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Seasonality of reproduction in the sable antelope

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Summary

The timing of reproduction of the sable antelope *Hippotragus niger roosevelti* was studied in the Shimba Hills National Reserve, Kenya. The pattern of four herds was followed through a 3-year period. Distribution of births throughout the year characterizes this population while sable in southern latitudes calve seasonally. In the Shimba Hills members of a herd may synchronize their reproduction and possible adaptive significance of such synchrony is discussed.

Résumé

L'époque de reproduction de l'Antilope Sable, *Hippotragus niger roosevelti* a été étudiée dans la Réserve Nationale de Shimba Hills, au Kenya. La composition de quatre troupeaux fut suivie durant une période de trois ans. La répartition des naissances tout au long de l'année est caractéristique de cette population alors que, sous des latitudes plus méridionales, l'Antilope Sable met bas saisonnièrement. Dans les Shimba Hills, il se peut que les membres d'un troupeau parviennent à synchroniser leur cycle de reproduction, et le sens d'une adaptation possible à une telle synchronisation est discuté.

Introduction

The effect of environment on reproduction is obvious in temperate lands where most animals produce young in the spring when food is most available. Environmental cues such as daylength can be used for breeding in species whose gestation period does not exceed 12 months. Near the equator, daylength and temperature do not vary much. The availability of food is closely associated with rainfall, and rainfall is often unpredictable. Animals with short gestation periods initiate mating, as well as produce offspring during the rainy period (Short, 1972).

The African antelopes have a gestation period of 5·5 to 9 months (Dittrich, 1972). Their breeding pattern has been described in particular by Ansell (1960), Fairall (1968), Leuthold & Leuthold (1975) and Skinner, Van Zyl & Oates (1974). Despite some exceptions, there is a tendency toward a single well-defined peak of reproduction as one moves away from the equator. The births usually coincide with a single rainy period. The pattern of two rainy seasons makes it extremely difficult to determine what influences the timing of reproduction in East Africa. Species with short gestation periods, such as the Thomson's gazelle, may reproduce twice per year (Robinette & Archer, 1971). Most species reproduce year round with birth peaks. The birth peaks

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have been related to the conditions at conception, the conditions when the young are born, or even the nutrition available to calves when they are weaned (Gosling, 1969).

Information on temporal patterns of sable *Hippotragus niger* reproduction is available for Rhodesia (Grobler, 1974), Zambia (Ansell, 1960), South Africa (Fairall, 1968) and Angola (Estes & Estes, 1974). The records from Rhodesia, South Africa and Angola indicate that sable are strictly seasonal breeders, with a 2–3 month calving season. The calving season coincides with the peak or the end of rains. The breeding pattern in Zambia and Kenya (Estes & Estes, 1969) has not been clear. Ansel writes that 'data are inconclusive and not much in accord with records from adjacent territories'. Estes and Estes suggested two calving peaks for the Kenya sable: January/February and/or August/September. The gestation period of the sable in zoos has been recorded as 261–281 days (Dittrich, 1972; Buechner, Stroman & Xanten, 1974). This duration has been generally accepted (Buechner *et al.* 1974; Estes & Estes, 1974; Grobler, 1974). Wilson & Hirst (1977), however, give a gestation period of 240–248 days ($n=7$) for sable observed in South Africa under semi-natural conditions.

Materials and methods

The patterns of reproduction were studied in the context of a broader behavioural investigation of Hippotragine antelopes in the Shimba Hills (Sekulic, 1976; Sekulic & Estes, 1977; Sekulic, 1978; Sekulic, unpublished). The sable were observed for a total of about 900 h during June to September 1973, July 1974 to January 1975, June to September 1975 and 1976. The animals were watched from a vehicle with the aid of a 7×50 mm and 16×50 mm binoculars. Most of the herds were habituated to vehicles and could be approached without apparent disturbance to a distance of 50 m or less. Composition of four sable herds was regularly noted. Accurate estimation of ages was possible by comparison with two marked calves and by observing a small herd of fifteen sable for 3 consecutive years.

Results

Each herd occupied a range of 10–25 sq km with an overlap of 20% or less with the range of a neighbouring herd (Sekulic, unpublished). Fig. 1 shows the monthly distribution of births (Herd A, eighteen to twenty-nine adult females; Herd B, four to six adult females; Herd C, seven to eight adult females; Herd X, three to five adult females). The climate diagram (modified from Walter, 1973) indicates the arid periods when rainfall was low relative to temperature and humid periods when rainfall was high relative to temperature. If we assume that every female has on the average one calf a year, the birth of at least 80% of the calves was recorded each year for herds A, X and C. Most of the unrecorded calves probably disappeared during the hiding stage. Some may have died later, but were not recorded because of my absence from the area.

While the sample size of the three smaller herds is not large enough for any firm conclusions, females of Herd A synchronized their reproduction to a certain extent. Calves born in herds B, C and X during 3-month periods between June 1973 and May 1976 (forty-four births) showed no correlation with the fifty-seven births in Herd A ($P_s = -0{\cdot}01$, $n=12$). There is an interval of 9 months (three times) to 10 months (once)

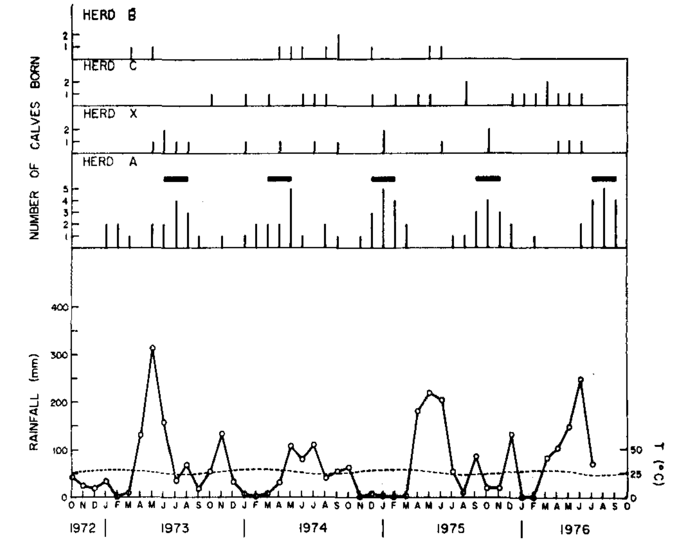

Fig. 1. Distribution of births in four sable herds compared with rainfall (Agriculture Dept., Kwale) and mean temperature (Glover, P. E. 1969. *An Ecological Survey of the proposed Shimba Hills National Reserve*, Kenya National Parks, Nairobi, 148 pp.). Dark bars indicate calving peaks.

between successive 3-month birth peaks in Herd A. When 9-month cycles are considered, birth synchrony in Herd A has steadily increased. In the first 9 months of 1973, 53% of the young were born during the 3-month peak while during the last 9 months of the study 81% of the calves were born during the peak.

Discussion

In Rhodesia and South Africa most of the rain falls during a 3 to 5 month period, and the sable have a well-defined calving season which occurs toward the end of rains. In Africa vegetational changes are closely related to rainfall; the young grasses with most protein grow at the onset of the rainy season (Dougall & Glover, 1964). Since late pregnancy and lactation are known to be the time of the greatest nutritional need for females (Sadleir, 1969), calves born during rains are most likely to survive. Those animals that conceive soon after parturition will be selected against because calves born before the rains will have less chance of surviving. In coastal Kenya and possibly Zambia, those sable that are in a good condition can conceive shortly after giving birth, the result being year round production of calves. It is interesting that although Zambia and Angola are at comparable latitudes and have a 5-month dry period, the Angolan sable were found to be seasonal while those in Zambia were not. The difference may be related to the total amount of rainfall; sable habitat in Angola receives 1200–1400 mm a year (Estes & Estes, 1974), which may be considerably more than most areas in Zambia. (Range 800–1300 mm, Ruffner & Blair, 1974.)

Females in the Shimba Hills were not observed to mate until several weeks post-partum. The birth peak interval therefore suggests a gestation period of 8 months, as described by Wilson & Hirst (1977). If we assume a 9-month calving interval, a Kenyan sable female could produce four calves in a 3-year period while a female in southern latitudes could produce only three.

Sable belong to the 'hider' type ungulates (Lent, 1974), in which the young lie alone for the first several weeks of their life and the mothers only approach once or twice a day to feed them. The main function of the hiding behaviour of the newborn is to avoid predation. Dispersion and rarity of calves is believed to be a prerequisite for effective concealment because it decreases the likelihood that a predator will locate a calf (Gosling, 1969; Joubert, 1970). Since Shimba Hills sable do not produce calves at a particular time of the year, one would not expect synchronized births. Yet sable in Herd A have shown considerable synchrony which does not coincide with births in other herds. Although the majority of females had calves hidden in the vicinity while they grazed with the herd, females with young calves have shown a tendency to stay together. I know of only three calves born to lone females over 1 km from the herd while nine newborn calves were observed in all female groups of three to seven (other females still appeared pregnant). This pattern suggests the following. (1) A female in a group can afford to spend less time watching and more time grazing, thus increasing her energy intake. I noticed a tendency for certain females to remain alert in the vicinity of calves while others grazed. (2) The ability of several mothers together to detect predators may outweigh the advantages of being dispersed. (3) A calf may gain direct protection from the presence of other females. Evidence for this hypothesis comes from a female that ran toward a strange calf calling in distress. (4) Once in the herd, any particular calf may have a greater chance of escaping predation when many calves of similar age are present, as described by Estes (1976) for wildebeest. Synchronized calving is not apparent in smaller herds and may be disadvantageous to individuals in a smaller group. Once out of hiding, a single young calf in a small herd may be less likely to attract a predator than several such calves. Inconspicuousness may be an effective strategy in a small herd where there are not enough other calves to provide protection.

One would expect that calving during the dry season would increase the birth peak interval. However, no such tendency is shown in Herd A. Breeding synchrony in Herd A may have been facilitated by the mowing and burning of grassland which occurred primarily in their range. If selective pressure for synchronized calving is present, synchrony could be maintained since all females would be in good condition and become receptive soon after calving. This would probably not be the case for herds utilizing less nutritious pastures where some females may have to delay conception for several months until they regain condition.

It is impossible to state which of the above hypotheses have acted to determine the breeding pattern of the Shimba Hills sable. However, most papers in the literature have been concerned with surveys of reproduction of whole populations. The Kenya sable may show a pattern which can only be distinguished at the level of the reproductive unit, a social structure that replicates itself through reproduction (Eisenberg, 1977). This report emphasizes the importance of observing animals that share the same home range and treating them as the reproductive unit. Such observations may provide more information on the selective pressures shaping reproductive patterns than a statement that a species is 'seasonal' or 'non-seasonal' in a certain area.

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