

OBSERVATIONS ON THE MOVEMENT PATTERNS AND DAILY HOME RANGE SIZE OF IMPALA, *AEPYCEROS MELAMPUS* (LICHTENSTEIN) IN THE KRUGER NATIONAL PARK*

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ABSTRACT

The movements and other behavioural and physiological patterns of impala and of some of the other more abundant game species in the Kruger National Park were studied to provide information which could be applied to their management, especially in regard to the artificial provision of water.

Preliminary results reveal that the daily home ranges of impala are relatively small ($\pm 0,98 \text{ km}^2/24 \text{ h}$), their short daily movements ($\pm 3,0 \text{ km}/24 \text{ h}$) are especially restricted at night ($\pm 0,6 \text{ km}/12 \text{ h}$) and that surface water and the availability of edible succulent vegetation in the vicinity thereof, strongly influence the regional distribution of this species in the Kruger National Park. Maps are included to illustrate typical impala movements in relation to the distribution of watering points and other ecological features, while quantitative information on their movements and daily home range size is compared with that of blue wildebeest, *Connochaetes taurinus* (Burchell), Burchell's zebra, *Equus burchellii antiquorum* H. Smith, buffalo, *Syncerus caffer* (Spartman) and the elephant, *Loxodonta africana* (Blumenbach).

Virtually no quantitative information on the movements of impala and the other South African ungulates could be found in the literature. Even Andrewartha and Birch (1954) in their very comprehensive discussion on the distribution and abundance of animals, provide no applicable quantitative information but merely refer to the general lack of published facts on the movements of wild animal species and the factors which may influence their natural movements.

This important aspect of the physio-ecology of various species is now being studied and some of the preliminary observations on the movements of free living impala in the Kruger National Park will be briefly dealt with in this paper.

PROCEDURE

The use of radiotelemetric game tracking equipment was originally considered. The necessary equipment was, however, not provided in time and the movements and activities of herds was followed by and observed directly from a Landrover. Herds of impala followed in this manner consisted of an average of 400 animals each in summer and 70 in winter and the movements of these were recorded directly for a total of 21 periods of 24 hours each.

An attempt was made to obtain adequately representative information by repeating the observations during different months of two consecutive years in different parts of the Park, thereby making provision for the effects of as great a variety of ecological phenomena as practically possible.

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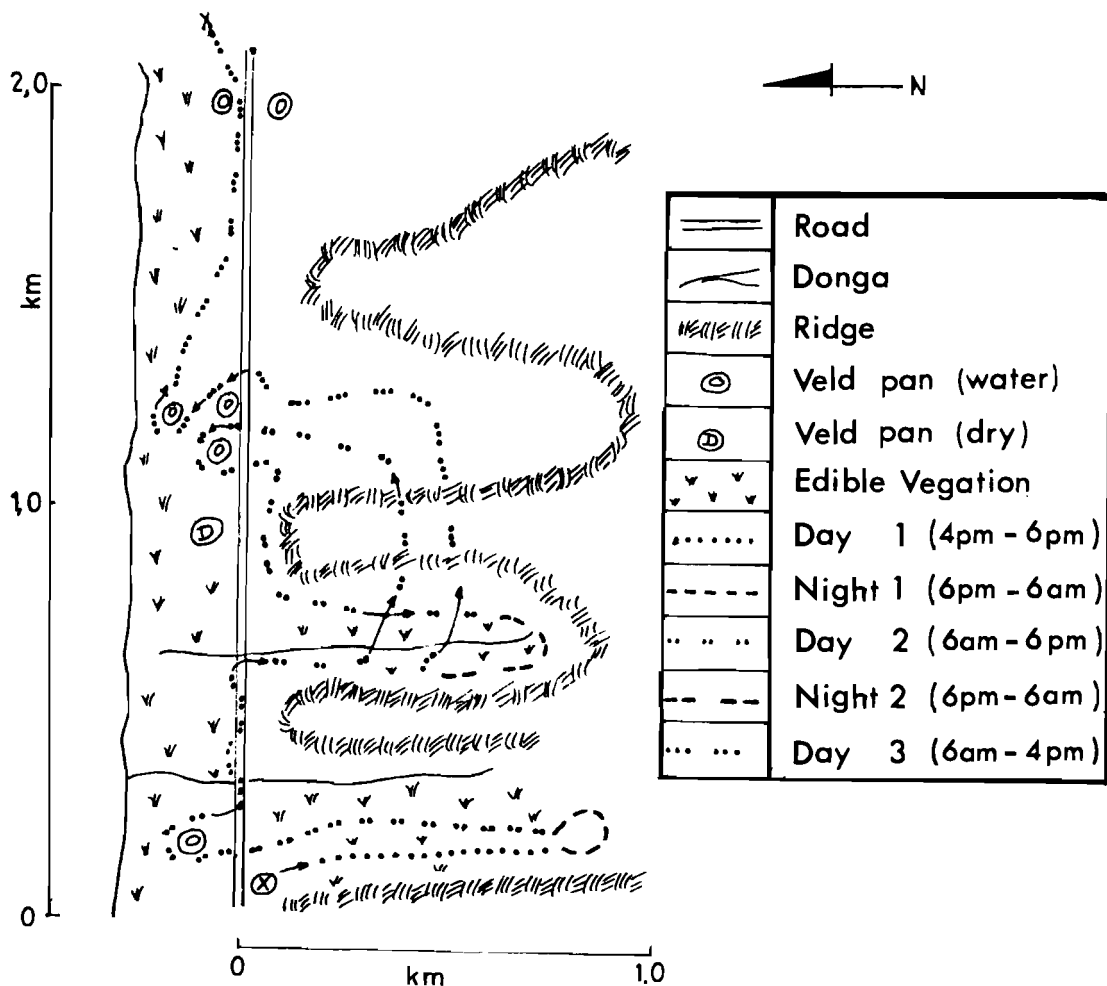


FIGURE 1
 Movement pattern of a herd of impala in summer during an observation period of 48 hours.

RESULTS AND DISCUSSION

Studying the movements of followed herds of impala by direct observation and without the aid of radiotelemetric equipment proved to be very successful. Impala herds soon accepted the Landrover as part of their natural environment and could be observed at quite close range for days on end without being disturbed by the observer – even the use of a powerful spotlight at regular intervals

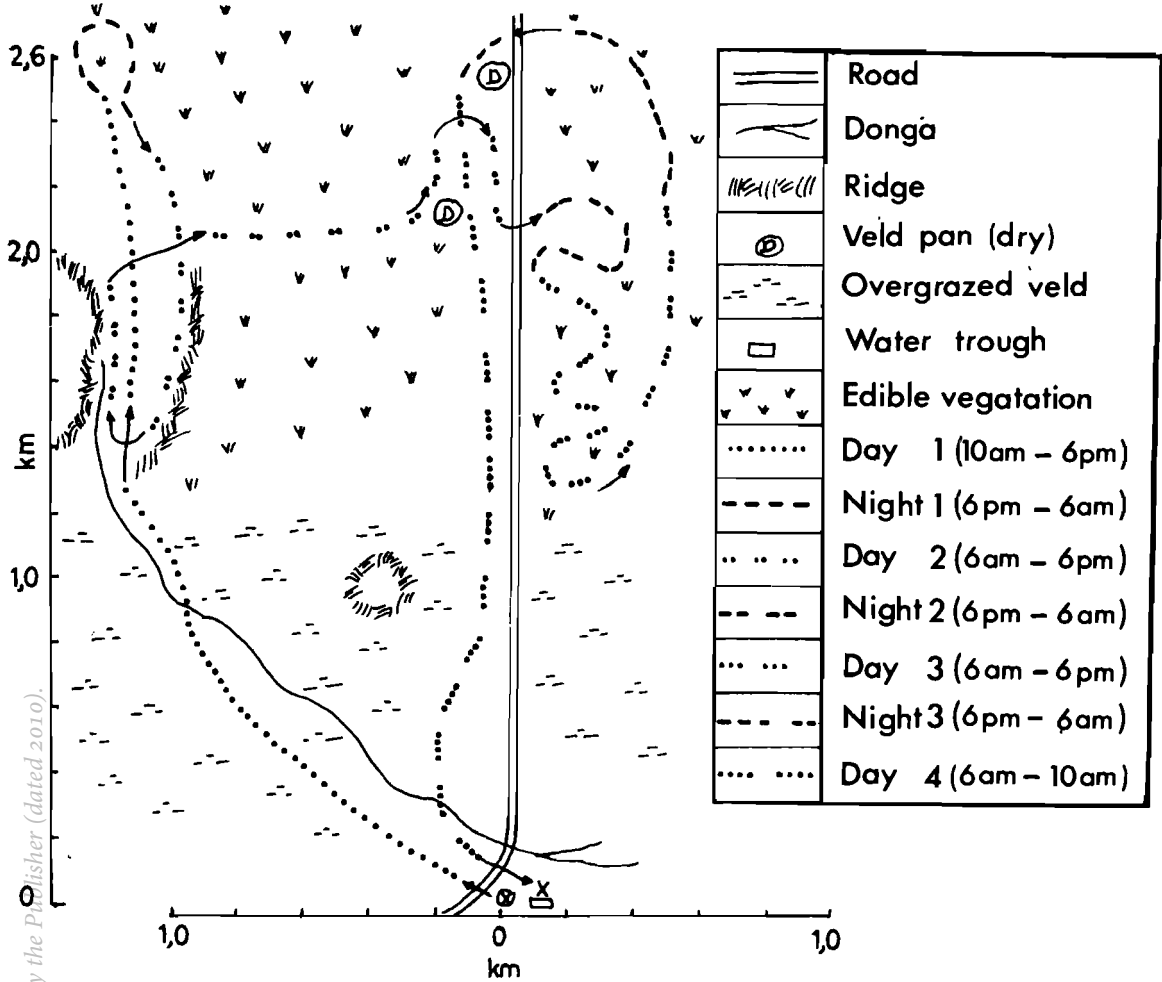


FIGURE 2
Movement pattern of a herd of impala in winter during an observation period of 72 hours.

during the night to locate them did not cause any significant disturbance. The more or less constant repeatability of our measurements of travelling distances and home range sizes as well as the relatively short distances which the animals moved every day confirm this view.

Movement patterns and regional distribution

The movements of individual herds were recorded diagrammatically and according to scale on maps of the particular study areas. Examples of such movement patterns are illustrated for two different herds during uninterrupted observation periods of 48 hours in summer (Fig. 1) and 72 hours in winter (Fig. 2) respectively.

The movement of an impala herd from one place to another is controlled by a high degree of co-ordination. This and other aspects of their behaviour are described by Leuthold (1970) and Schenkel (1966). Their distribution in a particular area is governed to a very great extent by their inherent feeding and drinking requirements and habits, and is influenced by a variety of environmental factors. The correlation of their movements with food and water is clearly demonstrated in Figs. 1 and 2.

Young grass shoots, such as may be found after rains or on newly burnt veld, green vegetation along watercourses and edible herbs and shrubs, often occurring on short and previously overgrazed or disturbed veld around drinking places or along roads, serve as special sources of attraction to impala. They depend to a great extent on such succulent vegetation as sources of moisture and their movement patterns are therefore greatly influenced by the availability and distribution thereof. This is particularly apparent during the dry winter months.

Impala in the Kruger National Park frequently move towards watering places during the early hours of the day, even when they are not going to drink and then move away from water in the late afternoon. This tendency is clearly demonstrated in Fig. 2. The night is usually spent in fairly open country mostly away from water. Schenkel (1966) comments on their general avoidance of waterlogged areas while Lamprey (1963) even describes their occurrence in waterless regions of Tanzania.

In spite of experimental evidence that impala can survive for practically indefinite periods without drinking (Young 1971a), they are seldom found in the Kruger National Park very far from water and then only in areas with adequate green and succulent foliage. A random survey and analysis of the distribution of 352 herds of impala in winter for instance revealed that more than 98% of the herds were within 8 km of drinking places during the day, while more than 50% of these herds occurred less than 1,6 km (1 mile) from the nearest water (Young 1971b).

The availability and distribution of surface water in the Kruger National Park therefore significantly influences the overall distribution of impala as well as their utilization of the available food in this park. The habit of impala to concentrate in the close vicinity of watering places and their pronounced preference for selective feeding can have marked effects on the floristic composition and cover around drinking places.

This is particularly true in overpopulated regions where focal areas of overgrazing and the undesired side-effects thereof may ensue due to the over utilization of their preferred food types; a problem which may be aggravated by the inadequate distribution of watering points.

This phenomenon in game, water and veld management has been enlarged on in separate papers (Pienaar 1970 & Young 1970a and b) and a suggestion is made that mineral licks be used on an experimental basis at strategic places in the veld in an attempt to induce a wider dispersal of water dependent game species, thereby relieving the intensive utilization of food plants in the close vicinity of water (Young 1970b & 1971b).

An attempt should, however, always be made to maintain zones which are relatively animal free between different population units in large and unfenced game sanctuaries, in order to make provision for adequate food reserves as well as to limit the distribution of infectious game diseases (Young 1970a and c).

Travelling distance and speed

The daily travelling distances of the different impala herds were measured on the Landrover's speedometer to the nearest one tenth of a mile and their average daily travelling distances and speed have been calculated from this information (Table 1).

TABLE 1
THE AVERAGE DAILY TRAVELLING DISTANCE (km) AND TRAVELLING
SPEED (km/h) OF IMPALA HERDS

<i>Season</i>	<i>Day</i> (6 a.m. – 6 p.m.)	<i>Night</i> (6 p.m. – 6 a.m.)	<i>Per 24 h</i>
Trav. dist.: Summer	2,46	0,61	3,07
Trav. dist.: Winter	2,25	0,64	2,89
Trav. speed: Summer	0,20	0,05	0,12
Trav. speed: Winter	0,19	0,05	0,12

Impala, in contrast to buffalo and some other species, may graze continuously in circles and in a shuttle pattern on the same small favoured feeding area, without making much progress in any particular direction. Their average travelling distances, presented in Table 1, describe the averages of the actual distances travelled by herds during specific periods and do not make provision for the many cyclic and to and fro movements of grazing individuals in moving herds.

A comparison of distances travelled during the day and night reveal greater movement activities during the day. Their average nocturnal travelling distance of less than 0,64 km, which has been confirmed by indirect observation, is surprisingly low. According to Schenkel (1966) and our own observations, impala seem to be more active at night in areas where they are more often disturbed by man. Seasonal effects on their movements are not as marked as those which have been encountered in the case of the other species, mentioned above.

Our preliminary investigations also suggest greater progressive mobility in the other species. Elephant, for instance, move on an average about 4,4 times as far as impala during any one day. The corresponding figures are 3,3 for buffalo, 1,9 for Burchell's zebra and 1,6 for blue wildebeest. Impala herds are occasionally seen to join passing herds of other game, such as wildebeest, zebra or kudu, in which case their movements may be affected to a certain extent by the other species.

Daily home range size

According to Blair (1953), the home range is the area over which an individual travels during its normal daily activities. In this discussion the daily home range may be defined as the area over which a particular herd travels during a particular 24 hour period.

Graphic presentations on scale of the daily movements of impala during the different seasons were used in establishing the rectangular area of their daily home ranges. The peripheral points of their movements were plotted on these maps. The furthest points for every 24 hours were connected by a straight line – representing the length of a daily home range. Thereafter the furthest points on each side of this line were joined perpendicularly to the latter. The sum of these

2 perpendiculars represents the breadth of a daily home range. Average figures based on these lengths and breadths were used to describe the area of daily home ranges for the different seasons. The average rectangular areas of the daily home ranges of some other species in the Kruger National Park, established in the same way, are also presented in this paper for the sake of comparison (Table 2 and Fig. 3).

TABLE 2
THE AVERAGE RECTANGULAR SIZES (km) OF DAILY HOME RANGES OF
GAME IN THE KRUGER NATIONAL PARK

<i>Species</i>	<i>Summer</i>	<i>Winter</i>	<i>Average</i>
Elephant	8,5 × 6,3	4,5 × 3,4	6,5 × 4,9
Buffalo	5,5 × 2,9	6,0 × 1,8	5,8 × 2,4
Zebra	0,8 × 0,8	5,6 × 0,6	3,2 × 0,7
Blue wildebeest	0,6 × 0,5	3,7 × 0,5	2,2 × 0,5
Impala	1,3 × 0,8	1,4 × 0,5	1,4 × 0,7

The daily home ranges of most species generally tend to be longer and relatively narrower in winter than in summer. This may be partially due to the fact that game have to travel longer distances in winter from their grazing grounds to relatively distantly situated drinking places and back to their grazing grounds. The daily home ranges of impala are, according to our preliminary investigations, considerably smaller in winter than those of the other studied species. Roan antelope, *Hippotragus equinus equinus* (Desmarest 1804) in the Kruger National Park also occupy more extensive daily home ranges (Joubert 1970).

The distribution of impala is, as in the case of wildebeest and zebra, also fairly restricted in summer to relatively small areas around available water with adequate grazing. One particular herd for instance, did not leave an area 0,3 x 0,2 km in size during a 24 hour observation period. Home range size may be expected to vary to some extent from one area to another as it is also influenced by a variety of environmental factors. Disturbances by man in smaller game reserves and on game farms may have a particularly significant effect on game movements.

Activity patterns

The activity patterns of impala have also been studied by direct observation. Like other ruminants, impala also reveal a cyclic activity pattern. Periods of active grazing, which may be initiated by different environmental factors, including the rise of the moon at night, are alternated by periods of rest and rumination. This study revealed an average of three feeding sessions per night.

Nocturnal cycles of activity and rest are more clearly defined. Their activities during the day are to a greater extent influenced by temperature and other environmental factors. The effects of these factors on the activity patterns of impala and some other species will be discussed in detail in a subsequent report (Young 1971c).

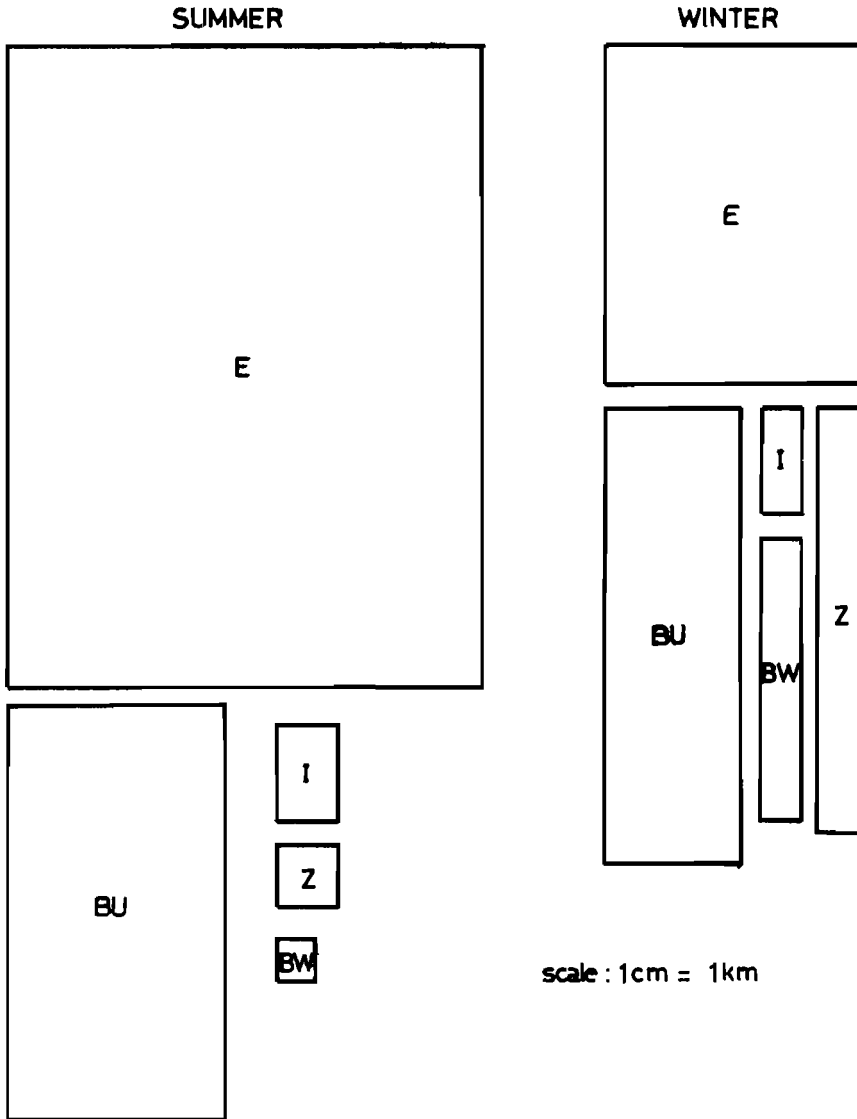


FIGURE 3

The average rectangular area of the daily home ranges of Elephant (E), Buffalo (BU), Impala (I), Zebra (Z), and Blue Wildebeest (BW).

SUMMARY

It has been established that the movements and other activities of impala can be studied successfully for prolonged periods by direct observation and without the aid of expensive radiotelemetric game tracking equipment. Studies of game movements may be simplified by the use of such equipment but valuable additional information on the ethology and ecology of the species can be obtained by continuous and direct observation of the study herds.

Impala movements in the Kruger National Park are closely related to the availability of water and the distribution of their preferred food types around drinking places. Other ecological features seem to have less significant effects on their regional distribution.

Several other species reveal more progressive movement patterns than impala. Nocturnal activities of impala in the Kruger National Park are especially restricted. Impala occupy relatively small home ranges in the close vicinity of surface water and this phenomenon may facilitate overgrazing and the undesirable side-effects thereof around drinking places, especially in overpopulated game sanctuaries.

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