Population fluctuations and breeding of eland *Taurotragus oryx* in a western Transvaal nature reserve

D. BUYS and H. M. DOTT

Buys, D. and H.M. Dott. 1991. Population fluctuations and breeding of eland *Taurotragus oryx* in a western Transvaal nature reserve. *Koedoe* 34(1): 31-36. Pretoria. ISSN 0075-6458.

The history of an eland population on the S A Lombard Nature Reserve in the western Transvaal is described. From a founder population of four eland in 1950 and 1951, the population grew to about 35 animals and was kept at this level through culling and translocation until 1976. During 1976 and 1977 unusual heavy rains were experienced and culling and removals were temporarily suspended. As a result the population increased unchecked and reached a peak of 81 in 1981. When climatic conditions returned to normal this was followed by a population crash in which 66 eland died over a period of three years. Calves are born throughout the year, but the majority of births occur during the period October to December, with a peak in November. The females have a high calving rate (90,9 %) and calf mortality is low (16,7 %).

D. Buys and H.M. Dott, Mammal Research Institute, University of Pretoria, Pretoria, 0002 Republic of South Africa. D. Buys, present address: Bathurst Experimental Farm, Department of Agricultural Development, Private Bag X1, Bathurst, 6166 Republic of South Africa.

Introduction

The eland, *Taurotragus oryx* (Pallas, 1766), belongs to the tribe Tragelaphini, but unlike other members of this tribe, it is not exclusively a browser. During the rainy season eland utilise grass extensively, but during the dry winter months when the nutritive quality of grass decreases, they revert to browsing (Field 1975; Lightfoot & Posselt 1977; Buys 1990). Eland occur in a wide variety of environments and are highly nomadic (Smithers 1983), which enables them to utilise sparsely distributed shrub and woodland during the dry season.

This paper deals with the dynamics of the eland population on the S A Lombard Nature Reserve. The causes of a rapid increase and a subsequent population crash, as well as the distribution of births, are discussed.

Study area

The study was conducted on the S A Lombard Nature Reserve (SALNR), situated about 16 km north-west of Bloemhof in the western Transvaal (25° 30' E; 27° 35' S). The reserve is approximately 3 500 ha in extent and consists mainly of *Cymbopogon-Themeda* grassland (Acocks 1975).

Five distinct woody vegetation communities cover less than 20 % of the reserve. These communities range from open savanna woodland consisting of only *Rhus lancea* trees to dense thickets containing up to ten different tree and shrub species of which *Tarchonanthus camphoratus, Diospyros lycioides, Grewia flava, Acacia karroo* and *Ziziphus mucronata* are the most abundant.

The reserve has a mean annual rainfall of 460 mm which is mainly confined to the period November to April (Skinner *et al.* 1974). Unusually heavy rains were experienced during 1976 (826 mm) and 1977 (668 mm). This caused the flooding of a large part of the SALNR which had an adverse effect on the grass cover and resulted in an increase in herb growth (Transvaal Provincial Administration 1977).

Table 1
The numbers of eland introductions, births, deaths and removals on the S A Lombard Nature Reserve from 1950 to 1985

Year	Total at beginning of year	Introductions	Births	Natural deaths	Culling and translocations	Total at end of year
1950	0	3	0	0	0	3
1951	3	1	0	0	0	4
1952	4	1	3	0	0	8
1953	8	0	2	1	0	9
1954	9	0	4	1	0	12
1955	12	0	3	0	0	15
1956	151	0	3	1	0	17
1957	17	0	3	1	0	19
1958	19	0	4	6	5	12
1959	12	0	3	2	1	12
1960	12	0	6	1	1	16
1961	16	0	7	2	1	20
1962	20	0	8	4	0	24
1963	24	0	3	2	0	25
1964						
1965			No data available			
1966						
1967						
1968	23	0	9	1	0	31
1969	31	0	13	5	0	39
1970	29	0	7	1	4	41
1971	41	0	15	3	19	34
1972	34	0	7	1	10	30
1973	31	0	10	2	0	38
1974	38	0	10	1	19	28
1975	28	0	5	2	0	31
1976	31	0	19	2	1	47
1977	47	0	12	2	6	50
1978	50	0	16	0	0	66
1979	66	0	18	4	21	59
1980	59	0	13	1	0	71
1981	71	0	12	49	0	34
1982	34	0	6	9	0	31
1983	31	1	9	8	0	33
1984	33	2	10	1	2	42
1985	42	0	10	1	21	30

Study population

The first eland, a male and two females, were relocated in 1950. Another male was released a year later and all the eland (except three females that were introduced in 1983 and 1984) since then are descended from this small group. The eland were introduced as part of a domestication experiment and were kraaled at night until 1960 (Van Zyl 1965). The population size is kept at about 35 by annual culling and translocation.

Methods

The information on numbers, deaths, removals and the numbers and distribution of births were obtained from the game register which is kept on the SALNR. Years

for which data were incomplete were omitted from the calculations. Data on the calving rate and survival of calves were obtained during a comprehensive study of the population during 1984 and 1985.

The upper size limit of the eland population that can be maintained on the SALNR was calculated from the increase in the population from 1950 to 1958 and from 1959 to 1963 from:

$$y = K + B(R^x)$$

where K = the asymptotic value of y
B = change in y when x passes from 0 to infinity
R = the factor by which the deviation of y from its asymptotic value is reduced per unit increase along the x-axis
x = year

K, B and R were calculated from y and x using an iteration procedure (Stevens 1951).

Results

Population fluctuations

The annual numbers of eland from 1950 to 1985 are given in Table 1. No data were available for 1964 to 1967. During this time few natural deaths were recorded until 1981. Relatively large numbers were periodically sold or distributed to other game reserves and a number of eland were shot. The number births remained fairly constant from 1968 until 1977, ranging from 8 to 12 during each 1 July - 30 June period, but increased sharply during 1978/79 when 24 calves were born.

The upper asymptote of the population growth curve was calculated at 31,8 ± 9,6 eland for the period between 1950 and 1958 and at 34,6 ± 0,6 eland from 1959 to 1963. These figures do not differ significantly and the appropriate stocking rate of the SALNR as derived from such growth curves would therefore be between 30 and 40 eland.

During and after the above-average rainfall experienced during 1976 and 1977, the numbers of eland increased exponentially ($\log(y) = 3{,}37 + 0{,}17(R)$; correlation coefficient = 95,864; t = 7,53 on 5 d f; $0{,}01 > P > 0{,}001$) and peaked at 81 in 1981.

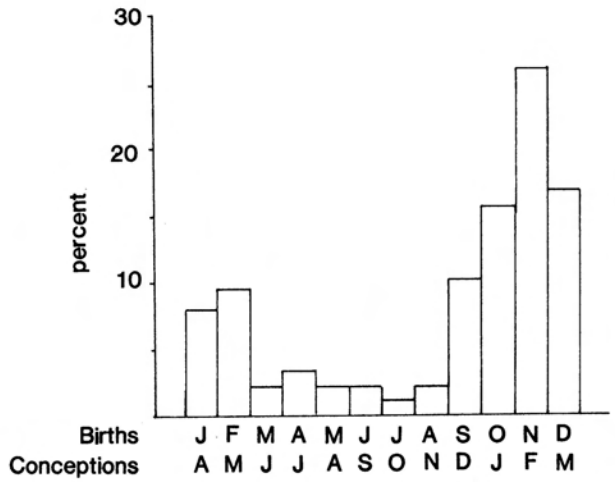

Fig. 1. Proportional distribution of 224 eland births on the S A Lombard Nature Reserve from 1950 to 1985.

A crash in the population followed and 49 eland died of unreported causes during 1981 and another 17 during the following two years. The turning point was reached in 1983 when there were 29 eland left and the mortality rate has been low since then.

Reproduction

A total of 224 births was recorded between 1951 and 1985. Calves are born all year round but most are born from October to December with a peak in November (Fig 1). The gestation period of eland in the western Transvaal is 279 ± 2,9 days (Skinner & Van Zyl 1969), therefore most females conceived during the period January to March.

During 1984 and 1985 the population had a high calving rate. From July 1984 to June 1985 12 out of 13 females gave birth, and 8 out of 9 from July to December 1985. The overall calving percentage during these periods was 90,9 %.

Six of the 12 calves born in the year of 1984/85 were removed from the reserve in May 1985. Of the remaining six only one died before the onset of the next calving season. This calf was born in February 1985 and had always been much smaller and weaker than the other calves of the same season. No information was available on the survival of the calves which had been removed, but the calves that remained had a survival rate of 83,3 %.

Discussion

The increase in eland numbers following the abnormally wet years of 1976 and 1977 was the result of the cessation of removals and an increased food supply because of excess herb growth. The subsequent crash in later years was probably the result of a food shortage once the effect of the flood on the vegetation had subsided. The herb cover had decreased and the available browse would not have been able to support the higher eland numbers during the winter.

In other cases where population crashes have occurred the population usually declined to a level well below the previous carrying capacity of the area (Klein 1968). On the SALNR this was probably prevented by the feeding habits of the eland. During the summer months eland graze extensively and are not dependent on woody vegetation for the provision of a high quality diet (Buys 1990). This could have allowed the woody communities to recover sufficiently during the wet season to support the same number of eland as before the large increase in the population.

The predicted upper limit of the eland population indicates that the SALNR can maintain 30 to 40 eland. This figure is supported by the data from the game register which shows that no excessive mortality was experienced when the population was maintained at 30 eland plus the calves of the year. The availability of browse during the periods when the nutritive quality of grass is too low to satisfy the eland's high energetic needs (Taylor & Lyman 1967) seems to be the limiting factor which determines the upper size limit of the population.

Although eland do not have a marked breeding season, definite peaks in calving occur. Differences in the timing of these peaks between different environments probably result from variations in nutritive quality of the winter diet (Skinner & Van Zyl 1969). Scotcher (1982) reported calving peaks in September and October in the Natal Drakensberg, which is earlier than the peak in November for Transvaal Highveld eland. In the Drakensberg the dry season ends in July or August (Scotcher 1982) which should result in an earlier improvement of the quality of grazing than that experienced on the Highveld where the first rains usually fall in October. Although the environmental conditions in the Drakensberg are harsher than on the Trans-

vaal Highveld this seems to play a less important role in the distribution of calving peaks than the quality of the forage. The peak in conceptions at the SALNR derived from the distribution of births occurs in February, which is somewhat later than found in other areas (Underwood 1975; Jeffery 1978; Scotcher 1982).

The life expectancy of captive eland ranged between 14 and 16 years at Askanya-Nova in Russia (Treus & Kravchenko 1968; Treus & Lobanov 1971). The age at first calving ranges from 22 to 57 months (Skinner 1966; Treus & Kravchenko 1968; Treus & Lobanov 1977; Roth *et al.* 1972), thus if an average of four years before calving is subtracted from the life expectancy it leaves the females with 11 years of potential reproductivity. The average fecundity of eland at Askanya-Nova was 0,9 (Treus & Lobanov 1971), thus if the same fecundity applies to the eland at SALNR, a female would be able to produce about 10 calves during her lifespan.

The calving percentage of the females (90,0 %) compared well with published figures of 80-85 % (Skinner & Van Zyl 1969), 88,9 % (Jeffery 1978), 67-68 % (Hillman 1979) and 95 % (Scotcher 1982).

The mortality rate (16,7 %) of the calves before they were one year of age was much lower than reported in other studies. Hillman (1979) found that calves numbered only 33 % of the number of females after four months after calving. Scotcher (1982) reported a mortality of 66 % of wild calves and Jeffery (1978) found a mortality rate of 20,9 % in captive-born calves in the Drakensberg. In another captive herd in Zimbabwe a mortality rate of 32 % of calves was experienced (Roth *et al.* 1972).

The higher survival rate of the calves on the SALNR can be ascribed to several factors like the absence of large predators, low tick infestation (contrary to Lightfoot 1977) or less harsh climatic conditions than experienced in places like the Drakensberg, but the most important factor was probably that the number of eland was maintained within the appropriate stocking rate of the reserve.

Acknowledgements

This study was conducted on the S A Lombard Nature Reserve with the permission of the Division of Nature Conservation, Transvaal Provincial Administration, who also granted us access to their records and provided accommodation. Members of the Mammal Research Institute and the Division of Nature Conservation provided assistance and advice during the study.

References

ACOCKS, J.H.P. 1975. Veld types of South Africa, second edition. *Memoirs of the Botanical Survey of South Africa* 40.

BUYS, D. 1990. Food selection by eland in the western Transvaal. *South Afican Journal of Wildlife Research* 20 : 16-20.

FIELD, C.R. 1975. Climate and food habits of ungulates on Galana Ranch. *East African Wildlife Journal* 13 : 203 - 220.

HILLMAN, J.C. 1979. *The biology of the eland* (Taurotragus oryx *Pallas*) *in the wild.* PhD thesis, University of Nairobi.

JEFFERY, R.C.V. 1978. *Age determination, growth and condition of a population of eland,* Taurotragus oryx *(Pallas, 1766), under semi-intensive management at Coleford Nature Reserve.* MSc thesis, University of Natal.

KLEIN, D.R. 1968. The introduction, increase and crash of reindeer on St. Matthew Island. *Journal of Wildlife Management* 32 : 350 - 367.

LIGHTFOOT, C.J. 1977. Eland (*Taurotragus oryx*) as a ranching animal complementary to cattle in Rhodesia. 1. Environmental adaptation. *Rhodesian Agricultural Journal* 74 : 47 - 52.

LIGHTFOOT, C.J. and J. POSSELT. 1977. Eland (*Taurotragus oryx*) as a ranching animal complementary to cattle in Rhodesia. 2. Habitat and diet selection. *Rhodesian Agricultural Journal* 74: 53 - 61.

ROTH, H.H., M.A. KERR and J. POSSELT. 1972. Studies on the utilisation of semi-domesticated eland (*Taurotragus oryx*) in Rhodesia. V. Reproduction and herd increase. *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 89 : 69 - 83.

SCOTCHER, J.S.B. 1982. *Interrelations of vegetation and eland* (Taurotragus oryx) *in Giant's Castle Game Reserve, Natal.* PhD thesis, University of the Witwatersrand.

SKINNER, J.D. 1966. An appraisal of the eland (*Taurotragus oryx*) for diversifying and improving animal production in southern Africa. *African Wildlife* 20: 29-40.

SKINNER, J.D. and J.H.M. VAN ZYL. 1969. Reproductive performance of the common eland (*Taurotragus oryx*) in two environments. *Journal of Reproduction and Fertility, Suppl.* 6: 319-322.

SKINNER, J.D., J.H.M. VAN ZYL and L.G. OATES. 1974. The effect of season on the breeding cycle of plains antelope of the Western Transvaal Highveld. *Journal of the Southern African Wildlife Management Association:* 4: 15-23.

SMITHERS, R.H.N. 1983. *The Mammals of the Southern African Subregion.* University of Pretoria, Pretoria.

STEVENS, W.L. 1951. Asymptotic regression. *Biometrics* 7: 247-267.

TAYLOR, C.R. and C.P. LYMAN. 1967. A comparative study of the environmental physiology of an East African antelope, the eland, and the Hereford steer. *Physiological Zoology* 40: 280-295.

TRANSVAAL PROVINSCIAL ADMINISTRATION: NATURE CONSERVATION DIVISION. 1977. Twelfth Annual Report 1976-1977.

TREUS, U.D. and N.V. KRAVCHENKO. 1968. Methods of rearing and economic utilisation of eland in the Askaniya-Nova Zoological Park. *Symposium of the Zoological Society of London* 21: 395-411.

TREUS, U.D. and N.V. LOBANOV. 1971. Acclimatisation and domestication of the eland. *International Zoo Yearbook* 11:147-156.

UNDERWOOD, R. 1975. *Social behaviour of the eland (*Taurotragus oryx*) on Loskop Dam Nature Reserve.* MSc thesis, University of Pretoria.

VAN ZYL, J.H.M. 1965. The vegetation of the S.A. Lombard Nature Reserve and its utilisation by certain antelope. *Zoologica Africana* 1 : 55 - 71.