ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/303639379

Report on surveying, catching and monitoring Black-footed cats (Felis nigripes) on Benfontein Nature Reserve, Nuwejaarsfontein and Taaiboschpoort Farms in 2015

Technical Report · April 2016

DOI: 10.13140/RG.2.1.3269.3365

CITATIONS
4

READS
418

5 authors, including:

Alexander Sliwa
Cologne Zoo
73 PUBLICATIONS **550** CITATIONS

SEE PROFILE

Beryl Wilson
McGregor Museum
28 PUBLICATIONS **66** CITATIONS

SEE PROFILE

Martina Küsters
16 PUBLICATIONS **195** CITATIONS

SEE PROFILE

Adrian Stephen Wolferstan Tordiffe
University of Pretoria
43 PUBLICATIONS **240** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Project Stress responses in captive cheetahs View project

Project Lion-tailed macaque research and conservation View project

All content following this page was uploaded by Alexander Sliwa on 29 May 2016.

The user has requested enhancement of the downloaded file.

- Black-footed Cat Working Group -

Report on surveying, catching and monitoring Black-footed cats (*Felis nigripes*) on Benfontein Nature Reserve, Nuwejaarsfontein and Taaiboschpoort Farms in 2015

Alexander Sliwa, Beryl Wilson, Martina Küsters, Adrian Tordiffe, Arne Lawrenz & Sterrie Marais

Introduction:

The Black-footed Cat Working Group (BFCWG) aims to conserve this rare cat species by furthering awareness and conducting multidisciplinary research on the species' biology. The BFCWG owns a research vehicle (Toyota Hilux) for which the insurance, running and maintenance costs are administered by the McGregor Museum, Kimberley, South Africa. The specialized equipment required for our research is also stored at the McGregor Museum. This year we made one joint trip to the two previous study areas: Benfontein Nature Reserve (BFN), near Kimberley, from 22-27 October 2015 then to Nuwejaarsfontein (NJF) and Taaiboschpoort (TBP) Farms, south of De Aar, from 27 October - 3 November 2015.

Study Areas and Project Aims

1 - Benfontein Nature Reserve (BFN):

A private nature reserve owned by De Beers Consolidated Mines, located 10 km southeast of Kimberley on the border of the Northern Cape and Free State Provinces in central South Africa. The majority of the 11 400 ha which consists of arid plant communities has been the subject of the first, and so far only, in-depth field study on the black-footed cat by Sliwa in the 1990s (1992-1998) (Sliwa 2004, 2006, Sliwa *et al.* 2010). BFN receives average annual rainfalls of 450 mm.

2 - Nuwejaarsfontein (NJF) and Taaiboschpoort (TBP) Farms:

Situated 24 km south of De Aar in the Northern Cape Province, these sheep and game farms are owned by Sterrie Marais and managed by his son Piet Marais. They are about 5 km apart, separated by the farm Eselsfontein. The BFCWG visited them for the first time in February 2009. The 9 000 ha of NJF and 4 500 ha TBP farms receive an average of 300 mm rain annually and the Karoo plant communities are fenced into 300–400 ha camps both sides of the secondary road parallel to and between the R348 and N10.

Project Aims: This project is part of a multidisciplinary effort to study the distribution, ecology, health, and reproduction of *F. nigripes* over an extended period. With the aim of repeatedly capturing black-footed cats (hereafter termed "bfc") for biological sampling and radio-collaring for subsequent observation, several methods were employed to survey areas, previously known to hold bfcs. From November 2005 annual capture operations were conducted on BFN and from February 2009 also on NJF and TBP until the present visit. 11 reports are available on these periods by the authors and are downloadable as PDFs on the website www.black-footed-cat.wild-cat.org.

Methods:

(A) Spot-lamp searching: For a total of 11 nights (5 nights on BFN, 6 nights on NJF & TBP,) a 4x4 vehicle (2.4 litre Diesel Toyota Hilux Double cab or Toyota Landcruiser) drove a route of 20–80 km in length along dirt roads at a speed of 20–30 km/h whilst looking for the characteristic bright eye-shine of cats. A minimum of 2 people (4-6 this trip) stood on the open back of the vehicle operating 2 spotlights (1 million candle power / Lightforce® SL240 mm).

(B) Catching via searching and pursuit: Once bfcs were located by their eye-shine in the spotlights, their species identity was swiftly confirmed, when necessary also using 10x42 binoculars. If positively identified, they were pursued quickly by vehicle for a short distance, of between 100–600m until the cat squatted low on the ground in front of the stopped vehicle. 1 or 2 people with fish landing nets then netted the cats. On other occasions the cats would find a den system (dug by aardvarks, ground squirrels or springhares) and were either captured by exposing them after digging, or were lost when escaping deeper into the den system. All accessible cats were subsequently anaesthetized with an intramuscular injection of medetomidine, midazolam, and butorphanol and covered with a blanket to shield them from lights and sounds. During this trip we processed all 12 captured cats in the field. All animals were given complete physical examinations, had biological samples collected for disease and genetic studies, morphometric measurements obtained, and radio-collars fitted. During this year's captures vital body parameters were collected while the cats were under anaesthesia, and a blood sample was drawn for blood gas analysis. The anaesthetic drugs were antagonized with intramuscular injection of atipamezole, flumazenile and naltrexone, and the cats then placed in a small plastic crate for recovery. All bfcs were released back into a den, close to their capture locations. A blanket was used to cover the den entrance, keeping them inside until they were fit to leave on their own account. One or two digital camera traps were set close to the den entrance to record the cat leaving the den. There were no complications associated with these procedures and all cats (n=12) were confirmed alive and well on subsequent nights using telemetry and visual verification.

(C) "Digging" of previously radio-collared cats: This method was employed four times this year, where the den or termite mound with the radio-collared bfc was either carefully opened with a spade or via hand-digging. Or the cat was extracted directly out of the burrow by probing, to prompt it to run into a draped-over net, or grabbing the cat directly behind the neck on the radio-collar. The still functioning radio-collars of the males "Bolt" and "Zuma" as well those of the females "Nele" and "Sani" were exchanged with either little or up to major digging being necessary.

(**D) Live-trapping:** no trapping was performed on this field trip.

The captures via vehicles were variously staffed in October/November 2015 by:
Ms. Beryl Wilson, zoologist, McGregor Museum, Kimberley, South Africa (berylwa@museumsnc.co.za)
Dr. Alex Sliwa, behavioural ecologist and zoo curator, Cologne (Kölner) Zoo, Germany (sliwa@koelnerzoo.de)
Ms. Martina Küsters, field technician, researcher bfc-study Namibia, Swakopmund, Namibia (kusters.m@hotmail.com)
Dr. Adrian Tordiffe, research veterinarian, National Zoo of South Africa, Pretoria, South Africa (adrian@nzg.ac.za)
Dr. Arne Lawrenz, zoo veterinarian, Wuppertal Zoo, Germany (a.lawrenz@zoo-wuppertal.de)
Mr. Sterrie Marais, farm owner of Nuwejaarsfontein and Taaiboschpoort, De Aar, SA (info@karooexperience.co.za)
Mr. Christoph Kiesow, zoo animal keeper, Cologne Zoo, Germany (visiting).
Ms. Alison Cook, veterinary student, Onderstepoort, Pretoria, South Africa (visiting)
Dr. Holly Ganz, microbiologist, University of California, Davis, USA (visiting) (h.ganz@gmail.com)

Results:

Trapping: no trapping performed on this field trip.

Spot-lamp searching and catching/exchanging radio-collars:
BFN: we saw 10 bfc individuals during five nights of searching and caught six of them. Thus we saw two bfcs unaided by telemetry on average on any of the five nights (200% chance of sightings/night). The entire area was part of the previous ecological study of Sliwa from 1992–1998, and the same as what we have covered during previous capture trips (2005-2014). During these night drives we observed other carnivores including aardwolves (*Proteles cristatus*), three black-backed jackal (*Canis mesomelas*) groups

and once 5 pups at a den site, several small groups of bat-eared foxes (*Otocyon megalotis*), an African wildcat (*Felis silvestris cafra*), hedgehog (*Atelerix frontalis*) and many aardvark (*Orycteropus afer*) (up to 5 per night!) and springhares (*Pedetes capensis*).
We caught six new cats on BFN, two subadult males, two fully adult males and two adult females via the pursuit method. For names and locations refer to Map 1 and Table 1. One bfc was seen across a fence on the while tracking a radio-collared can and we didn't attempt to catch it. We caught six out of nine bfcs we tried to catch, thus our success rate was 67%.
We exchanged the still running radio-collar of the male "Bolt" with a new one, by catching him in his den.

NJF and TBP: we saw bfcs on three occasions during six nights of searching (no search efforts 2nd Nov) and caught two in two attempts (100% capture success), we didn't attempt to catch the 3rd sighting, due to not being able to drive through a gateless fence. We caught two uncollared females, "Gyra" on Klein Rooidam close to northwestern NJF and "Luna" on northeast NJF. Thus we saw a bfc every two nights (50% chance of sightings /night). During these night drives we observed other carnivore species such as aardwolves, groups of bat-eared foxes, Cape foxes (*Vulpes cana*) and small-spotted genets (*Genetta genetta*). Also observed aardvark almost every night, porcupines (*Hystrix africaeaustralis*) and spotted eagle owls (*Bubo africanus*). This time we didn't spot any potential predators of bfcs, like caracals (*Carcacal caracal*) or black-backed jackals.
We caught two new cats on NJF and TBP via the pursuit method. Thus our success rate was 100% out of two pursuit attempts. We also exchanged the functioning radio-collars of the male "Zuma" and females "Nele" and "Sani", when we extracted them either from their den in a hollow termite mound, or their very deep dens they took refuge in during the hot days during daylight. So we had five radio-marked bfcs on these two farms, when we left on 3rd November 2015.

Fate of black-footed cats in 2015 (collared in 2014)
Male "Stan": caught in November 2013 as an adult on north-eastern NJF and then again there to exchange his radio-collar in November 2014. In November 2014 he had already lost weight and condition (Sliwa *et al*., 2015) and Martina Küsters and Alex Sliwa had seen him already with facial wounds and sores in May 2014. He roamed a large and very difficult to track area across northern NJF. In late February 2015 Martina saw him close to death, with nictating membranes pulled partly in front of the eyeballs. He died shortly later, on Swartkoppies farm (Map 2; skull sign) on 4th March 2015 due to AA Amyloidosis, later confirmed by Dr. Emily Lane, a pathologist at the National Zoo, Pretoria who performed the necropsy.
Male "Epoc": Caught as a subadult on TBP and only tracked in November 2014. Unfortunately Martina found him dead upon her return to TBP already on 31.1.15, as reported before (Sliwa *et al.*, 2015). He likely died around 20 January 2015. His carcass was dismembered and chewed and his destroyed skeleton was only 50 m from a water trough on Eselsfontein. His carcass was moved by a scavenger or predator, but the collar had not been chewed.
Other: the two males "Bolt" on southern BFN (Map 1) and "Zuma" (Map 2), radio-collared on NJF were still alive in October 2015 and their collars were replaced with new ones. Likewise the females "Nele" and "Sani" on NFJ, ESF, and TBP maintained their home ranges with slight shifts (Map 2). "Nele" did an exploratory trip from her normal home range on southern NJF and ESF south for a few days in winter (June) onto central TBP, but she returned to her normal range on NJF in July 2015.

Fate of black-footed cats in early 2016 (collared in 2015)
All 12 cats that were collared in October 2015 were found again in early February 2016, except for:
Female "Cinda": despite intensive multi day searches Martina has not been able to find this female in central BFN again. We must thus assume that she has been killed, her collar damaged or she emigrated out of range.

Locating the radio-collared cats

NJF, TBP and BFN: before and subsequent to their respective capture Martina, Alex, Arne and Christoph attempted to acquire location fixes (waypoints) of all newly radio-marked cats in their dens during daylight each day, and then additional fixes during the course of the nights, if time and energy on this busy field capture trip permitted. Altogether 70 (Tab 1) such fixes were obtained for the seven cats on BFN (Map 1) and five on NJF & TBP (Map 2). The short duration of the field trip allowed only for the collection of a very limited number of fixes this time, and thus to arrive at incompletely estimated ranges (Tab 1) for these new cats, even when incorporating all the fixes collected by Martina Küsters in late 2015 (November – December). The BFCWG was able to finance the tracking of all the cats (Table 1) by enumerating Martina Küsters, who was tracking them on all three farms (BFN, NJF, TBP) and had collected 1165 waypoints until 14th December 2015. Sterrie Marais and his son Piet checked the pulse rate of the radio signals when going out on predator patrols, so they could tell in what general area the radio-collared cats are staying on NJF and if they are alive (no mortality-signal). However, this doesn't provide data accurate enough for home range analysis. Home range size estimates incorporating all collected waypoints for all the individual cats tracked in 2015 are provided in Table 1 and Map 1 & Map 2.

Behavioural Observations of black-footed cats

A total of 13 cats were monitored in 2015 with varying intensity. On the De Aar farms the females "Nele" and "Sani" were intensively monitored by Martina Küsters since November 2014 and the males "Zuma" and "Stan" already since November 2013. All four were well-habituated. The excellent data sets for them will allow meaningful comparison of annual home range sizes between years and between study areas in future analyses. The only remaining cat from early 2015 on BFN, the male "Bolt" had likewise habituated quite well to the research vehicle, although he frequented mostly the longer grass areas in the South of the reserve and sometimes moved onto the adjacent farm. All the other cats were still rather shy, but with continued tracking will allow better behavioural observations and will become better approachable via vehicle.

Over the past months Martina has tracked the two new females (Gyra and Luna) on NJF (De Aar) and managed to collect good data and habituate them well to the vehicle, however the terrain in their home ranges is rather difficult and requires longer detours should they cross the fences between farms. Also the home range of "Gyra" is amongst the powerlines and thus makes the reception of her signal often difficult. Unfortunately all the cats in the De Aar area leave the study farms NJF and TBP at some point and thus permission must be sought with the adjacent land owners in advance to get periodical visual observations of them and to check on their condition. Good relations have been established with the land owner of ESF, who allowed the exclusive use of the internal roads for tracking by the research vehicle. With the many new cats on BFN habituation will take a longer time, since Martina spends far less time on the reserve, due to her commitment to her MTech study in De Aar, but she has found six of the seven collared cats on BFN on several tracking visits. Several of the new cats have habituated well to the tracking vehicle despite the limited time of Martina.

Reproduction: Of the six females caught in October we have assumed and confirmed reproductions in the following cases.

"Cinda": when examined during capture we found her to have nipples used at least once before. In November/December 2015 Martina assumed that she was hiding kitten(s) in a hollow termite mound, later confirmed that no kittens were inside. Unfortunately "Cinda" went missing over the new year and could not be found again in February 2016. No kittens or appropriate den was found during December, even after repeated attempts.

"**Freya**": was heavily pregnant when caught 26th October (Fig. 8). As with "Cinda" there is no confirmation that she had surviving kittens. She roams an area with long grass.

"**Nele**": was heavily pregnant when caught on 29th October. In November we were unable to find the den with her kittens. She has spent some time in the pan area of the farm but as females do not always rest with their young once they are older, one may not find the den. The birth may have been missed during December or the kitten/s may have died at an early age. At the end of February 2016 she was observed scent marking again, a sign that she was seeking attention from a male to mate (Molteno et al 1998).

"Sani": when captured on 31st October she appeared to be pregnant. No kittens were however recorded in December and by the end of February 2016 she was seen scent marking, which again indicated that she was seeking the attention from a male for mating. Thus if she was pregnant she must have lost her litter.

"Gyra": when captured on 28th October she had nipples being suckled and on 18th November Martina found her with two kittens of approximately six weeks of age. Unfortunately in early February the kittens were not seen again, so we don't know if they have survived until dispersal, which should be at about five months. "Gyra" was also scent marking at the end of February, similar to the other females.

"Luna": when captured on 30th October she must have just given birth. One kitten of approx. 10 days of age was found on 7th November by Martina (Fig. 20). She used a small area around the birth site in November. Again, in late February she is scent marking again, a sign that she is coming into oestrus and that she no longer had the kitten with her.

Veld conditions have not improved during 2015 with little summer rainfall by October 2015 and through to February 2016. So far there has been very little rain on NJF and TBP (status Feb 2016)

Camera Trapping: Alex Sliwa and Martina Küsters deployed two digital camera traps (Bushnell Trophy Cam HD, Reconyx Hyperfire HC600) after every release of the captured cats in their subterranean dens. The cameras recorded the exact time of their leaving their release dens. Some videos and pictures of the various cats, leaving their dens after waking from anaesthesia or when leaving their usual dens are available on www.black-footed-cat.wild-cat.org.

Outreach and social media coverage of BFCs and the BFCWG: throughout 2015 most members of the BFCWG have spread the information on the species, have given interviews and presentations about our joint research. Scientific tourists and interested laypersons were provided the opportunity to join on tracking sessions of the radio-collared bfcs at both sites. We continue to have our annual field capture trip followed on social media by ISEC Canada (International Society for Endangered Cats) as part of their long-term crowd sourcing project for the smaller wild cats!

Publications and Conference papers by BFCWG group members on *Felis nigripes*:

Kamler, J.F., Stenkewitz, U., Sliwa, A., Wilson, B., Lamberski, N., Herrick, J.R. & Macdonald, D.W. 2015. Ecological relationships of black-footed cats (*Felis nigripes*) and sympatric canids in South Africa. *Mammalian Biology* 80:122-127.

SLIWA, A. 2015. Field research, rehabilitation, release and breeding of small arid zone wild cat species. The International Conference for the Conservation Breeding and Reintroduction of Endangered Small Carnivores, Taipei Zoo, Taiwan on 23.6.2015.

SLIWA, A. 2015. Black-footed Cat Field Research - combining Conservation with Research. Endemic Species Research Institute, Jiji, Taiwan on 25.6.2015.

SLIWA. A. (2015): Linking Research and Conservation on smaller Wildcats in-situ and ex-situ – the case of the Black-footed Cat and others. Plenary during the annual meeting of the Deutsche Gesellschaft für Säugetierkunde (German Mammal Society) at the Tierärztlichen Hochschule, Hannover on 14.9.15.

Wilson, B., De Crom, N., Reilly, B., Roxburgh, L. & Sliwa, A. 2015. *The Black-footed Cat (*Felis nigripes*): a review of the geographical distribution and conservation status.* South African Wildlife Management Association Conference, 8 September 2015, Kimberley.

Wilson, B., Sliwa, A., De Crom, N, Reilly, B. & Roxburgh, L. 2015. *The Black-footed Cat (*Felis nigripes*): a review of the geographical distribution and conservation status.* 6th Diamond Route Research Conference, 20-21 October 2015, Johannesburg.

Wilson, B., Sliwa, A., De Crom, N, Reilly, B. & Roxburgh, L. 2015. *The Black-footed Cat (*Felis nigripes*): a review of the geographical distribution and conservation status.* 12th Annual Kimberley Biodiversity Research Symposium, 26 October 2015, Kimberley.

Discussion and Conclusions:

Valuable data on censusing and catching black-footed cats have been collected again on this trip of the BFCWG on BFN, where the species was intensively studied between 1992–1998. We captured 6 new cats (during 5 nights of spotting) and exchanged the collar of remaining male "Bolt" on BFN. While we saw another 3 cats but failed to capture them our success rate was only 75%, despite the record number of bfcs caught in such a short period. We attained a slightly higher percent success rate on NJF and TBP with two new cats captured in two attempts (100% capture success) and the daytime exchange of the collars of the male "Zuma" and females "Nele" and "Sani" through extracting them from dens. We only saw one other uncollared bfc which we didn't attempt to catch.

The sighting frequencies between the two established study areas were dramatically different during this trip (see progress reports 2005 to November 2014 – downloadable as PDF files at www.black-footed-cat.wild-cat.org). While NJF and TBP had a similar sighting frequency to previous years we had a much higher sighting frequency on BFN with two bfcs seen on average each night, more than double the average. Over the years, the detection chance of bfcs had been similar between the two sites as both have open habitats with good visibility. During this trip, we didn't encounter any rain and thus could drive on farm tracks for all the nights at two sites, so had no hampering of our work.

The jackal density on BFN seemed higher than during the November 2014 trip, since we saw three pairs/packs (at least two together) and also a litter of five young. We didn't see any jackal or caracal on NJF and TBP. In addition we saw an African wildcat on BFN, but none on NJF and TBP and no feral/domestic cats at either study area.

Due to the short time period spent by the group spent at both study areas, we were not able to make a reasonable judgement of the population sizes, however comparing the sighting frequency on BFN it is clear that there is quite a good number of males, both subadult and adult, and fewer females on BFN. Unfortunately the new female "Cinda" disappeared a few months later, which may be linked to predation by the high jackal population. It is reassuring that there are at least four breeding bfc females on NJF and TBP, with hopefully surviving kittens.

On TBP and NJF we caught three of the four cats from 2014 again, while one of them died in 2015 due to disease. Also the single radio-collared male remaining on BFN survived. The mortality or disappearance of adults was thus lower than in the year 2014. The deaths of the male "Stan" was sad, but evident after his necropsy. He had been losing condition and the facial inflammation seen in the months before could be attributed to his failing health due to AA-Amyloidosis (Emily Lane, pers. com. 2015). The direct and

fast transport of his carcass, shortly after his natural death, by Martina and Beryl to Pretoria for the necropsy provided unequivocal proof that AA-Amyloidosis is also present in the De Aar area and not just reserved to BFN, where it had been reported before (Terio *et al.* 2008; Zimmermann *et al.* 2011). This is in contrast to the disappearance of the new female "Cinda", which may be due to several reasons, however less likely to disease, since then her radio-collar would have been still working.

For 2015 we saw three kittens from two females and another two females were heavily pregnant. Although we have speculated about pregnancy in the two remaining females we have no proof. Thus reproduction has occurred in both study areas, however we have neither information whether the observed kittens survived to dispersal age (M. Küsters, pers. comm.), nor when the kittens of the definitively pregnant females were born and if they survived the initial days. All four females in NJF and TBP were scent marking at the end of February 2016 and thus were ready to mate again and thus could not be caring for kittens any more. Although weaning too place at two months in hand-raised bfcs (Olbricht & Sliwa, 1995) it is assumed that they become independent from the mother within 3-5 months but remain in the range of the mother for extended periods (Sliwa, 2013). Permanent dentition is only present at five months of age (Olbricht & Sliwa, 1995).

The waypoints collected during the latest capture field trip don't allow for a meaningful comparison of estimated home range sizes with those of past field trips. Home range size development, especially for new animals collared, is highly dependent on the number of locations collected over a minimum of several months for each individual cat and on its reproductive cycle in this period (Molteno *et al.* 1998; Sliwa 2004; Sliwa *et al.* 2010). Fortunately, Martina Küsters was able to collect over 1 000 waypoints for all the cats combined in 2015 and, particularly, the three surviving cats "Nele", "Sani" and "Zuma" south of De Aar, and to a lesser degree "Bolt" on BFN (Maps 2; Table 1). Also, the deceased male "Stan" was intensively tracked (Map 2, Table 1). Although he was not observed to drink water his deteriorating condition and facial inflammations had indicated AA-Amyloidosis ("kidney-disease") as a precursor to his death. Two males were resident and observed urine spraying in 2015, while "Stan" was last observed urine spraying in November 2014 and only urinating by squatting later, and used large home ranges in 2015 (36-58 km², MCP100; Table 1) compared to previously recorded resident male home ranges on BFN (average 21 km², range 16-24 km², n=5, Sliwa, 2004). The movement pattern of adult female "Nele" in 2015 showed a similarity to that of the female "Hasi" in 2014. She also made an excursion for at least a few days south while staying in a small range, away from her usual home range (Map 2) she occupied in the previous two years. It is not clear what precipitated this shift in home range location. She may have scouted a new area, left vacant by another female or she was being displaced by a younger and stronger female coming into her current range. When under anaesthesia on 29th October 2015 we discovered that her upper left canine was worn, a sign that she is an elderly cat. Sliwa (2004) only recorded minimal shifts in home range centres from one year to the next on BFN.
The capture field trip was highly successful, with the capture rate on BFN this time much higher than in the De Aar area, while in the past the capture rates between the study sites was similar duing previous field trips. We continued with our decision to radio-collar any captured bfcs heavy enough (> 1 kg) in order to get repeated biological samples during future trips, allowing for the comparison of home ranges to the sizes estimated by Sliwa (2004). Martina Küsters, Sterrie Marais and Piet Marais will be able to listen to radio signal frequencies and collect more location fixes on a regular basis for each of the 11 radio-collared cats on NJF, ESF, TBP and BFN in 2016.

We will return to BFN, ESF, NJF and TBP for further capturing and sampling of wild black-footed cats in late 2016.

Acknowledgements: We thank Sterrie Marais, his wife Ilse and son Pieter for their continued support of this capture trip to Nuwejaarsfontein and Taaiboschpoort. Not only did Sterrie and Pieter

drive and man spotlamps on the Toyota Landcruiser every night, but they also helped with the capture of two new female cats. In addition they covered all the running costs of this vehicle and provided the use of their equipment. We are especially indebted for their provision of our beautiful, tranquil and comfortable lodging at Taaiboschpoort entirely for free, again. Likewise, we thank De Beers Consolidated Mines and the Diamond Route for permission to work on Benfontein NR and the use of the research house and the hunting lodge for accommodation. Ecology Division of De Beers gave us permission for the sampling, and supported us in employing the pursuit method. Funds for fieldwork came from Cologne (Kölner) Zoo; Zoo-Verein Wuppertal e. V. (friends of Wuppertal Zoo, R. Stock & B. Stock); Christine Ritzen and K. Stellmacher (all Germany); SOS Félins & Co. Nesles (Paris, France); Zoological Association of America (ZAA), Punta Gorda FL, USA; Omaha's Henry Doorly Zoo & Aquarium, Omaha, NE, USA; The International Society of Endangered Cats (ISEC) - Canada Branch, gave generous funds for radio-collars and vehicle running costs and again reported directly to their sponsors when we were in the field. Martina Küsters' upkeep and lodging in De Aar was supported by funds donated to Alex Sliwa by Le Parc des Félins / SOS Félins & Co., France; ISEC - Canada Branch and Zoological Association of America (ZAA). Fuel and accommodation costs during field work are partly covered by the Rufford Foundation Grant for Nature Conservation awarded to Martina. Further generous funding was also received in the past from a private donor, Mr. Ralph Christie, who supported the running costs and field work in the Kimberley area for a period. We sincerely thank our respective employers for supporting us and granting us leave from our busy work schedules to carry out this field work.

References:

Molteno, A.J., Sliwa, A., & Richardson, P.R.K. 1998. The role of scent marking in a free-ranging, female black-footed cat (*Felis nigripes*). Journal of Zoology (London) 245: 35-41.

Olbricht, G. & Sliwa, A. 1995. Analyse der Jugendentwicklung von Schwarzfußkatzen (*Felis nigripes*) im Zoologischen Garten Wuppertal im Vergleich zur Literatur. Der Zoologische Garten 65 (4): 224-236.

Sliwa, A. 2004. Home range size and social organisation of black-footed cats (*Felis nigripes*). Mammalian Biology 69: 96-107.

Sliwa, A. 2006. Seasonal and sex-specific prey composition of black-footed cats (*Felis nigripes*). Acta Theriologica 51: 195-204.

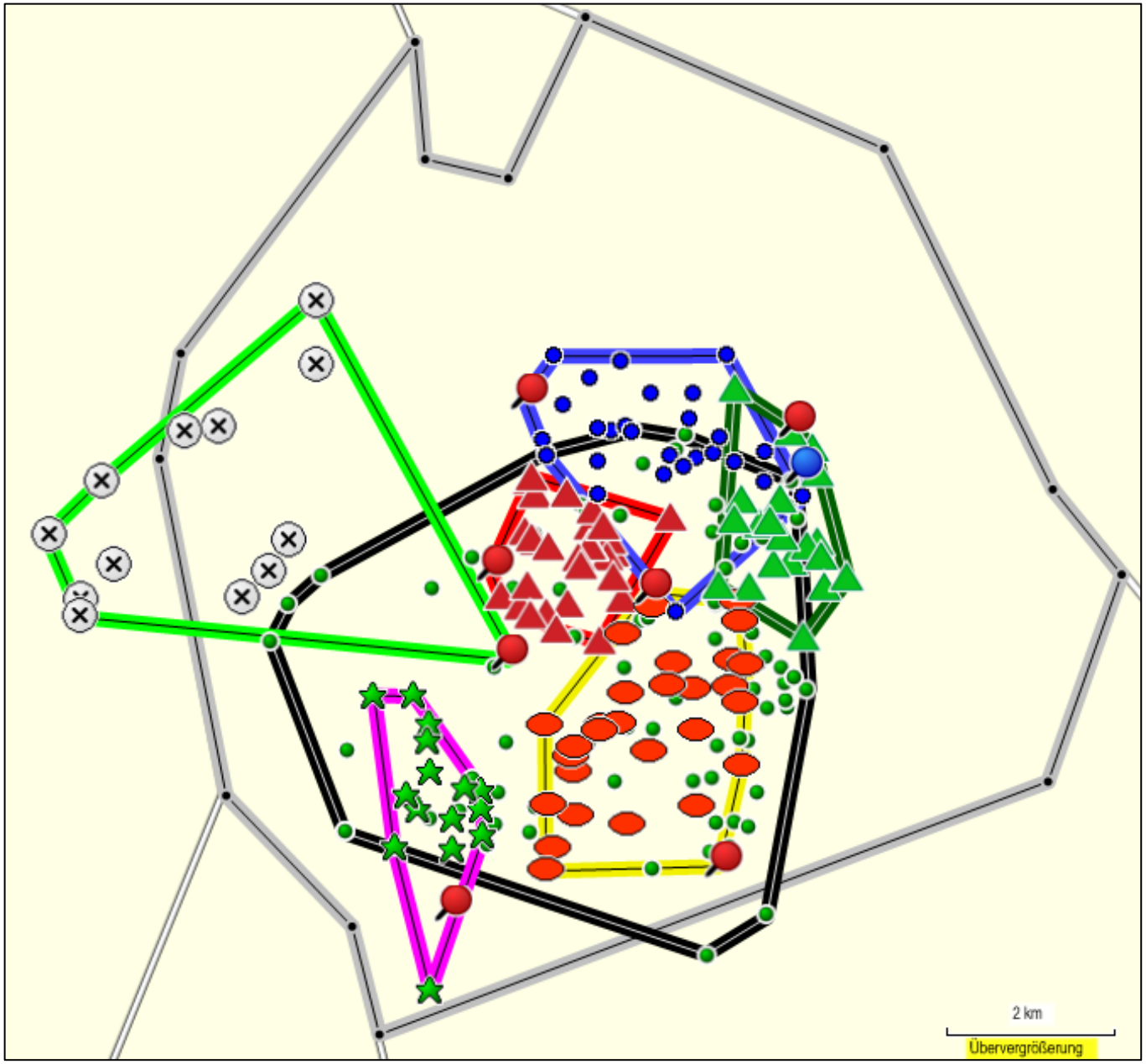
Sliwa, A. 2013. *Felis nigripes* Burchell. P. 203-206. In: Kingdon, J.S. & Hoffmann, M. (Eds). The Mammals of Africa Vol 5. Carnivora, Pholidota, Perissodactyla. In: Kingdon, J. Butynski, T. and Happold, D. (Eds). The Mammals of Africa Vols 1-6. Academic Press, Amsterdam.

Sliwa, A., Herbst, M., Mills M. 2010. Black-footed cats (*Felis nigripes*) and African wild cats (*Felis silvestris*): a comparison of two small felids from South African arid lands. Case study 26, p.537-558 *in* The Biology and Conservation of Wild Felids Oxford University Press, Editors. Macdonald, D. & Loveridge, A. pp. 736.

Sliwa, A., Wilson, B., Küsters, M., Lawrenz, A., Eggers B., Herrick, J., Tordiffe, A., Marais, P. & Marais, S. 2015. Report on surveying, catching and monitoring Black-footed cats (*Felis nigripes*) on Benfontein Nature Reserve, Nuwejaarsfontein and Taaiboschpoort Farms in 2014. Technical report pp. 14.

Terio, K.A., O'Brien, T., Lamberski, N., Famula, T.R., & MUNSON, L. 2008. Amyloidosis in black-footed cats *(Felis nigripes).* Vet Pathol 45(3):393-400.

Zimmermann, P.A., Lawrenz, A. & Sliwa, A. 2011. Untersuchungen zu Amyloidose und Akute-Phase-Proteinen bei Schwarzfußkatzen (*Felis nigripes*). Tierärztl. Umschau 66, 364 – 368 (2011). In German with English abstract.



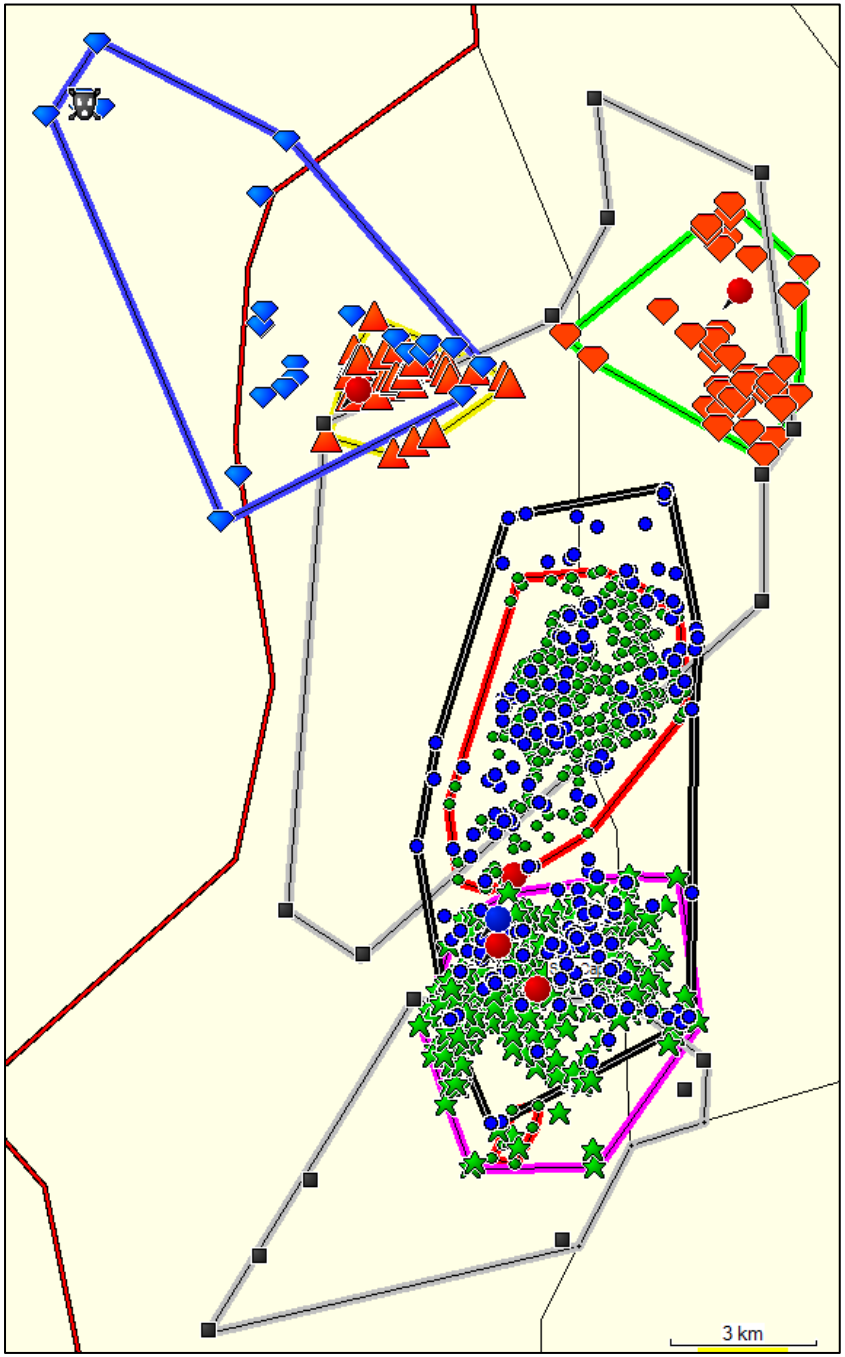
Map 1: GPS map of Benfontein NR (boundary = grey polygon), with minimum convex polygons (100% MCP) encompassing the locations of the 7 radio-collared cats collected during the year 2015. Total number of waypoint recorded 221. N = number of waypoint recorded for each individual.

- One cat remained from 2014: Male "Bolt" = 35.8 km² (n=81) in black polygon, green dots. Lost body mass (400g or 20%!) and shifted his range to south of Benfontein.

All other cats newly captured in October 2015:

- Subadult male "Mars"= 6,5 km² (n=29) in blue polygon, blue dots. In north-central Benfontein.
- Adult male "Thor" = 3,1 km² (n=21) in dark green polygon, green triangles. Central East Befontein.
- Adult male "Odin" = 13.1 km² (n=13) in light green polygon with cirle crosses sysmbols. Big adult male, ranges in Western Benfontein crossing dirt road to Mauritzfonetin.
- Subadult Male "Gust" = 2.6 km² (n=16); magenta polygon, green stars. Cryptorchid male with unusually slender tail. Ranges in Southwestern corner of Benfontein – close to
- Female "Cinda" = 2.7 km² (n=32) red polygon, red triangles. Had kittens in October (nipples in use), was seen last 13th December, not found again in February 2016. **Missing -. predated?**
- Female "Freya" = 5.8 km² (n=29); yellow polygon, red ovals. Was heavily pregnant in October when captured.

Map 2: GPS map of Nuwejaarsfontein (NJF) and Taaiboschpoort (TBP) farms (boundaries = grey polygons), with Eselsfontein (ESF) in between, with minimum convex polygons (100% MCP) encompassing the locations of 6 radio-collared cats intensively monitored between January – December 2015. Total number of waypoint recorded 1014. N = number of waypoint recorded for each individual.



- Female "Nele" with two red polygons, green dots (21.5 km²; n=348). She made an excursion from her normal range on NJF and ESF to the south onto TBP, between 12th and at least 13th June, where she use 0.6 km² (n=6) but was found on 9th July back in her normal range on NJF.
- Female "Sani" with magenta, green stars on ESF and northern TBP (26.3 km², n= 330)
- Female "Gyra" with yellow polygon, red triangles on northern NJF and adjacent farm Klein Rooidam.
- Female "Luna" with green polygon and red diamonds (14.3 km², n=46) on northeastern NJF and adjacent farm Haartebeesthoek.
- Male "Zuma" in black polygon, blue dots (57.6 km², n=220). Initially all over his large range, lately has been defeated by an uncollared male.
- Male "Stan" in blue polygon, blue diamonds (43.6 km², n=26). He was found ill on 28th February, then died (skull sign) on Swartkoppies farm on 4th March, due to later confirmed AA Amyloidosis.

October 2015 Benfontein Nature Reserve

Fig. 1: Processing "Bolt" in the South of Benfontein. (B. Wilson)

Fig. 2: Arian analysing blood of "Mars" with Abaxis®. (A.Sliwa)

Fig. 3: Female "Cinda" with ISEC Logo on our research vehicle. (A. Sliwa)

Fig. 4. The unusually slender tail of "Gust" a subdadult male with left-sided cryptorchism. (A. Sliwa)

Fig. 5: Capture of male "Odin" in a massive den – see Martina inside of it! (B. Wilson).

Fig. 6: Alex and Beryl measuring "Thor". (A.Lawrenz).

Fig. 7: Arne with "Thor". (A. Sliwa)

Fig. 8: "Freya", beautifully marked and heavily pregnant. (A.Sliwa)

October 2015 Nuwejaarsfontein & Taaiboschpoort Farms

Fig. 9. The team with "Gyra" (self-release picture)

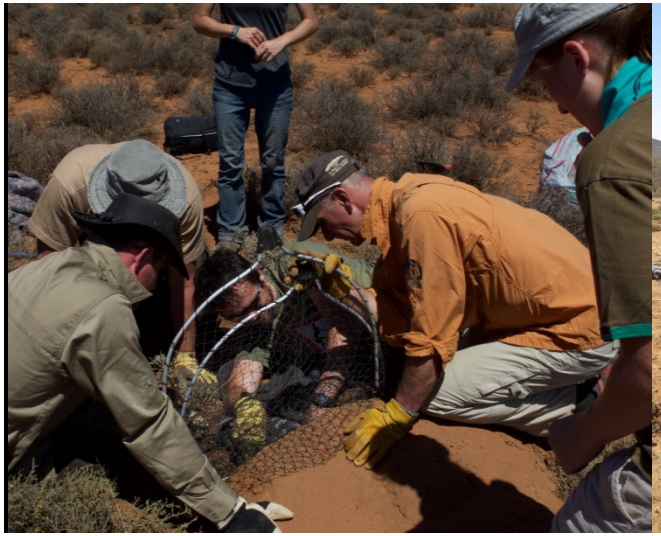


Fig. 10: Group effort to dig out "Nele". (H.Ganz).

Fig. 11. Arne and Alex digging for "Sani". (B..Wilson).

Fig. 12. Adrian and Holly Ganz collecting samples for the felid microbiome project (A.Sliwa).

Fig. 13: Adrian and Arne with "Zuma" on top of the sponsored Abaxis® machine. (A. Sliwa).

Fig. 14: Extracting the feisty "Sani" from her den and inserting her into the crate. (H.Ganz).

Fig. 15: Group in the hole dug in 3 hours to extract "Sani". (self release).

Fig. 16: Monitoring the collared cats in the rough terrain will be tough on the equipment (i.e. tyres) and Martina Küsters! (A.Sliwa).

Black-footed Cats tracked in 2015 and other work

Fig. 17: "Cinda" inspecting camera trap. (M.Küsters)

Fig. 18: "Gust" leaving den after waking up from anaesthesia. (A.Sliwa)

Fig. 19: "Stan" shortly before death, due to AA-Amyloidosis in March 2015. (M.Küsters)

Fig. 20: Kitten of"Luna", estimated at 10 days. (M.Küsters)

Fig. 21: "Nele" amongst rocks. Typical short bushy tail is visible. (A.Sliwa, A.Lawrenz, M. Küsters)

Fig. 22: "Zuma" peering from his den at dusk in late August 2015. (M.Küsters)

Fig. 23: Martina with Sterrie and helicopter pilot searching for "Ego" in April 2015 – without success. (M.Küsters)

Fig. 24: Martina doing vegetation surveys to estimate cover and density of shrubs and grass. (M.Küsters)

Table. 1: Body measurements (cm), range size and remarks on 13 black-footed cats with 12 captures on Benfontein, Nuwejaarsfontein and Taaiboschpoort in 2015.

Capture Date	22.10.15	23.10.15	24.10.15	25.10.15	26.10.15	26.10.15	26.10.15	28.10.15	29.10.15	30.10.15	30.10.15	31.10.15	*not captured*
Name (also on Map)	**Mars**	**Bolt**	**Cinda**	**Gust**	**Odin**	**Thor**	**Freya**	**Gyra**	**Nele**	**Zuma**	**Luna**	**Sani**	**Stan**
No. captured	Cat 1 15	Cat 2 15	Cat 3 15	Cat 4 15	Cat 5 15	Cat 6 15	Cat 7 15	Cat 8 15	Cat 9 15	Cat 10 15	Cat 11 15	Cat 12 15	Cat 1 13
Sex	M	M	F	M	M	M	F	F	F	M	F	F	M
Age (judged by teeth)	Sub-Ad	Adult	Adult	Sub-Ad	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Microchip #.	006B34FC4	0006FB1F0C	0006CB9750	-	-	953010000895671	953010000907170	953010000907240	0006CB8BE6	6CB9581	953010000907176	0006C67601	6CBBEBA
Mass (kg)	1.07	1.65	1.12	1.25	1.97	1.76	1.53	1.13	1.36	1.77	1.19	1.49	-
Ear (cm)	5.1	4.85	4.6	5.1	5.2	4.8	5.0	4.9	4.6	8.8	5.0	4.7	-
Shoulder (cm)	22	26	24	24	29	27	22	23	23	25 (err)	22	23	-
Total Length (cm)	54	64	58	60	65	60	55	53	55	60	56	54.5	-
Hind foot (cm)	8.73	9.6	8.5	9.2	9.6	9.4	8.4	8.2	8.4	9.1	8.4	8.4	-
Front foot (cm)	1.9 x1.76	2.0 x 2.0	1.8 x 1.7	2.0 x 1.9	2.2 x 2.0	2.2 x 2.1	1.8 x 1.8	1.85 x 1.7	1.9 x 1.6	2.0 x 1.8	1.9 x 1.6	1.9 x 1.7	-
Tail (cm)	17	18	18	17	19	19	17	16	16	16	15	16	-
Neck (cm)	10.5	14	10	11	14	13	11	11	10.5	14	10	11	-
Canine UR (cm)	0.77	1.00	0.88	0.88	1.05	1.04	0.88	0.71	0.90	0.98	0.84	0.90	-
Canine LR (cm)	0.74	0.87	0.76	0.82	0.80	0-88	0.76	0.74	0.72	0.84	0.74	0.76	-
Canine UL (cm)	0.76	0.98	0.84	0.87	1.04	1.00	0.84	0.89	0.85	0.98	0.88	0.89	-
Canine LL (cm)	0.73	0.82	0.76	0.83	0.92	0.86	0.85	0.78	0.72	0.94	0.78	0.72	-
Testes (cm)/nipples	Small, descended	Good size	Teats used	Cryptorchid (left side)	Fully developed	Well developed	Highly pregnant	Nipples in use	Nipples used	Fully developed	Nipples in use	Nipples used	-
No. fixes collected in 2015	29	81	32	16	13	21	29	44	348	220	46	330	26
Range (100%MCP) in 2015	6,5 km²	35,8 km²	2,7 km²	2,6 km²	13,1 km²	3,1 km²	5,8 km²	6,0 km²	21,5 km²	57,6 km²	14,3 km²	26,3 km²	43,6 km²

All fixes collected in 2015, N=1235: Alex Sliwa / Arne Lawrenz / Christoph Kiesow / Martina Küsters in Oct 2015 (N=70) and Martina Küsters by herself (N=1165).

Remarks:

1) Mars (Cat 1 15): BFN subadult male, still small and growing. Caught and collared on Benfontein. Fair condition, lots of fleas, few ticks in the ears.
2) Bolt (Cat 2 15): BFN, adult male, lost condition (-400g!), much thinner and scruffier, had moved to South of BFN, sometimes on Melrose Farm. Probably lost territory to stronger male – displaced.
3) Cinda (Cat 315): BFN, adult female. In central area. Nipples used at least once. Went missing in Dec/Jan 2016. No knowledge about her fate. **MISSING or DEAD**
4) Gust (Cat 4 15): BFN, subadult male (~1 year old. Good condition, left-sided cryptorchid, tail unusually slender and smooth. An odd looking bfc – hybridisation with *F. silvestris*, or inbred?
5) Odin (Cat 5 15): BFN; fully adult, well built, pale background colour. Broken LL canine. Dug him out of large aardvark den. Captured in central BFN but later moved across to West to Mauritzfontein Farm.
6) Thor (Cat 6 15): BFN, adult male, ~2-3 years old, good condition, sleek coat. Caught in East-Central part of BFN
7) Freya (Cat 7 15): BFN, adult female in good condition, beautiful spotted coat, she was highly pregnant. Caught only 2 hours after male Thor (Cat 6 15), a few hundred m away from him.
8) Gyra (Cat 8 15): NJF; denes coat, dark background colour. Nipples in use – later discovered that she must have had ~ 3 week old kittens (2) at the time of capture. Captured on Klein Rooidam farm.
9) Nele (Cat 9 15): NJF, caught out of termite mount at southern edge of her range on Eselsfontein Farm. Heavily pregnant. Upper left canine worn.
10) Zuma (Cat 10 15): NJF/ESF, adult male, ~ 4 yrs old, lost condition from 2014. Upper canines both slightly worn. Caught on Eselsfontein. Has recently been displaced from home range. Moves also on TBP.
11) Luna (Cat 11 15): NJF north, adult female . ~ 3 years old. Nipples in use, later confirmed 1 kitten of ~ 2 weeks old. Must have just given birth when captured.
12) Sani (Cat 12 15): TBP, dug her out of deep and long den, good condition, pregnant, all teeth clean and unchipped, pads of toes pale and word from travelling a lot. Also frequents part of Eselsfontein.
13) Stan (Cat 1 14): NJF adult male, very thin and scruffy looking, little fat. Was found close to death in March 2015, transported and necropsied at National Zoo Pretoria, Amyloidosis confirmed. **DEAD**

View publication stats