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LARGE MAMMAL CENSUS OF PALABORWA COPPER MINING COMPANY AND NEIGHBOURING LAND, OCTOBER 2017

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SUMMARY

- An aerial game count was conducted in September 2017 using the same method as in the previous two years.
- Across the entire PMC area, Cleveland and the neighbouring part of the Kruger National Park, large decreases in the local populations of Buffalo and Hippo are clear. This is consistent with drought-induced mortality reported throughout the region.
- The larger browsing species, Elephant and Giraffe, showed strong increases which can be partly attributed to sampling error, but may also reflect an influx of these species into the area in response to the drought.
- While game count data is not yet sufficient to demonstrate clustering of any species, data combined for the past three years do provide some indication that Buffalo and Waterbuck have a preference for feeding on the Rock Dump and in the Operational Area. Their densities in these areas are greater than in natural areas, at least by the end of the dry season.
- Elephant do not avoid the Operational Area, and have similar densities in this area as along riparian areas in the adjacent conservation areas.
- Herbivore numbers in Pompey remain relatively low and stable, and a few more of the less common species have disappeared from the area. There do not appear to have been any negative impacts of the drought on the remaining populations.

INTRODUCTION

A helicopter count of large mammals was conducted on all PMC lands, as well as an adjacent strip of the Kruger National Park at the end of the dry season in 2017. This was a repeat of surveys conducted in 2015 and 2016, at a similar time of year and using the same method. The purpose was to monitor changes in the size of herbivore populations utilizing the area, to compare herbivore densities to a natural area within the Kruger National Park, and to gain insight into herbivore movements across the area.

METHODS

The count was conducted by Sunrise Aviation using a Bell Jetranger helicopter, with three observers (the ARC team led by Mike Peel) and a pilot (Mike Pingo). Doors were removed to improve visibility for the observers. The area counted contains six land management units:

1. The Operational Areas of PMC, including the intact vegetation around Loole Creek, and adjacent to the Vermiculite Pit and Return Water Dam.
2. The Rock Dump (Dump 4).
3. The Tailings Complex.
4. Cleveland (including Vereeniging).
5. A neighbouring part of the Kruger National Park (KNP), adjacent to Cleveland and incorporating the same habitats.
6. The fenced portion of Pompey.

Adjacent transects were flown over these areas on the 28th September 2017, using continuous strips, at an altitude of 40m and a speed of 40 knots per hour (~ 70 km/h). Counting bars were attached to each side of the helicopter to aid in delineating strips of 300-500m width. Animal sighting data (location, species, number, and gender where possible) were captured directly onto a GPS-enabled

laptop using CAPTURE software. Crocodile and Hippo seen within the Olifants and Selati Rivers, where these flow through or alongside the focus area, were included.

The first three sections above were flown between 8am and 1:30pm, and the Pompey section between 2pm and 4pm. The weather on the day was overcast and cool. Almost all trees had no leaves at the time of the counting, and grass cover was very sparse. The counting team reported that visibility was very good.

RESULTS AND DISCUSSION

Table 1 provides totals per species according to each of the major land management units, while Table 2 gives densities (i.e. numbers divided by land unit areas, estimated from Google Earth).

Table 1. Numbers of animals recorded for the five land management units around PMC mine, and the fenced portion of the Pompey property. 28th September 2017.

Species	Cleveland	KNP	PMC Operational	Rock Dump	Tailings	Pompey
Baboon Troops	2	0	5	0	0	0
Blue Wildebeest	0	14	0	0	11	0
Buffalo	24	0	41	6	0	13
Bushbuck	4	0	11	0	0	0
Crocodile	24	3	9	0	1	0
Duiker	0	7	1	0	0	10
Elephant	17	45	47	3	0	0
Giraffe	11	1	16	2	0	1
Hippo	21	24	6	0	0	1
Impala	367	392	553	25	26	36
Klipspringer	3	0	0	0	0	3
Kudu	36	29	48	0	2	2
Leopard	0	0	0	0	0	0
Sharpe's Grysbuck	0	2	0	0	0	0
Steenbuck	1	2	0	0	0	6
Warthog	10	4	27	5	0	2
Waterbuck	37	7	45	28	3	0
Zebra	7	5	3	3	0	0

Table 2. Density of animals (per km^2) recorded for the five land management units around PMC mine, and the fenced portion of the Pompey property. 28th September 2017.

Species	Cleveland	KNP	PMC Operational	Rock Dump	Tailings	Pompey
Baboon Troops	0.09	0.00	0.18	0.00	0.00	0.00
Blue Wildebeest	0.00	0.47	0.00	0.00	1.33	0.00
Buffalo	1.12	0.00	1.47	1.42	0.00	1.17
Bushbuck	0.19	0.00	0.39	0.00	0.00	0.00
Crocodile	1.12	0.10	0.32	0.00	0.12	0.00
Duiker	0.00	0.23	0.04	0.00	0.00	0.90
Elephant	0.79	1.50	1.68	0.71	0.00	0.00
Giraffe	0.51	0.03	0.57	0.47	0.00	0.09
Hippo	0.98	0.80	0.21	0.00	0.00	0.09
Impala	17.2	13.0	19.8	5.93	3.14	3.24
Klipspringer	0.14	0.00	0.00	0.00	0.00	0.27
Kudu	1.68	0.96	1.72	0.00	0.24	0.18
Leopard	0.00	0.00	0.00	0.00	0.00	0.00
Sharpe's Grysbuck	0.00	0.07	0.00	0.00	0.00	0.00
Steenbuck	0.05	0.07	0.00	0.00	0.00	0.54
Warthog	0.47	0.13	0.97	1.19	0.00	0.18
Waterbuck	1.73	0.23	1.61	6.64	0.36	0.00
Zebra	0.33	0.17	0.11	0.71	0.00	0.00

PMC focus area

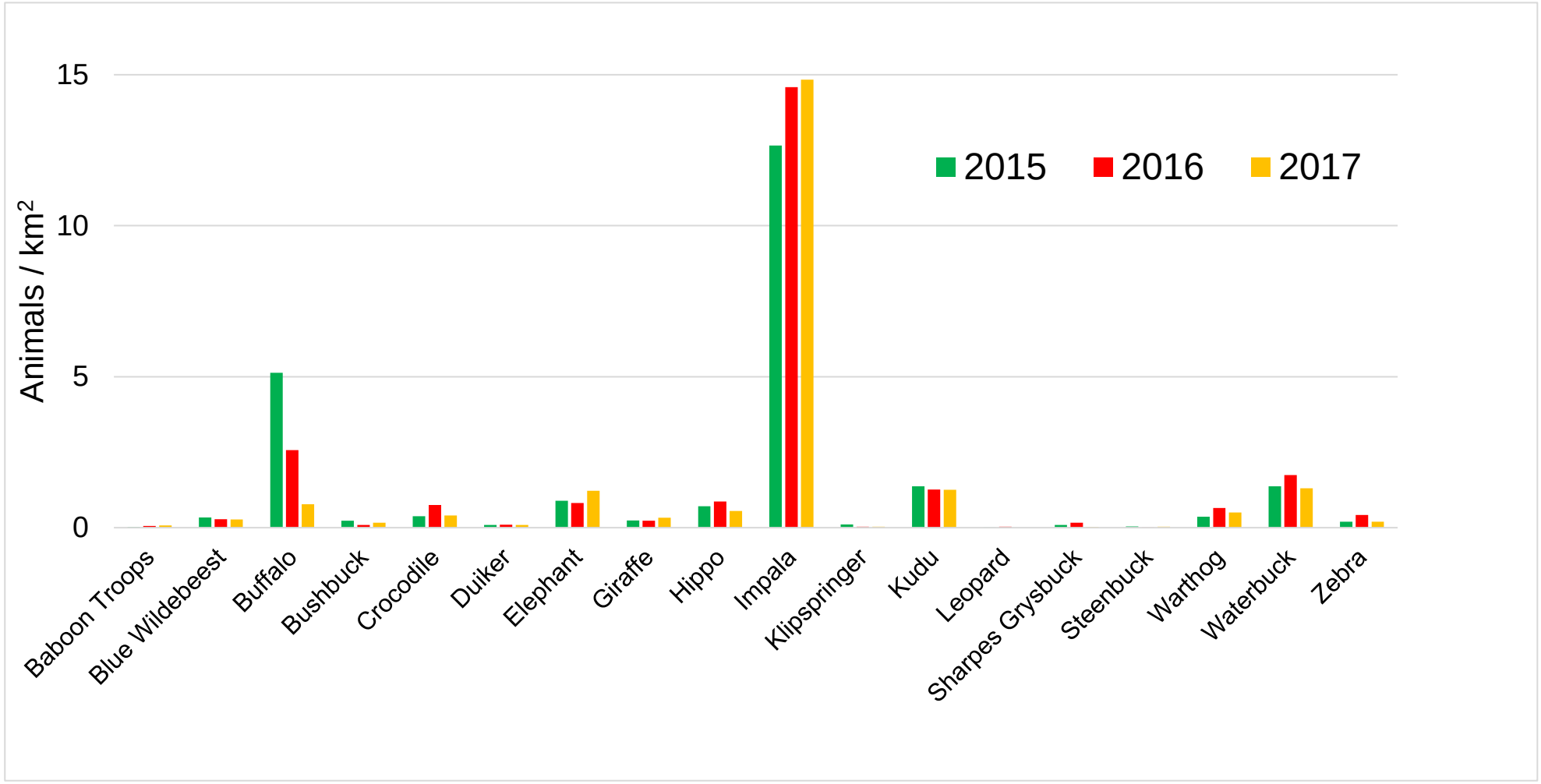
Changes over time

In comparison to the previous count, the numbers of most species have declined across the PMC focus area (Fig 1). There was an 11% decrease in the total number of animals counted compared to 2016, but decreases were substantially larger for three of the most common species: 70% for Buffalo, 36% for Hippo and 25% for Waterbuck. For buffalo, this decrease was even greater than the 50% decrease for 2016 versus 2015. While these figures may not be a precise estimate of change, two years of large decreases can be considered as reliable evidence of a substantial decline in the local Buffalo population. This was most likely due to extensive mortality and reduced birth rates of Buffalo caused by the 2014-2016 drought, although the small off-take of Buffalo from Cleveland would have also contributed. It is also possible that many Buffalo moved out of the area permanently, in search of better grazing, and similar large-scale movements appear to have occurred in parts of KNP where the drought was most severe. The large decline in Hippo was in contrast to a large increase in the previous year (23%) which may indicate that the reduced forage only began to impact this species after 2 years of below average rainfall. In constrast with the large-bodied grazers, the megaherbivore browsers apparently increased dramatically from 2016 to 2017, with Elephant numbers up by 49% and Giraffe by 43%. This contrasts with moderate declines recorded over the previous year (of 9% and 5% respectively). Impala and Kudu, which are less mobile species, showed far less change (2% increase and 1% decrease respectively). The two-year trend for these species suggest that previous growth of the local Impala population has been halted by the drought, while Kudu have suffered a slight decline (Fig 1).

The dramatic declines in abundance of the larger grazer species (buffalo and hippo) are consistent with declines recently reported for KNP and adjacent private reserves, although these were not as severe for buffalo as observed here. Likewise, limited change, or even increases, for browser species

(including elephant) has also been reported in KNP for the 2016 and 2017 game counts there. Therefore while the overall two-year trend in herbivore populations in the PMC focus area was similar to that for the greater region, the numbers reported here appear to be an exaggeration of actual changes in local population size for the larger species. Such exaggeration is to be expected when counting animals for only one day per year, in an area that they can potentially move into and out of on a daily time scale. Buffalo and Elephant herds regularly observed to cross the Olifants and Selati River, and move into adjacent game reserves. Hippo can move freely between Cleveland and Hans Merensky, or out of the study area along the Olifants River. It is also possible that there has been a more permanent exodus of Buffalo and Hippo from the focus area, in response to a lack of forage. Grass biomass was very low by the end of the 2017 dry season, particularly on Cleveland the Operational Area and the dumps, and these species may have moved off in search of better grazing.

Figure 1. The density of all species recorded in the aerial game counts of 2015, 2016 and 2017 in the PMC Operational Area and dumps, Cleveland and the neighbouring part of the KNP.



Spatial patterns

The effects of the PMC operations on the quality or quantity of forage has the potential to attract herbivores into the Operational Area of PMC, which could lead to hazardous encounters with PMC staff and overgrazing of sensitive rehabilitation areas (particularly the slopes of the Tailings Complex). Similarly, overgrazing of Cleveland, caused by fencing and water-provision, could be driving herbivores in the area to seek better forage in the Operational Area in the dry season. Regular game counts conducted throughout the year would be required for conclusively evidence of such clustering, and a single count conducted once a year is too unreliable for this. This is evident from the large changes in the location of the sightings from year to year (Fig 2). However, averaging three years of single count data does allow at least allow for a crude test of any such clustering (Fig 3). Such differences between land use were only statistically significant (at $p = 0.05$ using a one-way ANOVA per species) in the case of Impala and Kudu avoiding the dumps, and Waterbuck favouring the Rock Dump. For Impala and Waterbuck, this is a result of these species congregating along rivers, including Loole Creek and the Return Water Dam (Fig 2). There was also a trend of buffalo utilizing the Rock Dump and Operational Area more than the other land units. Elephants utilized the Operational Area as much as the conservation areas, indicating both a lack of fear of human activities in the Operational Area, and the attractiveness of forage in that area. A PhD study by Fiona Sach that is currently underway is investigating whether nutrient concentrations in plants and water could explain the regular movement of Elephant into this area.

Finally, spatial distributions may have changed over the past few years, in response to the drought. The massive increase in Elephant and Giraffe numbers could be an indication of a recent influx of animals to feed on the trees along Loole Creek, the Return Water Dam and the Rock Dump, which tend to hold green leaves longer in the dry season than those in Cleveland and KNP. However, the spatial distribution of Elephant on the day of counting does not support this, as there were sightings throughout the study area, and these were actually less clustered in these areas than in previous years (Fig 2). In 2016, 76% of the Elephant counted were on the Tailings Complex or within the Operational Area, while in 2017 only 42% were in these areas. There did however appear to be a small increase in the clustering of Buffalo into areas where forage greenness persists longer into the dry season (along Loole Creek and on the Rock Dump), with 66% of all Buffalo recorded in the Operational Area or on the Rock Dump in 2017, compared to 49% in 2016.

Figure 2. Locations of sightings of the five most abundant species recorded during the count of 2015 (green dots), 2016 (red dots) and 2017 (orange dots), for the five most common herbivore species in the PMC Operational Area and dumps, Cleveland and a neighbouring part of the KNP. The size of the dots is proportional to the number of animals recorded per sighting.

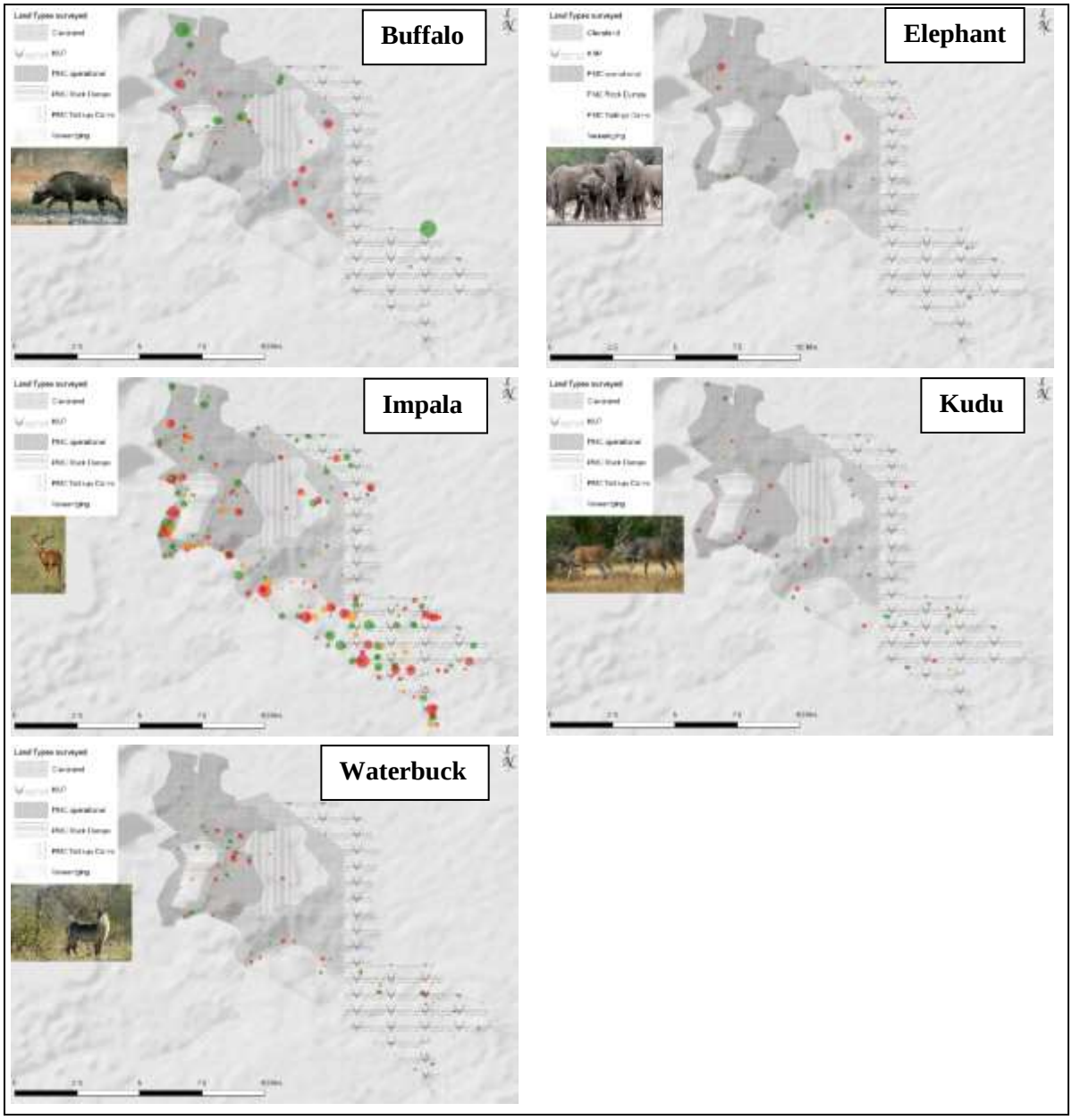
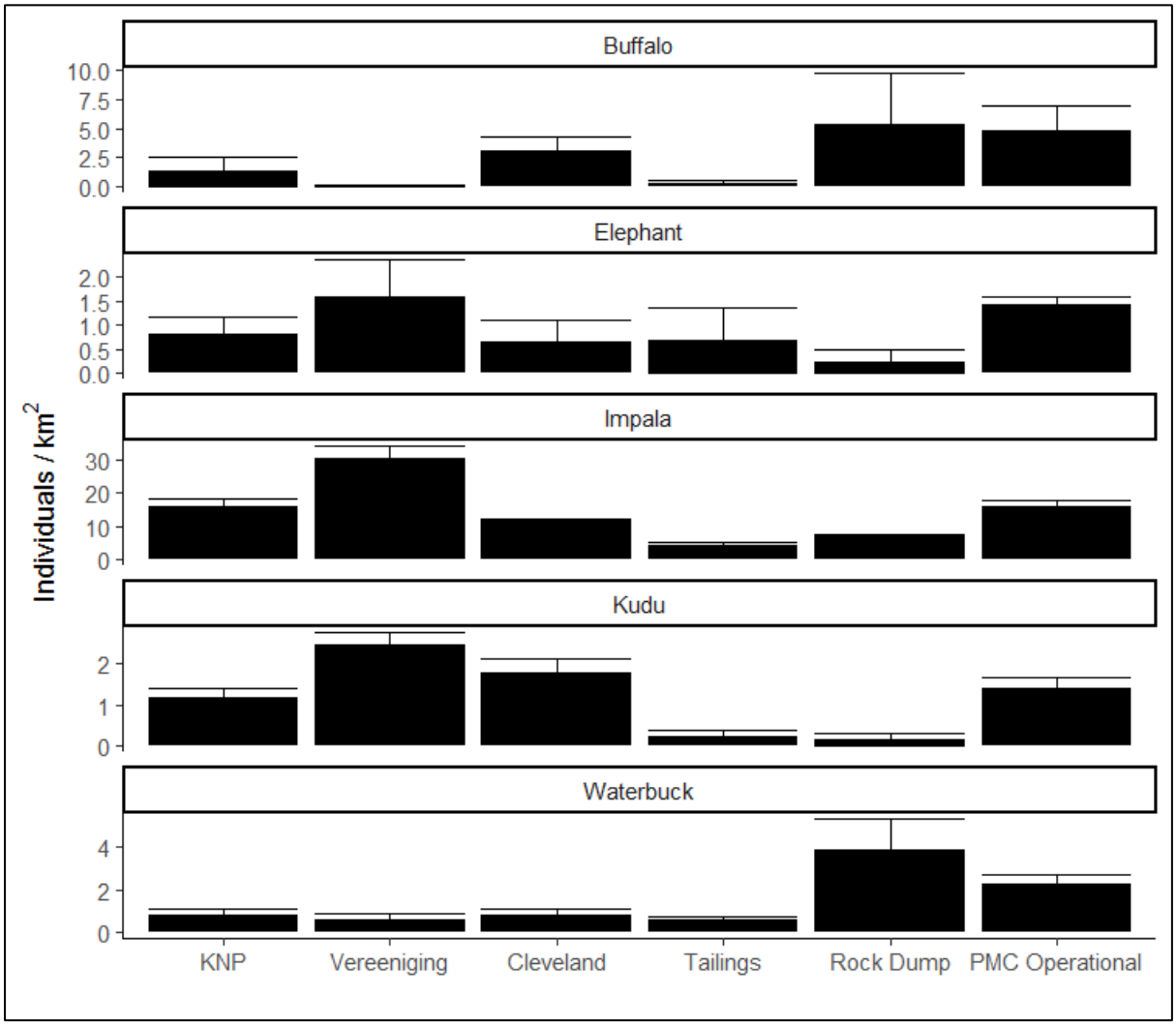


Figure 3. The mean density of the five most common species, per land unit within the PMC focus area, averaged for the game counts of 2015, 2016 and 2017. Error bars show 1 standard error.



Pompey

Herbivore numbers within Pompey have remained fairly stable over the past year (Fig 4), in contrast to large declines found between 2015 and 2016, and in contrast to the trends in the PMC area. As Pompey remains fenced, changes can be interpreted with far more confidence than those for the PMC area. The relative stability of the past year suggests less poaching that in previous years. It also indicates adequate forage availability despite the drought, which is a result of low herbivore densities over the past few years. For all species, densities have been lower than in the Cleveland, Vereeniging and the adjacent part of KNP over the past 3 years, although Buffalo numbers are now similar to the current density in those areas.

The herbivore community in Pompey continues to be dominated by Impala, which showed only a minor decrease from 2016 to 2017. Warthog and Kudu continue to decline, perhaps indicating that some snaring is still taking place. Waterbuck now appear to be absent, and only a single Giraffe and Hippo remain (Table 1). The few elephant recorded in 2016 have presumably returned to Letaba Ranch. Buffalo were the only species to increase substantially, which would have been a result of translocation from Cleveland.

These results indicate that there is no need to remove any species from Pompey despite the drought, and suggest that the vegetation of Pompey could support more herbivores, particularly browsers.

Figure 4. The density of all species recorded in the aerial game counts of 2015, 2016 and 2017 in Pomepy. Data for 2007 are from an ARC report.