Time Budgets of *Macaca mulatta*

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ABSTRACT. We measured the amount of time that 20 rhesus monkeys, *Macaca mulatta*, (four adult males, 10 adult females, four juvenile males, and two juvenile females) contained in two enclosed social groups devoted to 16 activities. For 14 of these 16 behaviors we found significant differences between age-sex classes. For 14 behaviors, there were also differences between individual monkeys. Twelve of the 16 activities showed significant diurnal variations. We discuss the relation between the use of time and social position, the adaptive significance of diurnal variation, and compare our data with that available for free ranging rhesus.

INTRODUCTION

The way in which a group of animals uses time reflects its survival strategy. How an individual uses time reflects its role in the group, and its relative contributions to group survival. The correlation between the time budget and survival strategy is grounded on the supposition that time measures accurately reflect the relative energetic costs of different behaviors. ORIANS (1961) proposed that measuring the time budgets of blackbirds is a way of ascertaining the relative success of different social systems. Several studies have demonstrated that the time allocation of a species reflects differences in habitat and social organization (GREENLAW, 1969; WOLF & HAINSWORTH, 1971; POST, 1974). FISLER (1967) described the time budgets of free-ranging adult male *Macaca mulatta* and BERNSTEIN (1971), BERNSTEIN and DRAPER (1964), BERNSTEIN and MASON (1963) have completed activity profiles for several primate species. Activity profiles yield information similar to time budgets, but unlike time budgets, do not enable observers to calculate activity totals over the whole diurnal period.

In this study we examine the time budgets of two enclosed social groups of *M. mulatta* during the non-breeding season. We conducted the study on Isla Cueva, Lajas, Puerto Rico. VANDENBERGH (1967) described the general environment and climate of La Cueva. Our objectives are to (1) describe the time budget, (2) relate the time budget to the age-sex class and position of individual animals, (3) examine diurnal variation in activity, and (4) compare our data with that for free ranging rhesus monkeys.

METHODS

We collected data from 4 January through 8 August, during the 1973 non-breeding season. We watched 10 monkeys in each of two groups of 18 monkeys. The groups were formed in September 1971. In each group we watched two adult males, five adult females, two juvenile males, and one juvenile female.
Housing

Both age-sex matched groups lived in identical 30.5 x 30.5 outdoor enclosures, separated by a 1.9 m corridor. The groups could not see each other. For ventilation, one side of each corral was opened to the outside with a wire mesh. The floors of the enclosures were natural substrate. Each enclosure had three shade structures, measuring 6.2 x 1.7 x 1.1 m, and two artificial pyramidal trees, 1.8 m high. Food was continuously available from hoppers located in the center of one of the walls of each of the enclosures. The water dispensers were 20 m and 33 m from the food sources. Drickamer (1973) studied the same social groups.

Method

We watched the monkeys from an elevated (7.4 m) platform between the compounds. We divided the diurnal period into six equal intervals, thus controlling for seasonal variations in day length. The 10-min observation sessions were spread equally through the day. The subjects studied during each interval were chosen at random, without replacement. We watched each monkey only once during each diurnal interval on the same day (see Table 3 for time of day corresponding to the diurnal intervals). We made five sessions per monkey for each diurnal interval, giving a total of 30 ten-minute sessions per animal (1800 observations per animal).

Following the method of Wiens et al. (1970), we noted the animal's behavior at 10 sec intervals on signal from a tape recorder. Each 10-min session consisted of 60 observations. In addition, we recorded all major social interactions the animal engaged in. The behavior categories are described below.

We did not take observations when it was raining, when winds were over 30 m.p.h, or when group behavior was affected by an outside interference such as proximity of humans or free ranging monkeys.

Results and Discussion

We treat each activity below in the order of time involvement of the group, where each age-sex class is given equal weight in determining the percent of time the entire group spent in an activity (Table 1).

Lookout

A monkey actively observed its surroundings, as indicated by either head or eye movements. The groups spent more time in lookout than in any other activity, although we found considerable variation between age-sex classes. For example, adult males spent 26.6% of their time on lookout, in contrast to juvenile females, who engaged in lookout only 11.6% of the time (Table 1). Adult males spent a significantly greater amount of time on lookout than did any other age-sex class, while adult females and juvenile males spent the same amount of time, and juvenile females spent significantly less time on lookout than did the other classes.

It is interesting to examine the proportion of time that individuals engaged in lookout (Table 2). D8, the lowest ranking male in enclosure 3, spent a significantly greater proportion of time on lookout than did any other monkey in the study. Y0,