EXECUTIVE SUMMARY

Annual Game Census
for
Nyae Nyae

2002

EXECUTIVE SUMMARY

It is important to annually assess the game populations in Nyae Nyae. The three critical objectives are to:

1. estimate the Population Numbers of game in the management area [i.e. how many animals?];
2. produce Game Distribution maps [i.e. where are the animals?]; and
3. monitor Population Change ("trend") [i.e. is wildlife increasing or decreasing over time?].

A full moon waterhole count formed the basis for achieving these objectives. It is recognized that this method will not yield good results for all species (e.g. water independent species, and animals that can go without water for long periods of time). Also unintended disturbance at water holes by the observers (smelling. poor/no hides) and the irregular water availability at the different waterholes counted, also played a major role in the results of the 2002 count.

1.The final population estimate for Nyae Naye is summarized in the table below.

This method uses correction factors based on the drinking frequencies of animal species. The lack of information on drinking frequencies and reduces the effectiveness of this method. Because of this, some estimates of species are approximate and may be misleading if taken at face value. They are left in for the record.

Information from other monitoring methods such as aerial census, foot patrols, specialist species monitoring and local knowledge are also important sources of data and are incorporated where available to reach a final population estimate.

However the strength of the count rest on the basis that, if sampling effort remains the same over time these data will provides a good index of the population trend.

GAME POPULATIONS ESTIMATES FOR NYAE NYAE CONSERVANCY

Species	Aerial Census 95	Aerial Census 98	Water Hole Minimum Estimate 2001 Sept	Water Hole Minimum Estimate 2002 Sept	Projected Number of Animals from 99-01 Introductions[1]	Animals Introduces for 2002	Minimum Estimated Population Based on All Information[2]	No. Animals per 5000 Hectare Unit[3]
Elephants	302	558	358	466	-	-	400	2
Giraffe	6	47	-	6	-	-	10	0.055
Buffalo	-	33	57	68	-	-	68	N/A
Eland Inside Buffalo Camp	-	12	60	27	-	-	30	N/A
Eland	-	-	17	9	110	0	110	1
Roan	123	-	89	39	0	0	80	0.444
Kudu	248	283	102	164	287	88	825	5
B. Wildebeest	164	204	198	192	59	53	290	2
Red Hartebeest	31	18	69	75	443	224	670	4
Gemsbok	110	429	-	54	270	93	900	5
Springbok	-	-	69	311	253	206	450	3
Ostrich	190	311	56	23?	-	-	400	2
Duiker	33	171	-	0?	-	-	+4000	22.
Steenbok	14	14	-	12?	-	-	+5000	28
Jackal	-	-	54	66?	-	-	+500	3
Leopard	-	-	-	1?	-	-	60	0.333
Hyaena	-	-	43	42?	-	-	100	0.556
Warthog	-	16	23	8?	-	-	100	0.556
Lion				0		-	Seasonally present	N/A

[1] The projected populations for the introduced game are based upon very conservative annual population growth rates of 15%/year for red hartebeest, oryx, and blue wildebeest and 10%/year for springbok, eland, and kudu. These conservative projections take into consideration that certain species (kudu, oryx, blue wildebeest, etc.) will also be used for subsistence purposes by local Ju/hoansi' people.

[2] The Minimum population estimates are based upon a variety of sources (i.e., 1995 and 1998 aerial game censuses, anecdotal information from the 2001 and 2002 water hole counts;, survey work and reports from Dr. Flip Stander, local knowledge of the area, estimates made based upon comparisons between the relative frequency of sightings of various species, and the short-comings associated with low-intensity aerial censuses for the species and habitat found in the Nyae Nyae Conservancy – see footnote 3 below).

[3] Given the vastness of the Nyae Nyae Conservancy, it is believed that the aerial census figures used to make population estimates are far below the actual numbers. For example: the 1998 aerial census estimated 55 cattle to be present in the conservancy, whereas a ground census of cattle for the same year showed over 600 cattle to be present. Thus, this column has been added to the table to allow the reader to judge the legitimacy of the estimated numbers by comparing the estimated figures with those encountered on commercial farm units.

Staff, Teams and Training

Count participants were made up of community members, MET officials and persons from various NGO's.

Teams were established and consisted of two observers. Observers sat at the waterholes for a period of two days (48 hours). Binoculars were used to make the counting as accurate as possible.

Prior to the survey, all members attended a training/planning exercise that covered the following issues:

- objectives for counting;
- agreement of the waterholes;
- explanation of how the count would be conducted e.g. avoiding double counting during a single drinking event, the count of groups etc.
- use of data sheets; and
- logistical checklists: (i) team departure from base, (ii) starting the count, and (ii) ending the count.

Field clipboards containing data sheets and count rules were issued to each team (refer to the count rules). Start and end times of all waterhole count were agreed upon to facilitate early morning deployment and efficient return to base.

Data collected

To achieve the three objectives mentioned above, the following parameters were measured:

- length of the count.
- numbers of each species sighted.
- notes on any particular sighting.

Copies of the report and data will be archived within the NACSO system and regional MET office.

Primary analysis.

This refers to some basic analysis that was necessary to support population estimation. Data were collected in a manner that allows populations to be estimated in two different ways:

1. using the conventional full moon water hole count
2. to determine an index of population trend

In basic terms, the full moon water hole method involves counting all animals, which visit water holes. The number of animals counted, of each species is then multiplied with that specific species drinking frequency, and then divided by the counting time/days.
The drinking frequency of species was determined from literature available from different National Parks in the SADC region and from local knowledge. It is acknowledged that the full moon water hole estimate could be greatly improved over successive counts through the use of proper hides, continuity of water availability at the different waterholes and research on drinking frequencies.
The following factors have had a dramatic effect on the results:

- Poor detection rate: due to no proper hides and the insufficient preparation of the hide/counting sites.
- Water availability: the irregular water availability at the different waterholes.
- Vegetation sprouting: veld fires have caused extensive vegetation sprouting.

These factors drastically influence the drinking behavior and drinking frequency of the animals and lead to a low observations rate while certain species have not been seen for the counting period.

The drinking frequency details for each animal species were obtain from research papers and literature as summarised in the Table below.

Drinking Frequencies in Days					
	Ethosa		Kruger	Local knowl	Mean
Species	*Dry season*	*Wet season*			
Elephants	1	2	2	2	2
Giraffe					4
Buffalo	1	1	1	1	1
Eland				3	3
Roan				2	2
Kudu				1.5	1.5
Blue wildebeest	2	2	1.8	2	1.95
Hardbeest				2	2
Oryx			3	3	3
Springbok	2	4	3	3	3
Ostrich					?
Duiker					?
Steenbok					?
Jackal				1	?
Leopard					?
Hyaena				1	?
Wild Dogs				1	?
Warthog				2	?

Note: Further review of literature on drinking frequency is still needed as well as research on drinking frequency of game. The estimated drinking frequency for each species are used as the correction factor. These correction factors were used to convert numbers of animals seen at the water holes into population estimates.

RESULTS for Nyae Nyae

Animals Counted

The table below contains the numbers of animals actually counted during 48 hours on each water hole.

NUMBER OF ANIMALS SEEN (Fullmoon Count)

Species	Gura	G=aing=oqo	Xaecha	/Aotcha	Taragaga	Xamsa	Nyae Nyae	Boboha	Noma pos	Grens pos	Buff camp	Total seen
Elephants	45	42	61	65	38	96	0	20	22	77	0	466
Giraffie	0	0	2	0	0	0	0	0	1	0	0	3
Buffalo	0	0	0	0	0	0	0	0	0	0	52	52
Eland Inside	0	0	0	0	0	0	0	0	0	0	18	18
Eland Outside	0	0	4	2	0	0	0	0	0	0	0	6
Roan	10	1	0	25	0	0	0	0	0	3	0	39
Kudu	12	60	17	31	2	0	18	0	35	0	44	219
Wildebeest	24	5	12	44	0	0	112	0	0	0	0	197
Hardbeest	21	0	23	0	0	0	25	6	0	0	0	75
Gemsbok	0	0	0	15	4	0	12	2	2	0	1	36
Springbok	2	0	0	0	0	0	205	0	0	0	0	207
Ostrich	0	0	0	0	0	0	23	0	0	0	0	23
Duiker	0	0	0	0	0	0	0	0	0	0	0	0
Steenbok	0	1	0	0	1	3	2	0	0	0	5	12
Jackal	25	0	3	5	0	4	27	2	0	0	0	66
Leopard	0	0	0	0	0	1	0	0	0	0	0	1
Hyaena	8	6	2	9	2	2	7	2	3	0	1	42
Wild Dogs	1	0	0	0	0	0	0	0	0	7	0	8

These numbers can be plotted on graphs over time (years) to serve as a monitoring tool to see how the populations are performing. This can be done either:

- on a waterhole by waterhole basis (e.g. monthly monitoring); or
- with the total numbers of animals seen (yearly monitoring).

Population Estimation

This method is largely based on the drinking frequencies of animal species. The lack of information on drinking frequencies and the discrepancy of the available data, reduce the effectiveness of this method. Because of this, some estimate of species may have a degree of approximation and may be misleading if taken at face value, but they are left in for the record.

Using the full moon water hole analytical method: the numbers of animals seen on each water hole are multiplied by the specific species estimated drinking frequency/correction factor. The estimated populations for Nyae Nyae are shown in the table below.

POPULATIONS ESTIMATED

POPULATION =ANIMAL SPECIES NUMBER x DRINKING FREQUENCY(DAY) \ COUNTING DAY

Species	Gura	G=aing=oqo	Xaecha	/Aotcha	Taragaga	Xamsa	Nyae Nyae	Boboha	Noma pos	Grens pos	Buff camp	Total Pop Est
Elephants	45	42	61	65	38	96	0	20	22	77	0	466
Giraffie	0	0	4	0	0	0	0	0	2	0	0	6
Buffalo	0	0	0	0	0	0	0	0	0	0	26	26
Eland Inside	0	0	0	0	0	0	0	0	0	0	27	27
Eland Outside	0	0	6	3	0	0	0	0	0	0	0	9
Roan	10	1	0	25	0	0	0	0	0	3	0	39
Kudu	9	45	13	23	2	0	14	0	26	0	33	164
Wildebeest	23	5	12	43	0	0	109	0	0	0	0	192
Hardbeest	21	0	23	0	0	0	25	6	0	0	0	75
Gemsbok	0	0	0	23	6	0	18	3	3	0	2	54
Springbok	3	0	0	0	0	0	308	0	0	0	0	311
Ostrich	0	0	0	0	0	0	23	0	0	0	0	23?
Duiker	0	0	0	0	0	0	0	0	0	0	0	0?
Steenbok	0	1	0	0	1	3	2	0	0	0	5	12?
Jackal	25	0	3	5	0	4	27	2	0	0	0	66?
Leopard	0	0	0	0	0	1	0	0	0	0	0	1?
Hyaena	8	6	2	9	2	2	7	2	3	0	1	42?
Wild Dogs	1	0	0	0	0	0	0	0	0	7	0	8?
Warthog	6	7	2	8	0	0	2	2	10	0	0	37?

Final population estimate for Nyae Nyae

The table below is a population estimate for Nyae Nyae that takes into account:

- results from the standard WATER HOLE method (using drinking frequency/correction factors);
- results from aerial census;
- knowledge regarding the efficiency of the methods as they relate to each species (in terms of drinking frequency, water dependency, animal behavior with regard of the presents of human, etc); and
- knowledge from Nyae Nyae staff, and field based personnel in local MET and NGO offices.

Obviously, these final population estimates are approximations and should always be used with caution. These estimates can (with the appropriate amount of caution) be used to:

- assist with setting quotas;
- estimate competition between wildlife and livestock for grazing; and
- estimate drought risk.

	Population estimates				Local know-ledge	Final Pop estimate
Species	Aerial Census1995	Aerial Census1998	Water hole Counts estim 01	Water hole Counts estim 02		
Elephants	302	552	358	466	600	**600**
Giraffe	6	47		6	10	**10**
Buffalo		33	56.5	26	68	**68**
Eland Inside Buff c	-	-	60	27	30	**60**
Eland Outside Buff c	-	-	16.5	9	100	**100**
Roan	123	-	89	39	100	**70**
Kudu	248	283	102	164	400	**300**
B Wildebeest	164	204	198	192	300	**350**
Hardbeest	31	18	69	75	300	**350**
Gemsbok	110	429	1.75	54	300	**250**
Springbok	-	-	69	311	150	**200**
Ostrich	190	311	56	23?	400	**350**
Duiker	33			0?	300	**300**
Steenbok	14			12?	300	**300**
Jackal	-		54	66?	300	**200**
Leopard	-			1?	100	**200**
Hyaena	-		43	42?	200	**150**
Wild Dogs	-		10	8?	27	**20**
Warthog	-	160	23	37?	50	**100**

Game Distribution

Fieldwork

It has been recognised that this method will not give a good indication of animal distribution. However by making use of that specific species drinking frequency, water dependency and water availability, a radius can be drawn around counted water holes that show the distribution of some species.

Analysis

The objective of the analysis was to produce maps showing where the game was seen. This was achieved through the following actions.

1. Capture data into the database.
2. Enter all animals that visited each waterhole into the database.
3. Link (SQL Connect) the database to the GIS.
4. Use the GIS to generate the game distribution maps.

Results

Refer to attached game distribution maps.

[See attachment.]

Monitoring Population Trend

Fieldwork

The following field rules were designed to ensure that 'sampling effort' on each successive count is as similar as practically possible.

1. Use the same fixed waterholes each year.
2. Make sure each water hole has water and a hide built at least two months before the count.
3. Always use binoculars for better night vision
4. Start each successive count at the same time of day i.e. noon.
5. Always count from a hide. (Temp or permanent).
6. Never sleep during the count, even when no animals are visiting the water.

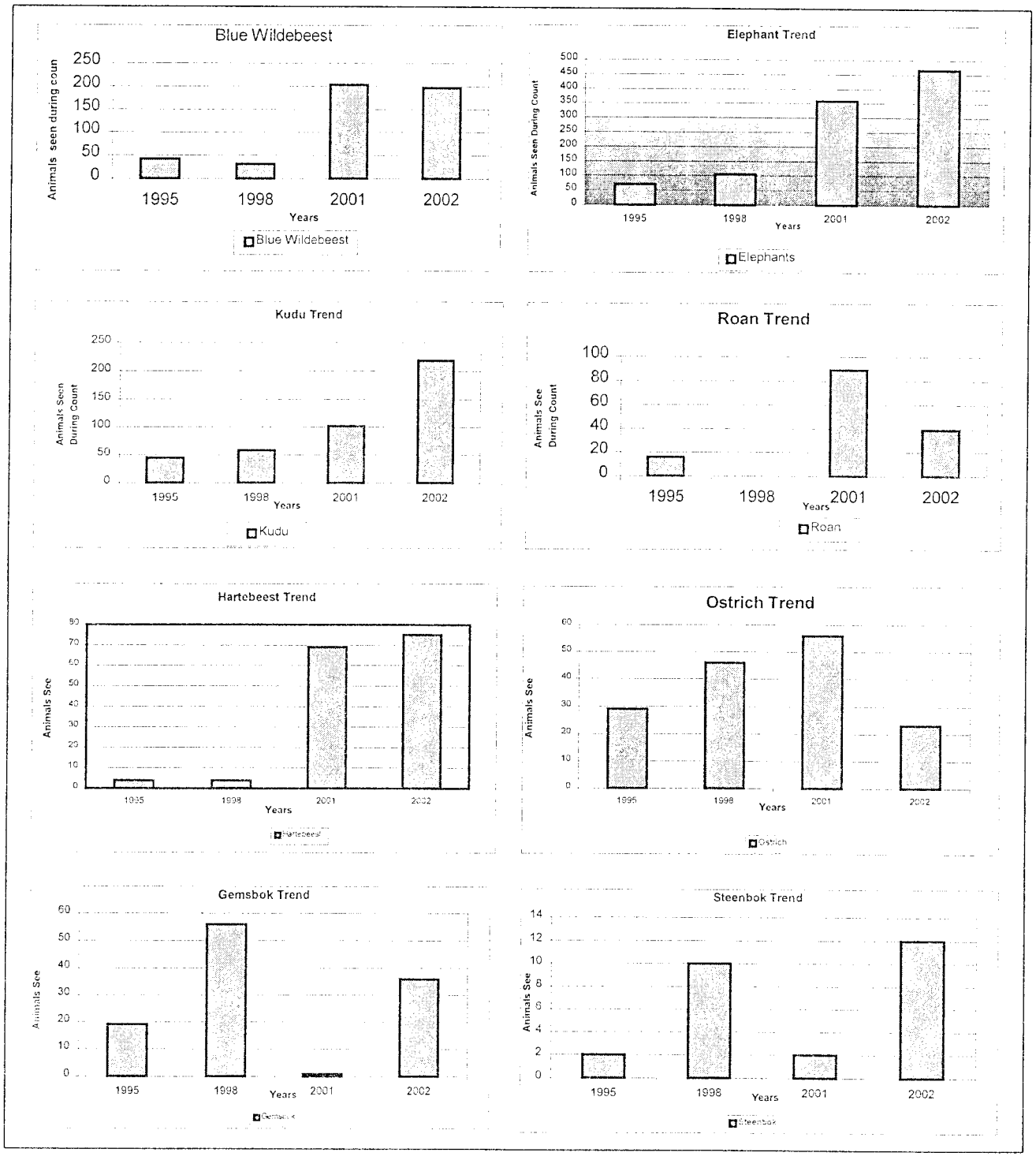
In addition to this, Nyae Nyae intends to select a number of key waterholes and repeat count these each month so that there is a monthly tracking of trend (a sub-sample of the area), in addition to the annual total area count.

Results

1. The trend table (below) is filled-in with the numbers of animals actually seen during the survey.
2. It is important to ensure that in future each water hole is actually counted. If all waterholes are counted it is only then that it will be possible to eventually draw trend graphs for each species.

	Number of animals seen on successive count dates							
SPECIES	1995 Aerial	1998 Aerial	2001 Water Hole	2002 Water Hole	2003 Water Hole	2004 Water Hole	2005 Water Hole	2006 Water Hole
Elephants	70	104	358	466				
Giraffe	1	4		3				
Buffalo			113	52				
Eland Inside Buff			40	18				
Eland Outside Buff			11	6				
Roan	16		89	39				
Kudu	45	58	102	219				
B Wildebeest	43	32	203	197				
Hartebeest	4	4	69	75				
Gemsbok	19	56	1	36				
Springbok			46	207				
Ostrich	29	46	56	23				
Duiker	5	17	2	0				
Steenbok	2	10	2	12				
Jackal			54	66				
Leopard		1	2	1				
Hyaena			43	42				
Wild Dogs			10	8				
Warthog		2	23	37				
Number of water holes counted			12	12				
Number of hours counting			48	48				

WARNING: Take care when interpreting trend changes. Use at last five years of data



CONCLUSIONS

Whilst the survey achieved much, there is stillroom **for improvement** as follows.

1. At present there are insufficient hides. More practical hides need to be designed.
2. The count estimates will be seasonally dependent (i.e. wet seasons dry seasons and rainfall distribution). To account for this under the Trend objective, it is recommended that a full moon waterhole count is undertaken at two or three water holes each month between the annual surveys.
3. The count should be integrated with neighboring conservation areas e.g. Khoudom National Park so that a regional picture of game can be developed and seasonal movements can be tracked between neighboring areas.
4. This information should be integrated with other sources of information such as foot patrols and aerial census.
5. It is recommended that more detailed analysis and 'fine tuning' of drinking frequencies take place in future years.

In terms of **repeating this survey** we recommend the following.

1. Training in age and sex classification and clarification to be undertaken before each subsequent count.
2. Make sure that the same waterholes are counted and that the same methods are used in subsequent counts.
3. Always use binoculars to improve sightings during the night.
4. Adequate preparation of hides should be done well in advance of the count.
5. Make sure that all waterholes are operating throughout the year.

Finally, it should be recognised that the count exercise has value other than the data it produces. It also serves an important team building and information exchange function between the different stakeholders. Once a year, it gets people out into the veld, often in areas they have never seen before.