

- 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 2017

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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: to Nuwejaarsfontein (NJF) and Taaiboschpoort (TBP) Farms,

south of De Aar, from 3 - 11 November 2017 and then Benfontein Nature Reserve (BFN), near Kimberley from 11 - 15 November 2017.

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 bfcs. Since November 2005 annual capture operations were conducted on BFN, and since February 2009 also on NJF and TBP until the present visit. Thirteen reports are available detailing 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 10 nights (six nights on NJF & TBP, four nights on BFN) a 4x4 vehicle (2.4 litre Diesel Toyota Hilux Runner D/C or a 4 litre Toyota Landcruiser S/C) 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 (4-6 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 100–600 m 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. The males were also given ketamine to ensure prolonged anaesthesia for semen collection. During this trip we processed five of the 11 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. We attempted to collect and preserve sperm in seven males, succeeding in all but one subadult male. The anaesthetic drugs were reversed (reversed) with an intramuscular injection of atipamezole, flumazenil and naltrexone. The cats were 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 accord. 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 collared 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 seven times this year, where the den or hollow termite mound in which the radio-collared bfc was resting, was either carefully opened with a spade or via extensive careful 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 "Hulk", "Darth", "Odin", "Luke" as well those of the females "Nele", "Leia" and "Freya" 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 November 2017 by:

Ms. Beryl Wilson, zoologist, McGregor Museum, Kimberley, South Africa (berylwa@museumsonc.co.za)

Dr. Alex Sliwa, behavioural ecologist and zoo curator, Cologne (Köln) Zoo, Germany (sliwa@koelnerzoo.de)

Ms. Martina Küsters, field researcher BFCWG, Swakopmund, Namibia (kusters.m@hotmail.com)

Dr. Jason Herrick, director of reproductive sciences, Omaha's Henry Doorly Zoo, USA (jason.herrick@omahazoo.com)

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

Mr. Julian Kusak, ape section head, Wuppertal Zoo, Germany (Julian.Kusak@stadt.wuppertal.de)

Barb Palmer, carnivore keeper, Denver Zoo, USA, Black-footed Cat SSP Coordinator, (BPalmer@denverzoo.org)

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 was performed on this field trip.

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

NJF and TBP: we saw seven different bfc's during six nights of searching (117% chance of sighting a bfc/night) and caught three of four that we attempted for, through sustained trials (75% capture success), two un-collared cats were behind fences with no gate nearby on TBP. One we tried by catching on foot, but it eluded us. We caught two un-collared males, "Rikon", a subadult male, on central NJF and a larger young adult male "Drogo" on Southwestern TBP. Also, we caught an older adult female "Arya" on Eastern NJF. The other two individual cats we saw unaided via telemetry were the radio-collared "Hulk" and "Darth". We also saw "Rikon" several times, after collaring him, who frequented the road through NJF on later nights. During these night drives we observed other carnivore species such as aardwolves (*Proteles cristatus*), groups of bat-eared foxes (*Otocyon megalotis*), several Cape foxes (*Vulpes cana*) and small-spotted genets (*Genetta genetta*). We also observed aardvark (*Orycteropus afer*) almost every night (up to 2/night), porcupines (*Hystrix africae australis*) and spotted eagle owls (*Bubo africanus*). The mammal watching highlight was, however that we spotted white-naped weasels (*Poecigale albinucha*) on two consecutive nights (7 & 8 November) on NJF and TBP. We didn't spot any jackals or caracals during this trip.

Additionally, we exchanged the functioning radio-collars of the three cats "Nele", "Hulk" and "Darth", when we extracted them from the dens into which they took refuge during daylight. We then sighted one ~ 3-week old kitten of "Nele" and later confirmed by Martina from pictures taken by a camera trap in early February 2018 that "Arya" had a kitten she was caring for (born shortly after her capture).

We had six radio-marked bfc's on these two farms, when we left on 11 November 2017.

BFN: we saw three bfc's during three nights of searching and caught one of them. Thus, we saw one bfc unaided by telemetry on average on any of the three nights (100% chance of sightings/night). The only new cat caught, was a young adult male "Tyrion", via the pursuit method. We decided not to collar him, due to the lower monitoring frequency of cats on BFN and the fact that subadult and young adult males often leave the reserve to disperse, and we have collected sufficient data on this behaviour so far. Still we measured, microchipped and collected a good sperm sample from him. One un-collared bfc ran into a deep den in the former "Red Pole" vicinity, in the north-eastern part of the reserve, and we decided not to attempt catching it via digging. Another cat was only sighted briefly in long grass and disappeared. We thus only caught one out of three different individuals, thus our capture success rate was 33%. 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 (2005–2016). During these night drives we observed many springhares (*Pedetes capensis*), but also other carnivores like black-backed jackals (*Canis mesomelas*) twice, several groups of bat-eared foxes, and aardwolves. We also sighted a caracal (*Caracal caracal*) during daytime in long grass, likely a female, close to Nine Tanks.

We exchanged the still-functioning radio-collars of males "Odin" and "Luke" as well as females "Freya" and "Leia" with new ones, by locating them in their dens. Thus, we currently have four radio-collared bfc's on BFN when we left on 16 November.

Fate of black-footed cats in 2017 (last collared in 2016)

Male "Anakin": Caught as a young adult of ~1-year old on BFN in November 2016 and tracked regularly by Martina since, when he maintained a smallish range of 8.9 km² (100%MCP) on central BFN until June 2017. He then dispersed westwards in late July and made his way past the Kimberley airport to the

southern outskirts of Kimberley, where we found him dead on 16 November 2017. No cause of death could be determined any more. Map 3, Table 1.

Female “Sani”: Adult when captured in November 2014 (Sliwa *et al.* 2015). She was monitored until 24 April 2017, when she was found dead, probably due to suspected renal failure (amyloidosis). Her range was relatively small (8.2 km², Map 1&2, Table 1) in the last months on TBP and ESF before her death, probably due to both the progressing disease and caring for kittens, which exacerbated her weak condition. Her kittens were observed until March 2017, which were likely restricting her movement range (Molteno *et al.* 1998).

Female “Gyra”: adult female caught in November 2015 (Sliwa *et al.* 2016). Starred in the BBC One “*Big Cats*” series Episode 2, where she caught a lark in a spectacular leap. Unfortunately, she was already sick with probable renal failure (amyloidosis) when filmed in November 2016, when she was observed drinking from sheep water troughs frequently. Martina found her dead in February 2017 on NJF. Map 1.

Other seven cats alive in November 2017: The only De Aar female left, “Nele” (10.4 km²), maintained her home range with a slight shift (Map 1&2). The adult male “Hulk” covered an exceptionally large (79.9 km²) home range and young adult male “Darth” became resident and covered an average-sized home range (43.3 km²) for De Aar males (Maps 1 & 2). We exchanged their three collars.

On BFN, the four adult cats roamed average-sized home ranges. Male “Odin” roamed 23.6 km² of the central and western part of BFN (Map 3), “Luke” with 26.0 km² shifted even further west, often crossing to Mauritzfontein and Alexanderfontein across the boundary road of BFN. Female “Freya” stayed in her 10.1 km² part of south central BFN, with very typical red Kalahari soils, bushman grass and some calcrete intermixed, while female “Leia” maintained a smallish (6.9 km²) home range in the more typical Karoo type habitat directly adjacent towards the west (Map 3). We replaced their collars with new ones.

Fate of Black-footed Cats in early 2018 (collared in 2017)

All 10 cats that were collared in November 2017 (Table 1) were found again in early February 2018. Throughout April 2018 all were alive and monitored, however the male “Hulk” was showing signs of probable renal failure (likely amyloidosis), being weakened, and he was drinking from water points. Amyloidosis only if confirmed on post mortem.

Locating the radio-collared Cats

BFN, NJF and TBP: before and subsequent to their respective capture Martina, Alex and Julian attempted to acquire location fixes (waypoints) of all collared cats in their dens during daylight each day, and then additional fixes during the course of the nights, if their 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 (Table 1) for these new cats in 2017. The BFCWG was able to finance the tracking of all the cats (Table 1) by Martina Küsters on all three farms (BFN, NJF, TBP). Altogether 1 115 waypoints were collected up until 14 December 2017. Home range size estimates incorporating all collected waypoints for all the individual cats tracked in 2017 are provided in Table 1 and Map 1-3.

Behavioural Observations of Black-footed Cats

A total of 14 cats were monitored in 2017 with varying intensity. On the De Aar farms the females “Nele” (since 2014), “Sani” (since 2014), and “Arya” (since 2017) were intensively monitored. Female “Gyra’s” single and last location was collected in February. In addition to the males “Hulk” and “Darth”, which we added to the study in November 2016, two more subadult and young adult males “Rikon” and “Drogo” were collared in 2017. Several were well-habituated through Martina’s skills and provided valuable insights in to killing various prey, spray-marking and giving birth to kittens. The large adult males allowed for close range photography (Figs. 15-17). 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 three new cats in De Aar were still rather shy, but continued tracking will allow closer vehicle approaches and better behavioural observations.

On BFN only the young adult male “Anakin” went missing for a few months after July, but was found dead in mid-November after employing the new telemetry tracking equipment, sponsored by Wuppertal Zoo through a “Pokemon hunt” on the zoo grounds. This still left the four adult cats there in November 2017, however only the male “Odin” allowed close approach and photography. Despite extended tracking of the other three cats since 2016, monitoring has been challenging with “Luke” often being on the neighbouring farms, “Leia” is shy and “Freya” often hunts in very dense and tall grass. Habituation of the BFN cats will continue, although Martina spends far less time on the reserve, due to her commitments to her MTEch study in De Aar.

Over the past months Martina has tracked the three new De Aar cats on NJF, TBP and neighbouring farms, managed to collect data and to habituate them better to the vehicle. However the terrain in their home ranges is rather difficult and often requires longer detours to reach them, when they cross the fences between farms and towards neighbouring properties. The male cats in De Aar, especially “Hulk” and “Darth” have extensive home ranges so finding the signal of their collars often requires climbing hills and co-ordinating access onto neighbouring farms. The rainy season also limits vehicular access into some areas. As visual observations are important to assess the health status of cats, monitoring them closely requires persistence and diligence.

Reproduction: Of the five females tracked in 2017 we have assumed and confirmed reproduction in the following cases.

“**Nele**”: She had a litter of two in February 2017, discovered in a hollow termite mound on ESF, estimated at a month old. Two weeks later “Nele” had moved them to the pan on NJF and the camera trap placed at dens captured good videos of mom and the kittens. Martina observed her catching a spotted thick-knee (*Burhinus capensis*) and then went to collect the kittens. Martina followed their progress until end of March until they were more active, but also secretive and more difficult to observe. One kitten of suitable age was seen on 21 April on the neighbouring farm, but it is unsure whether both kittens survived. “Nele” was observed mating with “Hulk” on 10 August and from that the estimated date of birth was mid-October. When capturing her on 5 November 2017 she had a ~3-week old kitten with her in the hollow termite mound. We managed to record via camera trap video when she moved this kitten to a new location. In December 2017, the kitten was strong and healthy, but no longer with her in January 2018. In early February 2018, “Nele” looked highly gravid (visual observation and camera photo of rounded belly, pers. obs. M. Küsters) but no kittens were found in February or March. She was seen frequently marking with urine sprays in mid-March and observed with “Hulk”. It may be difficult for her to raise kittens this late in the year and the persistent dry conditions could result in low prey density necessary to successfully raise kittens.

“**Sani**”: had a litter of three kittens, which were discovered on 5 February 2017, probably born mid-December 2016. There were only two left within two weeks. Martina was able to keep track of them for a month until the two were last seen on 15 March 2017. Their fate is not known. “Sani” died 1.5 months later.

“**Arya**”: In early February 2018, Martina observed a 2.5-month old kitten via camera trap with “Arya”. She likely gave birth in mid-November 2017 shortly after we captured her.

“**Freya**”: when capturing her she had two 2-month old kittens in the same aardvark dig. She ran out into the draped nets while the kittens stayed behind in the hole. The differences in body and head sizes indicated that the kittens were a male and a female. A few days later we were able to record her and the kittens in another deep den in the sandveld of southern BFN together with the remains of a Northern black korhaan (*Eupodotis afroides*) that she brought back to feed them with. Only one of these

kittens was seen on 13 December, but not again in January 2018. No kittens were found in March 2018 either.

“Leia”: A single, 7-10 day old kitten was recorded on 23 September 2017 in a hollow termite mound. However, two weeks later (5 October) “Leia” was seen mating with an unknown male. She lost the kitten and came into oestrus again. At re-capture on 12 November 2017 she didn’t seem gravid or had given birth already. The single single 2-month old kitten seen near her resting den in early March 2018 could have been from that litter or another born thereafter.

Camera Trapping: Alex Sliwa and Martina Küsters deployed three digital camera traps (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 2017 most members of the BFCWG have spread 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.

The footage filmed by BBC Natural History Unit in November 2016 was cut and edited in 2017 and both the female “Gyra” and “Nele”, the latter with her single kitten, featured in the 4-minute footage. “Gyra’s” name was mentioned and her collar explained in the footage. Alex advised the BBC on all three episodes of their series “Big Cats” and corrected their use of facts on *F. nigripes*. An extract from the series can be viewed at <http://www.bbc.co.uk/programmes/p05txr28> .

On 13 November, our capture and exchange of “Odin’s” collar was portrayed and broadcast that same evening on SABC 1 News. <https://youtube.com/watch?v=RdYjM-ZMrsc&sns=em>
Martina Küsters compiled the species account for *F. nigripes* for the Red Data Book on Carnivores in Namibia, with Dr. Sliwa and Beryl Wilson as reviewers. This is an important step to classify the species as ‘vulnerable’ in Namibia and will result in protection under the conservation legislation.

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

Sliwa, A. (2017): 25 years of Black-footed cat (*Felis nigripes*) Field Research and Conservation. Presentation at the Small Wild Cat Conservation Summit, Port Lympne on 11 September 2017.

Sliwa, A. (2017): How to radio-collar a small wild cat? Presentation at the Small Wild Cat Conservation Summit, Port Lympne, on 13 September 2017.

Sliwa, A. (2017): Sand Cat IUCN Red List Assessment and 25 years of Black-footed cat (*Felis nigripes*) Field Research and Conservation. Presentation at Rabat Zoo, Morocco, on 28 November 2017.

Discussion and Conclusions:

Valuable data on censusing and catching black-footed cats has been collected again on this trip of the BFCWG. We attained a good success rate on NJF and TBP with three new cats captured and one attempted for cat missed (75% capture success). However, this cat eluded capture by walking across a

fence line. Another cat, also spotted over a fence, we did not even attempt to catch. The daytime exchanges of the radio-collars of the female “Nele”, and males “Hulk” and “Luke” through extracting them from dens by careful and slow digging has resulted in no injuries and all cats and “Nele’s” kitten were unharmed and fit after the procedures.

On BFN, where the species was intensively studied between 1992–1998 we captured only one new cat, “Tyrion”, during three nights of spotting and exchanged the collars of the four remaining adults “Odin”, “Luke”, “Freya” and “Leia”. While we saw another two cats, tried to capture them but failed, making our success rate 33%, which was lower than in 2016. This was both due to the intensive daytime radio-collar exchange schedule and associated fatigue coming up after 9 hard days in the field, but also due to the stochastic effect of only three nights of spotting. This ratio might have changed significantly with every extra night we would have spotted. We also decided not to collar the young adult male “Tyrion”, due to the lower monitoring frequency of the BFN cats through our permanent field person Martina Küsters. The decision was also based on our experience with young males often dispersing far from the capture site and suffering a higher-than-average mortality rate (see previous BFCWG reports).

The sighting frequencies of 1.17 and 1.0 cats/night between the two established study areas were similar during this trip. This is slightly higher than in 2016, but still lower than in November 2015 on BFN then (Sliwa *et al.* 2016; 2017). Over the years, the detection rates 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 on all nights at both sites with no restrictions on our work.

The jackal density on BFN seemed average with two sighting in the three nights in 2017. We also observed a caracal (female) during daytime, when tracking “Freya”, only 500 m from where she hid her kittens in a large and open aardvark dig. We did not sight neither meso-predator species on NJF and TBP during November 2017. Likewise, no African wildcat or 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 good judgement of the population sizes, however comparing the sighting frequencies there is a good population of cats of both sexes, both resident and transient there.

It is very reassuring that the single long-term monitored female “Nele” and older newly collared “Arya” on NJF, ESF had a litter between September and November 2017 with, hopefully, at least the single sighted individual kittens surviving to dispersal and beyond. There is indication that “Nele” became receptive in December 2017 again, as she was seen with both “Hulk” and the new subadult male “Rikon” then. Also the female “Sani”, although found dead in April 2017, had three kittens in February 2017, which were last seen in March 2018. This is the first time, that a litter of three kittens has been recorded from the wild. We will maybe capture some of these youngsters during the upcoming November 2018 capture trip. On BFN, both females “Freya” and “Leia” had kittens, and thus there was confirmed reproduction at this site in 2017 as well.

On TBP and NJF, we caught three of the five cats from 2016 again. The mortality (40 %) of adults in 2017 was the same as in 2016, although similarities and differences in percentage shift quickly with such small numbers of cats monitored by telemetry. The deaths of the females “Gyra” and “Sani” were sad, but unfortunately expected. Both lost condition (body mass and fur appearance) in the final weeks and were seen drinking water frequently. Whether they also had AA-Amyloidosis, which would have debilitated them before, will probably remain unanswered. When found by Martina Küsters their bodies were either too decomposed (“Gyra”), or samples were still taken (“Sani”), but the state of decay of these could hinder diagnosis. 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). Currently it is prevalent in both.

The death of the young adult male “Anakin” at the southern outskirts of Kimberley, close to the N12, after dispersing from BFN north, remains a mystery. The date of death could not be determined, as he was last seen in July and then only found again, dead, in mid-November 2017. His death so close to human habitation could be due to several causes. It is, however quite typical of young adult or adult, but non-resident males, during dispersal. Many males die during dispersal and only a few become successfully established elsewhere. We had five cats collared on BFN in November 2016 and were left with four a year later, which amounts to only 20% mortality, which is an unusually accurate figure, since no collared cats disappeared in 2017, in contrast to the last years (several young males; Sliwa *et al.* 2017), thus we can speak of 80% survival on BFN.

This year’s reproduction has been impressive with every adult female tracked having given birth at least once in 2017. The De Aar females “Nele” and “Arya” giving birth between October and November 2017 respectively and the deceased “Sani” having a new litter (with a record of three kittens initially) in early February 2017. On BFN females “Freya” and “Leia” gave birth in mid-September and at the end of 2017. Thus reproduction has occurred in both study areas, however we have only limited information whether the observed kittens survived to or even past dispersal age (M. Küsters, pers. comm.). 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 fitting of collars and with tiny battery capacities of even smaller collars technically challenging.

Fortunately, Martina Küsters was again able to collect well over 1 000 waypoints for all the cats combined in 2017, particularly for the cats “Nele”, “Sani”, “Hulk” and “Darth” on the farms south of De Aar, and to a lesser degree “Odin”, “Luke”, “Freya” and “Leia” on BFN (Maps 1-3; Table 1). The two adult resident males “Hulk”, “Darth” on NJF, TBP and neighbouring farms were both observed urine spraying in 2017. As predicted in last year’s report (Sliwa *et al.* 2017) “Hulk” with 79.9 km² ($N=229$ waypoints) used an exceptionally large annual home range, while “Darth” with 43.3 km² ($N=116$) conformed to average for the De Aar area. “Odin” and “Luke” with 23.6 km² and 26.0 km² roamed average to previously recorded resident male home ranges on BFN (average 21 km², range 16-24 km², $n=5$, Sliwa, 2004). Martina’s tracking and consecutive behavioural observations of the cats allowed also the recording of a new bird prey species, so far not taken by radio-tracked black-footed cats, a spotted thick-knee, which the female “Nele” provided to her two kittens.

The capture field trip was highly successful, with the sighting and capture rates of both study areas good and similar this time. Martina Küsters will collect more location fixes on a regular basis for each of the 10 radio-collared cats still alive in April 2018 for the rest of the year.

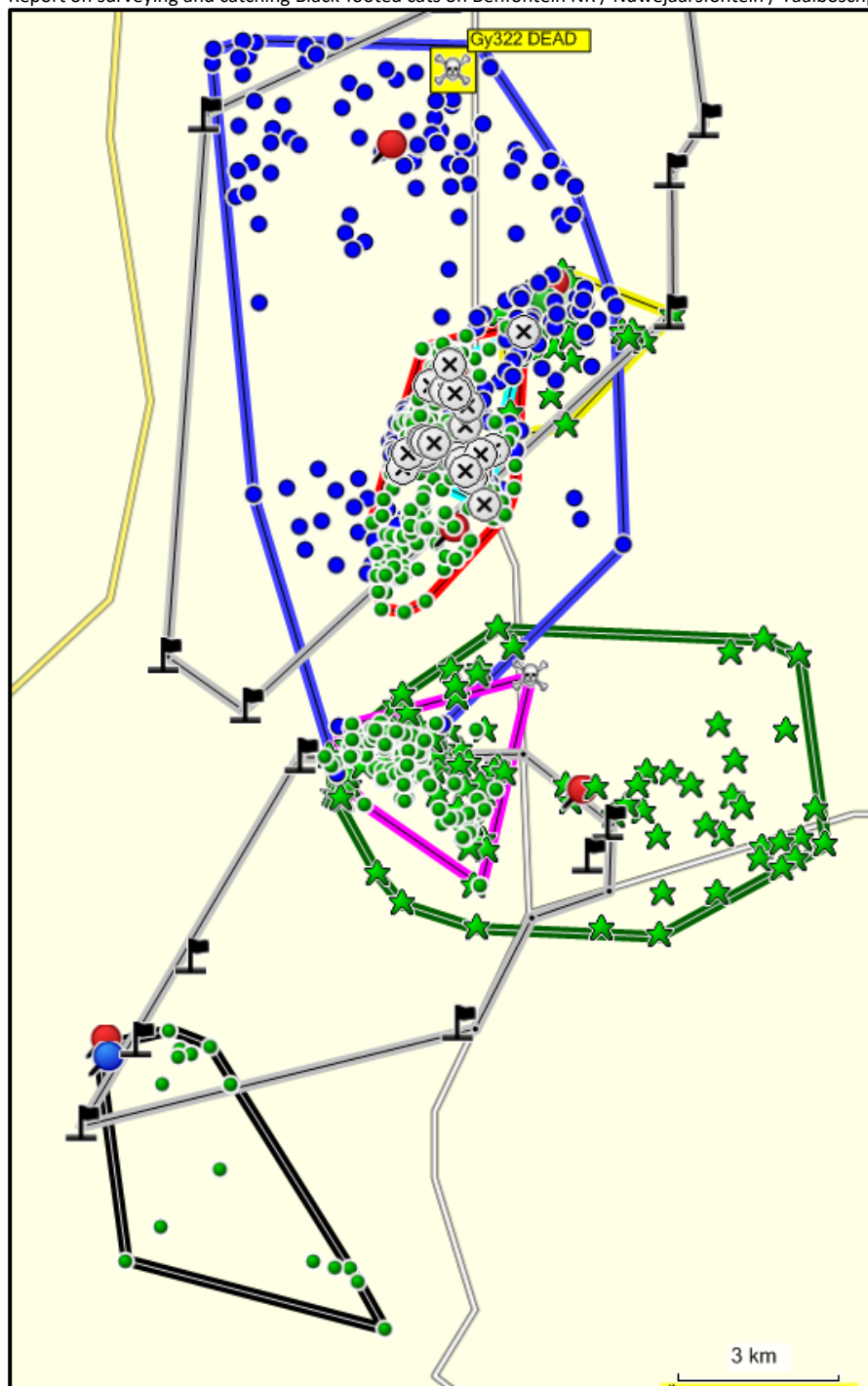
The BFCWG will return to BFN, ESF, NJF and TBP for further capturing and sampling of wild black-footed cats in November 2018.

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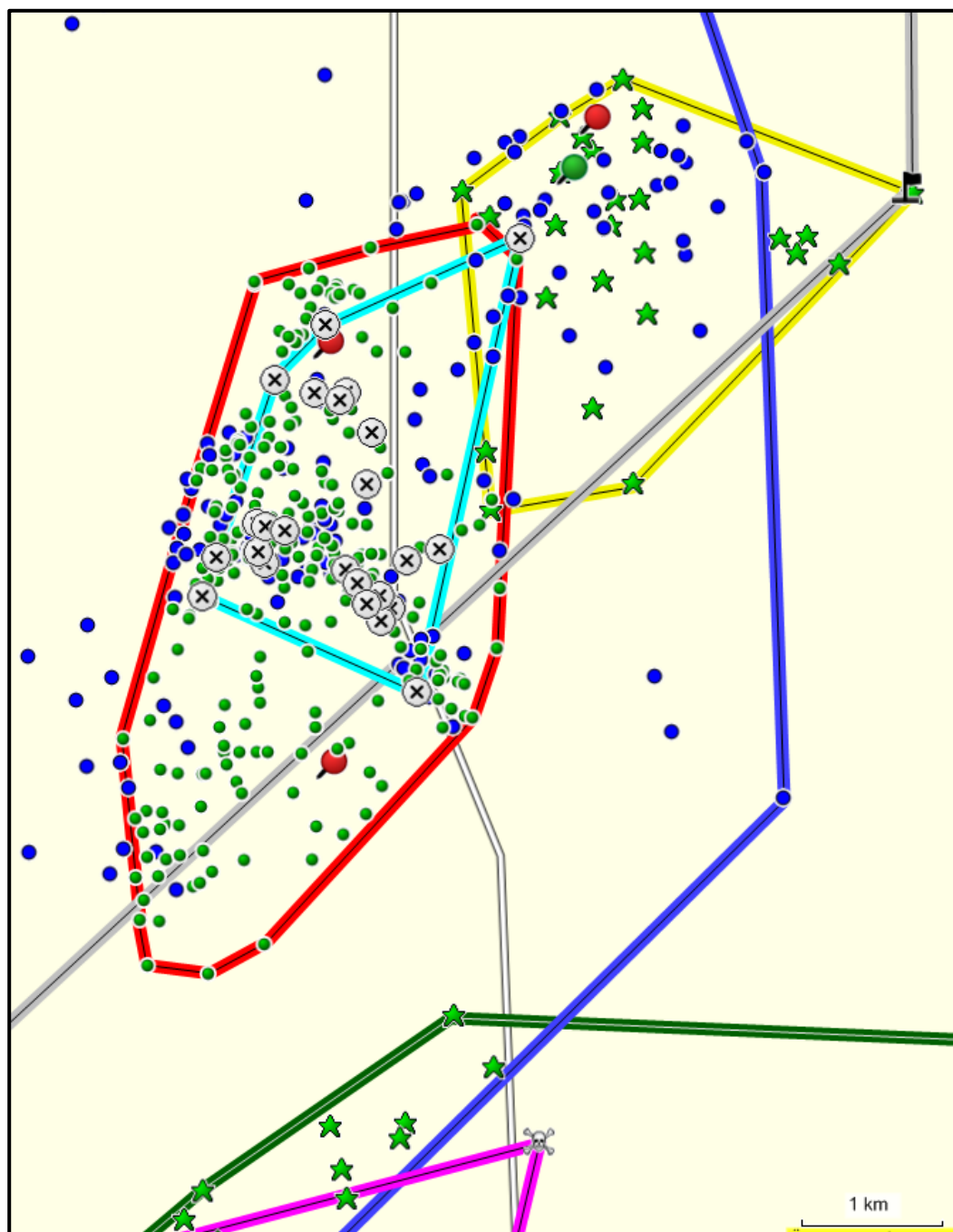
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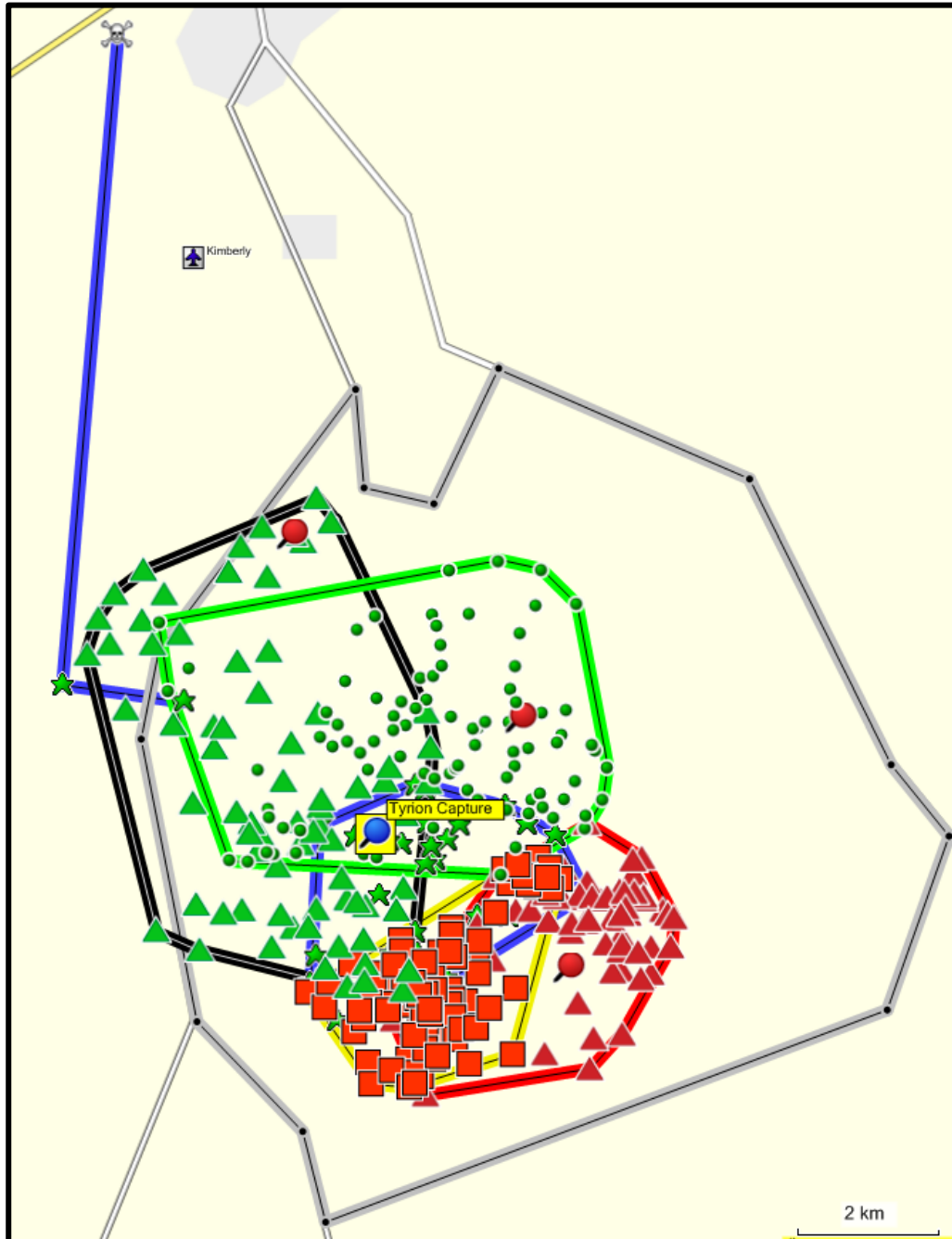
Map 1: GPS map of Nuwejaarsfontein (NJF) and Taaiboschpoort (TBP) farms (boundaries = grey polygons), with Eselsfontein (ESF) in between, with minimum convex polygons (100% MCP) encompassing the locations of 8 radio-collared black-footed cats intensively monitored between January – December 2017. Total number of waypoints recorded 932. n = number of waypoint recorded for each individual. Data also in Table 1.

- Female “Nele” with red polygon, green dots (10.4 km²; n = 246). On NJF but also partly on 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 2016.
- Female “Arya” with yellow polygon, green stars (6.0 km²; n = 28), captured new on 10 November 2017; older female with kitten, overlapping with “Nele”.
- Female “Sani” with magenta, green dots on ESF and northern TBP (8.2 km², n = 89). Had a restricted range either due to her illness with amyloidosis or since she still had kittens until late March 2017, restricting her range; died on 24 April 2017. **DEAD.**
 - Female “Gyra” was found dead February 2017 (Skull symbol), NJF farm, **DEAD.**
- Male “Hulk” in dark blue polygon, blue dots (79.9 km², n = 229). Exchanged his collar on 6 November 2017; lost condition (2.26 kg). Roamed the ranges of all 3 resident collared female (“Nele”, “Gyra”, “Sani”) and also new female “Arya” in 2017. Seen drinking in March 2018.
- Male “Darth” TBP, ESF and neighbouring farms in dark green polygon, green stars (43.3 km², n = 116), became resident.
- Male “Drogo” black polygon, green dots (15.4 km², n = 18), young adult male caught 9 November 2017 on southern TBP, but roams South and East onto neighbouring farms
- Juvenile Male “Rikon” in light blue polygon (barely visible, better on Map 2), crosses in white circles (4.1 km², n = 25), caught on 6 November 2017 on NJF in “Nele’s” home range. Is he her son? Was seen frequently when we were travelling at night on dirt road.



Map 2: Zoomed in detailed 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 black-footed cats intensively monitored between January – December 2017.

- Female “Nele” with red polygon, green dots (10.4 km²; $n = 246$). 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 2016.
- Female “Arya” with yellow polygon, green stars (6.0 km²; $n = 28$), captured new on 10 November 2017; older female with kitten, overlapping with “Nele”.
- Female “Sani” with magenta polygon (only marginally seen here). **DEAD.**
- Male “Hulk” in dark blue polygon (marginally on map), blue dots (79.9 km², $n = 229$). Exchanged his collar on 6 November 2017; lost condition (2.26 kg). Roamed the ranges of all 3 resident collared female (“Nele”, “Gyra”, “Sani”) and also new female “Arya” in 2017. Seen drinking in March 2018.
- Male “Darth” TBP, ESF and neighbouring farms in dark green polygon (marginally seen here), green stars (43.3 km², $n = 116$), became resident.
- Juvenile Male “Rikon” in light blue polygon, crosses in white circles (4.1 km², $n = 25$), caught on 6 November 2017 on NJF in “Nele’s” home range. He may be her son, although he was later observed to mate with her. We saw him frequently when we were travelling at night on the central dirt road.



Map 3: GPS map of Benfontein NR (BFN; boundary = grey polygon), with minimum convex polygons (100% MCP) encompassing the locations of the 5 radio-collared black-footed cats monitored in 2016. Total number of waypoints recorded for these 363. n = number of waypoint recorded for each individual.

- Adult male “Odin” = 23.6 km² (n = 91) in light green polygon with small green dots for locations. He covered Western / Central BFN, crossing the dirt road to Mauritzfontein Farm occasionally. Recaptured and exchanged his radio-collar.

- Adult male “Luke” = 26.0 km² (n = 75) in black polygon, green triangles. Overlapped ranges of “Odin”, young adult males “Anakin” and “Tyrion” and female “Leia”.

- Young adult male “Anakin” = 8.9 km² (n = 35); blue polygon and lines, green stars. Ranged in central part of BFN. His range was overlapped by both adult males “Odin” and “Luke”. He stayed until June 2017, then left the farm to the NW and was found dead (Skull sign) on the outskirts of Kimberley on 16 November 2017. **DEAD.**

- Young adult male “Tyrion”. **Captured** (blue pin) on 11 November 2017, biological samples taken and microchipped but not radio-collared. Decided not to collar due to the high likelihood of him emigrating, as he was caught in an area overlapped by both adult resident males.

- Female “Freya” = 10.1 km² (n = 64) red polygon, red triangles. With two large kittens when caught (ran out of aardvark den into our nets) and had her collar exchanged. Used an average sized area in central South of BFN throughout 2017, in an area with deep Kalahari sand and calcrete.

- Female “Leia” = 6.9 km² (n = 96); yellow polygon, red squares. Uses an area adjoining to and strongly overlapped by female “Freya”. Are these two females related? Her range is partly overlapped by “Luke”. She was observed to have a kitten in early March 2018, thus must have given birth in late December 2017.



Fig. 1: Four Ladies in the Karoo. Team with "Nele" on NJF. (A. Sliwa).



Fig. 2: Team after digging "Hulk" out. (B. Wilson – self release).



Fig. 3: Working on "Hulk" at the house on TBP. (A.Sliwa).



Fig. 4: Julian carrying our equipment back to the vehicle after capturing "Nele" (A. Sliwa).



Fig. 5: Beautiful vistas of southern TBP (A. Sliwa).



Fig. 6: Tyre worn smooth on the rocky tracks of NJF and TBP. We routinely run tyres down quickly (A. Sliwa).

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Fig. 7. The team with "Freya" (B. Wilson-self-release).



Fig. 8: Alex collaring "Freya" (J. Kusak)



Fig. 9. Preparing the LED endoscope waterproof inspection borescope tube camera for Leia's capture. (A. Sliwa).



Fig. 10. New equipment sponsored by Wuppertal Zoo. (A.Sliwa).



Fig. 11: The giant den system we had to dig "Luke" out of. (B. Wilson).



Fig. 12: Digging out "Luke" (B. Wilson).



Fig. 13: Measuring "Luke's" sizeable canine teeth. (J. Kusak).



Fig. 14: White-naped weasel (*Poecilogale albinucha*) on Taiboschpoort, De Aar. (A. Sliwa).

Black-footed Cats tracked in 2017



Fig. 15: "Hulk" a massive and beautiful male, NJF. (A. Sliwa)



Fig. 16: "Hulk" eating a gerbil (A. Sliwa)



Fig. 17: "Darth" became resident on TBP. (A. Sliwa)



Fig. 18: "Nele's" kitten, ~ 3 weeks old. (A. Sliwa)



Fig.19: "Nele" moving her kitten (M. Küsters & A. Sliwa)



Fig.20: "Freya's" 2-month old kittens. One of each sex. (A. Sliwa)

Table. 1: Body measurements (cm), range size and remarks on 14 black-footed cats with 11 captures on Benfontein, Nuwejaarsfontein and Taaiboschpoort in 2017.

Capture Date	5.11.17	6.11.17	6.11.17	7.11.17	9.11.17	10.11.17	11.11.17	12.11.17	12.11.17	13.11.17	14.11.17	<i>not captured</i>	<i>not captured</i>	<i>not captured</i>
Name (also on Map)	Nele	Hulk	Rikon	Darth	Drogo	Arya	Tyrion	Odin	Leia	Freya	Luke	Anakin	Gyra	Sani
No. captured	Cat 1 17	Cat 2 17	Cat 3 17	Cat 4 17	Cat 5 17	Cat 6 17	Cat 7 17	Cat 8 17	Cat 9 17	Cat 10 17	Cat 11 17			
Sex	F	M	M	M	M	F	M	M	F	F	M	M	F	F
Age (judged by teeth)	Adult	Adult	Juv M	Adult	Y-Adult	Adult	Y-Adult	Adult	Adult	Adult	Adult	Y-Ad	Adult	Adult
Microchip #.			945000001808 142			945000001808 144	945000001808 145		953010000907 268	-	953010000908 770			
Mass (kg)	1.33	2.26	1,28	1.90	1.50	1.50	1.45	1.92	1.27	1.24	1.94			-
Ear (cm)	5.1	6.0	5.5	5.2	4.6	4.8	5.2	5.1	5.1	5.2	5.4			-
Shoulder (cm)	24	29	24	28	28	25	27	28	24	25	28			-
Total Length (cm)	55	65	57	63	60	55	59	66	54	56	63			-
Hind foot (cm)	8.6	10.0	9.0	9.6	-	8.85	9.2	9.6	7.9	8.4	9.9			-
Front foot (cm) (L x W)	1.9 x 1.9	2.3 x 2.25	2,0 x 1.9	2.0 x 2.2	2.2 x 1.9	2.0 x 1.9	1.9 x 1.8	2.1 x 2.1	1.8 x 1.7	1.9 x 1.7	2.4 x 2.1			-
Tail (cm)	16	20	16	18	18	17	16	17	16	17	17			-
Neck (cm)	10	14	12	14	13	12.5	12	13	11	10	14			-
Canine UR (cm)	0.90	1.10	0.95	1.01	1.02	0.92	0.92	0.88	0.86	0.88	1.19			-
Canine LR (cm)	0.69	0.94	0.87	0.88	0.90	0.83	0.83	0.88	0.72	0.77	0.93			-
Canine UL (cm)	0.83	1.11	0.93	1.07	1.00	0.62	0.91	1.14	0.75	0.88	1.18			-
Canine LL (cm)	0.73	0.94	0.83	0.86	0.88	0.78	0.82	0.90	0.65	0.75	1.00			-
Testes (cm)/nipples	In use, nursing	Well developed	Small testes	Developed	Well developed	Nipples plucked	Good size	Good size	Used nipples	With 2 kittens	Good size			-
No. fixes collected in 2017	246	229	25	116	18	28	-	91	96	64	75	37	1	89
Range (100%MCP) in 2017	10.4 km ²	79.9 km ²	4.1 km ²	43.3 km ²	15.4 km ²	6.0 km ²	-	23.6 km ²	6.9 km ²	10.1 km ²	26.0 km ²	8.9 km ²	-	8.2 km ²

All fixes collected in 2017, n = 1 115

Remarks:

- 1) Nele (Cat 1 17): NJF - adult female in good condition; 1 kitten nursing; sleek coat, good condition; dug her out of den; upper left canine worn more since last capture.
- 2) Hulk (Cat 2 17): NJF- dug out of his den; dominant male of the area; right ear tip missing; has lost weight since last capture, but still very large; covers the ranges of 3 resident collared females (i.e. Nele, Arya, Sani).
- 3) Rikon (Cat 3 17): NJF- juvenile male (\pm 10 months) caught via chase; stays in area of adult females Nele and Arya; was seen mating Nele, but maybe not during height of oestrus.
- 4) Darth (Cat 4 17): TBP- adult male; dug out of den; has grown larger; full belly from past night's hunting; good condition; has settled around Taiboschpoort and visits neighbouring farms.
- 5) Drogo (Cat 5 17): TBP- young adult male (\pm 18 months); caught via chase and short dig on Taaiboschpoort; good condition and muscular.
- 6) Arya (Cat 6 17): NJF - adult female; caught via chase; very large, good condition; has dependant kitten; \pm 4 years old; upper left canine broken and discoloured; stays adjacent to female Nele across dirt road on NJF.
- 7) Tyrion (Cat 7 17): BFN - young adult male (\pm 14 months); captured via chase; very good condition; collected sperm; decided not to collar due to less time spent monitoring on BFN.
- 8) Odin (Cat 8 17): BFN - fully adult male, well built, good condition, slight weight decrease; upper right canine broken and discoloured; recaptured in a den in northern BFN; capture was filmed for SABC TV.
- 9) Leia (Cat 9 17): BFN - adult female (>2 years); used nipples, good condition, nice fur not lactating; has occupied a small territory in south central part of BFN.
- 10) Freya (Cat 10 17): BFN - adult female in good condition with two kittens; ran into net from aardvark den where she was sitting with her kittens.
- 11) Luke (Cat 11 17): BFN - adult male (\pm 4 years); well-built and pale; pads strongly worn; spends time on NE BFN, adjacent Alexanderfontein and Mauritzfontein farms; shy and runs a lot.
- 12) Anakin (Cat 1 16): BFN - young adult male; stayed on central BFN until June 2017, then dispersed West in late July; was found dead at southern edge of Kimberley close to N12, 12 km to North of last location. **DEAD.**
- 13) Gyra (Cat 10 16): NJF - died in February 2017 due to Amyloidosis, was observed drinking already in November 2016; starred in BBC film – episode 2. **DEAD.**
- 14) Sani (Cat 8 16): TBP - adult female that had several litters; found dead on Eselsfontein (ESF) on 24 April 2017; monitored for 29 months. **DEAD.**