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SHORT-TERM RESPONSE IN UNGULATE NUMBERS TO RAINFALL IN THE NOSSOB RIVER OF THE KALAHARI GEMSBOK NATIONAL PARK

by

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Abstract – Counts of springbok, gemsbok, red hartebeest and blue wildebeest were made in the Nossob riverbed of the Kalahari Gemsbok National Park to measure the response in abundance of these species to the onset of the summer rains. Springbok and red hartebeest showed an immediate increase in numbers, probably in response to improving grazing as the first green sprouts of the riverbed vegetation appeared. Gemsbok showed a delayed reaction, their numbers increasing only after the vegetation in the riverbeds grew tall enough to be utilized by them. Blue wildebeest showed a relatively small decline in numbers which could be due to local movements or the start of their annual east-west movement in winter.

Introduction

In the ecology of the Kalahari Gemsbok National Park, an area without natural permanent water, rainfall is of particular importance. The vegetation has adapted to these conditions and show a rapid response in growth following the first good rains of the limited summer rainfall period. Under the delicately balanced environmental conditions experienced in this semi-arid area, the animals also are adapted to utilize fully the rapid change in vegetation which follows periods of good rainfall.

During early 1972 the response of four ungulate species, i.e. springbok *Antidorcas marsupialis*, red hartebeest *Alcelaphus buselaphus*, gemsbok *Oryx gazella* and blue wildebeest *Connochaetes taurinus* to good rains, as shown by their numbers in the Nossob river, was noted over a three-month period. These observations are few in number and indicate the need for detailed studies on the movements of the major ungulate species in this park.

Methods

Periodic counts of gemsbok, springbok, red hartebeest and blue wildebeest were made over the entire length of the Nossob river in the park from

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early January to late April 1972. The method employed was described by Bothma (1971). All counts were made on the days indicated, except the January 15 figure which is a date chosen for a combination of a count from Nossob camp to Union's End on 17 January and one from Twee Rivieren to Nossob camp on 14 January 1972. Rainfall data as presented in Fig. 1 are based on daily averages for the combined rainfall at Twee Rivieren and Mata-Mata during December 1971 and January 1972, while Nossob camp data were only used for the average figures for February to April 1972, as rainfall figures for Nossob camp were not available on a daily basis for December 1971 and January 1972.

Results and Discussion

The Kalahari Gemsbok National Park, situated in the southern Kalahari Desert, is a semi-desert region with unreliable and fluctuating rainfall where the average annual evaporation from a free-water surface is ten times higher than the mean annual precipitation (Leistner, 1967). An average of three and a minimum of one to two dry years can be expected during a ten-year period, with the average duration of drought periods being almost two years. The rainy season usually lasts from November to April, with 50 per cent of the precipitation falling in January to March.

Two showers of rain totalling 20-25 mm and falling within about two weeks have a marked effect on the vegetation at any time of the year. A single shower of less than 10 mm falling on dry soil appears to be ineffective unless it is closely followed by another, bringing the total to at least 10 millimetres. From spring and summer, vegetative growth is possible until May when the frosts begin and the summer annuals die off (Leistner, *op. cit.*).

Bothma (1971) demonstrated how the four ungulate species under discussion here vary in their distribution along the Nossob riverbed. This variation probably results from differences in vegetation occurring in different sections of the riverbed. These differences in the riverbed are described by Leistner (1959). A further influence on game distribution in the Nossob riverbed stems from geomorphic and topographic variations; especially springbok and red hartebeest seem to prefer relatively wide, open, flat areas such as is commonly found in the northern portion of the Nossob, i.e. from Union's End to the vicinity of Kameelsleep south of Nossob camp. The bed of the Nossob in this section of the river is a wide, shallow, sandy trough up to 1 000 m wide, while south of Kameelsleep, and especially between Kij-Kij and Twee Rivieren, the riverbed forms a relatively narrow channel from 100 to 500 m wide (Leistner, 1967).

In the years immediately preceding the time of the observations discussed here, the park experienced relatively dry conditions with limited good showers in terms of quantity and distribution. According to long-term weather data for Twee Rivieren, that area of the park receives an

average annual precipitation of approximately 150 millimetres. This figure increases northwards into the park but reliable long-term data for Mata-Mata and Nossob camp are lacking. During the 1969/70 (April to March) season, Twee Rivieren experienced poor precipitation (84,3 mm) while the 1970/71 season was more nearly normal (155,2 mm). These dry and almost normal years were followed by excellent rains in terms of quantity and distribution during the 1971/72 season (240,8 mm), most of which fell from January to March 1972. The same general picture applies to the rest of the park, although the rainfall at Mata-Mata is usually higher than at Nossob camp, where in turn it is higher than at Twee Rivieren.

The first good rains of any consequence occurred on 5 January 1972 (Fig. 1). This initiated a period of relatively well-spaced, adequate showers for the whole park. For example, Twee Rivieren received 72 per cent of its average, normal, annual rainfall during January 1972 when 108,5 mm was measured. Since most of the grasses in the riverbeds are sweet, ecologically effective rains soon brought on a crop of highly nutritive annuals while the feeding value of most of the perennials was increased (Leistner, 1967). Game counts (Table 1) during this period showed a remarkable response to these improving range conditions according to the particular preferences and requirements of each species.

Table 1

Counts of four ungulate species occurring in the Nossob riverbed, Kalahari Gemsbok National Park, from January to April 1972.

Date	Animal Numbers			
	Springbok	Red Hartebeest	Gemsbok	Blue Wildebeest
4 Jan. 1972	2260	37	24	107
7 Jan. 1972	1967	92	15	54
15 Jan. 1972	2670	246	71	59
20 Jan. 1972	3691	366	133	81
19 Feb. 1972	6489	619	127	62
20 Apr. 1972	3800	482	890	28

Springbok and red hartebeest show the same pattern of response, i.e. a rapid increase in numbers in the riverbed, followed by a peak and a gradual decline in numbers. Springbok are known for their habit of feeding close to the ground (Eloff, 1959 a and Leistner, 1959), while Skinner, Von La Chevallerie and Van Zyl (1971) demonstrated that springbok commence feeding on succulent, green grass immediately it appears after rain. The emerging green sprouts in the riverbed was thus

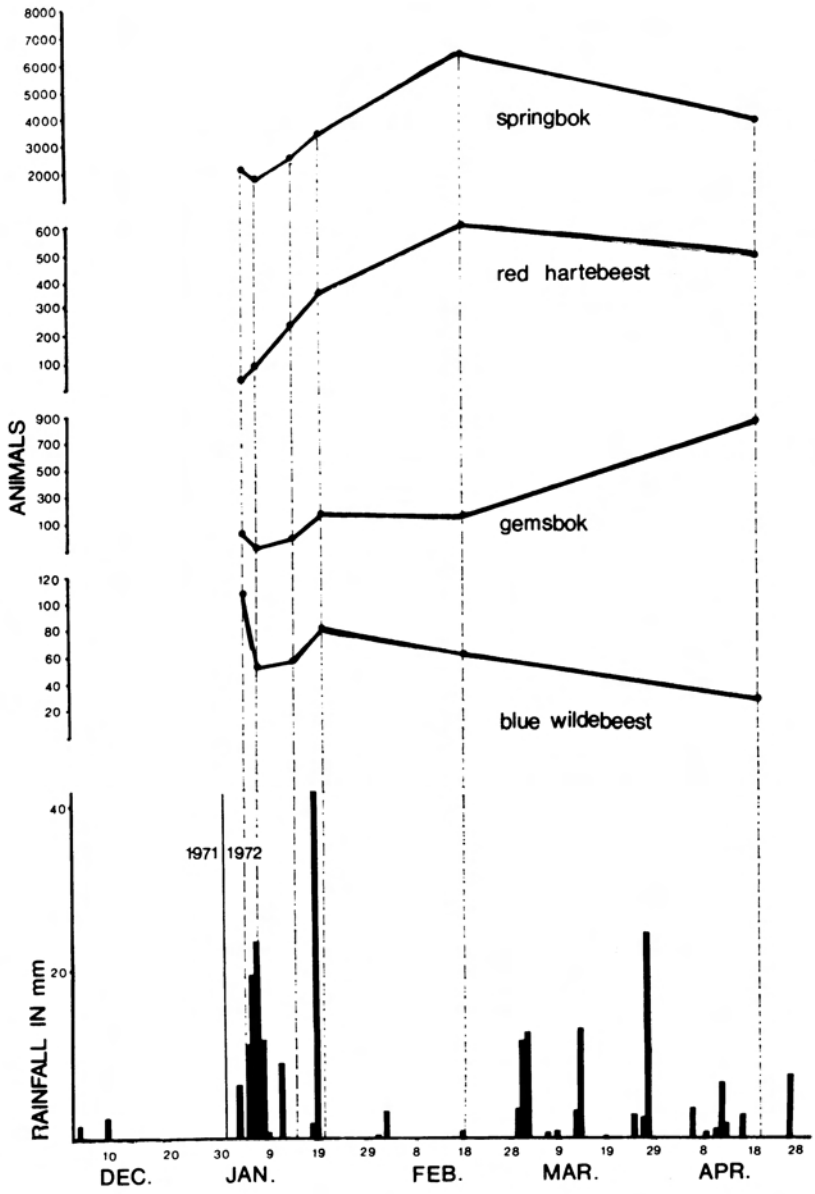

Fig. 1. Short-term response in ungulate numbers to rainfall in the Nossob riverbed of the Kalahari Gemsbok National Park from January to April 1972.

favoured by springbok. The red hartebeest equally favours short vegetation (Leistner, 1959).

In the Kalahari Gemsbok National Park it is especially the young bushmangrass (*Stipagrostis obtusa*) occurring on the banks and bends of the riverbed that attracts the springbok and the red hartebeest (Eloff, 1962). In the Nossob riverbed other grasses important in this connection are *Panicum coloratum*, *Eragrostis bicolor*, *Eragrostis lehmanniana* and *Enneapogon brachystachyus* (Leistner, 1959, 1967). As the rainy season progressed, however, both springbok and red hartebeest showed a decline in numbers. Skinner *et al* (1971) have shown that as grass matures and becomes drier, springbok utilize it to a lesser extent. Leistner (1967) and Eloff (1959 b) also state that springbok and red hartebeest avoid tall grass, being taken mostly when short, young and green. Although direct evidence is lacking, it is considered likely that the vegetation in the riverbed gradually became too tall and dense for these species since they both prefer short veld.

The gemsbok showed a pattern almost directly opposite to that of the springbok and red hartebeest. There was a relatively long period of low population levels, followed by a considerable increase in numbers (Table 1). It appears likely that the same factor, i.e. vegetative growth, responsible for the decline of springbok and red hartebeest numbers in the riverbed, resulted in this delayed increase in gemsbok numbers. Gemsbok feed mainly on grasses, although they do a fair amount of browsing (Leistner, 1959, 1967; Eloff, 1959 a, b) and they are often found in areas of relatively tall grass, on which they prefer to feed. Ephemereals also provide an attractive menu to gemsbok (Eloff, 1962). It is therefore possible that the time of high gemsbok concentration in the riverbed is coupled to the height of the grass occurring, and the delay caused by the time needed for these ephemereals in the riverbed to sprout and grow.

The pattern shown by the blue wildebeest is more difficult to explain. As in the case of the springbok and the gemsbok there was an initial decrease in wildebeest numbers in the riverbed after the first heavy showers. During this time there was relatively little to feed on in the riverbed since the whole bed was waterlogged and extremely muddy. Conditions like this probably cause most ungulates to leave the riverbed temporarily. After an initial small increase following the wettest period, wildebeest again showed a gradual decline in numbers. This decline is difficult to explain although two possibilities exist.

Wildebeest are relatively sedentary animals, staying in the vicinity of water and not moving about much once they are present in an area (Eloff, 1959 a, 1966). The decrease in their numbers could therefore merely be a random fluctuation since the temporary absence of a single herd from the riverbed would drastically influence an already low population count. However, the Nossob wildebeest population may move eastward into Botswana in search of better grazing in the thornveld areas at the start of the rainy season (Eloff, 1961). The second possibility therefore is that the wildebeest in the Nossob had started their eastward movement soon after

the rains fell. This seems less likely, however, in view of the experience of Mr. C. le Riche (*pers. comm.*) who maintains that this eastward movement away from the Nossob usually starts later in the year, especially after the first frost of the season.

Conclusions

Springbok, red hartebeest, gemsbok and blue wildebeest show different patterns of response, as is evidenced by their numbers in the Nossob riverbed, to the onset of good rains which follow on a relatively dry period. These response-patterns vary from species to species but still give an important clue to the overall ecology of ungulates in the Kalahari Gemsbok National Park. The response of the springbok and gemsbok apparently concerns local movements into and out of the riverbed. This is probably also true for the red hartebeest although the decline in numbers in April could signify the start of a long-range movement into Botswana as mentioned by Eloff (1962). The decline in blue wildebeest numbers appears to be either local, or the direct consequence of the start of their annual, long-range, east-west movement into Botswana as mentioned by Eloff (1961).

These findings, of a tentative nature, again emphasize the need for a two-fold research on the ungulates in this park: one being a simultaneous study of animal densities at various distances away from the riverbed (preferably using aircraft), in order to get an idea of local distribution and movements of game; the second being an intensive marking programme to provide information on local and long-range movements of ungulates in the park and between the park and the rest of the southern Kalahari. The need for this has been advocated time and again by various authors working on this subject and it is considered a top priority to get basic information on the ecology of the larger ungulates in the Kalahari Gemsbok National Park in order to work out a sound management programme.

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