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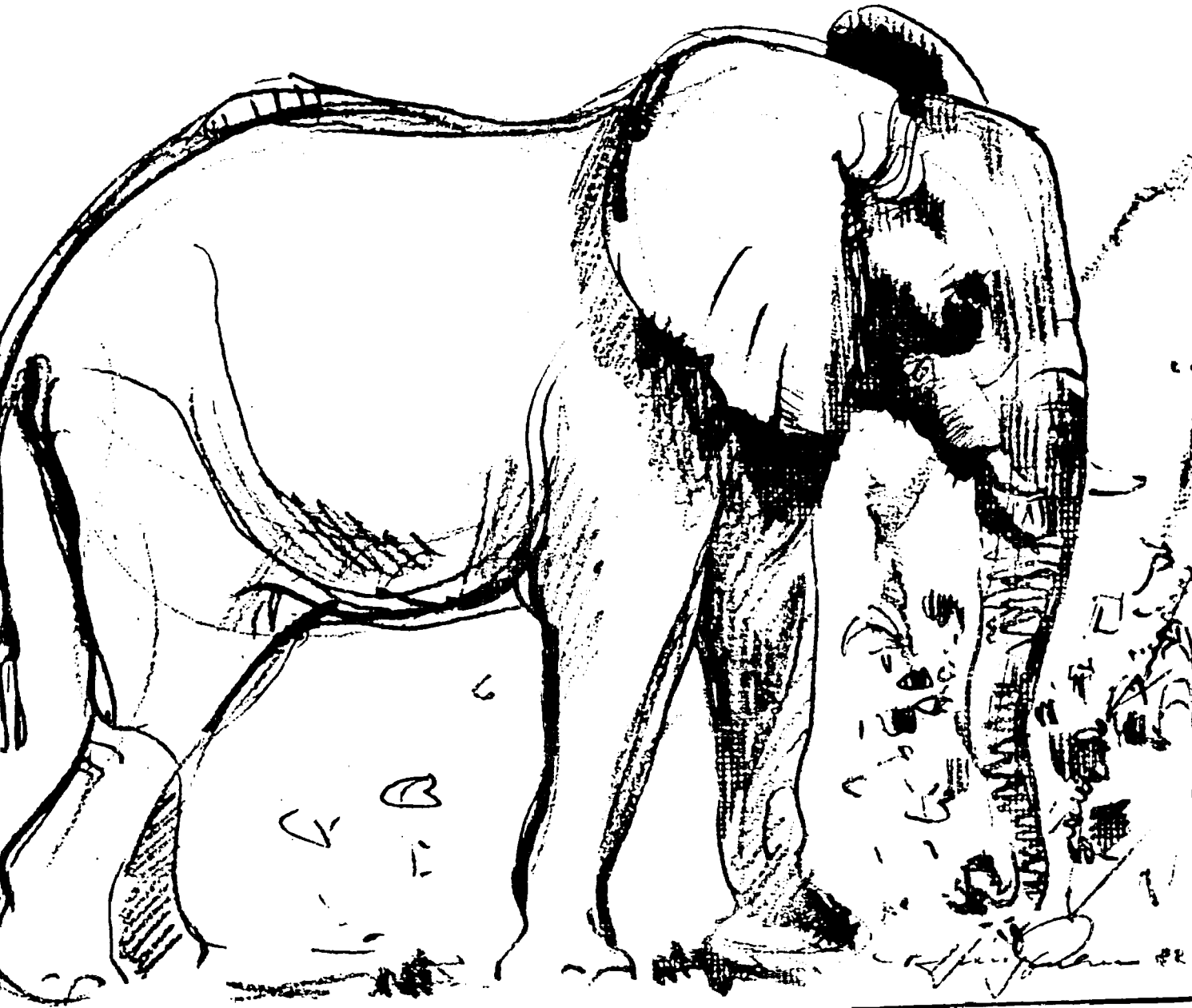
AERIAL GAME CENSUS
1982



WESTERN KAOKOLAND, DAMARALAND AND THE SKELETON COAST PARK AERIAL GAME CENSUS

July 1982

P J Viljoen

OBJECTIVES

To determine changes in the status of the game for sound management, utilization and conservation strategies.

PILOTS

Mr Bertens and H Kriese.

AEROPLANE

Cessna Centurion, highwing.

TOTAL CENSUS TIME*

84 hours 22 minutes.

CENSUS AREA

The Skeleton Coast Park, west of the 150 mm isohyet in Kaokoland and Damaraland, including the Beesvlakte, the Palmfontein Omumborombonga area, and the farms West End, Tevrede, Marenphil, Swartskamp and De Ville. This includes the whole region between the Kunene and Ugab Rivers, known as the Northern Namib Desert.

METHODS

The area was censussed by a systematic non random total count method. Where topographically possible, parallel adjacent transects were flown and in mountainous terrain a systematic count was done at two levels - first, in all the valleys and river courses, and secondly on the mountain slopes and plateaus. A flying height of 100 m to 300 m, and a flying speed between 120 km and 150 km per hour, was maintained, depending on the terrain. For example, in open valleys the height and speed were increased and in mountainous areas the height and speed were reduced. Flying time was restricted to the early morning, between 8 am and 11.30 am and the late afternoon, between 3.45 pm and 6.30 pm, to utilize optimum light conditions. The area was divided into surveying blocks, corresponding as near as possible with topographic-ecological units, although practical considerations (location of airstrips, sizes of the units and available flying hours), necessitated compromises.

* Six hours were used in tracking poachers and the rest was used in travelling between airstrips and survey blocks.

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Large survey blocks were flown in two consecutive sessions within the same day to minimise duplication. A total of ten counters were used on a rotating basis to minimise observer fatigue. Navigation was done by persons with an intimate knowledge of the area to eliminate navigational errors.

Information on the numbers, location, social structure, population structure (where possible) and habitat preference were gathered. Habitat types were simplified into river courses, gravel plains, sandy plains, mountainous terrain and dunes to minimise subjectivity.

Because of the heterogeneous topography, animal distribution and rainfall in the Northern Namib, the area cannot be censussed by sample methods. The only method that will give a reasonable account of the true game status is a total count method. This is however extremely costly and time consuming. It was therefore decided to concentrate mainly on the uninhabited areas with a reasonable game density during this survey. Ground surveys prior to this aerial survey indicated a very low game density in the south of Damaraland as well as on most of the inhabited eastern regions of Damaraland and Kaokoland. Consequently, we decided to do an intensive survey in the western regions of Kaokoland and Damaraland, north of the Agab River, as well as in those areas with a high game density in the east (Figures 1 and 2).

Aerial surveys have certain deficiencies, but still prove to be the most efficient in terms of accuracy, time and cost. It far outweighs any other method to determine the status of the larger game in the given area. In order to eliminate the major sources of error in an aerial survey, the following precautions were taken:

1. A highwing aeroplane with a low stalling speed was used.

2. Only experienced pilots with a high degree of safety and the ability to do low and slow flying in dangerous terrain were used.

3. Errors in navigation and orientation were ruled out as only experienced navigators were used who have an intimate knowledge of the area and did intensive ground surveys prior to this survey.

4. Observer errors were minimised by flying during periods of optimum visibility conditions, rotating observers to prevent fatigue and counting errors were ruled out because of the small group sizes of the animals.

RESULTS:

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Table 1: Total numbers of game counted during July 1982 in Kaokoland and Damaraland and the adjacent Skeleton Coast Park.*

Species	Total	
	Damaraland	Kaokoland**
Springbok (Antidorcas marsupialis)	309	217
Gemsbok (Oryx gazella)	404	164
Kudu (Tragelaphus strepsiceros)	41	5
Giraffe (Giraffa camelopardalis)	232	45
Steenbok (Raphicerus campestris)	3	0
Hartmann Zebra (Equus zebra hartmannae)	563	193
Black Rhinoceros (Diceros bicornis)	23	0
Elephant (Loxodonta africana)	184	36
Black-backed Jackal (Canis mesomelas)	7	13
Brown Hyaena (Hyaena brunnea)	0	1
Aardwolf (Proteles cristatus)	1	0
Honey Badger (Mellivora capensis)	1	0
Lion (Panthera leo)	6	0
Chacma Baboon (Papio ursinus)	4 troups	1861***
Ostrich (Struthio camelus)	271	264
Lappet-faced Vulture (Torgos tracheliotus)	49	38
Karoo Korhaan (Eupodotis vigorsii)	83	114
White-backed Vulture (Gyps africanus)	1	0
Crocodile (Crocodylus niloticus)	0	21
Elephant carcasses	85	36
Black rhinoceros carcasses	19	2
Giraffe carcasses	6	1
Cape Fur Seal carcasses	17	159

* Skeleton Coast Park counts included with those of Kaokoland and Damaraland.

** For comparative purposes, counts in the Hoanib River are included with those of Kaokoland.

*** Photographic count.

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KAOKOLAND AND THE ADJACENT PORTION OF THE SKELETON COAST PARK

Total census time: 34 hours 42 minutes.

The various census blocks are indicated in figure 1.

Counts in the Skeleton Coast Park and western Kaokoland are represented together, as the two areas cannot be ecologically separated, the boundary between them being totally artificial.

Block 1: Marienfluss

Includes the area west of the Otjihipa Mountains, south of the Kunene River, east of the watershed in the Hartmann Mountains, and north of the Otjiha Plains.

Survey Time: 1 hour 50 minutes

Springbok	17	Ostrich	51
Gemsbok	4	Lappet-faced Vulture	2
Hartmann Zebra	10	Karoo Korhaan	2

Block 2: The Kunene River

The southern bank and islands of the Kunene River west of Otjinungwa.

Survey Time: 40 minutes

Elephant	6
Crocodile	21
Elephant carcasses	2

Block 3: Hartmann Valley

Includes the area west of the watershed in the Hartmann Mountains, south of the Kunene River, north of the Rooidrom-Ondondojengo Plains and east of the dune belt.

Survey Time: 2 hours 5 minutes

Springbok	4	Ostrich	24
Gemsbok	13	Lappet-faced Vulture	4
Hartmann Zebra	79	Karoo Korhaan	55
Giraffe	6		
Black-backed Jackal	2		

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Block 4: Dune Area

Includes the dune area west of the Hartmann Valley,south of the Kunene River, north of the Ondondojengo River and east of the coastal plains (approximate 10 km from the sea).

Survey Time: 1 hour 44 minutes

Springbok	1	Ostrich	7
Gemsbok	10		

Block 5: Engo Valley

The Ondondojengo River Valley extended to the coastal plains.

Survey Time: 1 hour 19 minutes

Gemsbok	1	Karoo Korhaan	15
Ostrich	3	Lappet-faced Vulture	1

Block 6: Mountains and Plains west of Orupembe

Includes the area west of the Otjiha Plains, south of the Ondondojengo River Valley and north of the Munutum-Nadas Mountains and east of the Bushman Paradise area.

Survey Time: 2 hours 35 minutes

Springbok	28	Ostrich	6
Gemsbok	22	Karoo Korhaan	12
Hartmann Zebra	55		
Giraffe	6		
Kudu	2		
Elephant carcass	1		

Block 7: Bushman Paradise Area

Includes the area west of the MunutumPlains, south of the Ondondojengo River, north of the Munutum River and east of the coastal plains.

Survey Time: 1 hour 44 minutes

Springbok	3	Karoo Korhaan	3
Gemsbok	11	Lappet-faced Vulture	2
Ostrich	22		
Giraffe carcass	1		

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Block 8: Munutum, Nadas Area

Includes the area north of the Sechomib drainage system, south of the Munutum River and Orupembe Plains and east of the coastal plains.

Survey Time: 1 hour 57 minutes

Springbok	10	Ostrich	1
Gemsbok	10	Lappet-faced Vulture	1
		Karoo Korhaan	5

Block 9: Sechomib Area

Includes the area west of the Khumib River, south of the Nadas Drainage system, and east of the coastal plains.

Survey Time: 3 hours 24 minutes

Springbok	153	Ostrich	21
Gemsbok	14	Lappet-faced Vulture	1
Hartmann Zebra	24		

Block 10: Khumib River

The Khumib River from Orupembe to the sea.

Survey Time: 43 minutes

No animals were counted.

Block 11: The Otjiha-Okumutati Area

Includes the area north of the Okumutati-Orupembe road, the Otjiha Plains and the area east of the plains.

Survey Time: 2 hours 20 minutes

Hartmann Zebra	10	Ostrich	2
Black-backed Jackal	1	Karoo Korhaan	4
Elephant carcasses	2		

Block 12: Otjitambai Area

Includes the area between the Khumib and Hoarusib Rivers, south of the Okumutati-Orupembe road extended to the coastal plains. Including the Hoarusib River.

Survey Time: 1 hour 20 minutes

Hartmann Zebra	4	Lappet-faced Vulture	2
Elephant carcasses	11		
Black Rhinoceros carcasses	2		

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Block 13: Gomatum Area

Includes the area east and south of the Hoarusib River and north and west of the Gomatum River.

Survey Time: 2 hours 48 minutes

No animals were counted.

Block 14: Ganias Area

Includes the area west of the Tsuxub River, south of the Hoarusib River, north of the Hoanib River and east of the coastal plains.

Survey Time: 2 hours 35 minutes

Springbok	1	Ostrich	96
Gemsbok	69	Lappet-faced Vulture	9
Hartmann Zebra	3	Karoo Korhaan	17
Giraffe	6		

Block 14: Giribes Area

Includes the area west of Sesfontein, east of the Tsuxub River, south of the Gomatum River and north of the Hoanib River.

Survey Time: 3 hours 7 minutes

Hartmann Zebra	3	Ostrich	18

Block 16: Hoanib River

The Hoanib River west of Sesfontein to the sea.

Survey Time: 50 minutes

Gemsbok	1	Ostrich	6
Elephant	25	Lappet-faced Vulture	4
Giraffe	13	Karoo Korhaan	1
Elephant carcasses	11		

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Block 17: Coastal Plains

The coastal plains between the Kunene and Hoanib Rivers west of the dunes (approximately 10 km wide).

Survey Time: 2 horus 15 minutes

Black-backed Jackal	10	Cape fur Seal	1861*
Brown Hyaena	1		
Cape fur Seal carcasses	159		

* Photographic count.

Block 18: Beesvlakte

Includes the area north of the Ombonde River, west of the Veterinary fence, east of the Aap River and south of a line from Otjovasando west.

Survey Time: 1 hour 26 minutes

Gemsbok	9	Ostrich	7
Hartmann Zebra	5	Lappet-faced Vulture	12
Giraffe	14		
Elephant	5		
Kudu	3		
Elephant carcasses	9		

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TABLE 2: SUMMARY OF AERIAL GAME CENSUSSES CONDUCTED IN KAOKOLAND AND THE ADJACENT SKELETON COAST PARK

Date of Census	1969 unknown		1975 February		1976 October		1977 May		1977 August		1982 July	
Duration:	unknown		unknown		40 hours		25 hours		25 hours		35 hours	
Author:	E Joubert		P de Villiers		P J Viljoen		P J Viljoen		P J Viljoen		P J Viljoen	
Area Covered	Kaokoland		Kaokoland		Kaokoland and the Skeleton Coast Park		Western Kaokoland* and the Skeleton Coast Park		Western Kaokoland* and the Skeleton Coast Park		Western Kaokoland and the Skeleton Coast Park	
Species	Total	%**	Total	%**	Total	%**	Total	%**	Total	%**	Total	%**
Springbok	1 060	22,38	1 528	43,34	974	45,49	4 859	60,75	2 526	57,23	217	32,88
Gemsbok	637	13,45	590	16,73	593	27,69	1 191	14,89	1 182	26,78	164	24,85
Kudu	336	7,09	13	0,37	118	5,5	9	0,11	70	1,58	5	0,76
Giraffe	58	1,22	79	2,24	40	1,86	32	0,40	52	1,18	45	6,81
Burchell Zebra	1 476	31,17	323	9,16	137	6,3	667	8,34	55	1,24	0	0
Hartmann Zebra	735	15,52	803	22,77	117	5,46	1 199	14,99	492	11,14	193	29,22
Elephant	434	9,16	190	5,39	162	7,56	41	0,51	34	0,77	36	5,43
Black Rhinoceros	0	0	0	0	0	0	1	0,01	3	0,06	0	0
TOTAL	4 736	100,00	3 526	100,00	2 141	100,00	7 998	100,00	4 414	99,98	660	100,00

* West of the 150mm isohyet including the Beesvlakte

** Percentage of total

DAMARALAND AND THE ADJACENT PORTION OF THE SKELETON COAST PARK

Total census time: 49 hours 40 minutes.

The different census blocks are indicated in figure 2.

Counts in the Skeleton Coast Park and western Damaraland are represented together as the two areas cannot be ecologically separated and the boundary between them is totally artificial.

Block 19: Mudorib-Kharu-gaiseb Area

Includes the area west of the Mudorib River, north of the Kharu-gaiseb River, south of the Hoanib River and east of the coastal plains.

Survey Time: 3 hours 16 minutes

Springbok	4	Hartmann Zebra	19
Gemsbok	12	Ostrich	24
Giraffe	13	Lappet-faced Vulture	5
Black Rhinoceros	1	Karoo Korhaan	4
Elephant	1		

Block 20: The Kharokhaob Area

Includes the Kharokhaob Plains and the area east of the Mudorib River and west of the Kowarib Plains.

Survey Time: 3 hours 11 minutes

Gemsbok	2	Ostrich	10
Hartmann Zebra	64	Lappet-faced Vulture	1
Baboon	1 troup	Karoo Korhaan	1
Black-backed Jackal	1		
Elephant carcasses	6		

Block 21: Samanab Area

Includes the area west of the Obob River, south of the Kharu-gaiseb River, north of the Iniab River and east of the coastal plains.

Survey Time: 4 hours 30 minutes

Springbok	7	Ostrich	85
Gemsbok	32	Karoo Korhaan	2
Hartmann Zebra	45		

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Block 22: Obob-Barab Area

Includes the area west of the Barab River, north of the Iniab River and east of the Obob River.

Survey Time: 3 hours

Gemsbok	35	Ostrich	23
Elephant	3	Lappet-faced Vulture	17
Black Rhinoceros	6	Karoo Korhaan	3
Hartmann Zebra	100		
Elephant carcass	1		

Block 23: The Iniab River Area

Includes the area east of the Barab River, north of the Iniab River, south of the Kowarib Plains and west of the Grootberg Range and veterinary fence.

Survey Time: 4 hours 28 minutes

Springbok	2	Hartmann Zebra	60
Gemsbok	17	Ostrich	5
Kudu	8	Lappet-faced Vulture	3
Giraffe	27	Karoo Korhaan	7
Black Rhinoceros	10		
Elephant	51		
Elephant carcasses	7		
Rhinoceros carcasses	6		
Giraffe carcass	1		

Block 24: Rooiplaat Area

Includes the area north of the Agab River, west of the veterinary fence south and east of the Iniab River.

Survey Time: 1 hour 6 minutes

Springbok	27	Hartmann Zebra	32
Gemsbok	22	Ostrich	4
Giraffe	15	Karoo Korhaan	5
Elephant	4		

Block 25: Wêreldsend Area

Includes the area south of the Iniab and Agab Rivers, north and west of the veterinary fence and east of the coastal plains.

Survey Time: 4 hours 42 minutes

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Springbok	117	Ostrich	55
Gemsbok	56	Lappet-faced Vulture	3
Black Rhinoceros	2	Karoo Korhaan	12
Elephant	21	Black-backed Jackal	2
Hartmann Zebra	84		
Elephant carcasses	4		

Block 26: Kowarib Plains

Includes the Kowarib Plains south of the Hoanib River.

Survey Time: 4 hours

Springbok	3	Ostrich	25
Kudu	1	Lappet-faced Vulture	8
Elephant	11	Karoo Korhaan	24
Steenbok	1		
Hartmann Zebra	12		
Elephant carcasses	18		
Giraffe carcasses	2		
Rhinoceros carcasses	2		

Block 27: The Serengeti

Includes the drainage area east of the Kowarib Plains, south of the Ombonde River and west of the Omumborombanga drainage system.

Survey Time: 3 hours 5 minutes

Springbok	1	Hartmann Zebra	43
Gemsbok	73	Ostrich	12
Giraffe	80	Karoo Korhaan	1
Kudu	1	Baboon	1 troup
Steenbok	1		
Elephant	33		
Aardwolf	1		
Elephant carcasses	32		
Rhinoceros carcasses	10		
Giraffe carcasses	1		

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Block 28: The Omumborombonga-Palmfontein Area

Includes the Omumborombonga-Palmfontein drainage system, north and west of the veterinary fence, and south of the Ombonde River.

Survey Time: 2 hours 30 minutes

Springbok	2	Ostrich	1
Gemsbok	53		
Giraffe	55		
Elephant	7		
Hartmann Zebra	4		
Elephant carcasses	5		
Rhinoceros carcass	1		
Giraffe carcasses	3		

AREAS SOUTH OF THE VETINARY FENCE

Block 29: Proposed Damaraland Game Reserve Area

Include the fenced farms; West End, Tevrede, Marenphil, Swartskamp and De Ville.

Survey Time: 1 hour 4 minutes

Springbok	63	Hartmann Zebra	81
Gemsbok	50	Lion	6
Kudu	5	Honey Badger	1
Giraffe	41	Ostrich	1
Steenbok	1	Lappet-faced Vulture	3
Elephant	22	White-backed Vulture	1
Elephant carcasses	2		

Block 30: Palm-Juriesdraai Area

Includes the farms: Palmwag, Juriesdraai, Otjihavera, Palm, Spaarwater, Bergsig, Kliprivier, Tweespruit and Humor.

Survey Time: 4 hours 29 minutes

Springbok	54	Hartmann Zebra	1
Gemsbok	6	Black-backed Jackal	4
Kudu	24	Baboon	1 troup
Black Rhinoceros	3	Karoo Korhaan	9
Elephant	16		
Elephant carcasses	7		

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Block 31: Upper Huab Area

The Huab River from the farm Vrede up to the farm Tweelingskop.

Survey Time: 1 hour 21 minutes

Gemsbok	1	Giraffe	1
Kudu	2	Baboon	1 troup
Elephant	15		
Elephant carcasses	3		

Block 32: Koigab-Huab Area

Includes the area south of the veterinary line, north and west of the Huab River and east of the coastal plains.

Survey Time: 2 hours 21 minutes

Springbok	17	Ostrich	11
Gemsbok	9	Lappet-faced Vulture	7
Hartmann Zebra	11	Karoo Korhaan	6

Block 33: Ugab-Huab Area

Includes the area south of the Huab and Aba-Huab Rivers, north of the Ugab River, west of the farms and east of the coastal plains.

Survey Time: 4 hours 25 minutes

Springbok	12	Ostrich	15
Gemsbok	16	Lappet-faced Vulture	1
Black Rhinoceros	1	Karoo Korhaan	9
Hartmann Zebra	7		

Block 34: Coastal Plains

The coastal plains between the Hoanib and the Ugab Rivers, approximately 10 km wide.

Survey Time: 2 hours 12 minutes

Gemsbok	20
Black-backed Jackal	2
Cape fur Seal carcasses	17

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TABLE 3: SUMMARY OF AERIAL GAME CENSUSSES CONDUCTED IN DAMARALAND AND THE ADJACENT SKELETON COAST PARK

Date of Census	1975 February		1977 February		1978 October		1982 July	
Duration	± 4 hours		unknown		10 hours		50 hours	
Author	P de Villiers		G P Visagie		J le Roux		P J Viljoen	
Area Covered	North of the Veterinary Fence		unknown		Uninhabited area north of the Ugab River including the north-eastern corner		Uninhabited area north of the Ugab River including the north-eastern corner	
Species	Total	%	Total	%	Total	%	Total	%
Springbok	440	14,63	1 256	28,9	875	22,79	309	15,24
Gemsbok	455	15,13	692	15,92	825	21,48	404	19,93
Kudu	51	1,69	193	4,44	202*	5,26	41	2,02
Giraffe	114	3,79	91	2,09	94*	2,45	232	11,45
Hartmann Zebra	1 729	57,48	1 560	35,89	1 544*	40,21	563	27,77
Elephant	70	2,32	82	1,89	135*	3,51	184	9,08
Black Rhinoceros	10-25	0,33	16	0,37	12	0,31	23	1,13
Ostrich	139	4,62	456	10,49	153*	3,98	271	13,37
TOTAL	3 008	100,90	4 346	99,90	3 840*	99,90	2 027	99,9

* Totals wrongly added up in original report

SKELETON COAST PARK GAME COUNTS - JULY 1982

Most animals counted in the Park occurred near the border areas of Kaokoland and Damaraland. These animals utilize the areas on both sides of the border and the results given here are only a reflection of the situation during that specific time period. The actual numbers may change daily.

As mentioned previously, the Skeleton Coast Park area was not counted separately and the numbers given here must be subtracted from the appropriate survey blocks in Kaokoland and Damaraland. The numbers are given here separately for future comparative purposes.

Block 2: The Kunene River

Crocodiles	9	Elephant	6

Block 4: Dune Area

Gemsbok	10	Ostrich	7

Block 5: Engo Valley

Korhaan	6

Block 7: Bushman Paradise Area

Springbok	1	Ostrich	2

Block 8: Munutum-Nadas Area

Springbok	10	Karoo Korhaan	1
Ostrich	1	Lappet-faced Vulture	1

Block 9: Sechomib Area

Springbok	3	Ostrich	7

Block 10: Khumib River

No animals counted

Block 12: Otjitambai Area

Lappet-faced Vulture	1

Block 14: Ganias Area

Springbok	1	Ostrich	14
Gemsbok	49	Lappet-faced Vulture	1

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Block 16: Hoanib River

Giraffe	6	Ostrich	2
Elephant	25	Lappet-faced Vulture	1
Gemsbok	1		

Block 17: Coastal Plains

Black-backed Jackal	10	Cape fur Seal	1861 (Cape Fria)
Brown Hyaena	1		
Cape fur Seal carcasses	159		

Block 19: Mudorib-Kharu-gaiseb Area

Springbok	4	Ostrich	15
Gemsbok	7	Karoo Korhaan	2

Block 21: Samanab Area

Gemsbok	17	Ostrich	34

Block 25: Wêreldsend Area

Springbok	95	Ostrich	32
Gemsbok	49	Karoo Korhaan	5
Hartmann Zebra	59	Black-backed Jackal	2

Block 32: Koigab-Huab Area

Springbok	1	Ostrich	5
Gemsbok	4	Karoo Korhaan	5
Hartmann Zebra	1	Lappet-faced Vulture	7

Block 33: Ugab-Huab Area

Springbok	10	Gemsbok	5

Block 34: Coastal Plains

Gemsbok	20
Black-backed Jackal	2
Cape Fur Seal carcasses	17

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TABLE 4: TOTAL NUMBER* OF GAME COUNTED IN THE SKELETON COAST PARK - JULY 1982

Springbok	125
Gemsbok	162
Giraffe	6
Hartmann Zebra	60
Elephant	31
Black-backed Jackal	14
Brown Hyaena	1
Cape Fur Seal	1861**
Ostrich	119
Karoo Korhaan	19
Lappet-faced Vulture	11
Crocodile	9
Cape Fur Seal carcasses	176

* Totals must be subtracted from those of Kaokoland and Damaraland.

** Photographic count.

SPECIES ACCOUNT

Only those species of which a representative sample of the population has been obtained is discussed here. Other species were recorded, purely to determine their distribution.

TABLE 5: SPRINGBOK

Social structure and habitat preference, July 1982

	Kaokoland		Damaraland		Both Areas	
Numbers	217		309		526	
Social structure:						
numbers of groups	28		45		73	
mean size	7,75		6,87		7,21	
standard deviation	17,86		8,28		12,72	
range	1 - 75		1 - 38		1 - 75	
Habitat Preference:	No	%	No	%	No	%
River courses	0	0	1	0,32	1	0,19
Gravel plains	187	86,18	198	64,08	385	73,19
Sandy plains	30	13,82	63	20,39	93	17,68
Mountains	0	0	47	15,21	47	8,94
Reproduction	x		x		x	

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x Springbok lambs were seen from the air, but since they are difficult to distinguish from the adults at a distance, they were not counted separately. However, ground surveys indicate a lambing percentage of 17%.

In Kaokoland, the highest concentration of springbok occurred in the vicinity of the Ogams Waterhole, where 70,51 percent of the total were found. The rest of the springbok population is scattered in small groups, or as individuals, thoughout the region.

In Damaraland their highest concentration (37,86%) occurred on the plains south of the western section of the Iniab River. Most of them were inside the Skeleton Coast Park. This is followed by the north-eastern corner of Damaraland, where 20,39 percent of the springbok population occurred in the proposed game reserve area.

TABLE 6: GEMSBOK

Social structure and habitat preference, July 1982.

	Kaokoland		Damaraland		Both Areas	
Numbers	164		404		568	
Social structure:						
number of groups	37		87		124	
mean size	4,43		4,64		4,58	
standard deviation	5,77		4,97		5,2	
range	1 - 31		1 - 29		1 - 31	
Habitat Preference:	No	%	No	%	No	%
River courses	1	0,61	22	5,45	23	4,05
Gravel plains	94	57,32	200	49,50	294	51,76
Sandy plains	62	37,8	83	20,54	145	25,53
Mountains	7	4,27	99	24,5	106	18,66
Reproduction	0		0		0	

No gemsbok calves were seen during this survey, and since 1980, only two calves were seen.

In Kaokoland the highest concentration of gemsbok (42,07%) occurred in the vicinity of the Ganias Waterhole, followed by the plains west of Orupembe where 13,41 percent were found.

In Damaraland the gemsbok were more evenly distributed, with 18,07 percent in the Serengeti area, 13,86 percent on the plains south of the western Iniab River, 13,12 percent in

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the Omumborombonga area and 12,38 percent on the proposed game reserve farms. The rest are scattered in small groups throughout the whole region.

TABLE 7: GIRAFFE

Social structure and habitat preference, July 1982

	Kaokoland		Damaraland		Both Areas	
Numbers	45		232		277	
Social structure:						
number of groups	16		75		91	
mean size	2,81		3,09		3,04	
standard deviation	2,32		2,45		2,42	
range	1 - 9		1 - 13		1 - 13	
Habitat Preference:	No	%	No	%	No	%
River courses	23	51,11	34	14,66	57	20,58
Gravel plains	6	13,33	35	15,09	41	14,8
Sandy plains	9	20,00	32	13,79	41	14,8
Mountains	7	15,56	131	56,47	138	49,82
Reproduction	1		0		1	

Only one giraffe calf was seen in the Hoanib River.

In Kaokoland the giraffes are restricted to the plains west of Orupembe, the Ganias-Hoanib River area and on the Beesvlakte.

In Damaraland the highest concentration (58,19%) occurred in the Serengeti-Omumborombonga-Palmfontein area with the rest mainly restricted to a zone west of the abovementioned area.

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TABLE 8: HARTMANN ZEBRA

Social structure and habitat preference, July 1982.

	Kaokoland		Damaraland		Both Areas	
Numbers	193		563		756	
Social structure:						
number of groups	46		136		182	
mean size	4,2		4,14		4,15	
standard deviation	2,29		2,54		2,48	
range	1 - 14		1 - 15		1 - 15	
Habitat Preference:	No	%	No	%	No	%
River courses	3	1,55	31	5,51	34	4,5
Gravel plains	59	30,57	253	44,94	312	41,27
Sandy plains	50	25,91	27	4,8	77	10,19
Mountains	81	42,0	252	44,76	333	44,05
Reproduction	0		0		0	

No zebra foals have been seen in Kaokoland and Damaraland since 1980.

In Kaokoland the highest concentration (40,93%) during this survey occurred in the region of the Orumwe Waterhole in the Hartmann Valley. This is followed by the plains west of Orupembe where 28,49 percent of the Hartmann Zebras in Kaokoland occurred.

In Damaraland the highest concentration (17,76%) occurred in the Obob Watershed followed by 14,92 percent on the plains south of the western section of the Iniab River, 14,39 percent on the proposed game reserve farms, 11,37 percent on the Kharokhoab Plains and 10,66 percent in the Iniab River drainage system. The rest was scattered in small concentrations throughout the whole region.

During June 1982, 250 Hartmann Zebras were translocated from the Etosha National Park to Wêreldsend in Damaraland. Most of these zebras were marked with red paint and ear tags. During the survey, red painted zebras were seen at widely different locations - on the plains south of the western Iniab River, in the upper reaches of the Aub River and at the Omumborombonga Waterhole.

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TABLE 9: BLACK RHINOCEROS

Population structure, Social structure and Habitat preference.

	Damaraland	
Numbers	23	
Population structure	No	%
adult ♂	10	43,48
adult ♀	6	26,09
subadult	3	13,04
juveniles	0	0
unknown	4	17,39
Social structure		
number of groups	18	
mean size	1,28	
standard deviation	0,45	
range	1 - 2	
Habitat preference	No	%
River courses	6	26,09
Gravel plains	4	17,39
Mountains	13	56,52

No Black Rhinoceros calves were seen during this survey.

In Kaokoland no Black Rhinocerosses were seen at all but relatively fresh spoor was noticed in the Munutum-Nadas area and in the vicinity of the Tsuxub River. Over the rest of the area no sign of rhinocerosses were seen.

In Damaraland, the Black Rhinoceros were largely concentrated in four areas. Viz the Obob-Barab area, the upper reaches of the Aub River, north of Otjihavera and south of the veterinary fence on Palm and Juriesdraai.

The sex ratio was 1,67 adult males per female. The carcass to live animal ratio was 1,09 live rhinocerosses per carcass.

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TABLE 10: ELEPHANT

Population structure, Social structure and Habitat preference, July 1982.

	Kaokoland		Damaraland		Both Areas	
Numbers	36		184		220	
Population structure:	No	%	No	%	No	%
Adult ♂♂	7	19,44	14	7,6	21	9,54
Adult ♀♀	26	72,22	100	54,34	126	57,27
Subadult (3 to 10 years)	3	8,33	58	31,52	61	27,72
Juvenile (1 to 3 years)	0	0	11	5,97	11	5,0
Calf (≤ 1 year)	0	0	1	0,54	1	0,45
Social Structure:						
number of groups	5		30		35	
mean size	7,2		6,13		6,29	
standard deviation	6,01		4,06		5,08	
range	3 - 19		1 - 15		1 - 19	
Habitat Preference:	No	%	No	%	No	%
River courses	36	100,0	50	27,17	86	39,09
Gravel plains	0	0	11	5,98	11	5,0
Sandy plains	0	0	22	11,96	22	10,0
Mountains	0	0	101	54,89	101	45,9

Only one calf (<1 year) was seen during this survey.

Apart from a 137 elephants (determined by previous aerial and ground surveys) in the east of Kaokoland (which was not included in this survey) the only other elephants in Kaokoland occurred along the border areas in the Kunene and Hoanib Rivers. With a few exceptions most of the elephants utilize the adjacent areas, rather than Kaokoland itself.

In Damaraland 53 elephants occurred south of the veterinary fence, mainly in the Kliprivier-Huab area and on the proposed game reserve farms. North of the veterinary fence the elephants were mainly concentrated in the Omumborombonga-Serengeti area, the mountains north of Otjihavera, the Wêreldsend-Rooiplaat area and on the Kowarib Plains.

On the basis of the elephant's geographical distribution, their home ranges, adaptation to different environmental conditions and external morphology (such as tusk formation) two distinct populations can be distinguished in Kaokoland, Damaraland and the Skeleton Coast Park, with a third transitional population which shows characteristics common to both the other populations.

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TABLE 11: A BREAKDOWN OF THE DIFFERENT ELEPHANT POPULATION STRUCTURES IS AS FOLLOWS

	Western desert population	Transitional population	Eastern population	Total
Numbers	70	80	207*	357
adult ♂♂	7	2	19	28
adult ♀♀	48	44	133	225
subadult	13	28	44	85
juvenile	2	5	9	16
calf	0	1	2	3

* This includes 137 elephants from the east of Kaokoland which were not included in this survey.

The sex ratio was 6 adult females per adult male. The carcass to live animal ratio was 1,81 live animals per carcass.

TABLE 12: OSTRICH

Population structure, Social structure and Habitat preference, July 1982.

	Kaokoland		Damaraland		Both Areas	
Numbers	264		271		535	
Social structure:						
number of groups	86		72		158	
mean size	3,07		3,76		3,39	
standard deviation	5,41		3,78		4,73	
range	1 - 40		1 - 24		1 - 40	
Habitat Preference:	No	%	No	%	No	%
River courses	22	8,33	0	0	22	4,11
Gravel plains	101	38,26	233	85,98	334	62,43
Sandy plains	132	50,0	16	5,9	148	27,66
Mountains	8	3,03	22	8,12	30	5,6
Dunes	1	0,38	0	0	1	0,19
Population Structure:	No	%	No	%	No	%
adult ♂♂	74	28,03	94	34,69	168	31,4
adult ♀♀	44	16,67	56	20,66	100	18,69
chicks	126	47,73	111	40,96	237	44,29
unknown	20	7,57	10	3,69	30	5,6

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The sex ratio for the ostrich population in Kaokoland and Damaraland was 1,68 adult males per adult female. The total figure for the ostrich population is not a true reflection, as nearly half of those counted were newly hatched chicks, which have a high mortality rate.

In Kaokoland the highest concentration (36,36%) occurred in the vicinity of the Ganias Waterhole, followed by 19,32 percent in the Marienfluss.

In Damaraland the highest concentration (31,36%) occurred in the Samanab River area, followed by 20,29 percent on the plains south of the western section of the Iniab River. The rest are scattered in small groups on the plains, while the mountains are generally avoided.

TABLE 13: KAROO KORHAAN

Social structure and habitat preference, July 1982.

	Kaokoland		Damaraland		Both Areas	
Numbers	114		83		197	
Social structure:						
number of groups	60		48		108	
mean size	1,9		1,73		1,82	
standard deviation	0,573		0,792		0,681	
range	1 - 3		1 - 5		1 - 5	
Habitat Preference:	No	%	No	%	No	%
River courses	20	17,54	1	1,2	21	10,66
Gravel plains	25	21,93	61	73,49	86	43,65
Sandy plains	46	40,35	0	0	46	23,35
Mountains	23	20,18	21	25,3	44	22,34

Karoo Korhaan chicks were observed during ground surveys.

In Kaokoland the only concentration occurred in the Hartmann Valley (48,24%) whereas, in Damaraland and the rest of the region, they were scattered in small groups.

DISCUSSION

Unfortunately most of the previous aerial surveys are not comparable, especially to determine trends. This is because the duration was not the same, the areas covered varied and the seasons in which such surveys were conducted differ.

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This is clearly reflected in Table 2, where the results of the surveys, even those conducted in the same year, spanning the same time duration and covering the same area, showed a marked difference. For example, the May 1977 survey represents an increase of 366,2 percent in game numbers, compared to the previous survey. The main criterion being the season in which the survey was conducted. In the desert regions the tree density is so low that their phenology does not affect visibility seasonally but the seasonal habitat preferences,migration, and social structure of game has a marked influence on their visibility. For example, in the hot dry season (October - February) the game is dispersed in small groups mainly in the mountains and river courses, where they are not easily seen from an aeroplane. In contrast during the rainy season (March - May) and to a lesser extent the cold dry season (June - September) the game occurs in large groups and are mainly concentrated on the open plains. This increase their visibility (one animal versus a herd) and results in optimum numbers.

Therefore, to be comparable, care was taken to duplicate the methods of the present survey as far as possible with those of the August 1977 survey in Kaokoland - The same type of aeroplane was used, the census was conducted during the same season, the same survey blocks were used, the same speed and height were maintained and the navigator was the same. As far as the climate was concerned, the rainfall was roughly the same during this survey as that in 1977. Therefore the chance to see a specific number of game was the same between the two surveys. Thus, although the number of game counted during the two censusses are not the exact amount of game occurring in Kaokoland, the percentage increase or decrease in numbers are a true reflection of changes in the status of the game.

With the abovementioned in mind the following conclusions are drawn regarding the changes in the status of the game in Kaokoland.

TABLE 14: COMPARISON BETWEEN THE AUGUST 1977 AERIAL SURVEY AND THE JULY 1982 AERIAL SURVEY IN KAOKOLAND (TABLE 2)

Specie	Aug 1977 Survey	June 1982 Survey	Increase or decrease in status
Springbok	2 526	217	91,41 percent decrease
Gemsbok	1 182	164	86,13 percent decrease
Kudu	70	5	92,86 percent decrease
Giraffe	52	45	13,46 percent decrease
Burchell Zebra	55	0	100,00 percent decrease
Hartmann Zebra	492	193	60,77 percent decrease
Elephant	34	36	5,56 percent increase**
Black Rhinoceros	3	0	100,00 percent decrease
Ostrich	327	264	19,27 percent decrease
Karoo Korhaan	445	114	74,38 percent decrease
TOTAL	5 186	1 038	- *

* The mean percentage decrease of game numbers in Kaokoland is 79,98 percent.

** Ground surveys in 1977 revealed that most of the elephants occurred just over the border in Damaraland so that the amount of elephants counted in 1982 is not a real increase.

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In Damaraland, the present survey cannot be compared with the previous surveys. Mainly because the intensity and duration of the previous surveys were much lower (Table 3) but also because the seasons differ and the areas covered varied. But even so, although the present survey was five times more intensive than in 1978 (Table 3) there is still a marked decrease in most of the animal numbers. Notable exceptions are the elephant, giraffe and Black Rhinoceros but the larger number counted are only a reflection of the intensity of the present survey. The decrease in most animal numbers are attributed to the extremely severe four year drought, just prior to the aerial survey. But, as sustained by ground surveys, the increase in the amount of elephants, giraffes and Black Rhinocerosses, are not an increase in their status but a reflection of the intensity of this survey and a clear indication that they were less affected by the drought.

The intensity of the four year drought was the same in Damaraland and Kaokoland and with the lack of other comparable data, it is concluded that the decrease in animal numbers in Damaraland is probably the same as in Kaokoland.

What is even more disturbing, is the very low or zero reproduction rate of nearly all the animals (see species account). In the case of the Hartmann Zebra, Gemsbok and Kudu this is probably a direct result of the drought. However, in the case of the Elephant, Black Rhinoceros and Giraffe this is a combined result of the drought and the high occurrence of disturbance (chased by vehicle, aeroplane) and illegal hunting.

As indicated by the very high carcass to live animal ratio and the low reproduction rate in the elephant and Black Rhinoceros populations (see species account) there must also have been a marked decrease in the numbers of these species during the last three years (the age of the oldest carcasses). Ground investigations of the carcasses revealed that 86,78 percent of the elephants were shot and the rest died of natural or unknown causes. (There is evidence that in two cases the animals were chased to death by vehicle and aeroplane.)

During this survey, four hunting parties were spotted. By tracking them with the aid of the aeroplane, officials from the Department of Nature Conservation managed to arrest one of them. At present, with the low numbers and low reproduction rate, the high intensity of illegal hunting has a drastic affect on the animal populations. If this is not stopped the animals will not be able to restore their original numbers and some will become extinct. Already the Black Rhinocerosses in Kaokoland and the elephants in western Kaokoland has nearly been exterminated.

From an aesthetic, conservation, scientific and economic point of view, the combination of animals, plants and environment in the Northern Namib is one of SWA's most unique assets. With the present alarming state of affairs

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the uniqueness of this region is being destroyed at a fast rate. It is recommended that the conservation of this region receive the utmost priority and that no hunting concessions be granted until the game numbers show an improvement. This is our heritage and by virtue of our ability to manipulate nature, our responsibility. Let us not neglect it, or it may be lost forever.

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FIGURE 1: LOCATION OF CENSUS BLOCKS USED IN THE JULY 1982 AERIAL SURVEY IN KAOKOLAND.

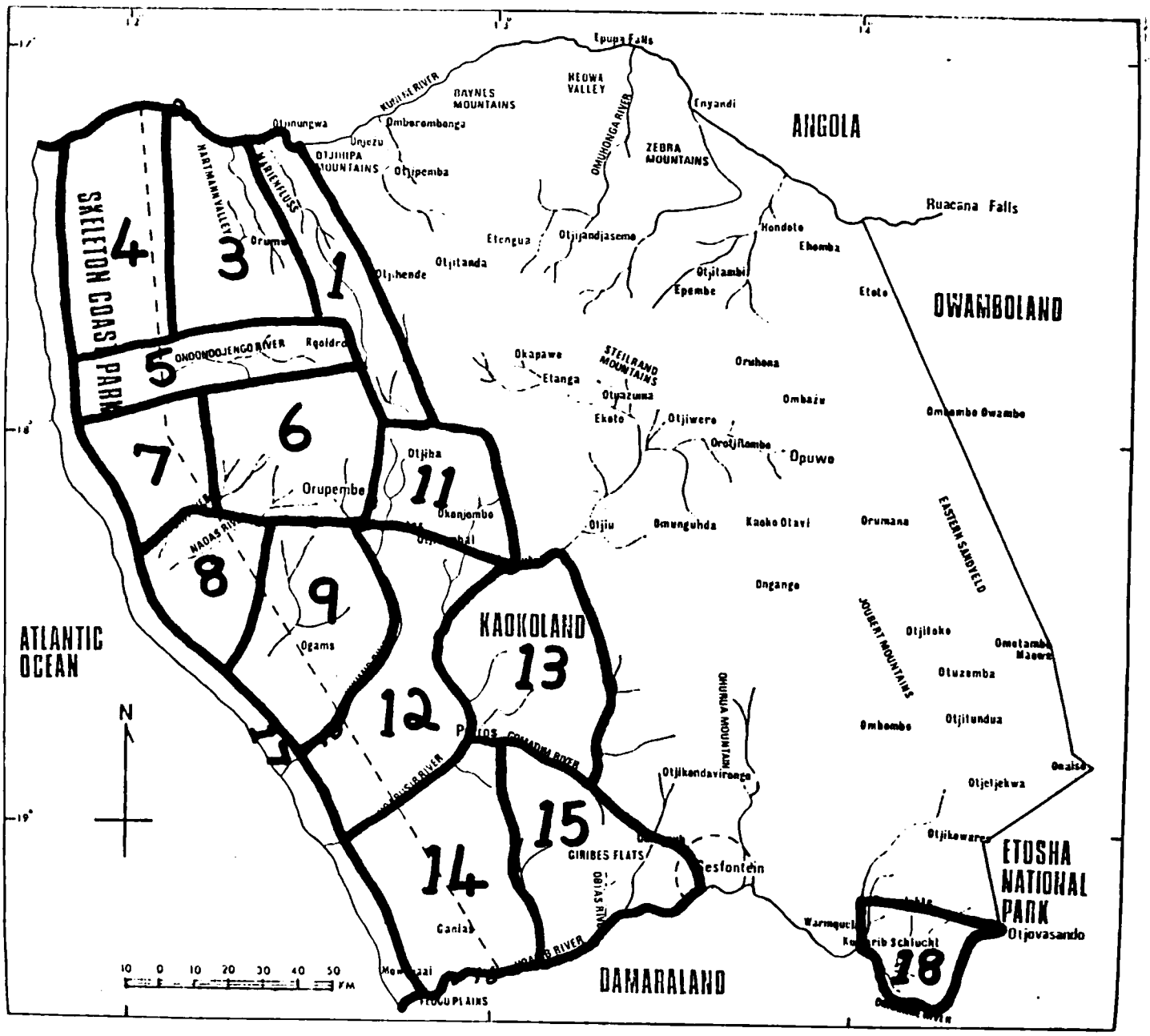

FIGURE 1: LOCATION OF CENSUS BLOCKS USED IN THE JULY 1982 AERIAL SURVEY IN DAMARALAND