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REPRODUCTION AND SEXUAL BEHAVIOUR OF CAPTIVE COLONY OF RHESUS MACAQUES IN THE KONÁROVICE PRIMATE CENTER – 1984–1994 STUDY

ABSTRACT: The Konárovice Primate Center has bred rhesus monkeys (Macaca mulatta) since 1958. The monkeys are bred using the multimale-group principle, with 3–6 males and 5 to 15 females in a breeding group. An independent ground floor building, equipped with internal breeding cages and premises, serves for breeding. In favourable weather the animals can move freely from internal cages to external ones. Rhesus monkeys breed regularly and rear their young. The total number of breeding monkeys is currently more than 140 animals. The reproductive performance of rhesus monkeys was observed between 1981 and 1993. In that period 270 living young were born. Reproduction was evaluated from the point of view of the single years, the origin of patterns, the age of the mother and the sequence of pregnancy. In the Konárovice Primate Center, breeding has been most frequently observed from June to February with the peak in the September – December period. Social hierarchy takes control in breeding, so the highest-ranked male copulates the most frequently. Altogether 270 monkeys were born alive. 221 new-born monkeys had been reared by their mother and 49 individuals were artificially reared from various reasons. 178 individuals were weaned and 43 died before weaning in the group of 221 mother-reared youngsters. 36 individuals were weaned and 13 died before weaning in the group of 46 artificially-reared youngsters. The distribution of births during the year was also studied. Mating and birth seasons are longer in captive breeding than in the wild. Mating regularly takes place from June to October, births from December to May. Births in other months are often due to the simple fact that already-pregnant females come for breeding. Our data show the trend of domestication in the Konárovice macaque colony. Both the development of the whole population in Konárovice and the decrease of seasonality in females during the last four years support this hypothesis. The results of study show that it is possible to successfully breed rhesus monkeys in Central Europe.

KEY WORDS: Macaca mulatta – Reproduction – Sexual Behaviour – Domestication Trends.

INTRODUCTION

The Konárovice branch of the Prague Research Institute for Pharmacy and Biochemistry has bred rhesus monkeys (Macaca mulatta) and other laboratory animals since 1958. We began purposeful breeding in the Seventies, when imports of animals from the wild gradually declined. The last imports of animals arrived in 1979, since which time the institute's requirement of monkeys has been ensured by our own breeding, and by exchanges with other institutions. The monkeys serve in pharmacological testing of sub-

stances with potential antihypertensive activity, as non-anaesthesized normotensive rhesus monkeys are a suitable model for basic testing of blood-pressure-lowering drugs. They are also used in research on stress and in psychopharmacology. The departments of biology and laboratory animal breeding at Konárovice are engaged especially in the reproduction, ethology and nutrition of rhesus monkeys (Jebavý 1991, 1992, 1994).

MATERIAL AND METHODS

In the past, monkeys of the genus Macaca, especially rhesus (Macaca mulatta), crab-eating (M. fascicularis) and bonnet macaques (M. radiata), were caught and imported from India (1958 – 1970) and Vietnam and Bangladesh (until 1979). Due to strict legislation and animal protection acts these imports were stopped in the 1970s, which is why our own breeding programme was established.

The monkeys are bred using the multimale-group principle, with 3 – 6 males and 5 to 15 females in a breeding group. An independent ground floor building, equipped with internal breeding cages and premises, serves for breeding. In favourable weather the animals can move freely from internal cages to external ones. For the nutrition of monkeys we use corn and seeds, wheat, maize, oat meal, peas, rice, sunflower seeds, soya in various formulations, different kinds of fruit and vegetables, potatoes, milk, eggs and bread. We also use meal worms and a complementary feeding mixture in extrusion form. The monkeys drink black and herbal tea and water ad libitum.

Rhesus monkeys breed regularly and rear their young, which are either added to the breeding groups, used in experiments, or sold to institutes and zoos. The total number of breeding monkeys is currently more than 140 animals.

The reproductive performance of rhesus monkeys was observed between 1981 and 1993. In that period 270 living young were born. Reproduction was evaluated from the point of view of the single years, the origin of patterns, the age of the mother and the sequence of pregnancy. As for their origin, the rhesus monkeys come from Indian and Vietnamese imports (group 1), or the former imports, several generations in captivity, from Bangladesh (group 2), last imported in 1979.

RESULTS

Sexual behaviour

In the Konárovice Primate Center, breeding has been most frequently observed from June to February with the peak in the September – December period (October – February under natural conditions – Lindburg 1987). Social hierarchy takes control in breeding, so the highest-ranked male copulates the most frequently. However, lower-ranked males usually participate in reproduction. Sexual behaviour of females begins roughly at the age of three, together with their first sexual swellings. The alpha male is primarily interested in the highest-ranked female but the breeding rank can essentially change the social position of females in the female hierarchy. In the event that a lower-ranked female becomes the favoured partner of the alpha male, she increases her position in a social hierarchy. Higher-ranked males are more attractive for females than the lower-ranked males. The period of gravidity varies from 140 to 180 days (on average 164 – 167 days in rhesus monkeys – Catchpole, van Wagenen 1975, Valerio et al. 1969). No multiple gravidity has been observed in the Konárovice Primate Center during the last 37 years. Spontaneous abortions are quite usual (see *Table 1*).

Reproduction

Altogether 270 monkeys were born alive. 221 new-born monkeys had been reared by their mother and 49 individuals were artificially reared for various reasons. 178 individuals were weaned and 43 died

TABLE 1. *Results of reproduction in the years 1982–1993.*

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Total
Total adult females	36	38	42	46	48	52	44	38	43	48	53	47	535
Non-pregnant females	14	23	35	20	25	14	13	7	15	22	22	21	231
Pregnant	22	15	7	26	23	38	31	31	28	26	31	26	304
Aborts				1	2	1	3	2	2	1	1		13
Born dead			1	4	3	2			4	3	4		21
Born alive	22	15	6	21	18	35	28	29	22	22	26	26	270
Reared by mother	22	14	6	15	14	26	25	24	18	17	17	23	221
Died before weaning	8		2	1	4	6	7	5	6	2		2	43
Weaned	14	14	4	14	10	20	18	19	12	15	17	21	178
Artificial rearing		1		6	4	9	3	5	4	5	9	3	49
Died before weaning					2	3		2	2	1	3		13

before weaning in the group of 221 mother-reared youngsters. 36 individuals were weaned and 13 died before weaning in the group of 46 artificially-reared youngsters. 1984 was the least successful for breeding; only four young individuals were weaned. The most successful years were 1987 (35 individuals born and 26 weaned) and 1993 (26 individuals born and 24 weaned).

Results of the analysis of the reproduction according to the origin of the parents are shown in *Table 2*. There are no significant differences among the groups.

The age of the mother refers to age at the time of birth of young. Clearly older mothers, over 5 years of age, breed better than younger females (*Table 3*). The multiparous females between 8 and 10 years seem to be the most fertile.

A similar tendency can also be observed regarding the sequence of pregnancy: primiparae have a much poorer reproductive performance. Females between the 3rd and 5th gravidity have the best results in their reproduction. The results are summarised in *Table 4*.

Distribution of births during the year

The distribution of births during the year was also studied. Mating and birth seasons are longer in captive breeding than in the wild. Mating regularly takes place from June to October, births from December to May (March to June under natural conditions – Lindburg 1987, Vančatová et al 1986). Births in other months are often due to the simple fact that already-pregnant females come for breeding. The results are presented in *Table 5*. After birth, the young stay with their mothers until the age of 6 – 9 months, and then they are weaned together. The differences have been found among the imported females and their direct offsprings and the females born in captivity after more than two generations where the seasonality of reproduction significantly decreases.

TABLE 2. *Evaluation of reproduction according to the origin of the parents.*

Group no. (origin)	Group 1 former import	Group 2 last import	Group 3 unknown origin
Total adult females	151	113	108
Pregnant	93	60	65
Aborts	4	2	5
Born dead	7	4	3
Born alive	82	54	54
Reared by mother dead	9	13	14
Reared by mother weaned	63	30	33
Artificial rearing dead	2	4	2
Artificial rearing weaned	8	7	5

TABLE 3. *Evaluation of reproduction according to the age of mother.*

Mother's age (years)	3	4	5	6	7	8	9	10
Total adult females	1	56	45	29	21	16	10	5
Pregnant	1	28	28	18	13	13	7	3
Aborts		2	2	2	1	1		
Born dead		2	3					
Born alive	1	24	23	16	12	12	7	3
Reared by mother dead		3	6	6	1	4	6	
Reared by mother weaned		12	12	7	9	8	5	3
Artificial rearing dead		9	5	3	2		1	
Artificial rearing weaned	1	7	4	1	1			

TABLE 4. *Evaluation of the reproduction to the sequences of pregnancy.*

No. of gravidity	1	2	3	4	5 and more
Number of pregnant females	43	27	15	5	3
Aborts	5	3			
Born dead	1	2			
Born alive	37	22	15	5	3
Reared by mother dead	6	7	3	1	
Reared by mother weaned	17	12	9	4	2
Artificial rearing dead	3	1	2		1
Artificial rearing weaned	11	2	1		

TABLE 5. *Distribution of births during the year.*

Month Year	1	2	3	4	5	6	7	8	9	10	11	12
1984	3	2	1									2
1985	8	7	4									
1986	5	7	3	1		1	1				1	4
1987	13	11	3	4							1	5
1988	5	4	10	3								1
1989	3	7	10	5	2	1						
1990	3	7	5	3	3	1					2	2
1991	4	2	4	4	3				1			2
1992	1	3	9	5	4	1	1		1			2
1993	1	2	5	5	9	3	1					
Total	46	52	54	30	21	7	3		2		4	16

CONCLUSIONS

Among other interesting results, our data show the trend of domestication in the Konárovice macaque colony. Both the development of the whole population in Konárovice and the decrease of seasonality in females during the last four years support this hypothesis. The preliminary data show that it is possible to successfully breed rhesus monkeys in Central Europe, and thus prevent the needless depletion of these monkeys in their natural environment in the wild.

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