons. The duration of effective activity was also correlated with the minimum temperature, night length and duration of the activity period during the corresponding night. The total duration of all resting bouts per night per animal was also correlated with night length and minimum temperature of the corresponding night. The 24 h activity budget, the diurnal (24 h – night length) activity budget as well as the nocturnal (24 h – day length) activity budget were also tested for differences between sexes and seasons and correlated with the corresponding temperature (minimum temperature for the 24 h and nocturnal activity budgets and maximum temperature for the diurnal activity budget).

Table 1: Activity parameters and descriptions of each parameter calculated for the rusty-spotted genets in Telperion Nature Reserve.

Activity parameter	Definition
Activity period	This was calculated as the time of activity onset until the time of activity offset (Camps, 2008).
Activity onset	The time when nightly activity started.
Activity offset	The time when nightly activity ended.
Effective activity	This was calculated as the length of the activity period minus the duration of all resting bouts during the activity period.
Total duration of resting bouts	The total duration of all resting bouts per night per animal.
24 h Activity budget (%)	$\left(\frac{\text{Effective activity}}{1440 \text{ minutes}} \right) \times 100$
Nocturnal activity budget (%)	$\left(\frac{\text{Effective activity from sunset until sunrise}}{\text{night length}} \right) \times 100$
Diurnal activity budget (%)	$\left(\frac{\text{Effective activity from sunrise until sunset}}{\text{day length}} \right) \times 100$

To test for the influence of sex, season and selected environmental variables (soil, wind, temperature and general weather conditions) on the nightly activity (active vs inactive) of the animals, a generalized linear model was generated (Norušis, 2008). Soil and wind conditions were grouped as follows: Soil: Dry, Humid, Wet to Sodden; Wind: No, Light, Medium, Strong to Very strong. Weather conditions were grouped as follows: 0% to 39%

cloud cover, 40% to 69% cloud cover, 70% to 100% cloud cover, Mist, Light rain, Medium to Heavy rain.

3.4 Resting sites

Due to genets being extremely alert and wary, precisely locating resting sites through the homing technique was difficult. To locate resting sites I would move in the direction of the radio-signal until a specific bush, rock crevice or other structure could be identified as the resting site (Mech, 1980). To do this, I needed to get very close to the genet, which proved impossible as they got disturbed very easily and would move away before the resting site could be identified. Because of the futility of this method, it was aborted. Resting site locations were thus determined through bi- or triangulation of the radio-collar signal for at least 15 consecutive days per animal per season. Additional resting site locations were opportunistically recorded during other field work activities, notably when monitoring activity during the day or before/after continuous night-tracking sessions.

The locations of the resting sites were plotted on a map to determine their spatial distribution and their relationship to the home range of the radio-tracked genets. The resting site locations for each individual were overlaid onto its respective 99% fixed kernel home range (see Chapter 6). These home ranges were calculated using all available location points for the rusty-spotted genets, including all resting site locations. Rusty-spotted genets may use specific resting sites more than once during the season or year. I calculated the number of different resting sites recorded per animal to determine differences between sexes and in different seasons. These calculations were done using a Mann-Whitney U-test and a Kruskal-Wallis test respectively (Mann & Whitney, 1947; Kruskal & Wallis, 1952; Zalewski, 1997b; Camps, 2011).

The index of reuse of resting sites was calculated with the following equation:

$$\text{Index of resting site reuse} = 1 - \left(\frac{\text{Number of different resting sites}}{\text{Total number of resting days}} \right) \quad (\text{Zalewski, 1997b}).$$

The index of resting site reuse refers to the number of tracking days in which a specific genet reuses the same site. A value of 0 means that the animal used a new resting site each time it was located, whereas a value of 1 means that the animal always used the same site (Zalewski, 1997b). Additionally, the resting site fidelity was calculated as a percentage using resting site locations on consecutive days. Resting site fidelity describes

the event when animals return to the same resting site as the night before. To test for differences between males and females a Mann-Whitney U-test was performed, while a Kruskal-Wallis test was used to test for seasonal differences in resting site fidelity (Mann & Whitney, 1947; Kruskal & Wallis, 1952; Zalewski, 1997b; Camps, 2011). Resting site fidelity was also correlated against the minimum ambient temperature during the day on which the animals were located, using a Spearman's rank-order correlation. Ambient temperature might have influenced their activity patterns and thus the chances that they may or may not move from a resting site.

The distances between resting sites on consecutive days were calculated. A Mann-Whitney U and a Kruskal-Wallis test were used to test for differences between sexes and seasons respectively, (Mann & Whitney, 1947; Kruskal & Wallis, 1952). Spearman's rank-order correlations were used to evaluate a potential association between home range size and the number of resting sites used per individual, as well as between home range size and the distance between resting sites. The distance between resting sites on consecutive days was also correlated with night length (Palomares & Delibes, 1994) to determine whether genets moved further when nights were longer.

3.5 Spatial ecology

The collared animals were tracked mainly during the night (three to seven nights per individual per season), but also during the day (up to 16 days per individual per season) to determine home range size and movement ecology. A location point was determined via bi- or triangulation once every 30 minutes during the nights while only one location was taken on each day. Any other locations that could be opportunistically recorded were also included in the analysis.

The kernel method was used to determine the utilization distribution in ArcGIS9 from location fixes taken during day and night tracks (Worton, 1989). With this method it is not necessary to avoid auto-correlation when collecting data as De Solla *et al.* (1999) found that an increase in sample size improve the accuracy of the home range calculation despite the increase in auto-correlation. Home range sizes were calculated as 99% volume contours and drawn on a map to visualise the shape of the home ranges, as well as possible overlap between the home ranges of different individuals.

Home range sizes were only calculated for animals that were tracked for at least three nights per season ($n = 68$) to ensure a large enough sample size. Differences between the total home range sizes of different sexes and for different seasons were then tested, using a Mann-Whitney U test and a Kruskal-Wallis test, respectively (Mann & Whitney, 1947; Kruskal & Wallis, 1952). Seasonal home ranges were also calculated and tested for differences between sexes using Mann-Whitney U tests (Mann & Whitney, 1947). The percentage of home range overlap between males and females; males; as well as females were calculated. The percentage overlap between male and female home ranges were compared between seasons using a Kruskal-Wallis test (Kruskal & Wallis, 1952).

Core areas within home ranges were determined as 50% volume contours. The sizes of the individual core areas were calculated, where after I tested for differences between seasons and sexes using a Mann-Whitney U test and a Kruskal-Wallis test, respectively (Mann & Whitney, 1947; Kruskal & Wallis, 1952). The sizes of core areas were also correlated with the total home range sizes using a Spearman's rank-order correlation.

To calculate the distance that the home range of an individual might shift during different seasons, the arithmetic means of the home ranges were determined for each season and the shift distance was calculated as the straight line distance between these arithmetic means (Herr *et al.*, 2009). Distances were calculated between the arithmetic means of the spring and subsequent summer home ranges, summer and subsequent autumn home ranges, and autumn and subsequent winter home ranges. The distances were then compared between sexes as well as between the three season groups (i.e. spring/summer, summer/autumn, autumn/winter) using a Kruskal-Wallis test and a Mann-Whitney U test, respectively (Mann & Whitney, 1947; Kruskal & Wallis, 1952).

The specific vegetation types that home ranges consist of was considered. The percentage overlap of home ranges with different vegetation types, as described by Mucina and Rutherford (2006), was calculated. I then plotted the percentage available area of each vegetation types within each home range with the percentage used for the core area of each animal (Aebischer, 1993).

Furthermore, the daily movement distances were calculated for each animal. These values were then divided by the effective activity (see Chapter 3.3) to determine the daily

travel speed. The daily movement distances and daily travel speeds were tested for differences between the sexes and seasons using a Kruskal-Wallis test and a Mann-Whitney U test, respectively (Mann & Whitney, 1947; Kruskal & Wallis, 1952). They were also correlated with the total as well as the seasonal home range sizes of the animals using a Spearman's rank-order correlation.

Results

4.1 Trapping success

Out of the 628 trapping nights, the total trapping success for all animal species was 9.87% while a total of 37 rusty-spotted genet captures took place (see Appendix 1). The trapping success for rusty-spotted genets only was 5.89% (Figure 6).

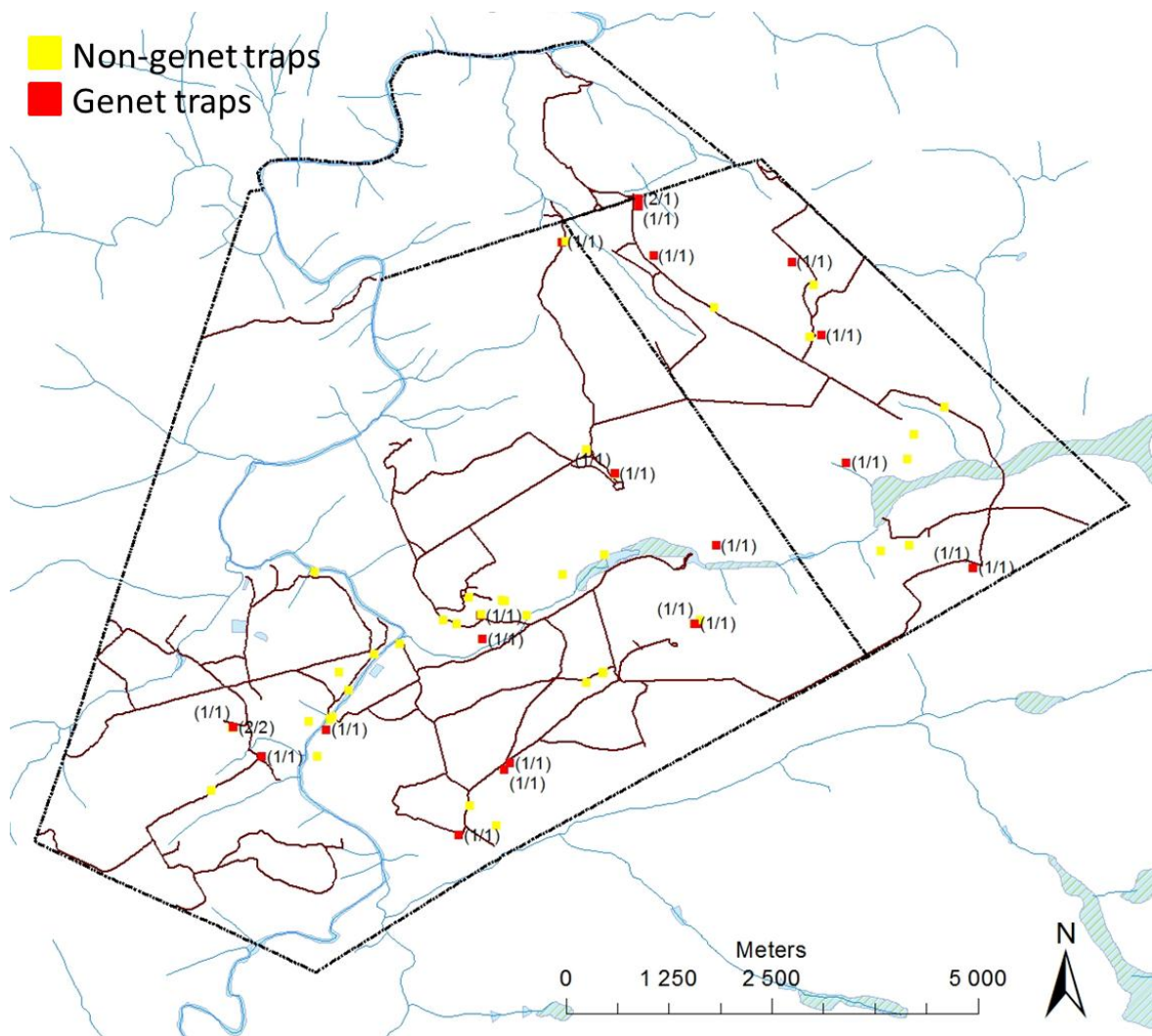


Figure 6: The trap locations in Telperion Nature Reserve. Red blocks indicate traps in which rusty-spotted genets were trapped with the number in brackets showing the “number of genets trapped/the number of different genets trapped”.

No difference was found between the success rate of individual traps in the different habitat types ($H = 4.31$; $p = 0.12$; $n = 61$). The success rate of individual traps did however increase with an increase in the altitude ($r_s = 0.27$; $p = 0.03$; $n = 61$) (Figure 7).

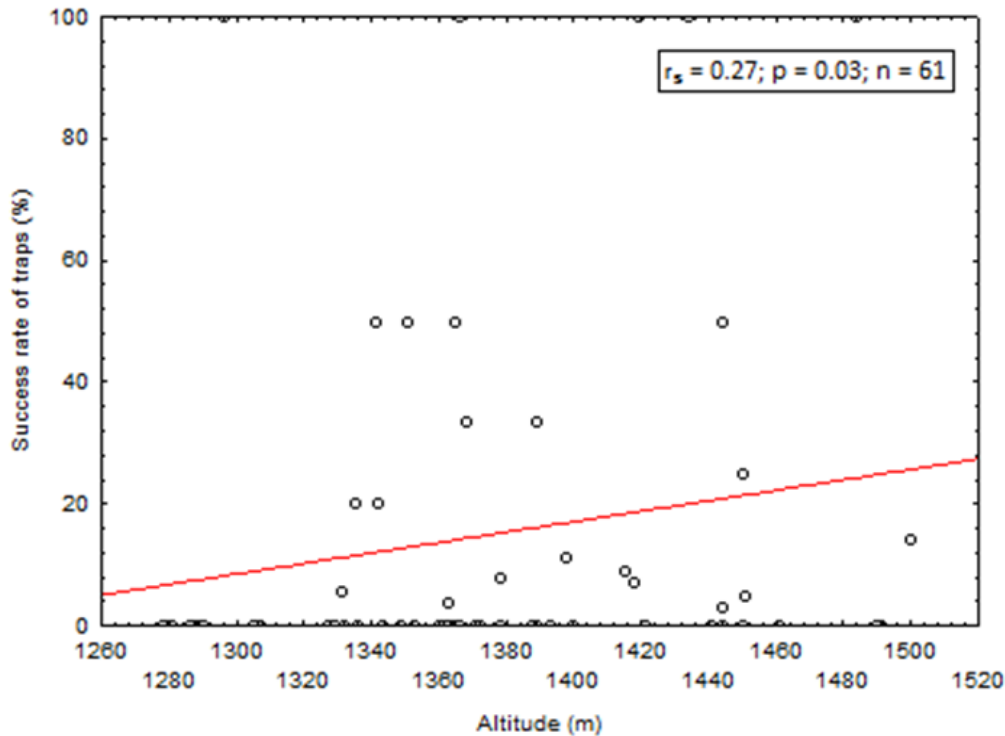


Figure 7: Spearman's rank-order correlation showing a significant positive correlation between the success rate of traps (to trap rusty-spotted genets) and the altitude in Telperion Nature Reserve.

4.2 Morphometrics

An approximately 15% difference between the morphometric data of males and females is expected based on the mass difference (see Table 12, p. 55). Male and female rusty-spotted genets were however generally the same size with the only significant differences being the neck circumference, the footprint length of the front right foot and the foot length of the hind right foot (Table 2) (see Appendix 2). When subadults and pregnant females were discarded, significant differences were only found between the mass ($Z = 2.38$; $p = 0.02$; Table 12, p. 55), the neck circumference ($Z = 2.08$; $p = 0.04$) and the hind left foot width ($Z = 2.21$; $p = 0.03$).

The approximate age was only correlated with the mass of the animals, but not with any of the other morphometric data (Table 3).

Table 2: Comparison of different morphometric parameters for male and female rusty-spotted genets in Telperion Nature Reserve. Significant differences are shown in bold.

Morphometric parameters		Average \pm SD (n)		Mann-Whitney U test
		Male	Female	
Mass (kg)		1.71 \pm 0.21 (9)	1.59 \pm 0.14 (6)	Z = 1.36; p = 0.18
Body length (cm)		50.33 \pm 1.64 (9)	49.42 \pm 1.28 (6)	Z = 1.18; p = 0.24
Tail length (cm)		44.12 \pm 1.57 (9)	44.63 \pm 2.50 (6)	Z = 0.00; p = 1.00
Tail length with hair tip (cm)		46.00 \pm 1.52 (9)	46.58 \pm 2.50 (6)	Z = -0.18; p = 0.86
Neck circumference (cm)		16.09 \pm 1.54 (8)	14.42 \pm 0.57 (6)	Z = 2.39; p = 0.02
Height of left ear (cm)		4.31 \pm 0.25 (6)	4.65 \pm 0.19 (5)	Z = -1.64; p = 0.10
Front left foot:	foot width (cm)	2.42 \pm 0.13 (9)	2.38 \pm 0.26 (6)	Z = 0.94; p = 0.35
	footprint length (cm)	4.63 \pm 2.77 (9)	3.89 \pm 0.52 (6)	Z = -0.12; p = 0.91
	foot length (cm)	10.64 \pm 2.57 (9)	11.45 \pm 0.73 (6)	Z = -0.35; p = 0.72
	length of longest claw (cm)	0.39 \pm 0.11 (8)	0.38 \pm 0.05 (6)	Z = 0.00; p = 1.00
Front right foot:	foot width (cm)	2.36 \pm 0.18 (9)	2.38 \pm 0.23 (6)	Z = -0.29; p = 0.77
	footprint length (cm)	3.74 \pm 0.51 (9)	4.12 \pm 0.09 (6)	Z = -2.00; p = 0.0496
	foot length (cm)	11.54 \pm 0.56 (9)	11.62 \pm 0.36 (6)	Z = -0.29; p = 0.77
	length of longest claw (cm)	0.36 \pm 0.09 (8)	0.37 \pm 0.10 (6)	Z = 0.26; p = 0.80
Hind left foot:	foot width (cm)	2.27 \pm 0.11 (9)	2.14 \pm 0.15 (6)	Z = 1.89; p = 0.06
	footprint length (cm)	2.91 \pm 0.28 (9)	2.90 \pm 0.18 (6)	Z = -0.18; p = 0.86
	foot length (cm)	8.37 \pm 0.17 (9)	8.28 \pm 0.14 (6)	Z = 1.18; p = 0.24
	length of longest claw (cm)	0.60 \pm 0.06 (9)	0.63 \pm 0.07 (6)	Z = -0.41; p = 0.68
Hind right foot:	foot width (cm)	2.23 \pm 0.20 (9)	2.20 \pm 0.14 (6)	Z = 0.00; p = 1.00
	footprint length (cm)	2.96 \pm 0.26 (9)	2.92 \pm 0.25 (6)	Z = 0.53; p = 0.60
	foot length (cm)	8.49 \pm 0.26 (9)	8.22 \pm 0.18 (6)	Z = 2.06; p = 0.04
	length of longest claw (cm)	0.62 \pm 0.10 (9)	0.64 \pm 0.09 (6)	Z = -0.65; p = 0.52
Number of black rings around tail		9.67 \pm 0.71 (9)	9.33 \pm 0.82 (6)	Z = 0.82; p = 0.41
Number of white rings around tail		8.67 \pm 0.71 (9)	8.33 \pm 0.82 (6)	Z = 0.82; p = 0.41

Table 3: Spearman's rank-order correlations showing the correlation of the approximate age with the different morphometric parameters for rusty-spotted genets in Telperion Nature Reserve. Significant differences are shown in bold.

Morphometric parameters to be correlated with the approximate age		Spearman's r_s; p-value (n)
Mass (kg)		$r_s = 0.73$; $p = 0.002$ (15)
Body length (cm)		$r_s = 0.45$; $p = 0.09$ (15)
Tail length (cm)		$r_s = 0.15$; $p = 0.58$ (15)
Tail length with hair tip (cm)		$r_s = 0.14$; $p = 0.63$ (15)
Neck circumference (cm)		$r_s = 0.53$; $p = 0.05$ (14)
Height of left ear (cm)		$r_s = -0.16$; $p = 0.64$ (11)
Front left foot:	foot width (cm)	$r_s = -0.05$; $p = 0.87$ (15)
	footprint length (cm)	$r_s = 0.07$; $p = 0.80$ (15)
	foot length (cm)	$r_s = 0.30$; $p = 0.27$ (15)
	length of longest claw (cm)	$r_s = -0.18$; $p = 0.54$ (14)
Front right foot:	foot width (cm)	$r_s = 0.22$; $p = 0.43$ (15)
	footprint length (cm)	$r_s = 0.15$; $p = 0.59$ (15)
	foot length (cm)	$r_s = 0.11$; $p = 0.69$ (15)
	length of longest claw (cm)	$r_s = -0.23$; $p = 0.43$ (14)
Hind left foot:	foot width (cm)	$r_s = 0.04$; $p = 0.89$ (15)
	footprint length (cm)	$r_s = 0.45$; $p = 0.09$ (15)
	foot length (cm)	$r_s = -0.30$; $p = 0.28$ (15)
	length of longest claw (cm)	$r_s = -0.36$; $p = 0.18$ (15)
Hind right foot:	foot width (cm)	$r_s = 0.20$; $p = 0.49$ (15)
	footprint length (cm)	$r_s = 0.06$; $p = 0.82$ (15)
	foot length (cm)	$r_s = -0.13$; $p = 0.64$ (15)
	length of longest claw (cm)	$r_s = -0.07$; $p = 0.80$ (15)
Number of black rings around tail		$r_s = 0.14$; $p = 0.61$ (15)
Number of white rings around tail		$r_s = 0.14$; $p = 0.61$ (15)

4.3 Activity patterns

Rusty-spotted genets in Telperion Nature Reserve were primarily nocturnal but exhibited occasional active bouts during the day. They were most active during the first half of the night and tended to have short resting bouts after midnight after which they could become active again during the second half of the night (Figure 8). The nocturnality index for both sexes was high (close to 1) during all the seasons (Table 4).

None of the tested activity parameters showed any significant difference between sexes (Table 5).

There were significant seasonal differences in the activity periods for male and female rusty-spotted genets combined (see Appendix 4). The activity period during autumn were significantly longer than during summer ($Z = 2.73$, $p = 0.04$) and winter ($Z = 3.34$, $p = 0.01$) (Figure 9). The duration of effective activity was significantly shorter during winter than spring ($Z = 3.82$, $p < 0.05$) and autumn ($Z = 3.57$, $p = 0.002$) (Figure 10). The total duration of resting bouts during winter was significantly higher than in spring ($Z = 3.22$, $p = 0.01$) and summer ($Z = 2.72$, $p = 0.04$) (Figure 11). Genets were active on average $78.6 \pm 25.0\%$ of the night, but only $7.0 \pm 5.4\%$ of the day. The 24 h activity budget during winter was significantly smaller than during spring ($Z = 3.84$, $p < 0.05$) and autumn ($Z = 3.57$, $p < 0.05$) (Figure 12). The nocturnal activity budget (%) during winter was also significantly smaller than during spring ($Z = 3.63$, $p < 0.05$), summer ($Z = 5.00$, $p < 0.05$) and autumn ($Z = 3.05$, $p = 0.01$) (Figure 13). All other dyadic seasonal comparisons were not statistically significant ($p > 0.05$).

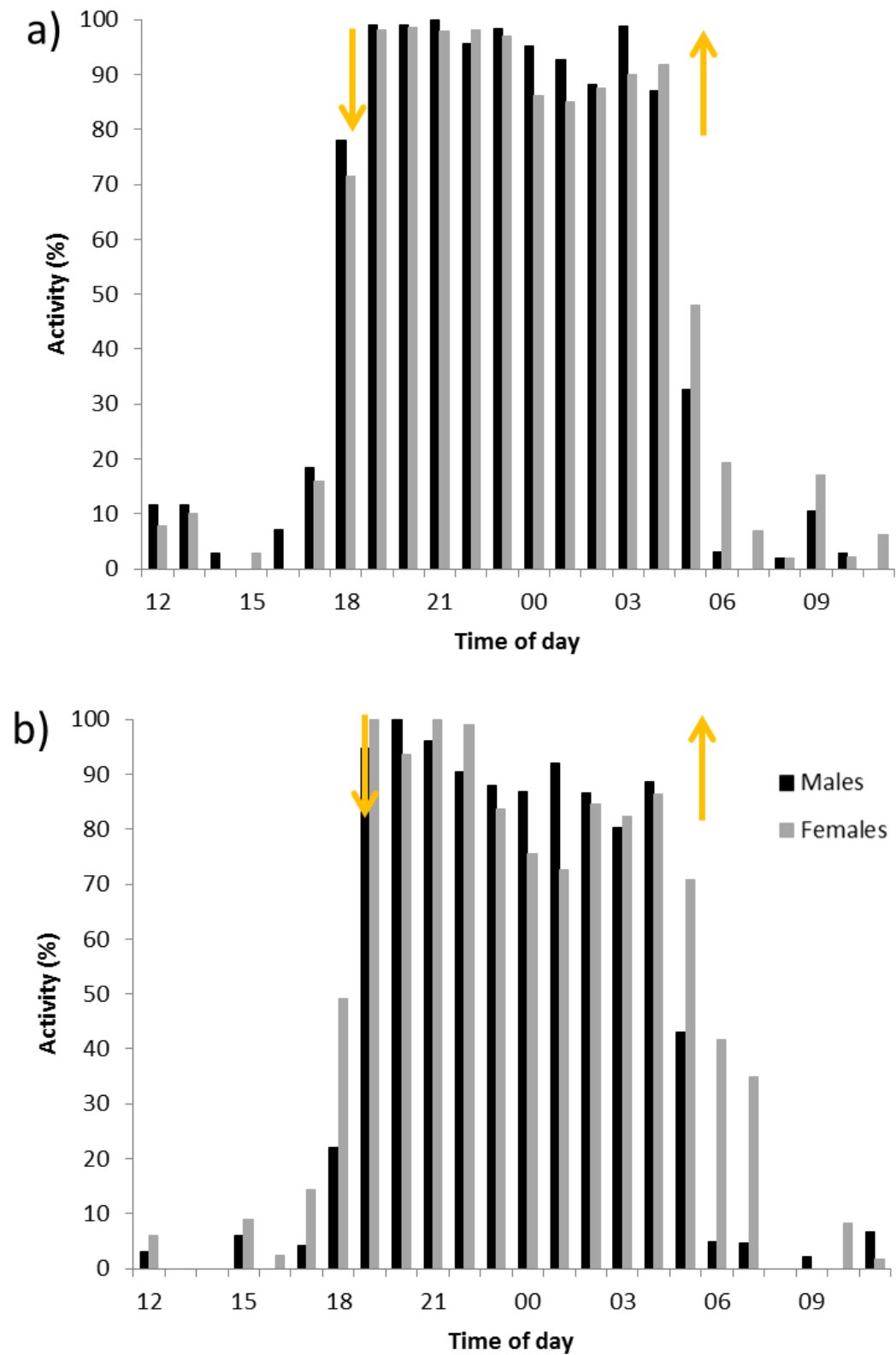


Figure 8: Activity profiles of male (black bars) and female (grey bars) rusty-spotted genets in Telperion Nature Reserve for (a) spring and (b) summer. Arrows show the average times of sunset and sunrise respectively.

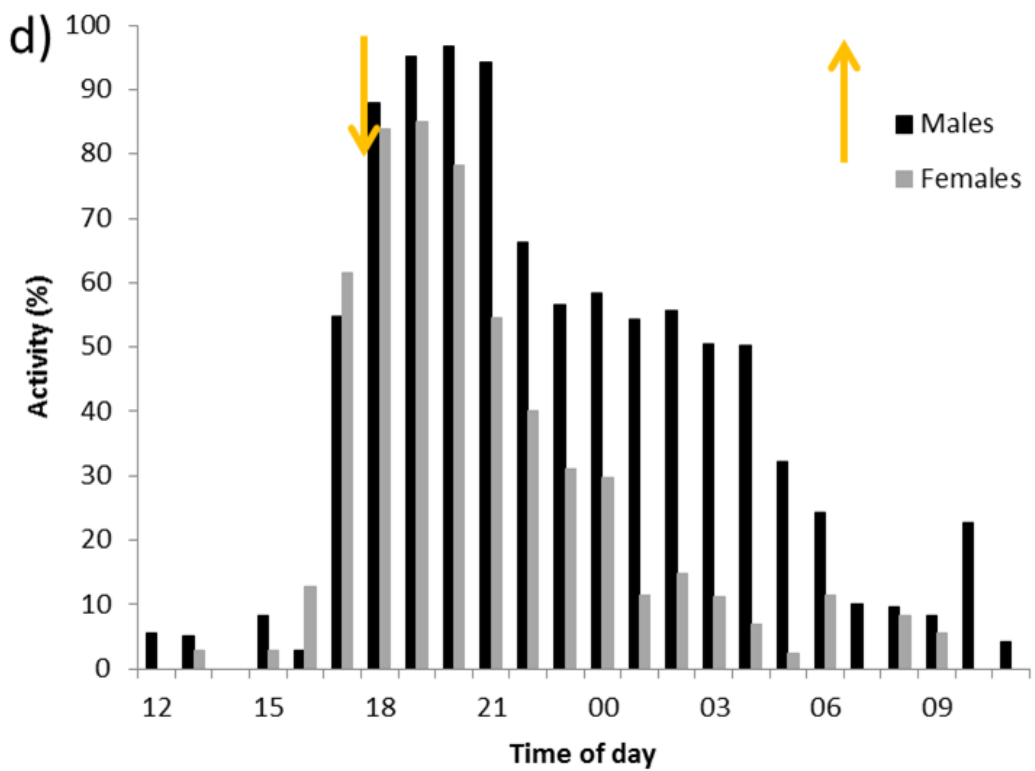
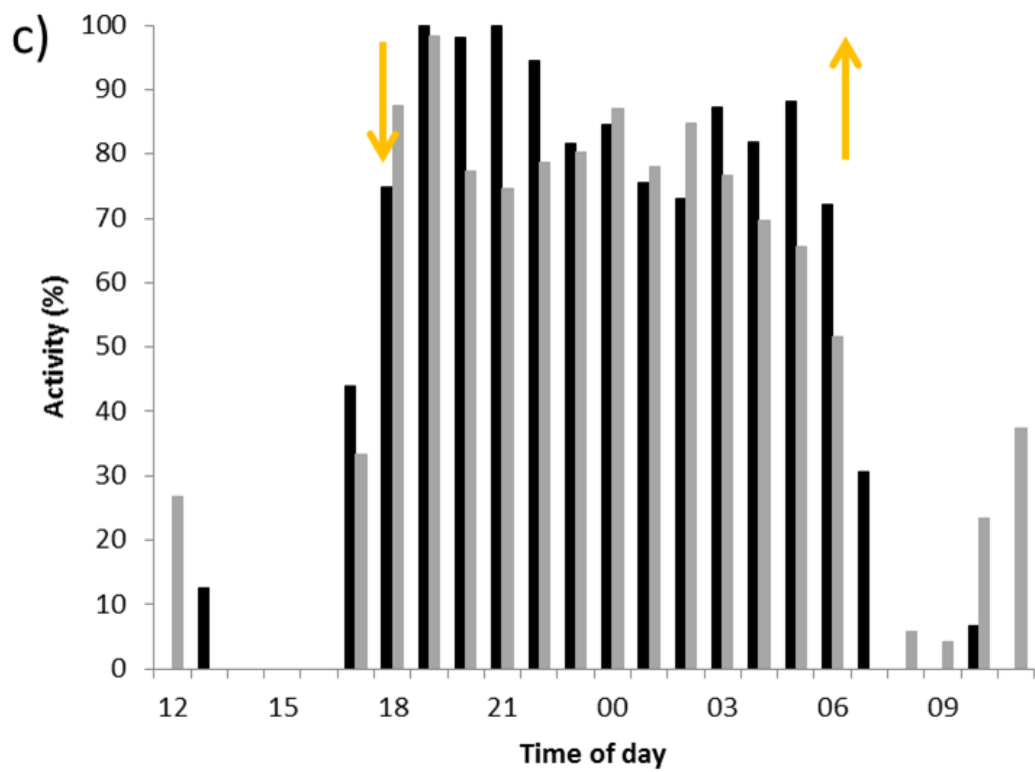


Figure 8: Activity profiles of male (black bars) and female (grey bars) rusty-spotted genets in Telperion Nature Reserve for (c) autumn and (d) winter. Arrows show the average times of sunset and sunrise respectively.

Table 4: The seasonal nocturnality index of male and female rusty-spotted genets in Telperion Nature Reserve.

Season	Nocturnality index	
	Males	Females
Spring	0.77	0.82
Summer	0.91	0.84
Autumn	0.84	0.85
Winter	0.86	0.83
Yearly	0.84	0.83

Table 5: Comparison of the different activity parameters for male and female rusty-spotted genets in Telperion Nature Reserve.

Activity parameters	Average \pm SD (n)		Mann-Whitney U test
	Males	Females	
Activity period (min)	658 \pm 128 (27)	615 \pm 137 (32)	Z = -1.32; p = 0.19
Activity onset (h:min)	18:04 \pm 00:36 (48)	18:13 \pm 00:35 (54)	Z = 1.38; p = 0.17
Activity offset (h:min)	06:20 \pm 03:51 (40)	06:49 \pm 04:53 (48)	Z = -0.17; p = 0.87
Effective activity (min)	586 \pm 172 (27)	564 \pm 175 (32)	Z = -0.52; p = 0.61
Total duration of resting bouts (min)	73 \pm 96 (27)	51 \pm 93 (32)	Z = -1.18; p = 0.24
24 h Activity budget (%)	40.7 \pm 11.9 (27)	39.2 \pm 12.2 (32)	Z = -0.52; p = 0.61
Nocturnal activity budget (%)	78.2 \pm 23.7 (27)	78.9 \pm 26.4 (32)	Z = 0.53; p = 0.60
Diurnal activity budget (%)	5.9 \pm 4.4 (8)	7.8 \pm 6.1 (12)	Z = 0.54; p = 0.62

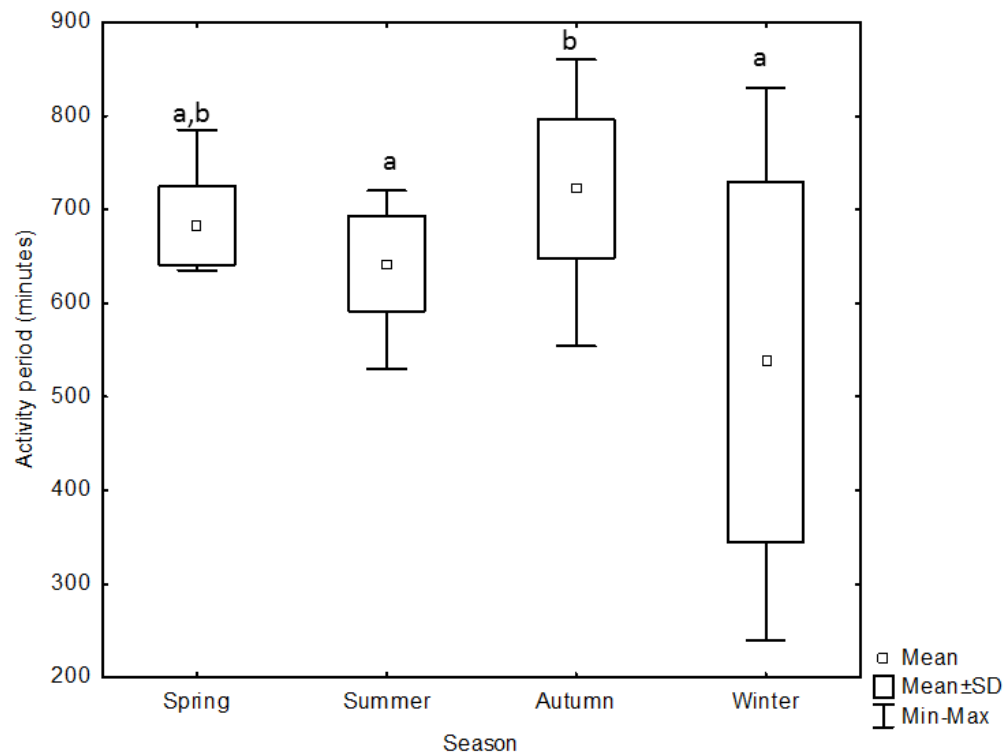


Figure 9: Boxplot showing the distribution of the activity periods of rusty-spotted genets in Telperion Nature Reserve in minutes per season. Similar letters indicate no significant differences while different letters indicate significant differences.

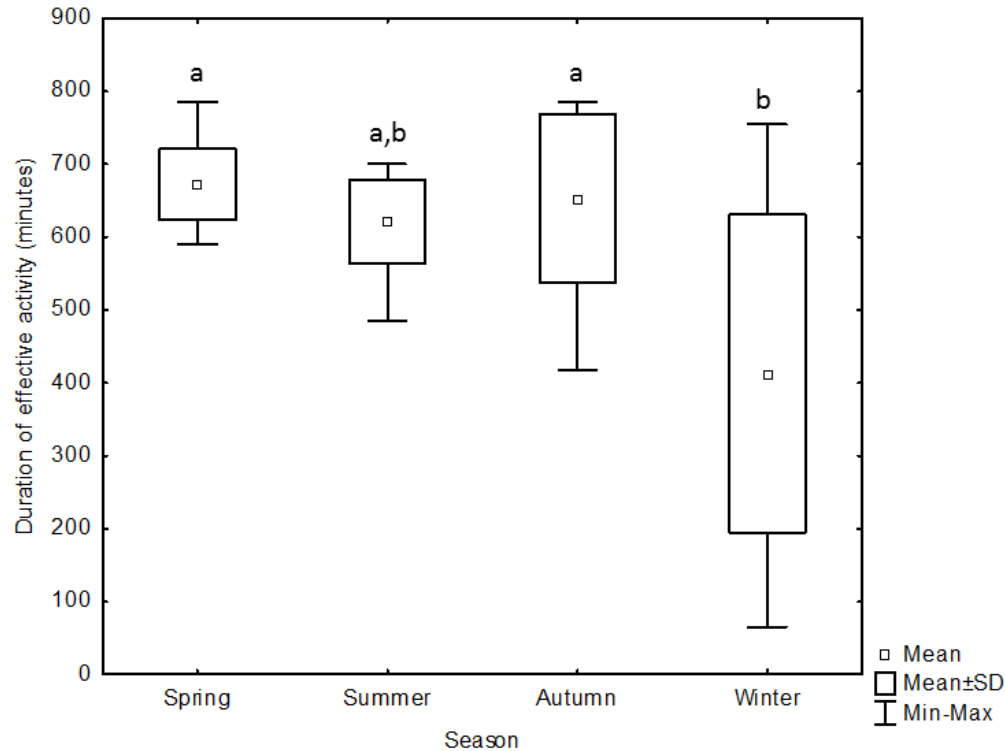


Figure 10: Boxplot showing the duration of effective activity in minutes for rusty-spotted genets during different seasons in Telperion Nature Reserve. Similar letters indicate no significant differences while different letters indicate significant differences.

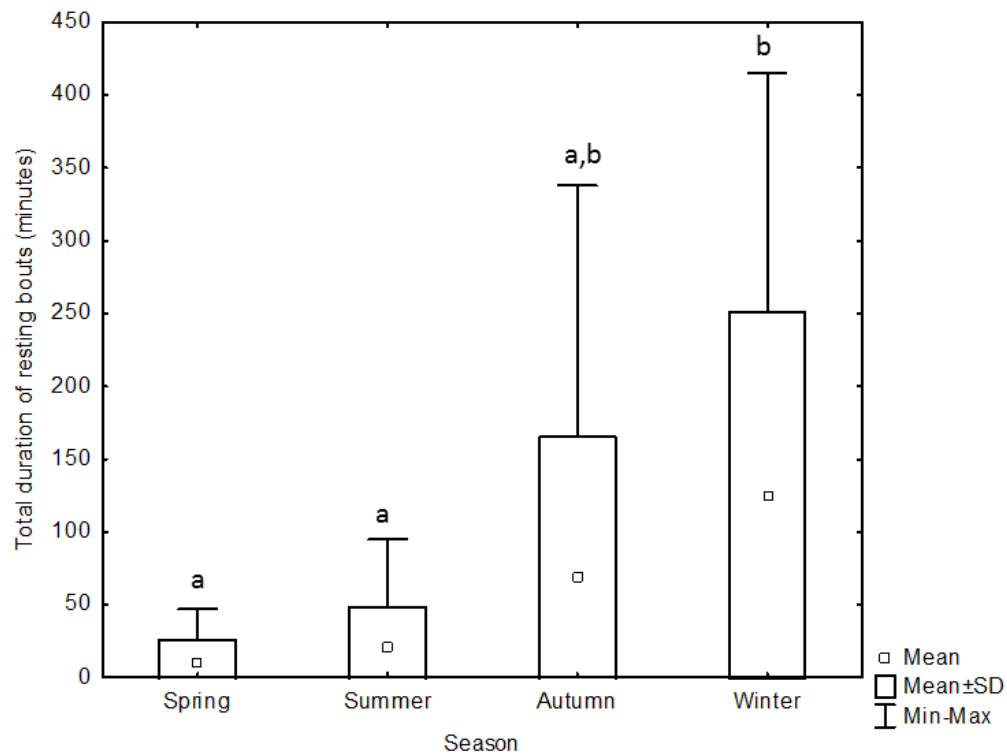


Figure 11: Boxplot showing the distribution of the total duration of resting bouts per animal per night for rusty-spotted genets during different seasons in Telperion Nature Reserve. Similar letters indicate no significant differences while different letters indicate significant differences.

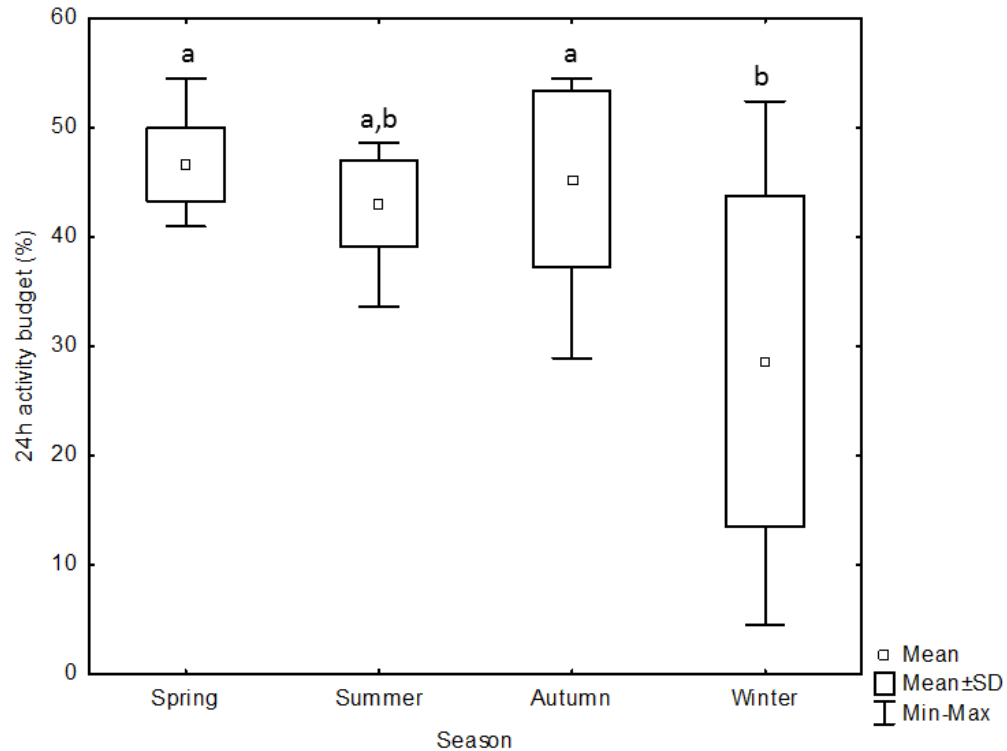


Figure 12: Boxplot showing the distribution of the 24 h activity budgets (%) of rusty-spotted genets in Telperion Nature Reserve for the different seasons. Similar letters indicate no significant differences while different letters indicate significant differences.

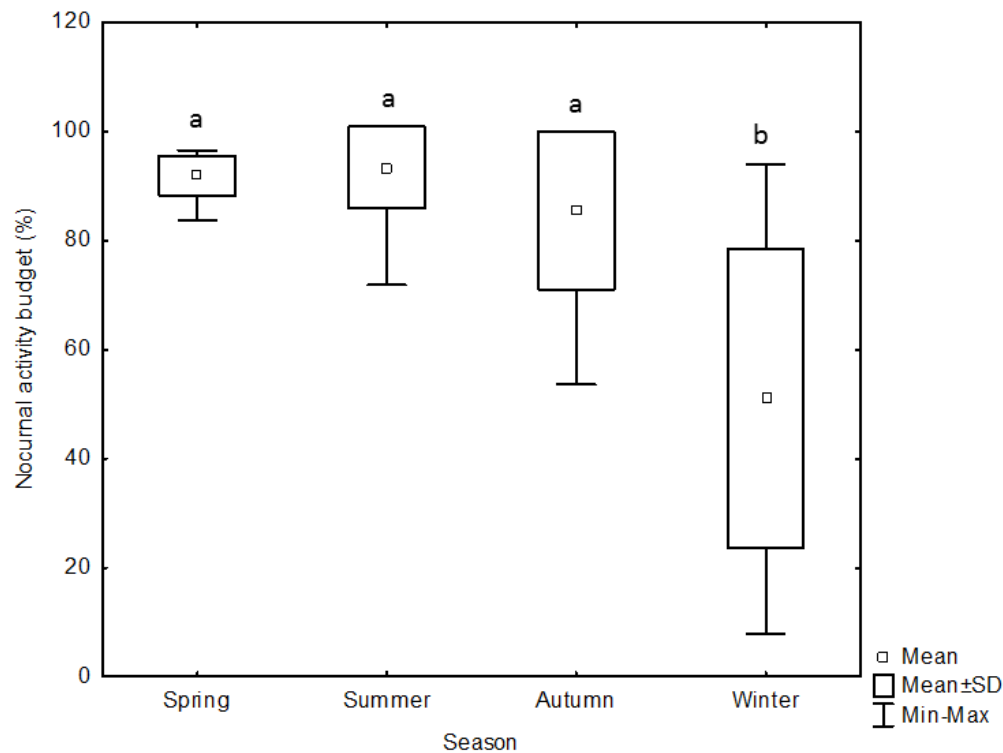


Figure 13: Boxplot showing the distribution of the nocturnal activity budgets (%) of rusty-spotted genets in Telperion Nature Reserve for the different seasons. Similar letters indicate no significant differences while different letters indicate significant differences.

For male and female rusty-spotted genets, a significant correlation was found between the time of activity onset and sunset ($r_s = 0.70$; $p < 0.05$; $n = 102$), but not between the time of activity offset and sunrise ($r_s = 0.19$; $p = 0.08$; $n = 88$) (Figure 14). The correlation between the activity period and the night length was not significant when the whole year was considered ($r_s = 0.04$; $p = 0.79$; $n = 59$) or during summer ($r_s = 0.14$; $p = 0.59$; $n = 17$), autumn ($r_s = 0.01$; $p = 0.97$; $n = 12$) or winter ($r_s = 0.20$; $p = 0.42$; $n = 18$). The correlation between the activity period and night length was however positive during spring ($r_s = 0.71$, $p < 0.05$, $n = 12$). The duration of effective activity increased significantly as the minimum ambient temperature increased (Figure 15). There was also a significant correlation between the length of the activity period and the duration of effective activity (Figure 16). There was a significant correlation between the total duration of resting bouts and the night length (Figure 17). The total duration of resting bouts increased significantly as the minimum ambient temperature decreased and the correlation was thus negative (Figure 18). The 24 h activity budget (Figure 19) and the nocturnal activity budget (Figure 20) increased significantly with increasing ambient temperature (see Appendix 5).

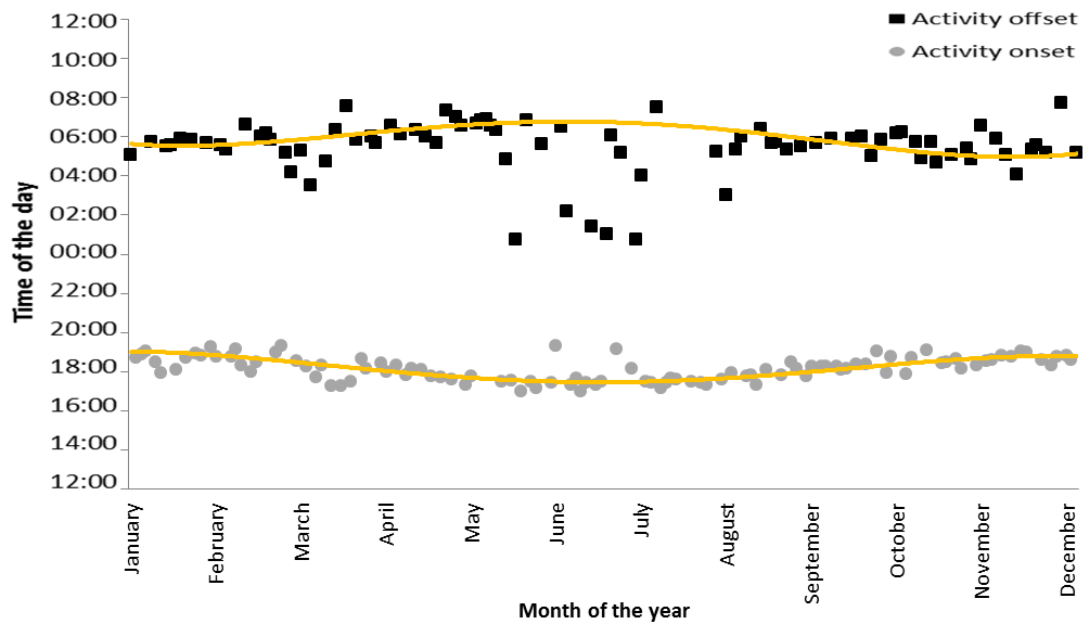


Figure 14: Activity onset (grey circles) and offset (black squares), of rusty-spotted genets, in relation to sunset and sunrise (orange lines) respectively as recorded in Telperion Nature Reserve.

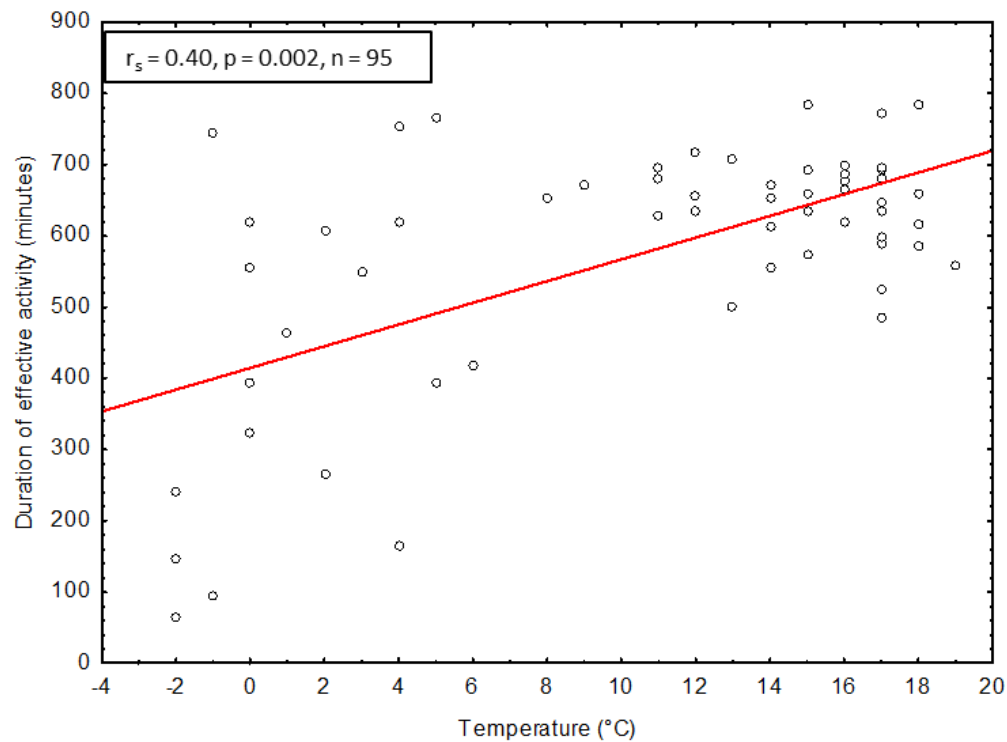


Figure 15: Spearman's rank-order correlation showing a significant positive correlation between the duration of effective activity (minutes) of rusty-spotted genets and the minimum daily temperature (°C) recorded in Telperion Nature Reserve.

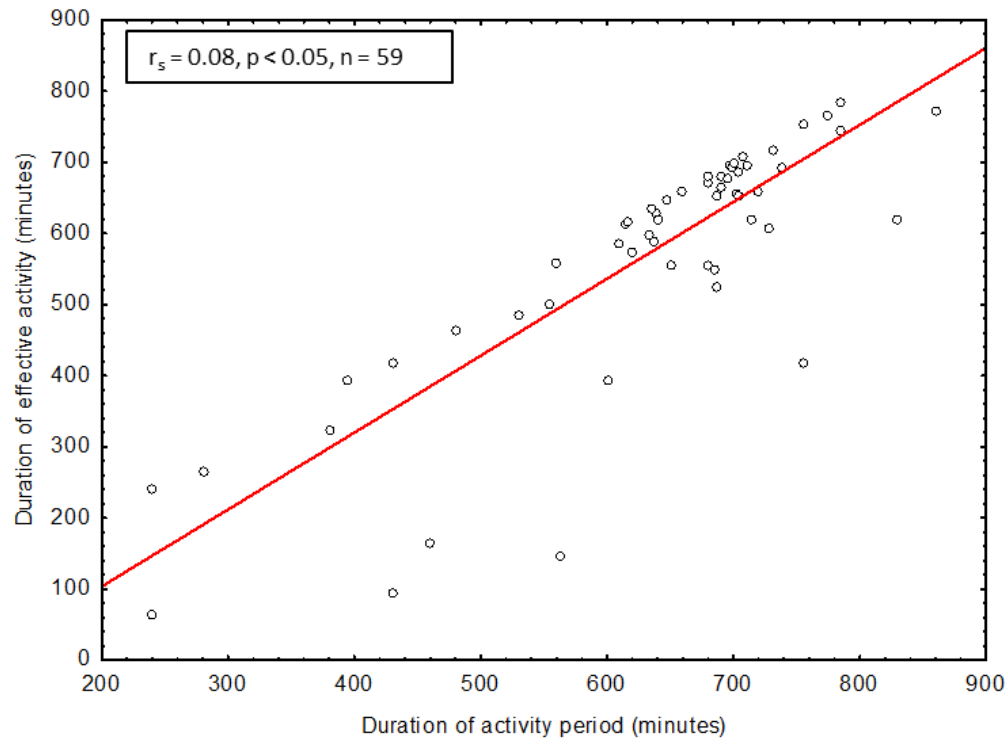


Figure 16: Spearman's rank-order correlation showing a significant positive correlation between the duration of effective activity (minutes) and the duration of the activity period (minutes) for rusty-spotted genets in Telperion Nature Reserve.

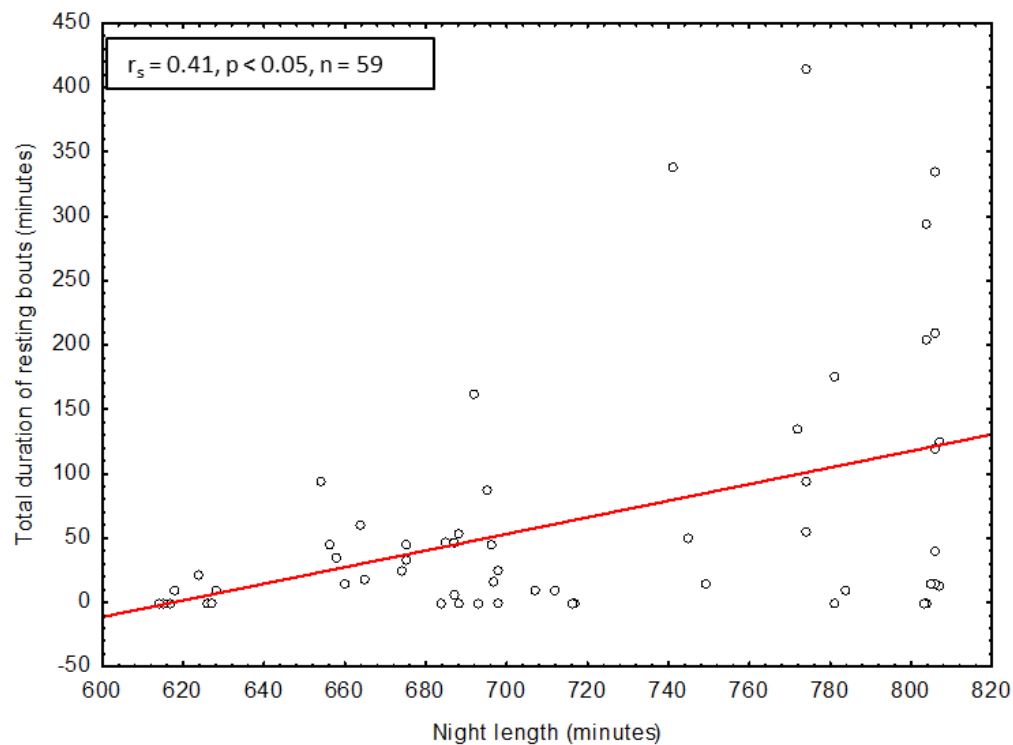


Figure 17: Spearman's rank-order correlation showing a significant positive correlation between the total duration of resting bouts per animal per night (minutes) and the night length (minutes) for rusty-spotted genets in Telperion Nature Reserve.

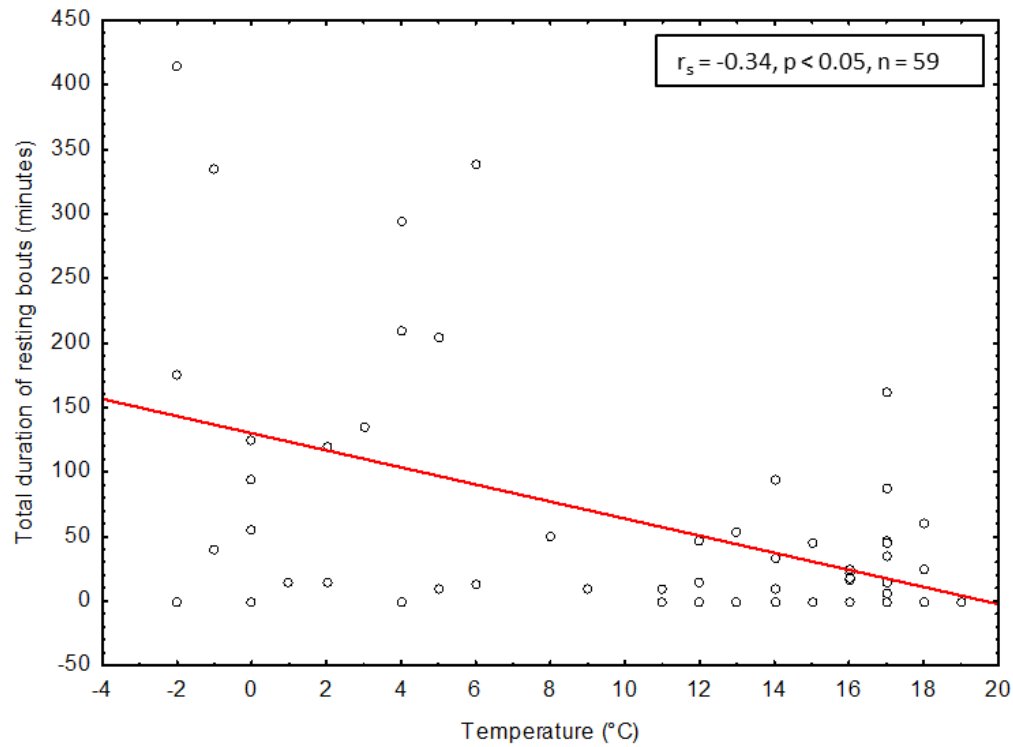


Figure 18: Spearman's rank-order correlation showing a significant negative correlation between the total duration of resting bouts per animal per night (minutes) and the minimum daily temperature (°C) for rusty-spotted genets in Telperion Nature Reserve.

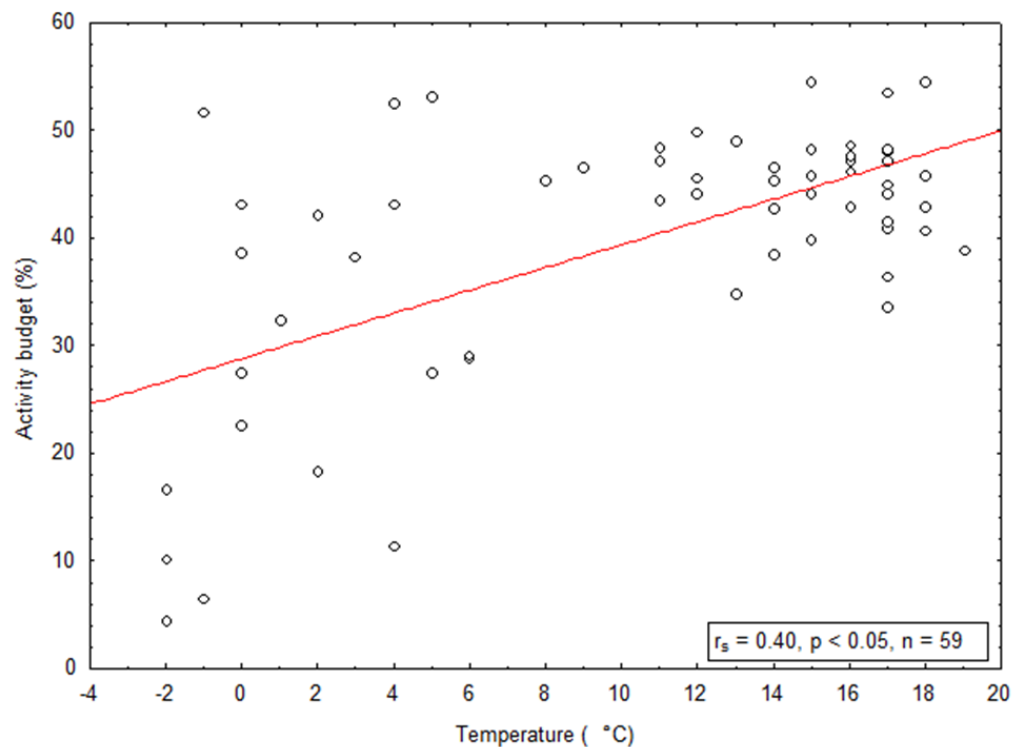


Figure 19: Spearman's rank-order correlation showing a significant positive correlation between the 24 h activity budget (%) and the minimum temperature (°C) for rusty-spotted genets in Telperion Nature Reserve.

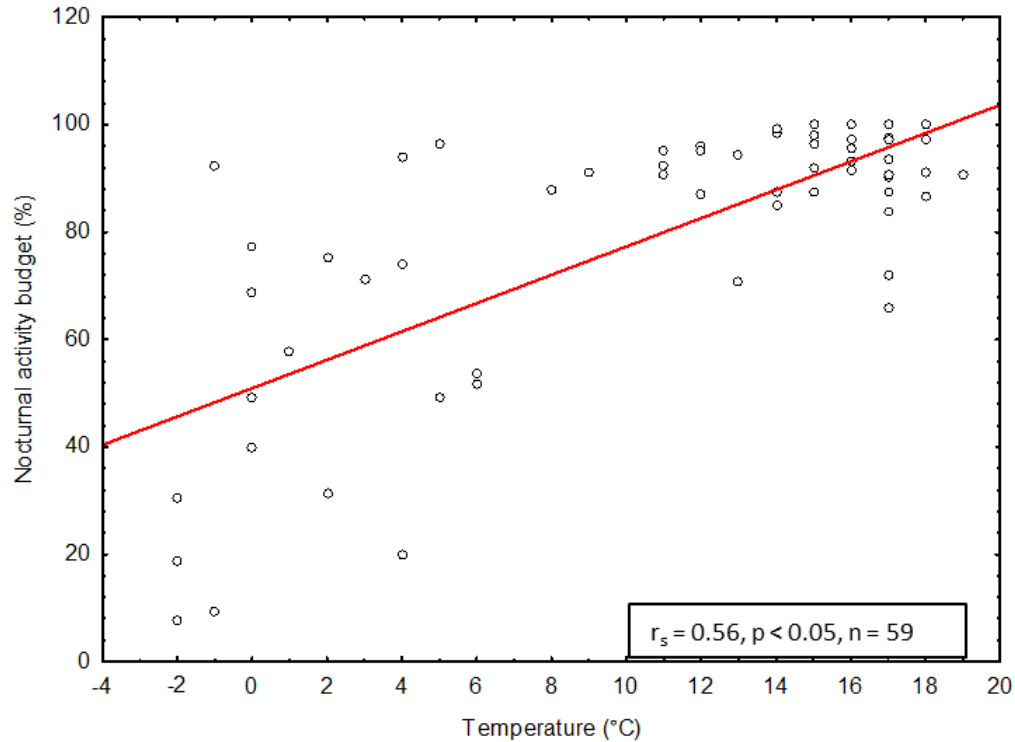


Figure 20: Spearman's rank-order correlation showing a significant positive correlation between the nocturnal activity budget (%) and the minimum ambient temperature (°C) for rusty-spotted genets in Telperion Nature Reserve.

Sex, season, soil, weather conditions and the temperature significantly influenced the nightly activity of the animals. Wind, however, did not have a significant influence (Table 6).

Males were significantly more active than females. Animals were less active during winter than during the other seasons. They were most active when the soil was humid than when it was dry or wet. Animals were the least active when cloud cover was less than 40%. There was also a positive correlation between the ambient temperature (measured every 30 minutes) and activity levels (Table 7).

Table 6: Generalized Linear Model (Type 3 test) showing the effects of sex, season and four meteorological parameters on the nightly activity of rusty-spotted genet in Telperion Nature Reserve. Significant effects are shown in bold.

Parameters	Wald statistic	df	P
Sex	44.23	1	<0.05
Season	1458.68	3	<0.05
Soil	38.75	2	<0.05
Wind	4.95	3	0.18
Weather	61.98	5	<0.05
Temperature	285.75	1	<0.05

Table 7: Generalized Linear Model showing the effects of different parameters on the activity of rusty-spotted genet in Telperion Nature Reserve. Significant effects are shown in bold.

Parameters	Estimate	Standard Error	Wald statistic	P
Sex _M	0	-	-	-
Sex _F	-0.15	0.02	44.23	<0.01
Season _{Spring}	0.79	0.06	202.25	<0.01
Season _{Summer}	0.57	0.05	110.46	<0.01
Season _{Autumn}	0.07	0.05	2.096	0.15
Season _{Winter}	0	-	-	-
Soil _{Dry}	-0.61	0.10	38.08	<0.01
Soil _{Humid}	0.35	0.14	6.28	0.01
Soil _{Wet to Sodden}	0	-	-	-
Wind _{No}	-0.33	0.18	3.43	0.06

Parameters	Estimate	Standard Error	Wald statistic	<i>P</i>
Wind _{Light}	-0.03	0.16	0.03	0.85
Wind _{Medium}	0.32	0.20	2.40	0.12
Wind _{Strong to Very strong}	0	-	-	-
Weather _{0–39% cloud cover}	-0.78	0.22	12.22	<0.01
Weather _{40–69% cloud cover}	-0.02	0.28	0.00	0.95
Weather _{70–100% cloud cover}	0.50	0.26	3.72	>0.05
Weather _{Mist}	0.27	0.89	0.09	0.76
Weather _{Light rain}	-0.08	0.56	0.02	0.89
Weather _{Medium to Heavy rain}	0	-	-	-
Temperature	0.15	0.01	285.75	<0.01

4.4 Resting sites

A total of 546 resting site locations were recorded with a mean of 36 ± 24 locations per animal (minimum = 3; maximum = 77) for the full year (see Appendix 6). Animals often chose resting sites in areas with seemingly dense vegetation along rivers, waterways or thickets. Resting sites were located along most of the home ranges, more often towards the middle of the home range rather than along the borders (Figure 21; 22).

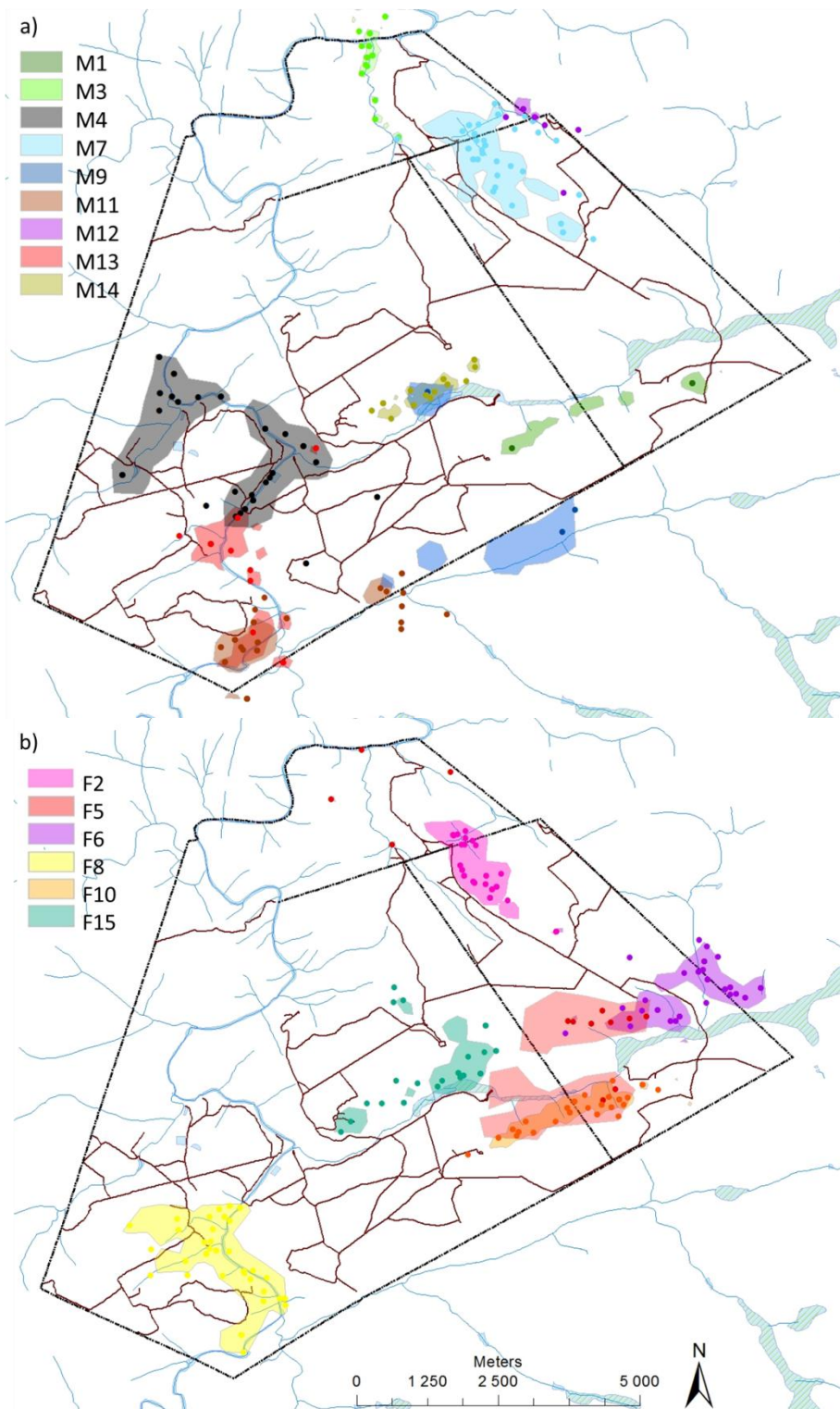


Figure 21: Distribution of resting sites (circles) relative to 99% fixed kernel home ranges (polygons) for (a) male and (b) female rusty-spotted genets in Telperion Nature Reserve.

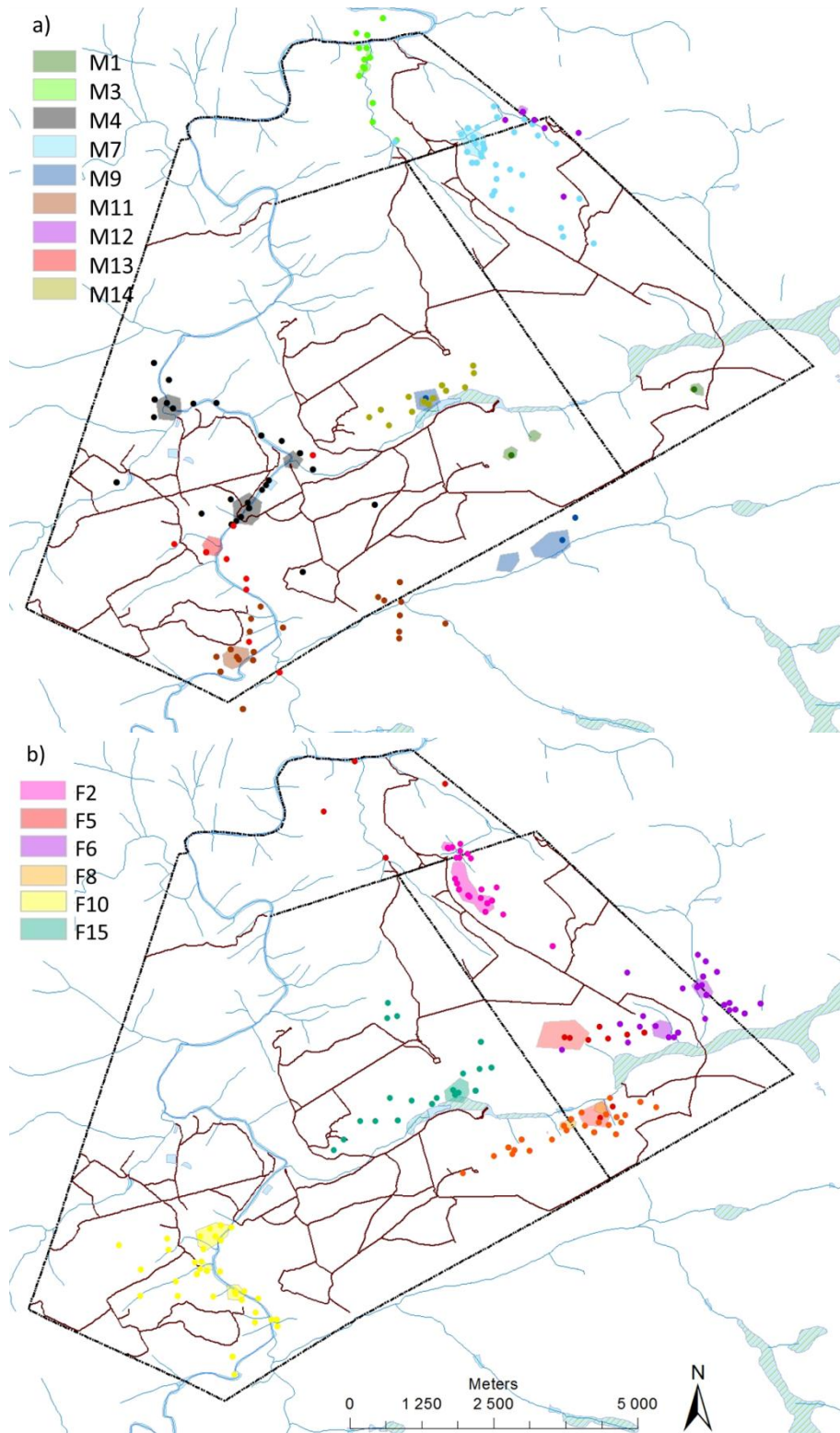


Figure 22: Distribution of resting sites (circles) relative to the 50% fixed kernel core areas (polygons) for (a) male and (b) female rusty-spotted genets in Telperion Nature Reserve.

Specific resting site locations were very hard to determine through the homing method. Out of all the resting sites that I tried to locate, only 8% (three out of a total of 38 attempts) could be found before animals moved away. In only one case could the animal

be seen while moving out of its resting site due to the disturbance from the researchers. The few resting sites that could be located were always well-covered (Figure 23).

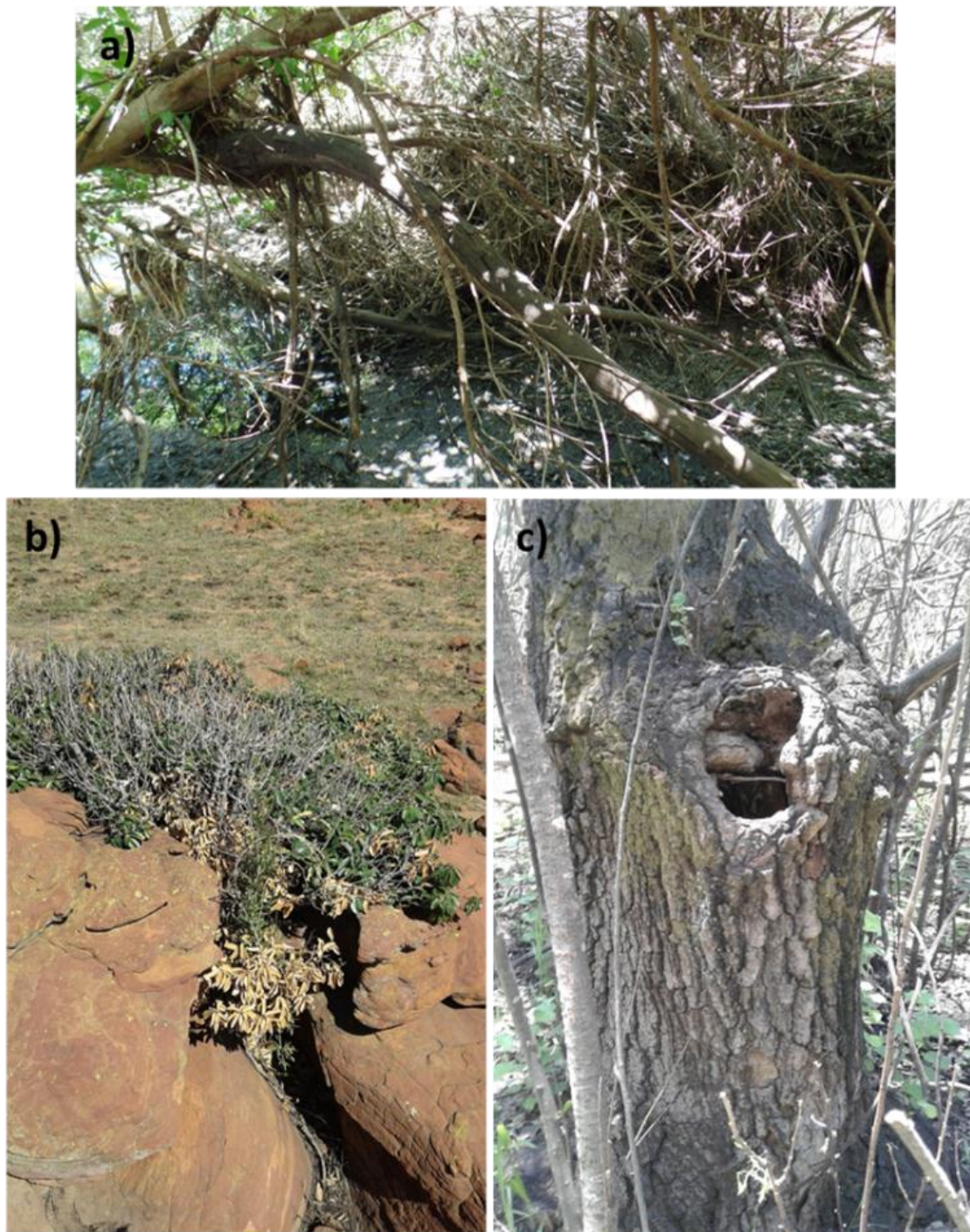


Figure 23: Resting sites of rusty-spotted genets in Telperion Nature Reserve were located in (a) dense vegetation, (b) rock crevices and (c) tree holes.

The number of different resting sites used by males and females throughout the study period did not differ (Table 8). There was also no difference between the number of sites used in different seasons (Table 8). The index of resting site reuse ($37\% \pm 17\%$) and the

resting site fidelity ($16\% \pm 25\%$) (Figure 24) were calculated. Neither differed between either sexes or seasons (Table 8). The minimum ambient temperature did not have an influence on resting site fidelity ($r_s = -0.05$; $p = 0.76$; $n = 34$).

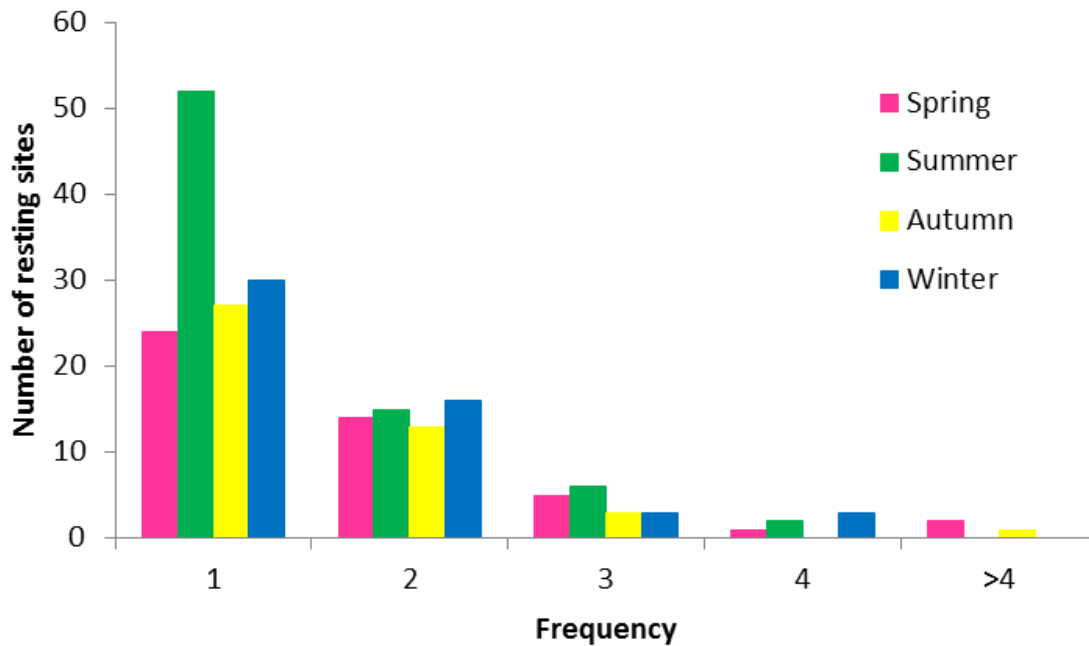


Figure 24: The number of resting sites used with different frequencies per season by rusty-spotted genets in Telperion Nature Reserve.

The distance between resting sites on successive days was significantly higher for males (938 ± 848 m; $n = 169$) than females (707 ± 661 ; $n = 204$) when the whole year was considered ($Z = 2.42$; $p = 0.02$) (Figure 25). The inter-resting site distance varied between a minimum value of 0 for both sexes, when they returned to the same resting site as the day before, and a maximum distance of 3 213 m for males and 2 541 m for females respectively.

Table 8: Comparison of different resting site parameters between male and female rusty-spotted genets as well as between seasons in Telperion Nature Reserve. Parameters were calculated per animal per season. Values are presented as Average \pm SD (n). No significant differences were found.

	Number of different resting sites	Index of resting site reuse	Resting site fidelity (%)
Males	8 \pm 5 (19)	0.36 \pm 0.15 (19)	20.4 \pm 31.2 (19)
Females	10 \pm 5 (16)	0.37 \pm 0.19 (16)	11.7 \pm 12.6 (16)
Mann-Whitney U- test	Z = -0.83; p = 0.42	Z = -0.46; p = 0.64	Z = 0.17; p = 0.87
Spring	7 \pm 4 (10)	0.37 \pm 0.23 (10)	12.8 \pm 14.9 (10)
Summer	12 \pm 3 (8)	0.37 \pm 0.14 (8)	8.0 \pm 9.5 (8)
Autumn	8 \pm 6 (10)	0.32 \pm 0.15 (10)	18.8 \pm 32.2 (10)
Winter	11 \pm 6 (7)	0.42 \pm 0.11 (7)	27.7 \pm 34.0 (7)
Kruskal-Wallis test	H = 4.80; p = 0.19; n = 35	H = 2.15; p = 0.54; n = 35	H = 2.40; p = 0.49; n = 35

The distance between resting sites for both sexes combined was significantly higher during autumn than during the other seasons (Figure 26). To clarify whether this difference might be related to mating actions, differences between males (1178 \pm 892 m; n = 32) and females (1270 \pm 733 m; n = 44) were considered for autumn only. No significant difference was however found (Z = 0.72; p = 0.47).

No significant correlation was found between the total home range size and the number of different resting sites used during the course of the year ($r_s = 0.47$; p = 0.07; n = 15). This was also true when seasons were considered separately (spring: $r_s = 0.27$; p = 0.45; n = 10; summer: $r_s = -0.11$; p = 0.80; n = 8; autumn: $r_s = 0.29$; p = 0.53; n = 7; winter: $r_s = 0.68$; p = 0.09; n = 7). There was also no significant correlation between the total home range size and the average distance between resting sites ($r_s = 0.47$; p = 0.21; n = 15).

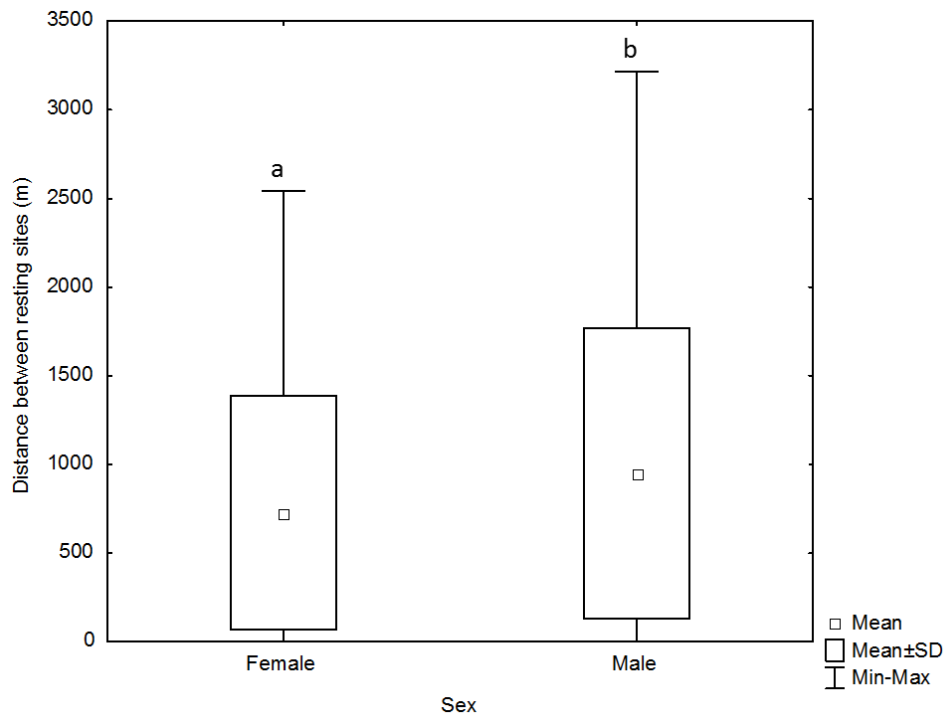


Figure 25: Boxplot showing the distance (m) between resting sites on consecutive days for male and female rusty-spotted genets in Telperion Nature Reserve. Similar letters indicate no significant differences while different letters indicate significant differences.

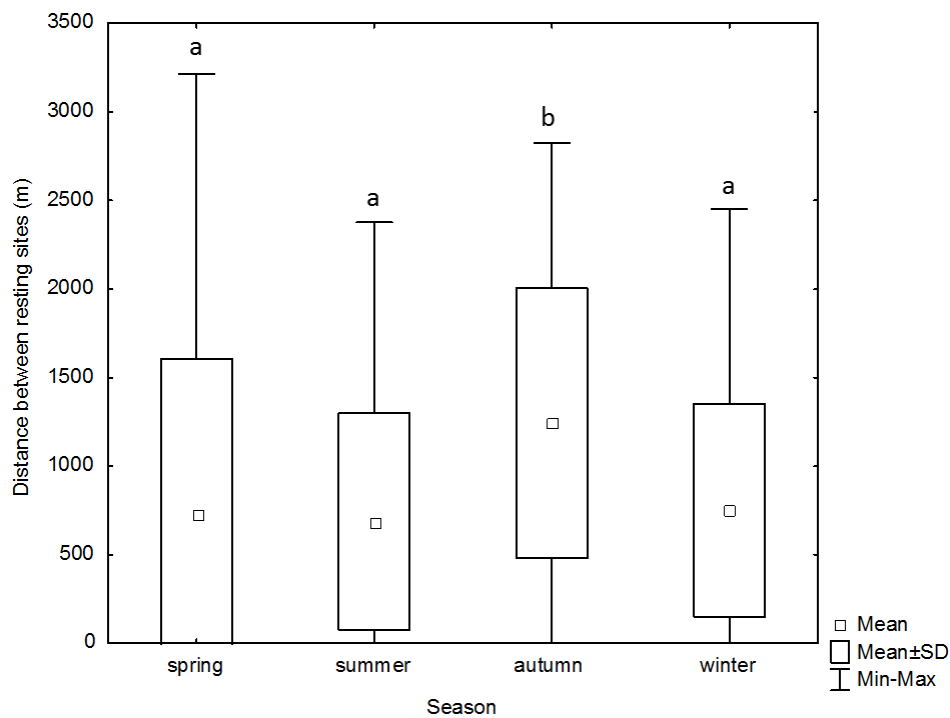


Figure 26: Boxplot showing the distances (m) between resting sites on consecutive days for both male and female rusty-spotted genets during the different seasons in Telperion Nature Reserve. Similar letters indicate no significant differences while different letters indicate significant differences.

The distance between resting sites on consecutive days increased significantly with increasing night length ($r_s = 0.16$; $p < 0.05$; $n = 316$). The correlation was also significant when only data for summer was analysed (Figure 27). There were however no significant correlations between the distances between resting sites on consecutive days and the corresponding night lengths for spring ($r_s = 0.01$, $p = 0.94$, $n = 80$), autumn ($r_s = 0.08$, $p = 0.54$, $n = 65$) or winter ($r_s = 0.13$, $p = 0.27$, $n = 77$).

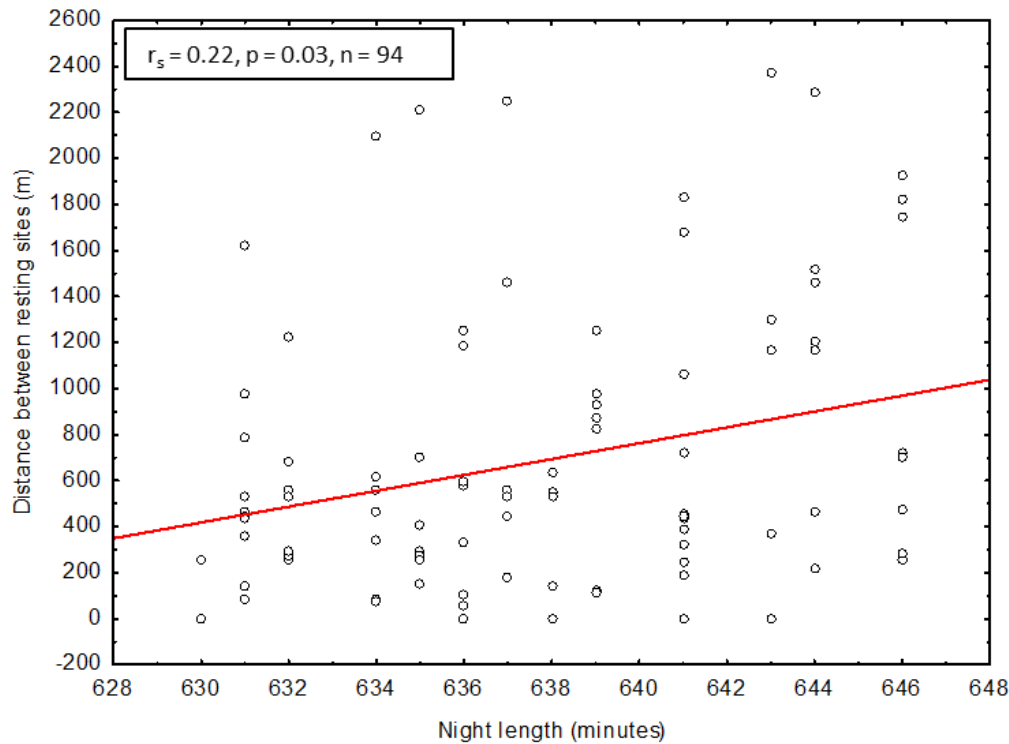


Figure 27: Spearman's rank-order correlation showing a significant positive correlation between the night length and the distance between resting sites on consecutive days during summer for rusty-spotted genets in Telperion Nature Reserve.

4.5 Spatial ecology

For all animals across all seasons the home range sizes (99% kernel home ranges) were on average $3.33 \pm 1.66 \text{ km}^2$ while core areas (50% kernel core areas) were $1.76 \pm 1.43 \text{ km}^2$ in size. No significant difference was found between either the total home range size or the size of the core area for sexes or between seasons (Table 9; Figure 28). None of the seasonal home ranges differed between sexes (Table 10). A significant correlation was found between the total size of the home ranges and the sizes of the 50% core areas ($r_s = 0.88$; $p < 0.05$; $n = 12$) (Figure 29).

Home ranges shifted on average 544.7 ± 547.7 m each season. The distance that home ranges shifted each season did not differ between seasons or sexes (Table 9). Home range overlaps occurred mainly between males and females (Table 11). Overlap between animals of the same sex did also occur, as exemplified by F5 and F10 (females) during summer, as well as M11 and M13 (males) during winter (Figure 30).

Of the tracked animals' home ranges, 77.9% overlapped with Loskop Mountain Bushveld while only 22.1% overlapped with Rand Highveld Grassland (Figure 31a). The greater overlap with Loskop Mountain Bushveld was even more evident when only the core areas were used in the calculation. Of the core areas, 90.5% overlapped with Loskop Mountain Bushveld, while only 9.5% overlapped with Rand Highveld Grassland (Figure 31b). The general shape of the home ranges conformed to these existing vegetation structures. The higher the percentage available Loskop Mountain Bushveld were in a home range, the more it was utilized in the core areas (Figure 32).

The daily movement distance for rusty-spotted genets was on average $4\,626.5 \pm 2\,130.7$ m. There was no significant difference between the daily movement distances for males or females or between seasons (Table 9). The average daily movement distance of individual genets was not correlated with the corresponding total individual home range sizes ($r_s = 0.21$; $p = 0.46$; $n = 15$), or with the seasonal home range sizes ($r_s = 0.33$; $p = 0.07$; $n = 31$) of the animals. An outlier resulting from a roaming animal with no set home range were removed before this correlation was done.

The daily travel speed was on average 0.44 ± 0.16 km/h and did not differ between males and females. On a seasonal basis the daily travel speed also did not differ (Table 9). Travel speed was significantly correlated with the seasonal home range size (Figure 33), but not with the total home range size ($r_s = 0.14$, $p = 0.62$, $n = 15$). The outlier was again removed before the correlation was done. Travel speed was also calculated for 30 minute periods. During such short foraging or travelling phases, the average speed was 0.46 ± 0.44 km/h with a minimum of 0.00 km/h and a maximum of 4.23 km/h.

Table 9: Comparison between sexes and seasons for spatial parameters of rusty-spotted genets in Telperion Nature Reserve. Values are presented as the Average \pm SD (n). Averages of the home range shift between seasons were calculated between spring and summer; summer and autumn; and autumn and winter. No significant differences were found.

	Home range size (km ²)	50% core area size (km ²)	Home range shift between seasons (m)	Daily movement distance (m)	Daily travel speed (km/h)
Males	2.9 \pm 2.3 (6)	0.1 \pm 0.1 (6)	566.2 \pm 656.0 (10)	4 945.3 \pm 2 466.0 (49)	0.5 \pm 0.2 (49)
Females	3.3 \pm 2.0 (6)	0.2 \pm 0.2 (6)	523.1 \pm 449.4 (10)	4 326.0 \pm 1 728.7 (52)	0.4 \pm 0.1 (52)
Mann-Whitney U-test	Z = 0.5; p = 0.6	Z = 1.4; p = 0.2	Z = 0.2; p = 0.8	Z = 1.2; p = 0.2	Z = 0.9; p = 0.4
Spring	1.8 \pm 1.6 (5)	0.1 \pm 0.1 (5)		4 775.5 \pm 2 851.9 (28)	0.4 \pm 0.2 (28)
Summer	1.5 \pm 0.9 (7)	0.1 \pm 0.0 (7)	690.4 \pm 488.1 (8)	4 529.5 \pm 1 324.2 (26)	0.4 \pm 0.1 (26)
Autumn	1.3 \pm 0.5 (3)	0.1 \pm 0.0 (3)	340.4 \pm 303.5 (7)	5 232.5 \pm 1 951.4 (22)	0.4 \pm 0.1 (22)
Winter	1.8 \pm 1.2 (5)	0.1 \pm 0.0 (5)	597.5 \pm 866.6 (5)	4 027.1 \pm 1 964.7 (25)	0.4 \pm 0.1 (25)
Kruskal-Wallis test	H = 0.3; p = 1.0	H = 1.2; p = 0.8	H = 1.8; p = 0.4	H = 4.8; p = 0.2	H = 0.2, p = 1.0

Table 10: Seasonal home range sizes (km²) for male and female rusty-spotted genets in Telperion Nature Reserve. Values are presented as the Average \pm SD (n). No significant differences were found between sexes during any of the seasons.

	Spring	Summer	Autumn	Winter
Male	3.7 \pm 2.2 (5)	2.1 \pm 2.1 (3)	2.5 \pm 2.0 (4)	1.4 \pm 1.2 (5)
Female	3.9 \pm 6.4 (5)	2.4 \pm 1.4 (5)	2.0 \pm 1.0 (3)	2.4 \pm 1.1 (2)
Mann-Whitney U test	Z = 1.1; p = 0.3	Z = 0.4; p = 0.7	Z = 0.7; p = 0.5	Z = -1.1; p = 0.2

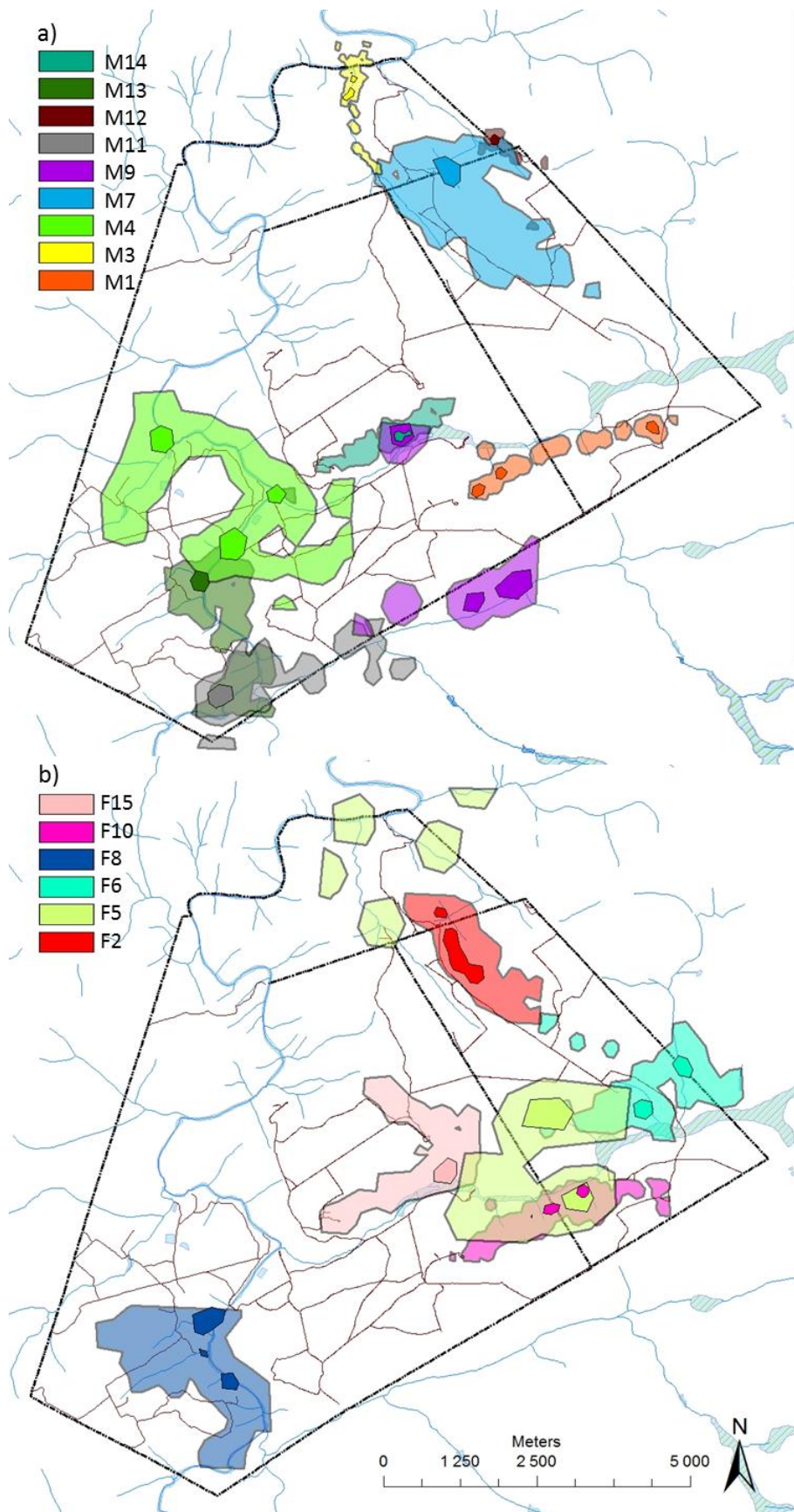


Figure 28: 99% fixed kernel home ranges of (a) male and (b) female rusty-spotted genets in Telperion Nature Reserve with 50% fixed kernel core areas indicated in darker shades of each colour.

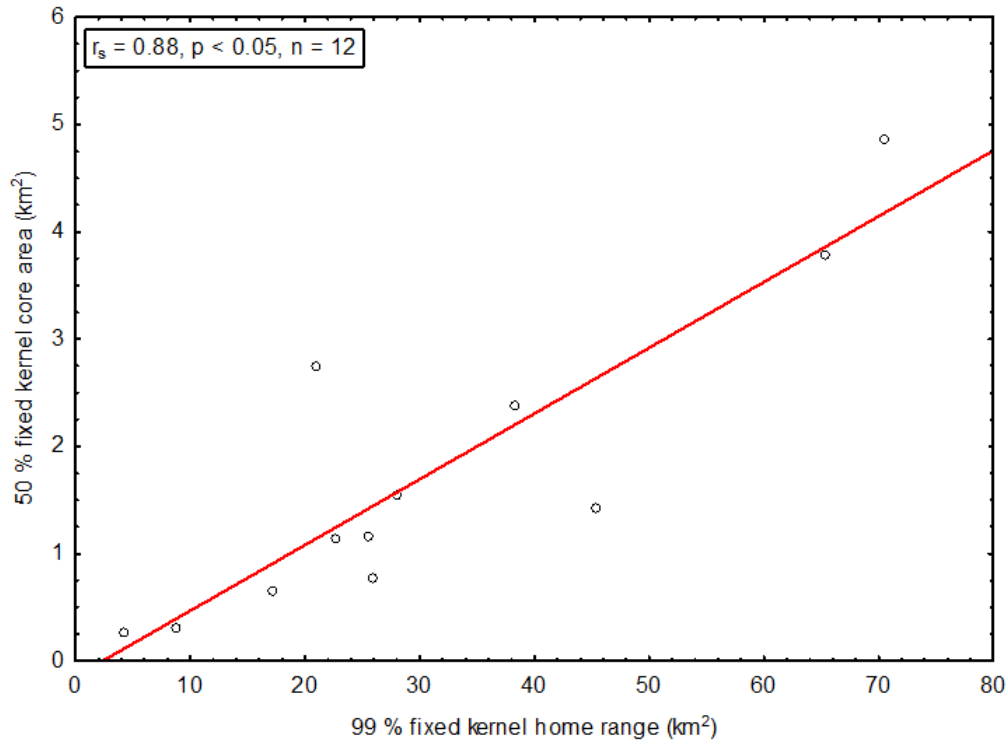


Figure 29: Spearman's rank-order correlation showing a significant correlation between the total size of the home ranges and the size of the 50% core areas (km²) of rusty-spotted genets in Telperion Nature Reserve.

Table 11: The percentage overlap between the home ranges of male and female; male and male; and female and female rusty-spotted genets in Telperion Nature Reserve. Values are presented as the Average \pm SD (n). No significant differences were found between the different seasons.

	Male–Female	Male–Male	Female–Female
Spring	25.4 \pm 31.7 (9)	0	0
Summer	30.2 \pm 43.7 (6)	0	1.0 \pm 0.3 (2)
Autumn	10.8 \pm 10.9 (4)	0	0
Winter	38.7 \pm 37.1 (4)	26.1 \pm 20.9 (2)	0
Kruskal-Wallis test	H = 2.7; p = 0.4	-	-

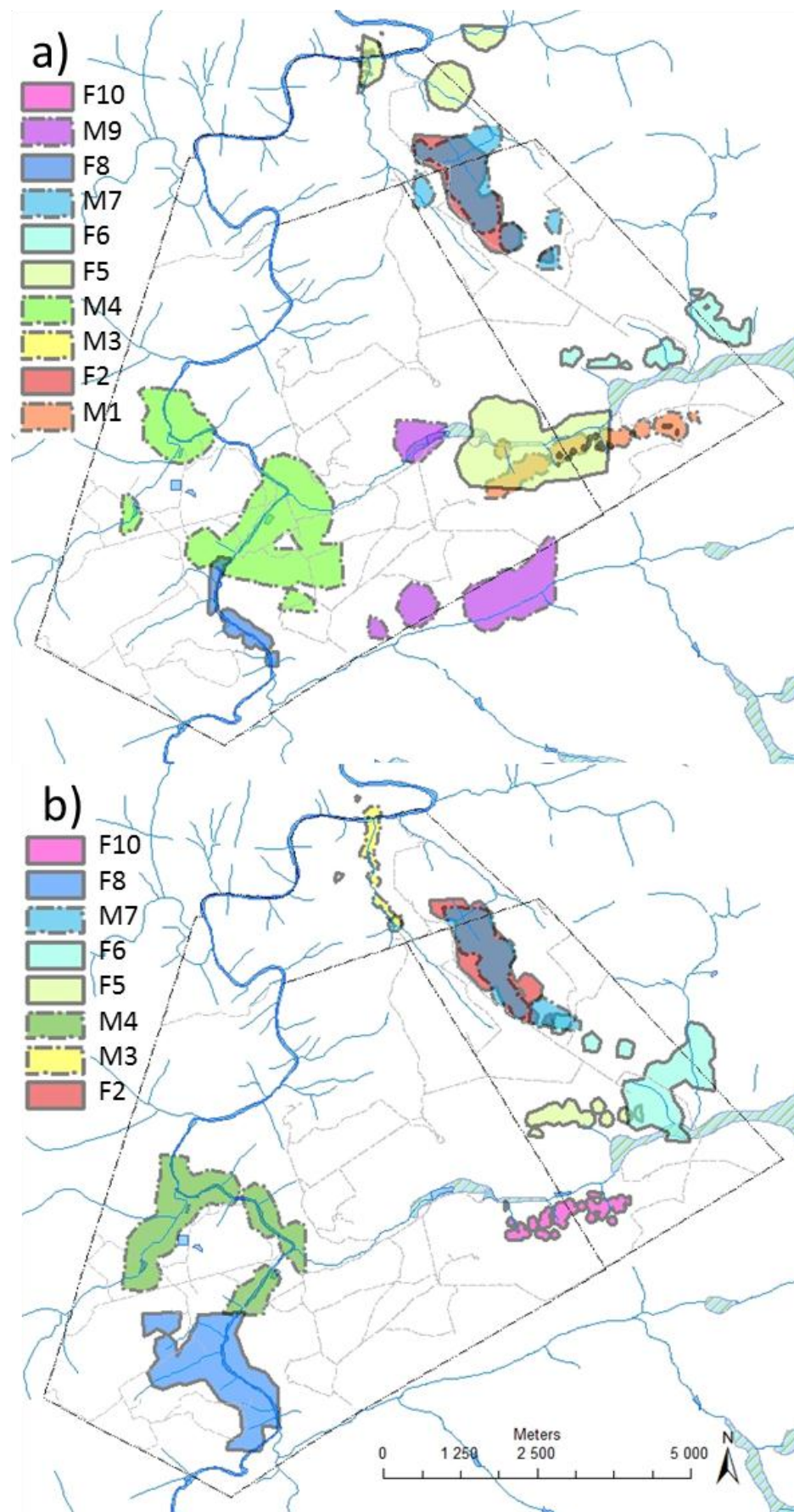


Figure 30: 99% fixed kernel home ranges of rusty-spotted genets in Telperion Nature Reserve for (a) spring and (b) summer.

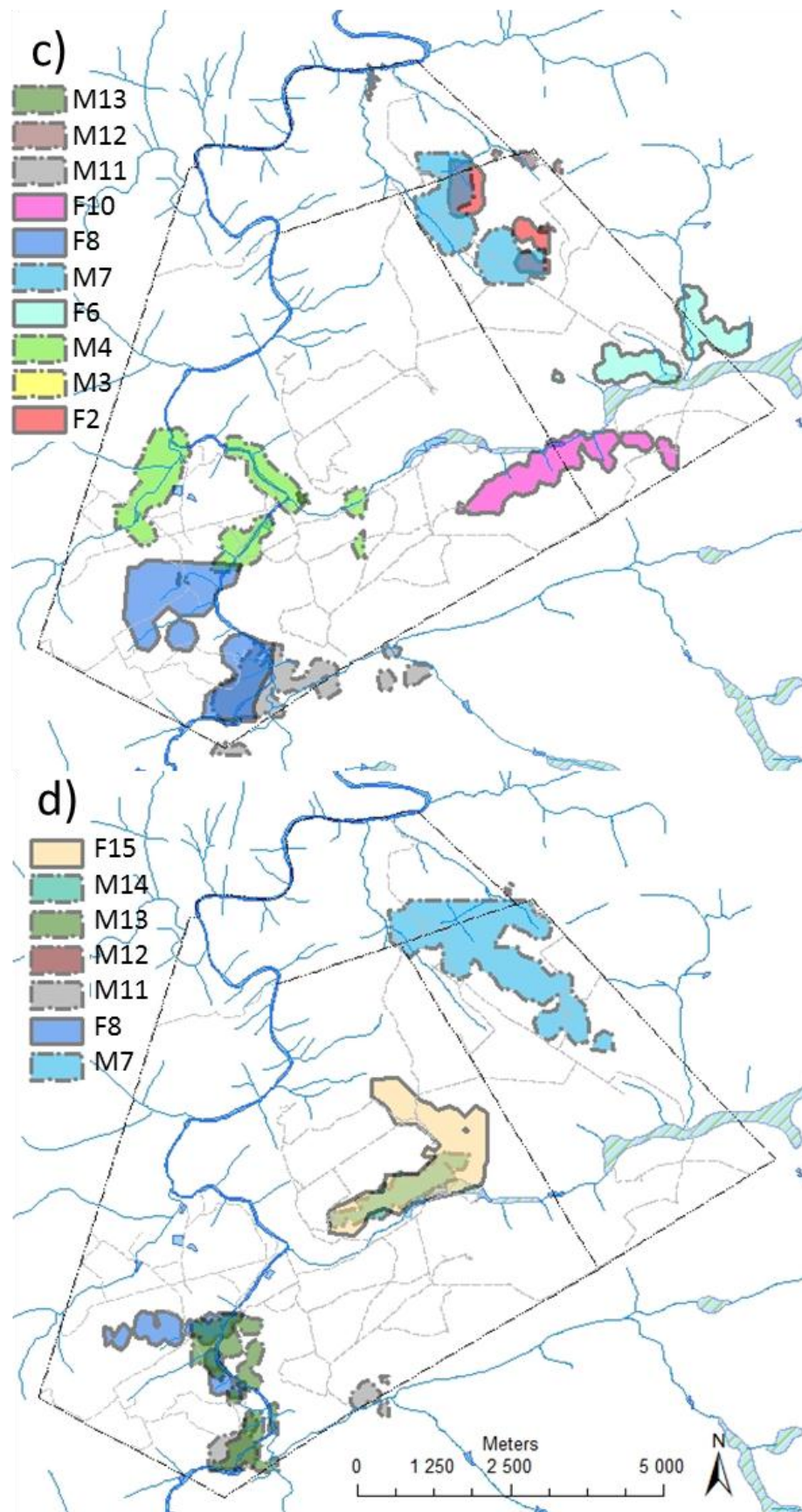


Figure 30: 99% fixed kernel home ranges of rusty-spotted genets in Telperion Nature Reserve for (c) autumn and (d) winter.

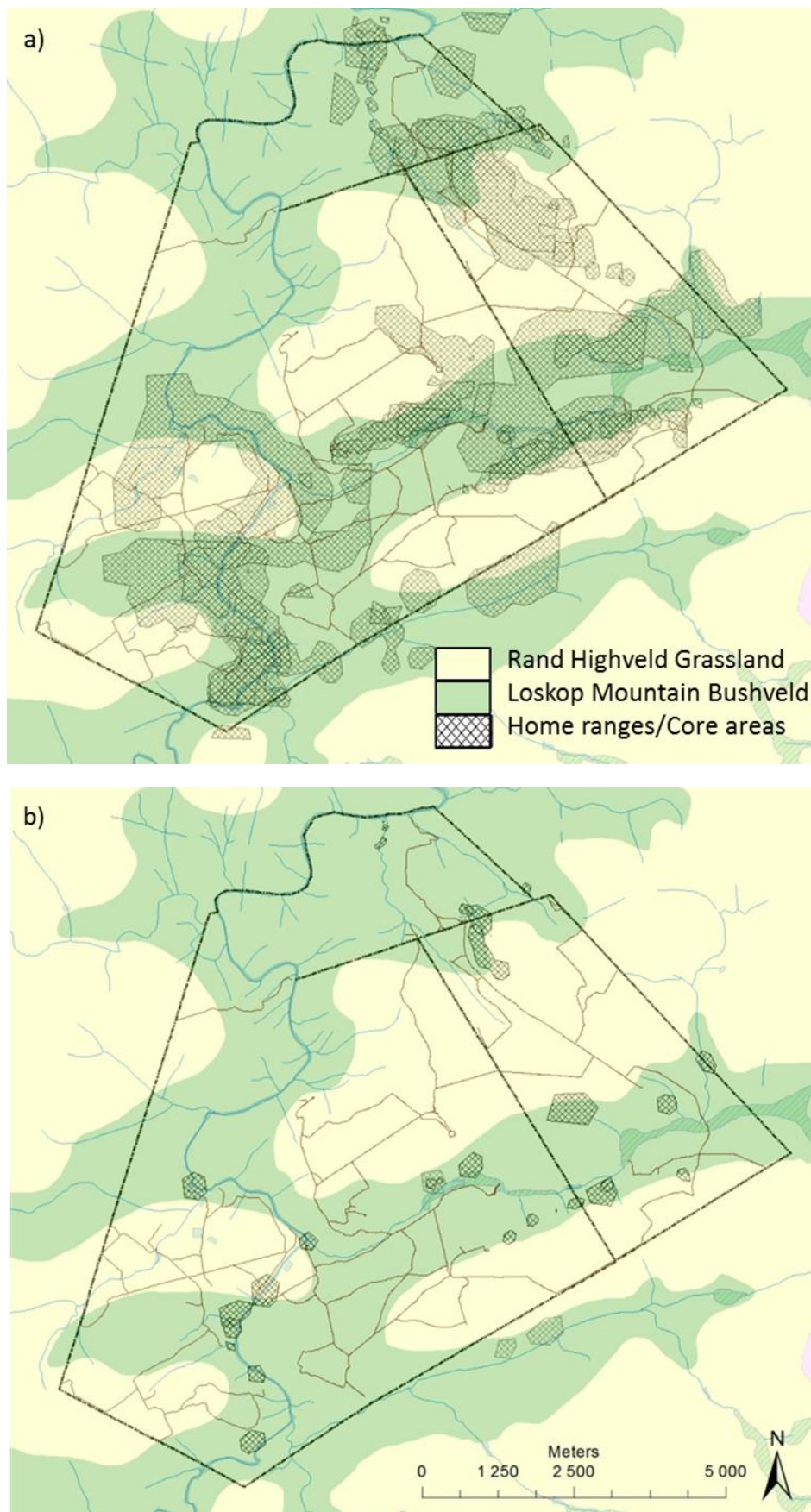


Figure 31: Overlap of (a) 99% home ranges and (b) 50% core areas used by the rusty-spotted genets with the two vegetation types present in Telperion Nature Reserve.

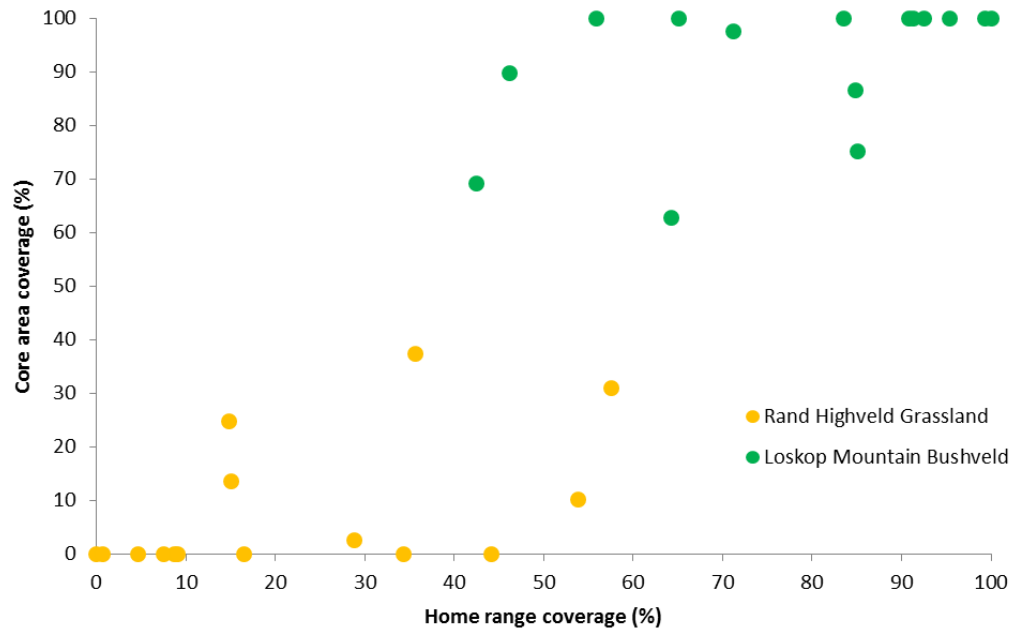


Figure 32: Influence of the percentage home range coverage by Rand Highveld Grassland and Loskop Mountain Bushveld on the percentage core area coverage of each vegetation type.

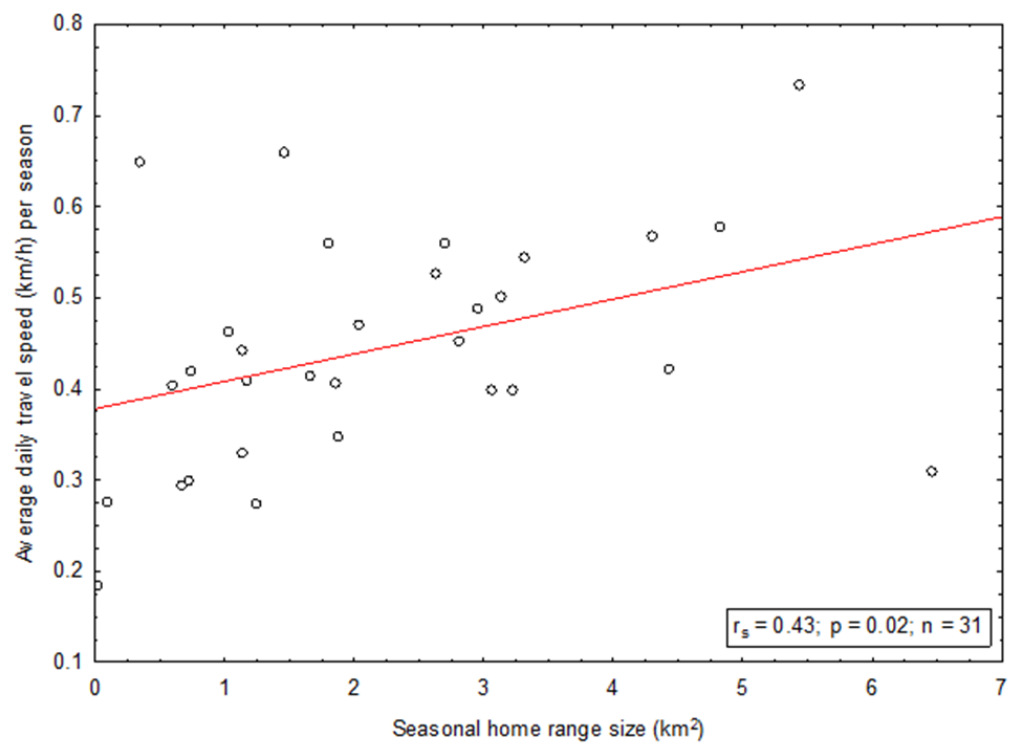


Figure 33: Spearman's rank-order correlation showing a significant positive correlation between the seasonal home range sizes (km²) and the average daily travel speed (km/h) per season for rusty-spotted genet in Telperion Nature Reserve.

Chapter 5

Discussion

5.1 Trapping success

Trapping success seemed relatively low (5.89%), but was similar to other studies. Camps Munuera and Llimona Llobet (2004) trapped 16 common genets, *Genetta genetta*, in 216 trapping nights (7.41% success). The genets studied by Camps Munuera and Llimona Llobet (2004) had home ranges of 1.13 km² (males) and 0.72 km² (females) respectively, which were smaller than the home ranges of rusty-spotted genets in Telperion Nature Reserve and indicates a higher density which would make it more likely to trap them. Carvalho *et al.* (2014) trapped 32 common genets in 1 886 trapping nights (1.70% success). Rodriguez-Refojos *et al.* (2011), trapping in three different sites captured 55 common genets in 7 550 trapping nights (0.73% success), 17 common genets in 216 trapping nights (7.87% success), and 41 common genets in 4 653 trapping nights (0.88% success). Furthermore Zuberogoitia *et al.* (2002) trapped 21 common genets in 1 199 trapping nights (1.75% success). The relatively low trapping success generally, can be an indication of the low density of genets due to their solitary nature. This will also be the reason why trapping success decreases when the number of trapping nights become extremely high. In an area with a specific genet density, all individual genets are likely to be trapped after a certain number of trapping nights and increasing the number of trapping nights will not result in an increase in the number of new genets trapped anymore.

The success rate of traps was similar in woodlands, rocky outcrops and riverine vegetation indicating that rusty-spotted genets use these areas to the same extent. These areas all provide enough cover and genets probably feel safe to use them. Should traps be set out in open grassland areas, however, I would not expect to trap any genets at all (Palomares & Delibes 1994; Zuberogoitia *et al.*, 2002; Blaum *et al.*, 2007; Sarmiento *et al.*, 2009; Galantinho & Mira, 2009; Camps & Alldredge, 2013). The reason why the success rate of traps increased with an increase in altitude could corroborate this expectation. In Telperion Nature Reserve, woody areas are often found on ridges while grasslands are generally located in the lowland areas. Genets prefer these woody areas due to the cover

that it gives (Palomares & Delibes 1994; Zuberogoitia *et al.*, 2002; Blaum *et al.*, 2007; Sarmiento *et al.*, 2009; Galantinho & Mira, 2009; Camps & Alldredge, 2013) and would thus be more likely to be trapped in these areas.

5.2 Morphometrics

Similar to rusty-spotted genets in Telperion Nature Reserve, Martinoli *et al.* (2006) also found that male rusty-spotted genets in Tanzania were significantly larger, and heavier, than females (Table 12).

Table 12: Mass of rusty-spotted genets in different countries.

Location	Mass (kg) (n)		Reference
	Male	Female	
Telperion Nature Reserve	1.76 (8)	1.53 (4)	This study
Tanzania	1.21 (6)	0.81 (5)	Martinoli <i>et al.</i> , 2006
Kenya	1.9 (3)	1.5 (2)	Fuller <i>et al.</i> , 1990
Botswana	2.1 (7)	2.0 (7)	Smithers, 1971
Nigeria	1.9 (16)	1.7 (13)	Kingdon <i>et al.</i> , 2013
Zimbabwe	1.8 (28)	1.7 (28)	Kingdon <i>et al.</i> , 2013

Few significant differences were found in the morphometric measurements of rusty-spotted genets in Telperion Nature Reserve. Differences in foot sizes were small and also not consistent across sexes with the front right footprint length of females being larger than those of males, while the foot length of the hind right foot of males were larger than those of the females. I will thus rather ascribe these differences to the sample size of 15 genets being too small. Rodriguez-Refojos *et al.* (2011) also found no significant difference in the morphometric data of male and female common genets. The neck circumference of rusty-spotted genet males in Telperion Nature Reserve are however significantly larger than that of females and could be due to the fact that males have to fight to defend their territories. They will thus need larger and better developed muscles in their neck area. Thorsell (2009) similarly found a larger neck circumference for male Malay civets (*Viverra zibetha*) than for females in Indonesia, but did not regard it as

indicative of anything due to the absence of any other significant morphological differences as was found in my study.

Only the mass of the animals increased as they got older. Their bodies are thus completely developed at a young age as their morphometrics did not change with age. They probably pick up mass as they get older as a result of muscle development and also because their skills and ability to hunt improve, which possibly allow them to eat more regularly. The importance of weighing these animals before collaring them should therefore be emphasized, as an animal might look fully grown, but can still be too light, and thus not strong enough, to handle the mass of the collar.

5.3 Activity patterns

Genets are primarily nocturnal (Dücker, 1965; Rowe-Rowe, 1971; Lack, 1977; Waser, 1980; Ikeda *et al.*, 1982, 1983; Smithers, 1983; Fuller *et al.*, 1990; Maddock & Perrin, 1993; Palomares & Delibes, 1994; Camps, 2008) and the rusty-spotted genet is no different as can be seen not only with the high nocturnality index (0.84), but also in the significant correlation ($r_s = 0.70$; $p < 0.05$; $n = 102$) between activity onset and sunset time (Palomares & Delibes, 1994). This is the case for most of the smaller carnivores (Morrell, 1972; Trapp & Hallberg, 1975; Lindsay & Macdonald, 1986; Geffen & Macdonald, 1993). Such smaller carnivores can be nocturnal for different reasons, one of which can be heat avoidance. Their long bodies allow them to absorb heat quicker while the fact that they are small increase their waterloss-rate and thus chance to dehydrate (Harlow, 1994). Another reason for nocturnality can be predator avoidance as the lower visibility during the night make them less exposed to larger predators. Prey availability can also increase nocturnality (Cloudsley-Thompson 1961; Geffen & Macdonald, 1993). Rodents are usually active during the night (Lodé, 1995; Flowerdew, 2000; Schmidt *et al.*, 2009) and make up a large part of a genet's diet (Palomares & Delibes, 1992).

However, some diurnal activity was recorded in rusty-spotted genets in Telperion Nature Reserve and it cannot be stated that these animals are exclusively nocturnal as suggested by several authors (Ikeda *et al.*, 1982, 1983; Fuller *et al.*, 1990; Maddock & Perrin, 1993; Palomares & Delibes, 1994). Such occasional diurnal activity can be a result of disturbance by the trackers (Vila *et al.*, 1995; Klinka & Reimchen, 2002; Phelan & Sliwa,

2006), although this is unlikely in my study as the animals were tracked from about 300 m to 1 km away, with the tracking distance determined by plotting the location points (determined with triangulation) on a map. Juveniles are often found to be more active than adults (Palomares & Delibes, 1988; Ralls & Siniff, 1990; Palomares & Delibes, 1992) and age is one of the factors influencing genet activity (Kaczensky *et al.*, 2006). Only adults were considered in my study and active bouts were usually short in duration suggesting that genets were merely having grooming bouts within the resting site or were possibly moving from one resting site to another. Unfortunately it was impossible to determine whether they moved to different resting sites if these resting sites were only 30–40 m away. Such small distances cannot be picked up when radio-tracking from 300 m or further away. Daily movements could also be due to disturbance from predators or possibly the increase in the 24 h ambient temperature, which may make a resting site that was suitable early in the morning less suitable when it gets hot later in the day (Cloudsley-Thompson, 1961; Geffen & Macdonald, 1993). A denser vegetation structure and thus better cover also allows more activity during the day (Palomares & Delibes, 1988).

Similar to the results obtained by Camps (2008) for common genets, the rusty-spotted genets were also most active during the first half of the night (Figure 8). However, a second activity peak often was seen after a short resting bout, as was the case for common genets in Spain (Palomares & Delibes, 1988, 1994). Such a bimodal pattern of activity is common for many nocturnal carnivores, including common genets (Palomares & Delibes, 1994; Camps, 2008), polecats, *Mustela putorius* (Lodé, 1995; Marcelli *et al.*, 2003), European otters, *Lutra lutra* (Ruiz-Olmo, 1995), pine martens, *Martes martes* (Zalewski, 2001) as well as wolves, *Canis lupus* (Theuerkauf *et al.*, 2003). Bimodal activity patterns are also found in diurnal carnivores such as large grey mongooses, *Herpestes ichneumon* (Palomares & Delibes, 1992), spotted necked otters, *Lutra maculicollis* (Perrin & D’Inzillo Carranza, 2000), brown bears, *Ursus arctos* (Kaczensky *et al.*, 2006), Asiatic black bears, *Ursus thibetanus* (Hwang & Garchellis, 2007), Geoffroy’s cats, *Leopardus geoffroyi* (Manfredi *et al.*, 2011) and smooth-coated otters, *Lutrogale perspicillata* (Hussain, 2013). Short resting bouts during the active period also occurs in other species (Palomares & Delibes, 1992). Such resting bouts halfway through the activity period gives

the animals a chance to rest before continuing their search for prey. The resting bouts do not assist with digestion as the animals have a long digestive tract retention time and resting bouts are too short to have an influence (Clevenger, 1996).

As observed in radio-tracked rusty-spotted genets in Telperion Nature Reserve, Camps (2008) found that male common genets in the Iberian Peninsula display higher activity than females. Such differences in activity could be attributed to the higher body mass of males (Zalewski, 2001; Camps, 2008; Zschille *et al.*, 2010). Larger individuals have higher energy requirements and need to be more active to find more food (Peters, 1983; Bunnell & Harestad, 1990; Palomares & Delibes, 1994). Alternatively, the smaller females lose their body heat more easily and will for that reason be more likely to avoid cold winter nights (Harlow, 1994; Zschille *et al.*, 2010). The difference between male and female activity in winter is evident in Figure 8d. The increased activity among males could also be due to territoriality as the males need more time to patrol their home ranges (Ray, 1997). During certain times of the year, males also need to find females to mate with, which will increase their activity (Camps Munuera & Llimona Llobet, 2004; Schmidt *et al.*, 2009). Similarly, the activity patterns of females will change when they have to rear young (Schmidt *et al.*, 2009). Significantly higher female activity during spring or summer was however not found in my study.

The breeding period of the genets influences their seasonal activity as was also found in other smaller carnivores such as stoats, *Mustela erminea* (Debrot & Mermod, 1983), fishers, *Pekania pennanti* (Arthur & Krohn, 1991), polecats (Lodé, 1995), stone martens (Posillico *et al.*, 1995), Eurasian lynx, *Lynx lynx* (Schmidt, 1999) and pine martens (Zalewski, 2000, 2001). Rusty-spotted genets generally breed during the summer months (Smithers, 1971; Smithers & Wilson, 1979) and have a gestation period of about 70 days (Gittleman, 1986) and a lactation period of 56 days (Eisenberg, 1981). Mating during spring and raising kittens during summer and into autumn increases their activity during these months effectively showing a shorter activity period during winter.

However, the main factor influencing seasonal changes in genet activity is believed to be food availability (Aschoff, 1964; Nielsen, 1983; Halle, 2000), as has also been found for other carnivores such as polecats (Lodé, 1995) and common weasels, *Mustela nivalis*

vulgaris (Brandt & Lambin, 2005). Changes in the activity of the prey species of genets will thus also influence the activity of genets similar to what Kruuk (1995) found for European otters. Genets feed on small mammals as well as invertebrates and the distribution as well as activity patterns of these prey will thus effect the activity of the genets (Curio, 1976; Melquist & Hornocker, 1983; Zielinski *et al.*, 1983, Ferguson *et al.*, 1988; Palomares & Delibes, 1988; Palomares & Delibes, 1991a; Palomares & Delibes, 1992; Perrin & D’Inzillo Carranza, 2000; Theuerkauf *et al.*, 2003; Schmidt *et al.*, 2009; Zschille *et al.*, 2010; Manfredi *et al.*, 2011). Genets should be more active during times when their prey are most vulnerable (Halle & Stenseth, 2000; Theuerkauf *et al.*, 2003), i.e. when the prey are active and thus sending some sort of signal (visual, scent or noise) that would indicate where they are (Cloudsley-Thompson, 1961; Curio, 1976; Pereira, 2010). The activities of invertebrates are affected by the weather conditions, specifically temperature (Holm & Edney, 1973; Whitford & Ettershank, 1975; Thomas, 1979; Kruuk, 1978; Macdonald, 1980; Abushama, 1984), which changes with seasons. During winter invertebrates are scarce and genets will need to increase their hunting efforts, decrease their activity to save energy or change their food source (Trites & Donnelly, 2003). Insects such as those belonging to the orders Coleoptera and Orthoptera are available throughout the day and night (Posillico *et al.*, 1995), but are more easily found and thus eaten during the warmer seasons (Amroun *et al.*, 2014). Similarly fruits are also more available during the warmer months especially late summer and autumn (Amroun *et al.*, 2014). The significance of prey availability as a factor determining predator activity patterns has often been found when the activity patterns of carnivores change during times of food scarcity (Zielinski, 1988; Salvatori *et al.*, 1999; Pereira, 2010). In this way they try to use energy more efficiently so as not to negatively influence their body condition (Trites & Donnelly, 2003). Posillico *et al.* (1995), however, concluded that food availability does not influence the activity of stone martens. It is likely that many different factors combined determined genet activity.

One might expect a reduced activity period when food is commonly available, as animals more readily meet their energy requirements (Brandt & Lambin, 2005). It would then make sense for genets to retreat to a safe resting site to avoid unnecessary encounters with predators. However, such a pattern was not found in common weasels which were

more active at times when food was freely available. The length of the common weasel's activity period possibly was influenced by factors other than food availability, such as the weather or interaction between individuals (Brandt & Lambin, 2005). Polar bears, *Ursus maritimus*, also were more active when food was more readily available (Ferguson *et al.*, 2001). The decrease in activity when food is scarce (during winter) is attributed to the fact that the animals move less to rather conserve their energy than spend it in a fruitless search for food and lose their body heat in the process (Ferguson *et al.*, 2001; Hwang & Garshelis, 2007). Although the environmental conditions in the Telperion Nature Reserve is by no means as severe as those experienced by polar bears in their natural habitat, the decrease in rusty-spotted genet activity during winter also may have been related to the colder nights at this time of year. The duration of the activity period was longer during autumn. During this season food is also less available than during the other seasons, but temperatures are still high enough for genets to continue their search for food without an extreme influence on their body condition. Such patterns were also found in Asiatic black bears (Hwang & Garshelis, 2007).

Genets are not physically adapted to endure extremely cold temperatures. Similarly, martens in Poland are also not adapted for cold temperatures and avoid temperatures below 0 °C (Zalewski, 2000). In Telperion Nature Reserve the ambient temperature during winter nights decrease below 0 °C and the rusty-spotted genets tend to terminate activity when temperatures reach 4 °C (R. Roux pers. obs. 2015–2016). To avoid the thermal stress that accompanies very low temperatures, animals stay in their resting sites during such periods and so avoid exposure to the cold (Thompson & Colgan, 1991). In some species, animals do not avoid cold temperatures as the heat that they produce while being active makes up for the heat loss to the environment (Covell *et al.*, 1996; Zalewski, 2000). However, due to the small and long body of genets, the heat loss to the environment likely will be greater than the heat generated with activity. As a result, most of the smaller carnivores reduce their activity during the colder months (Birks & Linn, 1982; Skirnisson, 1986; Robitaille & Baron, 1987; Buskirk *et al.*, 1988; Dunstone, 1993; Niemimaa, 1995; Manfredi *et al.*, 2011).

Other climatological factors such as wind (Buskirk *et al.*, 1988; Geffen & Macdonald, 1993), rain (Geffen & Macdonald, 1993; Brandt & Lambin, 2005) and cloud cover

(Shortridge, 1934) can play a significant role in the seasonal changes of carnivore activity. Weasels were less active in cool, wet conditions (Brandt & Lambin, 2005). Camps (2008) however found that the Mediterranean climate in Spain did not influence the activity of genets, which is contrary to what I found even though my study also took place in an area with hot summers and mild winters.

Manfredi *et al.* (2011) found that Geoffroy's cats were more active during brighter nights (clear sky and full moon) which was contrary to what I found. The rusty-spotted genet was less active when the sky was less cloudy (0–39% cloud cover) and especially when the moon was full (R. Roux pers. obs. 2015–2016). This is probably due to their higher visibility to predators. Rusty-spotted genets were significantly more active when soil conditions were humid. This coincides with light rain and an overcast sky, which were the weather conditions when visibility to predators was low. Due to the vast abundance and diversity of predators of genets such as leopard, *Panthera pardus*, black-backed jackal, *Canis mesomelas*, brown hyena, *Hyaena brunnea*, and caracal, *Caracal caracal*, in Telperion Nature Reserve, it can be expected that rusty-spotted genets will alter their activity patterns to avoid these animals. The remains of at least two rusty-spotted genets, which were probably preyed on by one of these animals, were found. Further research is however needed to determine the significance of the influence of moonlight and cloud cover on rusty-spotted genet activity.

Changes in predator activity can also be due to competition with other sympatric predators (Hayward & Hayward, 2007), avoidance of predators, disturbances by humans (Fox *et al.*, 1975; Eguchi & Nakazono, 1980; Van Dyke, 1986; Herrmann, 1989; Haspel & Calhoun, 1993), and changing day length (photoperiod). Extensive human disturbance in my study was however highly unlikely due to it being carried out in a conservation area.

The time of activity onset in many nocturnal carnivores can be explained by light conditions as it is correlated with sunset (Daan & Aschoff, 1975; Kavanau & Ramos, 1975; Nielsen, 1983; Geffen & Macdonald, 1993; Beltrán & Delibes, 1994). No significant correlation was found between the offset of activity and sunrise. This was also found for Blanford's foxes, *Vulpes cana*, in Israel (Geffen & Macdonald, 1993). A similar pattern was found for Egyptian mongooses, *Herpestes ichneumon*, in Spain even though these animals

were diurnal (Palomares & Delibes, 1992). Activity onset was regular and synchronized with sunrise while activity offset was irregular and not correlated with sunset time (Palomares & Delibes, 1992). Activity offset is thus rather influenced by other factors such as the feeding success during the active period (Garshelis & Pelton, 1980; Palomares & Delibes, 1992; Geffen & Macdonald, 1993).

Rusty-spotted genets are primarily nocturnal and make use of the darkness for cover when hunting. Males are more active than females possibly because they search for females to mate with as well as due to their larger body size. Seasonal changes in activity are evident – specifically in winter – and are probably a function of both food availability and temperature. Changes in genet activity cannot be seen as the function of a single factor, but rather of a combination of different factors such as feeding success, predator avoidance and reproductive behaviour.

5.4 Resting sites

Similar to previous studies on common genets, it also seemed like the rusty-spotted genet chose areas with a dense vegetation structure for their resting sites (Camps, 2011; Camps & Alldredge, 2013). Good vegetation coverage is probably the most important factor determining resting site selection of genets (Camps, 2011; Camps & Alldredge, 2013). Such areas not only provide the best protection against unfavourable weather conditions and predators, but are also a good source of food and often water (Palomares & Delibes, 1994; Virgós & Casanovas, 1997; Delibes, 1999; Larivière & Calzada, 2001; Virgós, 2001; Virgós *et al.*, 2001; Zuberogoitia *et al.*, 2002; Santos-Reis *et al.*, 2004; Matos *et al.*, 2009; Camps, 2011; Santos *et al.*, 2011; Carvalho *et al.*, 2014). Similar results were also found in other mammals such as the American marten, *Martes americana* (Buskirk, 1984; Buskirk *et al.*, 1989; Taylor & Buskirk, 1994; Wilbert *et al.*, 2000), pine marten (Brainerd *et al.*, 1995; Lindström *et al.*, 1995; Zalewski, 1997a, b), eastern spotted skunks, *Spilogale putorius* (Lesmeister *et al.*, 2008), Tibetan foxes, *Vulpes ferrilata* (Wang *et al.*, 2008), northern tamandua, *Tamandua mexicana* (Brown *et al.*, 2014), various rodents (Brown *et al.*, 1988), roe deer, *Capreolus capreolus*, and red deer, *Cervus elaphus* (Okarma *et al.*, 1997), as well as lizards (Pietrek *et al.*, 2009). According to Carpenter (1970), rusty-spotted genets are territorial, but in the current study territoriality could

not be noted in the way that they situate their resting sites as these were not positioned along the border of their home ranges, as observed in other carnivore species (e.g. European badgers, *Meles meles*: Doncaster & Woodroffe, 1993 and Egyptian mongooses: Palomares & Delibes, 1993).

The number of resting sites used per individual during the whole year did not differ between sexes, as was also found for common genets (Camps, 2011). Following Carvalho *et al.* (2015), an increase in sample size could alter this result as the reproductive actions of males (searching for females) and females (raising young) indicate that a difference in resting site use should occur. Due to a lack of time, I could however not increase my tracking efforts to enlarge my sample size. The number of resting sites did not increase significantly with an increase in home range size although this was found by Camps (2011) for common genets. Data to calculate home range sizes in the current study were collected over a longer time period than for resting sites and also not during the same time period as for resting sites. This might be a reason for the insignificant comparison. Other studies on genets suggested that a smaller home range size was the reason for the smaller number of resting sites found (Palomares & Delibes, 1994; Camps Munuera & Llimona Llobet, 2004). Indeed, animals with a smaller home range do not need such a large number of resting sites as fewer resting sites still satisfy their resting requirements (Camps, 2011). Furthermore the number of resting sites could increase in areas with a higher predation risk or sparsely distributed food sources (Brainerd *et al.*, 1995) or even with less competition with other genets (Camps, 2011). Carvalho *et al.* (2015) suggested that a minimum of 50 resting site locations should be collected to get significant results. It is therefore possible that my sample size was too small.

Some animal species use different resting sites to avoid the build-up of parasites within the resting site, including least weasels, *Mustela nivalis* (King, 1976), Egyptian mongooses (Palomares & Delibes, 1993), European badgers (Butler & Roper, 1996), pine martens (Zalewski, 1997b), and Eurasian red squirrels, *Sciurus vulgaris* (Wauters & Dhondt, 1990). They also select different resting sites to be closer to sources of food or mates (pine marten: Zalewski, 1997b). Different resting sites were reused with different frequencies by the rusty-spotted genets although differences between sexes and seasons were not significant. In Poland differences in resting site reuse by martens were correlated with

weather conditions and food availability (Zalewski, 1997b). In my study area, weather conditions during winter did however not reach such extreme low temperatures as in Poland (Zalewski, 1997b) and did not affect resting site fidelity. Resting site fidelity was very low for rusty-spotted genets in Telperion Nature Reserve which supports the parasite avoidance hypothesis (King, 1976; Wauters & Dhondt, 1990; Palomares & Delibes, 1993; Butler & Roper, 1996; Zalewski, 1997b). Another reason for the low resting site fidelity could be that the habitat contains many suitable areas for resting sites and animals do not need to go back to the same site continuously (Carvalho *et al.*, 2014).

If males use resting sites further apart on consecutive days, they will often have to cover a larger part of their home range during the active period. Such greater home range coverage likely increases their mating opportunities as it probably enables them to come into contact with more females, as observed in pine martens (Zalewski, 1997b). The distance between resting sites was not correlated with home range size, indicating that the larger home ranges of males was not the reason for the larger distances between resting sites. Zalewski (1997b) also suggested that males situate their resting sites along the border of nearby female home ranges in order to maximise their mating opportunities, which is also probable for male rusty-spotted genets. Males also select the locations for their resting sites in such a way that it will increase mating opportunities (Zalewski, 1997b).

Distances between resting sites on consecutive days were also higher during autumn than during the other seasons. I could again reason that rusty-spotted genets will likely have to cover a larger part of their home ranges to be able to reach resting sites that are further apart. A number of different explanations could describe this increase in distance between resting sites (and thus home range coverage) during autumn. One hypothesis could be that animals need to gain fat reserves before the colder winter months during which they spend more time inside their resting sites (see Chapter 4). Thus they would need to find more food during autumn. European badgers were found to accumulate such fat reserves before the colder months (Kruuk & Parish, 1983). A change in body fat was however not found for genets ever before, even in areas with harsher weather conditions than on my study site, which makes this an unlikely hypothesis. Pine martens

occurring in areas with cold winters also did not have body fat reserves, but rather adapted their activity patterns (Zalewski, 1997a).

A second hypothesis suggests that genets can increase their distances moved during autumn as they are less likely to encounter certain predators during this season. Potential predators of genets in Telperion Nature Reserve include leopard; black-backed jackal; brown hyena and caracal, as well as large birds of prey (Larivière & Calzada, 2001; Kingdon *et al.*, 2013). Animals often change their activity patterns significantly to avoid predators (Brillhart & Kaufman, 1991; Zalewski, 1997a, b). None of these predator species are however known to be less active during autumn (Sinclair, 2002; Skinner & Chimimba, 2005), which would have given genets the chance to increase their home range coverage. Predator avoidance is thus not seen as a plausible reason for the increase in the distance between resting sites on consecutive days during autumn.

A third possible explanation was the weather conditions during autumn which were mild, with a decrease in windy conditions. From previous research, wind was however not found to have any influence on the activity of the rusty-spotted genet in Telperion Nature Reserve (see Chapter 4).

Fourthly, and often a noteworthy aspect, is the mating behaviour of mammals. As mentioned earlier, a greater distance moved would increase the opportunity for mating. However the gestation period is 10 to 11 weeks (Kingdon *et al.*, 2013) and kittens are only born from September, as suggested by pregnant females ($n = 2$) trapped during this period as well as a lactating female trapped during October. This means that the mating period would be June–July (winter) and not during autumn and thus does not support this hypothesis.

Food availability and food distribution are the most plausible factors explaining the increase in distance between resting sites during autumn. Both also had a significant influence on the activity patterns of other carnivores such as the Asiatic golden cats, *Catopuma temminckii*, which were active during day and night time, reflecting the activity patterns of their prey (Kawanishi & Sunquist, 2008). Genets feed on a wide variety of food items of which rodents, insects and other arthropods make up the largest part (Carvalho & Gomes, 2001; Rosalino & Santos-Reis, 2002; Roberts *et al.*, 2007; Amroun *et*

al., 2014; Camps & Van den Broek, 2016). They hunt animals up to the size of hares and will also eat lizards, fruit and birds (Delibes *et al.*, 1989; Amroun *et al.*, 2006; Amroun *et al.*, 2014; Camps & Van den Broek, 2016). Genets are opportunistic feeders and will thus eat whatever food source is most abundant at a specific time period (Carvalho & Gomes, 2004; Amroun *et al.*, 2006).

Genets in Europe and northern Africa feed mainly on insects during summer, whereas fruit and birds are more important during autumn and winter (Calviño *et al.*, 1984; Delibes *et al.*, 1989; Gil Sánchez, 1998; Rosalino & Santos-Reis, 2002; Amroun *et al.*, 2006, 2014). Mammals play an important role in their diet throughout the year (Calviño *et al.*, 1984; Delibes *et al.*, 1989; Gil Sánchez, 1998; Rosalino & Santos-Reis, 2002; Amroun *et al.*, 2006, 2014). Insects are the most common food source in summer, as they are negatively affected by the cold weather conditions during winter (Mbatyoti, 2012), and mammals and birds thus have the highest numbers in winter, which is why these respective food sources are more common in genet diets during the respective seasons (Amroun *et al.*, 2014). The food source that is most easily caught (insects) is thus less available during autumn and winter making it necessary for genets to increase their hunting efforts to be able to obtain enough food (Rosalino & Santos-Reis, 2002; Amroun *et al.*, 2006).

The question then arises as to why similar patterns were not found in winter, as the prey species are then also less abundant. I suggest that this could be due to the low temperatures and that genets are less active in winter due to thermoregulatory challenges. It would therefore be a waste of energy to travel to further resting sites when no extra food can be consumed on the way, as suggested by Zalewski (1997b) for pine martens. Such a period of lethargy during the coldest times are described in many other carnivores (Tibetan foxes: Wang *et al.*, 2008; raccoon dogs, *Nyctereutes procyonoides*: Kowalczyk & Zalewski, 2011) and will result in a shorter daily travelling distance, and likely a shorter distance between resting sites on consecutive days.

The distance between resting sites on consecutive days increased with night length. This was specifically evident in summer when temperatures did not have such a big influence on activity. The positive correlation between the inter-resting site distance and the night length can be because longer nights allow more time to travel. The animal is thus likely to

be further away from the resting site of the previous night (point where activity started), when it terminates its activity at the end of the night. Resting sites on consecutive days can thus be further apart. The correlation between the inter-resting site distance and night length can also be a by-product due to a food shortage. Longer nights occur during late autumn and winter. These are the time periods when less food are available (Trites & Donnelly, 2003; Amroun *et al.*, 2014) and animals need to travel more in search of food. A longer travelling time is likely to result in a longer travelling distance and resting sites will be further apart.

5.5 Spatial ecology

No differences were found between the home range sizes of male and female rusty-spotted genets. There were also no differences when seasonal home ranges were compared within seasons only. However intersexual differences in home range sizes are common in carnivores with males generally having larger home ranges than females (Kruuk, 1995; Camps Munuera & Llimona Llobet, 2004). Camps Munuera and Llimona Llobet (2004) found this specifically for common genets during winter and suggested that males need more food because they are usually larger than females (Kruuk, 1995; Camps Munuera & Llimona Llobet, 2004). A larger home range is thus necessary to fulfil their requirements (Kruuk, 1995; Camps Munuera & Llimona Llobet, 2004).

Another reason why males may have larger home ranges than females could be related to the males searching for females to mate with, specifically during winter (Sandell, 1989; Camps Munuera & Llimona Llobet, 2004; Zschille *et al.*, 2010). If however the density of animals in a specific area is high, it would negate the need for males to travel far in search of females and home range sizes will not necessarily significantly increase (Liberg *et al.*, 2000). The density of animals in my study could not be evaluated accurately as traps were only occasionally set, and therefore whether all animals in an area were trapped is unknown.

Home range sizes for rusty-spotted genets in Telperion Nature Reserve did not differ between the different seasons. Generally home range sizes could change seasonally due to food availability and its distribution (Hixon, 1980; Macdonald, 1983; Spong, 2002; Camps Munuera & Llimona Llobet, 2004; Bartoszewicz *et al.*, 2008). Home range size will

increase as food availability decreases and thus as the habitat quality becomes worse (Harestad & Bunnell, 1979; Powell, 1979; Hixon, 1980; Lindstedt *et al.*, 1986; Powell, 1987; Sandell, 1989; Weber, 1989; Reid *et al.*, 1991; Dunstone, 1993; Palomares & Delibes, 1994; Joshi *et al.*, 1995; Johnson *et al.*, 2000; Lodé, 2000; Camps Munuera & Llimona Llobet, 2004; Begg *et al.*, 2005; Rathbun *et al.*, 2005; Adams *et al.*, 2006; Zabala *et al.*, 2007; Bartoszewicz *et al.*, 2008). According to Gittleman and Harvey (1982) the proportion of rodents as compared to insects and fruits in the diet has an influence on the home range size. The higher the proportion of rodents, the larger the home range will be (Gittleman & Harvey, 1982). The opposite is true for the proportion of insects and fruits (Gittleman & Harvey, 1982).

Marker and Dickman (2005) proposed that one possible reason for leopards in Namibia to have a consistent home range throughout the year, could be a well-spread and consistent availability of prey. If the quality of the food sources within the habitat used also does not change between seasons, a shift or change in home range size will not be necessary (Macdonald, 1983; Prange *et al.*, 2004). Diet and seasonal variation in food availability and its quality were not evaluated in my study and this hypothesis can thus not be confirmed. It might however be possible that overall food availability (as related to genets' diet) does not change significantly over the year, which doesn't necessitate a shift in home ranges. Similar to my study, Palomares and Delibes (1994), Santos-Reis *et al.* (2004) and Carvalho *et al.* (2014) also did not find a difference between the home range size of male and female genets.

Another possibility is that genets changed their diet to other food sources when one source became scarce, making it unnecessary for them to increase their home range sizes (Baker *et al.*, 2001; Diefenbach *et al.*, 2006). Crooks and Van Vuren (1996) suggest that differences in habitat use over different seasons by male and female Island foxes, *Urocyon littoralis*, in California does not influence the size of the home range or even its shift, but rather their movement patterns within the home range. Zalewski *et al.* (2004) also found that even though pine martens did not change the size of their home ranges seasonally, they did change the way in which they use their habitat. It could also be that there were no better areas available to rusty-spotted genets in Telperion Nature Reserve during periods of food scarcity. There is thus nowhere for them to go and they rather

adapt their activity patterns by increasing time spent resting or sleeping to conserve energy.

Alternatively, the summer of 2015/16, during which the study was executed, was drier than usual. This could result in fewer areas with available water for the animals. Rusty-spotted genets prefer areas closer to water (Rautenbach & Nel, 1978; Kingdon *et al.*, 2013). They will thus still have a larger home range more similar to that of winter to be able to include water sources within their home ranges (Atwood & Weeks, 2003).

Colón (2002) found a similar lack of significant differences in home range shifts between seasons for the Malay civet and suggested that both food and mates are readily available, making it unnecessary for animals to increase their home range sizes. This was also found for Malay civets in Sulawesi (Jennings *et al.*, 2006). Jennings *et al.* (2006) suggested that home ranges for females were larger than normal because they have to feed young and thus search for more food. Marker and Dickman (2005) also suggested that a similar pattern found in leopards could be caused by a lack of food resources. Females had to increase their home ranges to such an extent to find enough food, that it was physically impossible for males to have even larger home ranges (Marker & Dickman, 2005).

Core areas in my study were usually distributed around areas with a large number of often used resting and possible den sites. Core areas were small and represented only 7% of the total home range. Smaller core areas are normally the result of a good quality habitat with enough resources (Gilchrist & Otali, 2002; Camps Munuera & Llimona Llobet, 2004). In such circumstances, animals only need to use a very small part of their total home ranges in order to satisfy their basic needs. The fact that animals only need to use a small part of their home ranges to satisfy their basic needs also supports the hypothesis that a habitat of good quality does not necessitate a significant increase in home range size during periods of food scarcity, to satisfy their needs. This good quality habitat hypothesis will then be the reason why no significant difference in home range sizes were found between seasons or sexes in this study. It also explains why home ranges did not shift significantly between seasons.

I found home range overlap mainly between animals of different sexes, but also between animals of the same sex. Camps Munuera and Llimona Llobet (2004) also found range

overlap between different sexes but not between animals of the same sex. Such intra-sexual competition can be ascribed to reproductive behaviour when animals fight for better mating opportunities as well as social status when young animals try to overtake the home ranges of older animals (Macdonald, 1983). It can also be the result of nomadic animals (Palomares & Delibes, 1988) that occasionally cross the home range of other animals as was the case with F5. Inter-sexual range overlap likely result from movements, generally by males, to enhance mating opportunities (Camps Munuera & Llimona Llobet, 2004; Sliwa, 2004). Loveridge and Macdonald (2001) found that home range overlap of jackals, *Canis spp.*, in Zimbabwe increased during the mating season.

The spatial distribution of resources will also allow inter-individual home range overlap (Colón, 2002; Atwood & Weeks, 2003; Luengos-Vidal *et al.*, 2012). If certain resources such as available water or den sites only occur in certain areas, all animals need to use this area at some stage and home ranges will thus overlap in this area (Roeder, 1978, 1980; Waser & Waser, 1985; Palomares, 1993; Clevenger, 1996; Engel, 1998a, 1998b, 2000; Dunstone *et al.*, 2002; Atwood & Weeks, 2003). If an animal already has to travel far to get to this resource, it will not be energy efficient to defend it (Dunstone *et al.*, 2002). In areas where the density of animals is high, the percentage overlap will also increase as animals will use the same resources (Ray, 1997; Bartoszewicz *et al.*, 2008). Smaller home ranges will lead to smaller percentage overlap as more animals can use the same amount of space without overlapping (Sutor & Schwarz, 2012). Females with young might avoid other females due to the possibility of infanticide and will thus avoid overlapping their home ranges with that of others (Wolff, 1997). Infanticide in genets has, however, never been recorded. Slight overlapping between genet home ranges is common although genets are generally accepted to be mainly territorial (Palomares & Delibes, 1988; 1994; Zuberogoitia *et al.*, 2002; Admasu *et al.*, 2004; Camps Munuera & Llimona Llobet, 2004; Zuberogoitia & Zabala, 2004). Overlap between the home ranges of rusty-spotted genets on Telperion Nature Reserve is likely due to a combination of resource distribution and reproductive behaviour.

In previous studies large shift distances of home ranges were ascribed to the shift of prey species or other food sources (Prange *et al.*, 2004; Marker & Dickman, 2005). Animals in the current study possibly did not shift home ranges during different seasons because

they might not have been able to find a better food source elsewhere or because the total possible home range was already covered (Geffen *et al.*, 1992).

Genets in Telperion Nature Reserve seemed to select Loskop Mountain Bushveld over the Rand Highveld Grassland. In Portugal it was also evident where agricultural lands (with less dense vegetation) were not used by common genets (Carvalho, 2015). Sarmento *et al.* (2009) also found that dense woodlands were significantly chosen by genets rather than areas with less dense vegetation. Similarly, others also found the selection of denser vegetation (Palomares & Delibes 1994; Zuberogoitia *et al.*, 2002; Blaum *et al.*, 2007; Sarmento *et al.*, 2009; Galantinho & Mira, 2009; Camps & Alldredge, 2013). Cover, whether vegetation or rocks, is considered to be the most important factor when genets select their home ranges (Camps & Alldredge, 2013; Palomares & Delibes, 1991b; Virgós & Casanovas, 1997; Larivière & Calzada, 2001; Virgós, 2001; Santos-Reis *et al.*, 2004; Zuberogoitia & Zabala, 2004; Calzada, 2007; Espírito-Santo *et al.*, 2007; Sarmento *et al.*, 2009).

Denser vegetation structures provide better cover and are thus safer against predators (Rasa *et al.*, 1992; Galantinho & Mira, 2009). Available food, especially rodents, is also higher in these areas (Sarmento *et al.*, 2009; Galantinho & Mira, 2009; Matos *et al.*, 2009). They also provide better covered resting sites (Palomares & Delibes, 1988; Sarmento *et al.*, 2009). Blaum *et al.* (2007) found that genet numbers increase with increasing vegetation cover. According to Angelici and Luiselli (2005), the rusty-spotted genet in Nigeria preferred savannas and tree plantations above the natural forest. They did, however, suggest that this was to avoid competition with the crested genet, *Genetta cristata*, rather than a specific preference of savannas and plantations (Angelici & Luiselli, 2005). Similar to what Camps and Alldredge (2013) found, genets were much more specific when selecting core areas. In the current study, the 50% core areas were almost exclusively located in Bushveld vegetation.

The daily movement distance did not differ between the different seasons. However rusty-spotted genets were active for a shorter time period during winter (see Chapter 4). It was thus expected that the daily traveling speed should be higher during winter, as the animals still have to cover the same distance. This was however not found in the current

study. Polar bears increased their movement patterns and home ranges when ice conditions, and thus food availability, became unpredictable (Ferguson *et al.*, 2001). A constant food availability in Telperion Nature Reserve might however make it unnecessary for rusty-spotted genets to increase their traveling speed. Ray (1997) suggested that the shape of the home ranges of the long-nosed mongoose, *Herpestes naso*, and the marsh mongoose, *Atilax paludinosus*, in the Central African Republic can influence the travel speed. Travel speed will increase for animals with a linear home range where the distances between the borders are greater (Ray, 1997). The shapes of home ranges for rusty-spotted genets in Telperion Nature Reserve did not allow a difference between the distances to the borders and thus a change in travel speed.

Seasonally, the travel speed increased as the home range sizes increased, which indicates that the animals with larger seasonal home ranges attempt to cover it as fast as possible. One could argue that the driving factor is the daily movement distance, and not the home range size. When animals move longer distances, they will cover a larger area and their home range size will be larger. Considering the constraints imposed by night length, animals that move over longer distances will have to do so at a faster speed. A similar pattern was found for Blanford's foxes (Geffen & Macdonald, 1993) as well as for the long-nosed mongoose and the Egyptian mongoose (Ray, 1997) with home ranges increasing as travel speed increased. Ultimately, though, traveling distance and/or home range size are determined by other factors such as food availability and reproductive condition. Travelling between the home ranges of all surrounding females will also increase the distance covered by a male rusty-spotted genet. The correlation of home range size with travelling speed was however not extended through to the total home ranges sizes of the rusty-spotted genet, which shows that it is not significant on the long term. It could also mean that animals change their home ranges over seasons and then do not consider areas previously included in their home range as still being part of it and so will not attempt to cover these areas as well.

Chapter 6

General conclusion

Trapping success of rusty-spotted genets are low and can be ascribed to the solitary nature of the animals. The neck circumference of male genets is larger than that of females and their mass increased with age which could be due to an increase in hunting success when genets get older and more experienced.

Rusty-spotted genets were primarily nocturnal and therefore made use of the darkness for cover when hunting. Males are more active than females possibly because they search for females to mate with as well as due to their larger body size. Seasonal changes in activity were evident – specifically in winter – and were probably a function of both food availability and temperature. Changes in genet activity cannot be seen as a function of a single factor, but rather of a combination of different factors.

Areas with a denser vegetation structure seemed to be more suitable for rusty-spotted genet resting sites. Neither the number of resting sites nor the reuse rate of these resting sites differed between sexes or seasons. Males search for females to mate with by travelling larger distances. This possibly caused the distance between resting sites on consecutive days to be higher for males than for females. The inter-resting site distance was higher during autumn, likely due to the decrease in food availability, which made it necessary for genets to increase their hunting efforts. However, a similar increase in hunting effort was not evident during winter as genets decreased their overall activity, possibly in order to avoid colder temperatures.

No differences between the home range sizes of males and females or between seasons were found. This was attributed to a well-spread and consistent availability of food sources. Core areas were small which further supports the hypothesis that food was readily available. Both intra- and intersexual home range overlaps were recorded. This was not unusual for carnivores and due to a combination of reproductive and social actions. Home ranges and specifically core areas were located in denser bushveld vegetation rather than grassland as these areas provided better cover and likely more abundant food sources.

As this was the first exhaustive study of its kind on the rusty-spotted genet over a full annual cycle, the information gathered is important for the development of conservation strategies for the species (Gittleman *et al.*, 2001). Information on the activity patterns of the species describes the ecological role of the animals which allows us as conservationists to depict the importance of the species (Gittleman *et al.*, 2001). Being able to predict resting site locations is important as it allows us to manage habitats in which the species can survive (Camps, 2011). Finally information on the habitat use of the species assists us in the correct management of the species (Gittleman *et al.*, 2001).

Chapter 7

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Chapter 8
Appendices

Appendix 1

List of all trap locations and animals trapped in Telperion Nature Reserve for the period September 2015 until August 2016.

Trap number	X-coordinates	Y-coordinates	Elevation	Habitat type	Number of nights deployed	Total number of captures	Number of collared genet captures	Number of different collared genet captures	Genet code	Number of genets captured but not collared	Number of slender mongoose captures	Number of other captures
1A/8B	29.05312	-25.69833	1450	Woodland	4	2	1	1	M1	0	1	0
1B	29.01086	-25.68541	1450	Woodland	10	0	0	0		0	0	0
2A	29.01090	-25.71090	1371	Woodland	13	1	0	0		0	1	0
3A	29.00437	-25.70355	1307	Riverine vegetation	13	0	0	0		0	0	0
4A	28.99932	-25.70355	1342	Woodland	5	1	1	1	M4	0	0	0
4B/17A	29.03927	-25.68688	1398	Woodland	9	1	1	1	F6	0	0	0
4C	29.00195	-25.72035	1368	Woodland	3	1	1	1	M4	0	0	0
5A	29.00820	-25.66276	1389	Woodland	3	1	1	1	M3	0	0	0
5B	29.04668	-25.68381	1444	Woodland	7	0	0	0		0	0	0
6A	29.01656	-25.65885	1419	Woodland	1	1	1	1	F2	0	0	0
6B	28.98056	-25.71515	1280	Riverine vegetation	10	0	0	0		0	0	0
7A	29.03650	-25.67293	1500	Rocky outcrop	7	1	1	1	M7	0	0	0

Trap number	X-coordinates	Y-coordinates	Elevation	Habitat type	Number of nights deployed	Total number of captures	Number of collared genet captures	Number of different collared genet captures	Genet code	Number of genets captured but not collared	Number of slender mongoose captures	Number of other captures
7B	28.98247	-25.71599	1296	Riverine vegetation	1	1	1	1	F8	0	0	0
8A	28.98499	-25.71164	1288	Riverine vegetation	6	1	0	0		1	0	0
9A	29.04599	-25.68642	1389	Woodland	10	1	0	0		0	1	0
10A	29.02503	-25.69589	1351	Rocky outcrop	2	1	1	1	F5	0	0	0
10B	29.04613	-25.69583	1400	Woodland	5	0	0	0		0	0	0
11A	29.01284	-25.69687	1329	Woodland	10	0	0	0		0	0	0
12A	29.01268	-25.70984	1372	Woodland	1	0	0	0		0	0	0
13A	29.02300	-25.70444	1365	Woodland	2	1	1	1	M9	0	0	0
14A	29.00836	-25.69903	1305	Riverine vegetation	3	0	0	0		0	0	0
14B	29.01401	-25.68807	1441	Woodland	9	0	0	0		0	0	0
15A	29.00196	-25.70196	1327	Woodland	3	0	0	0		0	0	0
15B	29.00175	-25.70188	1336	Woodland	4	0	0	0		0	0	0
16A	29.02332	-25.70404	1364	Woodland	5	0	0	0		0	0	0
18A	29.04304	-25.69654	1393	Woodland	4	1	0	0		0	1	0
19A/1A	29.05312	-25.69832	1444	Woodland	2	1	1	1	F10	0	0	0
19B/1A	29.00111	-25.72649	1363	Rocky outcrop	3	1	0	0		0	1	0
20A	28.97000	-25.72264	1366	Woodland	7	0	0	0		0	0	0
21A	28.97226	-25.71580	1329	Woodland	7	0	0	0		0	0	0
22C	28.99943	-25.70344	1343	Woodland	5	0	0	0		0	0	0
23C	28.97236	-25.71572	1335	Woodland	5	1	1	1	F8	0	0	0

Trap number	X-coordinates	Y-coordinates	Elevation	Habitat type	Number of nights deployed	Total number of captures	Number of collared genet captures	Number of different collared genet captures	Genet code	Number of genets captured but not collared	Number of slender mongoose captures	Number of other captures
24C	29.00251	-25.71970	1378	Woodland	13	2	1	1	M11	1	0	0
25C	29.02270	-25.70444	1366	Woodland	5	0	0	0		0	0	0
26C	29.01275	-25.70974	1362	Woodland	1	0	0	0		0	0	0
27C	28.98151	-25.71889	1332	Riverine vegetation	1	0	0	0		0	0	0
28C	28.99810	-25.70152	1378	Woodland	1	0	0	0		0	0	0
29A	29.01657	-25.65808	1418	Woodland	14	3	2	1	M7	0	1	0
29B	28.98118	-25.69881	1281	Riverine vegetation	7	0	0	0		0	0	0
30A	29.01822	-25.66425	1415	Woodland	11	2	1	1	M7	1	0	0
31A	29.02486	-25.66989	1461	Woodland	48	3	0	0		2	1	0
32A	29.03567	-25.66741	1491	Woodland	11	1	0	0		1	0	0
32B	29.03534	-25.67315	1490	Rocky outcrop	1	0	0	0		0	0	0
33A	29.03329	-25.66496	1484	Woodland	1	1	1	1	M12	0	0	0
33B	28.97549	-25.71895	1444	Woodland	32	3	1	1	M14	1	1	0
33C	28.98776	-25.70772	1281	Riverine vegetation	11	2	0	0		1	1	0
34A	28.97235	-25.71575	1331	Woodland	36	5	2	2	F8; M13	2	1	0
34B	29.01397	-25.68804	1434	Woodland	1	1	1	1	F15	0	0	0
35A	28.98396	-25.70976	1290	Riverine vegetation	44	2	0	0		2	0	0
36A	28.99953	-25.70612	1363	Rocky outcrop	28	2	1	1	M14	0	1	0

Trap number	X-coordinates	Y-coordinates	Elevation	Habitat type	Number of nights deployed	Total number of captures	Number of collared genet captures	Number of different collared genet captures	Genet code	Number of genets captured but not collared	Number of slender mongoose captures	Number of other captures
36B	29.02270	-25.70444	1366	Woodland	1	1	1	1	F10	0	0	0
36B(2)	28.98286	-25.71485	1278	Riverine vegetation	14	4	0	0		0	3	Water mongoose
37A	29.01398	-25.68804	1451	Woodland	21	3	1	1	F15	1	0	Water mongoose
38A	29.05000	-25.68073	1421	Rocky outcrop	35	2	0	0		1	1	0
39A	29.00866	-25.66267	1388	Woodland	35	1	0	0		0	1	0
40A	28.99675	-25.70443	1349	Woodland	33	1	0	0		0	1	0
41A	28.99822	-25.72432	1360	Rocky outcrop	8	0	0	0		0	0	0
42A	28.99694	-25.72752	1341	Woodland	2	1	1	1	M11	0	0	0
42B	28.99055	-25.70658	1287	Riverine vegetation	8	1	0	0		0	0	Hornbill
42C	28.98315	-25.71458	1286	Riverine vegetation	17	3	0	0		3	0	0
43A	28.99525	-25.70408	1353	Woodland	9	0	0	0		0	0	0

Appendix 2

Morphometric data of rusty-spotted genets trapped in Telperion Nature Reserve.

Animal code		M1	F2	M3	M4	F5	F6	M7	F8	M9	F10	M11	M12	M13	M14	F15
Sex		Male	Female	Male	Male	Female	Female	Male	Female	Male	Female	Male	Male	Male	Male	Female
Approximate age		2 - 2½ years	2 - 2½ years	4 - 5 years	4 - 5 years	1½ years	3 - 4 years	1½ - 2 years	2 - 3 years	1½ - 2 years	2 - 3 years	Young	Old	3 years	Young	Young
Trap number		Trap 1A	Trap 6A	Trap 5A	Trap 4A	Trap 10A	Trap 6B	Trap 7A	Trap 7B	Trap 13A	Trap 19A/1A	Trap 24C	Trap 33A	Trap 34A	Trap 36A	Trap 34B
Date of analysis		2015/09/02	2015/09/02	2015/09/05	2015/09/06	2015/09/06	2015/09/09	2015/09/09	2015/09/11	2015/09/15	2015/11/14	2016/03/02	2016/05/21	2016/05/24	2016/06/03	2016/06/15
Time of analysis		13:23:00	14:08:00	13:51:00			15:23:00	15:55:00	13:30:00	16:37:00	17:33:00	15:28:00	11:38:00			
Mass (kg)		1.74	1.46	1.84	2.09	1.46	1.78	1.78	1.64	1.56	1.49	1.33	1.76	1.74	1.53	1.70
Body length (cm)		52.00	49.00	52.00	52.00	50.50	51.00	51.00	50.00	49.00	48.00	48.00	50.50	48.00	50.50	48.00
Tail length (cm)		45.00	43.00	43.40	44.00	48.80	46.00	47.00	45.00	46.00	42.50	42.50	43.50	43.20	42.50	42.50
Tail length with hair tip (cm)		47.00	45.00	45.50	46.00	51.00	48.00	49.00	46.00	47.00	44.50	44.00	45.00	46.00	44.50	45.00
Neck circumference (cm)		15.00	14.00	18.80	17.20	14.10	14.50	16.00	14.00	16.00	15.50	14.50	17.00		14.20	14.40
Height of left ear (cm)				3.98	3.99	4.45	4.80	4.47	4.68	4.38	4.86	4.50			4.51	4.45
Front left foot	foot width (cm)	2.14	2.12	2.42	2.44	2.33	2.18	2.61	2.34	2.36	2.49	2.48	2.50	2.48	2.35	2.84
	footprint length (cm)	4.02	3.08	3.59	4.42	3.76	3.76	11.90	3.98	3.92	4.67	3.82	4.05	3.02	2.90	4.07
	foot length (cm)	12.16	11.89	10.01	11.92	11.5	11.9	3.99	11.89	11.26	10	11.63	11.76	11.63	11.36	11.51
	length of longest claw (cm)	all broken	0.40	0.21	0.32	0.43	0.33	0.33	0.36	0.51	0.44	0.33	0.50	0.49	0.41	0.33
Front right foot	foot width (cm)	2.05	2.09	2.50	2.34	2.37	2.59	2.59	2.62	2.50	2.12	2.22	2.43	2.43	2.18	2.49
	footprint length (cm)	3.99	4.04	3.91	4.31	4.21	4.02	4.06	4.23	3.98	4.14	3.52	4.05	2.85	2.99	4.10
	foot length (cm)	12.38	11.57	12.15	10.89	11.04	11.69	11.64	12.12	11.96	11.49	11.35	11.69	10.9	10.92	11.81
	length of longest claw (cm)	all broken	0.37	0.28	0.27	0.46	0.32	0.39	0.52	0.34	0.27	0.33	0.54	0.33	0.43	0.27
Hind left foot	foot width (cm)	2.20	1.96	2.27	2.15	2.07	2.11	2.32	2.40	2.21	2.14	2.50	2.35	2.30	2.13	2.18
	footprint length (cm)	3.10	2.74	2.91	2.87	2.87	2.92	3.31	2.84	2.63	3.24	2.62	2.75	3.33	2.70	2.78
	foot length (cm)	8.29	8.22	8.51	8.15	8.34	8.35	8.55	8.05	8.29	8.26	8.43	8.47	8.11	8.56	8.46
	length of longest claw (cm)	0.64	0.61	0.49	0.58	0.53	0.59	0.59	0.59	0.53	0.72	0.65	0.63	0.63	0.68	0.71

Animal code		M1	F2	M3	M4	F5	F6	M7	F8	M9	F10	M11	M12	M13	M14	F15
Hind right foot	foot width (cm)	1.89	2.05	2.19	2.25	2.16	2.30	2.28	2.31	2.28	2.03	2.28	2.39	2.56	1.99	2.35
	footprint length (cm)	3.04	3.25	2.56	3.00	2.66	2.92	2.94	2.70	2.70	3.17	2.76	2.98	3.26	3.40	2.84
	foot length (cm)	8.26	8.32	8.22	8.49	8.22	8.54	8.63	8.03	8.19	8.09	8.99	8.4	8.58	8.64	8.15
	length of longest claw (cm)	0.54	0.59	0.52	0.62	0.59	0.53	0.52	0.70	0.78	0.66	0.53	0.74	0.68	0.65	0.79
External parasites		ticks and fleas	ticks	ticks	yes	yes	ticks and fleas	ticks and fleas	4 ticks	yes	ticks and fleas	ticks and fleas			ticks	ticks
Excluding merged ring	Black rings	10	10	10	10	10	9	10	10	10	8	8	10	9	10	9
	White rings	9	9	9	9	9	8	9	9	9	7	7	9	8	9	8
Including merged ring	Black rings	11	11	11	11	11	10	11	11	11	9	9	11	10	11	10
	White rings	10	10	10	10	10	9	10	10	10	8	8	10	9	10	9
Collar frequency (Hz)		148.024Hz	148.083Hz	148.141Hz	148.205Hz	148.261Hz	148.334Hz	148.393Hz	148.435Hz	148.494Hz	148.024Hz	148.533Hz	148.234Hz	148.057Hz	148.114Hz	148.5113Hz
Ketamine Hydrochloride (mg)		40	35	35	35 + 20 + 15	35	35	35	35	35	35	35	35 + 7.5	18	20	25
Medetomidine (mg)		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	18.5 (Medetomidine Hydrochloride)	20 (Medetomidine Hydrochloride)	25 (Medetomidine Hydrochloride)
Remarks		Lower left canine missing	Canines either side are broken	Lower right canine broken, Lower incisors worn	Wore on all four canines, Incisors almost gone	Worn tips on canine, Right upper canine broken, Pregnant	Infested with fleas and ticks	Pregnant, 1.12cm hind right teat, 0.91cm front teat	Lower right canine worn		Notch in right ear					

Appendix 3

List of radio-tracked rusty-spotted genets in Telperion Nature Reserve during the period September 2015 to August 2016, and information on corresponding data collection for each animal.

Animal code	Sex	Mass at first capture (kg)	Collar frequency	Date collared	First tracking date	Last tracking date	Tracking period (days)	Cause	Season	# day tracks	# night tracks	# resting site locations
M1	Male	1.74	148.024	2015/09/02	2015/09/20	2015/10/15	25	Death	Spring	0	2	4
F2	Female	1.46	148.083	2015/09/02	2015/09/16	2016/04/13	210	Collar died	Spring	1	5	23
									Summer	1	3	23
									Autumn	0	3	4
M3	Male	1.84	148.141	2015/09/05	2015/10/10	2016/03/11	153	Collar died	Spring	1	1	17
									Summer	1	4	18
									Autumn	0	1	2
M4	Male	2.09	148.205	2015/09/06	2015/09/23	2016/05/25	245	Collar died	Spring	1	3	18
									Summer	1	3	19
									Autumn	1	2	16
F5	Female	1.46	148.261	2015/09/06	2015/09/17	2016/02/25	161	Moved away	Spring	0	2	6
									Summer	0	1	9
F6	Female	1.78	148.334	2015/09/09	2015/09/18	2016/05/05	230	Collar died	Spring	1	4	19
									Summer	1	4	22
									Autumn	0	2	17

Animal code	Sex	Mass at first capture (kg)	Collar frequency	Date collared	First tracking date	Last tracking date	Tracking period (days)	Cause	Season	# day tracks	# night tracks	# resting site locations
M7	Male	1.79	148.393	2015/09/09	2015/09/25	2016/04/15	203	Collar died	Spring	1	3	20
		1.73	148.467	2016/06/03	2016/06/25	2016/09/09	76	End of study /	Summer	1	3	21
								Collar removed	Autumn	0	2	4
									Winter	1	3	20
F8	Female	1.64	148.465	2015/09/11	2015/09/26	2016/05/14	231	Collar died	Spring	1	3	20
		1.64	148.362	2016/06/13	2016/06/20	2016/07/07	17	Death	Summer	1	3	20
									Autumn	1	2	17
									Winter	1	2	20
M9	Male	1.56	148.494	2015/09/15	2015/09/21	2015/10/02	11	Moved away	Spring	0	2	3
F10	Female	1.49	148.024	2015/11/14	2015/11/19	2016/05/30	193	Collar removed	Spring	1	1	3
		1.36	148.303	2016/06/10		not tracked	0	Death	Summer	1	3	22
M11	Male								Autumn	1	4	29
		1.33	148.533	2016/03/02	2016/03/07	2016/08/08	154	End of study /	Autumn	1	5	28
M12	Male							Collar removed	Winter	1	3	20
		1.76	148.234	2016/05/21	2016/05/22	2016/06/22	31	Collar died	Autumn	0	0	6
M13	Male								Winter	0	1	2
		1.74	148.057	2016/05/24	2016/05/25	2016/08/05	72	End of study	Autumn	0	0	3
M14	Male								Winter	1	3	11
		1.53	148.114	2016/06/03	2016/06/24	2016/08/31	68	End of study /	Winter	2	6	27
F15	Female							Collar removed				
		1.7	148.513	2016/06/15	2016/06/24	2016/08/31	68	Collar died	Winter	2	7	33

Appendix 4

Seasonal differences in activity parameters of rusty-spotted genets in Telperion Nature Reserve. Significant differences are marked in bold.

Activity parameters	Average \pm SD (n)				Kruskal-Wallis tests
	Spring	Summer	Autumn	Winter	
Activity period (min)	683 \pm 42 (12)	642 \pm 51 (17)	722 \pm 74 (12)	538 \pm 192 (18)	H = 12.96; p < 0.05
Activity onset (h: min)	18:18 \pm 00:23 (26)	18:43 \pm 00:21 (28)	17:56 \pm 00:25 (20)	17:36 \pm 00:31 (28)	H = 52.85; p < 0.05
Activity offset (h: min)	05:38 \pm 00:31 (21)	05:34 \pm 00:44 (23)	06:11 \pm 00:54 (21)	08:54 \pm 08:15 (23)	H = 8.05, p = 0.05
Effective activity (min)	672 \pm 49 (12)	621 \pm 57 (17)	653 \pm 115 (12)	413 \pm 218 (18)	H = 19.70; p < 0.05
Total duration of resting bouts (min)	11 \pm 15 (12)	22 \pm 27 (17)	69 \pm 96 (12)	125 \pm 126 (18)	H = 13.93; p < 0.05
24 h Activity budget (%)	46.66 \pm 3.39 (12)	43.10 \pm 3.97 (17)	45.31 \pm 8.01 (12)	28.67 \pm 15.13 (18)	H = 19.70; p < 0.05
Nocturnal activity budget (%)	91.9 \pm 3.7 (12)	93.4 \pm 7.5 (17)	85.5 \pm 14.5 (12)	51.0 \pm 27.3 (18)	H = 27.81; p < 0.05
Diurnal activity budget (%)	10.0 \pm 5.9 (4)	8.0 \pm 7.5 (5)	8.1 \pm 4.5 (4)	4.0 \pm 3.2 (7)	H = 4.18; p = 0.24

Appendix 5

Correlations showing the influence of different variables on activity of rusty-spotted genets in Telperion Nature Reserve. Significant correlations are shown in bold.

Dependent variable	Independent variable	Spearman's rank-order correlation
Activity onset	Sunset	R = 0.70; p < 0.05; n = 102
Activity offset	Sunrise	R = 0.19; p = 0.08; n = 88
Activity period	Night length	R = 0.04; p = 0.79; n = 59
Distance between resting sites	Night length	R = 0.16; p < 0.05; n = 316
Effective activity	Temperature	R = 0.40, p = 0.002, n = 59
Effective activity	Night length	R = -0.24; p = 0.68; n = 59
Effective activity	Activity period	R = 0.80; p < 0.05; n = 59
Total resting bout duration	Night length	R = 0.41; p < 0.05; n = 59
Total resting bout duration	Temperature	R = -0.34; p < 0.05; n = 59
24 h Activity budget	Temperature	R = 0.40; p < 0.05; n = 59
Nocturnal activity budget	Temperature	R = 0.56; p < 0.05; n = 59
Diurnal activity budget	Temperature	R = 0.07; p = 0.78; n = 20

Appendix 6

Resting site parameters of tracked rusty-spotted genets in Telperion Nature Reserve.

Animal ID	Sex	Season	Number of different resting sites	Index of resting site reuse	Resting site fidelity (%)	Average distance between resting sites on consecutive days (m)
M1	Male	Spring	2	0.50	0.0	3237
F2	Female	Spring	12	0.48	17.6	817
M3	Male	Spring	7	0.59	21.4	187
M4	Male	Spring	13	0.28	7.1	1886
F5	Female	Spring	6	0.00	0.0	984
F6	Female	Spring	8	0.58	38.5	187
M7	Male	Spring	13	0.35	7.1	670
F8	Female	Spring	8	0.60	35.7	118
M9	Male	Spring	3	0.00	0.0	390
F10	Female	Spring	2	0.33	0.0	748
F2	Female	Summer	10	0.57	27.8	231
M3	Male	Summer	9	0.50	11.1	714
M4	Male	Summer	12	0.37	0.0	1550
F5	Female	Summer	8	0.11	0.0	729

Animal ID	Sex	Season	Number of different resting sites	Index of resting site reuse	Resting site fidelity (%)	Average distance between resting sites on consecutive days (m)
F6	Female	Summer	14	0.36	6.3	599
M7	Male	Summer	16	0.24	0.0	638
F8	Female	Summer	12	0.40	13.3	548
F10	Female	Summer	13	0.41	5.9	616
F2	Female	Autumn	4	0.00	0.0	198
M3	Male	Autumn	1	0.50	100.0	0
M4	Male	Autumn	10	0.38	12.5	1525
F6	Female	Autumn	11	0.39	8.3	1223
M7	Male	Autumn	3	0.25	50.0	972
F8	Female	Autumn	12	0.25	0.0	1585
F10	Female	Autumn	16	0.43	11.1	1177
M11	Male	Autumn	15	0.46	6.3	1170
M12	Male	Autumn	5	0.17	0.0	833
M13	Male	Autumn	2	0.33	0.0	-no data-
M7	Male	Winter	14	0.30	0.0	1154
F8	Female	Winter	9	0.55	6.7	599

Animal ID	Sex	Season	Number of different resting sites	Index of resting site reuse	Resting site fidelity (%)	Average distance between resting sites on consecutive days (m)
M11	Male	Winter	12	0.40	35.7	495
M12	Male	Winter	1	0.50	100.0	0
M13	Male	Winter	8	0.27	25.0	662
M14	Male	Winter	13	0.54	10.5	536
F15	Female	Winter	21	0.40	16.0	919

Appendix 7

***Genetta maculata* – Rusty-spotted Genet**



Joe Grosel

*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.*

Regional Red List status (2015)	Least Concern
National Red List status (2004)	Least Concern (but assessed with <i>G. tigrina</i>)
Reasons for change	No change
Global Red List status (2016)	Least Concern
TOPS listing (NEMBA)	None
CITES listing	None
Endemic	No

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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), !Noreb (Damara, Nama), Insimba (Ndebele, Swati, Zulu), Thsipa-thoko (Sepedi), Thsipa, T'sipa, Tsipa e Matheba a Maholo (Sesotho), Tshipathokolo, Tsimba (Shona, Venda), Thokolo (Tswana), Msimba-mangovo, Nsimba (Tsonga), 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 localized 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.

Distribution

This species is widely distributed in sub-Saharan Africa, ranging from east of the Volta R. 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.

Within the assessment region, this species occurs across Limpopo, eastern Mpumalanga, Swaziland, KwaZulu-Natal (up to Durban), as well as Gauteng and North West Province (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 these 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).

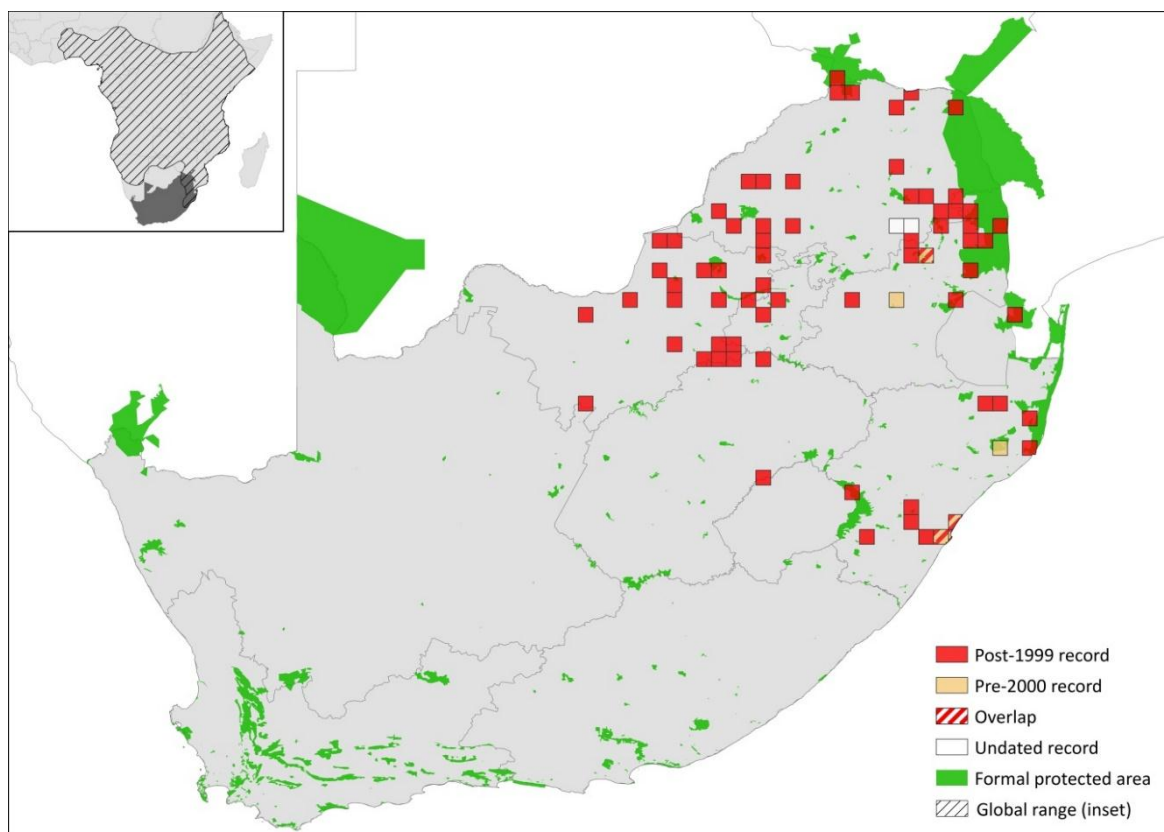


Figure 1: Distribution records for Rusty-spotted Genet (*Genetta maculata*) within the assessment region.

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

Population

This species is relatively common, though its nocturnal and elusive habits mean that it may be infrequently recorded. For example, in south-eastern 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).



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

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. In Zimbabwe, 68% of the stomach contents of Rusty-spotted Genets 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 in 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 had 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 (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 km² (Angelici & Gaubert 2013). In Telperion Nature Reserve, the home ranges of 15 individuals were found to be on average 2.7 km² (range 2.1–7.0 km²) 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 it 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, has 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 by Zulus to confection traditional clothing items. 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.

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).

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 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.

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 A. Halijian pers. comm. 2015–2016	Empirical Anecdotal	National Local	Increasing with road construction and habitat fragmentation.
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 - A. de Klerk pers. comm. 2016	Empirical Anecdotal Empirical	Local - Local	Stable due to cultural use being localised. Pet trade unknown. 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.

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.

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

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	<i>2.1 Site/Area Management:</i> install road-crossing structures in key habitats at road collision hotspots.	Collinson et al. 2015	Anecdotal	-	-	-
2	<i>4.3 Awareness & Communications:</i> 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	<i>2.1 Site/Area Management:</i> the promotion of the “holistic” approach to the management of damage-causing animals.	-	Anecdotal	-	-	-
4	<i>2.2. Invasive/Problematic Species Control:</i> 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	<i>2.2. Invasive/Problematic Species Control:</i> neuter or spay feral cats and dogs on game farms, ranches, conservancies, rural, peri-urban and urban areas.	-	Anecdotal	-	-	-
6	<i>4.3 Awareness & Communications:</i> establish a national campaign to educate the public about responsible domestic cat and dog ownership.	-	Anecdotal	-	-	-

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). Also, 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 at 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.dolinh-san@gmail.com). GPS locations and photographs would be of great assistance.

Data Sources and Quality

Table 6: 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

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