

As the female tapir was docile enough to be milked, an analysis of her milk was made by Mr Davis, the States of Jersey Analyst. His findings are given in Table 2.

CONSTITUENTS	EARLY	AFTER
	LACTATION	FILTRATION
	per cent	per cent
Total solids	15.67	14.94
Fat	3.40	3.77
Solids, not fat	12.27	11.17
Protein	5.70	5.06
Carbohydrate	5.61	5.24
Ash	0.96	0.87

Table 2. Analysis of the milk of an American tapir *Tapirus terrestris*.

Notes on the breeding of the Black rhinoceros

Diceros bicornis

ZWARTERHOEDENBOORD

at Bristol Zoo

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The pair of Black rhinoceroses *Diceros bicornis* at Bristol Zoo arrived in October 1962 from John Seago in East Africa. The male, 'Willie', was slightly larger (approximately 1 m at the shoulder) than the female, 'Stephanie'. It was estimated that they were both between 18 and 21 months old. They were both quite tame and seemed to enjoy being fondled by the keepers. They shared a single enclosure, 8 × 6 m, for the next 20 months and were observed trying to mate on two occasions (3 August 1953 and 12 May 1954). As they were together at night it is possible that other attempts at mating took place unobserved.

In June 1954 both animals were transferred to the newly constructed rhinoceros house, which consisted of an outdoor enclosure and two indoor dens, partitioned with steel poles, about 7.5 cm in diameter and fixed 35 cm apart. During the day they were kept together as much as possible. As with most pairs of Black rhinos, they spent many hours lungeing and parrying with their horns and it was noticeable that as they grew and matured, so their play become more determined and

earnest. The female invariably instigated the 'fights', but the male was always more dominant. Their behaviour did not worry us but we were nevertheless relieved that we had been able to introduce them to each other when they were small and immature.

The pair was put together every day in the hope that eventually they would breed. The keepers found it almost impossible to see any physical change when the female was in oestrus: this could only be reliably deduced from the male's behaviour. Dr Lang, the director of Basle Zoo, has made similar observations on the Indian rhinos *Rhinoceros unicornis* at Basle Zoo (pers. comm.). No records were therefore made of the date when the female 'appeared' to be in oestrus. However, notes were kept of all matings. There was no possibility that other matings occurred as the rhinos were always separated at night.

The female's oestrous cycle appears to be irregular, judging from the recorded dates of matings. In 1955 when she was about 4½ years old, matings took place at about 17-day intervals. In

¹ These notes were compiled by Mr G. R. Greed from reports submitted by Senior Keeper D. Packham, Keeper S. Evans, and the late Senior Keeper G. Hunt.

the second half of 1955 the oestrous cycle became irregular and times between matings varied from 14 to 49 days. This was followed by a period from 11 October 1955 of 172 days without matings and our hopes were raised that the female was pregnant. However, on 1 April 1956, 'All Fools Day', the pair mated again and continued mating during the next 14½ months at intervals varying from 21 to 45 days.

The female at last became pregnant and 438 days after the last mating a bull calf, 'Roger', was born on 22 August 1958. At this time the pair was estimated to be about 7½ years old. The adult pair had been kept together until the 9th day before the birth when the female became very aggressive.

The baby was not weighed at birth but it measured 53 cm at the shoulder and 86 cm from nose to root of tail. He did not succeed in finding the mother's mammae and after 26 hours it was decided to milk the mother to give the baby a supplementary feed. On two occasions he was given ½ litre of milk. He refused a rubber calf teat but eagerly sucked a keeper's finger in an open bucket. He was seen to suckle for the first time 33 hours after the birth.

The male was kept separated, but he could smell the female and calf through the bars of the

dens. No records were kept of post-partum oestrus.

After 19 months the calf, 'Roger', was sent to Chester Zoo. The following day the female's udder was very swollen with milk and appeared to be causing her discomfort. She was milked, the milk analysed and the results published (Greed, 1963). The pair was then reintroduced and they fought fairly seriously, though the female was less aggressive than when she had attacked the male during the last few days of pregnancy. When the fighting became too serious, the keepers endeavoured to separate them - which was not easy!

Before the female became pregnant for the second time, mating was observed on nine occasions. Again, the cycle appeared erratic, varying between 17 and 60 days. A second bull calf, 'Ronald', was born at about 0500 hours on 28 December 1961, 419 days after the last observed mating. At birth the calf was the same size as the first calf, but appeared to be considerably stronger. It suckled 4½ hours after the birth. The mother allowed the keepers to enter the den and fondle her and the baby. It was therefore decided to milk her for a fuller analysis. This was done during the colostrum period and subsequently at regular 28-day intervals throughout the 16 months of

SEX AND NAMES OF CALVES BORN	♂ ROGER	♂ RONALD	♀ RHONA
Date of Penultimate Matings	20.5.1957 21.5.1957	12.10.1960 13.10.1960	23.5.1963
Duration of Penultimate Matings	2 and 18 minutes 20 minutes	5, 10, 15 and 7 minutes 15 minutes	55 minutes
Time Between Penultimate and Last Matings	21-22 days	22-23 days	21-22 days
Date of Last Mating	10.6.1957	4.11.1960	12.6.1963 13.6.1963
Duration of Last Mating	15 minutes	24 minutes	30 minutes 25 minutes
Time and Dates of Birth	ca. 0730 hours 22.8.1958	ca. 0500 hours 28.12.1961	1027 hours 24.8.1964
Additional Information	Sent to Chester Zoo 7.3.1960. Parents reintroduced March; mated in April	Sent to Dublin Zoo 30.4.1963. Parents reintroduced in May; mated 23.5.1963	Sent to Hollywood Tower Estate 28.6.1966

Table 1. Breeding results of a pair of Black rhinoceroses *Diceros bicornis* at Bristol Zoo.

APPROX. AGE IN YEARS	DATE OF MATING	NO. OF DAYS BETWEEN MATING	DURATION OF MATING IN MINUTES	
2½ 3¼	3.8.1953	}	} Attempted matings	
	12.5.1954			
	9.8.1954			
	19.11.1954			
	12.1.1955	54		
	22.1.1955	10		
	24.1.1955	2		
	25.1.1955	1		
	17.2.1955	17		
4	1.3.1955	18		
	18.3.1955	17		
	1.4.1955	14		
	19.4.1955	18		
	7.6.1955	49		
	20.6.1955	13		
	24.6.1955	4		
	12.7.1955	18		
	12.8.1955	31		
	3.9.1955	22		
	17.9.1955	14		
	11.10.1955	24		
	5	1.4.1956	172	12
		28.4.1956	27	15
23.5.1956		25	12	
29.5.1956		6	18½	
22.6.1956		24	15	
4.8.1956		43	5	
16.9.1956		43	25	
11.10.1956		25	15	
25.11.1956		45	5	
26.11.1956		1	10 and 15	
1.3.1957		38	8	
17.2.1957		45	10	
18.2.1957		1	5	
6		11.3.1957	23	25 and 10
	4.4.1957	24	10, 10 and 15	
	29.4.1957	25	15 and 10	
	20.5.1957	21	2 and 18	
	21.5.1957	1	20	
	10.6.1957	21	15	
	7½	22.8.1958—♂ calf, 'Roger', born March 1960—Pair re-introduced for trial periods each day 4.4.1960—Mated		
19.5.1960		28		
10.6.1960		23	27	
8.8.1960		60		
25.8.1960		17		
12.10.1960		48	10, 5, 15 and 7	
13.10.1960		1	15	
4.11.1960		22	20	
28.12.1961—♂ calf, 'Ronald', born 4.5.1963—parents re-introduced for trial periods each day 23.5.1963—Mated				
12.6.1963—Mated		21	30	
13.6.1963		1	25	
24.8.1964—♀ calf, 'Rhona', born				

Table 2. Observations on the mating behaviour of Black rhinoceroses at Bristol Zoo from 3 August 1953 to 13 June 1964.

lactation. The results were published (Gregory *et al.*, 1965).

The second calf, Ronald, was sent to Dublin Zoo in the spring of 1963 and the adult pair were once again reintroduced. The fighting seemed to be more violent than at the previous re-introduction and it was only possible to keep them together for periods of not more than one hour a day. Eventually they became quieter and mating occurred on three occasions, the last two being on successive days. The inter-oestrous period was 21 days.

The third calf, a female, 'Rhona', was born at 1027 hours on 24 August 1964, 438 days after the last mating. The birth was witnessed by a keeper who was preparing the adjoining den. At 1025 hours there were two bursts of water from the vagina, similar to those reported by Faust (1958) at Frankfurt Zoo. Two minutes later the female placed her nose flat on the ground and gave three grunts. On the third grunt she gave a big heave and the baby 'shot' out, while the mother was still standing. The baby landed about $1\frac{1}{2}$ m away with a thud. As with the Frankfurt baby rhino, there were no membranes attached to the baby. The mother ran off, pivoted, charged towards the baby, stopped suddenly and smelt it. The baby stood up within half an hour of the birth and had suckled within two hours.

As with the two previous births, the placenta came away during the fourth hour after the birth. This time the mother appeared to assist its expulsion by walking backwards and stepping on the part that was touching the ground. She then turned and smelt it, making no attempt to eat it, though she had eaten a small portion after the second birth.

The third calf, although a normal healthy youngster, had a rectal prolapse on 8 January 1965. It is believed this may have been caused by one of the mother's horns during play. The calf was crated and underwent successful surgery. She was returned to her mother the following day and remained with her until the end of June 1966 when she was transferred to Bristol Zoo's country estate about five miles away to join a younger male born at Hanover Zoo (*see* pp 161-162). At the time of writing (August 1966) the parents are still separated.

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