RESEARCH COMMUNICATION

Captive breeding of the white rhinoceros, *Ceratotherium simum*, and the Cape buffalo, *Syncerus caffer*

J.D. SKINNER[1], H.M. DOTT[1], A. MATTHEE[2] and L. HUNT[3]

ABSTRACT

SKINNER, J.D., DOTT, H.M., MATTHEE, A. & HUNT, L. 2006. Captive breeding of the white rhinoceros, *Ceratotherium simum*, and the Cape buffalo, *Syncerus caffer. Onderstepoort Journal of Veterinary Research*, 73:237–239

Breeding records of 40 white rhinoceros and 155 Cape buffalo were analysed. Three rhinoceros cows bred in captivity, themselves conceived for the first time at 84, 87 and 95 months of age, respectively. Rhinoceros cows breed throughout the year. There is no evidence of a relationship between calving interval and month of birth. Calving intervals were normally distributed about the mean of 34 months and there were no significant differences between bulls, cows or sex of calf. There was no difference in the sex ratio of calves born to young cows nor older cows. The male:female ratio of the calves was 1:1. Younger cows did not have shorter birth intervals.

Although captive Cape buffaloes breed throughout the year, there is a preponderance of births in midsummer. There was some evidence that larger cows produce heavier calves and that season of birth may influence birth weight. Male calves weighed 41.20 ± 0.68 kg vs 39.00 ± 0.73 kg (range 24–60 kg) for female calves but this difference was not significant. Calving intervals were normally distributed about the mean of 395 days and the male:female ratio of the calves was 1:1.2.

Keywords: Birth weights, breeding season, buffalo, calving interval, rhinoceros, sex ratio

INTRODUCTION

Birth records from mammals bred in captivity are an important source of information (Skinner, Moss & Skinner 2002), especially where the species are endangered, vulnerable or valuable for other reasons. The white rhinoceros, *Ceratotherium simum*, and Cape buffalo, *Syncerus caffer*, are members of the so-called "Big Five" which play an important role in ecotourism and in the game ranching industry. Both species command extremely high prices at game sales for aesthetic reasons, their importance as trophy animals and the scarcity of "disease-free" (e.g. foot-and-mouth disease, Corridor disease and bovine tuberculosis) buffaloes. It is therefore useful to garner as much information as possible from breeding records of captive animals to improve basic knowledge and husbandry.

In this paper are analysed the breeding records of white rhinoceros and Cape buffaloes from a number of years' data collected routinely at the Lichtenburg Game Breeding Centre and the Solole Private Nature Reserve, and compared with published data, where available.

[1] Veterinary Wildlife Unit, Faculty of Veterinary Science, University of Pretoria, Private Bag X04, Onderstepoort, 0110 South Africa. E-mail: john.skinner@up.ac.za

[2] National Zoological Gardens, P.O. Box 754, Pretoria, 0001 South Africa

[3] Solole Private Nature Reserve, P.O. Box 824, Sun Valley, 7975 South Africa

Accepted for publication 24 April 2006—Editor

METHODS

Rhinoceroses

Data were routinely collected from 1980–2003 at the Lichtenburg Game Breeding Centre in the North-west Province (26°15' S; 26°17' E). The rhinoceroses are free ranging and maintained in a 2 500 ha enclosure on natural veld (Mixed Sweet Veld Type, Acocks 1988) supplemented with lucerne hay in winter when the nutritional level of natural forage declines markedly.

The adult sex ratio is 1 male:5 females. Data on births are routinely collected and recorded immediately after calves are born, as they are precocial and accompany their dams from the outset. Date of conception is calculated using a gestation length of 16 months (Owen-Smith 1988).

Buffaloes

Data were routinely collected from 1998 to 2001 at the Solole Private Nature Reserve, Phalaborwa, Mpumalanga Province (23°56' S; 31°09' E). The buffaloes are retained in paddocks and fed with teff and/or lucerne hay. Cows are mated with wild captured bulls and the calves are removed and weighed at birth before being isolated from their dams and reared artificially on foster mothers in order to keep them disease free. Cows are placed in three categories according to size: extra large, large and medium.

Statistical analysis

The means are presented ± the standard error.

Means were compared using a Student t-test or a one-way analysis of variance.

RESULTS

White rhinoceroses

Age at first conception for three cows bred and born at Lichtenburg was 84, 87 and 95 months. A total of 40 calves were born, but only 33 calving intervals are available. The calving intervals were normally distributed about the mean (34 ± 1.8 months; range 21–61 months). There was no significant difference in calving interval between dams (ANOVA F = 1.745; df 5.24; $P = 0.16$) (Table 1).

The calving interval after a male calf (35 ± 3.0 months) was not significantly different from that after a female calf (33 ± 2.0 months; t = 0.39; df 31; $P = 0.69$).

There is not a clear-cut calving season but 12 (30%) of the calves were born in March and April. There is no evidence of a relationship between calving interval and month of birth, e.g. in January three calves were born and there was an annual interval of *c* 32 months until the next calf was born. The sex ratio was 1:1.

Buffaloes

The monthly distribution of buffalo calf births over a period of 3 years is illustrated in Fig. 1.

The mass of the 155 buffalo calves were normally distributed about the mean of 40.06 ± 0.51 kg (range 24–60). Females (39.0 ± 0.73) were lighter than

TABLE 1 Calving intervals in days for white rhinoceros dams

Dams	Number (*n*)	Mean	Variance
Dam 296	10	910.8	92 161.9
Dam 406	10	923.8	39 932.1
Dam 407	5	1 272.4	182 524.8
Dam 585	4	1 254.5	81 867.0
Dam 932	2	869.5	2 244.5
Dam 933	2	1 088.5	324 012.5

TABLE 2 Variation in buffalo calf masses (kg mean ± s.e.) according to years

	Year 1	Year 2	Year 3
Females	33.45 ± 2.19	37.35 ± 1.01	41.72 ± 0.92
Males	38.00 ± 1.18	39.75 ± 0.93	43.30 ± 1.07
All	37.73 ± 1.31	38.44 ± 0.71	42.44 ± 0.7

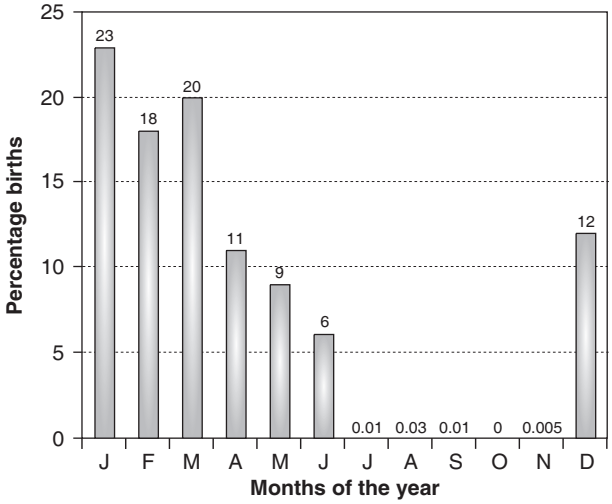

FIG. 1 Distribution of buffalo births at Solole Private Nature Reserve

males (41.2 ± 0.68; t = –2.207; df 153; $P = 0.029$). This was particularly evident in Year 1. The calves born in Year 3 (42.44 ± 0.7; $n = 76$) were heavier than those born in Years 1 (37.73 ± 1.31; $n = 22$) and 2 (38.44 ± 0.71; $n = 57$; F = 14.59; df 2 152; $P < .001$). In Year 1 the calves born to cows designated large and extra large (39.12 ± 1.5; $n = 8$) were heavier than those designated medium (31.45 ± 1.28; $n = 11$; t = 3.88; $P = 0012$; df 17).

There were 62 confirmed calving intervals (395.8 ± 4.82 days), which were normally distributed about the mean; the calving interval was unaffected by the sex of the preceding calf (t = –0.52; df 60; $P = –0.516$). The sex ratio was 1 male:1.2 females.

DISCUSSION

Very few data are available for comparison with those presented here. Age at first conception was 88.2 months ($n = 3$) for white rhinoceroses, whereas at Matobo National Park, Zimbabwe, this varied from 72–138 months (Rachlow & Berger 1998). Owen-Smith (1988) states that young white rhinoceros females produced a higher proportion of male calves and exhibited shorter birth intervals but qualifies this by stating that, at that time, there was a predominance of young rhinoceroses in captivity. Our data do not support this view and the overall sex ratio is 17 males:19 females. The calving interval of 34 ± 1.8 months is slightly longer than those cited by Owen-Smith (1988) for wild rhinoceroses in Hluhluwe-iMfolozi Park in Natal (2.63 years; $n = 53$) and those held in an enclosure in the Kruger National Park (2.70 years; $n = 19$). These are of the same order as rhinoceroses in Matobo National Park, Zimbabwe (2.85 years; $n = 23$, Owen-Smith 1988; 2.9 years; $n = 21$, Rachlow & Berger 1998) but less than for rhinoceroses in Kyle National Park, Zimbabwe (3.45 years; $n = 23$). Rachlow & Berger (1998) suggest that rate of calving may be inversely related to population density. The differences may be related to the most beneficial habitats, as the nutritive value of grasses in the veld at Lichtenburg shows a marked decline in winter. On the other hand, the differences are not great and are more likely to be spurious, particularly as one bull is adequate to cover five cows, and there is no competition between bulls. The peak in births around March to April corresponds with a similar pattern in Hluhluwe-iMfolozi Park. There is no evidence of a relationship between calving interval and month of birth or significant difference in calving interval between dams.

Although the buffaloes breed throughout the year (Fig. 1) husbandry may, in part, be responsible for apparent peaks, as there were no peaks in records from the National Zoological Gardens in Pretoria (Skinner *et al.* 2002). The fact that calves are removed from their dams at birth in the Solole Private Nature Reserve may also influence breeding patterns. For example, in the wild, the calving interval is at least 60 days longer, depending on locality (Bertschinger 1996). In addition, bulls were not permanently present in the cow paddocks. Moreover, the level of nutrition is possibly the most important factor determining reconception in buffalo cows. Those at Solole receive supplementary feeding to maintain their condition. Calves born in the first year were lighter than in Years 2 and 3. It was in this year that the difference between male and female calves was most marked and the large cows had significantly heavier calves than medium-sized cows possibly due to greater uterine capacity.

CONCLUSIONS

Because both species are aseasonal or opportunistic breeders and, despite apparent seasonal peaks in calving, they do lend themselves to manipulative breeding and the possibility of increasing calving rates. The key to this would appear to lie in reducing the intercalving interval, either by removal of offspring, in the case of rhinoceroses, or hormonal induction of ovulation in the case of buffalos. Both approaches could be tested experimentally.

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