Quantitative Observations on Feeding Behavior in *Saguinus geoffroyi* (Callithricidae, Primates)

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ABSTRACT. Feeding behavior of a six-animal group of marmosets, *Saguinus geoffroyi*, was observed under field conditions in the Panama Canal Zone. The order of feeding was recorded as the marked animals fed from a limited access food source. A combined distribution of observed visitations to the food source was shown to be significantly non-random ($p < .005$). The juveniles of the group were seen to feed at the source before adults on the average.

INTRODUCTION

Saguinus geoffroyi (Pucheran) is a small, squirrel-sized, callithricid primate occurring in Panama and extending into northern Colombia and southern Costa Rica (HALL & KELSON, 1959). At present, the taxonomy of the genus is uncertain (HERSHKOVITZ, 1966; HILL, 1957). The habitat of *S. geoffroyi* is mainly second growth tropical forest (MOYNIHAN, 1970); the more mature forested areas of Panama are only sparsely inhabited (G. A. DAWSON, per. comm.).

Studies on social and sexual behavior of captive callithricids (including *S. geoffroyi*) were reported by EPPLE (1967, 1970, 1972). She observed a distinct dominance hierarchy with associated behavior patterns in all the species studied.

To date, the only field study of behavior was conducted by MOYNIHAN (1970), in which he observed groups of *S. geoffroyi* in the Panama Canal Zone. He acquired little quantitative data except sonagrams of vocalizations and their behavioral contexts. The present paper presents an analysis of feeding behavior observed in free-ranging animals. The analysis examined a hypothesis of a non-random sequence in the order of feeding at a limited access food source.

MATERIALS AND METHODS

Observations were conducted from April to July 1973 in the Rodman Naval Ammunition Depot in the Panama Canal Zone. Actual quantitative data were recorded in the period 13 June to 11 July. The area consists of second growth dry tropical forest, with heavy underbrush, which renders vision into the canopy difficult or impossible. It is undisturbed, except for a few poachers who rarely bother the marmoset population. A complete description including rainfall and habitat data can be found in FLEMING (1971).

The study site consisted of a blind constructed at ground level about 30–40 feet away from a tree which supported a feeding station situated at a height of 25 feet. A National live trap (with stiff wire mesh sides, $6'' \times 6'' \times 20''$) placed on a wooden

platform, with the trap door removed, served as the feeding station. Provisioning of the animals was done by placing 4–8 ripe mangoes or bananas in this trap at the beginning of each observation period. Color-coded leather collars were placed around the necks of the animals for identification. With the aid of binoculars, the animals and collars could be seen clearly through a small opening in front of the blind.

The group studied was formed of six free-ranging animals, three males and three females (Table 1). Originally, another male and female had been observed, but these animals disappeared shortly after the study began. During the study, only four of the six animals were marked; the remaining two went untrapped until some weeks after termination of the study. Animal C was also tagged with a falcon bell to warn the observer of the group's approach.

This group fed at the station several times daily in separate periods; these are defined as "feeding sequences." The number of "visitations" to the station (defined as one animal entering and then leaving the station) in the order in which each animal entered and left were recorded for each feeding sequence. The two unmarked animals were simply recorded as a single animal ("UN"). The total number of visitations observed during each feeding sequence were divided into four segments. A sequence of n visitations in length would be divided into four equal segments of n/4 visitations per segment, regardless of the length of time covered by each segment. The number of visitations per segment for each animal observed was summed within corresponding segments over all sequences recorded. If feeding behavior is random, all animals should feed an equal number of times in each of the four segments. If there is some grouping or non-random effect, then certain animals should feed a disproportionate amount in one or more of the four segments of the combined sequence. This hypothesis was examined with a 5×4 (number $\times$ segment) chi-square test. Histograms were also constructed for each animal (excluding both unmarked animals UN) from these combined data to better illustrate this behavior.

RESULTS

In 16 days of observation, 29 separate feeding sequences were recorded. The number of visitations per sequence ranged from 1 to 19. Six of these sequences, having less than four visitations each, were excluded from the analysis. The number of visitations per segment for each animal, summed over all recorded sequences, is given in Figure 1. Results of the chi-square test for these data indicate a significant deviation from a random feeding sequence ($\chi^2 = 31.1$, 12 d.f., $p < .005$). Inspection of the

Table 1. Specifications of animals in the study group. The unmarked animals (UN) were trapped after termination of the sudy.

Animal	Weight (gm)	Age-sex
A	375	Juvenile ♂
B	346	Juvenile ♀
C	482	Adult ♂
D	505	Adult ♀
UN	256	Juvenile ♂
UN	545	Adult ♀

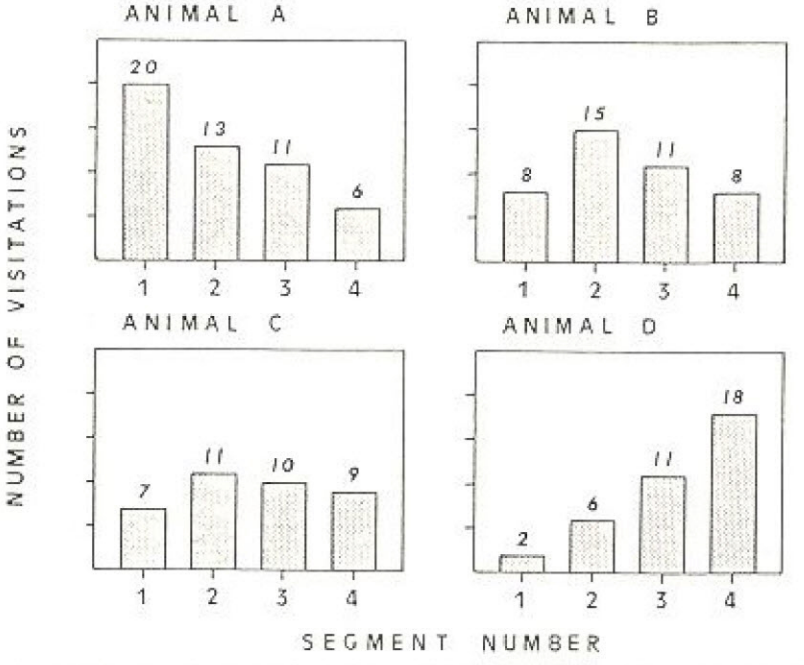

Fig. 1. Visitation histograms for the marked animals of the group. Number of visitations per segment are given above the appropriate bar for each animal. Number of visitations per segment for the two unmarked animals (combined) are, for the four segments respectively: 19, 9, 14, and 14.

histograms (Fig. 1) reveals an age dependent trend: (1) the two juveniles tended to feed most often in the first two segments, and (2) the adult male fed more or less equally throughout all four segments, whereas the adult female tended to feed last.

DISCUSSION

The feeding data analysed here show a non-random, somewhat age-dependent trend within the group studied. Further studies would be necessary to determine whether this trend is species-wide, or peculiar to this group.

Presumably, these observations represent a function of a hypothetical marmoset social structure which would allow intragroup toleration of juveniles by adults in certain social interactions. This explanation is supported by the work of EPPLE (1967) on captive groups of seven callithricid species. She found that juveniles were tolerated by adults in those social interactions that would normally include a dominance display (i.e., adult-adult intrasex interactions). This toleration behavior provides a basis for the early feeding of juveniles as reported here, but is not sufficient to explain it entirely. There must be some unknown factor in the juveniles' behavior which motivates them to feed before the adults. The framework of toleration would merely allow this motivating factor to express itself.

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