

- 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 2016

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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 specialised 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 25-

31 October 2016 then to Nuwejaarsfontein (NJF) and Taaiboschpoort (TBP) Farms, south of De Aar, from 31 October - 6 November 2016.

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 precipitation 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 of TBP farms receive an average of 300 mm precipitation 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 (henceforth termed “bfc”) for biological sampling and radio-collaring for subsequent observation, several methods were employed to survey areas, previously known to hold bfc's. Since November 2005 annual capture operations were conducted on BFN, and since February 2009 also on NJF and TBP until the present visit. 11 reports are available about previous fieldwork for download as PDF on the website www.black-footed-cat.wild-cat.org.

Methods:

(A) Spot-lamp searching: For a total of 11 nights (6 nights on BFN, 5 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 two people (4-7 this trip) stood on the open back of the vehicle operating two spotlights (1 million candle power / Lightforce® SL240 mm).

(B) Catching via searching and pursuit: Once bfc's 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. One or two people with fish landing nets then netted the cats. On other occasions the cats found 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 captured cats were subsequently anaesthetised 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 most of the 10 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 antagonised with intramuscular injection of atipamezole, flumazenil and naltrexone, and the cats then placed in a small plastic crate for recovery. All bfc's 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=10) were confirmed alive and well on subsequent nights using telemetry and visual verification.

(C) "Digging" of previously radio-collared cats: This method was employed five times this year, where the den or termite mound in which the radio-collared bfc was resting, 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 male "Odin" as well those of the females "Freya", "Nele", "Sani" and "Gyra" were exchanged with either little or up to major digging (several hours!) being necessary.

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

The captures via vehicles were variously staffed in October/November 2016 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 researcher BFCWG, Swakopmund, Namibia (kusters.m@hotmail.com)

Dr. Arne Lawrenz, zoo veterinarian and director, Wuppertal Zoo, Germany (a.lawrenz@zoo-wuppertal.de)

Dr. Birgit Eggers, specialised wildlife veterinarian, (blackegg@mweb.co.za)

Dr. Anneke Moresco, research veterinarian, (amoresco@denverzoo.org), sponsored by Cincinnati Zoo, USA

Mr. Sterrie Marais, farm owner of Nuwejaarsfontein and Taaiboschpoort, De Aar, SA (info@karooexperience.co.za)

Mr. Piet Marais, farm owner of Nuwejaarsfontein and Taaiboschpoort, De Aar, SA

Mr. Duane Ungerer; farm manager of Jagpoort (neighbouring NJF), De Aar, SA

Results:

Trapping: no trapping performed on this field trip.

Spot-lamp searching and catching/exchanging radio-collars:

BFN: we saw bfc's six times (one individual twice) during six nights of searching and caught three of them. Thus we saw one bfc unaided by telemetry on average on any of the six nights (100% chance of

sightings/night). The entire area was part of the previous ecological study of Sliwa from 1992–1998, and the same area we have covered during previous capture trips (2005–2014). During these night drives we observed other carnivores including aardwolves (*Proteles cristatus*), one black-backed jackal (*Canis mesomelas*), several small groups of bat-eared foxes (*Otocyon megalotis*), South African hedgehog (*Atelerix frontalis*) and many aardvark (*Orycteropus afer*) (up to two individuals per night this trip) and springhares (*Pedetes capensis*).

We caught three new cats on BFN, a young adult male “Anakin”, an adult male “Luke”, and one adult female “Leia” via the pursuit method. For locations and measurements please refer to Map 1 and Table 1. One un-collared bfc was seen in the former Westgate vicinity, in the centre of the reserve, whilst tracking a radio-collared cat, but we did not attempt to catch it. Another cat could not be caught. We caught three out of four different individuals, thus our capture success rate was 75%.

We exchanged the still functioning radio-collars of male “Odin” and female “Freya” with new ones, by locating them in their dens. Thus we currently have five radio-collared bfcs on BFN.

NJF and TBP: we saw four different bfcs during five nights of searching (80% chance of sighting a bfc/night) and caught two of those in four attempts (50% capture success). We caught two un-collared males, “Darth”, a young adult male on northern TBP and a very large adult male “Hulk” on Northwestern NJF. The other two bfcs spotted on the night of 4 November eluded capture. One was in long and difficult to traverse vegetation and we could not pick up its eyeshine again after the first contact. The second cat, certainly a very clever and fit male, crossed a fence three times, so that every time we had to drive around and through two different gates hundreds of meters away. Ultimately he slipped past an aardwolf deep into its active den. A camera trap (Reconyx HC600) positioned in front of the den’s entrance later obtained fantastic pictures of both the cat leaving and the aardwolf emerging from the same den (Fig. 21). During these night drives we observed other carnivore species such as aardwolves, groups of bat-eared foxes, several Cape foxes (*Vulpes cana*) (Fig.11) and small-spotted genets (*Genetta genetta*). We also observed aardvark almost every night (up to 3/night), porcupines (*Hystrix africaeaustralis*) and spotted eagle owls (*Bubo africanus*). We spotted a caracal (*Carcacal caracal*), a potential predator of bfcs, but no black-backed jackals.

Additionally, we exchanged the functioning radio-collars of the three females “Nele”, “Sani” and “Gyra”, when we extracted them from the dens into which they took refuge during daylight. We sighted the one kitten of “Nele” and the two kittens of “Sani” (Fig.15) in these dens. The smaller kitten of “Gyra”, was later corroborated by pictures of a camera trap.

We had five radio-marked bfcs on these two farms, when we left on 6th November 2016.

Fate of black-footed cats in 2016 (last collared in 2015)

Male “Bolt”: caught in November 2014 as an adult on central BFN, was monitored over the year 2015 (home range of 35 km²; Sliwa *et al.* 2016). He was captured in order to exchange his radio-collar in November 2015. In November 2015 he had already lost considerable weight and condition (- 400g!) (Sliwa *et al.*, 2016), being much thinner and scruffier, and had moved to the South of BFN and was sometimes on the neighbouring Melrose Farm. He was probably displaced from his territory by a stronger male. He then spent the first half of 2016 in the same small area (Map 2; Tab.1), was last seen alive by Martina Küsters on 18th August, before being found dead in a shallow aardvark dig on 15th September. His collar showed some minor carnivore bite marks, but his body was complete. We assume that he must died of AA Amyloidosis or was at least weakened by this disease.

Male “Mars” (Cat 1 15): Young adult male caught in October 2015 in BFN. Roamed BFN’s central part, last seen at more southerly area in February 2016 (Map 2). Not found again in April 2016. Missing or dead.

Male “Gust” (Cat 4 15): Young adult male caught in October 2015 on BFN. Frequented a small area in south western part (Map 2). Last seen alive on 9.2.16. On 28.4.16, he was found dead 3.4 km south of his last location, now on the neighbouring Melrose farm (Map 2).

Male “Thor” (Cat 6 15): Adult male, caught in the central eastern part in October 2015 was only observed until 8.2.16 (Map 2); when searching in late April 2016 not found again. Missing or dead.

Male “Zuma”: Caught as an adult of ~2 years on Northern NJF in November 2013 and tracked intensively by Martina since, when he maintained a large range of 57.6 km² (100%MCP) in 2015 (Sliwa *et al.* 2016). In November 2015 (at ~4 years age) he had already lost weight (-200g)(Tab. 1), and his upper two canines were slightly worn. He had moved south to the southern edge of NJF, onto ESF and partly TBP (Map 3). He was seen injured on 28 July 2016 and then close to death on 2 August not far away on ESF. Found dead on 3 August 2016. Again, we assume that he probably died of AA Amyloidosis or was at least weakened by disease and thus was displaced.

Female “Luna”: Adult when captured on 30 October 2015 having just given birth, with one kitten of approx. 10 days of age found on 7 November 2015 by Martina (Sliwa *et al.* 2016). She roamed a large territory of 15.7 km² (Map 3, Tab. 1) on NE NJF and neighbouring farm. She was monitored until 24.4.16, when she was killed by a caracal with a bite to her spine. She was seen alive the previous day.

Other five cats alive in October/November 2016: the male “Odin” roamed a large (40 km²) part of central BFN (Map 1) and the female “Freya” (Map 1) a only small (6 km²) part of south central BFN, both with still functioning radio-collars and we replaced their collars with new ones. Likewise the De Aar females “Nele” (15 km²), “Sani” (13.1 km²), “Gyra” (15.3 km²) on NFJ, ESF, and TBP maintained their home ranges with slight shifts (Map 3). Their three collars were exchanged.

Fate of Black-footed Cats in early 2017 (collared in 2016)

All 10 cats that were collared in October/November 2016 (Tab 1) were found again in early February 2017, however **female “Gyra” was found dead**, as we had feared, due to her frequent drinking of water from troughs on NJF in November and December 2016. We suspect kidney failure possibly as a result of AA Amyloidosis, as she had seemed otherwise very fit and a capable hunter. She killed a blue korhaan (*Eupodotis caerulescens*) and its two chicks shortly later on 16th November 2016 (Figs. 17 6 18). We don't know, whether her single kitten, seen on a camera trap video in early November, has survived to dispersal.

Locating the radio-collared Cats

BFN, NJF and TBP: before and subsequent to their respective capture Martina, Alex and Arne attempted to acquire location fixes (waypoints) of all newly radio-collared 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. 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 in 2016. The BFCWG was able to finance the tracking of all the cats (Table 1) in 2016 by Martina Küsters, who was tracking them on all three farms (BFN, NJF, TBP). Altogether 1 256 waypoints were collected until 14 December 2016. Home range size estimates incorporating all collected waypoints for all the individual cats tracked in 2016 are provided in Table 1 and Map 1-3.

Behavioural Observations of Black-footed Cats

A total of 16 cats were monitored in 2016 with varying intensity. On the De Aar farms the females “Nele”, “Sani” (since 2014), “Gyra” and “Luna” (since 2015) were intensively monitored by Martina Küsters and the male “Zuma” already since November 2013. All five were well-habituated and provided valuable insights in to killing various prey, spray-marking and giving birth to kittens. The excellent data sets for them will allow meaningful comparison of annual home range sizes between years and between study areas in future analyses. On BFN unfortunately two males went missing and two were found dead with the male “Bolt” having been habituated well to the research vehicle through previous tracking. This

left the two surviving cats there in October 2016, which allowed close approach and photography (Figs. 13, 14). All the new cats were still rather shy, but continued tracking will allow closer vehicle approaches and better behavioural observations.

Over the past months Martina has tracked the two new males on NJF, TBP (De Aar), managed to collect data and to habituate them well to the vehicle. However the terrain in their home ranges is rather difficult and requires longer detours when they cross the fences between farms and towards neighbouring properties. With the three new cats on BFN, habituation will take a longer time, as Martina spends far less time on the reserve due to her commitments to on her MTech study in De Aar, although she has found all five collared cats on BFN on several tracking visits. Several of the new cats have habituated well to the tracking vehicle despite the limited time Martina has been able to spend with them.

Reproduction: Of the five females caught in October/November 2016 we have assumed and confirmed reproduction in the following cases. We also have some information on an un-collared female on BFN.

“Freya”: when capturing her she was heavily pregnant with two foetuses and must have given birth in November. Despite this, no kitten was ever seen later, as she roams an area with long grass and stays in deep dens in the sandveld of southern BFN. This reduces the telemetry signal to a few hundred meters and makes finding her during daytime to set a camera trap very difficult.

“Nele”: gave birth ~29.9.16 to two kittens. When captured on 2.11.16 she still had a ~5 week old kitten nursing. Lovely camera trap videos were obtained of her nursing the kitten, bringing back prey, playing and shifting the kitten to another den. The BBC Natural History Unit crew, setting cameras at her den also obtained great footage of this kitten.

“Sani”: gave birth on ~9.9.16 to two kittens, when captured on 3.11.16 she had two about ~9 week old kittens with her in the den. Two weeks later only one kitten was found by itself, the other may have been somewhere else, while Sani was hunting in the surroundings.

“Gyra”: gave birth on ~27.9.16 to two kittens, when captured on 4.11.16 her nipples were suckled (Fig. 10). Although no kitten was seen in her den at the time, we confirmed a single kitten of ~5 weeks suckling from her later that night.

“Leia”: when captured on 26.10.16 she was not lactating or seemed gravid with inactive nipples, although it was evident that she had previously suckled kittens.

“Un-collared Female BFN”: Martina saw an un-collared female when looking for “Leia” on 13.11.16. She quickly placed a camera trap at the den the female ran into and recorded her with two kittens of ~ 6-weeks. The camera trap filmed the female bringing back a gerbil (*Tatera* sp.) which the kittens then ate.

In November 2016 veldt conditions were still dry but rains started to fall in January and February 2017. Both “Nele” and “Sani” each had a second litter of kittens in January 2017.

Camera Trapping: Alex Sliwa and Martina Küsters deployed three digital camera traps (Bushnell Trophy Cam HD; Bushnell Trophy Cam HD Nature View with close focus lens, 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, 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 2016 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 bfc's 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.

After lengthy negotiations with the BBC Natural History Unit starting in early 2016 there was an exploratory 2-day trip by one producer to visit Martina tracking on BFN in August and then another producer arrived on 15th November being introduced to the collared De Aar cats by Beryl, Alex and Martina for two nights, staying at Taaiboschpoort House, before his crew of an assistant producer and a camera man arrived for eight days of filming, made possible by Martina following “Gyra” with our research vehicle on her hunting forays and setting camera traps at “Nele’s” den with her single kitten. We are all very curious on the great footage they obtained for the “Wild Cats” series, due to be aired in 2018. On 16th November, this filming was covered by the Volksblad newspaper group and published online on 1st December on Netwerk24.

Publications, conference papers, presentations by BFCWG group members on *Felis nigripes*:

Eggers, B. MMedVet (Fer) - Dissertation. (Presentation given at the Veterinary Management of African Wildlife Congress, Onderstepoort, RSA on 25.2.2017)

Sliwa, A. 2016. Black-footed Cat Field Research - combining Conservation with Research. Presentation at Omaha Zoo, Nebraska, USA on 22.3.2016.

Sliwa, A. 2016. Linking Research and Conservation on the Black-footed Cat. Presentation to staff at Tswalu Kalahari Reserve, South Africa on 14.11.2016.

Sliwa A, Wilson B, Küsters M & Tordiffe A. 2016. *Felis nigripes*. The IUCN Red List of Threatened Species 2016: e.T8542A50652196. Downloaded on 05 July 2016.

Wilson B. 2015. The Black-footed Cat *Felis nigripes* (Burchell, 1824): a review of the geographical distribution and conservation status. Unpublished MTech dissertation, Tshwane University of Technology.

Wilson B, Sliwa A, Drouilly M. 2016. A conservation assessment of *Felis nigripes*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

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 three new cats (during six nights of spotting) and exchanged the collar of remaining male “Odin” and female “Freya” on BFN. While we saw another two cats, tried to capture one of them, but failed, our success rate was 75%, which was similar to 2015. We attained a lower success rate on NJF and TBP with two new cats captured and two cats missed (50% capture success). However the one male cat was exceptionally cunning and fit, eluding the capture team by repeatedly and certainly deliberately crossing the same fence line three times, whenever we arrived on its side to evade us. Each time we took a few minutes to arrive at the other side by racing along the fence and going through two gates. Finally he ran past an aardwolf into its large den. This is the first time it has been recorded that a black-footed cat has used an active aardwolf den, although this behaviour surely has been due to us pursuing the cat and it took a chance to evade us. The daytime exchanges of the radio-collars of the females “Nele”, “Sani” and “Gyra” through extracting them from dens by careful and slow digging has resulted in no injuries and all females and their kittens were unharmed and fit after the procedures.

The sighting frequencies of 1.0 and 0.8 cats/night between the two established study areas were similar during this trip. This has evened out in contrast to the October/November 2015 disparity, where there was a much higher frequency (2.0 cats / night) on BFN then (Sliwa *et al.* 2016). 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 both sites, so had no hampering of our work.

The jackal density on BFN seemed lower than during the November 2015 trip, since we saw only a single jackal in the six nights in 2016. We didn't see a jackal, but a single caracal on NJF and TBP. No African wildcat nor feral/domestic cats were seen at either study area.

Due to the short time periods at both study areas by the group, 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 seems to be a fair number of males, both young adult and adult, and fewer females on BFN. With the female "Freya" highly pregnant and recording the un-collared female with two kittens (Fig. 20) there is confirmed reproduction on BFN in 2016. It is very reassuring that the two long-term monitored females "Nele" and "Sani" on NJF, ESF and TBP each had two litters between September 2016 and February 2017, with hopefully several of the kittens surviving to dispersal and beyond. Also the female "Gyra", although found dead in February 2017, had two kittens in 2016, but only one was seen in November. Maybe we will capture some of these youngsters during the upcoming November 2017 capture trip.

On TBP and NJF we caught three of the five cats from 2015 again, one of them died in 2016 due to disease/fighting and the other due to injury from a predator. The mortality (40 %) of adults in 2016 was higher than in the year 2015 (when 25%), although differences in percentage are large with such small numbers of cats monitored by telemetry. The death of the male "Zuma" was sad, but expected. He had been losing condition (body mass) already since October 2015, when he seemed to have lost a fight with another male. When he was seen injured in late July 2016 he had weakened further. Whether he also had AA-Amyloidosis, which would have debilitated him before, still remains to be proven. We hope to have his samples, preserved by Martina Küsters and stored at the McGregor Museum, later sent and analysed at the National Zoological Gardens in 2017. Necropsies will remain crucial to provide a measure of the frequency and prevalence of AA-Amyloidosis in the De Aar area and not just on BFN, where it had been reported before (Terio *et al.* 2008; Zimmermann *et al.* 2011). The death of the adult male "Bolt" on BFN followed a similar pattern to that of "Zuma", having initially a large home range in 2015, then reducing it to a small area (5.3 km²) and finally dying within. Unfortunately we have no samples from him as they were too decomposed. The death of the young adult male "Gust" on Melrose Farm, to the south of BFN remains a mystery. His carcass was only skin and bones but complete, the skull already bleached, found less than 500 m from human habitation next to a den. His bones are preserved at the McGregor Museum. The disappearance of the two males "Thor" and "Mars" from BFN is unsatisfactory, but typical of young adult or adult but non-resident males, possibly having migrated far away from BFN on dispersal. Many males die during dispersal or become successfully established elsewhere. We had seven cats collared on BFN in November 2015 and were left with two a year later. Two cats died (29% mortality) and three disappeared (one could not be located already in February 2016; Sliwa *et al.* 2016; Tab. 1) and could also be presumed dead thus leading to a mere 29% survival (or continued presence) on BFN.

This year's reproduction has been impressive with two kittens born to each of the three De Aar females in September 2016, with female "Freya" highly gravid on BFN in late October and the kittens seen with the un-collared female in mid-November. We could only speculate about pregnancy in the newly captured female "Leia" on BFN, but we have no proof. Thus reproduction has occurred in both study

areas, however we have neither information whether the observed kittens survived past dispersal age (M. Küsters, pers. comm.), nor if the kittens of “Freya” were born and if they survived the initial days. Both “Nele” and “Sani” had a second litter of kittens in February 2017. Although weaning took 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). A goal of the Black-footed Cat Working Group should be to look into survival after kitten independence, although the small size of these kittens will make the fastening of collars and only small battery capacity of these even smaller collars challenging.

The waypoints collected on the new cats 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 2016 and, particularly, the five cats “Nele”, “Sani”, “Gyra”, “Luna” and “Zuma” south of De Aar, and to a lesser degree “Bolt”, “Odin” and “Freya” on BFN (Maps 1-3; Table 1). The recently deceased female “Gyra” was intensively tracked (Map 3, Table 1). She was observed to drink water frequently from September 2016 onwards and this frequency increased to at least once per night in November 2017, indicating AA-Amyloidosis (“kidney-disease”) as a precursor to her death.

The two resident males “Odin” and “Hulk” were observed urine spraying in November 2016 and used large home ranges (“Odin”= 39.8 km²; N=104 points between Feb-Dec 2016 / “Hulk”= 48.8 km²; N=39 points in Nov-Dec 2016, both MCP100%; Table 1) and compared to previously recorded resident male home ranges on BFN (average 21 km², range 16-24 km², n=5, Sliwa, 2004). We are curious what the annual home range size of the really large new male “Hulk” in 2017 will be. He is certainly the top resident male, probably covering most of the females in his range.

In comparison to 2015, when the adult female “Nele” made a short-term excursion from her range, she didn't leave her normal home range in 2016. Under anaesthesia on 2.11.16 we recorded that her upper left canine has worn slightly more, but she is still in good condition with a sleek coat, although she is aging.

The capture field trip was highly successful, with the capture rates of both study areas more similar this time. 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 will collect more location fixes on a regular basis for each of the nine radio-collared cats still alive in March 2017 for the rest of the year.

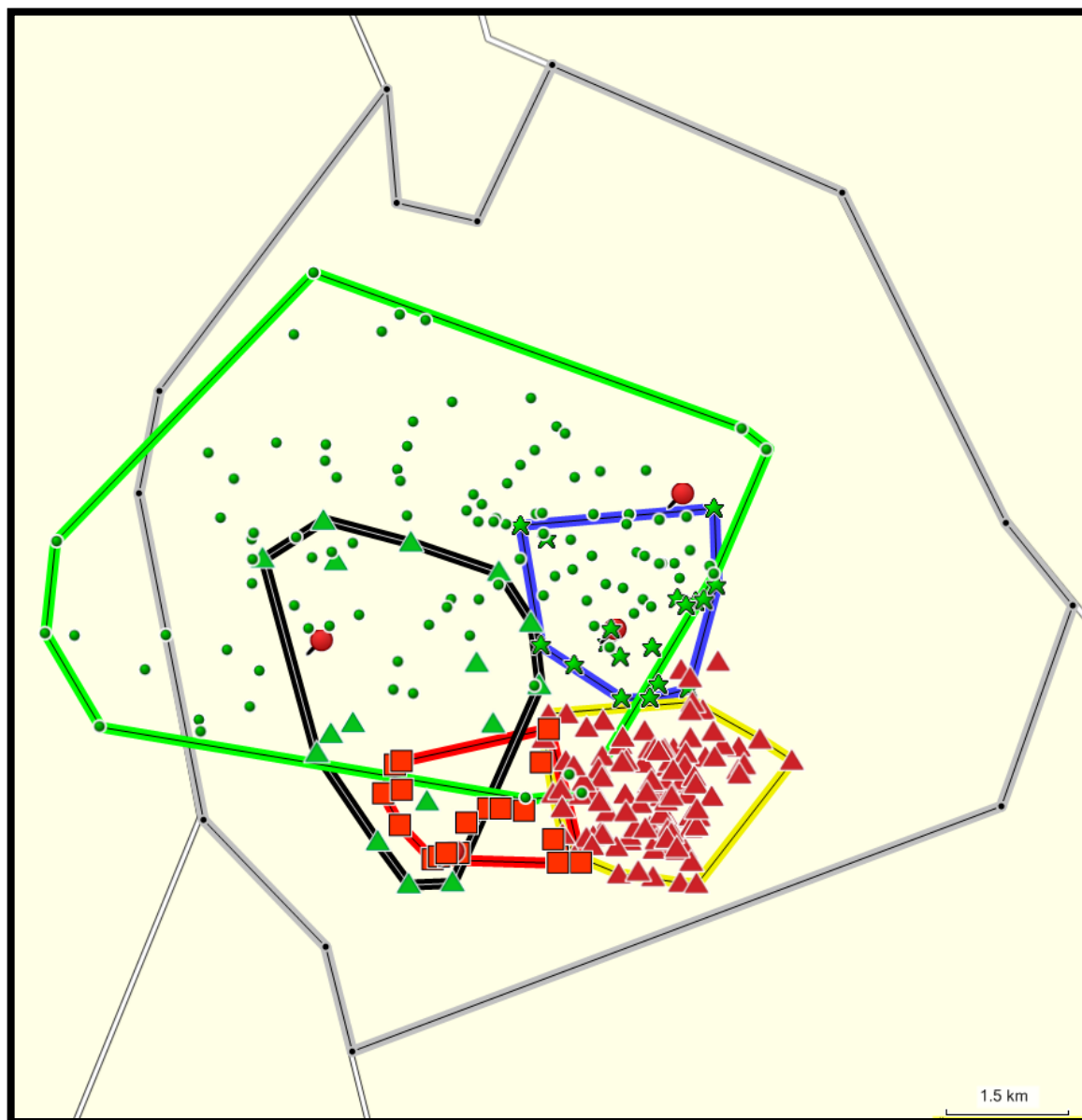
The BFCWG will return to BFN, ESF, NJF and TBP for further capturing and sampling of wild black-footed cats in late 2017.

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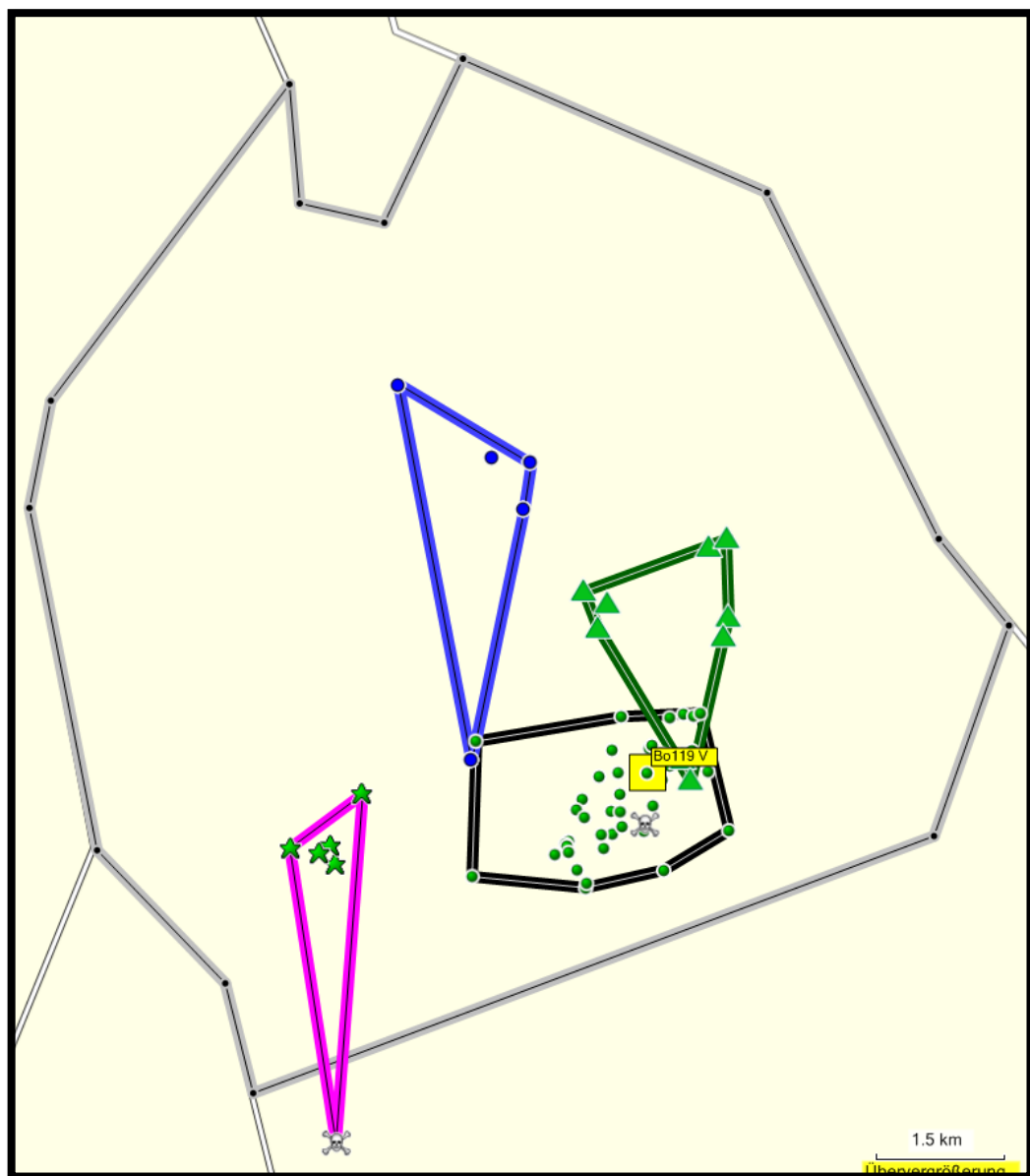
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Map 1: GPS map of Benfontein NR (BFN; boundary = grey polygon), with minimum convex polygons (100% MCP) encompassing the locations of the 5 radio-collared cats **alive** in November / December 2016. Total number of waypoints recorded for these 267. N = number of waypoint recorded for each individual.

- Adult male “Odin” = 39.8 km² (n=104) in light green polygon with small green dots for locations. He covered Western / Central BFN, crossing the dirt road to Mauritzfontein Farm. Recaptured and exchanged his radio-collar.
- Adult male “Luke” = 10.2 km² (n=17) in black polygon, green triangles. Overlaps ranges of “Odin” and female “Leia”.
- Young adult male “Anakin” = 4.6 km² (n=20); blue polygon, green stars. Ranges in central part of BFN. His range is overlapped entirely by male “Odin”.
- Female “Freya” = 6.0 km² (n=104) yellow polygon, red triangles. Heavily pregnant when caught (ran out of her den into our net) and had her collar exchanged. Used a smallish area in central South of BFN throughout 2016, in an area with deep Kalahari sand and calcrete.
- Female “Leia” = 3.1 km² (n=20); red polygon, red squares. Must have had kittens before, thus an adult female. Uses an area adjoining to female “Freya” and is partly overlapped by the ranges of males “Odin” and “Luke”.

Map 2: GPS map of Benfontein NR (BFN; boundary = grey polygon), with minimum convex polygons (100% MCP) encompassing all the 2016 locations of each of the 4 radio-collared cats that were **lost to observation** during the year 2016. They were either found **DEAD** or went **MISSING**. Total number of waypoints recorded 64. N = number of waypoint recorded for each individual.

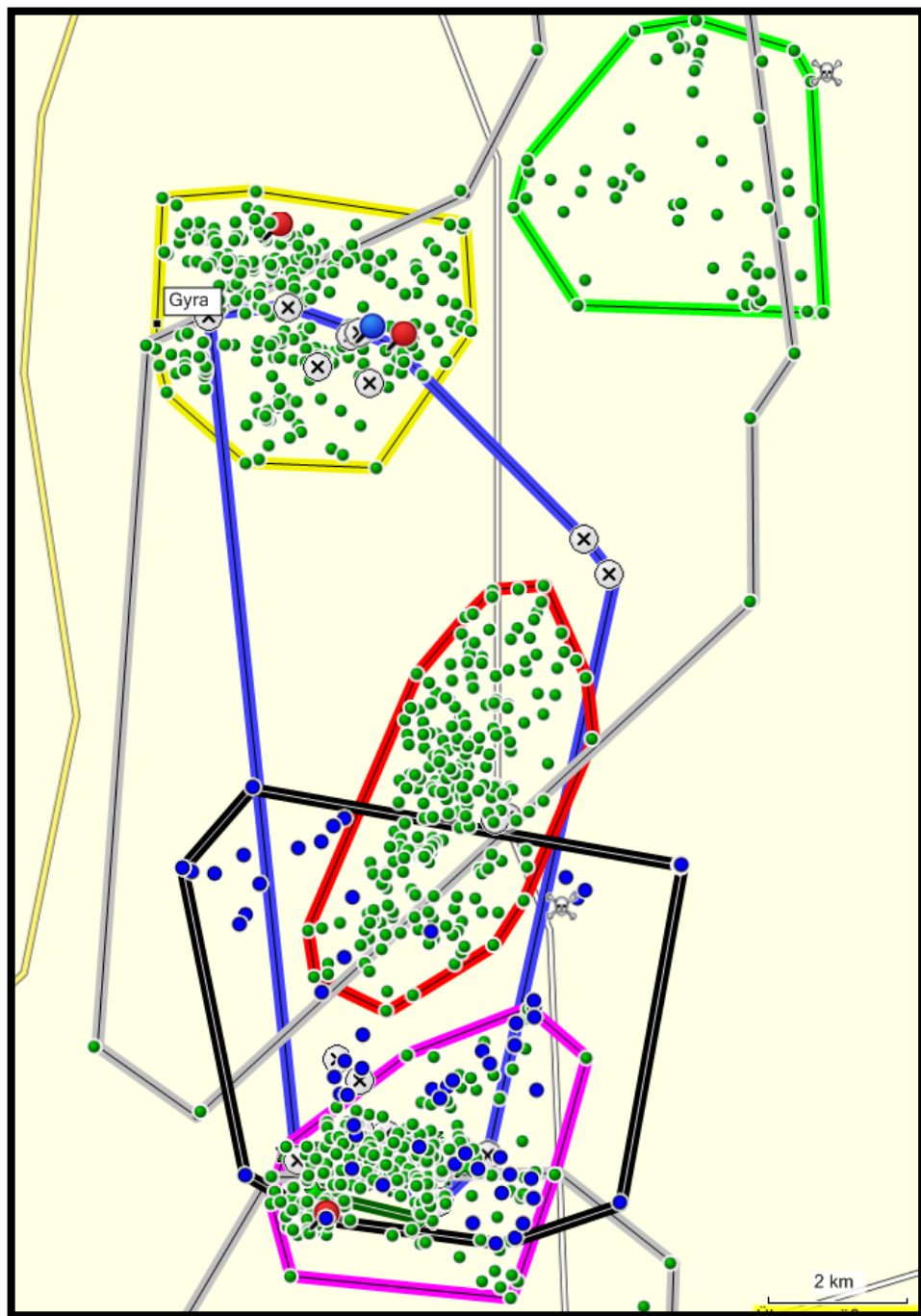


- Male “Bolt” = 5.2 km² (n=44) in black polygon, green dots. Remained in southern part of BFN, probably after losing his territory to other males, and was found **DEAD (Skull sign)**, probably due to amyloidosis.

- Young male “Mars” = 3,2 km² (n=5) in blue polygon, blue dots. Roaming the central part of BFN. Last seen a few km to the South on BFN in February 2016. Not found again in April 2016. **MISSING** or **DEAD**.

- Adult male “Thor” = 2,9 km² (n=9) in dark green polygon, green triangles. In central eastern part of BFN. Only observed until 8.2.16; when searching again in late April not found. **MISSING** or **DEAD**.

- Young adult male “Gust” = 1.7 km² (n=6); magenta polygon, green stars. Cryptorchid male with unusually slender tail. Ranged in Southwestern part of BFN. Last seen alive on 9.2.16. Then found dead on 28.4.16, 3.4 km south of last location on neighbouring Melrose Farm. **DEAD**.



Map 3: 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 7 radio-collared cats intensively monitored between January – December 2016. Total number of waypoints recorded 932. N = number of waypoint recorded for each individual.

- Female “Nele” with red polygons, green dots (15.0 km²; n=236). On NJF but also partly in ESF. Had initially two kittens, then when exchanging her collar only one remained. Starred in BBC Natural History Unit filming for “Wild Cats” in November.

- Female “Sani” with magenta, green dots on ESF and northern TBP (13.1 km², n= 231). Had two ~10-week-old kittens when captured. Concentrated in central and western part of her range. Kittens got independent in mid-November.

- Female “Gyra” with yellow polygon, green dots on western NJF and adjacent farm Klein Roodam (15.3 km², n=279). When exchanging her collar she was suckling at least one 4-6 week old kitten. Drank frequently from sheep water trough. **Died** in February 2017 due to Amyloidosis. Also starred in BBC Natural History Unit filming for “Wild Cats” in November.

- Female “Luna” with green polygon and green dots (15.7 km², n=59) on northeastern NJF and adjacent farm Haartebeesthoek. Had a single kitten in December 2015, which was not seen again in 2016. Was monitored until 24.4.16, killed by a caracal (*Caracal caracal*), bite to her spine, was seen alive previous day. **DEAD.**

- Male “Zuma” in black polygon, blue dots (36.9 km², n=63). ~ 5 yrs old. Has retreated to southern part of his large range, defeated by an uncollared male (likely “Hulk”) in July. Seen injured 28th July 2016 and then close to death on 2nd August not far away on ESF. Found dead on 3rd August 2016 **DEAD.**

- Male “Hulk” in blue polygon, white circles with cross inside (48.8 km², n=39). . NJF captured via chase. An incredibly large and sturdy male; largest ever caught in 25 years of field research (2.58 kg!)! Covers the ranges of all 3 resident collared female (“Gyra”, “Nele”, “Sani”).

- Young adult male “Darth” TBP in dark green polygon (only partly visible in map) (2.1 km², n=18), nearly adult sized, but lower weight, resident? Dispersing? Had contact with female “Sani” and her kittens – is he her son?

October 2016 Benfontein Nature Reserve



Fig. 1: Preparing to dig out male “Odin” in the north of Benfontein. Blocking holes, locating. (B. Eggers)



Fig. 2: Searching for “Freya” in the sandveld with deep dens amongst calcrete and sand. (A.Moresco)



Fig. 3: The team with female “Freya”. (B.Wilson – self release)



Fig. 4: Carrying our equipment back to the vehicle after capturing “Freya” (A.Sliwa).



Fig. 5: Fixing an auto electrical problem in the veldt. All hands needed! (A.Sliwa).



Fig. 6: Plenty of fleas in the ear of “Luke”. (A. Sliwa)



Fig. 7. The team with “Hulk” (B. Wilson-self-release)



Fig. 8: Alex collaring “Hulk”. This is the largest bf-cat ever collared in 24 years! (A.Moresco).



Fig. 9. Examining the collected sperm of “Darth” in the veldt. (A.Sliwa).



Fig. 10: “Gyra” plucked her teats for suckling her offspring. (A. Sliwa).



Fig. 11: A Cape fox (*Vulpes chama*) attracted to Sterrie’s expert squeaking. (A.Moresco).



Fig. 12: The BBC Natural History Unit filmed for 8 days for the “Wild Cats” series, due for screen in 2018 on Nuwejaarsfontein. (self-release BBC/NHU).

Black-footed Cats tracked in 2016



Fig. 13: "Odin" a beautiful male, BFN. (A.Sliwa)



Fig. 14: "Odin" approaches the vehicle. (A.Sliwa)



Fig. 15: Sani's kitten in den. (A.Sliwa)



Fig. 16: "Nele" with lark. (A.Sliwa)



Fig. 17: Blue korhaan (*Eupodotis caerulescens*) killed by "Gyra". (A.Sliwa)



Fig. 18: "Gyra" also killed the two chicks of the blue korhaan. (A.Sliwa)



Fig.19: "Gyra" – wide eyed innocence (A.Sliwa)



Fig.20: Un-collared female with kittens on BFN. Camera trap image (M.Küsters)



Fig.21: The male bfc that got away, hiding in an aardwolf den. CT image (BFCWG)

Table. 1: Body measurements (cm), range size and remarks on 16 black-footed cats with 10 captures on Benfontein, Nuwejaarsfontein and Taaiboschpoort in 2016.

Capture Date	25.10.16	27.10.16	29.10.16	29.10.16	26.10.16	2.11.16	3.11.16	3.11.16	3.11.16	4.11.16	not captured	not captured	not captured	not captured	not captured	not captured
Name (also on Map)	Anakin	Odin	Luke	Freya	Leia	Nele	Darth	Sani	Hulk	Gyra	Bolt	Zuma	Mars	Gust	Thor	Luna
No. captured	Cat 1 16	Cat 2 16	Cat 3 16	Cat 4 16	Cat 5 16	Cat 6 16	Cat 7 16	Cat 8 16	Cat 9 16	Cat 10 16	Cat 6 14	Cat 2 13	Cat 1 15	Cat 4 15	Cat 6 15	Cat 11 15
Sex	M	M	M	F	F	F	M	F	M		M	M	M	M	M	F
Age (judged by teeth)	Y-Ad	Adult	Adult	Adult	Adult	Adult	Y-Ad	Adult	Adult	Adult	Adult	Adult	Y-Ad	Y-Ad	Adult	Adult
Microchip #.	953010000907 166		953010000908 770	-	953010000907 268		953010000907 272		953010000895 655							
Mass (kg)	1.52	2.04	1.93	1.74	1,20	1.34	1.67	1.26	2.58	1.13	-	-	-	-	-	-
Ear (cm)	4.8	5.2	5.1	4.8	4.8	4.8	5.2	4.9	5.1	4.6	-	-	-	-	-	-
Shoulder (cm)	26	27	27	23	23	24	28	23	28	23	-	-	-	-	-	-
Total Length (cm)	59	64	64	56	55	57	59	54	65	55	-	-	-	-	-	-
Hind foot (cm)	9.1	9.6	9.8	8.6	7.8	8.5	9.0	8.4	9.9	8.0	-	-	-	-	-	-
Front foot (cm) (L x W)	2.2 x 1.9	2.5 x 2.0	2.3 x 2.1	2.0 x 1.6	2.0 x 1.6	2.0 x 1.6	2.2 x 1.9	1.8 x 1.6	2.1 x 2.2	1.9 x 1.6	-	-	-	-	-	-
Tail (cm)	19	19	18,5	17,5	16	16	18	16	19	16	-	-	-	-	-	-
Neck (cm)	11.5	14	13	11	10,5	11	13.5	11	16	10	-	-	-	-	-	-
Canine UR (cm)	0.95	0.78	1.20	0.83	0.78	0.86	1.02	0.94	1.10	0.69	-	-	-	-	-	-
Canine LR (cm)	0.95	0.90	0.97	0.76	0.67	0.79	0.83	0.74	0.90	0.69	-	-	-	-	-	-
Canine UL (cm)	0.91	1.13	1,13	0.84	0.73	0.81	1.02	0.87	1.15	0.90	-	-	-	-	-	-
Canine LL (cm)	0.85	0.92	1.00	0.78	0.63	0.76	0.85	0.72	0.95	0.72	-	-	-	-	-	-
Testes (cm)/nipples	Small, descended	Good size	Good size	had kittens before	Used nipples	In use, nursing	Developed	weaning 2 kittens	Well developed	Nipples in use	-	-	-	-	-	-
No. fixes collected in 2016	20	104	17	106	20	236	18	231	39	279	44	63	5	6	9	59
Range (100%MCP) in 2016	4.6 km ²	39.8 km ²	10.2 km ²	6.0 km ²	3.1 km ²	15.0 km ²	2.1 km ²	13.1 km ²	48.8 km ²	15.3 km ²	5.3 km ²	36.9km ²	3.2 km ²	1.7 km ²	2.7 km ²	15.7 km ²

All fixes collected in 2016, N=1256**Remarks:**

- Anakin (Cat 1 16): BFN young adult male, still rowing. Caught and collared on Benfontein. Fair condition.
- Odin (Cat 2 16): BFN; fully adult male, well built, increase his weight, further broken UR canine; recaptured in a den system in central BFN. Territorial: marking with urine and feces.
- Luke (Cat 3-16): BFN, adult male. About 3 years old; captured in eastern area. Soft pelage.
- Freya (Cat 4 16): BFN, adult female in good condition, highly pregnant (2 kittens palpated). Captured with minimal stress out of aardvark den – ran into net.
- Leia (Cat 5 16): BFN, adult female, used nipples, not lactating, lots of fleas and ticks in ears. East central part of BFN.
- Nele (Cat 6 16): NJF, adult female in beautiful condition, has 1 kittens still nursing. Sleek coat, body not fat but also not thin. Dug her out of den. Upper left canine worn more since last capture.
- Darth (Cat 7 16): TBP, young adult male, nearly adult sized, but lower weight, resident? Dispersing? Had contact with female “Sani” and her kittens – is he her son?
- Sani (Cat 8 16): TBP, dug her out of den, good condition, has two kittens about to be weaned, good teeth. Also frequents part of Eselsfontein (ESF).
- Hulk (Cat 9 16) NJF: capture via chase. An incredibly large and sturdy male; largest ever caught in 25 years of field research. Covers the ranges of all 3 resident collared female (Gyra, Nele, Sani)
- Gyra (Cat 10 16): NJF; shiny coat, Nipples prominently plucked; later discovered on Camera trap video that she has a ~ 4 week old kittens (1) at the time of capture. Captured on Klein Rooidam farm.
- Bolt (Cat 6 14): adult male, displaced to southern part of BFN, last seen 18th August, carcass found 15.9.16; probably died of Amyloidosis. **DEAD**. Caught in November 2014 for first time.
- Zuma (Cat): NJF/ESF, adult male, ~ 5 yrs old, lost condition and his territory. Seen injured 28th July 2016 and then close to death on 2nd August not far away on ESF. Found dead on 3rd August 2016 **DEAD**.
- Mars (Cat 1 15): BFN: young adult male, roamed central part of BFN, last seen at more southerly area or BFN in February 2016. Not found again in April 2016. **MISSING or DEAD**.
- Gust (Cat 4 15): BFN: young adult male. Frequented a small area in south western part of BFN. Last seen 9.2.16. Then found dead on 28.4.16, 3.4 km south of last loc on neighbouring Melrose farm. **DEAD**.
- Thor (Cat 6 15): BFN: adult male, in central eastern part. Only observed until 8.2.16; when searching again in late April not found. **MISSING or DEAD**.
- Luna (Cat 15): NJF: adult female, had kittens. Was monitored until 24.4.16, killed by a caracal (*Caracal caracal*), bite to her spine, was seen alive previous day. **DEAD**.