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Preliminary Observations on Handedness in Wild Tamarins (*Saguinus* spp.) and Titi Monkeys (*Callicebus cupreus*)

Júlio César Bicca-Marques
Claudio Arani Nunes
Karin Schacht

This paper reports on preliminary observations of handedness during feeding in wild populations of black-chinned emperor tamarins (*Saguinus imperator imperator*), Weddell's saddleback tamarins (*Saguinus fuscicollis weddelli*), and red titi monkeys (*Callicebus cupreus*

cupreus) in northwestern Brazil. Data were recorded on the hand(s) used to hold and bring to the mouth pieces of bananas left at experimental feeding sites. Records were collected by "behavior sampling" (Martin and Bateson, 1993) as part of a study on the cognitive aspects of foraging decisions in these primates. A total of 529 records (emperor tamarins - 208; saddleback tamarins - 167; titi monkeys - 154) were obtained from December 1997 through January 1998. The study was carried out at the Zoobotanical Park of the Federal University of Acre (UFAC) (9°56'30" - 9°57'19"S, 67°52'08" - 67°53'00"W; area 100 ha), Rio Branco, state of Acre, Brazil.

Prior to the beginning of the study, tamarins, except infants, were captured (capture methods detailed in Encarnación *et al.*, 1990), anaesthetized, weighed, measured, sexed, aged, and fitted with collars of different colors for individual recognition. A total of two emperor tamarin social groups (IA and IB, composed of four and five individuals, respectively, along with two solitary individuals ID and IE), and two saddleback tamarin groups (FU and FC of five and six individuals, respectively) were captured. Titi monkeys, however, were not trapped, and individuals could not be identified with certainty. Data on at least two titi monkey social groups were collected and analyzed only at the species level. Data on the tamarins were analyzed by individual and grouped by sex.

Emperor and saddleback tamarins were found to use one hand significantly more often than both hands to hold food and bring it to their mouths (emperor - $\chi^2 = 24.04$, d.f. = 1, $p<0.001$; saddleback - $\chi^2 = 43.83$, d.f. = 1, $p<0.001$). In contrast, titi monkeys used one hand or both hands equally ($\chi^2 = 0.47$, d.f. = 1, n.s.) (Figure 1). Saddlebacks showed a tendency to use only one hand for feeding more frequently than did emperor tamarins ($\chi^2 = 7.70$, d.f. = 1, $p<0.01$). Although using data for the solitary ID skews the species analysis, its exclusion did not change the results. Table 1 indicates that all classes of tamarins analyzed except for group IA and solitary IE, foraged and fed significantly more often using one hand than both hands. Considering those individuals for which sample sizes were large enough to test for statistical significance, only two

Table 1. Frequency of hand use (right, left, or both) by tamarin species, group, sex, and age, and respective levels of significance.

Class	Frequency of hand use			Level of significance	
	Right	Left	Both	One vs. both hands	Right vs. left hand
Saguinus imperator					
Group IA	29	17	12	$p<0.01$	n.s.
Group IB	25	12	22	n.s.	n.s.
Solitary ID	36	16	7	$p<0.001$	$p<0.05$
Solitary IE	10	8	11	n.s.	n.s.
Females	78	40	37	$p<0.001$	$p<0.02$
Males	22	13	15	$p<0.05$	n.s.
Adults	85	46	45	$p<0.001$	$p<0.02$
Immatures	15	7	7	$p<0.05$	n.s.
Saguinus fuscicollis					
Group FU	53	46	14	$p<0.001$	n.s.
Group FC	24	21	9	$p<0.001$	n.s.
Females	33	26	12	$p<0.001$	n.s.
Males	40	40	10	$p<0.001$	n.s.
Adults	56	50	18	$p<0.001$	n.s.
Immatures	21	17	5	$p<0.001$	n.s.

n.s.= not significant

out of eight emperor tamarins showed a higher use of one hand over two hands (ID: $\chi^2 = 17.16$, d.f. = 1, $p<0.001$; IA-PNK: $\chi^2 = 5.78$, d.f. = 1, $p<0.02$). In contrast, five out of six saddleback tamarins tended to hold the food with just one hand (FU-AZL: $\chi^2 = 10.56$, d.f. = 1, $p<0.01$; FU-BRA: $\chi^2 = 8.59$, d.f. = 1, $p<0.01$; FU-AMA: $\chi^2 = 7.22$, d.f. = 1, $p<0.01$; FU-ROS: $\chi^2 = 4.98$, d.f. = 1, $p<0.05$; FC-AEP: $\chi^2 = 4.92$, d.f. = 1, $p<0.05$).

These results may reflect differences in patterns of positional behavior among the three species. Titi monkeys generally ate bananas in a sitting posture, whereas saddleback tamarins fed more frequently while clinging to vertical trunks, a posture requiring at least one hand for support. Emperor tamarins appear to be intermediate between the other two species. A second variable that influenced the use of one or two hands when feeding in a sitting position was the size of the food item eaten. The monkeys often used both hands when holding relatively large pieces of banana.

Regarding the use of right or left hands, saddleback tamarins and titi monkeys did not exhibit a preference, and used each hand equally (saddlebacks: $\chi^2 = 0.35$, d.f. = 1, n.s.; titis: $\chi^2 = 0.18$, d.f. = 1, n.s.). In contrast, emperor tamarins showed strong right hand preference ($\chi^2 = 7.48$,

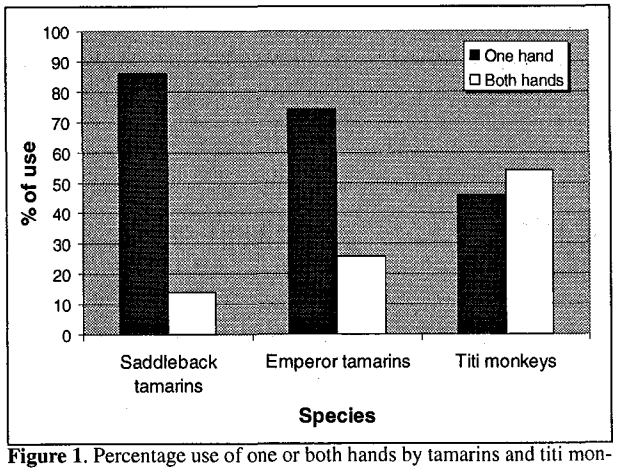

Figure 1. Percentage use of one or both hands by tamarins and titi monkeys.

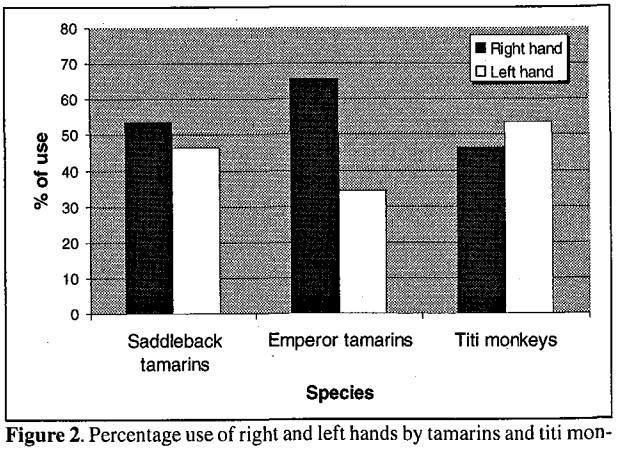

Figure 2. Percentage use of right and left hands by tamarins and titi monkeys.

d.f. = 1, $p<0.01$) (Fig. 2). Among saddleback tamarins there was no evidence of a hand preference by group, age or sex. In emperor tamarins, solitary ID, females, and adults showed a right-handed preference (Table 1). This significance by age and sex, however, disappears when the adult female ID is excluded from the analyses. Individual analyses showed that the right and left hands were used to the same extent by all saddleback tamarins tested (n = 5) and by three out of four emperor tamarins. These results, however, contrast with data from the individuals which indicate a higher frequency of use of one particular hand. While only one saddleback tamarin showed equal use of both hands, 17 tamarins (10 emperor and seven saddlebacks) showed a higher frequency of right-hand records and only three (one emperor and two saddlebacks) showed a higher frequency of left-hand records. This difference in right-left-hand use is statistically significant ($\chi^2 = 4.90$, d.f. = 1, $p<0.05$). A similar pattern of a right-handed preference was described by Singer (1996).

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News

A New Species of Marmoset in the Brazilian Amazon

A new species of marmoset has been described, the black-crowned dwarf marmoset *Callithrix humilis*, by Marc G. M. van Roosmalen, botanist and primatologist at the Botany Department of the National Institute for Amazon Research (INPA), Manaus, his son Tomas van Roosmalen, at Colgate University, New York, Russell A. Mittermeier, President of Conservation International, Washington D. C., and Chairman of the IUCN/SSC Primate Specialist Group, and Gustavo A. B. Fonseca, Professor of Mammalogy at the Federal University of Minas Gerais, and Director of Conservation International do Brasil, Belo Horizonte. This small marmoset (at 120-200 g adult weight it is larger than the pygmy marmoset but smaller than other *Callithrix* marmosets), was first encountered by Marc and Tomas van Roosmalen on 16 April 1996 in the town of Novo Aripuanã, where they saw a two-week-old infant, said to have been taken from the village of Nova Olinda on the west bank of the lower Rio Aripuanã, a tributary of the Rio Madeira. The marmoset was first seen in the wild in November 1996, during a survey of the lower Rio Aripuanã, near to Nova Olinda, where a group was feeding on the trunk exsudate of a morototó tree, *Didymoponax morototoni*. Marc and Tomas van Roosmalen were subsequently joined on this trip by Russell Mittermeier and Gustavo Fonseca, along with the journalist David Quammen who wrote up the story of the expedition in *Sports Illustrated* magazine (Quammen, 1997).

The type locality for *C. humilis*, is the "West bank of the lower Rio Aripuanã, one kiolometer south of the settlement of Nova Olinda, 41 km south-west of the town of Novo Aripuanã, Amazonas state, Brazil. This region is located in south-central Amazonia, Brazil, south of the Rio Amazonas and east of the Rio Madeira. Coordinates for the type locality are 05°30'63"S, 60°24'61"W. Altitude 45 meters.".

C. humilis was found to occur in dense primary *terra firme* forest as well as secondary forest surrounding plantations and fields. Local people confirmed that it it did not occur in inundated forests such as *várzea* and *igapó*; the habitat typical of *Cebuella pygmaea*. In this, and in a number of other behavioural and physical aspects, it is closer to the *Callithrix* marmosets than the pygmy marmosets. Amongst other pelage features, it is distinguished from *Cebuella* by the lack of a lion-like mane, exposed ears, and a well-defined mantle, by its darker, olive brown (not tawny agouti), even (as opposed to spotted) general coloration of the upper and outer parts of the body and by the orange yellow to golden chest, belly and inner sides of limbs. Van Roosmalen *et al.* (1998) provide detailed descriptions of the pelage, including changes with age, and compare it to *Cebuella* and other Amazonian *Callithrix*; all beautifully illustrated by the artist Stephen D. Nash, State University of New York, Stony Brook.

The known range of the species is from the west bank of the lower Rio Aripuanã, from the mouth, south to the Paraná Capimtuba. Interviews with local people also indicated its presence along the east bank of the Rio Madeira, from the mouth of the Rio Aripuanã, just south of the town of Novo Aripuanã, south to the mouth of the Rio Mataurá. The southern limit for the species is probably