2. Statistics on demography and reproduction

This book contains essential information on 2439 specimens from the five surviving species of rhinoceros exhibited in captivity. While the data on each animal are set out in the following chapters, a few general statistics have been combined here to help in the comparison between species. The data are presented here with little embellishment, because the present study was not designed to cover reproductive behavior in detail. I feel certain that the data can easily be compared with other studies.

Demography

Total numbers

Of the 2439 specimens, about two-thirds were imported from the wild and one-third was born in captivity. About a quarter belong to the three Asiatic species of rhinoceros, while all the others come from Africa (Table 1). The rhinoceroses have been seen in 501 collections spread over 79 different countries (Tables 2 and 3). Only in London Zoo has every form been exhibited, including the Javan rhinoceros and the Northern white subspecies.

This is a summary of the tables of collections in each chapter.

Sex ratio

The sex ratio of animals imported from the wild and those born in captivity is summarized in Table 4. From the statistics for specimens born in captivity, it would appear that, in each species (except for the Sumatran rhinoceros with only four births), there is a preponderance of males.

Table 1. Total number of imports and births of the five species of rhinoceros in captivity from early times until 1994

Species	*Imported animals*	*Births*	*Total*	
Unknown	44		44	1%
R. unicornis	260	137	397	16%
R. sondaicus	22	0	22	1%
D. sumatrensis	92	4	96	4%
D. bicornis	483	292	775	32%
C. simum	626	479	1105	46%
Total	1527	912	2439	
	62%	38%		

Table 3. Number of countries and collections where each species of rhinoceros has been exhibited

Species	*No. of countries*	*No. of collections*
R. unicornis	28	116
R. sondaicus	9	15
D. sumatrensis	20	49
D. bicornis	50	203
C. simum simum	60	314
C. simum cottoni	9	14

Table 2. Number of countries and collections exhibiting one or more species of rhinoceros

Continent	*No. of countries*	*No. of collections*	*No. of rhinoceros (sub-)species* *1*	*2*	*3*	*4*	*5*	*6*
Africa	12	39	30	9				
Asia	25	127	96	25	6			
Australia	2	11	7	3	1			
Europe	29	169	110	31	22	4	1	1
North America	2	127	89	22	8	6	2	
South America	9	28	22	5	1			
Total	79	501	354	95	38	10	3	1

Data are based on the list of collections in Chapter 1
Collections with six rhinoceros (sub-)species: London, UK
Collections with five rhinoceros (sub-)species: Antwerp, Belgium; San Diego, USA; Washington, USA

Table 4. Sex ratio of the rhinoceros in captivity

Species	*Imported animals* ♂/♀	%	*Births* ♂/♀	%	*Total* ♂/♀	%
R. unicornis	105/92	116:100	79/55	143:100	184/147	127:100
R. sondaicus	4/6	67:100	-		4/6	67:100
D. sumatrensis	26/47	57:100	1/3	33:100	27/50	55:100
D. bicornis	226/231	97:100	145/134	107:100	371/365	101:100
C. simum	265/359	73:100	254/220	115:100	519/579	90:100

This table only includes specimens of known sex. It presents the actual numbers of imported animals and captive born specimens of each sex, and has been translated into percentages with the number of females confirmed at 100%

Longevity

Some information on long-lived specimens is contained in the chapters on each species. The maximum longevity in captivity is set out in Table 5. These calculations exclude the time before the animal entered a collection, because the exact age at arrival is seldom known. This explains some of the differences in the maxima given by Jones (1993), who recorded higher ages for the Sumatran and East African black rhinoceros. The present data are not separated by subspecies, but it is unlikely that there would be major differences. A 40-year-old rhinoceros is old, but in exceptional cases they can reach the age of about 45 years. Table 6 presents the average ages of rhinoceroses in captivity. The first category of '0' years is rather unnatural since it includes specimens with insufficient data. However, it still appears that at least half the specimens live for less than ten years in a captive situation. Only very few reach old age.

Table 5. Maximum recorded age in captivity

Species	*Maximum age*	
R. unicornis	40 years 4 months	(14,742 days)
R. sondaicus	20 years 7 months	(7,603 days)
D. sumatrensis	28 years 6 months	(10,425 days)
D. bicornis	44 years 9 months	(16,337 days)
C. simum	40 years 8 months	(14,845 days)

This table only includes data on specimens which died in 1995 or earlier, and which have been listed in this book. Details can be found in the chapters on each species

Reproduction

The Javan rhinoceros was never known to reproduce in captivity, while both the Sumatran and Northern white rhinos only gave birth four times. The other three forms have done reasonably well, although the number of births remains low (Table 8). The year in which the first captive birth was recorded is noted in Table 7. At least three quarters of all rhinoceros births in captivity occurred after 1970, before that this was a very rare experience (Table 9). Rhinoceroses of all species have been bred in 141 collections in 36 countries (Table 10).

Unfortunately, it is quite common that a rhinoceros dies at birth or soon thereafter (Table 11). This is especially common in the Indian rhinoceros. The young are born throughout the year (Table 12), and it is dif-

Table 6. Average longevity of rhinoceroses of all species in captivity (shown in percentage)

Years	*unicornis n=397*	*sondaicus n=22*	*sumatrensis n=96*	*bicornis n=775*	*simum n=1105*
0	26	81	31	15	8
1-9	34	0	60	45	32
10-19	17	14	7	23	26
20-29	16	5	2	13	31
30-39	6	-	-	3	3
>39	1	-	-	1	0.1

This table records the percentage of the total number of specimens of each species which lived during a certain number of years. It includes both imported specimens and those born in captivity

Table 7. Year of first known birth of each species

Species	*Year*
R. unicornis	1824
R. sondaicus	-
D. sumatrensis	1872
D. bicornis	1941
C. simum simum	1967
C. simum cottoni	1980

Table 8. Number of captive births of each species up to 1994

Species	*Total*	*M*	*F*	*Unknown*
R. unicornis	137	79	55	3
R. sondaicus	0			
D. sumatrensis	4	1	3	
D. bicornis	292	145	134	13
C. simum simum	475	253	217	5
C. simum cottoni	4	1	3	
Total	912			

Table 9. Percentage of captive births of rhinoceros over time

Period	*unicornis n=137*	*sumatrensis n=4*	*bicornis n=292*	*simum n=479*
Before 1940	1	75	-	-
1940-1949	1	-	1	-
1950-1959	2	-	3	-
1960-1969	13	-	15	1
1970-1979	21	-	27	31
1980-1989	39	25	30	52
1990-1994	23	-	24	16

ficult to recognize a pattern, although there could perhaps be a slight preference for the months of October to December in the African species.

The gestation period was not part of this survey. A few data have been published previously and are summarized in Table 13 (see also, Jones DM, 1979:243). The higher values for the white rhinoceros seem excessive and the average also appears to be a little on the high side. Roughly, the gestation of each species is 16 months, with some individual variation.

Table 11. Number of babies born dead (stillbirths)

Species	*No.*	*%*	
R. unicornis	28	20	12/13/3
R. sondaicus	-		
D. sumatrensis	-		
D. bicornis	33	11	16/6/11
C. simum	35	7	19/13/3

Table 12. Distribution of known births per month of the year (shown in percentage)

Month	*unicornis n=137*	*sumatrensis n=4*	*bicornis n=292*	*simum n=479*
January	13	25	9	7
February	6	25	6	4
March	6		8	7
April	5		5	7
May	8	25	8	8
June	6		5	7
July	12		6	8
August	13		11	10
September	6		8	9
October	10		13	10
November	7		10	11
December	8	25	11	12

It is a strange phenomenon that females in captivity rarely produce many offspring. About half the mothers only give birth once or twice (Table 16). The interval between consecutive births in a young mother is a minimum of 16 months. This has been found in all three reproducing species (Table 17), and means that the females can conceive again very soon after giving birth (some data on the black rhinoceros in Smith and Read, 1992).

Table 10. Number of countries and collections where the rhinoceros was bred

	No. of countries	*No. of collections*	*RU*	*No. of animals bred DS*	*DB*	*CS*	*Total animals*
Africa	4	8	0	0	4	32	36
Asia	11	33	34	3	47	68	152
Australia	1	2	0	0	9	6	15
Europe	14	39	59	1	89	128	277
N. America	2	53	44	0	136	228	408
S. America	4	6	0	0	7	17	24
Total	36	141	137	4	292	479	912

Fig. 6. Female Black rhinoceros 'Kathleen' with Harry Warwick, London 1928 to 1939.

Table 13. Gestation periods

Species	*Mean*	*Range*
R. unicornis	478	462-489
R. sondaicus	-	
D. sumatrensis	-	
D. bicornis	457	438-493
C. simum simum	514	480-548
C. simum cottoni		482-485

The periods are given in days, based on the literature and information from collections in the survey

The age of sexual maturity can be calculated in females born in captivity and giving birth to second-generation zoo-born animals (Table 14). A few Indian and white rhinos have given birth when they were four years and four months old, which means that they were barely three years old when they mated successfully. No such early parturitions have been observed in the black rhinoceros. The males mature slightly later (Table 15), although some white rhinos were just over three years when they sired their first calf.

Table 14. Age of captive born females at first parturition

Age in years	*unicornis* (%) *n=18*	*bicornis* (%) *n=26*	*simum* *n=18*
4	22	-	11
5	5	-	6
6	12	19	39
7	5	12	11
8	5	15	11
9	18	4	-
10	5	23	6
>10	28	27	16

Youngest mothers:

4 yrs 4 mo	6 yrs 6 mo	4 yrs 4 mo
4 yrs 6 mo	6 yrs 6½ mo	4 yrs 11 mo

Fig. 7. Sumatran rhinoceros baby at Melaka, born 23rd May 1987.

Fig. 8. White rhinoceros mating at Ramat-Gan, 12th January 1988.

Fig. 9. Male Indian rhinoceros at Antwerp in 1880, drawn by A. Heins.

Table 15. Age of captive born males at the birth of first offspring (not at the time of mating)

	Age	
	years	*months*
R. unicornis	5	10
	7	11
D. bicornis	5	8
C. simum	3	2
	4	4

Table 16. Number of births and percentage of females giving birth in each species

No. of births	*unicornis n=39*	*bicornis n=91*	*simum n=126*
1	33	41	44
2	26	15	13
3	18	14	9
4	5	13	6
5	5	9	3
6	2.6	4	13
7	2.6	2	3
8	-	2	4
9	2.6	-	3
10	2.6	-	1
11	2.6	-	-
12	-	-	1

Table 17. Shortest intervals in days between captive births in each rhinoceros species

R. unicornis	*D. bicornis*	*C. simum*
457	483	409
494	494	451
501	525	469
512		506

In the case of multiple births in one female, the interval between parturitions can be calculated; the shortest intervals are given here