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Abstract: A short description is given of the physiographic, vegetation and climatic conditions of Namibia. The influence of modern man on game animals is given with examples of various situations. The distribution and status of the larger mammals in Namibia were determined by various methods such as questionnaires, aerial surveys and collection of personal communications. An evaluation of these methods is presented. 61% of the questionnaires have been returned. The distribution and status of 24 game species, 11 predator species and 7 other species in all of Namibia is given. Approximately 60 percent of all game species and 90% of the animals occur on private land. Of the eleven predators dealt with in the paper, lions, wild dogs, and brown hyenas show a marked decline in numbers as well as in distribution since 1934. During antecedent years the number of cheetahs have apparently increased on farmland. This might be attributed to two factors. First, since other predators such as lion, hyena and Cape hunting dogs have been virtually eradicated, the cheetah's cubs have a better chance to survive. The second factor is the increasing of kudu in the country, that insured a better supply of food. The questionnaire estimate by farmers of approximately 6252 for farmland is only little higher than a recent official estimate and the authors feel that this figure should be accepted as the population for Namibia.

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Distribution patterns and status of some mammals in South West Africa

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ABSTRACT

A short description is given of the physiographic, vegetation and climatic conditions in South West Africa. The influence of modern man on game animals is given with examples of various situations. The distribution and status of the larger mammals in South West Africa were determined by various methods viz. questionnaires, aerial surveys and personal communications. An evaluation of these methods are given. The questionnaire returns gave a percentage return of 61,0 percent. The distribution and status of 24 game species, 11 predator species and 7 other species in all of South West Africa is given. Analysis of the figure indicate that approximately 60 percent of all the game species occur primarily on privately owned land. Based on actual numbers of all the various species it means that approximately 90 percent of the game, occur on farmland. Of the eleven predators dealt with in the paper, three predators viz. lion, Cape hunting dog and the brown hyaena show a marked decline in numbers as well as distribution since 1934.

1 INTRODUCTION

The ever increasing shortage of red meat in Southern Africa has in recent years caused a growing awareness that our indigenous game species are an unutilized resource. At present, various research projects are under way to test the practicability of game ranching and the consumer's attitude towards venison. The question is however more often raised on as to what exactly the present situation is, regarding the status and distribution of game in South West Africa. This paper is the first comprehensive work on both the distribution and status of the wild ungulate mammals in all of South West Africa.

A number of works on the distribution of mammals in South West Africa exist. The oldest accounts of this century are those by the German Colonial Office (1913) and by Fischer (1914). More recent publications include the following: Wilhelm (1931), Shortridge (1934), Bigalke (1958), van der Spuy (1962) and Sidney (1965). Unfortunately most of these works have some serious shortcomings, mainly due to the lack of an intimate knowledge of the total area, which in turn can be ascribed to the vastness of the territory and in the past, the inaccessibility of large tracts of this territory. The work by Shortridge is a compilation of older literature and is therefore an important historical summary. This background is used extensively by the present authors as a basis for obtaining further information on past distribution. Shortridge however, hardly gives any figures to describe the status of most of the mammals.

After the first official attempt at a game census in 1913, another was undertaken during 1955/1956 by the Police authorities. The work by Bigalke (1958) was based on the result of this survey. Unfortunately Bigalke was not able to fully analyse this information and his paper is vague since no maps were used, giving little information on distribution, and nothing on the status of the majority of species.

At the request of the Nature Conservation and Tourism Division another census was done in 1960 and this took the form of a questionnaire, delivered to farmers by police officers. Van der Spuy (1962) based his work on the results of this survey, but unfortunately deals only with six species, i.e. kudu, gemsbok, springbok, eland, hartebeest and mountain zebra. A limitation of van der Spuy's work is that it

only covered the farms in S.W.A. and excluded some of the tribal territories as well as the Etosha National Park, Namib Desert Park and Diamond areas No's 1 and 2. Almost all these areas contain large numbers of game. An advantage of van der Spuy's work, however, is that it was based on questionnaire returns, and since the present work also covered the farms with questionnaires, the results are largely comparable. The distribution in the other areas was determined by aerial surveys and personal communications.

As the Eastern Caprivi is administered from Pretoria and since neither of the authors have experience of that area it is excluded from this paper.

2 RESUME OF PHYSICAL GEOGRAPHY

2.1 Physiography

South West Africa may be divided into the following regions:

2.1.1 The coastal desert in the west

2.1.2 The escarpment

2.1.3 The plateau to the east

2.1.1 The desert is known as the Namib. It stretches along the Atlantic coast and being about 80 km wide, covers the region between the coast and the foot of the escarpment zone. In its northern half the desert consists of pediplains, with dunes mainly in the proximity of the coast. South of the Kuiseb River, dunes cover the desert from the coast almost to the foot of the escarpment zone. The inland portion of the Namib is subdesert (sometimes known as the pre-, pro- or inner-Namib) receives scattered showers during some summers. Perennial waterholes are virtually non-existent in this area. The vegetation is sparse and for the greater part the ground surface is bare.

2.1.2 The escarpment is not a true escarpment as found on the south-eastern side of the subcontinent, but rather a mountainous transition belt, stretching from the inland plateau to the pre-Namib flats. The mountains reach heights of more than 2 000 m and are formed mostly by folded Nosib and Damara sediments that rise above the surrounding granites and gneiss which have been more severely weathered and eroded. All of the seasonal rivers in South West Africa originate in this mountain zone. The larger of these rivers, such as the northern Koichab, Hoarusub, Huab, Omaruru, Swakop and Kuiseb Rivers, drain exoreically into the Atlantic Ocean. Most of the smaller ones, such as the Munutum, Sechomib, Tsondeb, Tsauchab and southern Koichab Rivers, drain endoreically into inland vleis and pans or the waters merely disappear in the dunes. Perennial waterholes are relatively plentiful in this mountainous zone and are situated mostly in the riverbeds. The vegetation on the escarpment is dense and of a much more complex and varied (Joubert, 1971 and 1973) than the vegetation found in the Namib desert.

2.1.3 The inland plateau forms part of the great subcontinental plateau of southern Africa. It reaches

its highest elevations, ranging between 1 500 to 2 000 m, along the western rim. This largely forms the watershed between the catchment areas of the rivers draining into the Atlantic Ocean and the endoreic basins of the Kalahari and to a lesser extent the Etosha Salina. Apart from various drainage lines in the north-west that drain into the Etosha pan, this plateau is also drained in the north-east by a number of omurambas (drainage lines) into the Okavango River, and in the central and south-eastern parts by the Nossob and Auob Rivers into the Molopo River. Two other rivers, both seasonal, drain parts of the inland plateau seawards, the Ugab River in the north and the Fish River in the south. The latter first flows into the Orange and thence into the ocean. The inland plateau is for the greater part a featureless plain covered by calcareous sands, gravel and secondary limestone. Rubble calcrete sometimes forms pronounced ridges. The soil is seldom more than a meter deep. Towards the east the soil varies between clay and sand, the latter forming pronounced dunes. These dunes are mostly stabilized by a typical thicket and woodland vegetation. Perennial waterholes in this region are rare.

2.2 Climate

Generally speaking, temperatures and rainfall are the two main physical factors in determining the distribution of fauna and flora, with the latter actually being the more important. During the summer months of November, December and January daytime temperatures of 40°C or more are reached. From approximately April until September the days are moderately warm reaching temperatures of 30°C. During this period the nights are sometimes extremely cold with frost occurring often. The rainfall is usually of the thunderstorm type. The annual rainfall pattern is extremely irregular and being patchily dispersed, and most areas experience long droughts. The isohyets are more or less parallel to the coastline and the mean annual rainfall increases to the east and north. The rainfall varies from approximately 600 mm per annum in the north eastern corner of the territory to less than 25 mm per annum in the west and extreme south. The decline in rainfall is very sudden from the 600 mm to the 400 mm isohyet, and by studying the rainfall map it is quite clear that approximately 1/5 of the territory can be considered sub-humid, 3/5 semi-arid to arid and 1/5 as extremely arid (the Namib Desert region).

2.3 Vegetation

The vegetation has been described by various workers, Engler (1910), Boss (1934), Pole Evans (1936), Range (1940), Keet (1949) and Giess and Tinley (1966). More recently, Giess (1971) published a comprehensive and detailed description of the vegetation of South West Africa including a map. Giess is followed in this botanical description. Within the three major physiognomic groups viz. desert, savanna and woodland Giess recognizes 15 main vegetation types (see map).

2.3.1 Deserts

Giess (1971) divided the Namib desert into four zones, (i) Northern Namib, (ii) Central Namib and (iii) Southern Namib (basically on geomorphological grounds) and in the extreme southern portion of the Namib, the (iv) Desert and Succulent Steppe (on grounds of the winter rainfall that this area receives). Inland, in the relatively small fringe of halophytic vegetation around the Etosha Pan, Giess recognizes his fifth desert region, the (v) Saline Desert with Dwarf Shrub Savanna Fringe.

2.3.2 Savannas

According to Giess (1971) the savanna region can be subdivided into eight distinct zones on the basis of characteristic plants species. Briefly these zones are the following:

- i) Semi-desert and Savanna Transition (Escarpment zone) which as the name implies lies along the Namib Desert — Escarpment junction and receives an annual rainfall of 100 mm or less.
- ii) Mopane Savanna, with the characteristic plant species being *Colophospermum mopane*. The mopane occurs either as shrub or tree, depending on local edaphic and rainfall conditions, varying from dense woodland in areas to a shortstemmed shrub with scattered trees.
- iii) Mountain Savanna and Karstveld, which has a relatively wide distribution and includes all of the Karstveld, excluding the areas covered by mopane. This vegetation type has a very characteristic tree stratum, characterized by *Kirkia acuminata* on the dolomite ridges and *Peltophorum africanum* on the more sandy plains.
- iv) Thornbush Savanna (tree and shrub savanna), which covers most of the central region of South West Africa. The vegetation consists mostly of grassland with trees and shrubs in dense or open clumps.
- v) Highland Savanna (Bergthorn Savanna), in the mountainous area of the Khomas Hochland, as far south as Rehoboth, with the most characteristic trees being *Acacia hereroensis*, *Combretum apiculatum* and *Ozoroa crassinervis*.
- vi) Dwarf Shrub Savanna, consisting of Karoid shrubs with *Rhigozum trichotomum* as the most dominant species. This vegetation type covers the arid plains of the southern part of South West Africa.
- vii) Camelthorn Savanna (Central Kalahari) with *Acacia giraffae* in an open savanna or parkland landscape. This vegetation type is mostly sandbound.

- viii) Mixed Tree and Shrub Savanna (Southern Kalahari) in the longitudinal red dune area of the south eastern part of the territory. *Acacia haematoxylon* in either shrub or tree being the most typical plant.

2.3.3 Woodland

Giess (1971) recognizes only one tree woodland viz. (1) Tree Savanna and Woodland in the north eastern corner of the territory with its relatively high rainfall. Two trees dominate the tree canopy ie *Pterocarpus angolensis* and *Baikaea plurijuga*. Along the lower reaches of most of the larger rivers, one finds tall trees on the alluvial deposits. Giess (1971) classifies these riparian trees into a second woodland which he calls Riverine Woodland. The dominant trees are mostly *Acacia albida* and *A. giraffae*.

3 THE INFLUENCE OF MAN

When man first settled South West Africa he had an adverse effect on the wildlife. The availability of water for wildlife is one of the most important single aspects in their struggle for survival in SWA with its relatively arid climate and limited water-holes, especially in the plateau regions. As human settlement developed around permanent waterholes, these became unavailable for wildlife. With the development of drilling machines new boreholes were constantly being sunk resulting in new, sometimes virgin territory, being occupied by pastoralists. Apart from competing with livestock for water, wildlife also faced competition from livestock for food. The wildlife were thus also forced into competition for living space by the livestock. With the increase in human population, hunting pressure also increased and large numbers of game were shot out. Farming practices as such, also took its toll, especially among the predators whose numbers were severely reduced and in some cases they have even been completely wiped out on farm land eg. lion. The fencing off of farms and the subdivision of the farms into even smaller camps resulted in the game being more easily hunted. A decade ago however, a significant change in attitude towards game became noticeable amongst farmers. This awareness was heightened in 1968 when they received by Ordinance, the ownership of game on their lands and they began to realise the full financial implications of this.

Although most of the wildlife species have had their numbers reduced, several species apparently gained certain benefits. The more obvious example being the herbivorous game species which benefitted by the reduction of certain predator species. Certain species also benefitted by the improvement of their habitat, due to human interference. One of the classic examples of habitat improvement in South West Africa is related to the kudu. The kudu habitat has been improved by bad management practices on many farms, which lead to overgrazing with resulting bush encroachment, as well as by the installation of watering points for cattle all over the farms. This is also clearly illustrated by the increase in

their numbers during the last decade (B. J. G. de la Bat, *pers. com.*).

Other species were also adaptable to changing conditions, and benefitted from a reduction in competition from the more sensitive species which could not adapt themselves and suffered a decline in their numbers. One example is that of springbok and sheep which utilize virtually the same habitat. In South West Africa sheep farming and springbok populations have been and are linked in various ways. Although no figures are available, all indications in old reports and reference works are, that earlier this century the springbok population must have been considerable. With increased human settlement and intensified farming these populations as mentioned earlier, first declined and were then stabilized. At this stage the approach to sheep farming management also changed. Instead of having a flock of sheep with a shepherd to look after them, large tracts of land were fenced off with jackal proof fences and all sheep predators in this enclosed areas were eradicated. Sheep were then allowed to run on their own in these camps. As can be expected, this situation also had several advantages to the resident springbok populations.

With the sheep predators eliminated is meant that they also had no natural enemies left. With the shepherd and his dogs not looking after the sheep anymore, it also meant that the human interference was reduced. Added to this, is the fact that farmers now also started to care for their springbok and the ownership of a springbok herd today almost has a prestige value. During the last decade there has been a steady increase in springbok numbers on farms.

Warthog and dassies, because of the reduction of their predators, are two other species which have increased considerably during the last decade. So much so, that both are causing concern to farmers, especially the dassies in the south. The Division for Nature Conservation and Tourism has also been requested by farmers to render help and reduce the number of hartebeest and giraffe on their land in certain restricted localities. A species which does not seem to be able to hold its own, is the gemsbok. Although still distributed throughout most of South West Africa there has been little increase in their numbers.

4. METHODOLOGY AND EVALUATION

Due to practical considerations no uniform method could be used to cover all of South West Africa. Questionnaires could only be used for the portion of South West Africa which is divided into farms. For the game reserves aerial surveys were carried out and a combination of the latter plus additional information from various authoritative officials with an intimate knowledge of the various homelands, was used for all the other areas. The questionnaire results were analysed according to Bigalke and Bateman's (1962) „percentage occurrence” method. To quote — „For all animals in each district the ratio of the number of returns recording the species as

present to the total number of completed questionnaires received was expressed as a percentage". Thus in the Gobabis district, of 480 completed questionnaires received, 273 reported the presence of springbok. Evaluated, as a percentage, this gives the figure 56,9 (Table 1).

4.1 Questionnaires:

The basis of this census was roneod questionnaires, on which amongst other things, the occupiers of farms were asked to record the presence and their estimates of the number of each game species occurring on their properties. Addresses were obtained from the Department of Internal Revenue and the questionnaires were mailed. A reminder was sent off to all the farmers after four months. Each returned questionnaire was ticked off against a checklist and the farm from which it came, was marked on a 1:1 000 000 scale map of the farms in South West Africa. Map 3 illustrates the farms that returned the questionnaires. From it can be seen at a glance where there are gaps in the distribution of all species, due to the fact that no questionnaires were received for those areas. The information on the questionnaires was processed and transferred to summarization sheets from which the final analyses were made. For each of the magisterial districts, maps showing the various farms were used to plot the distribution of the various species. One map per species per magisterial district was used. From these maps, a final map was drawn for each species, showing the quarter degree square distribution on farms in all of South West Africa.

The validity of the information obtained with the aid of questionnaires is debatable, but the authors feel that if the limitations of this method are kept in mind, very useful information could be obtained, especially regarding the distribution of the various species and to some extent of their status. The senior author, in the line of duty, visited many farms, and found that the farmers did display certain tendencies. Those animals on which they placed a certain value viz, gemsbok and springbok they either knew accurately or tended to under estimate, while the animal species which caused them problems such as jackal and Hartmann mountain zebra were overestimated. Furthermore, if the numbers of a specific species were high they also tended to over estimate the population. Generally speaking there seemed to be a bias towards overestimation. Of all the game species occurring on farms in South West Africa, kudu is the one that gave the farmers the most problems when it came to estimating their numbers. This is mainly due to their secretive ways and the fact that ordinary fences do not restrict their movement. As their home ranges are also normally spread over a number of farms this complicated matters further, because a number of farmers would record the same group of kudu.

It was difficult to decide what to make of the figures on the questionnaire returns. The following lines of thought were followed. The completion and returning of questionnaires was on a completely voluntary basis. This immediately selected those farmers who are interested in their game and who have game on their farms. During recent years with

the more intensified farming practices and an increased awareness of the value of game Joubert (1974), farmers are paying more attention to the number of game on their properties. The number of game on the farm also plays a role in farm planning because it influences the carrying capacity for stock. Similarly the farmers have to give figures as to the number of game on their property when applying for participation in the stock reduction scheme. Thus the idea of estimating the number of game on the farm is not exactly a new idea or practice to these people. The figures obtained from the questionnaires also compared favourably with estimations by the Division regarding the status of game in South West Africa viz.

	Questionnaires	Division
Eland	7 779	8 000
Cheetah	6 252	5 000
Kudu	110 986	90 000

Since approximately half the farmers replied, it was decided to take this figure for all the farm land in SWA. Following this method meant that the overestimate was cancelled to some extent. The other reason for giving the questionnaire figures is for future reference. It would have been extremely interesting to compare the questionnaire estimates of the 1955/56 survey which Bigalke (1958) reported on with the present estimates. Van der Spuy (1962) gave figures for only six species and these figures are compared with those obtained from the present survey.

During the present survey 5 388 questionnaires were mailed and 2 886 completed questionnaires were returned. Several farmers however, own or farm on more than one farm, but completed only one questionnaire for all the farms. As a result, the figure of 2 886 returns, in actual fact represents 3 284 farms. This in turn, gives a percentage return of 61,0 per cent, which can be regarded as high. Bigalke and Bateman (1962) working in the Cape Province reported a return of only 25,9 per cent.

There are at present 16 magisterial districts in South West Africa. The percentage returns from these various districts show some interesting patterns. As already stated, the average percentage returns were quite high, with only two districts returning less than 50 per cent of the questionnaires sent out while seven districts had returns of 60 per cent and higher. On the average the percentage returns show a correlation with the density of game in those particular districts. The returns from the southern districts show an average of 52,0 per cent, whilst those from the northern districts show an average percentage return of 60,7 per cent.

4.2 Aerial surveys

During 1965 the Division of Nature Conservation and Tourism obtained a Piper Super Cup. It was found that this aircraft's low stalling speed and extreme maneuverability at low speeds were ideally

suitable for game census work in South West Africa, especially in the mountainous country of the Kaokoveld and the escarpment zone. Since 1966 half yearly surveys of game concentrations in the Etosha National Park have been carried out. These were augmented by a helicopter census in the Park during September 1973. Several aerial surveys have also been done in most of the other conservation areas in South West Africa, as well as in Diamond areas No's 1 and 2. The technique normally used, is to fly in parallel transect lines, the distance apart being determined by the topography of the terrain until a concentration of animals is observed. They are then circled until a count is made, the aircraft then continuing along the original course. During circling the aircraft would gain altitude to prevent excessive stampeding by the game.

Several methods were devised to determine a correction factor that could be used during aerial surveys. The two methods which gave the most satisfactory results were the following: an aerial survey was carried out, flying on predetermined transects, in the Daan Viljoen Game Reserve with its known population numbers for the various species. The factor determined here was used when working over a mountainous terrain. On the plains in the Etosha National Park, simultaneous surveys on the ground and from the air of a game concentration, produced a correction factor that could be used here.

In 1968 and 1969 aerial surveys were carried out in Damaraland, Kaokoland, and the western part of Owambo. These were backed up during the same period by ground surveys. The senior author has

an intimate knowledge of the general distribution and densities of game in this area. This knowledge proved invaluable when the aerial census work was carried out. Since 1970 annual and sometimes bi-annual surveys have been undertaken in the Kavango and Bushmanland. One aerial survey was also done in Hereroland in 1971. During 1971 and again in 1974 aerial surveys were undertaken in Diamond areas No's 1 and 2. Although some of this information is relatively old, it is felt that since nothing else is available, it should be included so as to obtain an overall picture of the present situation in South West Africa.

4.3 Personal communications

The Rehoboth Gebiet and Namaland were never covered by aerial surveys. Information on these areas was obtained from personnel of various government departments stationed there. Information was also obtained from similar sources in Hereroland, Bushmanland and Kavango to supplement the aerial surveys in these areas.

On the distribution maps, a different pattern is used to indicate the distribution of the species in those areas which were covered by aerial surveys and personal communications, since the latter two methods do not represent accurate quarter degree square distribution, such as obtained from the questionnaires.

5 RESULTS

Some of the data obtained from the questionnaires is summarised in Tables 1 and 2.

Table 1. Statistics obtained from the returned questionnaires, recording the more common game species occurring on farms in South West Africa.

PERCENTAGE OCCURRENCE* OBTAINED FROM RETURNED QUESTIONNAIRES

	No. of farms in district	No. of farms covered by the returned questionnaires	% Returns	Kudu	Gemsbok	Hartebeest	Eland	Hartmann's Zebra	Burchell's Zebra	Giraffe	Springbok	Duiker	Klipspringer	Dikdik	Steenbok **	Warthog
TSUMEB	182	97	53,3	82,5	8,2	2,1	41,2	—	3,1	49,5	5,2	79,4	15,5	46,4	10,3	70,1
GROOTFONTEIN	601	387	64,4	66,7	15,0	11,9	40,3	—	1,3	17,1	3,1	67,7	15,8	19,4	5,4	58,9
OUTJO	392	202	51,5	90,1	58,9	3,5	5,0	27,7	7,9	31,2	34,7	79,7	48,5	35,6	5,9	80,7
OTJIWARONGO	260	206	79,2	83,5	63,6	36,4	8,3	2,4	2,4	3,4	13,6	76,2	20,4	20,9	5,3	80,1
OMARURU	131	90	68,7	98,9	80,0	—	—	21,1	2,2	1,1	62,2	88,9	51,1	53,3	10,0	86,7
SWAKOPMUND	45	14	31,1	—	—	—	—	—	—	—	14,3	—	7,1	—	—	7,1
KARIBIB	164	94	57,3	75,5	51,1	1,1	2,1	36,2	5,3	—	53,2	53,2	50,0	13,8	4,3	57,4
OKAHANDJA	216	159	73,6	83,0	64,2	19,5	4,4	3,1	0,6	1,3	22,0	78,6	15,7	13,8	5,7	81,1
WINDHOEK	514	312	60,7	73,1	42,9	15,4	4,5	21,2	1,3	—	60,3	62,8	47,1	4,2	8,7	50,6
GOBABIS	714	480	67,2	64,0	22,7	16,5	5,2	—	—	—	56,9	79,8	4,8	2,3	6,3	57,1
MALTAHÖHE	203	131	64,5	67,2	31,3	1,5	0,8	23,7	1,5	—	72,5	18,3	55,7	1,5	13,0	3,1
MARIENTAL	990	356	36,0	12,6	27,5	3,1	2,8	0,3	0,3	—	72,8	71,1	3,9	2,5	10,1	3,4
LÜDERITZ	84	44	52,4	47,7	47,7	—	—	13,6	2,3	—	59,1	11,4	63,6	—	2,3	—
BETHANIEN	163	83	50,9	67,5	22,9	—	—	8,4	2,4	—	63,9	18,1	72,3	1,2	7,2	2,4
KEETMANSHOOP	400	228	57,0	36,4	20,6	—	3,5	0,4	0,4	—	68,9	41,7	32,5	0,9	10,4	0,4
KARASBURG	329	169	51,4	23,7	9,5	—	0,6	3,6	—	—	62,7	11,2	42,0	—	7,7	—

* See text for explanation.

** Steenbok was inadvertently omitted from the questionnaire and the percentage occurrence in this case represents the occurrence as supplied by some of the farmers of their own accord.

concentration along the sub-desert plains to the west of Orupembe. In both Kaokoland and Damaraland they occur right down to the coast into extreme desert.

As mentioned earlier, man at first had a detrimental effect on the springbok numbers, but recently due to modern farming practices and a change in attitude towards game the number of springbok on farms, have shown a considerable increase. Van der Spuy (1962) recorded 37 280 springbok on farmland in 1960, while the present questionnaire results indicate a total of 141 986 on farmland — this represents an increase of + 280 percent. As in the case of kudu, the number of springbok on government land (diamond areas), game reserves and the Bantu territories is such a small percentage when compared to this latest figure that it is ignored. The authors therefore would like to suggest that this figure of 141 986 springbok should be considered as the total for all of South West Africa.

6.2.15 Reedbuck *Redunca arundinum* Boddeart

Shortridge (1934) recorded reedbuck along the Okavango River, north-eastern Owambo, around the Ruacana Falls and in the Caprivi. Recent surveys by the authors in the Kavango and personal communications with various officials, indicate the present distribution of reedbuck in the Kavango to be the following. They occur on the floodplains along the Okavango River, especially below Andara, where they reach their highest numbers and along the Kwando River. They also occur in small numbers in the north eastern corner of the territory, along many of the west-east flowing omurambas (drainage lines) which lead into Botswana. Reedbuck has also been reported along the Omuramba Omataka (Carelse *pers com*, 1974). The present distribution thus shows reedbuck to have a much wider distribution, away from the actual vicinity of the Okavango River compared to the distribution as reported by Shortridge *op cit.*, when they were mostly restricted to the Okavango River. This is quite understandable, if one considers the increased human activity and cultivation along the river.

A reedbuck was recently reported from the Otjovasandu area of the Etosha National Park (Hofmeyr and Steyn, 1974).

The authors feel that there are at present, a maximum of approximately 50 reedbuck in South West Africa.

6.2.16 Lechwe *Kobus leche* Grey

Shortridge (1934) recorded lechwe from two localities along the Okavango River, one in the west near Kuring-Kuru, and the other in the east on the "lower Okavango". Another locality indicated by Shortridge (*op cit*) is along the Kwando River. The authors also located a small number of lechwe in the Chaudum omuramba during 1974. These three localities are at present the only places where lechwe occur in South West Africa. The total population is not expected to exceed 100 individuals.

6.2.17 Sitatunga *Tragelaphus spekei* Selater

Sitatunga at present occur only along the Kwando River and nowhere along the Okavango River as indicated by Shortridge (1934). During an aerial survey in 1972 the senior author counted 11 of these animals along the lower Kwando River and considers this to be the approximate figure for all of South West Africa.

6.3 The predators

6.3.1 Lion *Panthera leo* Linnaeus

Of all the larger predators still in South West Africa, the lion numbers are at present the lowest. Even in the northern Bantu territories they have been systematically eradicated by trapping, poisoning and shooting. Their present day distribution shows a marked decline since Shortridge (1934) recorded them over a relatively large area of South West Africa. They are completely absent from all farmland. There are still a fair number present in the north-western corner of Damaraland (formerly part of the Etosha National Park). In Kaokoland they have been reported only from Orupembe and Purros. They do not occur on the plateau regions of Kaokoland or Owambo anymore. Lion occur throughout the Etosha National Park. In Kavango they occur in the southern regions and along the Botswana border, as well as further south into Bushmanland and Hereroland. In the Kalahari region of South West Africa they sometimes cross the border from Botswana into South West Africa, where they are then immediately hunted. It is extremely doubtful whether more than 500 lion still occur in South West Africa, of which approximately 90 percent would occur in the Etosha National Park.

6.3.2 Leopard *Panthera pardus* Linnaeus

Questionnaire returns indicate that leopard occur all along the mountainous escarpment region in South West Africa and in the northern part with the denser vegetation, they also occur on the plateau regions. According to reports by nature censors they also occur in the eastern and western parts of the Etosha National Park. No records could be obtained from Owambo, to confirm their presence there. This distribution shows hardly any change from the distribution given by Shortridge (1934) pp 86: "Leopard are widely distributed over South West Africa, except perhaps along the extreme coastal portion of the Namib Desert. They are comparatively scarce in the arid and open plains of Great Namaqualand, and some what less numerous than usual in the more thickly populated parts of Ovamboland." Owing to the stealthy habits of leopards, it is difficult to determine their status. Judged by their tracks at waterholes and the number of skins offered for sale they must still be relatively abundant. The questionnaire analysis indicate that there are 3 353 leopards on farmland. The authors suggest this number as the total population of South West Africa.

6.3.3 Cheetah *Acinonyx jubatus* Erxleben

Cheetah show almost the same past and present distribution pattern as leopard. During recent years their numbers have apparently increased on farmland. There is a general agreement amongst farmers (J. Gaerdes 1974) that this might be attributed to two factors. The first being, that since the other predators such as lion, hyaena and Cape hunting dogs have been virtually eradicated from farmland, the competition for immature game has lessened and the cheetah pups thus have a better chance of becoming adults. These predators apparently also feed on young cheetah. The second factor being the increase in kudu and accordingly kudu calves which insured a better supply of food. The questionnaire estimate by farmers of approximately 6 252 for farmland is only little higher than a recent official estimate and the authors feel that this figure should be accepted as the population for South West Africa.

6.3.4 Spotted hyaena *Crocuta crocuta* Erxleben

The spotted hyaena was unfortunately omitted from the questionnaire and thus no information regarding their distribution on farmland was received. It is doubted whether there are many spotted hyaena left on farms anywhere in SWA. Shortridge (1934) reported pp 160: "the Spotted Hyaena is much more local and very much scarcer than the Brown species, being absent or of sporadic occurrence everywhere south of the Tropic of Capricorn. In the eastern districts, in fact, it appears to become scarce below the latitude of the Etosha Pan — although sparsely distributed throughout Damaraland. . . . the Brown hyaena everywhere greatly outnumbers the Spotted species."

At present, the spotted hyaena occurs in Diamond area no. 2, where they have been recorded from Sossus vlei and Tsondab vlei as well as in the Namib Desert Park, especially in the Kuiseb River. During the dry season gemsbok congregate in the Kuiseb River bed to pick up Acacia pods and utilize the waterholes. During the dry period, in the summer of 1973 prof. Hamilton (*pers. com.*) saw eight spotted hyaena at a gemsbok carcass in the Kuiseb River. Further north they occur in the north-eastern corner of Damaraland as well as in Kaokoland. Spotted hyaena have been recorded from the Etosha National Park, where they appear to be relatively abundant, especially in the western part — (west of approximately Longitude 15°E). They also occur around Okaukuejo, where a group of eight was observed by the senior author, Halali and Namutoni. They are sparsely distributed throughout Kavango (the southern parts), Bushmanland and Hereroland.

The authors feel that there may be approximately 150 spotted hyaena left in South West Africa.

6.3.5 Brown hyaena *Hyaena brunnea* Thunberg

The brown hyaena was unfortunately also omitted from the questionnaire and thus nothing can be said

about their distribution on farmland. Recently a brown hyaena was trapped in the Gobabis district on a farm. There is a possibility that they may occur in the Otjiwarongo district. Outside farmland, brown hyaena are much more restricted in their numbers and distribution than the spotted hyaena. In contrast to the spotted hyaena, they were never seen in anything but singles or pairs. Definite records were obtained by the senior author along the west coast at a point halfway between Lüderitz and Walvisbay, the Namib Desert Park, the beaches of the Skeleton Coast Park, Kaokoland, around Sesfontein in Damaraland, the western part of the Etosha National Park, to the north and south-east of Okaukuejo and from Halali. It is doubtful whether 50 brown hyaena still occur in South West Africa.

6.3.6 Cape hunting dog *Lycan pictus* Temminck

The status and distribution of the Cape hunting dog has changed considerably since Shortridge (1934) wrote (pp 181): "Wild dog are widely distributed in South West Africa, and hunting packs may be met with periodically almost everywhere except in the extreme south. Today, it is one of the most endangered species in South West Africa. Although recorded throughout the Etosha National Park in previous years, they have now practically disappeared. The last reported sighting was at Stinkwater in the Namutoni Area during October 1973 as reported by Grobler (1973). They have been recorded sporadically from the Waterberg plateau area, eastern Damaraland and the north-eastern corner of the Otjiwarongo and Grootfontein districts. They may still occur in Kavango, Bushmanland, Hereroland and eastern Owambo, but no definite records could be obtained. It is estimated that not more than 100 individuals survive in all of South West Africa.

6.3.7 Lynx *Felis (Lynx) caracal* Schreber

Lynx occur throughout South West Africa at present, which is in accordance with Shortridge (1934). This is a tribute to the hardiness and adaptability of this predator. The farmers estimate that there are 16 481 of these animals on farmland. The authors suggest this figure is acceptable for South West Africa.

6.3.8 Black-backed jackal *Canis mesomelas* Schreber

The situation regarding the black-backed jackal has not changed much since Shortridge (1934) reported them to be (pp 167) ". . . exceedingly abundant throughout South West Africa . . .". Their present distribution still includes most of South West Africa. The only exception is the sheep farming areas in the south, where their numbers have been severely reduced by jackalproof fences and organized hunting. Until the bounty system was stopped in 1973 more than 20 000 tails were handed in annually at Police

stations and magistrates offices. In the northern districts however, they are still relatively plentiful.

According to the questionnaire analysis there are 51 325 black-backed jackal on farmland. The authors feel that this figure could be accepted for all of South West Africa.

6.3.9 Side-Striped jackal *Canus adustus* Sundevall

The side-striped jackal was included in the questionnaire, but the returns clearly indicated that this animal is completely unknown to farmers. According to the questionnaire returns, this jackal occurs throughout the territory from the Orange River in the south to Kamanjab in the north. The only positive records obtained by the authors were from the Waterberg area of the Otjiwarongo district. They may still occur in the sandveld areas of Grootfontein, Kavango, Bushmanland, Hereroland and the Western Caprivi.

6.3.10 South African silver fox *Vulpes chama* Smith

The silver fox at present has a much wider distribution than the black-backed jackal. They are generally recognized by farmers to be harmless and as such, are not ruthlessly exterminated. In certain areas though, such as in the Stampriet district, where black-backed jackal have been completely exterminated within jackalproof camps, farmers have found that the population of silver foxes has increased markedly and cases have been reported where they have taken newly born lambs.

The figure of 25 576 silver foxes, estimated by farmers to occur on farmland is suggested for all of South West Africa.

6.3.11 Bat-eared Fox *Otocyon megalotis* Desmarest

As reported by Shortridge (1934) bat-eared Fox occur throughout South West Africa in relatively large numbers and the figure of 50 022 obtained from the questionnaire returns, is suggested for all of South West Africa.

6.4 Unrecorded mammals

Shortridge (1934) mentions a number of mammals occurring in South West Africa of which the authors could find no trace. These animals are, — oribi *Ourebia ourebia* (Zimmermann), Sharpe's grysbok *Raphicerus sharpei* (Thomas), vaal rehbok *Pelea capreolus* (Forster), waterbuck *Kobus ellipsiprymnus* (Ogilby), Bushbuck *Tragelaphus scriptus* (Pallas), African Bushpig *Patamochoerus porcus* (Linnaeus).

Two other species mentioned by Shortridge *op cit* viz. sable antelope *Hippotragus niger* (Harris) and mountain reedbuck *Redunca fulvorufula* (Afzelius), warrant discussion. Although no sable were ever

observed during surveys in Kavango, one report was received of a herd seen in the western Caprivi during 1972 (V. du Plessis, *pers. com*). The authors however, are of the opinion that these animals must have briefly crossed the Botswana border. Shortridge *op cit* mentions that during his survey, a pair of mountain reedbuck horns was brought to him. Persistent reports are received by this Division of an antelope, which might be a mountain reedbuck, that occurs in the Huns Mountains along the Orange River in the south. These rumours were officially investigated but no evidence could be found of these animals occurring there (V. du Plessis *pers. com* 1974).

7 DISCUSSION AND CONCLUSIONS

1. Despite many limitations as discussed elsewhere, the present survey did supply interesting information and new insight regarding the present day situation of game in South West Africa. The wild life spectrum of South West Africa as discussed in this paper is made up by 20 artiodactyl game species including the warthog and hippopotamus; three perissodactyl game species including two zebra and the black rhinoceros, with the elephant forming the last species, giving a total of 24 game species. A break down of their distribution and status indicates that with 12 (50 percent) of these species + 90 percent of the population at present occurs on farmland viz. eland, gemsbok, kudu, springbok, duiker, klipspringer, hartebeest, Hartmann mountain zebra, giraffe, dik-dik and warthog; another eight species occur only in Bantu territories, with the exception of black-faced impala and roan which have been translocated to the Etosha National Park, viz. tsessebe, buffalo, reedbuck, lechwe, sitatunga and hippopotamus. The remaining species viz. Burchall's zebra and blue wildebeest, occur largely in the Etosha National Park.

To this list one may also add the black rhinoceros and the elephant, the latter reaching their highest concentration in South West Africa in the Etosha National Park during the summer months.

2. If one excludes the species that occur only in Bantu territories because of their specialized habitat requirements viz. lechwe, sitatunga, hippopotamus and reedbuck it means that 60 percent of the game species in South West Africa occur primarily on farms. According to the estimated figures for all the various species, it means that approximately 90 percent of the game occurs on privately owned farmland. This is truly, a unique situation and it is doubtful whether a similar situation exists anywhere else in the world. This places a heavy responsibility on the shoulders of the land owners, because it is largely up to them to ensure the judicious exploitation of the game.

3. One finds almost a similar situation regarding the predators. Of the eleven predators species dealt with in this paper, only five species reach their highest numbers outside farmlands viz. lion, Cape

hunting dog, spotted hyaena, brown hyaena and side-striped jackal. The other six species viz. leopard, cheetah, lynx, black-backed jackal, bat-eared fox and silver-fox occur largely on farmland. According to the estimated figures for the various predator species, it appears that approximately 90 percent of the predators, also occur on farmland.

4. The lion, Cape hunting dog and brown hyaena are the three predators species, whose distribution and status show a marked decline since Shortridge (1934). Although this might be because these species have had the most direct confrontation with man, it also shows a lack of ability to adapt to changing situations, when compared to the other predators viz. leopard, cheetah and black-backed jackal.

5. Springbok and kudu are the most numerous game species in South West Africa today, each species totalling more than a hundred thousand individuals. These two species together form \pm 54 percent of the game animals on farmland.

6. Eland showed the smallest increase in numbers compared to van der Spuy's (1962) figures viz. 27,9 percent, but since they are considered to be a truly nomadic species, it is quite possible that the present day restriction of movement, by fences etc. has a detrimental effect on their recruitment rate.

7. Hartebeest and Hartmann mountain zebra are both considered by farmers to compete directly with their live-stock and are exterminated at an alarming rate.

8. Blue wildebeest, apparently occurred in large numbers on farmland and was considered by Shortridge (1934) to be the "most plentiful of large open-country antelope in South West Africa." According to the questionnaire returns there are at present only 245 of these animals on farmland. The alarming low total of approximately 4 200 individuals, most of which occur in the Etosha National Park, is suggested by the authors, for all of South West Africa.

9. The eight game species occurring only in Bantu territory can all be considered to be endangered species with their present low populations figures in South West Africa.

They are:

Tsessebe	100 individuals
Buffalo	30 individuals
Reedbuck	50 individuals
Lechwe	100 individuals
Sitatunga	11 individuals
Hippopotamus	13 individuals
Roan and	300 individuals
Black-faced impala	1 000 individuals

Two of these species have been translocated with considerable success by the Division of Nature Conservation and Tourism, viz. black-faced impala and roan, and their survival, at present seems ensured. With three of the abovementioned species viz. lechwe, hippopotamus and sitatunga however, the problem arises that their habitat requirements are so specific that no suitable conservation areas exists outside their present range.

10. The overall situation regarding the predators is much more promising. Despite the fact that the distribution and status of the lion has declined considerably, their survival is ensured in the Etosha National Park. Three other species however, do give cause for alarm viz. Cape hunting dog, brown hyaena and spotted hyaena. The latter two species still maintain small breeding nuclei in various conservation areas and with proper management practices might improve their status. The authors however, are not too sure about the future of the Cape hunting dog. Unless these animals can increase their numbers so as to cope with successful hunting, they are not expected to survive. The problem is further aggravated by the fact that there are very few wild dogs left in any of the conservation areas in SWA.

11. Despite problems elsewhere in Southern Africa, the situation regarding the spotted cats in South West Africa, is satisfactory at present. The questionnaire returns confirmed general beliefs that they were in no danger of becoming extinct at present.

12. The division has already made substantial progress in assuring the continued survival of several endangered species. Black rhinoceros, roan and black-faced impala have been very successfully re-introduced to the Etosha National Park. The Division hopes to translocate and re-introduce buffalo, tsessebe and reedbuck into existing conservation areas. To relieve the problem regarding the Hartmann mountain zebra and gemsbok, approval has been granted to extend the Naukluft Mountain Zebra Park by 144 000 ha which will then link it with the Namib Desert Park and thus ensure the survival of viable units of Hartmann mountain zebra and gemsbok.

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