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RESEARCH REPORT: INTRODUCTION OF A GROUP OF HAMADRYAS BABOONS FROM ZOO TO ISLAND. ST. PETERSBURG, RUSSIA: A CASE STUDY OF INDIVIDUAL CHANGES IN BEHAVIOUR AND LOCOMOTION

ABSTRACT: A group of six hamadryas baboons (Papio hamadryas) from St. Petersburg Zoo (Russia) was introduced to an island for a short summer period. Quantitative and qualitative changes of behaviour and locomotion of all members of this group were recorded before and after introduction. We observed the frequency of locomotor behaviour after the group moved to the island remained at the same level, although the character of the locomotion changed. We observed more terrestrial locomotor patterns on the island than in the Zoo. Social behaviour on the island increased by two-three times in all adult animals. We recorded a change in hierarchical position between two adult males on the island. An alpha male who was dominant in the Zoo, lost his position during the first several days of his introduction to the more natural conditions on the island. In the Zoo, the young juvenile male spent a lot of time engaged in social contact and he frequently played with his aunt. The play behaviour frequency of this juvenile male and his aunt rapidly decreased after introduction to the island. This male spent significantly more time with his mother on the island than in the Zoo. We also recorded a decrease in the individual distance between animals on the island. It follows that all animals in the group can adapt very quickly to new conditions in the wild. Changes in group hierarchy in this situation seem to be evident. We found that the individual experience of baboons is very significant in adaptation to wild conditions. In our opinion, environmental change substantially influenced the social structure dynamics in this captive group. Environmental change caused an increase in the quality and quantity of contacts. According to our short-term observation, such a change probably caused a change in the social hierarchy to take place – that of the change of alpha male position in the group.

KEY WORDS: Hamadryas baboons – Behavior – Locomotion – Adaptation – Semifree-ranging – Russia

INTRODUCTION

Primatologists have been discussing the comparability and usefulness of studies of wild living and captive primates for many decades. This is true for studies of behaviour and locomotion of wild-living and captive primates. Wild living primates have been studied for many years and hamadryas baboons belong to the best known species from this viewpoint. Hamadryas baboons were studied in regions of their origin (like Ethiopia and southern part of Arabian peninsula) and the regions where they were introduced, e.g. Caucasus Mountains – Gumista region (Chalyan *et al.* 1994).

There are many studies dealing with the behaviour of baboons in captivity (Čaljan *et al.* 1987a, b, 1991, Coelho *et al.* 1983, Colmenares 1991a, 1992, Kaumanns *et al.* 1987, Wasserman, Cruikshank 1983), however, little is known about behavioural changes when introducing a group into seminatural or natural conditions.

Hamadryas baboons are generally very adaptive primates (Kummer 1968, Kummer *et al.* 1985) and therefore they can easily adapt to the relatively cold climate in northern Russia. The group of hamadryas baboons from the St. Petersburg Zoo was introduced to the island in the Central Cultural Park (St. Petersburg) during the summer of 1995 for ethological observation and making films. This introduction was the second one. The first time, the same group of hamadryas baboons was introduced to the island during the summer of 1994 and after the end of the expedition this group came back to the Zoo.

The main goals of this presentation are (1) The analysis of behavioural changes of each animal from this group after introducing them to the island and, (2) Comparison of these changes with the behaviour of this group directly before the introduction.

We formulated the following working hypotheses: (1) Environmental change should substantially influence the social structure dynamics in this captive group and (2) Environmental change will cause an increase in the quality and quantity of contacts resulting in the formation of new features in social hierarchy.

MATERIAL AND METHODS

The group of six hamadryas baboons (*Papio hamadryas*) were kept in St. Petersburg Zoo in a 25 m^2 cage (*Table 1*). Although there were several benches and trees for vertical locomotion, the conditions for locomotion and spontaneous social contact were very limited in this environment.

The observation was conducted during the three weeks prior to the introduction of the baboons to the island and for seven days after the introduction. Each animal was observed repeatedly, at least ten times, in 15 minutes intervals before and after the introduction using the same

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TABLE 1. Observation group of hamadryas baboons, Leningrad Zoo, 1995.

Name	Sex	Age. date and place of born
Shurik	Male	6 years old, born 17. 12. 1989, Charkov Zoo
Romka	Male	6 (?) years old, unknown
Simona	Female	6 years old, born 14. 4. 1989, Sukhumi Primate Research Center
Sibilla	Female	6 years old, born 22. 3. 1989, Sukhumi Primate Research Center
Simon	Male	1 year old, born 10. 4. 1994, Leningrad Zoo
New-born	Male	1 month, born 31. 5. 1995, Leningrad Zoo

method. We registered seven basic types of behaviour: locomotor, feeding, social, play, parental, agonistic and sexual (Vančatová 1991, Vančatová, Vančata 1987, 1991). At the same time we registered 20 basic types of locomotion, divided into 4 groups: terrestrial, arboreal, static and dynamic forms (for the more detail see Vančata *et al.* 1986a, b, Vančatová, Vančata 1987a, b).

The island has 3125 m^2 with very dense vegetation with many trees and shrubs. On the island there were two small glades. The researchers came to the island on the boat. There was no access to the island for other visitors.

RESULTS

We observed in the group in the Zoo the following relations: α-male was Shurik, β-male was Romka. There are two infants in the group: Simon (15 months) and "Newborn" (5 weeks). The female Simona is the mother of both of them. After introduction to the island the behaviour of monkeys changed in the following way (*Tables 2, 3*).

1. α-male Shurik

The locomotor behaviour is the most predominate part of the general behavioural pattern and stays approximately the same both in the Zoo and on the island (*Table 2*). However, more precise analysis shows that arboreal forms of locomotion in the wild significantly decreased, both static and dynamic patterns (eight and six times accordingly, *Figure 1, Table 3*). On the other hand, the display of dynamic forms of locomotion on the ground increased approximately four times in the wild conditions. It was probably influenced by the active exploration of a new territory on the island, which is much larger than a cage in a Zoo. The remarkable increase of terrestriality in the α-male in the island environment was probably caused by the new ecological and social environment and also by avoiding of arboreal locomotion which is rather risky for the relatively heavy α-male.

The increase in feeding behaviour was caused by the change of feeding regime. In the Zoo the animals are given food at the same time several times per day. In the wild conditions the monkeys could explore the feeding objects (vegetation) for practically during whole day and they are given only a small amount of food in the evening.

The social behaviour of the α-male increased two-fold in the wild. In unknown conditions on the island the α-male was permanently surrounded by the other members of the group, which increased the number of direct contacts with them. The observation of grooming was more frequent on the island. Both static and dynamic forms of social behaviour of the α-male on the ground increased several times on the island. The α-male actively demonstrated his dominant position on the island not only in priority in approaching food (as in the Zoo) but he also in choosing resting places for the group. He was the initiator of moving the group around the island. The elements of play or parental behaviour were not observed in the α-male. He had no direct contacts with any of his offsprings.

Displays of agonistic behaviour from the α-male significantly decreased on the island. In the first few days after introduction to the island all members of the group actively explored the new conditions and adapted to them. This could be the main reason why the agonistic behaviour was registered much less frequently in semi-natural conditions than in the Zoo. It is necessary to stress that this behavioural pattern was

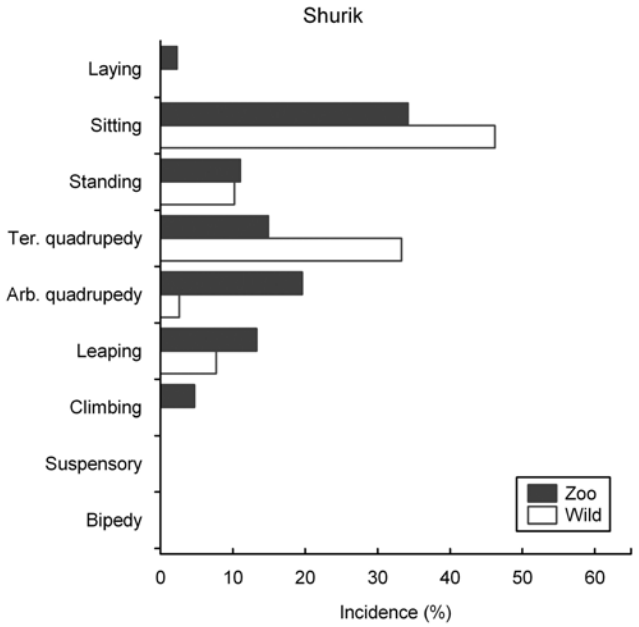

FIGURE 1. Differences in locomotion of α-male Shurik.

TABLE 2. *Papio hamadryas*, differences in behaviour in captivity and wild, St. Petersburg, 1995, incidence of behaviour in %.

	Shurik Male (alpha)		Romka Male (beta)		Simona Female		Sibilla Female		Simon Male		Newborn Male	
	Zoo	Wild	Zoo	Wild	Zoo	Wild	Zoo	Wild	Zoo	Wild	Zoo	Wild
Locomotor	31.3	33.3	27.3	30.3	15.8	19.7	30.5	20.4	18.0	11.9	9.3	2.1
Feeding	6.2	10.3	31.7	16.5	37.3	9.8	14.9	14.8	20.2	23.9	3.0	
Social	21.9	42.3	22.0	34.2	16.8	49.0	29.8	57.4	14.7	20.9	9.8	
Play			4.0				14.1		26.5	11.9	10.9	4.3
Parental			4.9		19.6	13.7			13.3	25.4	64.7	93.6
Agonistic	40.6	14.1	7.5	19.0	9.5	7.8	10.7	7.4	7.3	3.0	2.3	
Sexual			2.6		1.0					3.0		
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

observed for only several days after the introduction. After the adaptation of the baboon group to the island environment, we observed important changes in the hierarchy of males. The submissive male Romka had begun to occupy the dominant position in hierarchy of the group. Sexual behaviour in the α-male had not been observed both before and after the introduction of the group to the island.

2. β-male Romka

The locomotor behaviour of the β-male occurred in approximately the same frequency as in the α-male (*Table 2*). The character of the locomotor behaviour of the β-male Romka changed in a similar way to the α-male after the introduction to the island. This means that the observed tendency towards decreased arboreal dynamic form of locomotion was analogical in both males. However, Romka, in contrast to Shurik, displayed an increase in static forms of locomotion in the tree layers in the island (*Figure 2, Table 3*). We had observed very frequently that during rest the members of group stayed on the ground but Romka sat nearby on the stumps or in trees. Romka explored the new environment on the island quite actively. We also observed the situation when Romka took the initiative and led all the members of the group when Shurik had tried several times to lead the group along a path where there were people standing. Shurik went ahead but he was afraid and came back to the same place. After several of these unsuccessful attempts Shurik, Romka went to the front of the group, went around the humans and led the group away.

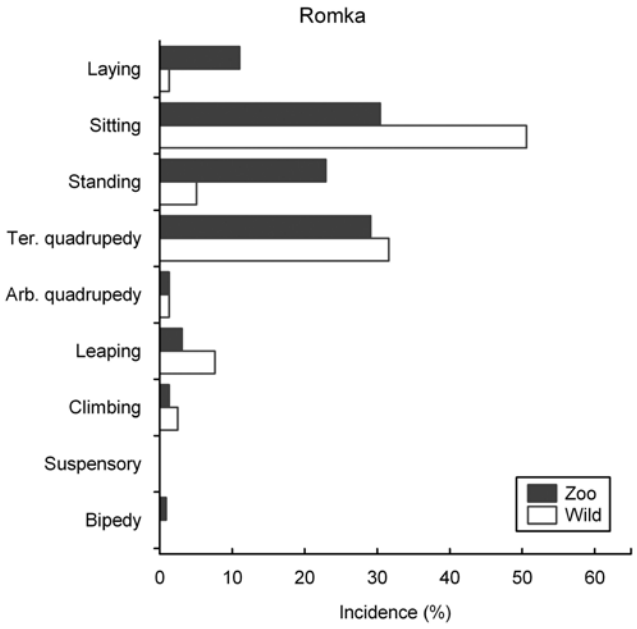

FIGURE 2. Differences in locomotion of β-male Romka.

The feeding behaviour of the β-male decreased on the island. It was probably influenced by the decrease in competition for the food between a- and β-males in the semi-natural conditions. The social behaviour of β-male also significantly increased in the wild conditions. In our opinion it was the result of the same tendency as in α-male, that means much more intensive social relations in the group in the new unknown environmental conditions. In contrast to the α-male, we observed Romka's play behaviour in the Zoo. He frequently played with the oldest offspring (about 4% from general behavioural pattern). We did not register this play with infants during the first several days on the island. We also did not register parental behaviour of Romka because he had no offspring in this group. However, we frequently observed Romka taking a newborn infant from his mother, carrying and grooming the infant, to draw the attention of female to himself. This behaviour of subordinated males was also observed by other authors who studied baboons in comparable environmental conditions (Chalyan *et al.* 1994, Colmenares 1991b).

The agonistic behaviour of Romka doubled in the wild conditions. It is possible to explain that the subordinated male was trying to occupy the dominant position and he also actively protected the island from newcomers (when a boat with unknown people approached the island). Romka stayed during sleep and rest at the distance from the other members (several meters) in contrast to the other animals of the group. All members of the group occasionally hide in the open transportation cage installation on the island in extreme situations, like heavy rain. Romka came several times to the cage and went away but in the end, he stayed in the rain.

In connection to this, Romka's sexual behaviour in the Zoo should be mentioned. Romka copulated with both females only when the α-male slept or couldn't see him, which was not the case on the island. Consequently, we suggest that the new elements in Romka behaviour and locomotion were the indications that subordinated male was trying to take over the dominant position in the group.

3. Female Simona (the mother of both offsprings)

Although the locomotor behaviour of the female Simona increased only slightly on the island (*Table 2*), the character of the locomotor behaviour changed substantially – terrestrial forms of locomotion were much more frequent on the island (*Figure 3*, *Table 3*). Simona's feeding behaviour decreased three times on the island. In our opinion, this shows the same tendency as the β-male, Romka. Simona 's social behaviour increased on the island (by three times) as with all animals in the group (*Table 2*). We observed more frequent grooming and other social contacts between all the members of the group on the island. We also observed a decrease in the distance between the members of group during first few days on the island. With the exception of the β-male Romka, the baboons frequently sat or slept near others (about 0.0–0.5 m).

Play behaviour from Simona was neither observed in the Zoo nor on the island. We observed a decrease of parental behaviour from Simona on the island. This can be explained by the increase of activity of the infant which began to move deliberately around the island and started

TABLE 3. *Papio hamadryas*, ontogeny of locomotion in captivity and wild, St. Petersburg, 1995, incidence of locomotion in %.

	Shurik		**Romka**		**Simona**		**Sibilla**		**Simon**		**Newborn**	
	Male (alpha)		**Male (beta)**		**Female**		**Female**		**Male**		**Male**	
	Zoo	**Wild**	**Zoo**	**Wild**	**Zoo**	**Wild**	**Zoo**	**Wild**	**Zoo**	**Wild**	**Zoo**	**Wild**
Laying	2.3		11.0	1.3	2.2		16.5		2.5		3.4	6.4
Sitting	34.2	46.2	30.4	50.6	45.9	60.7	29.0	48.1	30.1	53.6	45.1	59.5
Standing	11.0	10.2	22.9	5.1	14.5	2.0	21.5	14.8	11.7	7.5	12.0	
Ter. quadrupedy	14.9	33.3	29.1	31.6	29.6	35.3	19.8	31.5	18.7	28.4	9.7	6.4
Arb. quadrupedy	19.6	2.6	1.3	1.3	3.8		2.5	3.7	11.0			
Leaping	13.3	7.7	3.1	7.6	0.9		4.1		11.0	1.5	0.4	
Climbing	4.7		1.3	2.5	1.2		4.1	1.9	10.6		8.7	
Suspensory							0.8		1.8	1.5	15.0	27.7
Bipedy			0.9		1.9	2.0	1.7		2.6	7.5	5.7	
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

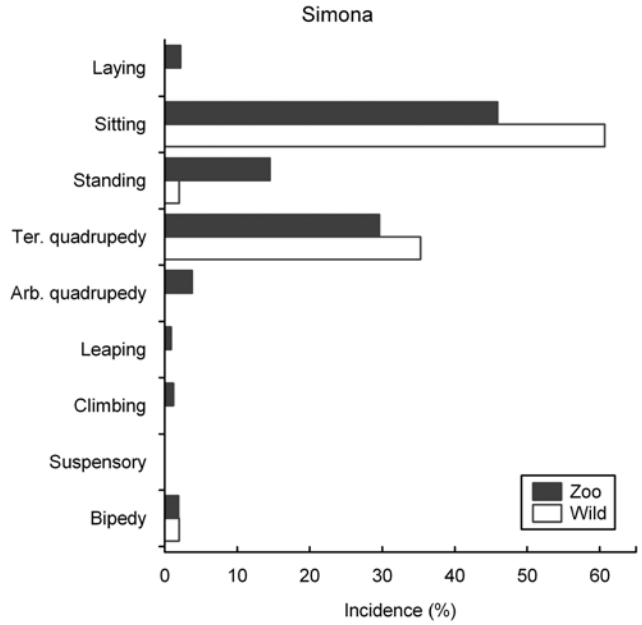

FIGURE 3. Differences in locomotion of female Simona.

actively exploring the environment of the island and struggled to gain independence from the mother for short periods of time. Agonistic behaviour from Simona decreased on the island but these differences are not significant. Sexual behaviour of this female was observed only in the zoo. This type of behaviour was not observed on the island.

4. Female Sibilla

Locomotor behaviour of the female Sibilla, in contrast to the other adult individuals, significantly decreased on the island in comparison with her behaviour in the Zoo (*Table 2*). Similarly, as with the other adult animals the locomotor patterns at ground level (terrestrial locomotion) on the island were more common in the locomotor behaviour of Sibilla (*Figure 4*, *Table 3*). Sibilla's activity at tree level was much higher in the Zoo. Feeding behaviour of Sibilla stayed roughly the same. Social behaviour from this female on the island was two times more frequent than in the Zoo. This is probably a common tendency for all adult members of

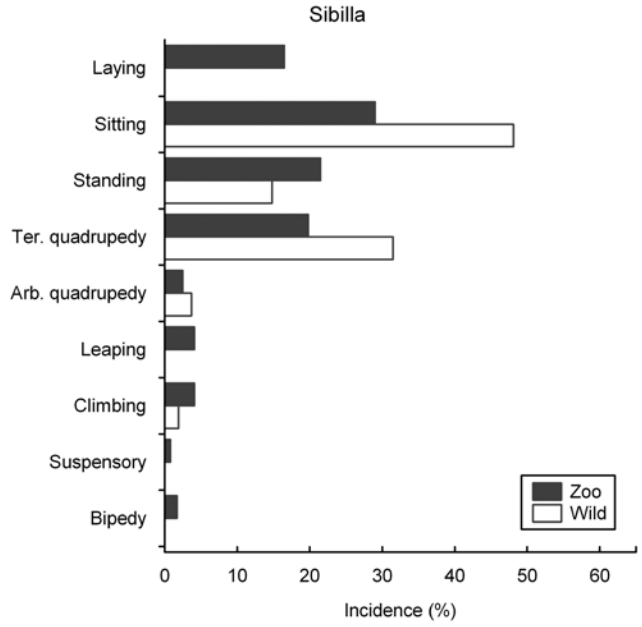

FIGURE 4. Differences in locomotion of female Sibilla.

group (with the exception of the newborn infant). The main specificity of Sibilla's general behavioural pattern is play behaviour. Sibilla is the only individual among adult animals in this group who displayed the play behaviour in the Zoo (about 14% of the common behavioural patterns). However, we never observed this type of behaviour in Sibilla on the island, in the unknown environment, during first few days after the introduction. Her frequent partner in play, the young male Simon, preferred contact with his mother after introduction to the island. He initiated these contacts very actively and he tried to stay as near his mother as possible. The agonistic behaviour of Sibilla decreased on the island, similarly to the other female, Simona. Sexual behaviour from this female was not observed during our observation both on the island and in the Zoo.

5. Male Simon

Simon was 15 months old during the expedition. Locomotor behaviour from Simon decreased on the island (*Table 2*) with a preference for terrestrial locomotion as with the other animals (*Figure 5*, *Table 3*). However, arboreal types of locomotion, like jumping or suspensory

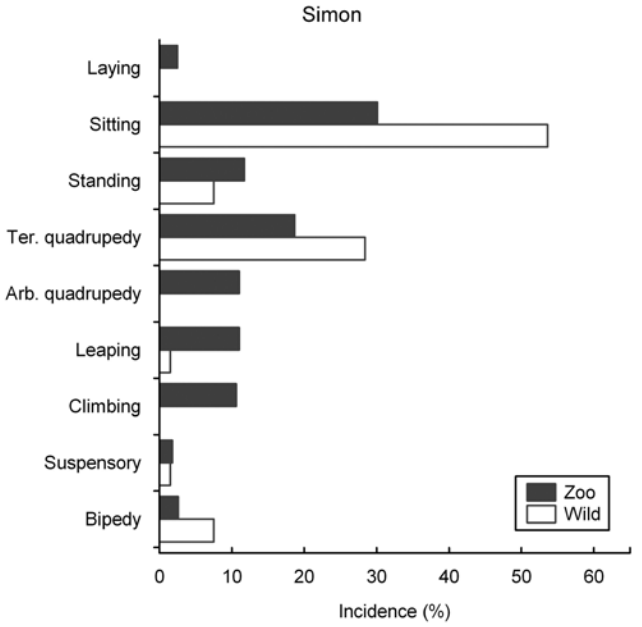

FIGURE 5. Differences in locomotion of male Simon.

behaviour and it was observed on the island too (*Figure 5*). Feeding behaviour stayed at the same level both in the Zoo and on the island. As with all the animals in the group, the social behaviour from Simon increased on the island though not to such a degree as in the adult animals. However, the play behaviour decreased two times on the island. In the new conditions on the island, Simon stayed more frequently with his mother, than with the female, Sibilla, who was his frequent partner in play behavioural activities in the Zoo. Simon frequently played at a distance from his mother and slept near Sibilla in the Zoo. However, he slept only with his mother on the island (she had at this time another newborn infant). Agonistic behaviour from Simon significantly decreased on the island (*Table 2*). The common aggression of the group on the island was directed towards newcomers or it was the conflicts between a- and β-males for the dominant position in the group. Simon began to display elements of "sexual behaviour" (at this time we observed the sex-skin swelling of Sibilla). He examined her genitals and tried to stand as adult males do during copulation (without the insertion of his penis). We did not observe this activity in the Zoo.

6. Newborn male infant

The infant male was five weeks old during expedition. All changes in the behaviour of newborn infant were influenced by two main factors:

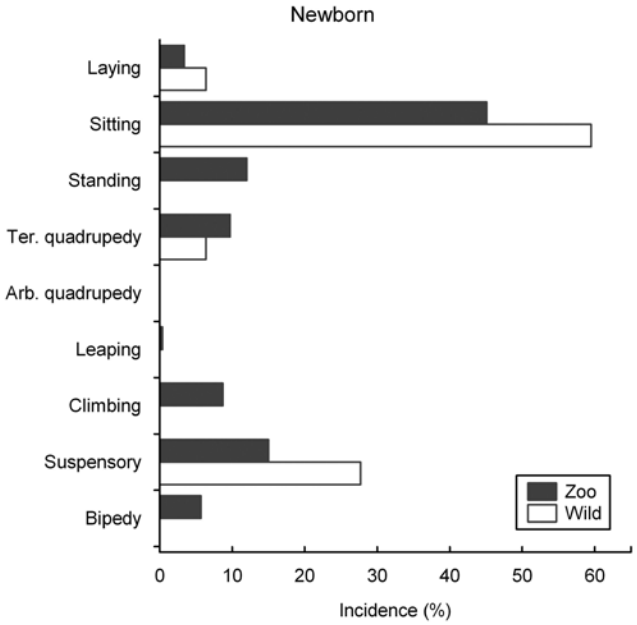

FIGURE 6. Differences in locomotion of newborn male.

(1) age of infant, (2) new, "dangerous" situation on the island. The new environment influenced at first the locomotor behaviour (it significantly decreased in the new, unknown environment on the island) and on parental behaviour (he stayed much more frequently under the protection of his mother) (*Figure 6*, *Table 2*). The decrease or non-display of these types of behaviour, like feeding (actively searching and examining, not milk feeding), play, agonistic behaviour was connected to the increase in the mother's protection on the island (*Table 2*). However, staying under the control of his mother, the infant begun to display new elements of behaviour connected at the first with exploration of the environment. He examined new food, new objects, tried to climb trees or played near his mother and he moved from his mother at a distance of no more than 1–2 meters (in contrast to the last few days in the zoo before introduction to the island).

DISCUSSION

This paper is basically intended as a case study; however, the observations brought some important information regarding the functioning of behavioural mechanisms in basic social units of hamadryas baboons in both captive and semi-free ranging conditions.

The new more suitable environment perhaps improved the quality of affiliation and post-conflict mechanisms as has been described for captive baboons in some other studies (Colmenares 1991a, b, 1992, Vančatová 1993) and mother infant relations as well (Coelho *et al.* 1983).

It is difficult to prove whether such an environment really can stimulate social relations that are similar, or at least comparable, to those known from baboons living in the wild; or whether it is just a positive behavioural reaction to changes in behaviour and social structure that frequently occur after a major environmental enrichment and the enlargment of secluded area in Zoos. However, we can speculate, with respect to the high sociability and environmental adaptability typical for the hamadryas baboons, the positive influence of the natural environment without strict "borders" on the dynamics of social structure is a more probable explanation. The "brave" behaviour of the male, Romka,is one good example, where factors can play an important role in the formation of social structures in an environment where behavioural stereotypes are suppressed.

In any event, this study has proved that the relatively cold climate of northern Russia is not a serious problem for adaptation as is also shown in the successful adaptation of two hamadryas baboon groups who inhabited two Nature Reserves in the Caucasus mountains (Chalyan *et al.* 1994). However, comparison of our results with other studies of hamadryas baboons, including our studies of Caucasus free living groups (Chalyan *et al.* 1994, Čaljan *et al.* 1987a, b), is limited by the relatively very short time of study in semi-natural condition on the north Russian island. An experiment that would be suitable for such comparative analysis would have to be designed for several years and the group should be much larger.

Nevertheless, this study has shown that a positive change of environment can stimulate the dynamics of social relations in a group and such change can be one of the important factors related to the formation of a social structure and a social hierarchy. In our opinion, our study also stresses the necessity of systematic study of environmental changes in captive primates. Such studies are very important for a deeper understanding of the behavioural mechanisms that are potentially important, together with environmental enrichment, for improving the dynamics of social structures of captive primates.

Our study also shows that captive primate studies depend very much on the current situation of a group. We were very lucky to have a group with a social structure not too dissimilar from the harem of hamadryas baboons that is common in wild living populations. The experiment was done under exceptional conditions because there are very few captive groups that have the opportunity to live, even for a very short time, in the wild. In this sense our study gives very important results but does not particularly allow for generalisations to be drawn.

CONCLUSIONS

The first hypothesis has been confirmed. In our opinion the environmental change substantially influenced the social structure dynamics in this captive group. The second hypothesis has also been confirmed. Environmental change caused an increase in quality and quantity of contacts. According to our short term observation, such change probably stimulated the formation of new feature in the social hierarchy – a turnover of the alpha male position in the group. Hypotheses can be verified by the following results:

(1) The independence of infants from the mother decreased on the island in the new environment. Furthermore, the oldest infant himself initiated contacts with mother on the island more frequently than in the Zoo.

(2) The individual distance between animals decreased on the island. The animals were in the close contact more frequently on the island than in the Zoo.

(3) Introduction to the island challenged the changes of the social behaviour of all members of the group. It was especially demonstrated in the adult females (increase of social behaviour of two-three times).

(4) The change of dominance between males was observed after adaptation to the new environment. We described the turnover in social hierarchy when the β-male moved up into the dominant position. In this case individual characters and individual experience of males manifested themselves: α-male was born and lived all his life in zoos; β-male was caught in a town where he was able to learn to live in the totally unknown, inadequate conditions of an urbanised environment and he probably started to be more effective in behavioural adaptations. He proved to be a more initiating and bolder male after the group transfered to the island. In this place, it is necessary to stress that the same change of hierarchy was observed during the first expedition in the summer of 1994. However, the situation changed after group came back to the Zoo where α-male Shurik recovered his dominant status in the group. This was not the case after the second expedition in the summer of 1995 because the male Romka kept his dominant position when the group was transferred back St. Petersburg Zoo.

In conclusion our main hypotheses were proved to be positive – environmental change substantially influenced social structure and hierarchy within the group. This experiment has also shown that behavioural and social changes in baboon groups are not instant. The stabilisation of a new rank takes some time, most probably months, before the group as a whole accepts a new hierarchy.

The reliability of our hypotheses is supported also by observed changes in locomotion, namely:

(1) The frequency of locomotor behaviour changes were not important in adult animals after introduction to the island. But the character of locomotor patterns changed significantly – we observed terrestrial patterns more frequently on the island than in the Zoo, where the animals frequently moved at the tree level in a stable, known environment.

(2) The frequency of locomotor behaviour decreased in both infants on the island which was also connected with the new environment. The male, Simon, kept arboreal locomotor patterns on the island too.

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REFERENCES

CHALYAN V. G., MEISHVILI N. V., DATHE R., 1991: Dominance rank and reproduction in female hamadryas baboons. *Primate report* 29: 35–40.

CHALYAN V. G., MEISHVILI N. V., LAPIN B. A., VANCHATOVA M. A., 1994: Reproductive aspects of free-ranging groups of hamadryas baboons. In: J. R. Anderson, J. J. Roeder, B. Thierry, N. Herrenschmidt (Eds.): *Current primatology, Vol. III. Behavioural neuroscience, physiology and reproduction*. Pp. 237–244. Univ. Louis Pasteur, Strasbourg.

COELHO A. M. JR., TURNER S. A., BRAMBLETT C. A., 1983: Allogrooming and social status: An assessment of the contributions of female behavior to the social organization of hamadryas baboons (Papio hamadryas). *Primates* 24, 2: 184–197.

COLMENARES F., 1991a: Greeting behaviour between male baboons: Oestrous females, rivalry and negotiation. *Anim. Behav.* 41, 1: 49–60.

COLMENARES F., 1991b: Greeting, aggression, and coalitions between male baboons: Demographic correlates. *Primates* 32, 4: 453–463.

COLMENARES F., 1992: Clans and harems in a colony of hamadryas and hybrid baboons: Male kinship, familiarity and the formation of brother-teams. *Behav.* 121, 1–2: 61–94.

ČALJAN V. G., MEIŠVILI N. V., VANČATOVÁ M. A., 1987a: Infanticide and primate evolution. In: V. Leonovičová, V. J. A. Novák (Eds.): *Behaviour as one of the main factors of evolution*. Pp. 321–330. Czechoslovak Academy of Sciences, Prague.

ČALJAN V. G., MEIŠVILI N. V., VANČATOVÁ M. A., 1987b: Sexual behaviour of hamadryas baboons. *Anthropologie (Brno)* 25, 2: 183–187.

KAUMANNS W., OLFENBUETTEL T., PUDEL V., SCHWIBBE G., SCHWIBBE M., WOLF A., 1987: Determinants of feeding behaviour of hamadryas baboons (Papio hamadryas) in captivity. *Primate Report* 17: 33–43.

KUMMER H., 1968: *Social organization of hamadryas baboons.* Karger, Basel.

KUMMER H., BANAJA A. A., ATO-KHATWA A. N., GHANDOUR A. M., 1985: Differences in social behaviour between Ethiopian and Arabian Hamadryas baboons. *Folia Primatol.* 45: 1–8.

VANČATA V., VANČATOVÁ M. A., ČALJAN V. G., 1986a: Adaptive patterns in behaviour of Old World monkeys. In: V. J. A. Novák, V. Vančata, M. A. Vančatová (Eds.): *Behaviour, Adaptation and Evolution.* Pp. 67–80. ČSAV, Praha.

VANČATA V., VANČATOVÁ M. A., ČALJAN V. G., 1986b. Locomotion and form of behaviour in primates (in Russian). *Vestnik Akademii Nauk* 3: 37–40.

VANČATOVÁ M. A., 1991: Quantitative analysis of the aspects of behaviour in some monkey species. In: A. Ehara, T. Kimura, O. Takenaka, M. Iwamonto (Eds.). *Primatology today.* Pp. 193–196. Elsevier, Amsterdam.

VANČATOVÁ M. A., 1993: Infanticide in primates. *Global Bioethics* 6, 3: 187–192.

VANČATOVÁ M. A., VANČATA V., 1987a: Evolutionary meaning of interaction between locomotion and behaviour in primates. In: V. Pesce Delfino (Ed.): *Biological Evolution.* Pp. 199–212. Adriatica Editrice, Bari.

VANČATOVÁ M. A., VANČATA V., 1987b: Formation of behavioural patterns in ontogeney of higher primates. In: V. Pesce Delfino (Ed.): *Biological Evolution.* Pp. 189–198. Adriatica Editrice, Bari.

VANČATOVÁ M. A., VANČATA V., 1991: Ontogeny of behaviour in macaques and baboons: Quantitative analysis of behavioural patterns, sexual differences and developmental trends. *Primate Report* 29: 3–13.

VANČATOVÁ M. A., VANČATA V., HAVRÁNEK T., 1991: Socialization in the ontogeny of higher primates and its evolutionary meaning. *Primate Report* 29: 15–22.

WASSERMAN F. E., CRUIKSHANK W. W., 1983: The relationship between time of feeding and aggression in a group of captive hamadryas baboons. *Primates* 24, 3: 432–435.

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