

Short Notes

Predators of the nest building gladiator frog, *Hyla faber*, in southeastern Brazil

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Amphibians are claimed to be important components in the diet of many predators (Duellman and Trueb, 1986), although only few attempts have been made to document the diversity of predators of a particular frog species and the effects of predation on its populations (e.g. Schaub and Larsen, 1978). Most data on Neotropical anuran predators are sparse or anecdotal, but a few detailed natural history studies provided important information on this topic (e.g., Kluge, 1981; Ryan, 1985).

The hylid frog *Hyla faber*, a member of the *boans* group (nest building gladiator frogs, cf. Kluge, 1979), occurs from northern Argentina to eastern Brazil and breeds in permanent ponds adjacent to streams in the Atlantic Forest (Martins and Haddad, 1988). Kluge (1981) observed adults and larvae of *Hyla rosenbergi* (another species of the *boans* group) being preyed upon by diverse predators, such as aquatic insects, tadpoles of the same and other species, frogs, snakes, and mammals. Although the natural history of *H. faber* is relatively well known (see Martins and Haddad, 1988, and references therein), no data are available on its predators. Here we present and comment on several instances of predation on *H. faber* in southeastern Brazil.

Field observations were carried out in the State of São Paulo, southeastern Brazil, mainly at a man-made pond in an open area at Fazenda Santa Mônica, Campinas, where the natural history of *H. faber* was intensely studied from November 1988 through

March 1989 (Martins, 1990). A detailed description of this study area is to be found in Martins (1993). Most nocturnal observations were made with a head lamp. Opportunistic observations were made at several other breeding sites in São Paulo.

Both invertebrate and vertebrate predators feed on larval and juvenile stages of *H. faber*. Aquatic insects were found inside nests with embryos or tadpoles, sometimes feeding on them. After leaving their nests, the frog larvae were preyed upon by aquatic insects (mostly odonate naiads and adult heteropterans, such as the giant water bug), observed at high densities in the pond shallows where tadpoles concentrated. Tadpoles were also preyed upon by juvenile and adult snakes, the colubrid *Liophis miliaris* (total lengths 50-100 cm). Metamorphosing froglets (stage 43-44 of Gosner, 1960) were preyed upon by adult frogs (the leptodactylid *Leptodactylus* cf. *ocellatus*; see fig. 23 in Haddad and Sazima, 1992) and snakes (*L. miliaris*, about 90 cm in total length). Juvenile frogs (4-5 cm SVL) were found in the gut contents of the colubrid *Xenodon newwiedii* (adult, about 80 cm in total length) and the viperid *Bothrops jararaca* (juvenile, about 40 cm in total length).

Four species of vertebrates were recorded preying or attempting to prey on adults of *H. faber*. Water snakes *L. miliaris* (total length 70-100 cm) were observed on seven nights foraging at the pond in Campinas and preyed or attempted to prey on *H. faber* in four occasions (see fig. 7 in Sazima and Haddad, 1992). A foraging snake was observed in the area where frogs called, inspecting each water filled depression (including nests) by poking its head searching the bottom: after a few minutes, this snake found and preyed on a calling male inside its nest.

The colubrid water snake *Helicops modestus* (total length 35-70 cm) was observed foraging in the pond on seven nights; one snake (about 70 cm in total length) was found grasping a male *H. faber*. At another site one adult *Chironius bicarinatus* (about 190 cm in total length), a semiarboreal colubrid snake, was caught while swallowing a subadult *H. faber* during the day.

A barn owl, *Tyto alba*, tried to prey on a male *H. faber* while the frog was calling. The owl flew over the pond twice, hovering some 2 m over the frog during the second pass. Then it landed on the pond margin some 5 m from the frog; after a few seconds, it flew towards the frog and tried to catch it with its claws without success.

The omnivorous crab-eating fox, *Cerdocyon thous*, was observed foraging around the pond on four nights. In one occasion a *C. thous* was observed facing a male *H. faber* that was calling about 1.5 m above the ground; apparently frightened by the light of the lamp, the fox withdrew.

Our few observations on predation upon larval stages and juvenile frogs preclude any quantitative analysis on the effects of this predation on survivorship.

Predation by snakes is likely to be an important factor of mortality of adult *H. faber*. Considering that at the pond in Campinas this frog was reproducing for 115 nights during the 1988/1989 rainy season (Martins, 1990), and that observers were present at only 44 of them, the actual predation rate by snakes may be at least 2.5 times greater than that here reported. At least 15 adult males may have been preyed upon during one

reproductive season. This number represents 60% of all males marked during the study by Martins (1990). Olson (1989) and Hinshaw and Sullivan (1989) estimated that 20% and 8% of individuals in breeding aggregations of *Bufo boreas* and *Hyla versicolor*, respectively, may be killed by predators during a single reproductive season.

We suspect that, in the past, *H. faber* populations were associated mainly to forested habitats, such as the Atlantic Forest. However, intense deforestation in southeastern Brazil in this and past centuries (see Prance and Campbell, 1988) may have forced some populations to breed in open areas. The "open habitat" populations probably face different predator assemblages and may suffer a higher rate of predation than those frogs breeding in forested situations, where they presumably may take advantage of the higher spatial heterogeneity.

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