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SECRETARIA DO MEIO AMBIENTE
COORDENADORIA DE INFORMAÇÕES TÉCNICAS, DOCUMENTAÇÃO E PESQUISA AMBIENTAL
INSTITUTO FLORESTAL

A STUDY OF THE BEHAVIOUR OF CAPTIVE GOLDEN-HEADED LION TAMARINS (Leontopithecus chrysomelas, CALLITRICHIDAE - PRIMATES) WHILST IN QUARANTINE

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SUMÁRIO/CONTENTS

A STUDY OF THE BEHAVIOUR OF CAPTIVE GOLDEN-HEADED LION TAMARINS (*Leontopithecus chrysomelas*, CALLITRICHIDAE - PRIMATES) WHILST IN QUARANTINE*

Letícia Domingues BRANDÃO**

RESUMO

O comportamento social de quatro pares de *Leontopithecus chrysomelas* mantidos em quarentena, em "Jersey Wildlife Preservation Trust" foi comparado durante 47,5 horas de observação.

Dois pares mostraram maiores interações entre si que os dois demais. Foram encontradas diferenças em intensidade de "allogrooming" e "scent-marking" que podem estar relacionados ao comportamento sexual e agonístico mostrados.

Foi verificado através dos resultados, que não existe diferenças significativas no comportamento de machos e fêmeas e, que ambos são responsáveis pelo estabelecimento do contato e aproximação.

Palavras-chave: comportamento, *Leontopithecus chrysomelas*, primatas.

ABSTRACT

The social behaviour for four pairs of *Leontopithecus chrysomelas* maintained in quarantine in JWPT were compared during 47.5 hours of observations.

Two pairs showed interactions more than the other two. Differences were found in intensity of allogrooming and scent-marking that could be related to sexual and agonistic behaviour shown.

The results showed there is no significant difference between males and females performing behaviours and that both are responsible for contact maintained.

Key words: behaviour, *Leontopithecus chrysomelas*, primates.

1 INTRODUCTION

The genus *Leontopithecus* is the most endangered primate genus in the New World (COIMBRA FILHO & MITTERMEIER, 1977a). The genus belongs to the family Callitrichidae. Until recently it contained one species *Leontopithecus rosalia* which was divided into three distinct subspecies *L. r. rosalia*; *L. r. chrysomelas* and *L. r. chrysopygus*, but a recent comparative review by A. L. ROSENBERGER considers them to have specific status (RYLANDS, 1983; THORNBACK, 1982). The golden-headed lion tamarin (*Leontopithecus chrysomelas*), the subject of this study, has a small range and isolated population in the wild. They are restricted to patches of Atlantic rain forest in the southern part of the state of Bahia (COIMBRA FILHO & MITTERMEIER, 1977a). They are confined to a small area and their habitat is rapidly being destroyed.

(*) Projeto desenvolvido como parte do Curso de treinamento do programa de reprodução em cativeiro de espécies ameaçadas, em"Jersey Wildlife Preservation Trust", Jersey Channel Island, England, U.K. Aceito para publicação em novembro de 1993.

(**) Instituto Florestal, Caixa Postal 1322 - 01059 - São Paulo, SP. Fundação Florestal, Autônomo.

Efforts are being made by various national and international entities in order to effectively preserve their occurrence in this area (Oliver W., pers. comm.), which is also considered a centre of endemism for different species (RYLANDS, 1983). Their distribution in the wild is show in FIGURE 1.

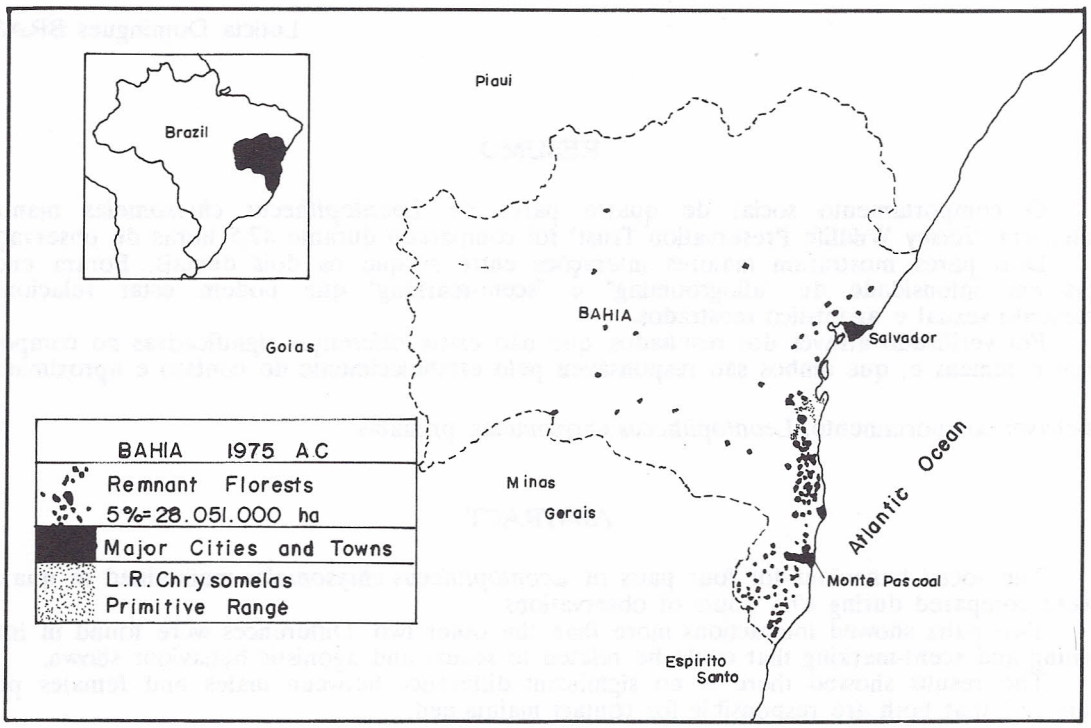

FIGURA 1 - The distribution of golden-headed lion tamarin (*Leontophitecus chrysomelas*). From: MAGNANINI, A. 1977. In: KLEIMAN, D. G. (ed.) *The biology and conservation of the Callitrichidæ*. Washington, D.C., Smithsonian.

In order to preserve this species a captive breeding programme is being expanded, with the arrival in September of 1987 of the first colony from Rio de Janeiro Primate Centre to the Jersey Wildlife Preservation Trust.

Very little is known about the behaviour and ecology of *Leontopithecus chrysomelas*, there is only one field study conducted by RYLANDS in 1983 and there is not study in captivity.

The aim of this study is to compare the social behaviour of four pairs of *Leontopithecus chrysomelas* that were being maintained in quarantine in the Jersey Wildlife Preservation Trust.

2 MATERIALS AND METHODS

For this study four pairs of golden-headed lion tamarins (*Leontopithecus chrysomelas*) were observed that were being maintained in quarantine (September of 1987 until March of 1988).

Each pair was housed separately, without visual communication with other pairs. Three cages were 2.1 m high x 2.25 m wide x 2.70 m deep and the fourth was 2.1 m high x 1.5 m x 1.65 m deep. Internally the cages were furnished with natural branches, a platform and a wooden nest boxes.

The ambient temperature was maintained at 22°C and glass windows allowed daylight to enter. Artificial light was also provide on a time clock from 07:30 until 19:30 hours and infra-red light was

provided from 05:00 until 16:30 hours.

The animals were fed at 09:00 with mixture (commercial primate diet) at 12:30 with differents fruits and at 16:30 with a snack (more detail in JWPT, nutritional handbook, Allchurch, 1986).

Four pairs of captive-born golden-headed lion tamarins were observed for a total of 47.5 hours during one month between September and October of 1987. TABLE 1 presents the history of the animals from the CPRJ (Rio de Janeiro Primate Centre) and the number of observations with each pair. Unfortunately, this study had a short period of observation because of limited of time in JWPT. Although, the sample data is small, we can have interesting comparison results between pairs and discussion with others studies done with others primate species.

TABLE 1 - History and hours of observation of golden-headed lion tamarins at the JWPT.

Cage Pair	Hour obs.	Sex	Birth date	Comment	Date when put together
1	13.5	♂	28/10/83		10/08/87
		♀	16/10/85	nulliparous	
2	10.5	♂	31/10/85	full siblings	always
		♀	31/10/85	nulliparous	together
3	10.5	♂	08/09/81	prov. breeder	03/05/87
		♀	13/12/83	abort. during travel	until 29/07/86 again in 07/04/87
4	13.0	♂	19/10/80	prov. breeder	29/07/87
		♀	28/01/85	nulliparous	

Note: All animals were captive-born.

Observations were made in the quarantine area through transparent glass, first between 10.00 and 16.00 and afterwards increased to 08.00, 12.00 and 14.00.

Observations were made for 30 minutes each on a check sheet. Some behaviour categories used have been described for *Callithrix jacchus* by STEVENSON & POOLE (1976); for *Saguinus oedipus*, *Saguinus midas*, *Callithrix argentata*, *Leontopithecus rosalia* and *Callimico goeldi* by OMEDES & CARROLL (1980).

Definitions are as follows:

proximity: if both individuals were within 15 cm of each other

contact: when their bodies were strictly together; contact was also recorded when they were inside the nest box and/when they were allogrooming.

leave: meant one animal going from within 15 cm to further than 15 cm from another, and approach is vice-versa.

Three types of **scent marks** were distinguished as defined by EPPLE (1972): circumgenital, suprapubic and sternal.

Observations with pairs 3 and 4 were done after 24/10/87 by using a video because they were spending most part of their time inside the nest boxes. Although these pairs were extremely shy, it may have been the presence of the observer causing this reaction.

The first observations were done with one-zero sampling and later were done with scan

sampling as follows:

Pair 1: 5.5 hours in one-zero and 8.0 hours in scan sampling
Pair 2: 7.0 hours in one-zero and 3.5 hours in scan sampling
Pair 3: 5.5 hours in one-zero and 5.0 hours in scan sampling
Pair 4: 8.0 hours in one-zero and 5.0 hours in scan sampling

The events considered as approach, leave, follow and scent marking were recorded and analysed in one-zero sampling and scan sampling, but state behaviours considered as feeding, autogrooming, allogrooming, active and nest box were recorded with both methods as above but these data were analysed from scan sampling to give a better approximation to the proportion of time spent performing the behaviours.

3 RESULTS

3.1 General Social Behaviour

The behaviours shown in TABLE 2 and FIGURES 2 and 3 demonstrate the proportion of time which the male and female were feeding, autogrooming, allogrooming, active and remaining inside the nest box. Staying inside the nest box took up more time than the time devoted to other behaviours.

The low proportion of time feeding must be because the food was given after periods of observation. Sometimes pair 1 and pair 2 were seen foraging on the floor.

TABLE 2 - Proportion of time allocated to different behaviours (scan-sampling).

Pair	1		2		3		4	
	♂	♀	♂	♀	♂	♀	♂	♀
Feeding	2.8	5.0	8.5	5.7	4.5	7.8	4.1	2.6
Autogro.	5.8	1.1	0.4	1.4	0	0	0	0.1
Allogro.	13.8	0.2	1.4	3.3	0	0.1	0	0
Activity	15.9	11.6	11.9	19.7	3.5	5.8	0.6	1.1
Nest box	23.2	20.5	44.7	45.7	80.5	70.3	87.0	90.0
n:	960	960	420	420	600	600	600	600

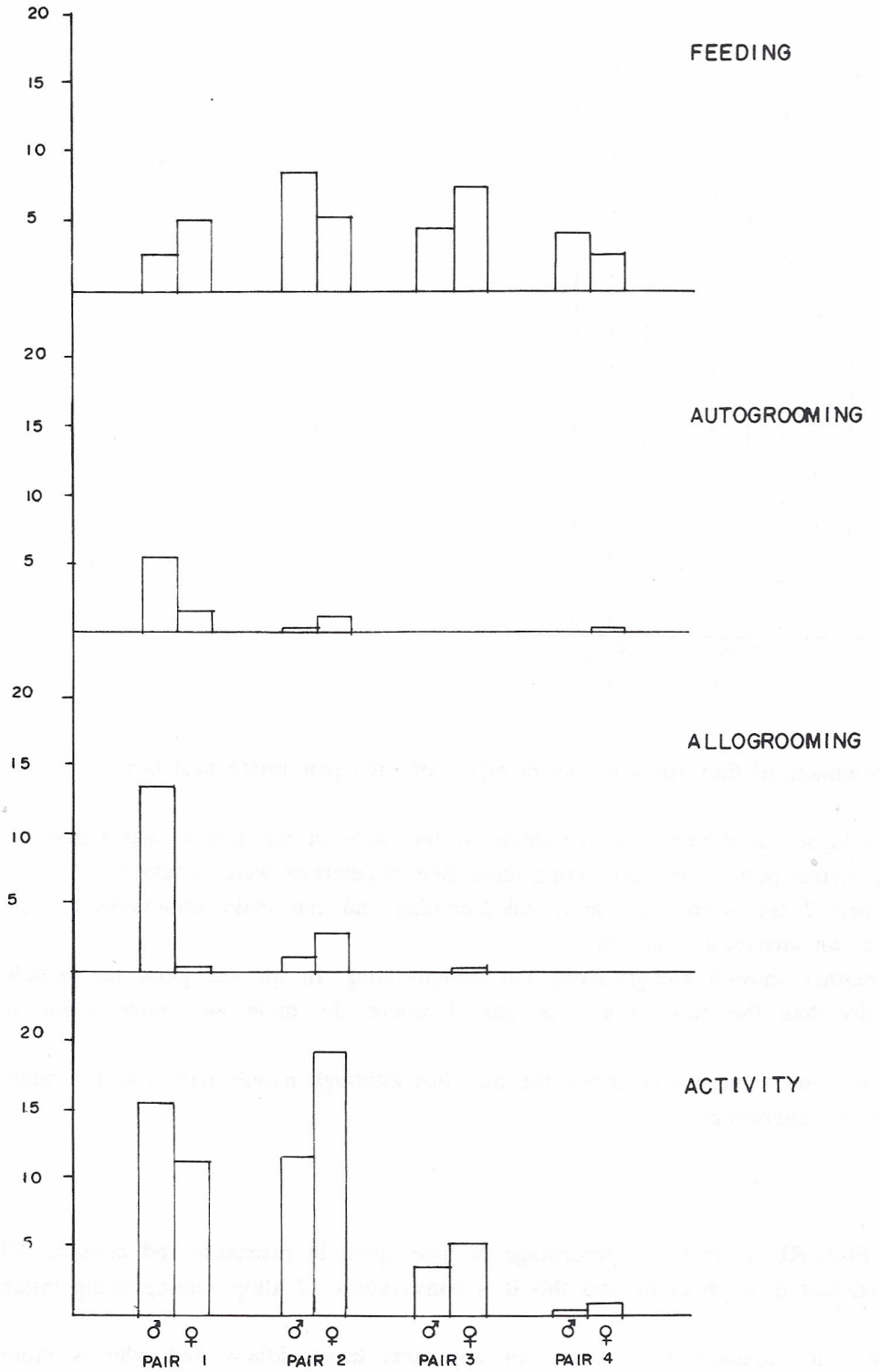

FIGURE 2 - Percentage of time spent by the members of each pair feeding, autogrooming, allogrooming and active.

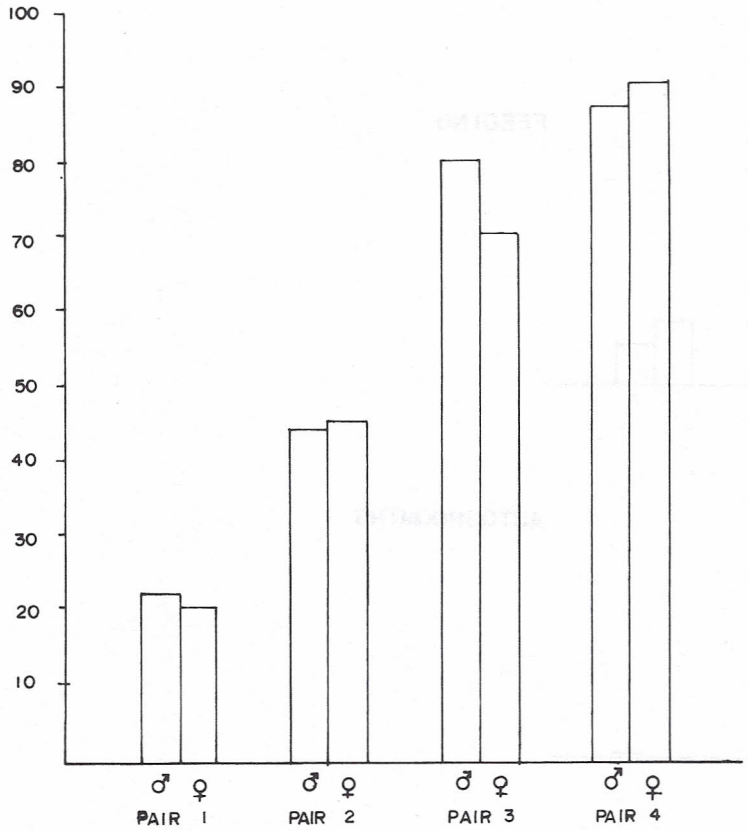

FIGURE 3 - Percentage of time spent by the members of each pair inside nest box.

Pair 1 showed a higher incidence of allogrooming by the male of the female which may be due to the female being in oestrus period (because during these days copulations were observed).

By contrast in pair 2 the female did more allogrooming and the male sometimes bit the females hands or sprawled as an invitation to groom.

Pair 3 and 4 neither showed autogrooming nor allogrooming. In all the pairs the female showed a little more activity than the male except for pair 1 where the male was more active as explained above.

All four pairs spent much more time inside the nest box although mainly pair 3 and 4 while pairs 1 and 2 did it only in the afternoons.

3.2 Contact and Proximity

TABLE 3 and FIGURE 4 show the percentage of time spent in proximity and contact. All pairs spent more time in contact than proximity and this is a consequence of allogrooming being inside the nest box.

TABLE 4 shows the comparison of scores for approach, leave, follow and who is more responsible for maintaining contact, by comparing the percentage of approaches made by one individual and the percentage of departures.

Which animals were more responsible for maintaining contact was calculated using the Hinde and Spencer-Booth Index. If the index is positive, the male is more responsible for contact maintenance, if negative the female is more responsible.

TABLE 3 - Percentage of proximity and contact between male and female.

Pair	1	2	3	4
<15 cm (P)	2.0	4.0	4.0	2.8
Contact (C)	43.0	58.0	68.0	83.0

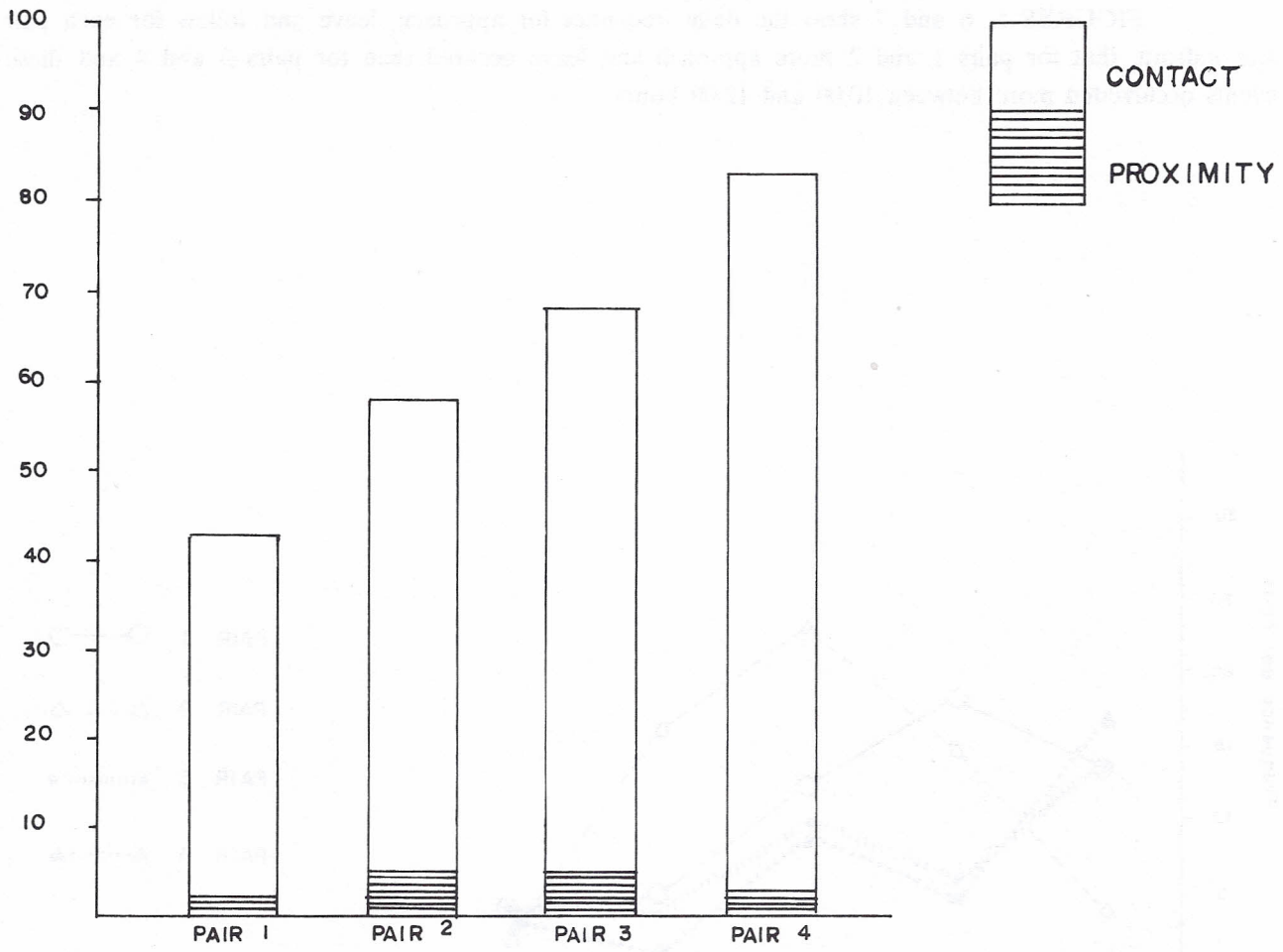

FIGURE 4 - Percentage of time spent in proximity (< 15 cm) and contact.

TABLE 4 - Comparision of behaviours between the pairs.

Pair	1		2		3		4	
	♂	♀	♂	♀	♂	♀	♂	♀
Approach	4.81	6.63	4.86	8.0	2.19	4.85	1.84	5.15
Leave	7.48	7.18	6.38	7.81	2.19	6.85	1.92	5.76
Follow	0.74	1.41	0.67	1.90	1.14	0.57	0.46	0.15
Hinde and Spencer Booth Index	-0.08		-0.07		0.07		0.01	

That the values found are near to 0 for all pairs indicates that the male and female were equally responsible for maitaining proximity.

FIGURES 5, 6 and 7 show the daily frequency for approach, leave and follow for each pair and indicate that for pairs 1 and 2 more approach and leave occured than for pairs 3 and 4 and these events occurreded more between 10.00 and 12.00 hours.

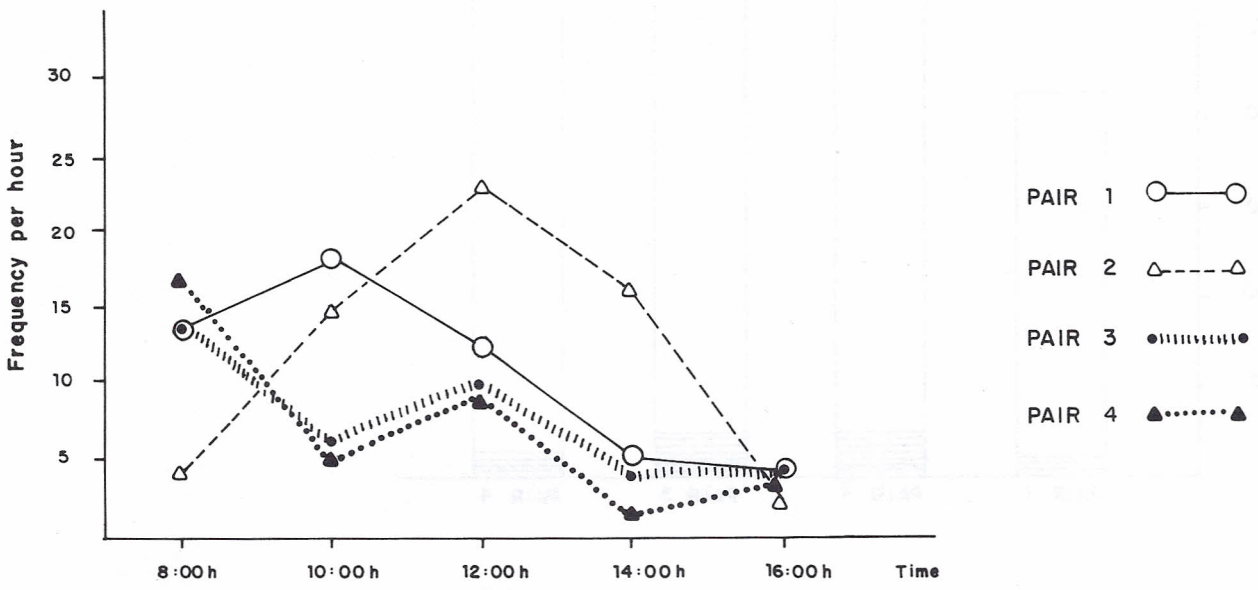

FIGURE 5 - Daily patterns of approaching.

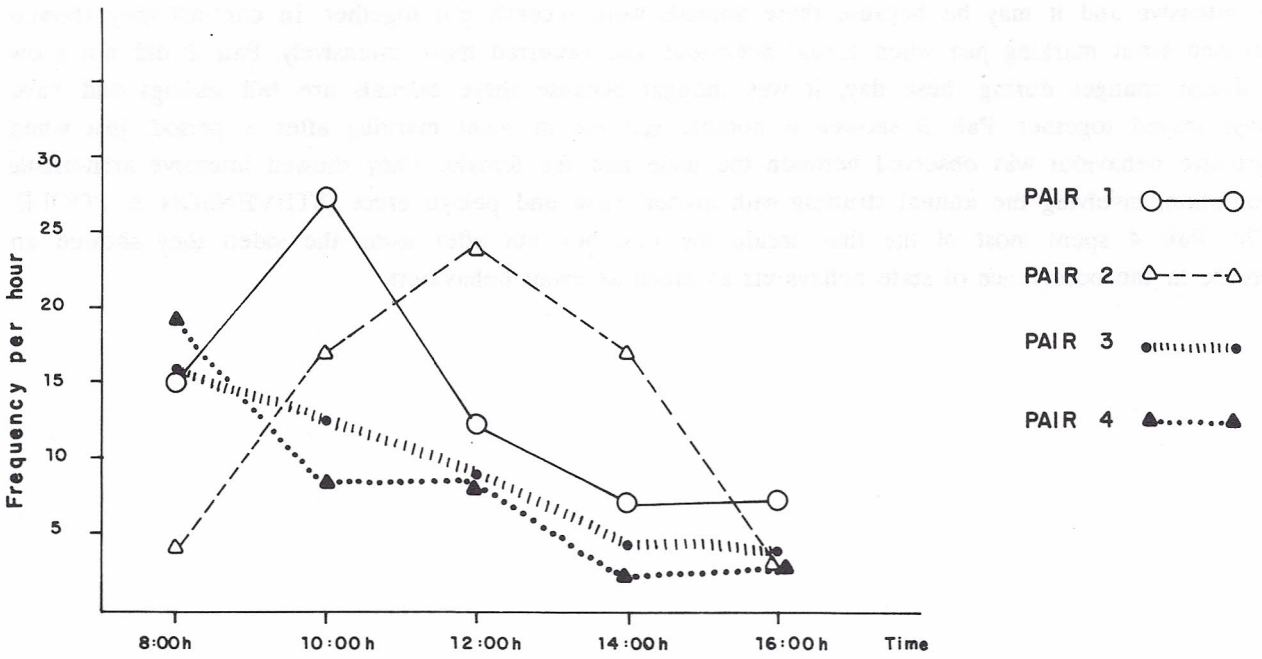

FIGURE 6 - Daily patterns of leaving.

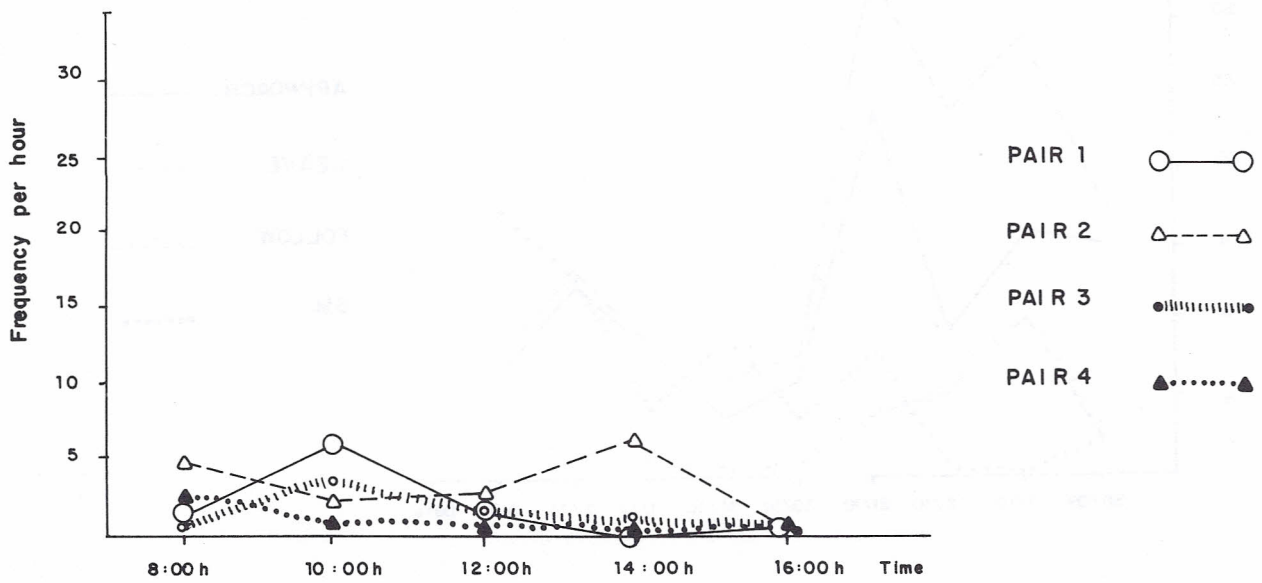

FIGURE 7 - Daily patterns of following.

FIGURES 8, 9, 10 and 11 show the changes in behaviour, including scent marking with length of time in the quarantine enclosures.

Pair 1 exhibited more approach and leave during the first few days, but later these became less intensive and it may be because these animals were recently put together. In contrast they showed increased scent marking just when sexual behaviour also occurred more intensively. Pair 2 did not show significant changes during these day, it was thought because these animals are full siblings and have always stayed together. Pair 3 showed a notable increase in scent marking after a period, just when aggressive behaviour was observed between the male and the female. They showed intensive arch-bristle locomotion, involving the animal strutting with arched back and pelage erect (STEVENSON & POOLE, 1976). Pair 4 spent most of the time inside the nest box but after using the video they showed an increase in the occurrence of state behaviours as much as event behaviours.

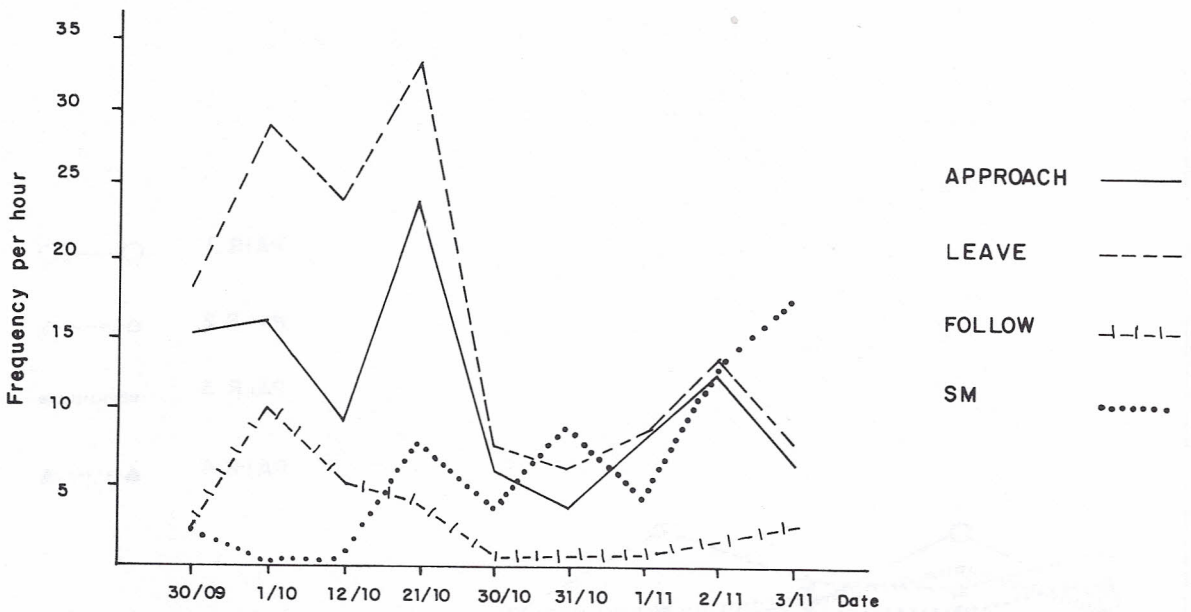

FIGURE 8 - Changes in behaviour with lenght of time in quarantine enclosure in pair 1.

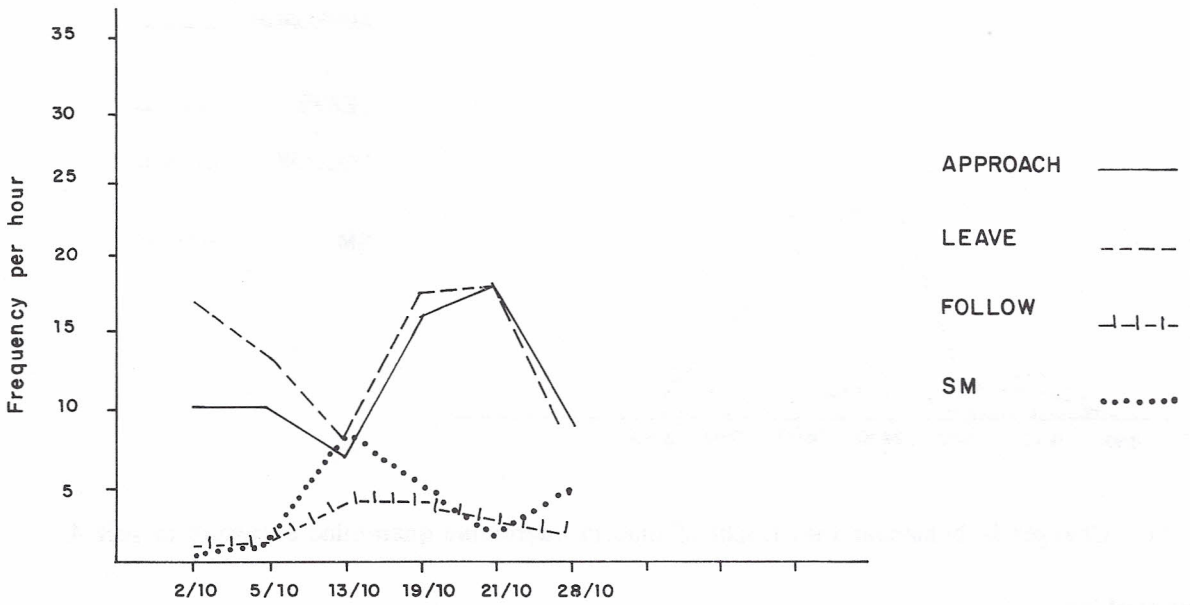

FIGURE 9 - Changes in behaviour with lenght of time in quarantine enclosure in pair 2.

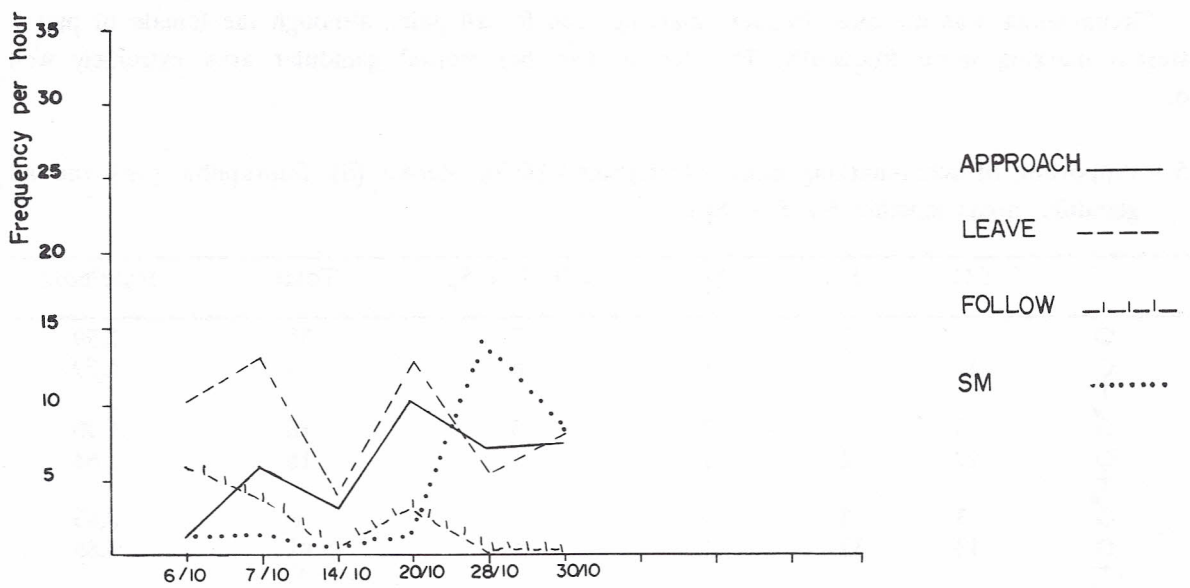

FIGURE 10 - Changes in behaviour with lenght of time in quarantine enclosure in pair 3.

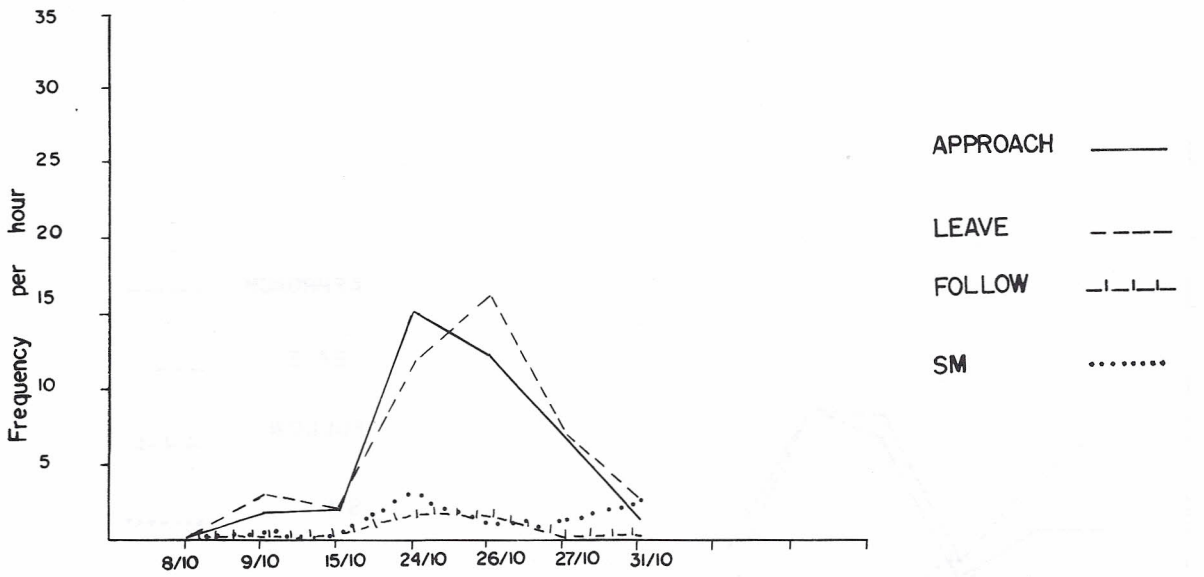

FIGURE 11 - Changes in behaviour with lenght of time in quarantine quarantine enclosure in pair 4.

3.3 Scent-marking

TABLE 5 shows the proportion of different types of scent-marking between male and female for each pair. TABLE 6 shows the locations of scent-marking and FIGURE 12 shows the daily patterns of scent-marking.

Pair 1 and 3 were the pairs that showed scent-marking more frequently. Pair 1 male and female marked in the same proportions, but the female was seen marking in more locations.

Pair 3 female did more scent-marking and also in more places than the male.

Circumgenital was the most frequent marking seen for all pairs, although the female of pair 3 showed sternal marking more frequently. This female had her sternal glandular area extremely well developed.

TABLE 5 - Proportion of scent-marking using circumgenital (CG), Sternal (S), Suprapubic (SP) and all glandular areas together (G, S & Sp).

Pair		CG	S	Sp	CG, S & Sp	Total	Rate/hour
1	♂	18	2	8	7	35	2.59
	♀	19	7	3	6	35	2.59
2	♂	7	1	7	3	18	1.90
	♀	12	2	1	1	16	1.64
3	♂	3	3	-	-	6	0.95
	♀	13	32	1	1	47	4.86
4	♂	1	9	4	-	14	0.85
	♀	1	-	1	-	2	0.15

TABLE 6 - Location of scent-marks by pairs.

Pair		Branches	Nest	Wall, Heater and Shelves
1	♂	15	20	--
	♀	21	4	10
2	♂	17	1	--
	♀	13	3	--
3	♂	3	1	2
	♀	7	12	28
4	♂	3	11	--
	♀	1	1	11

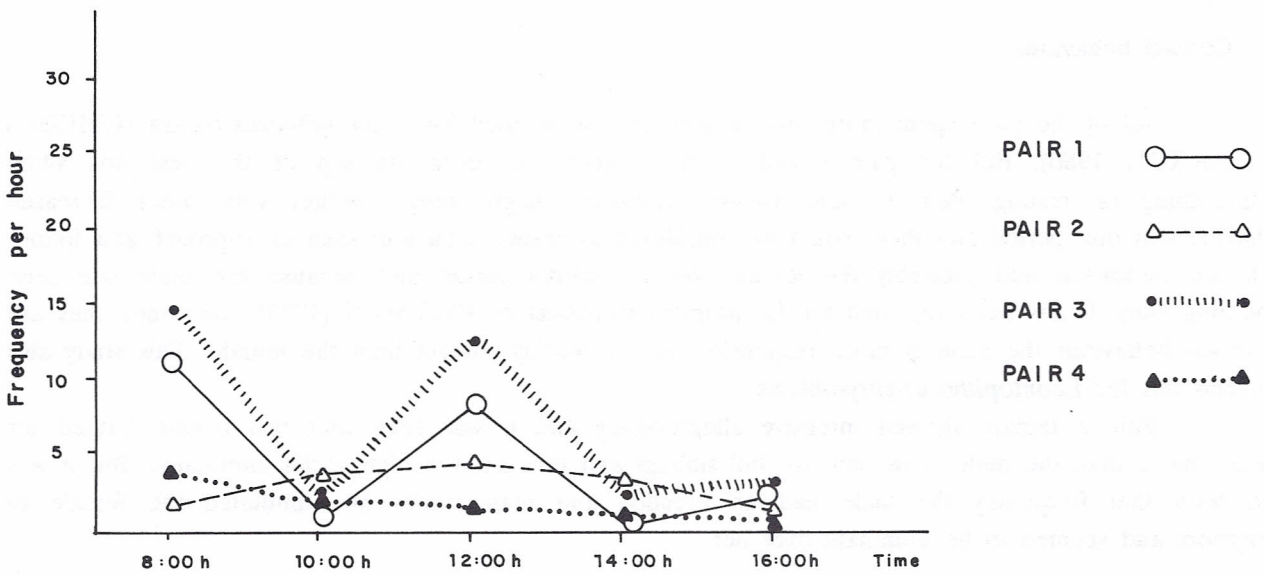

FIGURE 12 - Daily patterns of scent-marking.

3.4 Sexual behaviour

Sexual behaviour was seen only in pair 1. There was a conspicuous increase in allogrooming by the male following by copulations during these periods. The male sniffed and groomed the female around genitalia more frequently. The female showed approach behaviour too, but sometimes she spent all the period of observation alone and far from the male. During this period it was verified that the female had lost a lot of hair on one side of her body.

3.5 Agonistic behaviour

Agonistic behaviour was observed only in pair 3, when the male and female showed arch-bristle locomotion and sometimes simultaneously during a period. The same pair were seen fighting during one observation and this was mainly caused by the male.

4 DISCUSSION

The comparision among four pairs studied here showed differences between them although many studies behaviours are similar. Pairs 1 and 2 showed more behaviours than pairs 3 and 4.

The males of pairs 3 and 4 have already had offspring before with other females, and pair 3 female had her first offspring aborted in transit to Jersey. These two pairs didn't show social interactions during the observation period, and most of the time they were inside the nest boxes. They showed very little autogrooming and allogrooming and little scent-marking by pair 4. Low levels of approach, leave and activity were observed and when these were seen it was mainly during feeding periods. When this pair showed some social behaviour the female was more responsible. It has been reported by EPPLE (1972) for *Saguinus geoffroyi* that the female engages most frequently in friendly social and sexual interactions for maintaining stable pair bonds.

4.1 Contact behaviour

All of the pairs spent more time in contact, also verified for *Leontopithecus rosalia* (OMEDES & CARROL, 1980). But for pair 1 and 2 this contact was done on top of the nest box when allogrooming or resting. Pair 1 male showed intensive allogrooming together with other increased behaviours in one period and these could be considered as sexual behaviour such as approach and follow, with the indication that probably the female was in oestrus period and because the male was seen mounting daily. It has been reported for *Leontopithecus rosalia* by KLEIMAN (1978), that when they are in sexual behaviour the male is more responsible for promoting contact than the female. This study also confirms this for *Leontopithecus chrysomelas*.

Pair 2 female showed intensive allogrooming and it was seen that this female looked for contact more than the male. This pair are full siblings and they showed high social interaction. But it was also seen that frequently the male had an erection and many times he stimulated the female to allogroom and seemed to be dominant over her.

4.2 Scent marking

Leontopithecus chrysomelas showed scent-marking with circumgenital, sternal and suprapubic

glandular areas. It has been reported by EPPLE (1972) for *Leontopithecus rosalia*, *Saguinus geoffroyi*, *Saguinus oedipus* and *Saguinus fuscicollis* that they use the same glandular areas.

It was seen that scent-marking was related to sexual behaviour and agonistic behaviour.

MACK & KLEIMAN (1977) suggested that there are differents functions for the use of differents kinds of glands: circumgenital related within territory, sexual communication and social status and sternal glands used alone for marking territorial boundaries.

In this study pair 1 showed high levels of sexual behaviour, the male and female marked more with the circungenital gland area, and the female marked in more places in the cage than the male. This could be related with the function of the circumgenital gland for sexual communication and might be that females used more territory than males.

Pair 3 showed signs of agonistic behaviour, the female showed intensive marking with the sternal gland area and also explored more places in the cage.

What we can conclude from these results is that females and males did not show significant difference in display from each other, although females sometimes showed more activity. In general for all pairs there were not large differences between the sexes. Contact initiation and scent-marking were shown to be related to sexual and agonistic behaviour.

It is difficult to apply these results more generally, because it was a short period of observation by the reasons exposed previously and consequently a small sample. It is suggested that this study should continue after the quarantine period to detect if the differences found between pairs could be due to different observation times and adaptations for each pair in quarantine i.e. differences by chance alone.

ACKNOWLEDGEMENTS

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APPENDIX

This study started with one-zero sampling and TABLE 7 shows these results. Only events were analysed from both methodologies (one-zero and scan-sampling). In order to show if there were significant differences between these two methodologies the data were tested (Wilcoxon Test), and it was found that for males there was not a significance difference, but the females showed a significant difference (P = 0.01). Therefore, it is inconclusive that the one-zero method should have consistently overestimated the occurrence of behaviours. Also, each methodology was made at a different time and therefore the results do not bear good comparision.

However, the scan-sampling data were used to analysed the results of this study because although scan-sampling restricts the observer to recording only one category of behaviour per sample point and can miss changes in behaviour which occur between sample points, the data when analysed are more accurate (MARTIN & BATESON, 1986). In contrast, one-zero sampling records two or more behaviour patterns that can occur within the same sample interval. When the data are analysed there could be over-estimates, because the behaviour is recorded as though it occurred throughout the sampling interval.

TABLE 7 - Proportion of time allocated to different behaviours (one-zero scampling).

Pair	1 %		2 %		3 %		4 %	
	♂	♀	♂	♀	♂	♀	♂	♀
Feeding	9.3	8.7	11.0	10.7	2.4	6.0	5.8	4.0
Autogro.	1.8	0.3	4.0	1.7	0	0	0	0
Allogro.	0	0.4	3.0	4.8	0	0	0	0
Activity	34.5	31.6	33.9	40.4	2.4	9.2	6.3	10.3
Nest box	57.7	58.0	26.4	24.5	97.0	91.0	90.2	92.2
n:	660	660	840	840	660	660	960	960

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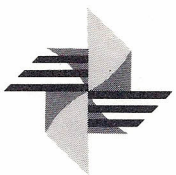

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