- Black-footed Cat Working Group -Report on surveying, catching and monitoring Black-footed cats (*Felis nigripes*) on Benfontein Nature Reserve, South Africa and Grünau Farms, Namibia in 2022

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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 (Ford Ranger 2.6 I) which is insured, and its running and maintenance costs are covered through a dedicated Non-Profit Company since 2019. The specialised equipment required for our research is stored at the McGregor Museum, Kimberley, Northern Cape Province.

This year we made one capture trip from 4-10 November 2022 to exchange the radio collars of one female and capture new individual black-footed cats (BFC) in the current long-term study area, Benfontein Nature Reserve (BFN), near Kimberley and continued onwards to southern Namibia, on farmland in Grünau (GR) from 11-16 November 2022. We also report here, in abbreviated form, on the Black-Footed Cat Research Project Namibia, which is managed locally by Martina Küsters (wildlife specialist) and Dr. Morgan Hauptfleisch (Namibia University of Science and Technology). This project used a vehicle (Toyota Hilux) loaned from the Namibian Chamber of Environment (NCE) from January to April 2022. The project was able to purchase a dedicated field vehicle, a Mitsubishi Triton, from funds received from the Cat Life Foundation, while accessories and insurance came from Pupkewitz Foundation and April Campbell in April 2022.

Background and Study Areas

Background: This project is part of a multidisciplinary effort to study the distribution, ecology, health, and reproduction of *Felis nigripes* to collect long-term data. The aims are repeated captures of BFCs for biological sampling and radio-collaring for subsequent observation. Several methods like camera trapping, den monitoring, and focal animal surveys, were employed to survey areas previously known to hold BFCs. From November 2005 until the present, almost annual capture operations have been conducted on BFN. From 2009 to 2018, annual captures were also conducted on two additional properties in the Upper Karoo, Northern Cape, close to the town of De Aar, before research ended on these properties in November 2018. In February 2020 we started with a new study area in southern Namibia. Nineteen reports detailing previous fieldwork are available for download as PDFs on the website <u>www.black-footed-cat.wild-cat.org</u>.

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 consists of arid plant communities receiving an average annual precipitation of 450 mm. BFN has been the subject of the first field study on the species by A. Sliwa in the 1990s (1992-1998) (Sliwa 2004, 2006, Sliwa *et al.* 2010) and continues to be an important site for long-term monitoring.

<u>1 – Grünau (GR) study areas in Namibia:</u>

Report on surveying and monitoring Black-footed cats on Benfontein NR, South Africa and Grünau Farms in Namibia / 2022 Sliwa et al. 2023 2 Private farmland comprising an extensive area of 70 000 ha with Dwarf Shrub Savannah vegetation in typical Nama Karoo habitat. The area receives low rainfall of 80-120 mm on average and is lightly stocked with sheep (*Ovis aries*). We captured and radio-collared four female BFCs in February 2020 in the area (Sliwa et al. 2021) and one of these females dispersed 25 km to the north two months later. A well-maintained grid of sand and gravel roads traverses the property allowing good survey coverage.

Methods:

- (A) Spot-lamp searching: For a total of 11 nights (5 on BFN, 6 on GR,) a 4x4 vehicle (Ford Ranger 2.6 l) 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 three people (four to five this trip) stood on the open back of the vehicle operating two spotlights (1 million candle power / Lightforce[®] SL240 mm) and landing nets, while two to four people were in the vehicle.
- **(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, 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*=10). Two people with landing nets then netted the cats. On other occasions, the cats found a den system (dug by aardvarks, ground squirrels, or springhares) and were captured by exposing them after digging (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. During this entire trip, we processed the 19 captured cats (including three kittens) in the field. All animals were given complete physical examinations, had biological samples collected for disease and genetic studies, morphometric measurements obtained and all but three (too small/young) had radio collars fitted. 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 awaiting full recovery (Eggers *et al.* 2020).

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 radio-collared cats (n=6 BFN and n=10 GR) were confirmed alive and well on subsequent nights using telemetry and visual verification.

(C) "Digging" of previously radio-collared cats: This method was employed six times this year. The entrance of the den system, in which the radio-collared BFC was resting during the daytime, was quickly draped with a net and the cat either ran into the net or was extracted after only slight and careful digging. The still-functioning radio collars of female *Kazi* on BFN and the females *Prima*, *Kara*, *Zola*, *Nama*, and *Lace* in Namibia were exchanged with mostly slight digging or modification on their current dens being necessary.

The capture on BFN (South Africa) was staffed in November 2022 by:

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The capture vehicle in Namibia was staffed in November 2022 by:

Mrs. Beryl Wilson Hartmann, zoologist, Okaukuejo, Namibia (berylwa@gmail.com)

Ms. Martina Küsters, Black-footed Cat Research Project Namibia, Swakopmund, <u>bfootedcat@gmail.com</u> Dr. Alexander Sliwa, zoologist, Cologne (Kölner) Zoo, Germany, <u>sliwa@koelnerzoo.de</u>

Ms. Michelle Schroeder, field technician, BFCWG, Kimberley, South Africa, <u>MustelaMichellea@gmail.com</u> Dr. Axel Hartmann, veterinarian, Ministry of Environment, Forestry and Tourism, Etosha Ecological Institute, Okaukuejo, Namibia, <u>axel.hartmann@meft.gov.na</u>

Mr. Shipala Ndele, field technician and NUST student, Windhoek, Namibia, phillemonferguson@yahoo.com

Results:

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

BFN: Total distance searched was 232 km (average 46.4 km/night) and the total time spent searching was 24 hrs 47 min in 5 nights. We saw six BFCs during five nights of searching (120% chance of sighting a BFC/night). We caught five out of six BFCs (83.3% capture success of those we attempted for). New animals were the males *Rodeo* and *Shongo*, and the adult females *Atty*, *Ember* and *Gale*.

We exchanged the still-functioning radio collar of the single remaining female *Kazi*, by locating her in a favourable den. Careful extraction via slow digging exposed her for an anaesthetic injection and as the other cats she was fit and showed no obvious aversive reaction when checked over the consecutive days. Thus, we had six radio-collared BFCs on BFN when leaving on 11 November 2022 for GR. We could not capture on two nights due to rain. Other carnivores and nocturnal mammals seen during our spotlighting included African wildcat (*Felis lybica cafra*, may have been a feral cat), bat-eared fox (*Otocyon megalotis*), small-spotted genet (*Genetta genetta*), aardwolves (*Proteles cristatus*), black-backed jackals (*Lupulella mesomelas*), aardvark (*Orycteropus afer*), Cape porcupine (*Hystrix africaeaustralis*) and South African hedgehog (*Atelerix frontalis*).

GR, Namibia: Total distance searched was 757 km (average 126.2 km/night) and the total time spent searching was 25 hrs 4 min in six nights. We saw ten BFCs during six nights of searching (167% chance of sighting a BFC/night), of which two had been collared the nights before, so we didn't attempt to catch them again. We caught seven out of eight BFCs (87.5% capture success of those we attempted for). The new animals were the males *Hom, Xam, Obub* and *Sasa*. These are the first males we have collared in Namibia, and the adult female *Tima*. We did not collar two juvenile females, since they were with ~750g and 1020g, respectively, and thus below or on our 1 kg cut-off to radio collar. However, we microchipped them for recognition if re-captured later and took hair and blood drops for genetics. We saw many other small carnivores, like African wildcats, aardwolves, bat-eared foxes, Cape foxes (*Vulpes cana*), common (small-spotted) genets and the particularly plentiful striped polecats (*Ictonyx striatus*). We also observed aardvarks, porcupines, and spotted eagle-owls (*Bubo africanus*). We did not spot any black-backed jackals or caracals (*Caracal caracal*) in the area of GR.

We exchanged the still-functioning radio collars of the five females *Zola*, *Nama*, *Lace*, *Prima*, and *Kara* with new collars, by locating them in their dens. With the females with kittens of different ages, like *Lace*, *Nama* and particularly *Prima*, we made sure to not disturb their kitten(s) too much whilst working on them and placed them back in their dens with the kitten(s) when finished. Thus, we had 10 radio-collared BFCs on GR when the BFCWG left on 17 November 2022.

Monitoring radio-collared cats on BFN and GR:

BFN: Field technician Michelle Schroeder tracked the four radio-collared BFCs in their dens during daylight and at night, and wildlife biologist Dr. Kenneth Buk helped, when she was on leave or conducting fieldwork in Namibia for two months in winter. Sufficient waypoints were acquired only for the female Kazi to determine her annual home range (HR) accurately, the other eight cats being only tracked for part of the year due to either dying in May/June or having been captured only in early

Report on surveying and monitoring Black-footed cats on Benfontein NR, South Africa and Grünau Farms in Namibia / 2022 Sliwa et al. 2023 4 November. Overall, 950 waypoints were collected up until 31 December 2022. HR size estimates incorporating all collected waypoints for all the individual cats tracked in 2022 are provided in Table 1 and Minimum Convex Polygon (MCP100%) outlines are shown in Map 1.

GR: Field technician, Shipala Ndele, was able to complete three long tracking periods in 2022. Initially from 14 January 2022 to 6 April 2022; again from 23 May 2022 to 31 August 2022 and continued tracking the six females, he then returned to the study site from 1 October 2022 to 30 December 2022. All but one of the females maintained relatively stable and mostly smaller than last year's annual HRs. Altogether in 2022, 1.148 waypoints were collected for the seven females and fournew males, while all the newly collared males and one female were only tracked for the period of just five weeks and thus didn't display the full extent of the annual HRs, while the six females we had already captured in 2020 and 2021 were tracked for a whole year's cycle. This is a very solid foundation for defining their annual HRs and will serve as highly interesting comparisons between years and study sites. HR size estimates incorporating all collected waypoints for all the individual cats tracked in 2022 are provided in Table 1 and Minimum Convex Polygon (MCP100%) outlines are shown on Map 2. Shipala returned between 4 Feburary 2023 and 3 May 2023.

Ranging and survival of Black-footed cats in 2022:

BFN

Altogether nine BFCs were monitored in 2022. After the whole previous year without any deaths, we had three longer-term monitored cats die within 6 weeks in May/June:

Male Hamba: An adult with a stable HR in west-central BFN, where we first captured him in November 2018. He was well-habituated. Found dead on 6 May 2022. Lungworms were confirmed and the proximity of the carcass close to standing water suggests renal failure – likely amyloidosis, but the carcass was too rotten for necropsy confirmation. With 8.98 km² his 2022 HR (41 waypoints) was incomplete, including only the first five months of the year, thus below the average annual HR size for a resident male (Sliwa 2004).

Male *Putter***:** An adult caught in March 2020; resident and likely sired several litters. Found dead on 17 June 2022. The post-mortem revealed signs of kidney failure and high levels of amyloids (amyloidosis) in the tissue. His HR was 9.46 km² (81 waypoints), thus again an incomplete HR in comparison to the annual HR of 18.96 km² in 2021.

Female *Durga*: An adult first captured in March 2020. Her HR in the first half of 2022 was only 3.8 km², thus even smaller than the 2021 (6.5 km²) and 2020 (6.6 km²) annual HRs. She was found dead on 24 June 2022 a few days after a wet, cold winter storm. Amyloidosis was confirmed in her necropsy.

Female Kazi: A large adult, tracked since November 2018. She has habituated to a degree that she is oblivious to a vehicle, as witnessed when tracked on a visit of Alex Sliwa in August. She took down a fully-grown Northern Black Korhaan (*Afrotis afraoides*) (Fig. 10) then. She maintained a remarkably small annual HR of only 6.44 km² (257 waypoints) in 2022, which is similar to the one in 2021 of 5.8 km² and 7.2 km² in 2020, however in prey-rich "pan veld" habitat.

Due to their deaths in mid 2022, the overlap with the other radio-collared BFCs, *Durga, Putter* and *Hamba* could not be meaningfully calculated. Hereafter, some notes on the new cats.

Male *Rodeo*: Adult captured in early November. He seems to have taken over the HR of *Hamba*, the east-central part of BFN, with only two months tracking in 2022, he already exhibited a HR of 18.03 km² (88 waypoints).

Male Shongo: smaller adult captured on central BFN. He seemed to be a floater since he left immediately to the west. We barely heard him from the Beacon Koppie (Fig. 6) deep into the neighbouring stud farm Mauritzfontein, where we didn't manage to find him despite extensive searching on the ground. Luckily, he was back on BFN three weeks later and has been in central BFN since, overlapping strongly with Rodeo and female Ember. His HR, with 6.59 km², was incomplete (though we excluded his extreme excursion onto Mauritzfontein; Map 1).

Female *Atty*: large adult captured in central/west BFN; was found to have a ~3 month-old well-fed kitten via a camera trap image on 9 December. Her chewed collar was found on 20 December 2022, while her last living location was in a den nearby on 15.12. She was likely killed by jackals, which were seen nearby, however the collar was in a mongoose burrow. At this age, the kitten was not able to fend for itself, so either was killed in the same incident or starved afterwards. She covered a HR of only 3.21 km² (66 waypoints) in the 6 weeks she was monitored.

Female *Ember*: older adult captured close to the pan with her upper right canine fractured. We called her "*Ember*" due to her fiery/feisty nature in running and fighting the injected drug. She seems to be resident in the central part of BFN, while her yet incompletely defined HR is already 6.13 km² (127 waypoints), however this is probably not going to increase a lot in size. She was gravid when captured.

Female *Gale*: adult captured in the West of BFN, a bit south of Kazi's HR. She ran like a storm ("gale-force"), at least two years old with nipples previously well-used, but not recently. She had a small HR of 4.35 km² (98 waypoints) in 2022.

GR area:

Female *Auas*: Older adult, while her HR was 82.8 km² (266 waypoints) in 2021, due to shifts of HRs, in 2022 it reduced back to a more normal size of 6.9 km² (135 waypoints). She died on 8 October, likely of predation as she was half eaten, either by a jackal or a Cape fox. The first radio-collared cat that died in the Namibian study area.

Female *Kara*: Adult in good body condition, in 2021 she had a 13.4 km² HR (252 points). In 2022 it was 9.4 km² (189 waypoints).

Female *Lace*: She had a large but stable HR range in 2021 (19.3 km², 217 points). She is still the shiest of the Namibian females. In 2022 she only used a much smaller HR of only 5.1 km² (163 waypoints).

Female *Nama*: Adult in good condition captured first on 21.6.21. In 2021 she covered an average-sized HR of 17.6 km² (101 waypoints). She still hasn't habituated to the tracking vehicle but has become more comfortable to camera traps set at her dens (Fig. 26). Her HR in 2022 was, as with the previous females, much smaller, only 8.9 km² (162 waypoints).

Female *Prima*: Between May and June 2022 she moved from Mickberg Farm, where she had a smallish 9.4 km² HR (230 waypoints) in 2021, back to Grünau. The initial months (Jan-May 2022), she had a HR of only 3.3 km² (32 waypoints) on Mickberg Farm and after moving to the same HR where we captured her in 2020 on Grünau, a HR of 6.0 km² (162 waypoints, June-Dec). This is the first time such a repeated HR shift has been recorded in BFCs anywhere. The straight-line distance between these HRs was 25 km. What causes precipitated these moves is unknown.

Female *Zola*: Still a shy adult, captured first on 23 June 2021. In 2021 she covered an average-sized home range of 13.5 km² (112 waypoints), while for the full year 2022 she covered 4.7 km² (137 waypoints). She died in early February 2023 and her skull was found on 8 February 2023.

Hereafter are some notes on the new cats.

Female *Tima*: is a beautiful adult in a long grass area on and between dunes. Due to the dense vegetation, she is difficult to observe. She only frequented a HR of 2.1 km² (28 waypoints) in the 5 weeks of monitoring in 2022.

Male Hom: first adult male ever captured on Grünau, and thus Namibia. He was thin and dehydrated, had many ticks and took a long time to recover from the anaesthesia. He has relaxed after the first few months of tracking but is still shy and tricky to observe when hunting in thick and tall grass. His HR was 7.1 km² (37 waypoints) in 2022.

Male Xam: a subadult (8-10 months) and thus not fully grown (Fig. 29). In 2022, he used a HR of 4.7 km² (37 waypoints). He was found dead on 15 March 2023 and was observed limping a few days before, resting a lot and seemed weak. His body was found close to the deserted farmhouse by the Gamkhab River, already decomposing, but one kidney was preserved for later amyloidosis analysis. He likely died of disease or emaciation, since there were no bite marks on him.

Report on surveying and monitoring Black-footed cats on Benfontein NR, South Africa and Grünau Farms in Namibia / 2022 Sliwa et al. 2023 6 **Male Obub:** a fully grown adult with a big head. He is still shy several months after his capture and hunts only at a distance from the tracking vehicle. He shares his range with female Lace on Grünau 17, however he seems to be moving towards the southeast from there. His HR in 2022 was 18.8 km² (28 waypoints). This a comparable size to sizes published for annual HRs on BFN (Sliwa 2004).

Male *Sasa*: A young adult in good condition. He hunts along the thicker small gullies and only rests quietly in dense grass at a distance to the tracking vehicle. His HR was 2.5 km² (28 waypoints) in 2022.

Observations of Black-footed Cats: A total of 20 cats were monitored via telemetry during 2022. Most of the ones from previous years were habituated to various degrees by the field technicians and provided valuable insights into the killing of various prey species. Additional information on spraymarking, courting during the mating seasons, also by unmarked individual BFCs, and the birth of kittens was recorded. These excellent data sets will allow meaningful comparison of annual HR sizes between years and between study areas in future analyses.

Reproduction on BFN:

Kazi: had a single kitten born at the end of November 2022, seen in a shallow burrow on 5 December 2022. It was last seen on 22 January 2023; however we could not ascertain when it disappeared, due to the changeover between field assistants in early 2023.

Durga: Gave birth in mid-December 2021 and one kitten of about two weeks of age was first observed on 1 January 2022. It was last observed on 14 February 2022, so presumed not to have survived to dispersal age and thus presumed dead. As *Durga* died of amyloidosis and bacterial infection, with the associated immune-depressed status it was unlikely that she had another litter before her death in late June.

Atty: was found to have a ~3 month-old, well-fed kitten, via a camera trap image on 9 December 2022, so this kitten was born in about mid-September. Atty's chewed collar was found on 20 December 2022, whilst her last living location was in a den nearby on 15 December 2022. She likely was killed by jackals, and with her death, the kitten must have either died at the same time or it starved a few days later, as it was too young to survive on its own.

Ember: She was gravid with two thumb-sized foetuses when captured on 9 November 2022. She would have been suspected to have given birth in early December, but the kittens were never observed. Since she scent-marked frequently in mid-December it is likely that the litter did not survive.

Gale: when captured on 9 November 2022, no obvious pregnancy was detected and her nipples were not in use, although they had been used previously.

In summary for BFN, although four out of the five tracked females gave birth in 2022 none of the kittens survived past about three months, which is too early for dispersal. Thus, the year 2022 was not successful, despite ample rains, estimated at about 650 mm and thus far above the average 450 mm.

Reproduction on GR: Of the six females tracked in 2022, we have confirmed reproduction in the following females (Küsters et al. 2022a & b).

Auas: She was shadowed by two males in early June 2022 and was expected to have given birth in August. Two kittens were captured on camera on the night of 4 October 2022, estimated no older than six weeks old. A male BFC came to the den in the early hours of the next morning, sniffing at the entrance, the kittens were inside the den. Unfortunately Auas' remains were found on 8 October, most likely predated and her carcass was half-consumed. Her kittens were never found / seen again, presumably also killed or died.

Kara: had a litter around 10 June 2022. She looked very round, restless and was urine-spraying then. Two kittens were confirmed by Shipala who heard them in the den. However they were not heard or seen again. Maybe the litter was lost during a sudden cold spell in June, temperatures reaching below freezing (down to -4°C). On 30 October a small kitten (estimated at seven days old) was found in the front chamber of a den, with *Kara* located in another den 50 m away. It is very likely it was her kitten. Unfortunately, it was never seen again. *Kara* does use communal dens very often, dug by other mammal

species, as a result obtaining camera trap images is very difficult. Upon her capture on 16 November 2022, she was not lactating, and also no larger kittens could be palpated.

Lace: Two kittens were born around 12 November 2021 and were both seen last on 26 January 2022, at about 2.5 months of age. Tracking stopped on 30 January 2022, so it is not known if they survived to independence. On 30 March 2022 a new litter was recorded; two more kittens were recorded on the camera trap, estimated at about 1.5 months, probably born in mid-February. Given a gestation of two months she must have conceived in mid-December 2021, whilst still caring for the previous kittens on 17. January 2022. Two kittens were seen at night with Lace on 25 June 2022, hiding in the grass nearby. Unfortunately these kittens were never seen again even with visual den monitoring. She was attended by two males in July 2022. She gave birth to two kittens in early September 2022 as a CT photo showed them at about 5 weeks old on 15. October (Fig.28). When we captured *Lace* on 13 November 2022 she was still lactating and there were spoors of kitten(s) in a nearby den. Several CT photos recorded one kitten with her on 24 November 2022, so she lost one. The single kitten was last seen on 9 December 2022.

Nama: a kitten seen in November 2021 was not seen again in January 2022. The birth of an unknown number of kittens was also confirmed by Shipala by sound, when locating her in a den on the afternoon of 8 June 2022. However, the kittens were never seen again or recorded on a CT, probably due to the freezing temperatures affecting survival. Nama had two kittens recorded on CT photo on 25 October (Fig. 27), estimated 5-6 weeks, thus born mid-September. We only handled one female kitten (Fig.19, Tab 1.) on 14 November 2022. The kitten was not recorded afterwards.

Prima: had a litter of two born in early to mid-February, recorded via CT on 30 March 2022. Shipala saw the kittens hunting with Prima on 4 April 2022, but not afterwards again. She was seen with a male on 10 June and in early August she looked in very good condition and highly gravid, so must have given birth shortly after. No litter or kitten was recorded and she most likely lost it. She had moved back to the HR where she was captured in 2020, which impacted the survival. On 15 November, upon capture to exchange her collar, she had two kittens >10 days old (Fig.25). They were seen on CT on 17 December 2022, but not again when Shipala returned on 4 February 2023, when they would have been ~3 months old. It is very difficult to monitor kittens of this age.

Tima: when captured we saw the eyes of 2-3 kittens, but shortly afterwards on a camera trap image an exceptional number of four kittens were recorded with her on 18 November 2022 (Fig. 32). Three kittens form this litter were recorded on CT on 12 December 2022, so one was lost. Another litter of about four weeks old was recorded on 27 February 2023 in CT, so she gave birth in early February.

Zola: She was camera-trapped moving a single 10-14 days old kitten on 26 January 2022, so one or two were born in mid-January. One kitten was last recorded on 28 March 2022, so about 2.5 months old. She had another litter in early May, a single kitten was CT recorded on 8 June 2022 (Fig. 30) about five weeks old, still CT recorded a strong and healthy kitten on 21 July 2022 (Fig. 31). When captured on 12 November 2022, she was pregnant with more than one kitten, due in 2-3 weeks, so likely born early December. The date and occurrence of when this litter was born and the fate of the kitten(s) is not known. Her skull was found on 8 February 2023 and her cause of death could not be determined anymore as she must have died in January, before Shipala had returned to the study area.

Two juvenile female kittens (*JuvF3* & *JuvF4*, Tab. 1) were caught on 13 and 15 November. When considering their body weight of ~750 g and 1020 g they were probably four to five months old, on the verge of independence. We didn't anaesthetise them and thus could not accurately check their dentition to confirm ages. They were born probably in winter (June) 2022 and were still living close to or within their mothers' home ranges. They could be *Zola*'s and any of the resident females' offspring from litters born in winter.

Camera Trapping: The field technicians deployed digital camera traps (Bushnell Trophy Cam HD Nature View with close focus lens, Browning Strike Force Pro XD, Secacam Pro, SpyPoint Force-11D) to acquire

Report on surveying and monitoring Black-footed cats on Benfontein NR, South Africa and Grünau Farms in Namibia / 2022 Sliwa et al. 2023 8 regular pictorial material of all the monitored cats and to check for the presence of kittens (Sliwa *et al.* 2018, Küsters et al. 2022a & b, Schroeder 2022) at their subterranean dens (Fig.11-15 & Figs 25-31).

Scat Dog work: Michelle Schroeder continued training detection dog *Lyka* who became certified for BFC scat detection by Braveheart Biodog Academy, an astute detection dog training facility in South Africa (<u>https://www.braveheart.co.za/</u>). To assess variation in detection probabilities in a more arid region where BFCs had in 2021 on average larger HRs, she and the Namibian team member Shipala and Martina conducted systematic surveys at the Black-footed Cat Research Project Namibia near Grünau in winter (Fig.24). *Lyka* exceeded expectations and found over 120 BFC scats in a 2-month period traversing over 200 km. Genetic results indicate that *Lyka* was highly species-specific in her indications with 97.8% of scats collected genetically confirmed to be BFC. DNA from BFC confirmed scats will be further analysed to determine the sex and individual using microsatellites. The team was joined in the field by Stanford University, USA, PhD candidate Victoria Grant, who is working to develop a more informative and cost-effective genomic tool for scat DNA. Victoria is also diving deep into the BFC genome to investigate contemporary and historic BFC evolution and population bottlenecks.

Conservation Status and Red List of the Terrestrial Carnivores of Namibia: Martina Küsters has been at the forefront of the conservation assessment of BFCs in Namibia, with the outcome now listed as Vulnerable. The publication, which has been included in a fine-looking soft-back book, launched in Windhoek on 24 November 2022, is available for download under https://n-c-e.org/sites/default/files/2022-

<u>09/Press%20Release%20Carnivore%20Red%20Data%20Book%20%2812%20Sep%202022%29.pdf</u> or can be purchased for NAD 260 <u>https://www.namibiabooks.com/english-books/field-guides/product/1580-conservation-status-and-red-list-of-the-terrestrial-carnivores-of-namibia</u>.

Investigating potential new study sites in the Free State, South Africa: through long-term contacts with Dr. Nico Avenant, HOD Mammalogy Department of the National Museum Bloemfontein, several members the BFCWG were able to investigate sites around the Soutpan area, 45 km north of Bloemfontein in the western Free State Province. Michelle Schroeder and Beryl Wilson Hartmann had visited in May to meet the landowners and assess the suitability of the Florisbad Quaternary Research Station as a base and the surrounding mix of farmland. Michelle visited again in June to delineate road and fence boundaries and searched for BFC presence with the scat detection dog. Upon another visit to the different sites by Nico Avenant and Alex Sliwa on 10 August 2022, they were fortunate to receive a call by landowner Hendrik van Aswegen, who had just captured a BFC during daylight (Fig.7). It looked like a young female and was released close to its capture location on farmland unharmed after photographing it. It looked thin and had a high tick-load, which was probably the reason that it was active during daylight. After the release, they visited several sites where BFCs have been sighted (Fig. 8). We sincerely thank the visited farmers, who have shown their interest and willingness to host the BFCWG, however due to the current changeover between field assistants, we decided to not move study areas from BFN at this time.

Outreach and social media coverage of BFCs and the BFCWG: Throughout 2022, several members of the BFCWG have spread information on the species, through interviews, popular press items and presentations about our joint research. Scientific tourists and interested laypersons were provided the opportunity on a few occasions to join in tracking sessions of the radio-collared BFCs.

Also, from November 2018, Beryl Wilson Hartmann and Alex Sliwa have regularly updated the Facebook Page "Black-footed Cat Working Group" <u>https://www.facebook.com/groups/black.footed.cat/</u> with publicly visible posts. These are shared from the public Instagram page "blackfootedcat.life" <u>https://www.instagram.com/blackfootedcat.life/</u> administered by Alex Sliwa with posts every 4-7 days

Martina Küsters started the Facebook page "Black-footed Cat Research Project Namibia" https://www.facebook.com/blackfootedcatsnam/ and developed a new logo for it, which was used on the vehicle, in reports, and also on the certificates presented to supporters of the projects, including farmers and financial sponsors. The "Custodian of Black-footed Cats" [Bewaarder van Miershooptiere] program aims to recognise landowners/ farmers throughout Namibia who voluntarily strive and commit to conserving the BFC and its habitat; support active research and practice selective species-specific methods of predator control measures. This may promote overall biodiversity conservation and raise awareness within the farming community and the public. Interested farmers can contact the project coordinator Martina Küsters at <u>bfootedcat@gmail.com</u>.

The field technicians provided regular updates on the monitored cats and wrote several (n=3) field reports for sponsors, leading to excellent support even in these difficult post Covid-19 times in 2022.

Non-Profit Company (NPC): The Working Group continues to be solvent and funding for fieldwork is still possible for the financial year 2023. There are no outstanding debts or stipends owed.

Publications, reports, conference papers, and presentations by BFCWG group members on *Felis nigripes* in 2022:

Küsters, M. 2022. Das Schwarzfusskatzen Projekt in Namibia. Interviewed by Sybille Moldzio Schonecke. Hit Radio Namibia. 17 March 2022.

Küsters, M. 2022. A conservation assessment of Black-footed Cat Felis nigripes. In: NCE, LCMAN, MEFT (eds) 2022. Conservation Status and Red List of the Terrestrial Carnivores of Namibia. Pp 23-28. MEFT, LCMAN & NCE, Windhoek, Namibia.

Küsters, M., Hauptfleisch, M., Sliwa, A. & Ndele, S. 2022. Black-footed cat research Project Namibia. Project update January 2022. Unpublished report, 7 pp.

Küsters, M., Hauptfleisch, M., Sliwa, A. & Ndele, S. 2022. Black-footed cat research Project Namibia. Project update August 2022. Unpublished report, 8 pp.

Küsters, M. 2022 Black-footed cat research Project Namibia. Unpublished progress report. Namibian Commission on Research, Science and Technology, Windhoek. Permit renewal application October 2022.

Schroeder, M. 2022: Update from the field: Black-footed Cat Working Group – December 2022. Unpublished report, 13 pp.

Sliwa, A., Lai, S., Küsters, M., Herrick, J., Lawrenz, A., Lamberski, N., Eggers, B., Tordiffe, A., Marais, S., Marais, P., Schroeder, M., Anver, J., & Wilson, B. (2022). Causes of mortality in a population of blackfooted cats in central South Africa. African Journal of Ecology, 60 1-7. (1), https://doi.org/10.1111/aje.13033

Sliwa, A., Wilson, B., Küsters, Hartmann, A., Schroeder, M., Shipala, N., Fölscher, H. & Hauptfleisch, M. 2022. Black-footed Cat Working Group - Report on surveying, catching and monitoring Black-footed cats (*Felis nigripes*) on Grünau Farms, Namibia and Benfontein Nature Reserve, South Africa in 2021. June 2022. DOI: 10.13140/RG.2.2.17733.78569.

Discussion and Conclusions:

Highly valuable data on censusing and monitoring of black-footed cats was collected again by the BFCWG in 2022. We saw more than one BFC per night on both BFN and GR and caught 12 out of 14 (86% capture success) we attempted for in 11 nights.

The BFC sighting frequency on GR was even higher this year than on BFN, but both in the range of the two South African study areas over the years (Sliwa et al. 2019; 2020). The capture success was similar and comparable to that of preceding capture periods in previous years. On BFN we managed to exchange the single remaining functional radio collars of cats monitored, while on GR we exchanged five collars. We could not go out on two nights on BFN, while we used all six nights on GR. No technical issues hampered out operation. We saw no jackals and caracals during any of the nights of spotting on GR, however, we saw jackals every night on BFN. Despite a continuously high jackal density on BFN (pers. comm. M. Schroeder) sighting frequencies of un-collared cats confirm that there is still a good population of BFCs of both sexes, probably both resident and transient, on BFN.

2022 has been another year of kittens in GR. We jointly recorded 14 litters born/likely born in 2022, from the seven females. Some females had more kittens than others, particularly Lace and Prima had three litters born each. The high reproduction rates are phenomenal, maybe due to improved productivity and higher prey densities through good rainfall again in 2022 and 2021 (Küsters et al. 2022). The two juvenile females we caught on GR in November and didn't collar, due to their insufficient body weight, were likely born in winter 2022 and may have been clandestinely born and raised by females Lace, Nama, Prima and Zola or even yet by not-detected-and-caught adult females in the adjacent areas of the monitored females' home ranges (Map 1). We hope that genetic testing can help us to determine parentage/relatedness, thanks to the blood samples taken form all the cats. Already in 2021, we recorded the unusual births in GR during the colder months of the year (June, July, August), with litters usually born from September to March on BFN and in the Upper Great Karoo close to De Aar, but some births have been recorded until May (Sliwa et al. 2010). This may be not an exception but the norm in the milder winters in southern Namibia, but there was indication that a litter of female Kara and possibly others (Lace, Prima) did not survive a cold snap. In general, despite the high numbers of litters born we have little proof that many of those and single kittens survived past dispersal age which is four to even five months, given that permanent dentition is only present at five months in the species (Olbricht & Sliwa 1995).

In contrast, reproduction on BFN was again not good in 2022 neither in number of litters (n=3) nor in survival, as was the case in 2021. *Kazi* had a single reproductive event in December 2022 only, with the single kitten last seen in late January 2023. *Durga* had no litter born in 2022, until she died in June, and the new female *Atty* had a large kitten, which didn't survive when she was predated in December. *Ember*'s behaviour indicated that she lost her litter that must have been born in early December. Maybe the continuing years of above the average rainfall, which is 450 mm for BFN (800mm in 2020, 700mm in 2021, 650mm in 2022) has resulted in reduced fitness (disease, higher parasite load, difficult hunting conditions in thick/tall grass). We anticipate that this will improve as the three years of La Nina's wet influence transitions back to drier conditions.

Adult Mortality on BFN with 4 out of 9 (44%) adult monitored cats was high in 2022 again after zero mortality in 2021, with three long-term-monitored BFCs dying in a short period of six weeks, which is more typical than the zero mortality for 2021. This is more typical of what we recorded with 38% in 2020 and 50% in 2019 due to predation. We had the first mortality recorded on GR, *Auas*, thus, for eleven monitored cats there, we only had a 9% adult mortality. Apart from the males *Shongo* on BFN and *Xam* and *Sasa*, all collared cats seem to be established residents, with no added dangers encountered during dispersal. However, with our long-term research, we continue to be surprised that even older resident females may shift their ranges back and forth, as in the case of *Prima*, who has shifted her range after two years back to the range where we captured her initially. It is intriguing to imagine how these small felines sense vacancies of HRs in the vast landscape and how they then decided to scout an area again for vacancy.

HR sizes of female cats on BFN and GR were mostly lower than previously recorded (Tables 1 & 2, Maps 1 & 2), lower than average published for BFN from the 1990s (Sliwa 2004). There were no complete annual HRs for males established this year. *Kazi* seems to keep her HR size in between previous years, while residing in her stable and prey-rich pan-veldt HR on BFN. The six GR females, for which we have annual HR data in 2022, had a median HR size of 6.45 km² (± 1.96 km² SD) while in 2021 they had a median of 15.55 km² (± 28.04 km² SD). It is likely that good rainfalls at least allows females to move within a much more restricted HR than during drier years. Thus, in 2022, the ranges of females in both study areas were very similar, despite the difference in sample sizes between them. The high reproductive rate of GR females, again in 2022, with the caring for kittens resulting in more restricted movements of females close to them (Molteno et al. 1998). Although we didn't measure it, prey density in 2022 could have been similar in the drier Namibian study site on GR, compared to the long-term study site on BFN.

With two active field sites, BFN with five BFCs and GR with ten radio-collared BFCs at the end of 2022, the BFCWG was happy to enlist the work of two field technicians in 2022, collecting 950 waypoints on BFN and 1 148 waypoints on GR (Maps 1 & 2; Table 1&2). This was possible despite the difficulties in schedules and some vehicle issues on both BFN and GR.

The BFCWG will return to the study sites for capturing and sampling of wild black-footed cats in 2024, because the batteries of the currently fitted radio collars should be operational for a minimum of 18 months, thus at least until mid 2024.

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Report on surveying and monitoring Black-footed cats on Benfontein NR, South Africa and Grünau Farms in Namibia / 2022 Sliwa et al. 2023 12 substantial funding to purchase a dedicated field vehicle for the project and fieldwork. April Campbell made funds available to cover costs of vehicle insurance, vehicle registration and other vehicle-related expenses. ISEC is thanked for its financial support to the Black-footed Cat Research Project, enabling fieldwork to continue, thank you. We are grateful to Secacam, VenTrade GmbH, Köln, Germany for donating camera traps.

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Map 1: Map of Benfontein (BFN; tan polygon) with ranges of BFCs in 2022, minimum convex polygons (100% MCP) encompassing the locations (*n* = 950) of nine radio-collared blackfooted cats monitored between January – December 2022. All BFCs were monitored throughout 2022 and there were four deaths.



Map 2: Map of Grünau (GR) with minimum convex polygons (100% MCP) home ranges encompassing the locations (*n* = 1148) of 11 radio-collared black-footed cats monitored in 2022.

Report on surveying and monitoring Black-footed cats on Benfontein NR, South Africa and Grünau Farms in Namibia / 2022 Sliwa et al. 2023 Fieldwork on Benfontein (BFN) and in Soutpan area, South Africa, in 2022



- Fig. 1: most of the varying BFN capture team. (D. Saayman)
- Fig. 2: working on female *Kazi* during daylight (A. Sliwa)
- Fig. 3: Martina, Marine & Kazi (A. Sliwa)

Fig. 4: Beryl & Alex - 30 years of capturing cats together (M. Schroeder)



Fig. 5: Veterinarian Katy Gaigg working on *Gale* (A. Sliwa)

Fig. 6: Group photo on Beacon Koppie – after looking for *Shongo*'s signal (self-release)

Fig. 7: Young female captured in Soutpan area on farmland (A. Sliwa) Fig. 8: Nico Avenant discussing BFCs with landowner in Soutpan area (A. Sliwa)



Fig. 9: The unmistakeable face of Kazi (A. Sliwa).

Fig. 10: Kazi killing a male Northern black bustard (Eupodotis afroides) (A. Sliwa).

Fig. 11: Hamba waking up from his den (CT set by M. Schroeder).



Fig. 12: Putter on a clear summer day (CT set by M. Schroeder).

Fig. 13: Durga emerging from her den (CT set by M. Schroeder)

Fig.14 Kazi's kitten, 5 Dec 2022, less than 2 weeks old (M. Schroeder).

den where we put him after capture (BFCWG).

Fig.15: The muscular *Rodeo* leaving the aardvark

Report on surveying and monitoring Black-footed cats on Benfontein NR, South Africa and Grünau Farms in Namibia / 2022 Sliwa et al. 2023 November 2022: Grünau (GR), Namibia - Fieldwork



Fig. 16: Team with Lace (self-release).

Fig. 17: Martina, Michelle, and Shipala covering *Hom* in the net (A. Sliwa).

Fig. 18: Alex collars *Xam* (B. Wilson Hartmann).

Fig. 19: Nama's kitten with her in the crate (B.Wilson Hartmann).

Fig. 20: Beryl with *Tima* (A. Sliwa).



Fig. 21a/b: *Zola*'s capture: Alex pushing her gently and fleas in her ear (B. Wilson Hartmann)

Fig. 22: Martina with *Prima* and the new field vehicle – a Mitsubishi Triton – with sponsors' logos (A. Sliwa)

Fig. 23: *Prima* ready for weighing (B. Wilson Hartmann).

Fig. 24: Michelle and *Lyka* scat searching (M. Küsters).



Fig. 25: *Prima's* kittens, younger than 10 days (A. Sliwa)

Fig. 26: The beautiful *Nama* at her den in July (CT set by S. Ndele – BFC-RPN)

Fig. 27: Nama + 2 kittens 25.10. (CT set by S.Fig. 28 Lace with kittens 15.10.22 (CT set by
S. Ndele – BFC-RPN)Ndele – BFC-RPN)S. Ndele – BFC-RPN)



Fig. 29: *Xam* leaving his den in the evening 13.11.23(CT by S. Ndele – BFC-RPN).

Fig. 30: *Zola* with single kitten on 8.6.22 (CT by S. Ndele – BFC-RPN) Fig. 31: *Zola* with her grown kitten on 21.7.22 (CT set by S. Ndele – BFC-RPN)

Fig. 32: *Tima* with four kittens on 18.11.22, estimated at 6-8 weeks of age (CT S. Ndele – BFC-RPN).

Table 1: Body measurements (cm), range size (km²) and remarks on 6 black-footed cats captured in November 2022 and 3 additionally tracked for part of 2022 on Benfontein Nature Reserve (BFN), South Africa. Shaded animal columns indicate individuals that died in 2022.

Capture Date	4.11.22	5.11.22	8.11.22	8.11.22	9.11.22	9.11.22	-	-	-
Name (also on Map)	Rodeo	Shongo	Kazi	Atty	Ember	Gale	Durga	Hamba	Putter
No. captured	Cat 1 22	Cat 2 2	Cat 3 22	Cat 4 22	Cat 5 22	Cat 6 22	Cat 11 21	Cat 12 21	Cat 9 21
Sex	М	М	F	F	F	F	F	М	М
Age (judged by teeth)	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Microchip #.	9450000018 08150	992003000013 0398	9450000018 08148	945000001808 149	945000001808 147	945000001808 146	945000001951 981	276095610401 684	945000001951 984
Mass (kg)	1.85	1.66	1.54	1.51	1.24	1.48			
Ear (cm)	5.2	4.9	5.1	4.9	4.9	4.8			
Shoulder (cm)	26	25	25	24	23	25			
Total Length (cm)	60	60	58	59	55.5	57			
Hind foot (cm)	9.5	8.9	9.4	8.8	8.3	8.9			
Front foot (cm) (L x W)	2.1 x 1.8	2.1 x 1.8	2.1 x 1.8	2.1 x 1.7	2.1 x 1.7	2.0 x 1.8			
Tail (cm)	17	17	18	17	16	16			
Neck (cm)	13	12.5	12	11	11	11.5			
Canine UR (cm)	1.00	1.02	0.93	0.89	0.62	0.91			
Canine LR (cm)	0.94	0.85	0.81	0.72	0.69	0.69			
Canine UL (cm)	1.05	0.95	0.97	0.85	0.79	0.89			
Canine LL (cm)	0.97	0.80	0.82	0.72	0.72	0.70			
Testes (cm) / condition of nipples	Normal	Good size	nipples used	plucked, had an older kitten	plucked nipples	well-used nipples, not recently			
No. fixes collected in 2022	88	94	257	66	127	98	98	41	81
Range (100MCP) 2022 (km ²)	18.03	6.59	6.44	3.21	6.13	4.35	3.80	8.98	9.46

Total fixes collected in 2022 for 9 BFN = 950

Remarks:

1) Rodeo (Cat 1 22): adult male, lean and muscular, healthy, some tartar on carnassials, moving about a lot.

2) Shongo (Cat 2 22): adult male, smaller than Rodeo, very shy; moved off BFN as a reaction, but then returned a week later.

3) Kazi (Cat 3 22): adult female; large & good condition, gravid with 2 foetuses estimated ~ due in 4 weeks, nipples well used. Well worn (pink) toe pads; monitored her now over 4 years

4) Atty (Cat 4 22): adult female; central BFN, very pale, later found to have a grown kitten. Found dead on 21.12.23, likely due to jackal predation. DEAD.

5) Ember (Cat 5 22): adult female, captured close to pan in NE; ran with "fiery" energy; upper right canine fractured tip; lots of ticks; pregnant with 2 small kittens (early).

6) Gale (Cat 6 22): adult female, captured in W of BFN, close to Kazi's HR; covered in fleas; condition, nipples have been used in past, but not recently.

7) Durga (Cat 11 21): adult female, collared first in March 2020; several litters, found dead on 24.6.22 a few days after a wet, cold winter storm. Amyloidosis confirmed in necropsy DEAD.

8) Hamba (Cat 1 18): adult male, collared as subadult in October-2018. Re-collared many times, resident and sired various litters. Found dead 6.5.22. Lungworms were confirmed and proximity of carcass close to water suggest renal failure – likely amyloidosis, but carcass was too rotten for necropsy confirmation. DEAD.

9) Putter (Cat 8 20): adult male, caught as adult in March 2020; resident, likely sired litters. Found dead on 17.6.22. Postmortem revealed signs of kidney failure and high levels of amyloids (amyloidosis) **DEAD**.

Table 2: Body measurements (cm), range size (km ²) and remarks on 14 black-footed cats captured and/or tracked in 2022 on Grünau F	⁻ arms (GR), Namibia	. Shaded anima
column indicate individual that died in 2022.	· · ·	

Capture Date	11.11.22	12.11.22	12.11.22	13.11.22	13.11.22	14.11.22	14.11.22	14.11.22	15.11.22	15.11.22	15.11.22	15.11.22	16.11.22	
Name (also on Map)	Hom	Zola	Xam	Lace	Juv. 3	Nama	Nama's Kit	Obub	Sasa	Prima	Tima	Juv. 4	Kara	Auas
No. captured	Cat 7 22	Cat 8 22	Cat 9 22	Cat 10 22	Cat 11 22	Cat 12 22	Cat 13 22	Cat 14 22	Cat 15 22	Cat 16 22	Cat 17 22	Cat 18 22	Cat 19 22	
Sex	М	F	М	F	F	F	F	М	М	F	F	F	F	F
Age (judged by teeth)	Adult	Adult	subAd	Adult	Juvenile	Adult	Kitten	Adult	Adult	Adult	Adult	Juvenile	Adult	Adult
Microchip #.	953010004663 341	992003000078 774	953010004663 369	953010004073 717	953010004663 325	992003000078 777	953010004663322	953010004663 360	953010004663 331	953010004073 751	992003000078 778	992003000078 770	953010004073 718	
Mass (kg)	1.65	1.57	1.30	1.44	~0.75	1.16	~0.40	1.62	1.55	1.18	1.33	1.02	1.18	
Ear (cm)	5.4	4.8	4.7	5.1		5.1		5.0	4.8	4.8	5.1		5.3	
Shoulder (cm)	27	26	25	24		24		27	26	23	24		23	
Total Length (cm)	60	59	57	55		57		61	60	53	59		56	
Hind foot (cm)	9.4	8.85	9.1	8.6		8.7		9.5	9.2	8.1	8.5		8.1	
Front foot (cm) (L x W)	2.0 x 1.9	2.0 x 1.8	1.8 x 1.1	1.9 x 1.7-		1.9 x 1.5		2.2 x 1.8	2.1 x 1.8	1.9 x 1.7	1.9 x 1.7		1.9 x 1.6	
Tail (cm)	17.5	17	17	15.5		16		18	17	16	17		16	
Neck (cm)	12	11	11	11		10.5		12.5	12	10	10		10	
Canine UR (cm)	1.00	0.89	0.77	0.80		0.95		1.07	0.86	0.81	0.88		0.73	
Canine LR (cm)	0.85	0.74	0.70	0.62		0.72		0.90	0.76	0.67	0.68		0.60	
Canine UL (cm)	0.95	0.90	0.80	0.82		0.85		1.08	0.85	0.83	0.84		0.66	
Canine LL (cm)	0.78	0.73	0.74	0.67		0.57		0.87	0.74	0.72	0.63		0.58	
Testes (cm) / condition of nipples	1.5 x 1.0	gravid, used nipples	1.2 x 0.8	lactating		Lactating, one kitten (400g)		Fully developed	developed	2 small kittens ~10 days	Up to recently used		Not lactating	
No. fixes collected in 2022	37	137	37	163	-	162	-	28	38	194 (32+162)	28		189	135
Range (100MCP) 2022 (km ²)	7.1	4.7	3.2	5.1	-	8.9	-	18.8	2.5	3.3 + 6.0	2.1		9.4	6.9

Total fixes collected in 2022 for 11 Namibian Cats, n = 1148

Remarks:

10) Hom (Cat 7 22): adult male, many fleas and ticks, thin, slightly dehydrated. Ran into donga

11) Zola (Cat 8 22): adult female, good condition, gravid ~ due in 3 weeks; many fleas, particularly in ears. Died in early 2023. Unknown cause of death. DEAD.

12) Xam (Cat 9 22): subadult male, est. 8-10 months; in good condition. Some mites in the ears. Found dead on 15.3.23, was weak and limping the night before. DEAD.

13) Lace (Cat 10 22): adult female, good condition, fleas in ears, lactating, worn foot pads.

14) Juv 3 (Cat 11 22): juvenile female, younger than 5 months, pink nose, seemed to have only milk dentition. Sampled, but not anaesthetised and radio-collared.

15) Nama (Cat 12 22): adult female, thin and dehydrated, was with a larger kitten (also sampled). Lactating. Many large ticks

16) Nama's Kitten (Cat 13 22): kitten of about 400g, 6-8 weeks as mother Nama still has milk. Sampled, but not anaesthetised and radio-collared.

17) Obub (Cat 14 22): adult male with big head, older cat, upper left canine slightly blunted, tartar on carnassials, in former Auas HR.

18) Sasa (Cat 15 22): young adult male, good looking, clever since tried to evade through Driedoring thicket and dongas.

19) Prima (Cat 16 22): adult female; good condition with currently two ~10 day-old kittens (we didn't touch), put her back with kittens 40 minutes after injection.

20) Tima (Cat 17 22): adult female, lean but good condition; in very long grass area. Had an incredible 4 kittens 6-8 weeks at capture, confirmed by camera trap on 18.11.!

21) Juv. 4 (Cat 18 22): juvenile female (5-6 months old); just over 1 kg, weighed and sampled in net, but not radio-collared.

22) Kara (Cat 19 22): adult female; good condition, not lactating, very few parasites.

23) Auas (Cat): adult female; older when captured in March 2020; shifted her range repeatedly. Found dead on 8.10.22; probably predated and half eaten by canid (jackal or fox). DEAD.