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A STRESS-FREE METHOD OF IDENTIFYING COMMON MARMOSETS (*CALLITHRIX JACCHUS*) IN THE WILD

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Abstract . This study was based on observations of five free-ranging groups of common marmosets (*Callithrix jacchus*) in Camaragibe in northeastern Brazil. Identification methods were tested on 42 individuals over two periods between 1998 and 2002, using binoculars, photography and voice recorders. The procedure has four steps of identification: (i) group composition; (ii) age classes; (iii) gender classes; (iv) distinguishing marks (physical defects, scars, form of the forehead "star", color of the fur, size and color of ear tufts). Based on this information, individual identification check-sheets (including a drawing of the individual) were created. In some cases (infants), a small portion of the tail fur was cut. All subjects were identified successfully by the procedure, in between 2 and 4 weeks. Given the potential risks of capture and marking, this procedure is recommended as a stress-free alternative to artificial methods.

Key words: individual identification, natural marks, stress, behavioral studies, *Callithrix jacchus*, common marmoset.

Resumo. Este estudo foi baseado na observação de cinco grupos silvestres de sagüis comuns (*Callithrix jacchus*) em Camaragibe, Nordeste do Brasil. Os métodos de identificação foram testados em 42 indivíduos em dois períodos entre 1998 e 2002, usando binóculos, fotografia e gravadores. O procedimento tem quatro passos de identificação: (i) composição do grupo; (ii) classes de idade; (iii) classe de sexo; (iv) marcas diagnósticas (defeitos físicos, cicatrizes, forma da "estrela" da testa, cor do pêlo, tamanho e cor dos tufos auriculares). Baseado nestas informações, tabelas individuais de identificação (incluindo uma gravura do indivíduo) foram criadas. Em alguns casos (infantes), uma pequena porção do pêlo da cauda era cortada. Foi possível identificar com sucesso todos os 42 indivíduos em entre 2 e 4 semanas. Frente aos riscos em potencial da captura e marcação, recomenda-se este procedimento como uma alternativa a métodos artificiais, livre de estresse.

Palavras-chave: identificação de indivíduos, marcas naturais, estresse, estudos comportamentais, *Callithrix jacchus*, sagüi-comum.

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INTRODUCTION

Individual recognition is especially important in long-term and field behavioral research (Lehner, 1996). Studies of primates have shown that chimpanzees can be distinguished by their morphological characteristics (Goodall, 1968), but it is difficult for the untrained eye to recognize individual differences in many other primates, particularly in the field (Fossey, 1983; Ron & Whitehead, 1993). Thus, the practice of marking individuals as means of identification has been the dominant and standard procedure (Lazaro-Perea, 2001; Dominy *et al.*, 2003). However, such techniques require considerable resources and can cause the animal significant discomfort and stress, given the need for capture and anesthesia (Glander et al. 1977; Cuthill, 1991). Recently the journal Animal Behaviour (Anon., 2003) published guidelines for animal research, in which it emphasized the importance of avoiding the capture and marking of animals for individual identification.

Common marmosets are small and very active Neotropical primates. Most field studies of this species have used some form of artificial marking, primarily collars with colored beads (e.g. Camarotti & Monteiro da Cruz, 1997; Lyra-Neves, 2007), although few mention the method specifically. In some other studies of marmosets (e.g. Ferrari *et al*., 1996), individuals have been identified successfully on the basis of natural markings, although there has been no effort to standardize a procedure for *C. jacchus* similar to that seen in some other primates (e.g., de Waal, 1982; Fossey, 1983; Ron & Whitehead, 1993).

In this study, our aim was to evaluate the viability of identifying free-ranging marmosets by their natural morphological characteristics alone, thereby avoiding the drawbacks associated with artificial marking. We present a standardized procedure for the identification of individuals in the wild, which guarantees efficient recognition without the need for potentially deleterious captures and artificial marking.

METHODS

Subjects and Study Site

This study was based on observations of five groups of common marmosets (*Callithrix jacchus*) in Camaragibe, in the northeastern Brazilian state of Pernambuco (7°56’97”S, 35°1’23”W). The study site is an urban fragment of 32 ha of primary and secondary Atlantic Forest, where the local population of *C. jacchus* is well habituated to the presence of human observers. The procedure was tested and applied in two long term

studies, the first between January and June, 1998, when nine individuals were observed (group A), and the second between October, 2001 and May, 2002, when 33 animals were monitored (groups B, C, D and E).

Procedure

Observations were conducted using 7-15 x 35 Minolta binoculars, and photographs were taken with a Canon EOS500n camera with 160-600 mm lens (1998) and a digital Olympus C-2100UZ with 380 mm zoom in 2001-2. On-the-spot observations of physical differences were recorded on a microcassette recorder.

The identification procedure has four steps:

(i) group count;

(ii) classification of group members by age class, following the classification of Ingram (1977) adapted by Schiel & Huber (2006);

(iii) classification of age-classes by gender;

(iv) identification and register of distinguishing marks and other physical characteristics.

For the last step, the following categories were considered (in decreasing order of importance for individual identification): (a) physical defects; (b) facial scars on the face; (c) shape of the white forehead "star"; (d) scars on the "star"; (e) pelage coloration; (f) length of each ear tuft; (g) color of each ear tuft. Additional information was also collected, whenever relevant, e.g. social dominance. *A posteriori*, the identification of each individual was achieved through a process of elimination, checking through each of the four steps (see Ron & Whitehead, 1993).

Identification of *C. jacchus* infants is especially problematic, not only because their small size and young age (when scars are unusual), but also because twin births are the norm. To facilitate the identification of these individuals, the tail fur was trimmed with scissors. For this, the animals were not captured, but distracted with a slice of banana while the fur was cut. The reaction of both the infants and other group members to this procedure was monitored closely, and all individuals were monitored subsequently in order to record possible changes in their behavior towards the observers.

In addition to the steps outlined above, each individual was photographed a number of times. A standardized drawing of each subject's face was produced based on these photographs and other information collected during field observations, with the emphasis on distinguishing marks. These drawings and all other relevant information were recorded on a check sheet for each individual, which was used as an identification aid in the field.

RESULTS

All 42 individuals (Table 1) were identified successfully using the procedure. Identification of the nine individuals from group A took two weeks, whereas it took only four weeks to identify the 33 members of groups B to E. The individual check-sheets (Figure 1) proved especially useful for the identification of individuals in the field (see Figure 2 for other examples of facial drawings). In general, scars were the most useful markers, especially those on the face, although they were not present in all individuals.

None of the marked infants reacted adversely to the marking procedure, and no subsequent change in the behavior of any of the subjects was observed. Similarly, none of the adults in groups B-E responded in any way to the procedure, or to the observers.

DISCUSSION

Despite the difficulties of identifying individual *C. jacchus* in the wild, the systematic procedure developed during the present study proved highly successful. The only intervention was the trimming of the tail fur of some of the infants, but as this did not involve capture, and did not appear to cause any noticeable stress or modification of behavior. The key to the success of this procedure appeared to be the accentuated degree of habituation of the subjects to the presence of human observers, which allowed the use of hand-feeding as a distraction. Researchers are unlikely to be able to approach with arm's length of individual marmosets in most free-ranging populations of *C. jacchus*, however.

Standard procedures of capture and marking not only provoke high levels of stress (Cuthill, 1991), they may even cause death (Glander *et al*., 1977; Müller & Schildger, 1994). In addition, marking sometimes modifies significantly the subsequent behavior of the animals, thus contaminating the data from subsequent observations (Cuthill, 1991; Laurenson & Caro, 1994), and there may even be ethical considerations, with regard to the animals' suffering (Martin & Bateson, 1986).

Given all these questions, the adoption of an identification procedure based on the systematic compilation of natural characteristics and markings should always be used, where viable, and the present study has shown that it can be viable, even in such a small-bodied species as *C. jacchus*. We thus recommend the implementation of similar procedures in other studies, in particular those of endangered species.

Table 1. Number of individuals identified through natural markings in each *C. jacchus* group according to age class.

	Number of individuals:			
Group	Adult	Subadult	Juvenile	Infant
A	6	0	2	1
B	5	1	0	4 (2)
C	3	1	0	3 (1)
D	4	0	0	4 (2)
E	5	0	1	2 (1)

*In parentheses, the number of infants with marked tails.

Name	Patrícia		
Identification code	F1B		
Group	B		
Gender	Female		
Age class	adult	**Months:** >20	**Birth date:** n/a
Characteristics	**Form**		**Scars**
	left side	**right side**	**left side** / **Right side**
Star			
Ear tuffs	dark border	dark border	
Head	light border on the top of the head		scar on lip
Fur color			
Tail			
Physical defects			
Observations	dominant female		

Figure 1. Sample check-sheet for the identification of an adult female.

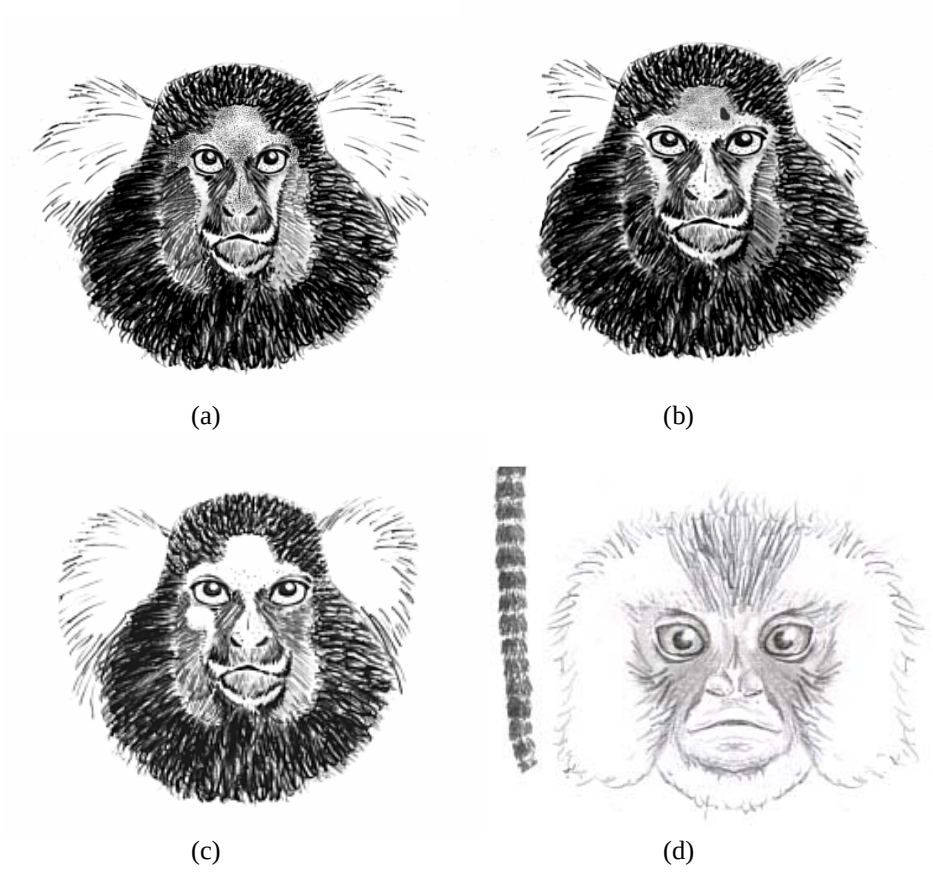

Figure 2. (a) adult male with irregular ear tufts; (b) adult female with a scar on the left forehead and short ear tufts; (c) juvenile with a round white spot on the right cheek; (d) infant showing cut tail.

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