THE ROLE OF MALE VOCALIZATIONS IN *DENDROBATES PUMILIO*

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Abstract. Male poison dart frogs, *Dendrobates pumilio*, call from perches to defend territories and attract females, and cease to do so when disturbed. We hypothesized that there would be a cost to not calling, and that the time it took males to restart calling after disturbance would change with distance to the nearest calling male (DNC) and the presence of females. When females were present, males started calling faster than when they were absent. When females were absent, time to restart calling increased with increasing DNC, but when females were present, DNC had no effect on calling behavior. Apparently, male poison dart frogs call to defend territories in the absence of females, attracting females becomes their priority when potential mates are present.

Key words: mate attraction, poison dart frogs, territories

INTRODUCTION

Calls from strawberry poison dart frogs, *Dendrobates pumilio*, are a common sound heard in forests of La Selva. These vocalizations may serve two functions for males: (1) to maintain spacing between territories (Bunnell 1973, Donnelly 1987 in Donnelly 1994) and (2) to attract females (Limerick 1980 in Donnelly 1994). Vocalization behavior may be partially related to male-male interactions aimed at ultimately attracting females. Ginsberg et. al (1995) found that males on high perches weighed more, had larger territories, and had more females than those calling from lower areas, suggesting that males on high perches may have greater reproductive success.

We tested the effects of a disturbance--simulating a potential predator-- on territorial males to determine if the presence of females and/or nearby calling males influences calling behavior. We hypothesized that following a disturbance, males with females in their immediate vicinity would resume calling sooner because they may incur a reproductive cost by remaining silent and risking the departure of a potential mate. We also hypothesized that following a disturbance, males will call sooner when other males are calling nearby; by remaining silent, males risk encroachment on their territories or could lose potential mates to nearby calling males.

METHODS

06:00 – 10:00 on 15 - 17 February 1998, we surveyed *Dendrobates pumilio* in 3 experimental plantations in Estacion Biologica La Selva, Costa Rica. All plots were 30 x 4 0 m, and consisted of a 3 m canopy of palms and banana trees. Trees were evenly spaced and there was thick leaf litter spread evenly in all plots. We located males by their vocalizations, and disturbed them by moving a stick ~ 2 m in length to within 1 m of the frog to simulate a snake. We remained ~ 3 m away from the frog and determined with binoculars how long it took for the male to resume calling, so as not to disturb the frogs with our presence. We measured the distance to the nearest calling neighbor (DNC) during that trial and recorded presence of females within ~ 2 m of the focal male. We were able to distinguish males from females by a characteristic blue coloration on male throats that is lacking in females (Crump 1983).

We tested the effects of female presence, DNC and female x presence on time to restart calling with a two-way ANCOVA (female presence = categorical variable and DNC = continuous variable).

RESULTS

Neither female presence nor DNC had a significant main effect on time to restart calling following a disturbance ($F_{3,53}$ = 0.47 P = 0.50, $F_{3,53}$ = 1.24, P = 0.27, female presence and DNC respectively), but there was a significant female presence x DNC interaction ($F_{3,\ 53}$ = 7.42, P = 0.009; Fig. 1). When females were absent (closed circles, Fig. 1), the time to restart calling increased significantly with increasing distance to nearest calling male (15 vs. 67 s with 50 vs. 1000 cm DNC), but when females were present (open circles, Fig. 1), the distance to the nearest calling male had little effect on time to restart calling (21 vs. 8 s with 50 vs. 1000 cm DNC).

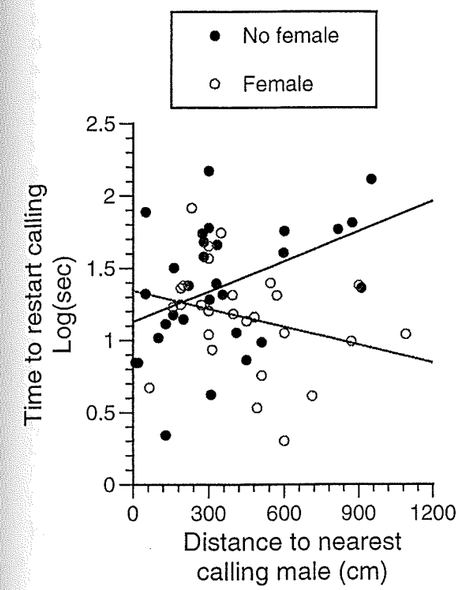

FIG. 1. The effect of distanceto nearest calling male on time to restart calling after a disturbance with and without females present.

DISCUSSION

Calling by males following a disturbance appears to be related to both the presence of females and the distance to the nearest calling male. Bunnell (1973) found that male vocalizations did not change in the presence of females. In contrast, we found that the time it takes for males to restart calling was less in the presence of females if no calling males were within ≅ 300 cm (Fig. 1). Time to restart calling increased with increasing distance to the nearest calling male, but only when females were absent (Fig. 1). When females were present, DNC had no appreciable effect on recalling times. The pattern of this interaction between female presence and DNC suggests that territory defense is more important in the absence of females, but when females are present, mate attraction becomes the primary reason for calling. Future studies should attempt to separate the effect of DNC and presence of females by manipulating these factors in an experimental setting.

LITERATURE CITED

Bunnell, P. 1973. Vocalizations in the territorial behavior of the frog *Dendrobates pumilio*. Copeia 2: 277-284.

Crump, M. L. 1983. *Dendrobates granuliferus* and *Dendrobates pumilio*. Pp. 396-398*in* D. H. Janzen, editor. Costa Rican Natural History. The University of Chicago Press: Chicago, IL, U.S.A.

Donnelly, M. A. 1994. Amphibian diversity and natural history. Pp. 199-209 *in* L. A. McDade, K. S. Bawa, H. A. Hespenheide, and G. S. Hartshorn, editors. La Selva: Ecology and Natural History of a Neotropical Rain Forest. The University of Chicago Press: Chicago, IL, U.S.A.

Ginsberg, M. A. 1995. "The effects of perch height on territory size and female attraction by *Dendrobates pumilio* males." Pp. 113-115 *in* Dartmouth Stdies in Tropical Ecology. Dartmouth College, Hanover, NH. USA.