Observations on the Habitat Preferences and Population Dynamics of the Black-Faced Impala *Aepfceros petersi* Bocage, 1875, in South West Africa

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CONTENTS

I. INTRODUCTION

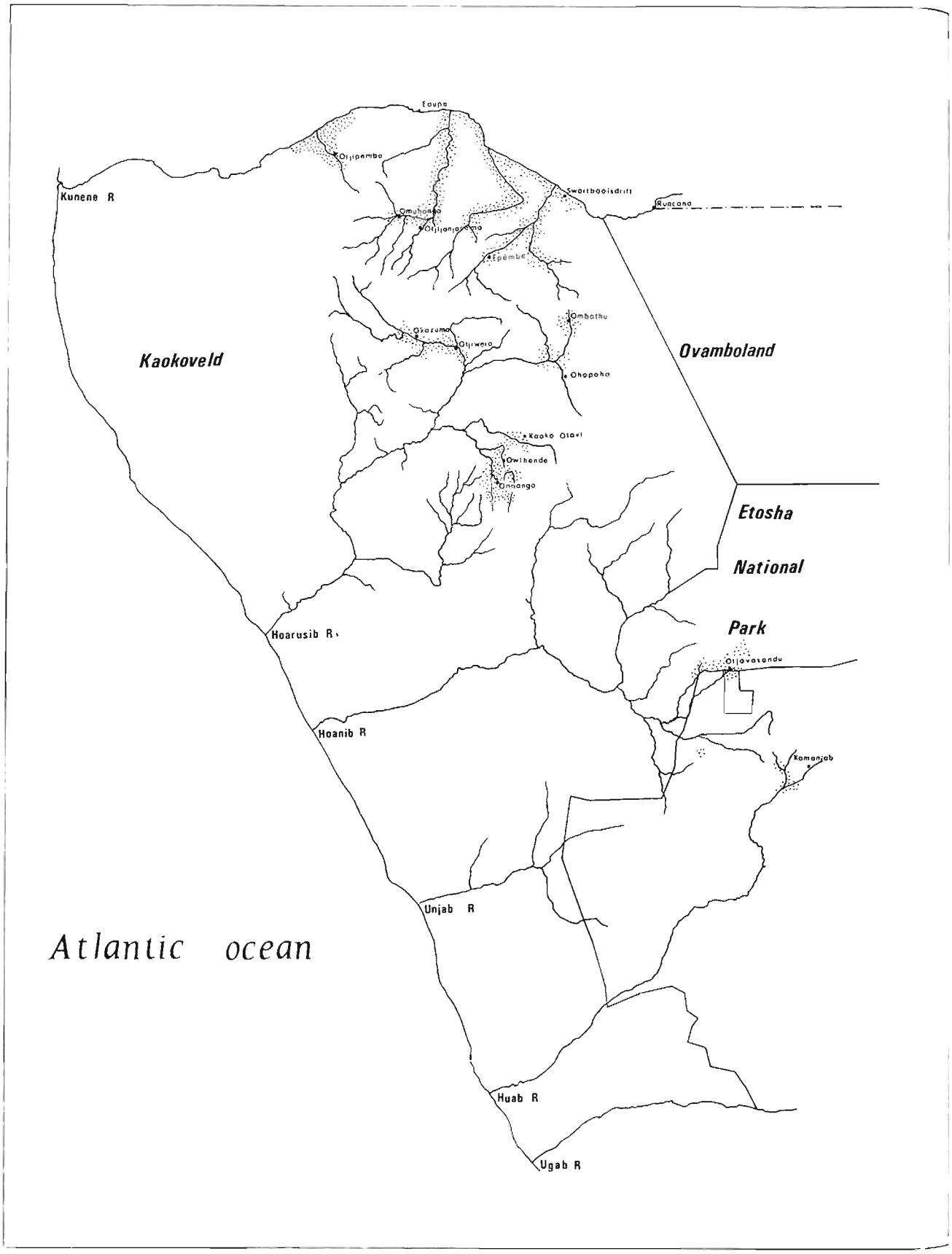
In South West Africa the black-faced impala occurs only in the zoogeographic entity known as the Kaokoveld which is bounded by the Namib desert to the west and by the inland plateau to the east. The southern border of this area is described by Shortridge (1934) as being the Ugab River. The Kaokoveld approximately falls between the latitudes 17°S and 19° 15'S and longitudes 11° 50' E and 14° 13'E.

Apart from a small group of about 60 animals at Otjovasandu in the western Etosha National Park all the black-faced impala occur in the northern Kaokoveld. Here their numbers have dwindled away, mainly owing to continuous drought, hunting pressure and competition from livestock. To ensure the survival of the black-faced impala, the Nature Conservation and Tourism Branch of the SWA Administration in 1968 decided to translocate as many as possible of these animals to Otjovasandu, a portion of the Etosha National Park lying within the zoogeographic borders of the Kaokoveld.

During this operation information was gathered regarding the weights and body sizes of the impala. These results, as well as notes kept by the author werever he infrequently encountered the black-faced impala during four years spent in the area on another research project are used in this and another paper. The latter will deal mainly with their taxonomy. In this present paper Oboussier (1967) is followed in regarding the black-faced impala as a species distinct from *Aepyceros melampus*.

II. DISTRIBUTION AND PRESENT STATUS

Very little is known about the past distribution of the black-faced impala in South West Africa. It seems possible that they might have occurred in suitable localities throughout the Kaokoveld. Steinhardt (1924) records that a pair moved as far south as Franzfontein where they were shot. Until recently a small number still occurred on the farm Katemba in the upper reaches of the Huab River near Kamanjab. According to the first white inhabitants in this region they came across black-faced impala at Kaross, Otjovasandu and Kowares. According to most recent authors, Steinhardt (1924), Shortridge (1934), Roberts (1952), Gaerdes (1965) and Swart (1967) the black-faced impala never occurred more than a few miles south of the Kunene River. Shortridge gives their range as the Kunene Watershed west of Longitude 13E. Shortridge and Steinhardt names Ombathu as the most southerly permanent habitat of the black-faced impala in the Kaokoveld, although a few individuals have been known to visit the springs at Okorosawe and Onjanjeresse during the rainy period. Gaerdes states that the black-faced impala have completely disappeared from former inland habitats around the permanent waterholes of Ombathu, Korosawe, Kaoko-Otavi and Otjanjeresse.



Map 1. The present distribution of the black-faced Impala in South West Africa.

During the four years the author spent in the Kaokoveld he established their present distribution fairly accurately. They are not restricted to the banks of the Kunene River but also occur in several other localities, some of which are very isolated. They still occur along the Kunene River where they reach their highest concentrations between Swartbooisdrift and Epupa. Between Epembe and Otjanjeresse several small herds have also been noticed. At Otjirekeha a concentration of these animals has been recorded. The biggest concentration in the northern Kaokoveld occurs at Omuhonga. Apparently the floodplain and riverine vegetation in this area suits them or their requirements very well. (See habitat preference). The furthest west that black-faced impala occur along the Kunene River is at Otjiomborongbonga. The small number previously seen at Otjinungua has not been seen for the past five years. Black-faced impala still occur in small numbers at Ombathu, Otjirekeha, a small way north of Ohopoho, Etanga and Otjiwero.

As already mentioned Gaerdes states that the black-faced impala has disappeared from its previous distribution areas at Korosawe and Kaoko-Otavi. At both of these fountains Herero's are practicing limited irrigation and this might have caused the impala to move to Omeamo and Owihende. They also occur at Ongango, a little way to the south. At present their most southern distribution is at Kamanjab. During a census carried out in 1969 at Otjovasandu 57 animals were counted.

It is difficult to estimate the exact population numbers of animals for the various localities at which black-faced impala occur. At Omuhonga they number approximately 500 individuals. Their second biggest concentration is along the Kunene River where there are not more than 150 animals. At Ongango and Otjirekeha an average of 50 individuals were counted during several aerial surveys. At all the other localities mentioned only very small groups of fewer than 25 individuals exist. The total number of black-faced impala for South West Africa is between 750 and 1 000 individuals, with the former probably the more accurate figure.

III. ECOLOGY

a) Habitat preference

Physiographically the Kaokoveld shows the following characteristics. From the western edge of the plateau the country falls away to the west to form an extremely broken landscape. The mountains are composed of the Nosib and Damara sediments which rise above the surrounding granites and gneiss's which have been more severely weathered and eroded. The Kaokoveld is dissected by the tributaries of the Kunene River, the Hoarusib River and the Hoanib River which all form part of a well developed eshorheic drainage system. The only perennial river is the Kunene.

This area lies within the 25—300 mm isohyets. Owing to an extremely patchy rainfall pattern some areas experience long or repeated droughts while other areas may receive a fair rainfall for one or two seasons before they, in their turn experience the drought. This arid climate with its frequent drought carries a typical arid savanna vegetation. Within the Kaokoveld the distribution of the black-faced impala is limited to areas with suitable vegetation, cover and apparently to areas within reach of surface water. It may well be that the vegetation available in these areas is the chief factor determining this distribution pattern. It is noticeable that most of these localities are comprised of zones of dense riverine vegetation bordered by zones of moderate vegetal density. The impala appear to prefer these localities because of the greater variety of food plants available in the ecotone of the two vegetation types and also the protection offered by the denser vegetation.

In the Kaokoveld the impala reach their greatest density in the vicinity of the Omuhonga waterhole. Here the seasonal river winds through a flat valley with rocky hills on either side. The valley floor varies in width from localities where the hills press against the river to open flood plains about one and a half miles wide. The water is contained in the sandy riverbed about 2 feet below the surface and both the pastoralist Ovahimbas and the elephants dig "gorras" in the sand to obtain their water supply.

The valley floor where it is more open, can be said to form a flood plain with a distinct vegetation. The riverine vegetation is dominated by the tall *Acacia albida* trees which may reach heights of 20—23 metres with trunks of up to 10 metres in circumference. These trees are abundant in the valley floor and in the sandy river bed. The spacing varies from dense aggregations to open stands with crowns more than two diameters apart. Also contributing to the tree canopy are — *A. giraffae* and *Combretum imberbe*. Although these trees do not occur in such large numbers as *A. albida* they also form large spectacular trees. The Makalani palm, *Hyphaene ventricosa*, is present but is not as common as it is along the Kunene River. *Ficus petersi* is present in small numbers.

The second storey is formed by a semi-deciduous tree and tall shrub layer which is almost impenetrable and as a result grass cover is absent. This second storey may reach to eight metres in height. The two most dominant plants are *Diospyros lycioides* and *Euclea pseudebenus*. In between, one also finds *Ziziphus mucronata*, *Combretum hereroense*, *Croton subgratissimus*, *Acacia tortilis* on the valley floor and closer to the hills *Colophospermum mopane*. *Lonchocarpus nelsii* also occur but are not very abundant. In certain localities along the river *Tamarix usnoides* and *Salvadora persica* form large communities. *Gardenia spatulifolia* and *Diospyros mespiliformis* are immigrants from the Kunene riverine vegetation. *A. albida* seedlings occur in large numbers.

The third layer consists of shrub such as *Rhigozum brevispinosum, Pechuel-Loeschea leubnitziae, Mundulea sericea and Montinia caryophyllacea.* Between these thickets of trees and shrubs, large open glades occur which are covered by lawn-like short grasses which are kept short by the multitude of sheep, goats, cattle and to a lesser extent by impala, Damara dik-dik *Madoqua kirki*, Duiker *Sylvicapra grimmia*, and Steenbok *Raphicerus campestris*. The grass cover consist mostly of *Cynodon dactylon* and *Odyssea paucinervis*.

The important herbs which occur are mainly *Geigeria* spp., *Datura* species, *Otoptera burchellii*, *Vernonia cinerrasiens* and *Juncellus laevigatus*.

In this Omuhonga valley the Ovahimbas, a primitive Herero-speaking race, practice a shifting cultivation and open up plots in the riverine vegetation. Their only produce is maize which they cultivate during the rainy season. During the rest of the year these open plots are often used by the impala to lie up at night.

The vegetation on the surrounding hills consists predominantly of a mopane woodland. The trees are often stunted, especially where the soil is shallow. Other trees which occur are *Terminalia prunioides*, and in smaller numbers *Acacia reficiens, Maerua schinzii* and *Combretum apiculatum. Berchemia discolor* and *Pachypodium lealii* also occur where it is more rocky. Shrubs are represented mainly by *Ximenia americana, Croton, Euclea* and *Grewia* species. *Stipagrostis uniplumis, Aristida rhiniochloa, Pogonarthria fleckii, Eragrostis denudata, Enneapogon brachystachus* and *Eragrostis porosa* are the most common grasses.

Along the Kunene River the riverine vegetation is more or less the same but *Acacia albida* does not occur in such large numbers as along the Omuhonga River and the other tributaries. Along the Kunene the dominant tree growth consists of *Hyphaena ventricosa, Acacia sieberiana var. vermoeseni, Balanites welwitchii, Maerua schinzii, Colophospermum mopane, Combretum imberbe, Cordia gharaf* and *Salvadora persica.*

The impala usually keep to the dense riverine vegetation during the day where they tend to lie up in the thickets. From the time that the *A. albida* pods drop in October and November, the animals concentrate on the floodplains to feed on these pods. During the rainy season the Ovahimba cultivate their plots and at this time the impala utilize the ecotone between the riverine vegetation and the mopane woodland.

Further south the Hoanib and Hoarusib Rivers which cut through several mountain ranges have a riverine vegetation, elements of which they carry through the sub-desert and even into the desert itself. Impala, however, do not occur in the lower reaches probably owing to a lack of suitable cover. They usually only occur in the upper reaches of the Hoarusib and Hoanib River drainage systems. Here the eshorheic drainage systems sometimes open up and form wide valleys with ill-defined drainage lines. Some of the seasonal streams debauching into these valleys have perennial waterholes. Isolated populations of these impala inhabit the various valleys and hills adjoining these waterholes, namely Okauzuma, Otjirekeha, Epembe, Omeamo, Orgango and Otjovasandu.

The vegetation in the hills surrounding these valleys is the same as that described earlier. The vegetation in the valleys is however very typical. Trees occurring are *A. tortilis* ssp. *heteracantha*, A. *giraffae*, A. *hebeclada*, *Albizia anthelmintica*, *Lonchocarpus nelsii*, *Boscia albitrunca* and *Colophospermum mopane*. In the ecotones *Sesamothamnus guerichii* and *Catophractes alexandri* are sometimes common with scattered *Acacia nebrownii* within the community.

These valley plant communities contain a wide variety of shrubs the more common being *Grewia* species, *Mundulea sericea, Gossypium triphyllum, Lycium oxycarpum, Montinia caryophyllacea,* shrub *Colophospermum mopane, Rhigozum brevispinosum, Pechuel—Loeschea leubnitziae, Bidens biternata* and *Leucas pechuelii.*

Herbs are also common, the following occurring: *Nerine duparquetiana, Cyperus fulgens, Cleome diandra, C. elegantissima, Petalidium coccineum, Cassia italica.* During the early rainy season *Tribulus terrestris* is conspicuous. Legumes occurring are *Crotalaria podocarpa, Indigofora rautanenii, Plycholobium biflorum* and *Lessertia benguellensis.* The grass cover is chiefly *Anthephora schinzii. Eragrostis porosa, E. rotifer, Stipagrostis uniplumis, Enneapogon brachystachyus, Cenchrus ciliaris. Panicum coloratum, Tragus racemosus* and *Monelytrum luderitzianum.*

b) Feeding records

Impala are known to be both browsers and grazers (Ansell, 1960), the intensity of either form of feeding is determined by the season of the year. It was observed in the Kaokoveld that during the rainy season they browse and graze with apparently the same intensity. During this period they move away from the flood plains and browse on the young leaves and shoots of shrubs and trees varying their diet by grazing in the ecotones with the open woodland areas.

During the dry season they move into the riverine and floodplain vegetal areas where the emphasis is mainly on browsing. As already mentioned, in these floodplains and wide valleys with their ill-defined drainage lines, Acacia species form part of the dominant cover. Here the black-faced impala feed on the dropped pods which have a high protein value. *A. albida* sheds its flowers as well as the pods during this period, and large numbers of impala have been noticed picking up these flowers from the sandy river beds. Certain dominant plants confined to the riverine vegetation are not subjected to heavy browsing such as *Diospyros lycioides* and *Euclea pseudebenus.*

Plate 1. A small group of black-faced impala in the Omuhonga River bed. (Photo D. v. d. Heever).

Plate 2. A view of the Omuhonga River. Note the tall *Acacia albida* trees and dense riverine vegetation. (Photo E. Joubert).

The following feeding records have been obtained in South West Africa.

Trees and shrubs

(Mainly leaves and shoots).
Acacia albida
A. tortilis ssp. *heteracantha*
A. hebeclada ssp. *hebeclada*
A. giraffae
A. hebeclada ssp. *tristis*
Asparagus denudatus
A. mellifera var. *detinens*
Croton subgratissimus
Colophospermum mopane
Combretum imberbe
C. hereroense
C. apiculatum
Dichrostachys glomerata
Euclea pseudebenus
Ficus petersi (mainly fruits)
Grewia bicolor
G. flavescens
Mundulea sericea
Terminalia prunioides
Ximenia americana (fruit, bark and leaves)
Ziziphus mucronata

Grasses and other herbs

Aristida effusa
Aristida rhiniochloa
Cassia italica
Cynodon dactylon
Eragrostis nindensis
E. porosa
Otoptera burchellii
Odyssea paucinervis
Vernonia cineracens
Senecio marlothianus
Stipagrostis uniplumis
Panicum coloratum

c) Associated animals

Animals which share the black-faced impala's habitat to some extent are black rhino, kudu, dik-dik and duiker. The inter-relationships between these animals are not known. No direct competition between the species has been noticed. It may be, however, that these animals are complementary to one another viz. the rhino and kudu making more fodder available for impala and dik-dik by breaking branches and also bringing about the growth of new shoots. The black rhino, black-faced impala and kudu maintain a suitable habitat for dik-dik through a trampling effect and feeding on smaller shrubs in open ground storey.

At Ongango and Otjovasandu the spectrum of game species that might intermingle with the black-faced impala is slightly larger. Here one finds that springbok *(Antidorcas marsupialis)* and Burchells zebra *(Equus burchelli antiquorum)* sometimes utilize the open valleys and mopane woodland. Giraffes also feed in the same areas occasionally. As already mentioned no direct competition was observed, owing to the fact that all these species actually utilize different vegetation communities and where these communities overlap in the ecotones they feed on different levels.

In the northern Kaokoveld, where the bulk of the black-faced impala occur the only serious competition noticed was between them and domestic livestock. Goats especially, are a menace to the existence of the impala. In these regions a marked browse line is noticeable around waterholes and in the riverine vegetation. The domestic livestock, mainly the goats, outnumber the black-faced impala by approximately 100 to 1, resulting in keen competition when the Acacia shed their pods.

d) Predation

At Otjovasandu the black-faced impala is confronted with the whole spectrum of natural predators. In the northern Kaokoveld, however, where the inhabitants are mostly pastoralists the larger carnivores have been ruthlessly hunted and are extinct in many places. After man, the leopard is considered to be the most important predator in this area. The inherent astuteness of the leopard is complemented by the extremely broken terrain with the result that it is the most abundant natural predator left in the area.

In the northern Kaokoveld the young Ovahimba pastoralists guard the livestock by day. They all own packs of dogs and during the lambing season it is considered a great sport to scatter the female herds and try and catch the new born lambs. On several occasions the author was presented with young lambs that were offered for sale.

The adult animals, with their natural meekness form an easy target for hunters.

IV. POPULATION STRUCTURE

The numbers of black-faced impala in the Kaokoveld have been steadily declining during the last decade. This can be ascertained by comparing the numbers seen by earlier travellers in this region viz. Shortridge (1934) and Gaerdes (1922 and 1960) with the numbers now to be seen and also by the way their distribution area has shrunk since 1934. This decline in population could be attributed to internal factors in the population eg. inbreeding, parasites or diseases and/or to external factors eg. predation and/or competition with livestock. It was, therefore, decided to combine a population analysis with the capture operations of the team of the Nature Conservation and Tourism Branch who were translocating black-faced impala, to determine the population structure.

The catching operations during November 1968 were carried out on a completely random basis for the first 10 nights. During the following nights only

females were caught. This was the first time ever that spotlights were used at night to catch impala in the Kaokoveld. None of these animals, therefore, had any previous experience of such operations and as the whole population at this time was concentrated along the flood plain at Omuhonga, they all stood an equal chance of being caught. During the catching operation in September 1969 it was decided to concentrate on females and only a few males were caught. The females however were still being caught in a completely random way with no selection as to age.

As the impala are seasonal breeders the young born during a lambing season consist of an easily recognizable group of individuals until their second year. During this time they are distinguishable by their body size and the size of their horns.

During the November 1968 catching operation the population thus consisted of animals approximately 20 months old and animals over two years. The animals caught were grouped into two age classes namely adult and juveniles. The latter consisted of animals nine months old to twenty months old. The females caught during September 1969 were divided into age classes according to weight and thus consisted of animals up to eight months old, 20 months old, 32 months old and fully grown animals.

Only the figures obtained during the first 10 nights in November 1968 were used as basis for working out the population structure. The figures obtained during September 1969 were used as a basis to determine the age structure in the female sex class. According to Table 1 juveniles form 20.4 per cent of the population while the adult females (58.1 per cent) and the adult males (21.5 per cent) form the remaining 79.6 per cent. The male:female ratio for the whole population is 1:2.1, the male:female ratio for adults is 1:2.7, while the male:female ratio for juveniles is 1:0.9. The juvenile:adult ratio is nearly 1:3.9.

Table 1. The black-faced impala population structure, Kaokoveld South West Africa.

	Numbers			Ratio	
	Male	Female	Total	Male	Female
Juveniles	10	9	19	1	0.9
Adults	20	54	74	1	2.7
Total population	30	63	93	1	2.1

The same trend is observable when the figures for the females caught during 1969 are studied. The juvenile females (eight months old) form 24.9 per cent of the total females caught, this is 4.5 per cent higher than the percentage juveniles for the whole population sample caught during November 1969. Stewart and Stewart (1966) did a survey in the Mkuzi Game Reserve to determine sex and age ratios of impala in Natal. The result is shown in table 3. The figures show striking similarities with the figures obtained in the Kaokoveld. In Mkuzi the juveniles also form the smaller part of the population e.g. 21.2 per cent, while the adult females (55.7 per cent) and adult males (23.1 per cent) form the remaining 78.8 per cent. Even the male:female ratio for the different age groups shows a similarity.

Table 2. Females caught during September 1969 in age classes according to weight. (Kilograms).

± 8 months	± 20 months	±32 months	Mature
23.6	40.8	47.2	49.9
27.2	41.7	46.3	49.9
29.0	42.6	45.4	51.7
31.8	40.8	46.3	49.1
26.8	41.7	46.3	49.1
30.8		44.5	51.7
33.1			51.3
			49.9
			50.8
% of total population			
24.9	18.0	21.4	35.7

Table 3. The population structure of impala in Mkuzi Game Reserve, Natal. (Numbers after Stewart and Stewart, 1966).

	Numbers			Ratio	
	Male	Female	Total	Male	Female
Juveniles	433	400	833	1.08	1
Adults	904	2184	3088	1	2.4
Total population	1337	2584	3921	1	1.9

If one assumes therefore that the Mkuzi Game Reserve's population structure of impala is normal, it follows that the population structure of the black-faced impala must likewise be normal. With the present recruitment rate they were beginning to have problems of over-population in Mkuzi while with similar recruitment rates the population in the Kaokoveld is declining. If this reduction was due to inherent faulty population dynamics it must have shown in the sex and age ratios, which is not the case. One must come to the conclusion that the present state of affairs in the Kaokoveld is due to external factors, and given the opportunity the population of black-faced impala might well re-establish itself.

There are certain doubts as to the accuracy of the figures obtained in the Kaokoveld, owing mainly to the fact that so few were caught. It is also possible that the females and juveniles are more cautious than the males and that certain age groups

learned faster than others to move away when they saw or heard the capture team. It was felt, however, that until a full research project is initiated on these animals, the information may give some indication on the present state of affairs. Furthermore, they compare favourably with the findings of Stewart and Stewart (1966) in Natal.

V. SOCIAL STRUCTURE

It is well known that impala form female herds and male herds, Shortridge (1934), Ansell (1960) and Schenkel and Schenkel (1966). Normally the female herds also contain the young of the season and/or the previous season. The female herds are usually accompanied by a dominant male.

Observations on herd size were made whenever the opportunity arose. The observations were compiled into figure 1. Normally herds tend to be composed of three to fifteen individuals. However, herds consisting of 21 individuals were seen twice. Unfortunately no accurate figures were obtained of herd sizes during or shortly after the lambing season, but one can expect breeding herds to be slightly larger. These larger herds split up into smaller herds again, soon after all the lambs of the season have been born. This might be ascribed to the disturbance factor caused by the dogs and Ovahimba youngsters and to the topography of their area which discourages large herds. This occurrence of small or splinter herds was also noticed at Omuhonga where the greatest concentration of black-faced impala in the Kaokoveld occurs. At Omuhonga the total population numbers 450 to 500 individuals, but rarely were herds exceeding 15 animals seen.

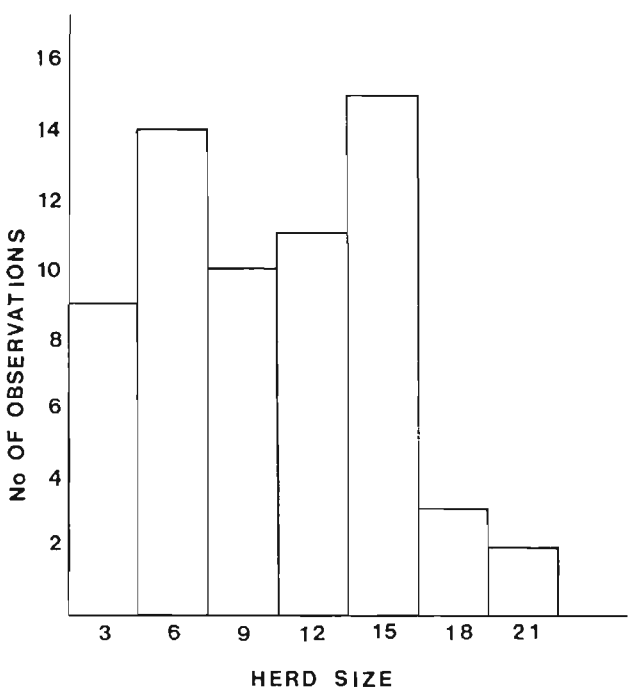


Figure 1. Distribution of herd sizes for the black-faced impala in South West Africa.

Solitary males or just two individuals are often encountered. Although no solitary females were ever observed the author once came across a female with a juvenile of approximately six months old with her and although considerable time was spent in the area no other black-faced impala were observed. On other occasions a pair of females were observed alone.

During the night these herds congregate in open localities to lie up. Disused patches opened up by the shifting cultivation practices of the Ovahimbas along the Omuhonga flood plain are especially favoured. Elsewhere the open glades are used. Between 50 to 150 individuals may lie up in such an open spot. Whether these congregations form a single herd or whether they are separate groups remains a debatable point and more observations are required. The author is under the impression however that this habit must have a survival value in that a more vigilant watch can be kept against predators at night, while during the day the smaller herds are more difficult to track down.

In these clearings, favoured by the black-faced impala, large roughly circular patches of accumulated droppings can be observed. By looking for fresh droppings on these dung heaps one can quickly determine where the different groups of black-faced impala in a certain locality are spending their nights.

It was noticed that the dik-dik, which share this habitat with the black-faced impala also frequently use the same dung piles (Tinley 1969).

VI. GROWTH RATES

Owing to practical considerations not all the animals caught could be weighed and measured. More information was gathered about the females than the males, but it is doubtful as to whether it will have a marked influence on these calculations. Few fully mature males were caught and the highest maximum weight might be slightly higher than the figure given here. This again will only have a limited influence on the calculated average weight for fully matured male animals.

At birth the lambs weigh approximately 5 kilogram. During the first nine months they pick up weight at the rate of approximately 2.69 kg/month for the males and 2.58 kg/month for the females. During the following 12 months the weight gain is approximately 1.34 kg/month for the males and approximately .95 kg/month for the females. The rate at which they gain weight in the following months is less. From their 22nd month they gain weight at about .79 kg/month and .63 kg/month for the males and females respectively. (See Figure 2).

As can be seen in figure 2 the rate of growth during the first 20 to 22 months is very marked. During this period the males increase in height

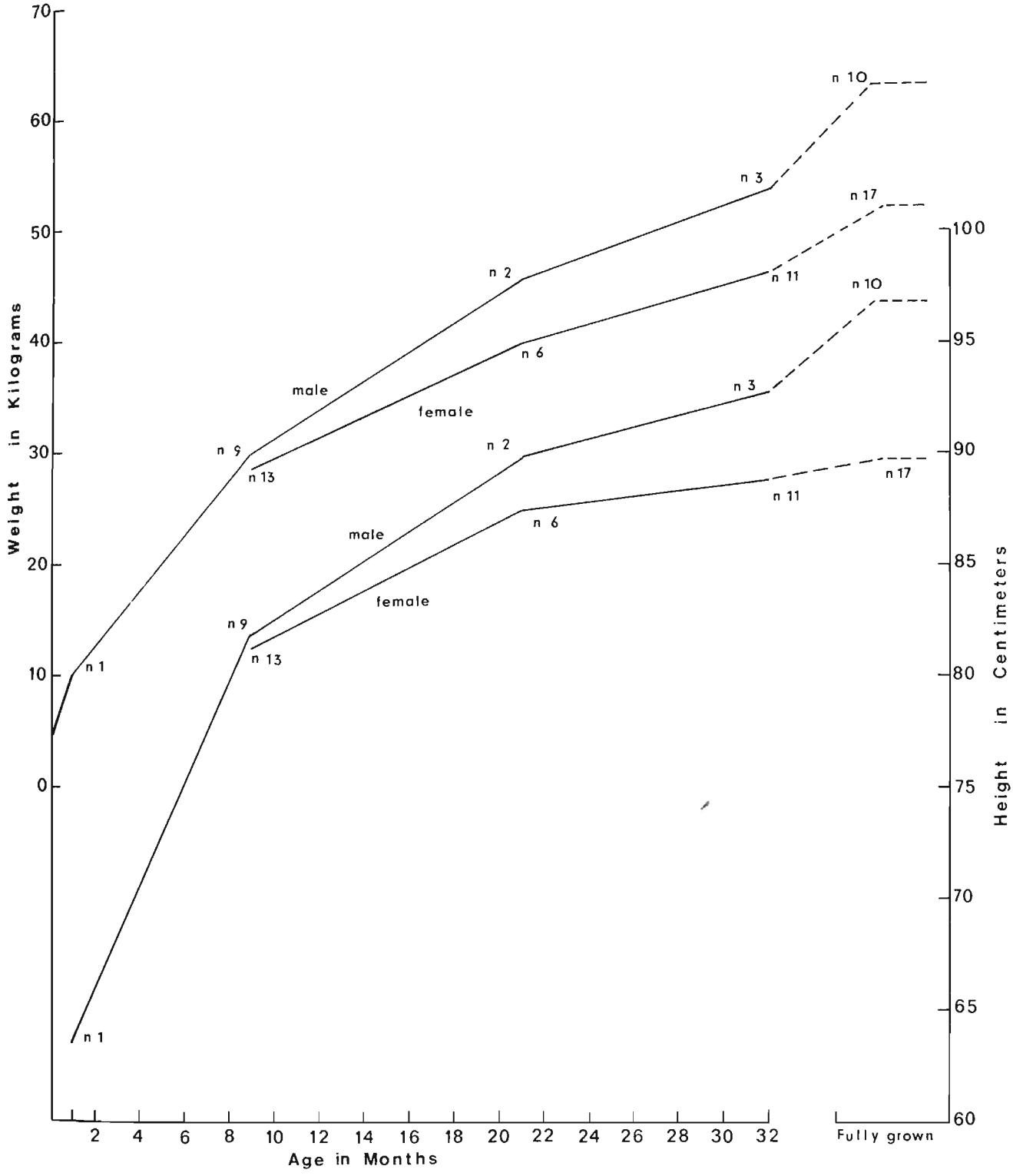


Figure 2. Growth rates — height and weight — for the black-faced impala in South West Africa.

(measured at shoulder) at a rate of .65 cms/month and the females at a rate of .50 cms/month. During the following year the growth rate slows down and the males only gain .26 cms/month and the females .12 cms/month. After the 32nd month the females show a very small height increment. The males however gain an average of 3.9 cms after the 32nd month. Despite this the females gain nearly as much in weight as the males do. The average is 6 kg in the females as against the 9 kg in the males (See figure 2).

VII. REPRODUCTION

In Natal the lambing season of *A. melampus* starts in November and by the end of March all the lambs have been dropped (Stewart and Stewart, 1966). In the Kruger National Park the lambing season is given as "usually in November and December" (Labuschagne and van der Merwe, 1963). In the Kaokoveld the impala appears to have a short and marked lambing season which might be attributed to the equally short rainy season. It was observed that the black-faced impala usually start dropping their lambs at the very end of December with a peak in January. By February new-born lambs were rarely seen. The breeding dates for the females translocated during the past two years were between the 20th December and the 15th January. Of the 28 females translocated to Otjovasandu during November 1969, 10 were under two years of age. All the other females dropped lambs, which indicates a high lambing percentage. At Namutoni one of the translocated black-faced impala females had a pair of twins. One of the lambs was totally ignored despite the fact that it was in excellent health, and it eventually died (R. Biggs, 1970).

VIII. ENDOPARASITES AND ECTOPARASITES

Endo- and ectoparasites were collected only during the dry season. It might well be that the degree of infestation varies during the different seasons of the year. It is known, however, that contamination is usually relatively low in the more arid parts of Southern Africa.

Post mortems were conducted on 9 animals. Only four of these animals had any internal parasites and even so the degree of infestation was very low. In three of the animals hookworm lesions (*Cooperioides hepatica*) were found. In two of the animals *Haemonchus bedfordi* were found. According to Dr. A. Verster (pers. com. 1969) both of these endoparasites are also found in the Transvaal *Aepyceros melampus*.

Unfortunately no information could be gathered on the actual degree of parasitism in the Transvaal and Natal populations of impala.

Ticks were confined to the scrotal and anal regions and also in external ear canals of the animals. The degree of infestation however was low and only an average of four to ten ticks were found per animal. In the external ear canals however the degree of infestation was markedly higher. The latter infestation were formed mainly by immature stages.

The following ectoparasites were found:

Rhipicephalus duttoni
R. evertsi mimeticus
R. capensis
R. oculatus

IX. SUMMARY

Information on black-faced impala was gathered during the catching operations in 1968, 1969 and also during infrequent encounters over a period of four years. In the Kaokoveld the distribution of the black-faced impala is limited to areas with suitable vegetation, cover and possibly the availability of open water. These localities usually comprise a dense riverine vegetation zone bordering on vegetation zones of moderate density. A detailed description is given in the black-faced impala's distribution areas.

A description is given of the feeding habits as well as a list of food plants. Apart from competition with domestic livestock no direct competition with other animals sharing the black-faced impala's habitat was noticed.

Apart from man, the leopard is the most important single predator of the black-faced impala in the Kaokoveld.

The population dynamics of the black-faced impala in South West Africa show marked similarities with the figures obtained from the Mkuzi Game Reserve's impala population in Natal. Herds seem to be composed of three to fifteen individuals. A description is given of the growth rate of the impala. The most rapid growth occurs during the first 20 to 22 months after which it slows down. The lambing season usually starts towards the end of December with a peak in January.

Infestation by endo- and ectoparasites is relatively low.

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