

- 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 2018

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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 Benfontein Nature Reserve (BFN), near Kimberley from

28 October - 4 November 2018, in between to Nuwejaarsfontein (NJF) and Taaiboschpoort (TBP) Farms, south of De Aar, from 4 - 6 November, and then back to Benfontein 6 -11 November.

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 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. Fifteen 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 11 nights (nine on BFN, two on NJF & TBP) 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 (4-5 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 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 100–600 m until the cat squatted low on the ground in front of the stopped vehicle ($n=3$). 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 ($n=5$) or were lost when escaping deeper into the den system ($n=2$).

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 six of the 10 captured cats in the field. All animals (but one) 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. We attempted to collect and preserve sperm in four males, succeeding in all. The anaesthetic drugs were reversed with an intramuscular injection of atipamezole, flumazenil and naltrexone. The cats were 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 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 subsequently radio-collared cats ($n=8$) were confirmed alive and well on subsequent nights using telemetry and visual verification.

- (C) "Digging" of previously radio-collared cats:** This method was employed twice this year, where the entrances of hollow termite mounds, in which the radio-collared bfc was resting, were draped over with nets and the cat ran into them. The still-functioning radio-collar of the female "Leia" was exchanged with no digging or modification on the den being necessary, likewise did the female "Arya" run from a hollow termite mound directly into the nets and her collar was subsequently removed for good.

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

The captures via vehicles were variously staffed in November 2018 by:

Ms. Beryl Wilson, zoologist, McGregor Museum, Kimberley, South Africa (berylwa@museumsonc.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, director Wuppertal Zoo (lawrenz@zoo-wuppertal.de)
 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)
 Ms. Melyssa van Herden, veterinarian, Production Animal Department Onderstepoort, SA (melyssavanheerden@yahoo.com)
 Ms. Michelle Rodgers, biologist, Namibian University of Science and Technology, Windhoek (michellerdgrs@gmail.com)
 Mr. Sebastian Kennerknecht, conservation photographer, USA (sebastian@pumapix.com)
 Mr. Piet Marais, farm owner of Nuwejaarsfontein and Taaiboschpoort, De Aar, SA (info@karooexperience.co.za)
 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 one bfc during two nights of searching (50% chance of sighting a bfc/night) and caught this female (100% capture success), but since we were stopping to work in the area didn't anaesthetize, nor radio-collar, but only micro-chipped this female. During the two night drives we observed other carnivore species such as aardwolves (*Proteles cristatus*), groups of bat-eared foxes (*Otocyon megalotis*), several Cape foxes (*Vulpes cana*), common (small-spotted) genets (*Genetta genetta*), striped polecat (*Ictonyx striatus*) and an African wildcat (*Felis lybica cafra*). We also observed aardvark (*Orycteropus afer*) every night (up to 2/night), porcupines (*Hystrix africaeaustralis*) and spotted eagle owls (*Bubo africanus*). We didn't see any black-backed jackals (*Canis mesomelas*) or caracals (*Caracal caracal*) during this trip.

We took the radio-collar of the remaining female "Arya" off after we captured her in her daytime resting spot within a hollow termite mound on 5th November.

With the decision to conclude the study we have no radio-marked bfcs on these two farms any more, when we left on 6th November 2018.

BFN: Following the decision to close our study site near to De Aar, we concentrated on capturing and collaring on BFN. During nine nights of searching we saw nine bfcs. Thus, we saw one bfc unaided by telemetry on average on any of the nine nights (100% chance of sightings/night). We managed to capture seven of the nine (78% capture success) via the pursuit method. All were collared, due to our dedicating a full time monitoring field person (Michelle Rodgers) to monitor them on BFN over the coming year. All were microchipped and sperm samples were collected from the males.

Two un-collared bfcs ran into deep dens and we gave up the digging process after about an hour on each occasion. We actually dug on seven separate occasions to reach a bfc, resulting in five successful captures. We also saw two radio-collared bfcs ("Hamba" and "Leia", unaided by telemetry on the night of 30.10. and didn't pursue them after checking their radio-signals. 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 (2005-2017). During these night drives we observed many springhares (*Pedetes capensis*), hedgehog (*Atelerix frontalis*) but also other carnivores like black-backed jackals every night (two litters at dens in East-central BFN), several groups of bat-eared foxes, and aardwolves. We sighted no caracal.

We exchanged the still-functioning radio-collar of the female "Leia" with a new one, by locating her in her den. Thus, we had eight radio-collared bfcs on BFN when the BFCWG left on 11 November 2018.

Fate of black-footed cats in 2018 (last collared in 2017)

On NJF and TBP

Female "Nele": caught on 18.11.2014 for the first time close to the pan on NJF. We monitored her for 44 months, thus we recaptured her three times. She produced several litters of kittens, the last one was made famous by the BBC's video of the kitten playing with her at her den. In 2018 she only had a small range divided between NJF and ESF and the dirt road running straight through it, partly overlapping with female "Arya". She was found dead on ESF on 25.7.18, probably killed by jackals as her collar had chew marks and dried blood on it. Map 1, Tab 1

Male "Hulk": caught in November 2016 he was re-collared in 2017. He roamed a very large home range (80 km², 100%MCP) in 2017 overlapping with several of our monitored females and probably the sire of many kittens. An exceptionally large male, he already had lost weight when recaptured in November

2017 and started to drink (suspected amyloidosis) in March 2018. His HR was 65 km² by then, so reduced from the previous year. We lost contact after 15.8.18 after 8.5 months, probably due to early collar termination (battery expired) . We consider him lost but he is highly likely dead (Map 1, Tab 1).

Male “Darth”: adult when captured in November 2016. Became resident over past two years on TBP and neighbouring farms and maintained a fairly large range (52 km² in 2018). He was monitored until 15.8.2018 after 8.5 months following when we lost contact with him, probably also due to early collar termination (battery expired) (Map 1, Tab 1).

Male “Drogo”: young adult captured in November 2017 who mostly stayed on southern TBP and the neighbouring farm Jagpoort, maintaining a fairly small range of 10.7 km² until he made an excursion north and west in late August 2018. Looked sick on 7.9.2018 and was in a really bad condition on 11.9.19 when he was found by Martina. He had been killed and strung up by farm labourers who saw him lingering in delirium next to the water trough on 12.9.18 and assumed he was rabid, ended his suffering with a blow to the head. His dissection by Martina and analysis of his conserved kidneys by Prof. Emily Mitchell (University of Pretoria, Faculty of Veterinary Science; Pathology Laboratory, Dept. Paraclinical Sciences; Accession Number: S04020-18) confirmed that he was affected by Amyloidosis (Map 1. Tab 1).

Male “Rikon”: subadult when caught in November 2017. Stayed in “Arya’s” and “Nele’s” range both sides of public road, with a good size home range of 37 km², becoming a young adult, while he overlapped with four other adult cats. First time seen apparently sick and limping badly was on 27.7.18. He made an 8.5 km far excursion west early September; was seen close to death on 21.9.18 and then found dead on 22.9.18. Unfortunately the pathology (again by Prof. E. Mitchell) of his preserved tissues (by Martina) didn’t provide proof of Amyloidosis because his tissues show advanced autolysis and putrefaction that precluded histological analysis.

Female “Arya”: older adult female captured in November 2017. She used a large range for a female of 16.9 km²; slightly overlapped with “Nele”. She likewise made a long excursion west in late July – probably due to the drought conditions. When caught on 5.11.18 she was thin but with good coat. We removed her radio-collar (Map 1; Tab 1).

On BFN

Female “Freya”: adult, initially caught in October 2015 and then recaptured her in 2016 and 2017, thus monitored for 31 months. She always maintained as small HR in the purely “Kalahari”-type habitat part of BFN. She had several litters over the period we monitored her. Last seen on 24.7.18 and then found dead on 13.10.18, stuck under a stone in a deep den, unfortunately decomposed, at the edge of her home range, which was only 6.4 km² in 2018. (Map 2; Tab1)

Male “Odin”: adult male; monitored 31 months (since Oct 2015, recaptured twice); stayed mostly on central BFN, but also moved across western border. In 2018 he had a very large range for a BFN male with 67 km². He was last seen 22.7.18 before he died 23.7.17 on Alexanderfontein. (Map 2; Tab1).

Male “Luke”: adult male collared November 2016. He maintained an average 25.0 km² home range in 2018 before, but often crossed over to Alexandersfontein, and last seen on 24.7.18. The batteries of his collar presumably expired and thus we unfortunately lost contact with him (Map 2; Tab1).

Female “Leia”: adult, captured November 2016. With a 5.2 km² HR she maintained a remarkably small home range in the more typical “Karoo-type” habitat in 2018. She lost 250g (20%) body mass from the previous year when we weighed her during a routine collar replacement. (Map 2&3, Tab1).

Fate of Black-footed Cats in early 2019 (collared in 2018)

All except one of the eight cats that were collared in November 2018 (Table 1) on BFN were found again in early mid-January 2019. The collar of female “Zonke” was found on the ground by Michelle with no obvious signs of being chewed. She could have died naturally, or was predated upon, and then her body and head separated leaving no trace of her. The same happened with female “Ufisa” when Michelle

found her collar without a body in mid-March 2019. Small bodies disintegrate quickly in the summer heat and during scavenging process and since cats were not monitored for 6 weeks during breaks, this is not unusual. Maybe there is also a connection with the bodies of these two females disappearing with the high jackal density of denning couples with cubs in these areas.

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 the 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 limited number of fixes during this time, and resulting in only guesstimated ranges (Tab 1) for these new cats in the single month November 2018. The BFCWG was able to finance the tracking of all the cats by Martina Küsters and Michelle Rodgers on all three farms (BFN, NJF, TBP). Altogether 956 waypoints were collected up until 30 November 2018. Home range size estimates incorporating all collected waypoints for all the individual cats tracked in 2018 are provided in Tab 1 and Map 1-3.

Behavioural Observations of Black-footed Cats

A total of 17 cats were monitored in 2018 with varying intensity. On the De Aar farms the females “Nele” (since 2014) and “Arya” (since 2017) were intensively monitored. 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. All were well-habituated through Martina’s skills and provided valuable insights into the killing of various prey, spray-marking and giving birth to kittens. These excellent data sets will allow meaningful comparison of annual home range sizes between years and between study areas in future analyses. The fully adult males in De Aar were sometimes difficult to find, due to the topography of the study area with high koppies, although we fitted radio-collars with an extended range to them, which unfortunately proved to expire earlier than expected, only a month after the battery life warranty.

On BFN, with only the adult and normally skittish female “Leia” alive in October 2018 who rarely allowed close approach and photography. With the intensive tracking and setting up of cameras every day during the capture trip, she has calmed down and monitoring has also gone well. “Leia” is normally shy, although easily found within her small home range. We observed her consuming a baboon spider (similar to tarantulas) on the night of 28.10.18, which may be an indication about the lack of prey due to drought conditions. Over the past months, Michelle Rodgers has tracked the seven new BFN cats, managed to collect data and to habituate them better to the vehicle. The male cats “Basa” and “Inkosi” have extensive home ranges, so finding their signal of their collars sometimes requires climbing hills and arranging access onto neighbouring farms. The rainy season also limited vehicular access to some areas. As visual observations are important to assess the health status of cats, monitoring them closely requires persistence and diligence.

Reproduction: Of the seven females tracked in 2018 we have confirmed reproduction in only the following cases.

“Nele”: 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 male “Hulk”. It may have been difficult for her to raise kittens this late in the year and the persistent dry conditions resulted in low prey density preventing her from successfully raising kittens.

“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.

“Leia”: A single 2-month old kitten seen near her resting den in early March 2018 could have been from that litter or another born thereafter.

Interestingly, none of the five anaesthetised females in October/November 2018 showed signs of pregnancy or lactation, which has been found frequently during this time of the year before.

Camera Trapping: Alex Sliwa and Martina Küsters deployed a digital camera trap (Reconyx Hyperfire HC600) after two releases of captured cats in their subterranean dens, when no digital SLR camera trap could be deployed. The cameras recorded the exact time of them leaving their release dens. Throughout 2018, Martina deployed camera traps (mostly Bushnell Trophy Cam HD Nature View with close focus lens) and got excellent pictures and video footage. Likewise, Michelle Rodgers obtained good pictures (Figs. 15, 16, 17) and footage of some of the new cats with the same type of camera traps. Throughout the capture trip Conservation Photographer Sebastian Kennerknecht (pumapix) deployed four sets of professional digital SLR camera traps on almost all releases, but the cats still managed to evade some of these or there was equipment failure. While deploying these sets systematically every day at dens (Fig. 3) with anticipated exit holes, he managed to capture some amazing images of the shy cats some of which can be seen below (Figs.19, 20, 21, 22).

Outreach and social media coverage of BFCs and the BFCWG: throughout 2018 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. The teaser clip by the BBC, was the most viewed clip of the BBC in 2018 and has currently reached 90 million views <https://www.facebook.com/bbcearth/videos/1829364507097097/?v=1829364507097097> and <https://www.youtube.com/watch?v=s6d9rqhivQY>.

The BBC emphasised the fact that black-footed cats are highly successful predators with a 60 % success rate making them “the deadliest cat” led to the Guinness World Records Ltd. approaching Alex Sliwa for confirmation. After providing them with the relevant scientific publications (Olbricht & Sliwa 1997), the record was officially recognized <http://www.guinnessworldrecords.com/world-records/554111-most-successful-feline-predator> .

Also, from November 2018, Beryl Wilson and Alex Sliwa regularly update the Facebook Page, formerly “Save the Black-footed Cat!” now “Black-footed Cat Working Group” <https://www.facebook.com/groups/black.footed.cat/> with publicly visible posts. These are shared from the public Instagram page “blackfootedcat.life” <https://www.instagram.com/blackfootedcat.life/> administered by Alex Sliwa with posts every 4 days with pictures of black-footed cats taken over the past decades with a few sentences of informative text.

Non Profit Organization (NPO): Beryl Wilson, Alex Sliwa and Jason Herrick had a meeting with Brian Loudon (professional accountant) about the final stages of establishing the NPO. Subsequently the members of the BFCWG had their first annual meeting on 9.11.18, which was minuted. We hope to have a dedicated account for all future funds at our disposition which will facilitate the purchase of equipment and making payments for the project.

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

Sliwa, A., Wilson, B., Lawrenz, A., Lamberski, N., Herrick, J & Küsters, M. (2018): Camera trap use in the study of black-footed cats (*Felis nigripes*). African Journal of Ecology 56: 895–897.
<https://doi.org/10.1111/aje.12564>

Sliwa, A., Wilson, B., Küsters, M., Eggers, B. & S. Marais (2018): Report on surveying, catching and monitoring Black-footed cats (*Felis nigripes*) on Benfontein Nature Reserve, Nuwejaarsfontein and Taaiboschpoort Farms in 2017. 16 pp.

Discussion and Conclusions:

Valuable data on censusing and catching black-footed cats has been collected again on this trip of the BFCWG. We saw one new cat on NJF and TBP and captured it (50% chance of sighting in 2 nights, 100% capture success). The daytime removing of the radio-collar of the female “Arya” through extracting her from a hollow termite mound resulted in no injuries and she was released unharmed and fit after the anaesthesia.

On BFN, where the species was intensively studied between 1992–1998 we captured seven new cats, during nine nights of spotting and exchanged the collars of the remaining adult female “Leia”. While we saw and pursued another two cats, tried to capture them but failed, since they escaped into extensive burrow systems, making our success rate 78%, which is comparable to 2016 and 2015. We decided to collar all captured bfcs above the minimum weight of 1 kg, regardless of sex and age, since we would only concentrate on the long-term study area BFN in late 2018 and 2019.

The sighting frequencies of 0.5 and 1.0 cats/night in the two established study areas were similar during this trip to previous years (Sliwa *et al.* 2017; 2018). 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 to our work.

The jackal density on BFN seemed high with at least one sighting every night in November 2018. We did not sight either meso-predator species on NJF and TBP in the two nights we searched there. An African wildcat was seen on TBP and a black feral/domestic cat was seen in the centre of BFN. This latter sighting is always worrisome, as these individuals often carry various viruses, which are transmissible to bfcs.

Due to the short time periods at NJF and TBP by the group, we were not able to make a suitable judgement of the population size, however comparing the sighting frequencies there is a good population of cats of both sexes, both resident and transient there, and particularly so on BFN.

It is disturbing that we had no sign of reproduction in any female cat monitored after March 2018 and that none of the captured females in November 2018 either seemed gravid or were suckling kittens. The latter was probably associated with their thin body condition and the general apparent scarcity of rodent prey, likely due to the prolonged drought conditions, the latter which was also noted during spotlighting activities.

On TBP and NJF, we only caught one out of the six cats from 2017 again. It is difficult to assign absolute mortality for these adults in 2018, although three cats (50% mortality) certainly died and a further two males went missing, likely due to collar battery expiry. A fourth animal may have died due to amyloidosis

(male “Hulk”), which would then result in four out of six cats dying (67 % mortality). It must again be stated that similarities and differences in percentages from previous years (2017 – 40% mortality) shift quickly with such small numbers of cats monitored by telemetry. The death of our long-term monitored female “Nele” was sad but expected as she had a smaller than average home range in 2018 (Tab 1), which is often a sign of weakness and approaching disease through amyloidosis. We monitored her for 44 months in the prime home range of the study area, the pan close to the NJF house, and were able to collect excellent long-term data on her. She was killed by jackals in the absence of Martina Küsters, but her condition and susceptibility might have been caused by AA-Amyloidosis that would have debilitated her beforehand. However, the absolute cause will unfortunately remain unanswered. The death of male “Drogo” is also notable, as we only considered him a young adult when captured in November 2017. With his condition deteriorating, his movements away from his initial area in search of food or after being chased out by a stronger opponent are typical of Amyloidosis-affected cats. He finally stayed close to a water point, due to the necessity of drinking frequently, and his abnormally tame behaviour in the last stages of delirium led to his killing by farm labourers who mercifully ended his suffering (Fig.11). The dissection of his kidneys and adrenals already showed grave alterations (Fig. 12) as Amyloidosis was proven after the preserved kidneys were sent to Onderstepoort. The death of the young adult male “Rikon” is likewise astonishing, however unfortunately, despite Martina digging him out of a deep den (Fig. 13), his body was already too decomposed for proving Amyloidosis. Necropsies will remain crucial to provide a measure of the frequency and prevalence of AA-Amyloidosis in any current and future study area, not only on BFN where it had been reported before (Terio *et al.* 2008; Zimmermann *et al.* 2011). Currently, it is prevalent at both study sites. We had four cats collared on BFN in November 2017 and were left with one (“Leia”) a year later. We know that two died, which amounts to 50% adult mortality, however the third “Luke” disappeared, most likely due to collar battery expiry, we are uncertain whether he is alive or not. We lost the adult male “Odin”, who Martina monitored for 31 months and found him freshly dead on the adjacent Alexandersfontein Farm. We are awaiting the results of the organ pathology analysis to confirm if he died due to Amyloidosis. In contrast, Martina found the decomposed carcass of female “Freya” deep in a den within her home range. There was no indication of her being sick beforehand as she was difficult to see in the long grass and we will never know the cause of death. So, in general and common to both study areas, the year 2018 has been a hard one with high adult mortality.

Fortunately, Martina Küsters was again able to collect close to 700 waypoints for all the cats combined in 2018, particularly for the cats on the farms south of De Aar, and to a lesser degree for those on BFN (Maps 1-3; Table 1). The two adult resident males “Hulk”, “Darth” had large home ranges of 65.7 km² (N=134 waypoints) and 52.6 km² (N=41) on NJF, TBP and neighbouring farms until they disappeared. However, “Odin”, with 66.8 km² (N=35 waypoints), also had a large range in the first 8 months of the 2018. Only “Luke” with 25.0 km² on BFN and adjacent farms roamed similarly to previously recorded resident male home ranges on BFN (average 21 km², range 16-24 km², n=5, Sliwa, 2004).

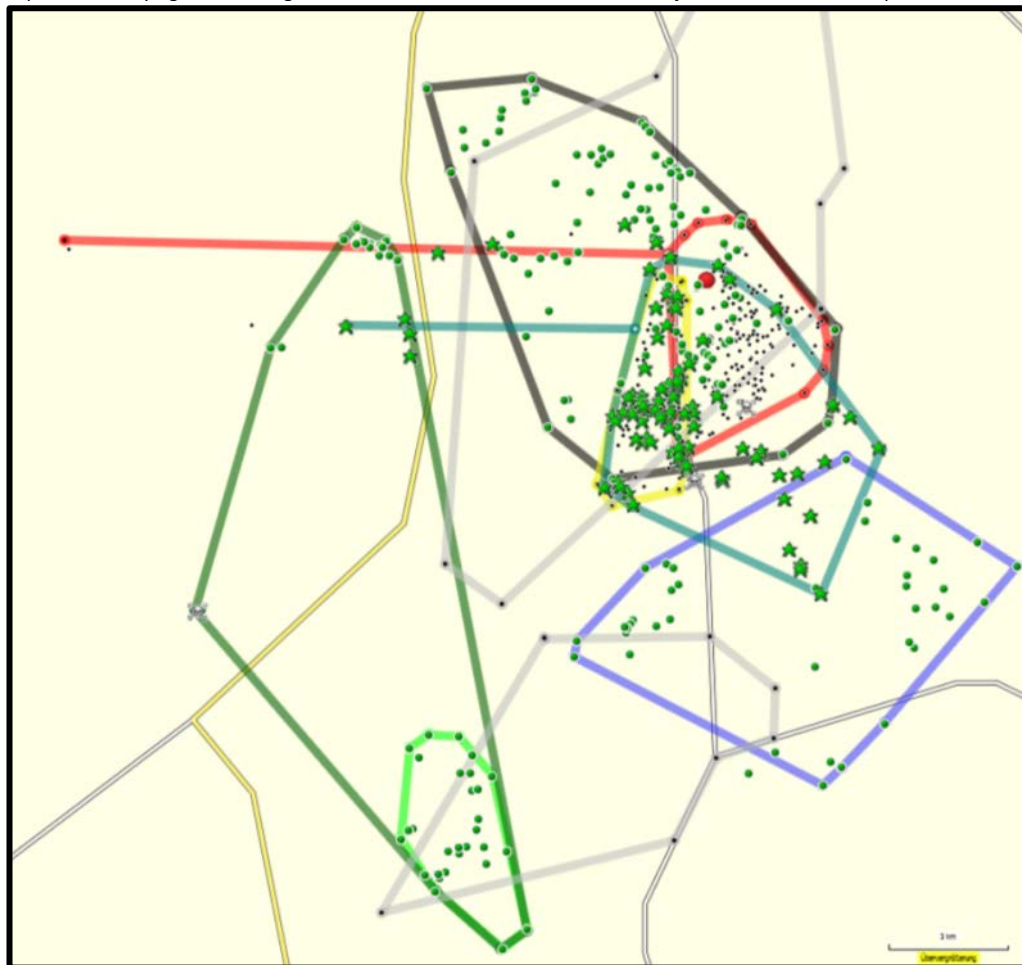
The capture field trip was highly successful, with the sighting and capture rates of both study areas good once again. Michelle Rodgers, who took over from Martina’s highly dedicated and excellent five years of monitoring, has continued to collect more location fixes on BFN in November 2018 and returned in January and March 2019 for each of the 8 radio-collared cats. By the end of March 2019 we are left with six cats still alive. Two females were likely killed by jackals in early 2019 as only their collars were recovered. We will need to train and install another field worker for the remainder of 2019 as Michelle left the project on 1 April 2019.

The BFCWG will return to BFN for further capturing and sampling of wild black-footed cats, either in late 2018 or the first half of 2020, because the batteries of the newly fitted radio-collars should be operational for at least 18 months.

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 Pieter drive the Toyota Land Cruiser for several nights, he also helped with the capture of a cat. 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 yet again. We would also like to thank all the farmers in De Aar who have supported and assisted the project, including Niels Grobbelaar (former owner Ezelsfontein farm), Manfred Lambrecht and his family (new owners Ezelsfontein farm), Sarel Marais (Manager of Mynfontein farm), Frank Sequeira (Kwesfontein farm) and especially Wilhelm van Zyl and his family. Likewise, we thank De Beers Consolidated Mines and the Diamond Route for permission to work on Benfontein NR and the use of the rented hunting lodge for accommodation. Ecology Division of De Beers gave us permission for the sampling, and supported us in employing the pursuit and digging methods. Landowners and farm managers that border Benfontein, including Dave Knight (Manager of Mauritzfontein), are thanked for their continued support and permission to enter the properties to check on cats. We are grateful to the Conservation Photographer Sebastian Kennerknecht, who not only fitted in perfectly with our hectic schedule and quirky team, but provided us with fantastic images of our work and the black-footed cats. Funds for fieldwork came from Cologne (Kölner) Zoo; Zoo-Verein Wuppertal e. V. (friends of Wuppertal Zoo); Ch. Ritzen, K. Stellmacher, T. Mennig (Felis felix Katzenpsychologie), A. Brüggemann & Koch Gang; Olaf Goldbecker (charity-kalender.de) - all Germany; SOS Félines & Co. Nesles (Paris, France); Zoological Association of America (ZAA), Punta Gorda FL, USA; Omaha's Henry Doorly Zoo & Aquarium, Omaha, NE, USA; San Diego Zoo Global, CA, USA; The Living Desert, Palm Desert CA, USA; Denver Zoological Foundation, CO, USA; Big Cat Rescue, FL, USA; The International Society of Endangered Cats (ISEC), Canada, provided funds and again reported directly to their sponsors when we were in the field and through Martina Küsters' and Michelle Rodgers' bi-monthly reports. Further generous funding was received again from a private donor, Mr. Ralph Christie, who supported the running costs and field work in the Kimberley area. We sincerely thank our respective employers for supporting us and granting us leave from our busy work schedules to carry out this field work.

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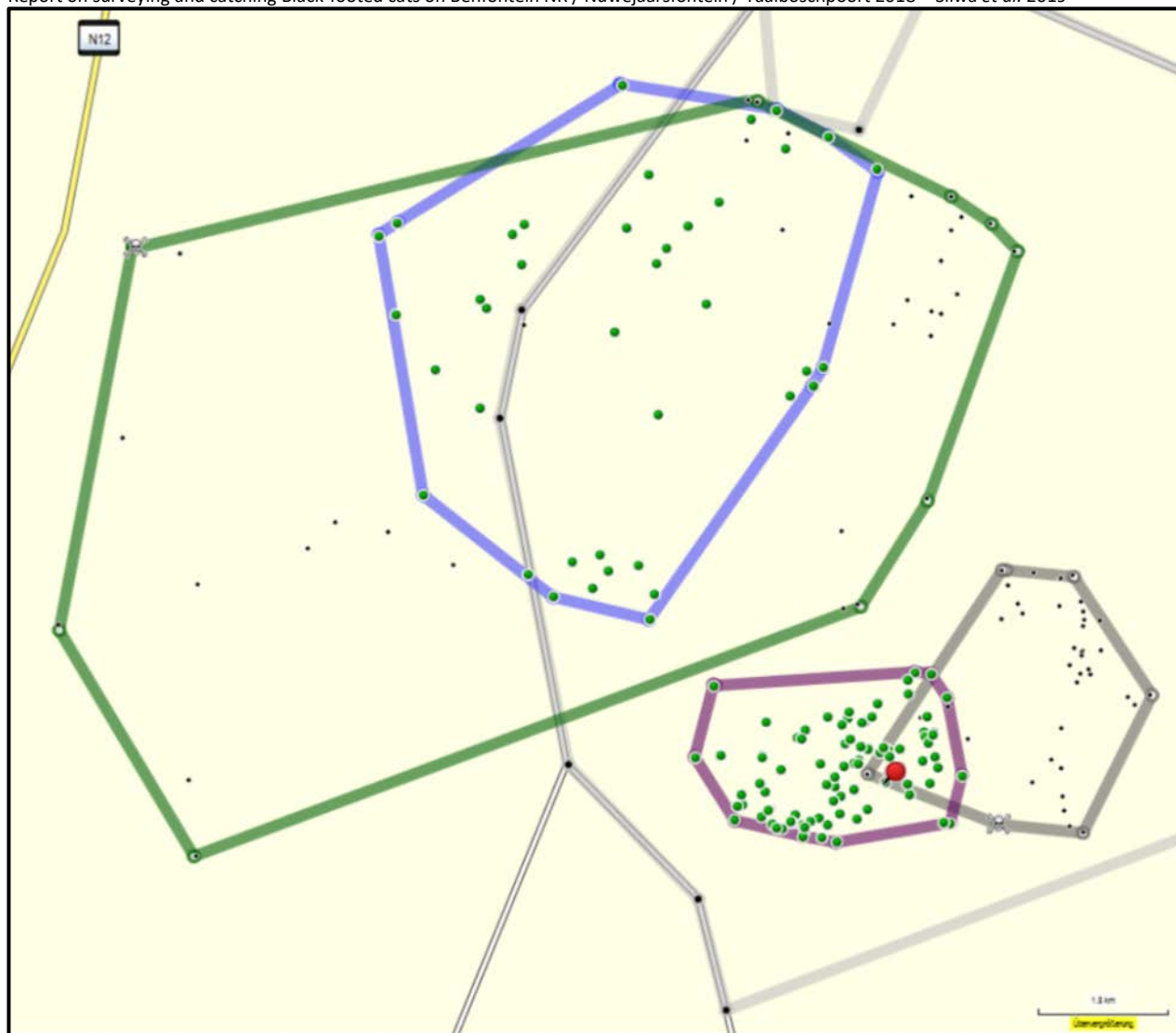
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Map 1: GPS map of Nuwejaarsfontein (NJF) and Taaiboschpoort (TBP) farms (boundaries = grey polygons), with Eselsfontein (ESF) in between, with minimum convex polygons (100% MCP) encompassing the locations of 6 radio-collared black-footed cats intensively monitored between January – November 2018. Total number of waypoints recorded 520.

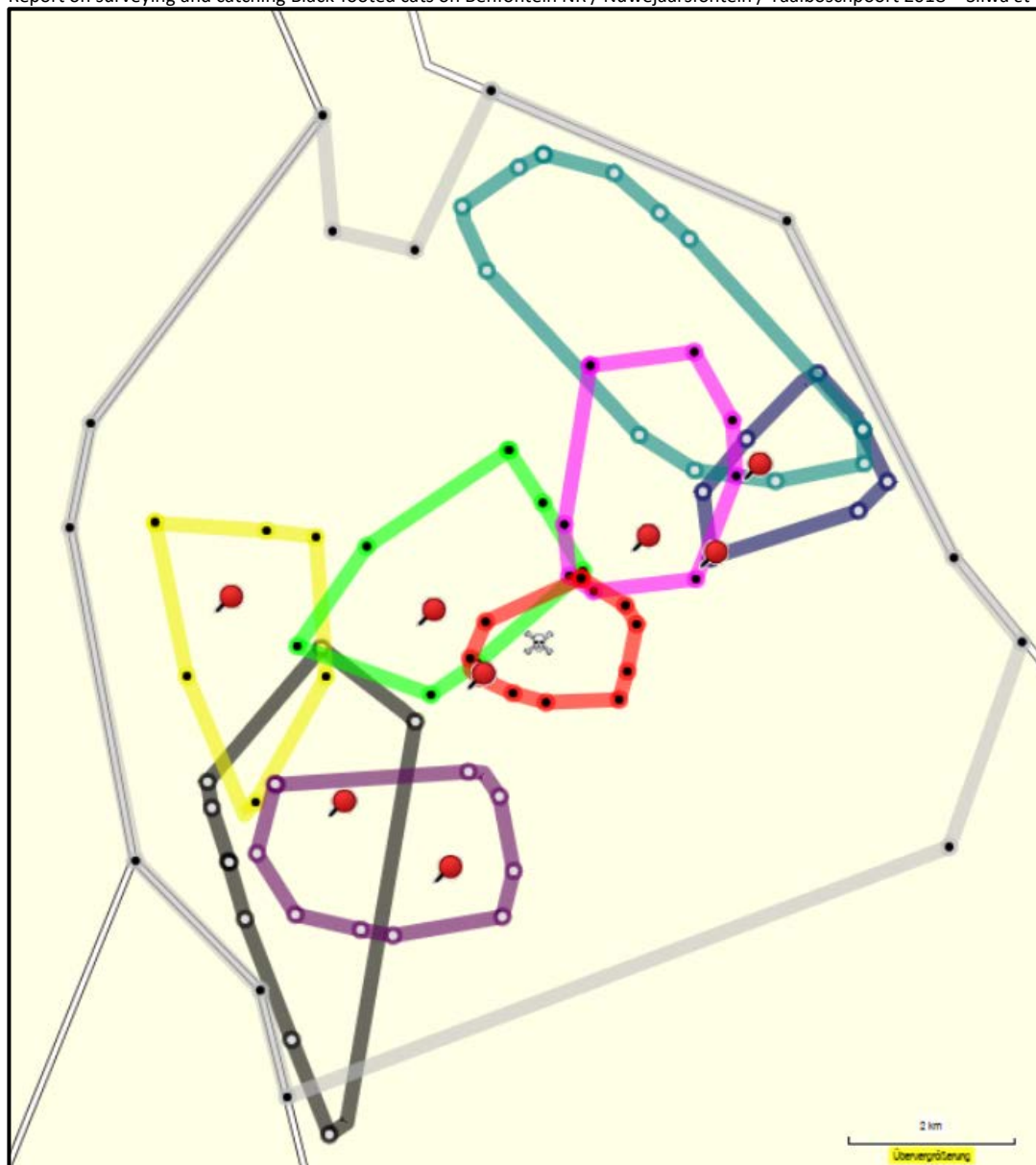
n = number of waypoint recorded for each individual. Data also in Table 1.

- Female “Nele” with yellow polygon, black dots (9.2 km^2 ; $n = 92$). On NJF but also partly on ESF. She died after 44 months of continuous monitoring, found dead on ESF on 25.7.18. **DEAD**
- Female “Arya” with red polygon, black dots (16.9 km^2 ; $n = 137$), large range; made long excursion (red horizontal line) west in late July – due to drought; thin but good coat on 5.11.18, when we removed her radio-collar; older female, slight overlap with “Nele”.
- Male “Hulk” with black, green dots on NJF and ESF (66.7 km^2 , $n = 134$). Very large male, was seen drinking March 2018; lost contact via collar battery expiry 15.8.18. **Lost** and presumed **DEAD**.
 - Male “Darth” with blue, green dots on TBP, ESF and neighbouring farms (52.6 km^2 , $n = 41$). Resident male, last seen 15.8.15 – collar battery expiry. **Lost**.
 - Male “Drogo” light green and dark green polygon, green dots (small polygon 10.7 km^2 , $n = 47$), Southern TBP, also Jagpoort. Made excursion north in late August, looked sick 7.9., was killed by farm labourers on 12.9.18 at water trough (skull sign) when close to death. **DEAD**
 - Subadult Male “Rikon” in dark cyan polygon, green stars (37.3 km^2 , $n = 93$), overlapped with 4 other adult cats. Seen sick late July; made 8.5 km excursion west in September (straight line - cyan). Found dead 22.9.18. **DEAD**



Map 2: Map of Benfontein (BFN; boundary = light grey polygon) with ranges of former bfcs in mostly first half of 2018, minimum convex polygons (100% MCP) encompassing the locations of 4 radio-collared black-footed cats intensively monitored between January – October 2018. Based on 207 waypoints.

- Female “Freya” dark grey polygon, black dots (6.4 km²; $n = 41$) in “Kalahari”-habitat type. Last seen 24.7.18 and found dead, wedged into den on 13.10.18 (skull sign). **DEAD**
- Female “Leia” purple polygon, green dots (5.2 km²; $n = 92$), remarkably small range. She lost 250g (20%) since last year. She is alive and we exchanged her radio-collar on 31.10.18.
- Male “Odin” in dark green polygon, black dots (66.8 km², $n = 35$). Shifted to Mauritzfontein and Alexanderfontein farms where he was last seen alive on 22.7.18 before he died there on 23.7.18 (Skull sign). **DEAD**
- Male “Luke” blue polygon, green dots (25.0 km², $n = 39$), but often crossed over to Alexanderfontein and last seen on 24.7.18. Collar batteries presumed expired. **LOST** contact



Map 3: GPS map of Benfontein NR (BFN; boundary = grey polygon), with minimum convex polygons (100% MCP) encompassing the locations of the 8 radio-collared black-footed cats monitored in November 2018. Red stalked signs demarcate the capture locations. Total number of waypoints recorded for these polygons was 257. n = number of waypoint recorded for each individual.

- Adult male “Basa” = 8.5 km² (n = 38) in black polygon. He covered southwestern BFN, also moving over to Melrose farm.
- Adult male “Inkosi” = 9.9 km² (n = 37) in dark cyan polygon. Overlapped ranges of young cats “Hamba”, and “Ufisa”. Remarkably close to human habitation and visited the army grounds.
- Young adult male “Hamba” = 2.9 km² (n = 40); dark blue polygon. Ranged in eastern part of BFN. His range was overlapped by adult male “Inkosi”. Very small range and he alternated and repeatedly used the same dens.
- Young adult male “Phusa” = 5.5 km² (n = 34); light green polygon. Stayed in central BFN and has unusual resting places.
- Sub-adult Female “Ufisa” = 5.0 km² (n = 36) magenta polygon. Ranges northeast central BFN. Very small and shy, but habituated well to vehicle. Collar found on 14.3.19, no carcass. **DEAD**
- Female “Zonke” = 2.3 km² (n = 30); red polygon, used central part of BFN. Her collar was found on 15. January 2019, after 6 weeks absence of field person, no sign of her. Probably predated. **DEAD**
- Female “Kazi” = 4.8 km² (n = 24); yellow polygon. Caught at windmill, shy and uses western part of BFN.
- Female “Leia” = 5.2 km² (n = 92, for whole 2018); purple polygon. Used a small and stable area adjoining female “Freya” (Map 2). Overlapped by male “Basa”.

November 2018 Benfontein Nature Reserve



Fig. 1: BFCWG with “Zonke” on BFN (@pumapix).



Fig. 2: Arne extracting “Leia” from the termite mound she was captured in (A.Sliwa).



Fig. 3: Team assists Sebastian Kennerknecht (@pumapix) setting digital trail camera at den (A. Sliwa).



Fig. 4: Phusa” with rather brown “nigripes”-type markings (A. Sliwa).



Fig. 5: Alex checking for signals (@pumapix)



Fig. 6: Sebastian Kennerknecht portraying field work by Martina (A. Sliwa).



Fig. 7: Michelle & „Ufisa“ (@pumapix)



Fig. 8. Digging for a cat that ran into a den (@pumapix)



Fig. 9. Caring, checking, recording (@pumapix)



Fig. 10. Jason checking sperm motility (@pumapix)



Fig. 11: "Drogo" hung up at water trough (M.Küsters).



Fig. 12: Enlarged kidneys and adrenals of "Drogo", NJF



Fig. 13: Martina extracts dead "Rikon" from den (M. Küsters)



Fig. 14: Alex discussing and thanking Piet Marais for welcoming the BFCWG for almost 10 years (@pumapix)

Black-footed Cats tracked in 2018



Fig. 15: "Hamba" our first capture 2018 (BFCWG)

Fig. 16: "Inkosi" emerges at dusk (BFCWG)

Fig. 17: "Ufisa" (BFCWG)

Fig. 18: "Leia" unusually confident (M.Rodgers)



Fig. 19: "Phusa" leaves hollow termite mound after capture (@pumapix)

Fig.20: "Hamba" leaving den (@pumapix)

Fig.21: "Basa" (@pumapix)

Fig. 22: „Phusa“ in the reeds (@pumapix)

Table. 1: Body measurements (cm), range size and remarks on 17 black-footed cats with 9 captures on Benfontein, Nuwejaarsfontein and Taaiboschpoort in 2018.

Capture Date	30.10.18	31.10.18	31.10.18	1.11.18	3.11.18	5.11.18	7.11.18	7.11.18	8.11.18	<i>not captured</i>	<i>not captured</i>	<i>not captured</i>	<i>not captured</i>	<i>not captured</i>	<i>not captured</i>	<i>not captured</i>	
Name (also on Map)	Hamba	Leia	Inkosi	Kasi	Basa	Arya	Phusa	Ufisa	Zonke	Freya	Luke	Odin	Hulk	Darth	Nele	Drogo	Rikon
No. captured	Cat 1 18	Cat 2 18	Cat 3 17	Cat 4 187	Cat 5 18	Cat 6 18	Cat 7 18	Cat 8 17	Cat 9 18								
Sex	M	F	M	F	M	F	M	F	F								
Age (judged by teeth)	SubAd	Adult	Adult	Adult	Adult	Adult	SubAd	SubAd	Adult								
Microchip #.	276095610401 584	checked	276095610401 593	94500001808 148	276035610404 201	checked	276095610404 684	2760956103 97868	276095610401 230								
Mass (kg)	1.37	1.02	2,18	1.23	2.33	1.18	1.21	1.00	1.02								
Ear (cm)	4.9	4.6	5.4	4.7	4.7	4.6	5.1	4.9	4.9					-			
Shoulder (cm)	26	24	28	24	29	26	25	23	24					-			
Total Length (cm)	60	52	65	57	67	57	59	55	54					-			
Hind foot (cm)	9.3	8.3	9.9	9.0	10.4	9.0	8.9	8.0	7.9					-			
Front foot (cm) (L x W)	2.1 x 1.8	1.8 x 1.85	2,5 x 2.1	2.1 x 1.8	2.3 x 2.2	1.8 x 1.7	1.8 x 1.9	1.7 x 1.5	1.8 x 1.7					-			
Tail (cm)	16	15	20	18	19	18	16	15	16					-			
Neck (cm)	12	10	15	1	15	11	11.5	10	10.5					-			
Canine UR (cm)	0.93	0.78	1.21	0.88	1.15	0.94	0.94	0.79	0.74					-			
Canine LR (cm)	0.89	0.70	1.01	0.80	0.87	0.77	0.77	0.72	0.70					-			
Canine UL (cm)	0.96	0.78	1.25	0.86	1.08	0.72	0.72	0.77	0.73					-			
Canine LL (cm)	0.91	0.66	0.89	0.77	0.85	0.83	0.83	0.69	0.67					-			
Testes (cm)/nipples		used, not recent	1.9 x 1.1 1.6 x 1.2	used, not recent	well developed	Used, not recent		un-used	used, not recent					-			
No. fixes collected in 2018	40	92	37	24	38	137	34	26	30	41	39	35	134	41	68	47	93
Range (100MCP) 2018 (km ²)	2.9	5.2	9.9	4.8	8.5	16.9	5.5	5.0	2.3	6.4	25.0	66.8	65.7	52.6	9.2	10.7	37.3

Remarks: Total fixes collected in 2018, n = 956

- Hamba (Cat 1 18): BFN – subadult male in lean but good condition; very pale background colour. Uses small area in NE of BFN, has reused the same two dens repeatedly.
- Leia (Cat 2 18): BFN- captured inside of hollow termite mound and ran into draped nets, lost 250g since last year; sleek coat and condition, foot pads very well worn. Nipples well worn, but not recently.
- Inkosi (Cat 3 18): BFN- fully adult male; left lower canine damaged; comes remarkably close to the houses on BFN; occupies the north eastern to eastern central part.
- Kasi (Cat 4 18): BFN- adult female; caught close to western windmill in short grass area. Lean to thin and long, had kittens before but not currently. Shy.
- Basa (Cat 5 18): BFN- large adult male - older; caught in the south of BFN; canines slightly rounded; strong nick in left ear; has crossed to Melrose farm to the south, but can be found readily from koppies.
- Arya (Cat 6 18): NJF - adult female; caught in hollow termite mound; **took collar off**; thin but o.k.- lost weight, coat in good condition; upper left canine's condition hasn't changed (broken and discoloured like last year).
- Phusa (Cat 7 18): BFN – subadult male (± 12-18 months); captured at pan fringe, pale ground colour, brown stripes and spots on flanks – “*nigripes*-type”. Often has unusual resting places.
- Ufisa (Cat 8 18): BFN – subadult female (± 12-18 months); permanent dentition and small unused nipples; was very shy of the camera trap and didn't leave before it was removed.
- Zonke (Cat 9 18): BFN - adult female; caught in central part; small and lean, used nipples, but not recent. Only monitored in November 2018; found collar on 15.1.19. **DEAD**
- Freya (Cat 10 17): BFN - adult female maintained as small HR in Kalahari part of BFN. Last seen 24.7.18 and then found dead on 13.10.18, stuck under a stone in a deep den, decomposed at edge of HR. **DEAD**
- Luke (Cat 11 17): BFN - adult male (± 5 years); mostly in NE BFN and adjacent Alexandersfontein & Mauritzfontein farms; last seen 24.7.18, probably early collar termination (battery expired); **LOST**
- Odin (Cat 8 17): BFN - adult male; monitored 31 months (since Oct 2015); stayed mostly on central BFN, but also moved across to W Border, last seen 22.7.18 before he died 23.7.17 on Alexandersfontein; **DEAD**.
- Hulk (Cat 2 17): NJF – large adult male; lost contact after 15.8.18, probably due to early collar termination (battery expired); started to drink (suspected amyloidosis) March 2018. **LOST & presumed. DEAD.**
- Darth (Cat 4 17): TBP - adult male; roamed increasingly on neighbouring farms close to TBP and ESF; last found on 15 August 2018, probably due to early collar termination (battery expired); **LOST**
- Nele (Cat 1 17) adult female; monitored for 44 months; in 2018 only small HR, then found dead on Eselsfontein (ESF) on 25.7. 2018. **DEAD.**
- Drogo (Cat 5 17) young adult male; mostly hunted on TBP and also Jagpoort; looking sick on 7.9.18, killed by farm labourers when they found him at water crib on 12.9. 2018; **DEAD.**
- Rikon (Cat 3 17): subadult male, stayed in Arya's and Nele's range both sides of public road. 1st sick on 27.7.18; limping, made excursion to W in September; very sick on 21.9.18 died in den 22.9.18. Digging and extraction prevented amyloidosis diagnosis **DEAD.**