The Namibian Elephant and Giraffe Trust

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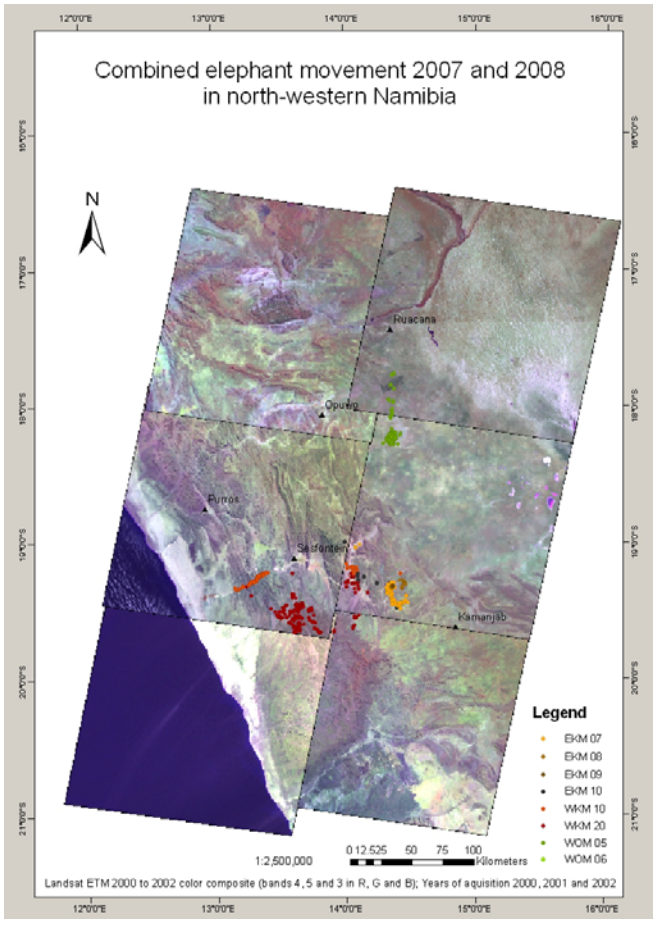
Annual Report 2008

For the

International Elephant Foundation

(January 2008 – December 2008)



January 2009

1.0 SUMMARY

Between 23rd-28th October 2007, eight elephants were collared in the western Hoanib River (2 elephants), Hobatere Game Reserve (4 elephants) and Omusati regions (2 elephants) with GPS collars provided by Data Scout (SA). Three other elephants were de-collared (these elephants had been collared in previous collaring exercises). As of April 2008 all of the new collars had failed. This was because of either the removal of the collars by the elephants or the failure of the collars due to a poor batch of batteries having been provided by the manufacturer to Data Scout. Data Scout has undertaken to provide an additional 8 collars to the project free of charge to compensate for the lack of durability in the current collars. They have also undertaken to part-fund the next collaring to reduce the cost to the Namibian Elephant and Giraffe Trust (NEGT).

Behavioural studies have continued and the heavy rainfall during the 2008 wet season has resulted in a change in feeding behaviour from mostly browsing during "normal" years to mostly grazing during the current year. It is too early to tell whether the increase in the abundance of vegetation will have any effect on the elephants' reproductive potential.

2. GENERAL INFORMATION

(A) **PROJECT TITLE**: Home Range, Movement And Monitoring Of Elephants In The Kunene And Omusati Regions Of Namibia.

(B) **SUMMARY LINE**: The project investigates the seasonal movement, seasonal distribution, behaviour, genetics and social interactions of the elephants in the Kunene and Omusati Regions of Namibia.

(C) **PROJECT LEADER:** Dr. Keith Leggett (elephant researcher)

(D) **OTHER STAFF**: Mr. Mike Godfrey, Ms. Elizabeth Weir

(E) **COLLABORATORS AND OTHER INSTITUTIONAL AFFILIATIONS**:

COLLABORATORS:	Dr. Julian Fennessy Ms. Claudia Heinze Dr. Ursula Bechert (University of Oregon) Dr. Rob Ramey (Independent Researcher) Dr. Laura Brown (Independent Researcher) Dr. Yirmed Dimeke (Ethiopian Elephant Foundation) Dr. Iain Douglas-Hamilton (Save the Elephant, Kenya)
INSTITUTIONAL AFFILIATIONS:	Earthwatch Institute University of Sydney Save the Elephants Wilderness Wildlife Trust Denver Zoo International Elephant Foundation Wildlife Conservation Society

(F) ACTIVITIES/PROGRESS IN THE LAST 12 MONTHS:

- 9 field trips
- Attended 1 community meeting
- Attended 2 meetings with Ministry of Environment and Tourism (MET) on elephant related issues
- 5 expeditions with Earthwatch Institute volunteers
- Involvement of community game guards in various aspects of the research, e.g., monitoring
- Assistance to other researchers (Dr. Rob Ramey, Dr. Laura Brown, Dr. Yirmed Dimeke)

(G) EXPLORATORY ACTIVITIES:

- Possible testosterone and oestrogen studies with Dr. Ursula Bechert (University of Oregon) on elephants.
- Genetic research on the elephant populations in conjunction with Dr. Rob Ramey and Dr. Laura Brown (Independent Researchers, Denver, USA) has commenced and preliminary results are available.
- The NEGT has recently been approached by the MET to undertake research on "problem elephants" within the research area. Funding is currently being sourced for this project.

(I) PROBLEMS AND CONSTRAINTS:

- The vehicles used by the project are old and require constant and expensive maintenance.
- The 2008 wet season was the best wet season on record for almost 70 years with substantial rainfall across the research area. The long-term average rainfall in the research area is 50-100mm. This year approximately 350mm fell across the region. This severely restricted research activities for 4 months because of the difficulty in accessing the research area.

3. CURRENT PROJECT STATUS

ACTIVITIES AND ACHIEVEMENT OF OBJECTIVES:

3.1. Quantify the movements, range and seasonal distribution of elephants in the Kunene and Omusati/northwestern Etosha areas of Namibia.

Research Questions:

(1) Does the seasonal and home range of male elephant vary annually?
(2) How large is the home range of male desert-dwelling elephants?
(3) Is there a genetic bottleneck with regards to the desert-dwelling elephants?

Method:

In October 2007, eight elephants were GPS collared in the western Hoanib River, the Hobatere Game Reserve and the western Omusati Region. This collaring was paid for by USFWS, the International Elephant Foundation and private donors. The GPS collars used were produced by Data Scout (SA). Two of the collars were either removed by the elephants (WOM-6) or failed for unknown reasons (EKM-09) very shortly after the collaring. With the exception of the elephants in the western Hoanib River, the GPS collared elephants' movements during the hot dry season were restricted to areas around the permanent water sources. The range of all eastern Hoanib River GPS collared elephants was further restricted to areas either immediately around or inside Hobatere Game Reserve and Kaross Game Park. The elephants in the Omustati region had a range restricted to areas around the permanent water sources.

The movements of the GPS collared elephants until the expiry of the collars are described in detail in the following section. The home range of the elephants was determined by minimum convex polygon (MCP) analysis. It is recognised that this is not the best way to determine the home range but, while Kernel Analysis would have probably been a more useful tool, the data were so limited in many cases as to make this type of analysis ineffective.

The geopolitical and infrastructural developments in the Kunene and Omusati Regions are presented in Figure 1.

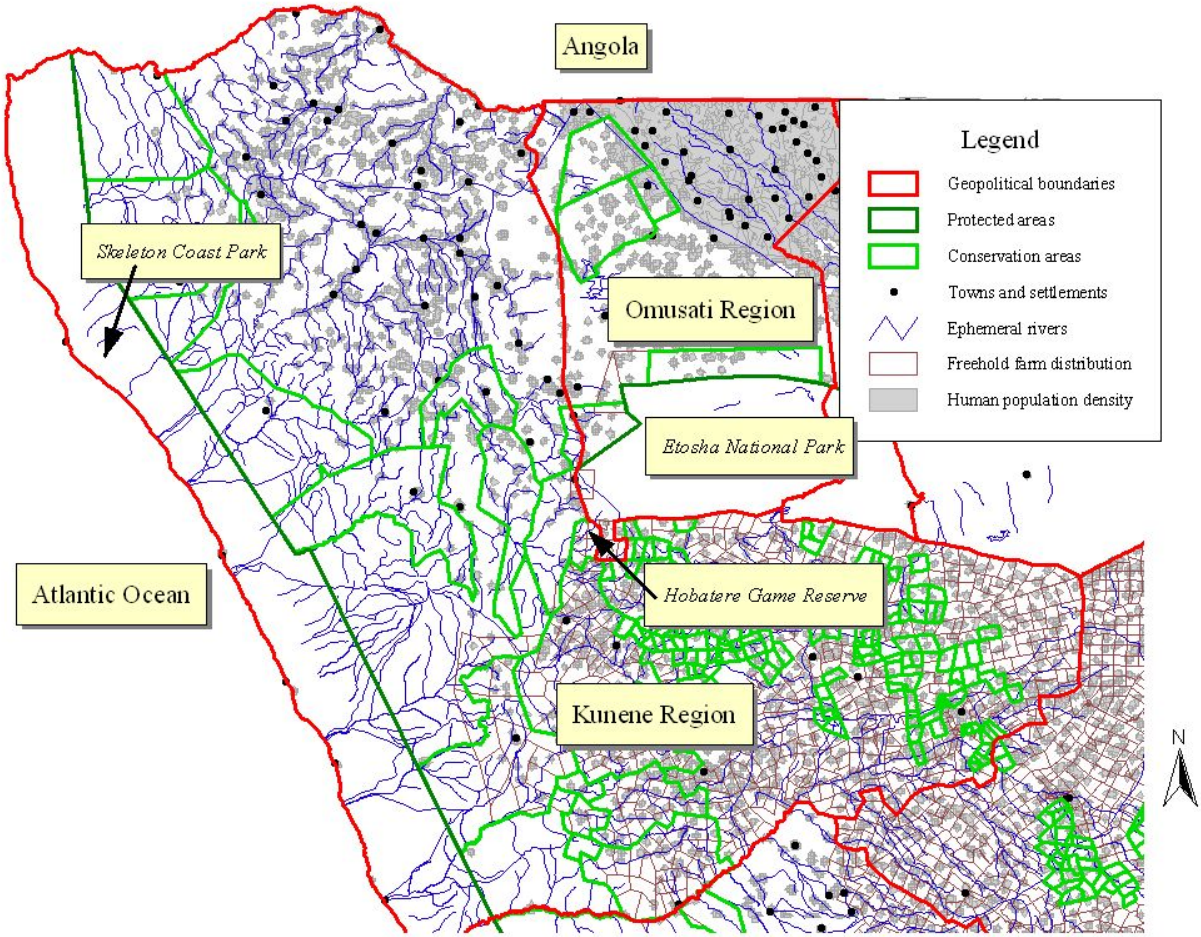


Figure 1: Geopolitical boundaries and infrastural developments in the Kunene and Omusati Regions, northwest Namibia

4. Results

4.1. Eastern Kunene Elephants

Eastern Kunene Male (EKM) -07

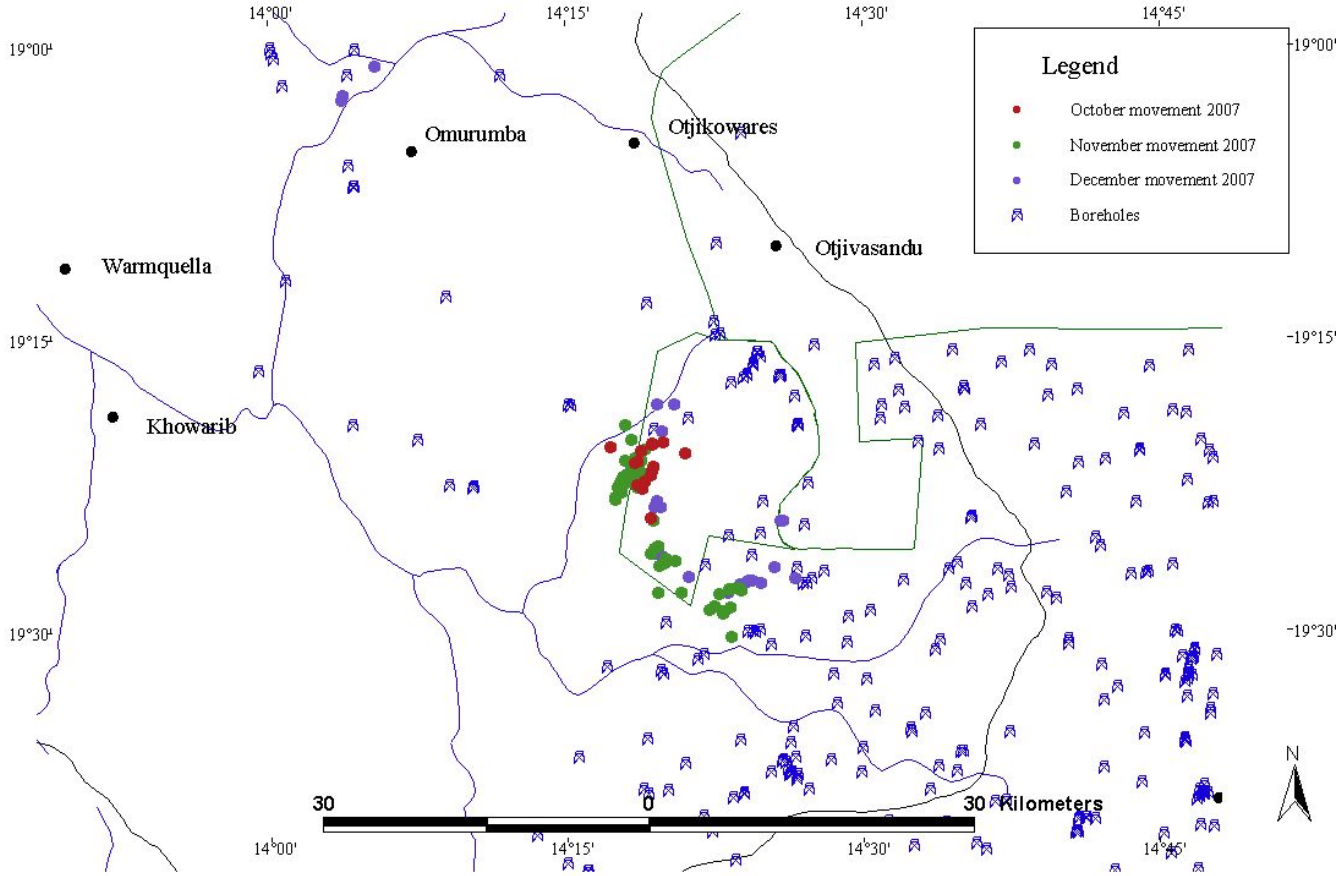


Figure 2: Movement of EKM-07 during the hot dry season in the Kunene Region, northwest Namibia 2007.

This is the first time that this elephant has been collared. EKM-07 is a mature male. After collaring, EKM-07 spent his time in and around the southern border of Hobatere Game Reserve. His daily movement and home range during the hot dry season were relatively small (see Table 1 for details). This compressed home range during the hot dry season around known water points and safe from disturbance is typical of elephants in this area.

Eastern Kunene Male (EKM) -08

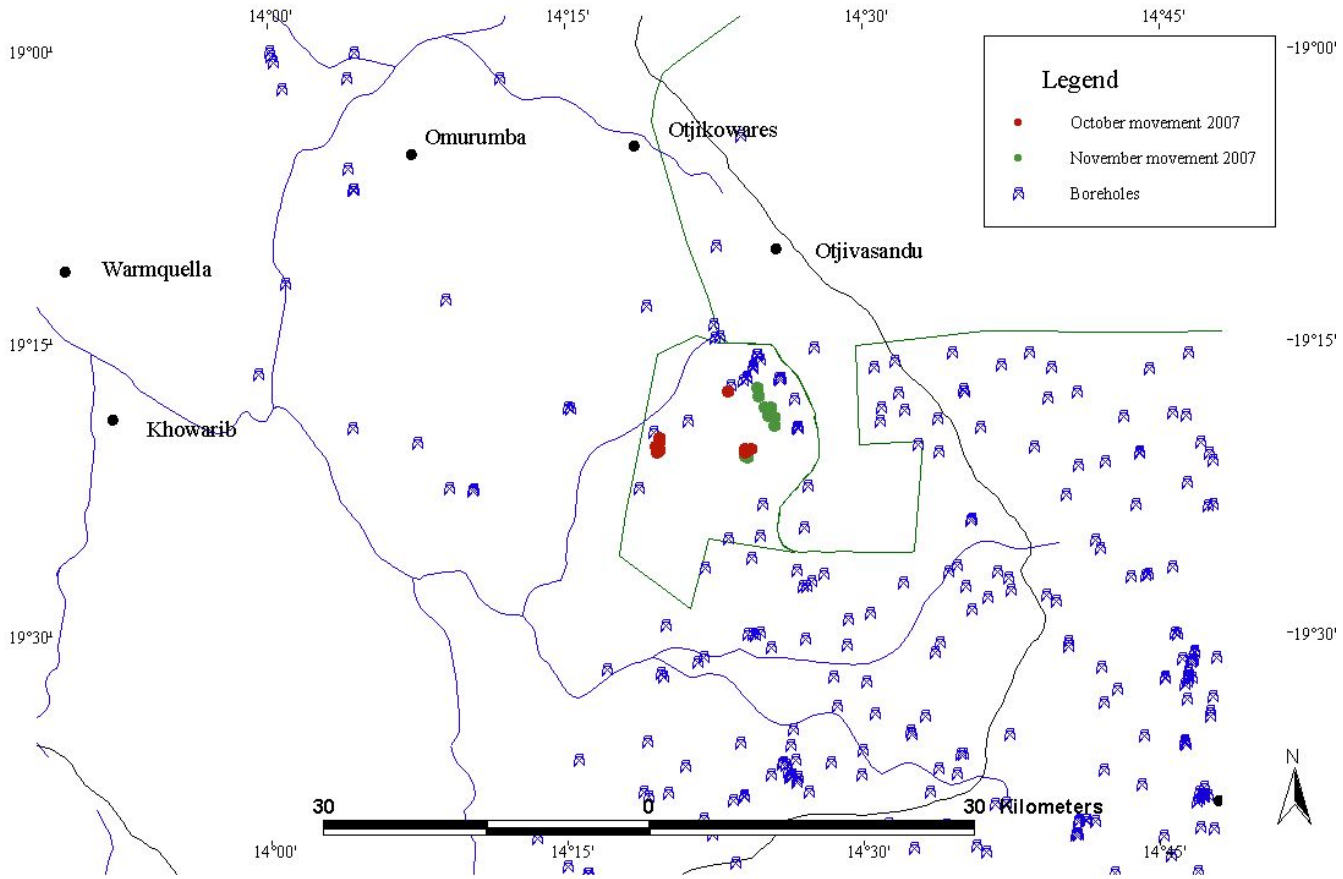


Figure 3: Movement of EKM-08 during the hot dry season in the Kunene Region, northwest Namibia 2007.

Until his collar failed in late November, EKM-08 spent his hot dry season in and around Hobatere Game Reserve. His home range and daily movements were relatively small (see Table 1 for details). Unfortunately, his collar failed before any wet season data could be obtained.

Eastern Kunene Male (EKM) -09

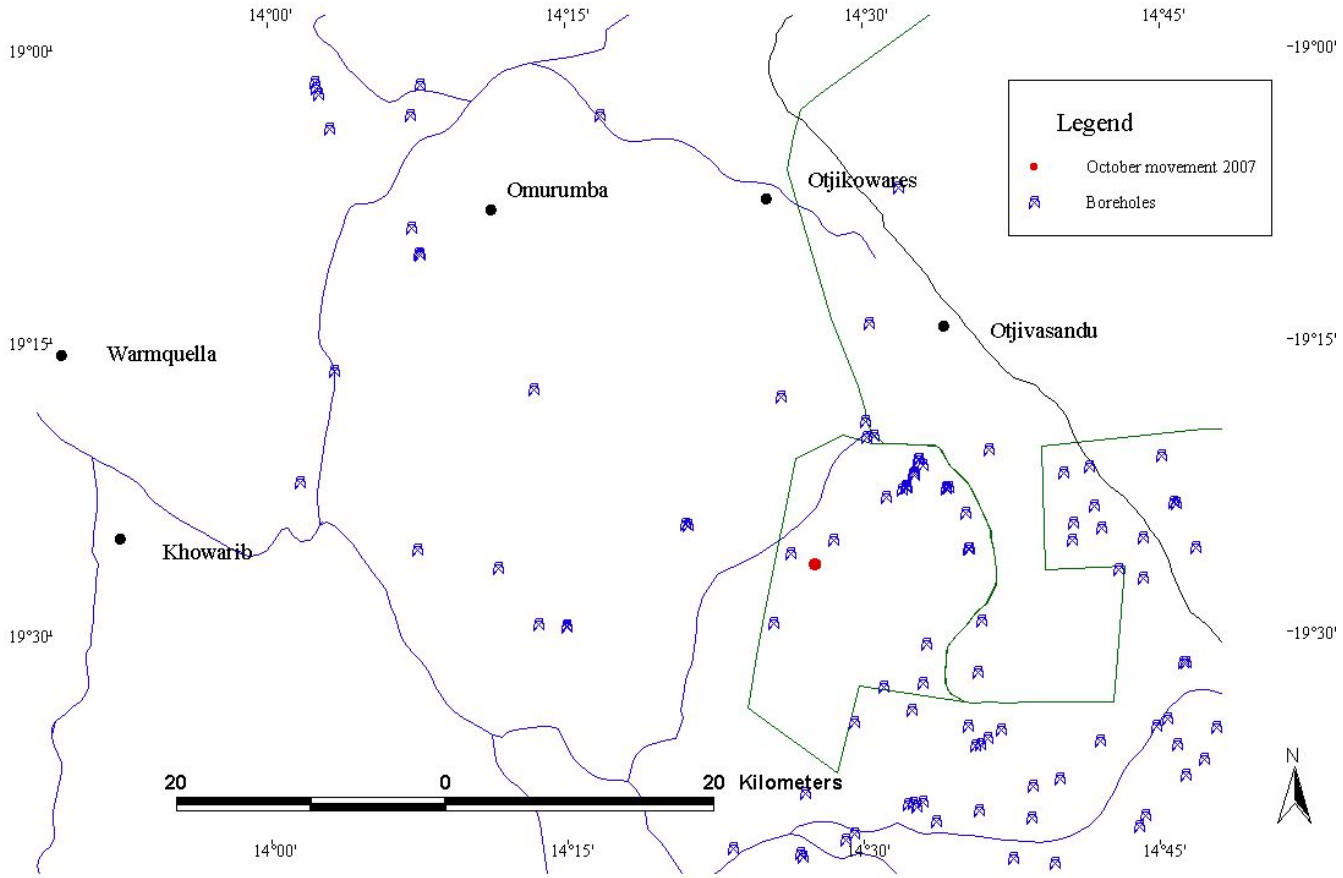


Figure 4: Movement of EKM-09 during the hot dry season in the Kunene Region, northwest Namibia 2007.

This was the first time that this elephant has been collared. Unfortunately, EKM-09's collar failed soon after fitting, so very few data points were obtained for this elephant.

Eastern Kunene Male (EKM) -10

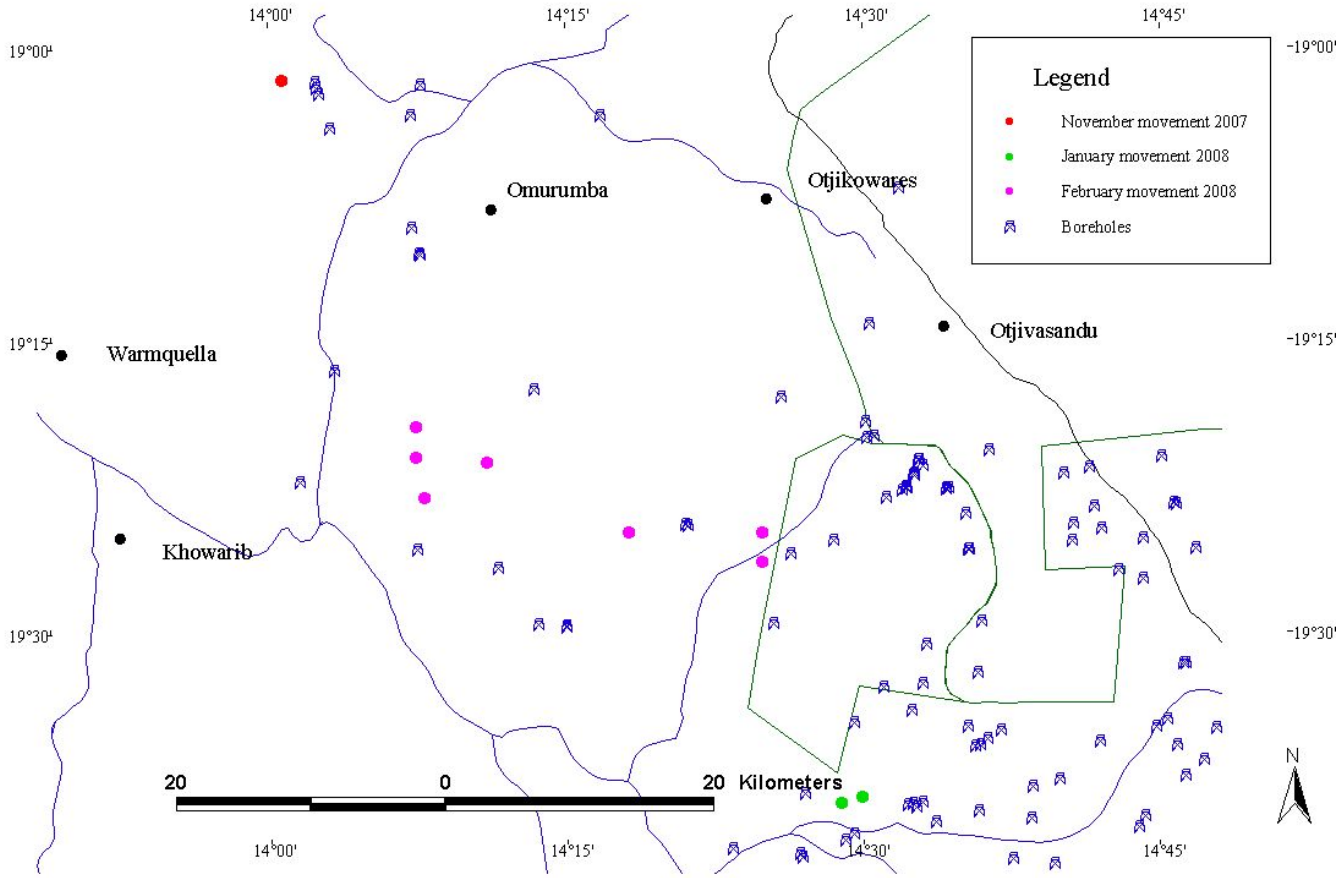


Figure 5: Movement of EKM-10 during the hot dry and wet seasons in the Kunene Region, northwest Namibia 2007/2008.

This is the first time that this elephant has been collared. EKM-10 remained within the borders of Hobatere Game Reserve during the 2007 hot dry season. Only erratic readings were recorded from EKM-10's collar during the 2008 wet season. However, they placed this elephant in the areas to the west of Hobatere Game Reserve. As very little data were obtained from this collar it was difficult to draw any conclusions. The home range data for EKM-10 during the hot dry and wet seasons are shown in Table 1.

4.2. Western Kunene Elephants

Western Kunene Male (WKM) - 10

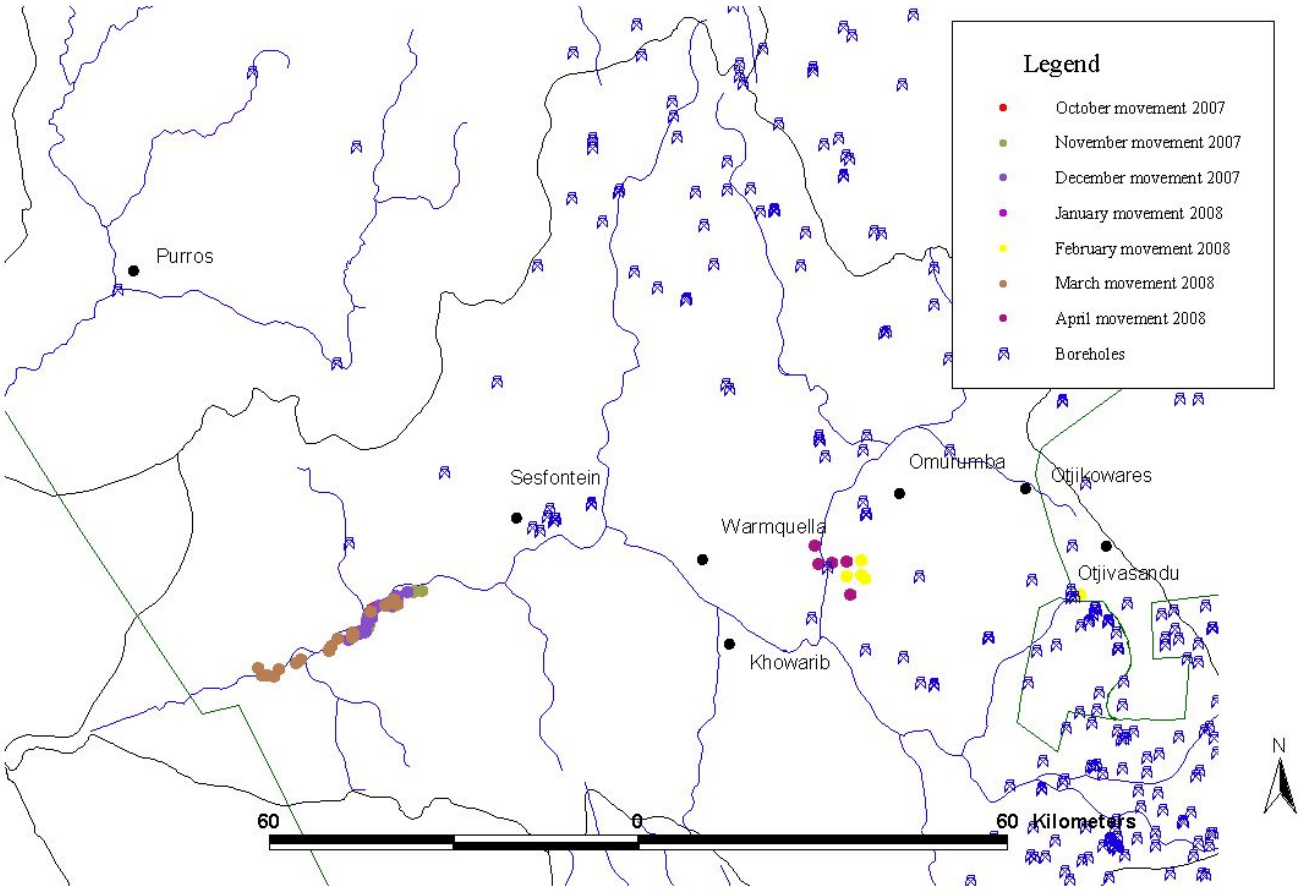


Figure 6: Movement of WKM-10 during the hot dry and wet seasons in the Kunene Region, northwest Namibia 2007/2008.

WKM-10 was collared for the fourth time. He still has the largest home range of any of the collared elephants in northern Namibia and one of the largest home ranges ever recorded for African elephants. WKM-10 spent the hot dry season in the Hoanib River. He moved to the eastern section of the research area in early February 2008. He stayed in this area until early March 2008 before moving briefly further east into Etosha National Park. Unfortunately, his collar failed at this time. He was observed to have returned to the western Hoanib River early in August 2008. His daily movements and home ranges during the hot dry and wet seasons are shown in Table 1.

Western Kunene Male (WKM) - 20

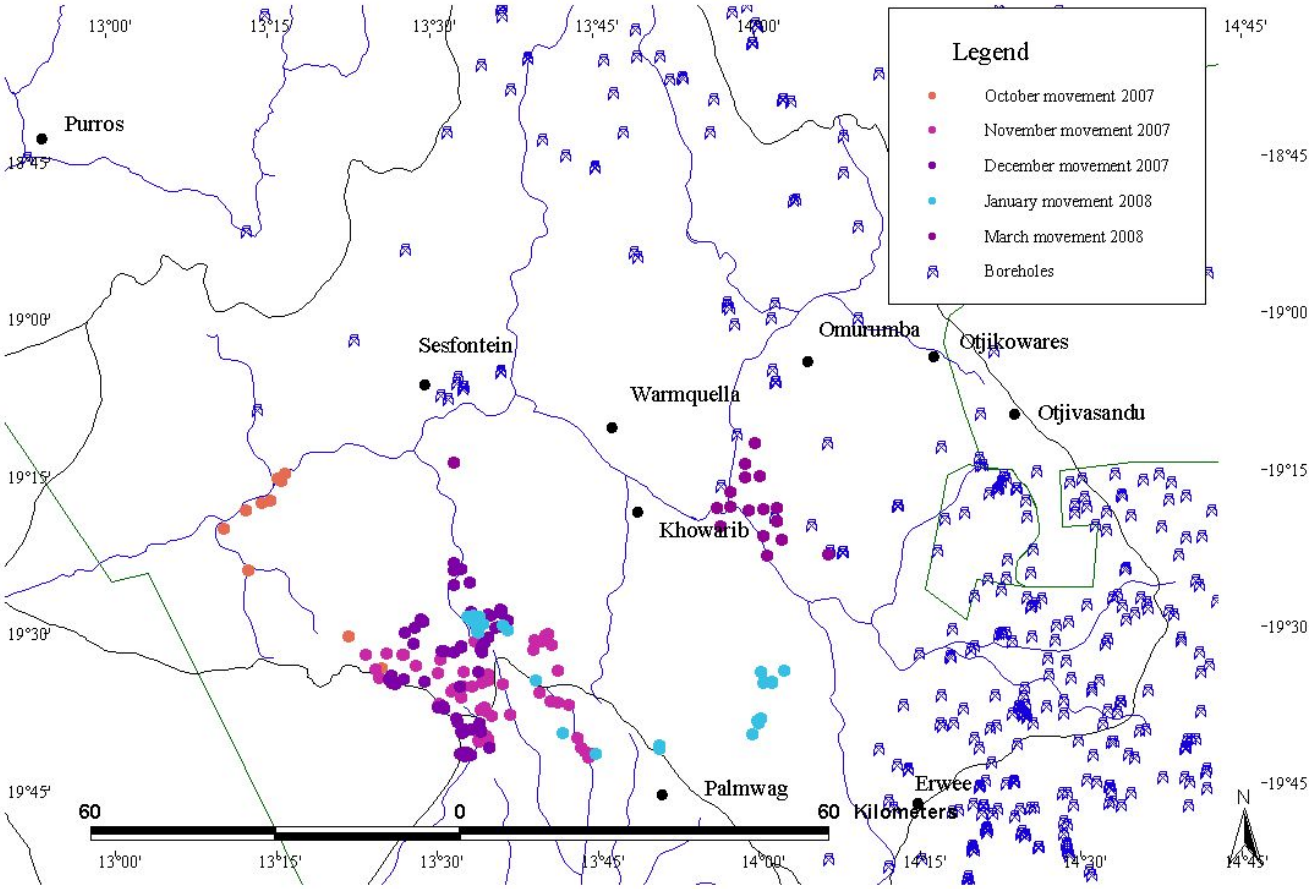


Figure 7: Movement of WKM-20 during the hot dry and wet seasons in the Kunene Region, northwest Namibia 2007/2008.

WKM-20 was a young male and this is the first time that this elephant has been collared. Shortly after collaring, WKM-20 moved to the south of the Hoanib River and spent his time there. In February 2008, WKM-20 moved from the hills in the south of the Hoanib River catchment to the east, joining WKM-10 in the area to the east of Hobatere Game Reserve. He remained here until early April 2008, when his collar failed. He was observed to have returned to the western Hoanib River in October 2008. His daily movements and home range during the hot dry and wet seasons are shown in Table 1.

4.3. Western Omusati Elephants

Western Omusati Male (WOM) - 05

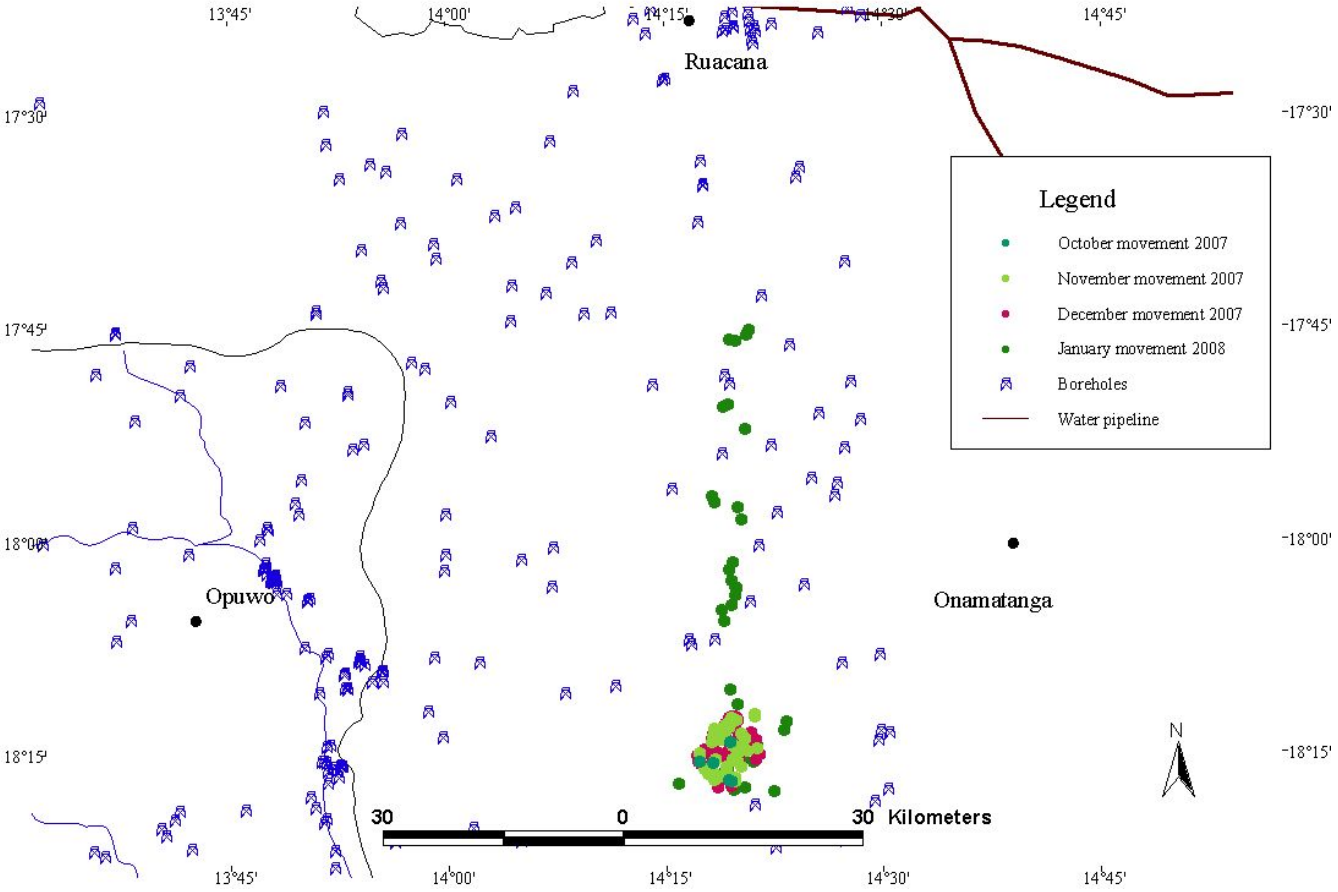


Figure 8: Movement of WOM-01 during the hot dry and early wet seasons in the Omusati Region, northwest Namibia 2007/2008.

This is the first time that this elephant has been collared. WOM-05 stayed in the area where he was collared for the entire hot dry season, with small daily movements and home range. During the wet season, before WOM-05's collar failed, he spent his time in the areas north of where he was collared. His range was larger than during the hot dry season, but still quite restricted. Details of his home range and daily movements during both the hot dry and wet seasons are shown in Table 1.

Western Omusati Male (WOM) - 06

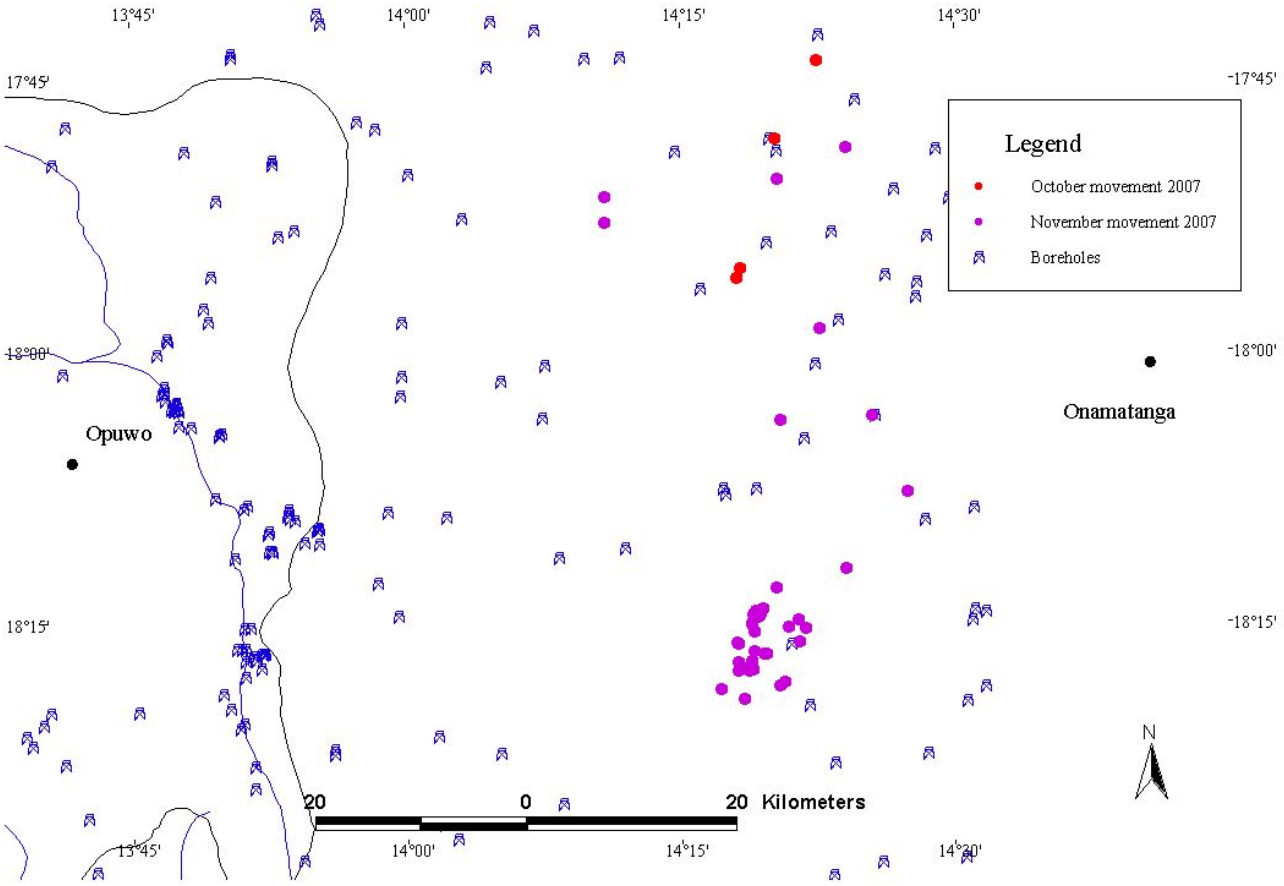


Figure 9: Movement of WOM-06 during the hot dry season in the Omusati Region, northwest Namibia 2007.

This is the first time that this elephant has been collared. Unfortunately, WOM-6 broke his collar within a month of its being fitted. His daily movements and home range were fairly large before the collared failed (see Table 1 for details).

Table 1: Movement and home range data for GPS collared elephants during the hot dry season 2007 and the wet season 2008.

Identification	Hot dry season 2007		Wet season 2008	
	Average daily movement (km)	Home Range (km^2)	Average daily movement (km)	Home Range (km^2)
WKM-10	3.01±3.03	21.18	4.52±8.93	1491
WKM-20	2.88±3.17	1280	3.07±5.55	2368
EKM-07	1.91±3.83	546.3	N.a.	N.a.
EKM-08	1.66±2.19	45.0	N.a.	N.a.
EKM-09	N.a.	N.a.	N.a.	N.a.
EKM-10	1.25±0.96	35.0	4.18±3.88	329.6
WOM-05	2.32±1.77	49.3	3.61±3.63	456
WOM-06	4.48±4.78	1072	N.a.	N.a.

N.a. – not analysed due to failure of the collars

The variance on average daily movement is high. This is due to several factors, not least is of which is that, due to the erratic nature of the collars, none of the data sets are complete. In addition, on the basis of hourly movement data obtained for elephants in north-western Namibia in the past, it appears that elephants walk excessively one day then spend the next few days resting (each individual has his own pattern), leading to large differences in daily distances walked. This data has been submitted for publication and copy of the paper will be supplied in later reports.

These hot dry and wet season data (where obtained) compare favourably to previously gathered data on GPS collared elephants in northwest Namibia (see Table 2 for details on previously collared elephants). Table 2 also shows the age, sex, number of data points, period of study and home range (determined by MCP analysis) of GPS collared elephants in the Kunene and Omusati Regions of northwest Namibia.

Table 2: Summary of current and previously GPS collared elephants in northwest Namibia.

I.D.	Sex	Date of collaring(s)	Age	Period of study	Number of readings	Home Range[6] (km^2)
EKF-01[1]	♀	September 2002	30-35	20 months	1233	871
EKM-01[2]	♂	September 2002 September 2004	45-50	36 months	1459	2168
EKM-02[2]	♂	September 2002 September 2004	45-50	43 months	1097	5844
EKM-03[2]	♂	September 2002 September 2004	20-25	51 months	2225	12150
EKM-06[2]	♂	September 2004	40-45	33 months	1093	4386

I.D.	Sex	Date of collaring(s)	Age	Period of study	Number of readings	Home Range[6] (km^2)
EKM-07[2]	♂	October 2007	30-35	3 months	123	541.3
EKM-08[2]	♂	October 2007	20-25	1 month	18	27.9
EKM-09[2]	♂	October 2007	15-18	1 month	2	_
EKM-10[2]	♂	October 2007	30-35	1 month	6	8.73
WKF-18[3]	♀	September 2002	40-45	17 months	946	5900
WKM-8[4]	♂	September 2002	15-18	13 months	1021	2573
WKM-10[4]	♂	September 2002 September 2004 October 2007	40-45	61 months	201	14310
WKM-14[4]	♂	February 2005	20-25	8 months	336	5870
WKM-20[4]	♂	October 2007	15-18	3 months	141	1280
WKM-21[4]	♂	September 2002	40-45	9 months	343	2881
WOM-01[5]	♂	October 2005	12-15	21 months	348	3669
WOM-02[5]	♂	October 2005	15-18	9 months	158	790
WOM-03[5]	♂	October 2005	25-30	2 months	43	210
WOM-04[5]	♂	October 2005	40-45	21 months	144	8952
WOM-05[5]	♂	October 2007	40-45	3 months	131	48.32
WOM-06[5]	♂	October 2007	40-45	3 months	44	1072

[1] EKF – Eastern Kunene Female
[2] EKM – Eastern Kunene Male
[3] WKF – Western Kunene Female
[4] WKM – Western Kunene Male
[5] WOM – Western Omusati Male
[6] Determined by Minimum Convex Polygon (MCP) Analysis

4.4. Behavioural Studies

4.4.1. Carry out identification, social and behavioural studies on resident elephants.

Research Question:

The annual variations in water availability and ambient temperatures are significant in an arid area (Jacobson et al., 1995; Leggett et al., 2001). This study examines the behaviour of elephants in response to variations in environmental conditions. By definition this study needs to be undertaken over a longer time scale to encompass the wider variation in climatic conditions that occurs in an arid region.

Method:

Elephants were individually identified using a combination of photographs and identification sheets. The photographic techniques used were similar to techniques already described by Douglas-Hamilton and Douglas-Hamilton (1975), Moss (1982) and Sukumar (1989). Photographs were taken from the front, left and right side of each individual. In addition, field identification sheets were kept for each individual elephant. When an unknown elephant was characterised, it was given a unique nomenclature and, during all subsequent observations, its nomenclature, current elephant-elephant associations and activity were recorded. The exception to this was if an elephant broke a tusk or if any additional holes or tears in the ears were noted. In this event, the relevant identification sheets were updated and the changes added to the database.

Three different types of activity studies were undertaken and compared. All methods used either point sample techniques or focal sample techniques over specified time intervals. When studying elephant groups, a point sample technique similar to that described by Barnes (1982) and Kalemera (1987) was used. All individual activity within the group was recorded at 2-minute intervals for up to 3 hours. This 2-minute scan study obtained data only on feeding, water, resting, social and walking activities for multiple individuals. The second method used a focal sample technique, where known individuals were observed for a minimum of 30 minutes to a maximum of 3 hours, data being recorded at 5-minute intervals (Kabigumila, 1993; Lee, 1996). Detailed information on each individual was recorded on a check sheet similar to that described by Lee (1996), and activities were defined in a manner similar to that described by Guy (1976). These were categorised under 5 main headings and subdivided as follows:

(1) Feeding:	(a)	Grazing
	(b)	Browsing
	(c)	Debarking of trees
(2) Activities associated with water: (Water Activities)	(a)	Drinking
	(b)	Wallowing
	(c)	Dust bathing
(3) Resting	(a)	Standing or sleeping in shade
	(b)	Standing or sleeping in the open or sun

(4) Social activities:	Activities include: playing, fighting, communication, aggression, nursing and courtship
(5) Walking	

The third method also employed a focal sample technique similar to that described by Guy (1976). The technique focused on an individual, with data recorded continuously for between 60 minutes and 5 hours, using the same activity categories as described for the 5-minute focal animal study. A change in behaviour was defined as any activity undertaken for longer than 1 minute. For example, if an elephant was walking and stopped to feed for less than a minute, then walked on, the activity would be regarded as "walking" and not "walking/feeding".

Throughout the study, an effort was made to collect data on all age groups. For the purposes of this study, age groups were defined as follows: juveniles, being those young elephants that had not yet been weaned (0-5 years), sub-adults (5-10 years female, or until they have their own offspring, 5-14 years male, or until they leave the family unit), and adults (>10 years female; >14 years male). During each field trip, attempts were made to collect data on all age groups for every hour between 0700 and 1900. However, due to seasonal light availability, this was not possible in all morning and evening time slots.

The first elephant encountered by the researcher at the start of a research day was observed and activities recorded. To avoid biasing the study to those individuals that were easily found, if the first individual encountered had been observed in the previous day, observations were not undertaken and another elephant was sought instead. Most elephants were initially encountered either in the riverbeds or on the river plains, then followed and observed. Although this infers a bias towards individuals that reside or traverse these areas, elephants in this area spend about 85% of their time in these habitats. When undertaking 2-minute scan or 5-minute focal animal studies, it was possible to observe up to four different individuals or groups in a day, depending on accessibility. However, the number of studies that could be undertaken was reduced when longer-term studies were conducted. There was generally a lack of data collected during the wet season as it was difficult to get into the field during this period due to rainfall and flooding in the rivers.

Results:

Identification and social studies are ongoing. As calves are born or any new elephants appear in the research area, they are identified, photographed and catalogued. Seasonal activity budget studies are currently in process and only preliminary analysis has been conducted. These studies also included behavioural and social interactions as well as current herd associations. Results from the 2008 season are presented in Table 3.

Table 3: Summary of diurnal activity (as percentage of time) from data obtained during the 2008 research season

	2008					Average 2004-2007				
	Feeding (%)	Walking (%)	Resting (%)	Social (%)	Water (%)	Feeding (%)	Walking (%)	Resting (%)	Social (%)	Water (%)
Wet Season										
Adult male	27.36	44.34	16.04	0.94	11.32	31.71	26.59	17.00	1.20	23.50
Adult female	63.36	23.66	8.40	2.29	2.29	43.49	26.10	13.35	1.37	15.69
Sub-adult	67.37	23.16	6.32	0.00	3.16	44.36	20.83	15.71	3.36	15.73
Juvenile	60.00	26.36	9.09	1.82	2.73	48.61	18.40	18.65	2.75	11.59
Cold dry season										
Adult male	33.88	22.31	39.67	0.00	4.13	50.31	22.85	19.36	2.05	5.43
Adult female	59.57	20.57	9.30	0.00	7.87	51.77	25.98	11.87	1.49	8.22
Sub-adult	58.61	22.44	9.80	1.31	7.84	52.07	26.83	9.37	3.33	8.40
Juvenile	56.09	23.48	4.35	2.26	11.74	39.33	30.01	13.47	5.47	11.20
Hot dry Season										
Adult male	38.24	21.66	37.97	0.00	2.14	39.69	31.00	20.43	2.08	6.79
Adult female	37.17	37.17	24.34	0.00	1.33	39.67	29.74	19.68	2.18	8.73
Sub-adult	29.80	39.74	9.93	19.87	0.66	44.27	24.90	15.41	9.93	5.49
Juvenile	22.09	44.19	16.28	17.44	2.5	41.29	28.80	16.64	6.49	6.78

As can be seen from the results, observed activity during the 2008 season has varied significantly from previous years. During the 2008 wet season, approximately 350mm of rain was recorded at Sesfontein (long-term average - 87.9mm) and approximately the same amount was recorded in Purros (no annual average available, but the town is in the 50mm isohyet). This was reflected in the amount of available grazing and browsing, which was much greater than in previous years. Grazing was by the far the dominant feeding activity during the later part of the wet season whereas, in all previous years, browsing has been the dominant feeding activity.

4.4.2 The Dung Study

Research question:

From data obtained during the activity studies it became apparent that elephants in the arid area of western Namibia defecated less than any other group of elephants in Africa (Table 4). A detailed series of studies examining the frequency, seed composition and potential distribution, weight and the percentage of moisture in the dung was undertaken.

Table 4: Comparison between defecation rates of elephants in three African countries

	Zimbabwe[1]			Tanzania[2]		Namibia[3]		
	Wet Season Av. (±SD) %	Cold Season Av. (±SD) %	Hot Season Av. (±SD) %	Wet Season %	Hot Season %	Wet Season Av. (±SD) %	Cold dry season Av. (±SD) %	Hot dry season Av. (±SD) %
Defecations per hour								
♂	0.65	0.48	0.70	1.32	0.40	0.48 (±0.26)	0.32 (±0.15)	0.41 (±0.22)
♀	0.40	0.33	0.44	N/a[4]	N/a	0.24 (±0.10)	0.25 (±0.12)	0.18 (±0.10)

[1] Guy (1976); [2] Barnes (1982); [3] This study
[4] Not Available

Method:

When a known individual was observed to defecate, the time, number of boluses and the total weight (using a digital 5000g scale) of the defecation event were recorded.

In addition, one bolus was retained from each defecation event to determine the percentage of moisture in the bolus. This study was undertaken to determine whether the percentage of moisture in the dung of desert-dwelling elephants varied significantly from elephants in higher rainfall areas of Africa. The bolus was weighed when first collected (within 15 minutes and 2 hours of the defecation event, depending on accessibility) and then stored in a net bag to allow airflow and prevent seed germination. The weight was then recorded at 24, 48 and 72 hour, and one month intervals. In practice, measurements were taken at 24 hour intervals and the bolus then left to air dry in the atmosphere for one month when it was re-weighed.

A second bolus was retained from each defecation event for seed analysis. This study was undertaken to look at the dispersal of *Acacia erioloba* and *Faidherbia albida* seeds in the dung. Once a bolus had been collected, it was dissected and the seeds were extracted and washed. Only whole seeds were then used for further analysis; partially crushed seeds and seeds that contained weevil holes were discarded on the grounds that they would never germinate. All seeds found in the dung were taken to the National Herbarium in Windhoek for identification. The vast majority (99%) of seeds found in the dung were either *A. erioloba* or *F. albida* seeds.

As the seeds in an elephant's stomach absorb moisture and swell to as much as twice their normal size, in order to establish the correct weight of the seeds at the time of consumption, dry seeds collected from *A. erioloba* pods were weighed. 1000 seeds were weighed 3 times and divided to get the mean weight of one seed, which was determined to be 0.26g. A similar exercise was undertaken with *F. albida* and the seed weight was determined to be 0.25g.

Results:

A summary of results obtained for the last three years of the project are shown in Table 3.

Table 3: Summary of dung results 2004-2008.

	2004-2007 Av.	**2008**
Av. No. of Bolus	4.43	4.73
Av. Total weight (g)	5846	6257
Av. No. Seeds	140.1	120
Seed/dung Ratio	0.08	0.10
%mass loss after 24hrs	21.0	16.8
%mass loss after 48hrs	29.2	28.6
%mass loss after 72hrs	37.8	n/a[1]
%mass loss after 1 month	66.0	70.92

[1] Not Available

In 2008, defecations consisted of an average of 4.73 boluses, which was higher than the average observed during the years 2004-2007. The average weight of one bolus (usually recorded after 15 minutes – 2 hours of defecation) was 1322 g and the average total defecation was 6257 g. This undoubtedly reflects the availability vegetation that was observed during this year.

Only two seed species (*Acacia. erioloba* and *Faidherbia albida*) were observed in the dung. There were a large number of seeds observed in the dung during the wet and early cold dry seasons, but, as the hot dry season developed, there was a noticeable decline in the number of *A. erioloba* and an increase in the *F. albida* seeds. The average number of seeds found in each bolus was 120 (0 – 230), which was lower than the average number of seeds found n previous years. This was probably due to the lower rainfall of the 2006-2007 wet season rather than the higher rainfall observed during 2007-2008 wet season.

The 2008 dung analysis revealed that an average of 16.8% of moisture in the elephant dung was lost in the initial 24 hours after collection, which was similar to that recorded in previous years. However, the moisture then decreased by a further 11.8% over the next 24-hour period (this was exceptionally high in comparison to previous years). There was a further 42.3% reduction to a dry weight measured after one month.

4.5. Document the demographic structure of elephant herds, including herd sizes, recruitment rates, age/sex ratios and mortality factors in the western Kunene, eastern Kunene, and Omusati Regions.

Research Question:

The desert-dwelling elephant's reproductive rate is probably one of the lowest of any elephant population. This study was undertaken to assess birth rates, mortality and the ratio of males to females in the elephant population of northwest Namibia.

Methods:

The family units and free roaming males of the research area were studied by direct observation and data recorded over the 10 years of study.

Results:

The reproduction rate of the desert-dwelling elephants varies considerably and is dependent on environmental conditions. Viljoen (1988) determined that the reproduction rate of elephants in the arid western areas of Namibia was 1.9%, while in the eastern section of the research area, it was 2.8%. Viljoen's study was conducted in 1981-83, a period of high stress for the elephants. Not only was there a civil war but there was also an arid climatic cycle that was affecting elephants' behaviour. During the NEGT study period, 14 calves have been born (reproduction rate of ~2.5%) in the arid western areas. These reproduction rates are low compared to those in elephant populations in higher rainfall areas of Namibia, with reproduction rates of up to 3.3% in the eastern section of the research area (Leggett, unpublished) and Etosha National Park (Lindeque, 1991). The reason for the low reproduction rates in the western region is probably due to the effect of the arid environment and the lack of nutritious vegetation on the females' ability to conceive.

Data on herd structure and demographics has been continually collected during the research. The current age class distributions are shown schematically in Figures 9 and 10.

Figure 10: Age class distribution of male desert-dwelling elephants

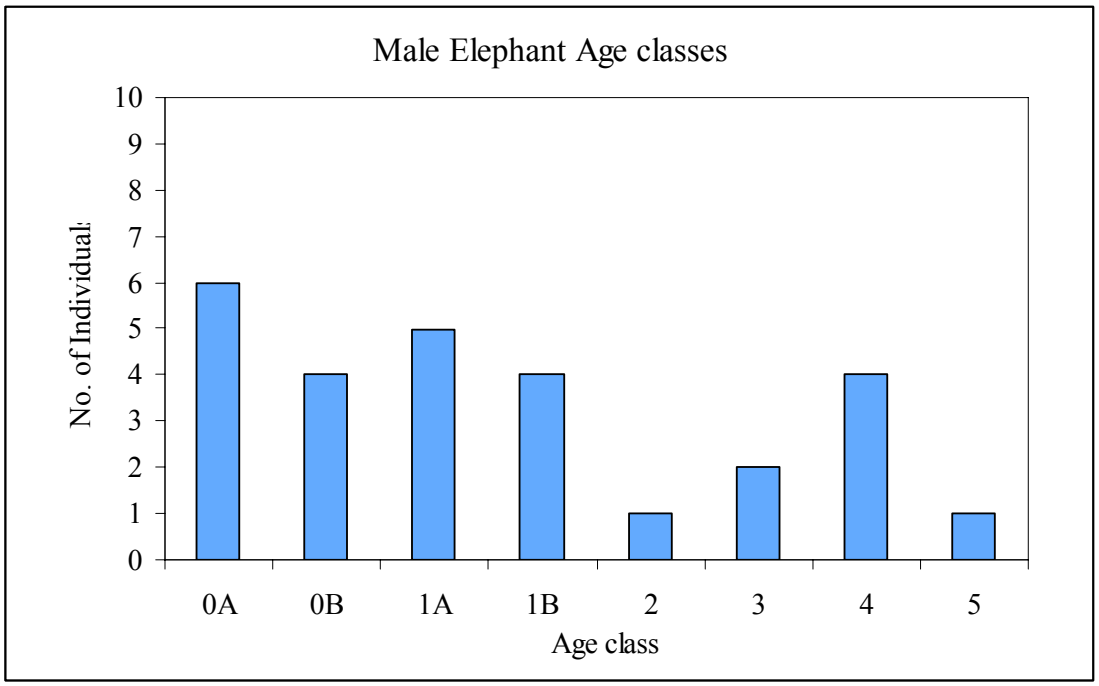
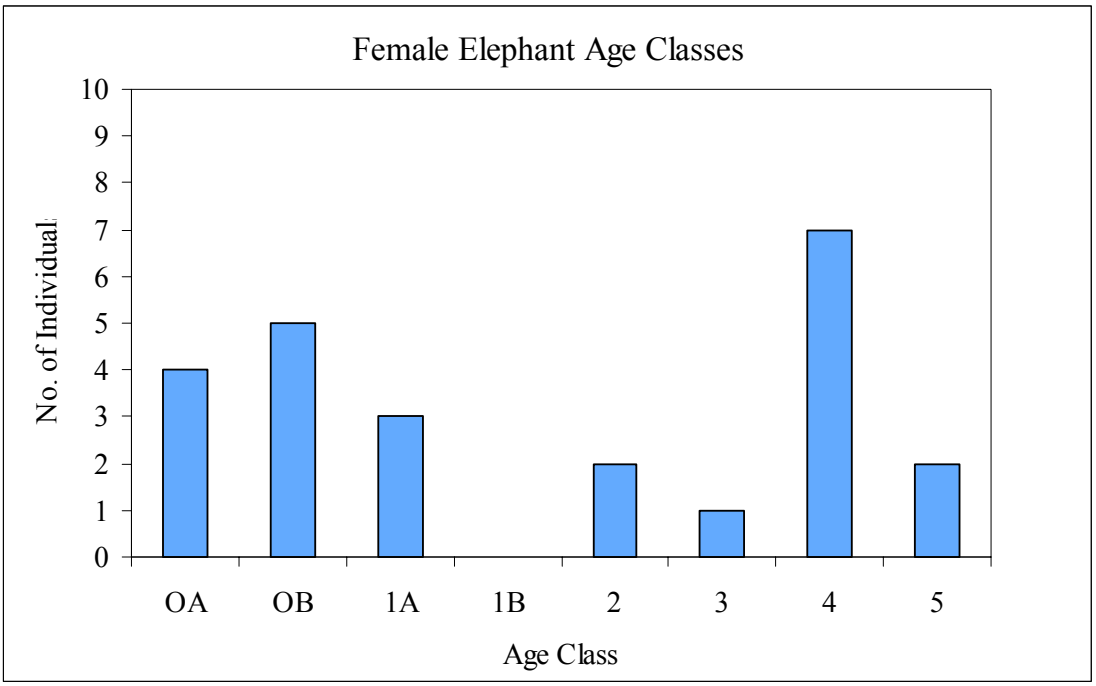


Figure 11: Age class distribution of female desert-dwelling elephants



Age class definitions (after Moss 1996):		
	0A	0-4.9 years
	0B	5-9.9 years
	1A	10-14.9 years
	1B	15-19.9 years
	2	20-24.9 years
	3	25-34.9 years
	4	35-49.9 years
	5	50+

The data reflect the history of these elephants with few adult males above 35 years as these would have been killed during the poaching events of the late 1970s and early 1980s. By contrast there are a large percentage of female elephants in this age class. There are currently few male and female elephants in the 1B, 2 and 3 age groups and the reason for this is uncertain. These years correspond to the late 1980's and early 1990's, while poaching had decreased during this period, there were several dry season back to back, possibly reducing the breeding rate of these elephants. Since this time the elephants have been reproducing at a rate of about 2.8%. The relative abundance of young males is interesting and could point to preferential selection for males under "normal" rainfall condition and periods of low stress.

Recent Mortalities

2006/2007 was a relatively low rainfall year, with no rainfall recorded west of Sesfontein. Interestingly, only 2 mortalities (one adult female (20-24 years of age) and one juvenile (2 years of age) were recorded during the 2006/2007 drought period. Neither of these two deaths could be directly attributed to the drought itself. The adult female was shot by a local Ovahimba herdsman who claimed that the female attacked him. This is possible as the female had a young calf (the other mortality) and

she may have been protecting the calf. The calf was still suckling at the time and lasted only 3 more months in the care of her grandmother. Malnutrition was thought to be responsible for the calf's death. It is possible that the drought was not over a significantly long enough period to affect mortality. The 2007/2008 wet season was an above average rainfall year and no deaths were recorded during this year.

In the 10 years of the study, 4 calves (2 males and 2 females), 2 sub-adults (2 males), and 4 adults (2 females and 2 males) have died. Of these, one adult female and one sub-adult male were shot either on problem animal control or by local herdsmen.

4.6. Provide appropriate elephant data and training to the MET, conservancy organisations and selected stakeholders to facilitate appropriate monitoring, management plans and decision-making within known elephant ranges.

Several meetings have been undertaken with MET officials both in Outjo and Windhoek concerning elephants and elephant-related activities. One community meeting was undertaken with members of the Sesfontein Conservancy. It has been agreed to undertake a series of training seminars with local conservancy members. The venue and timing of these training seminars has yet to be determined. After several unsuccessful approaches to conservancies, an alternative way of training conservancy game guides has been developed with the Namibian Academy for Tourism and Hospitality (NATH). Two courses will be offered through NATH in 2009. Initially, the course will be offered to tour guides already employed by safari companies; at a later time, conservancy game guides will be offered the same course. The course will be made up of theoretical and practical courses in the following topics:

Theoretical course (3 x 4 hour lectures)

(a) Origin and classification
(b) Anatomy and physiology
(c) Ecology
(d) Behaviour
(e) Social structure
(f) Historical distribution and abundance
(g) Present day distribution and abundance in Namibia

Practical Course (4 days in the field)

(a) How to track elephants
(b) How to behave around elephants
(c) How to deal with aggressive elephants
(d) Individual characteristics and identification
(e) How to avoid elephant problems while camping
(f) How to get the most out of the elephant experience

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