

defecation, urination and vocalizations. We conducted scans until 3 minutes elapsed with no aggression in any individuals, or until the troop dispersed. Once we had spotted the troop, we only advanced towards the animals if we could not adequately assess group size from our initial location. We noted how many mother/ infant pairs were in the group. It is probable that some troops were observed more than once, however, not likely on the same day.

RESULTS (AEL)

We found no significant difference between the mean number of aggressive displays by six foraging/resting groups compared to seven traveling troops (mean \pm SE = 0.11 ± 0.08 vs. 0.16 ± 0.07 ; $t = 0.48$, $df = 11$, $p > 0.25$). However, five of six foraging/resting groups displayed some aggression while only two of seven traveling groups displayed aggression ($p = 0.07$, Fisher exact test). There was no difference between the mean number of aggressive displays of troops with and without mother/ infant pairs (mean \pm SE = 0.15 ± 0.08 vs. 0.12 ± 0.08 ; $t = 0.33$, $df = 11$, $p > 0.05$). Similar types of aggressive displays were seen regardless of troop activity or presence of a mother/ infant pair (i.e. scratching, branch-shaking, vocalization, urination/defecation).

DISCUSSION (JLB)

A. geoffreyi displayed greater aggressive behavior in defense of established sites (foraging/resting) than when travelling through an

area. Regardless of troop activity, aggressive encounters were comprised of the same types of display.

Chapman (1990) has shown that spider monkey mothers with infants often travel in smaller subgroups, away from the perimeter of the territory, to minimize conspecific confrontations. We did not find a significant relationship between aggressive displays and mother/ infant groups, suggesting that it may be better at times to not attract attention to the mother/ infant pair.

Because grouping behavior of spider monkeys enhances mate selection (Chapman 1990) it could be that the ratio of males to females is related to aggressive displays. We were unable to determine whether aggressive displays were initiated more often by males or females. Other factors that may affect the amount of aggressive display are the distance of the group from the intruders and the abundance of resources remaining in the area. Any comprehensive study of primates needs an extended time period to locate and observe the sub-groups. Our data were not sufficient to provide satisfying tests of our hypothesis.

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GENDER-BASED DIFFERENCES IN PREY SELECTION IN *DENDROBATES PIMILIO* (ANURA: DENDROBATIDAE)

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ABSTRACT (EHA)

Dendrobates pumilio frogs prey mainly on ants and termites. We hypothesized that females are more selective in their diet than males based on higher energy requirements, more time available to forage, and a greater density of potential prey. We studied the food preferences of individual frogs in closed arenas. We assumed termites were more digestible, and thus a better food source than ants. Males and females differed in their food preferences; females consumed ≈ 2.57 termites per ant, while males consumed ≈ 2.28 ants per termite. Preferences may be due to minimizing competition with mates, differences in energy demands between the sexes, or the difference in digestibility between ants and termites.

Key Words: *Dendrobates pumilio*, diet selectivity, poison dart frogs, termites, ants

INTRODUCTION (EHA)

Most species of poison dart frog (*Dendrobates*) feed primarily on ants and termites (Crump, 1983). Ants are difficult to digest for many insectivores because of their thick exoskeletons and high formic acid content. Termites, being soft bodied, are presumably more digestible and provide more assimilable energy per mg consumed (Donnelly, 1991). Male *D. pumilio* individuals spend several hours per day maintaining and defending territories, giving them less time to forage than females (Donnelly, 1991). Females allocate large amounts of energy to reproduction and rearing offspring; these energetic demands may require them to feed more frequently than males. Furthermore, females have larger home ranges than males in which they may encounter more prey types (Donnelly, 1989).

We hypothesized that females should exhibit higher selectivity of prey items than males, due to differential energy demands, time available to forage, and prey availability.

We predicted that females would preferentially choose termites over ants, while males will consume them in proportion to their availability.

METHODS (DML)

This study was performed February 13-14, 1994 at La Selva Biological Station in Heredia Province, Costa Rica.

We caught 14 female and 17 male *D. pumilio*. We attempted to control for individual differences in hunger level by holding all frogs overnight without food.

We ran prey preference trials beginning at 07:50 the next day. Six cylindrical foraging arenas (15cm deep by 20cm in diameter) were stocked with prey prior to each trial. The arenas were lined with mud and covered with either wire mesh or mosquito netting to prevent prey escape. A single frog was placed in each arena with five termites and five *Atta cephalotes* ants, averaging 2.20mg and 1.90 mg in mass respectively. We recorded the

number of termites and the number of ants missing from the arena at the end of one hour and assumed that the missing insects had been eaten by the frog. Each of the thirty-one frogs was tested once for prey preference before being released.

To analyze our data, we calculated a prey preference index for each frog by subtracting the number of ants eaten from the number of termites eaten and then dividing by the total number of prey consumed. We compared male versus female prey preference indices using a t-test. We used a second t-test to compare the total number of prey eaten by males and females. A Chi-square test was used to compare the numbers of males versus females consuming only one or the other prey types.

RESULTS (JJR)

Female frogs consumed a higher number of prey items per hour than males (2.86 ± 0.38 vs. 2.12 ± 0.28) but this difference was not significant ($t = 1.56$, $df = 29$, $p < 0.20$).

Females consumed more termites than ants (index = $[\# \text{termites} - \# \text{ants}] / \text{total } \# \text{prey}$; mean \pm SE = 0.44 ± 0.20) while males consumed more ants than termites ($x = -0.39 \pm 0.19$). This difference between sexes was highly significant ($t = 2.97$, $df = 29$, $p < 0.01$).

Many frogs consumed only one type of prey. Eight of the fourteen females ate only termites, while only two of seventeen males did so ($X^2 = 4.94$, $df = 1$, $p < 0.05$). Ten of the seventeen males ate only ants while only

two of fourteen females did so ($X^2 = 3.89$, $df = 1$, $p < 0.05$).

DISCUSSION (AEL)

Our results support the hypothesis that prey selectivity differs between male and female *D. pumilio*. As predicted, females preferentially consumed the more digestible termites. However, males unexpectedly selected more ants than termites. In fact, their selectivity for ants was as strong as the females' selectivity for termites. Because frog territories contain significantly more ants than do unoccupied areas (Donnelly, 1991), males might naturally have high proportion of ants in their diets. In the artificial situation we created with both ants and termites, the males may have been more likely to consume ants because they already had a search image for the movement and appearance of ants.

An alternative explanation for male selection of ants is that eating the more abundant but lower quality prey type would reduce competition for food with their female mates. This hypothesis could be tested by comparing the foraging areas of male and female mates. It would be falsified if mates seldom forage in the same areas. Donnelly (1989) found that tadpole-rearing sites (bromeliads) limit the density of male *D. pumilio*. If males' territories are limited by factors other than food resources, the frogs may be forced to forage in areas of low prey availability. Females may choose males with high quality territories but do not defend areas of their arm. This

could allow females more opportunities for selective foraging. The length of time females spend in males' territories and the abundance of prey items in these territories could be important factors in the amount of competition for prey.

Our findings support the prediction that female *D. pumilio* preferentially select easily digestible prey. However, since all frogs were observed in one day during the dry season, we are not certain that this effect is constant throughout the year. Stress induced by our handling of the frogs might have affected our results. Further explanation of this topic

should be done over a longer period of time with more prey types and a larger sample size of frogs.

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