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Records on breeding behaviour of a rare neotropical microhylid frog, *Dasypops schirchi* (Gastrophryninae)

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Miranda-Ribeiro (1924) erected the genus *Dasypops* to accommodate a new species, *D. schirchi.* At present time, this genus is still monotypic. *Dasypops schirchi* is only known from the coastal plains of states of Bahia and Espírito Santo, east of Brazil (Frost, 2016), being a rare species in herpetological collections. Recently, De Sá et al. (2012) and Peloso et al. (2016) found *D. schirchi* as a sister species of *Myersiella microps* (Duméril and Bibron, 1841).

There is little behavioural or natural history information published on neotropical microhylids, including *Dasypops schirchi.* Usually only tadpoles and calls have been described (e.g. Wogel et al. 2000; Lehr et al., 2007; MacCulloch et al., 2010; Santana et al., 2009; Wogel et al., 2004; Hartmann et al., 2002) and few studies have addressed the breeding behaviour (e.g. Izecksohn et al., 1971; Kruger and Richter, 1995; Haddad and Hödl, 1997). The tadpole, mating call, and some observations on natural history of *D. schirchi* were described by Nelson (1973), Cruz and Peixoto (1978), Almeida and Gasparini (2004), and Haddad et al. (2013). Herein, we describe some observations on breeding behaviour of *D. schirchi*, including sexual dimorphism, temporal reproductive pattern, and its amplexus features.

We collected the data during a survey in the Reserva Natural Vale (19^0 08$'$ 09$''$ S, 40^0 04$'$ 45$''$ W, 55 m a.s.l.) located inside the Atlantic Rain Forest domain, municipality of Sooretama , state of Espírito Santo, southeastern Brazil on 25 November 1997. We found, after heavy rains, a pool where a large aggregation of anuran species were observed calling. Besides *Dasypops schirchi*, we observed three others microhylid species calling in the same place: *Arcovomer passarellii* Carvalho, 1954; *Chiasmocleis capixaba* Cruz, Caramaschi, and Izecksohn, 1997; *Stereocyclops incrassatus* Cope, 1870 "1869". Many non-microhylid species were recorded in the pool: *Dendropsophus anceps* (A. Lutz, 1929); *D. berthalutzae* (Bokermann, 1962); *D. bipunctaus* (Spix, 1824); *D. branneri* (Cochran, 1948); *D. elegans* (Wied-Neuwied, 1824); *D. seniculus* (Cope, 1868); *D.* cf. decipiens; *Hypsiboas albomarginatus* (Spix, 1824); *Scinax cuspidatus* (A. Lutz, 1925); *Scinax eurydice* (Bokermann, 1968); *Phyllomedusa burmeisteri* Boulenger, 1882; *Physalaemus aguirrei* Bokermann, 1966; and *Trachycephalus mesophaeus* (Hensel, 1867).

The adult specimens were collected manually, euthanized by submersion in a 25% ethanol and water solution, fixed in formalin 10% and preserved in ethanol 70% (see Simmons 2015), and were deposited in the Amphibians Collection of Museu Nacional, Rio de Janeiro, Brazil (MNRJ 22682-716). Measurements

Figure 1. Ventral view of a *Dasypops schirchi* female with its small ovules exposed (MNRJ 22701; SVL 56.8 mm).

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Figure 2. Surface of the pool water where *Dasypops schirchi* was found in municipality of Sooretema, State of Espírito Santo, southeasten Brazil. Note that almost the entire surface of the water is taken by eggs of *Dasypops schirchi* and probably *Stereocyclops incrassatus*.

(SVL = snout-vent length) are in millimetres and were taken with a calliper with 0.05 mm precision. The sex was determined by vocal sac present in males and absent in females. To evaluate sexual dimorphism in size we used Student's t-test (*t*) (Zar, 1996). An ovulated female (MNRJ 22701; SVL 56.8 mm; Fig. 1) was opened and its ovules removed for counting. For this, one part of the ovules (about half) was manually counted and the total volume measured. A second part had its total volume measured and, from that, their estimated number. The total number of ovules was calculated as the sum of the count of the first part with the second estimate part.

We observed morphological differences between males and females. Males (39.2-51.8 mm SVL; $\bar{x}$ = 45.0; SD = 3.25; n= 17) are smaller (t=7.580; DF= 27; p<0.000) than females (48.4-57.8 mm SVL; $\bar{x}$ = 54.5; SD = 3.40; n = 12). Males have an expanded blackish vocal sac and dorsal skin with very small-scattered dermal spines (smooth in females). The females have a posterior region of thighs with dermal spines (absent in males).

We calculated 5,200 ovules (total number) for the analysed female. The ovules have 1 to 1,1 mm ($\bar{x}$ = 1,03, n = 10). Species that deposit many eggs directly in water generally breed in unpredictable, ephemeral or temporary environments (Crump, 1974). We observed active females, calling males, and amplectant couples during day and night. The water surface between emergent vegetation was almost completely covered by floating eggs, mostly by *Dasypops schirchi* and *Stereocyclops incrassatus* (Fig. 2). On the next day we recorded several frogs calling, but *Dasypops schirchi* was absent. This short activity pattern has been considered typical of explosive breeding species (see Wells, 1977, 2007; Pombal and Haddad, 2005, 2007).

Males of this species have short arms and are unable to hold around the rotund females' bodies during the glued amplexus. The male remains glued to the back of the female by its pectoral and ventral region. Even after euthanized, the couples remain firmly attached (Fig. 3).

The amplectant couples with the male glued to the back of female have been recorded to Philippines species of Microhylinae (Microhylidae): *Kaloula conjuncta* (Peters, 1863) and *K. picta* (Duméril and Bibron, 1841) (Taylor, 1920; Inger, 1954); American species of Gastrophryninae (Microhylidae): *Chiasmocleis capixaba* Cruz, Caramaschi, and Izecksohn, 1997 (pers. obs.), *C. leucosticta* (Boulenger, 1888) (Haddad and Hödl, 1997), *Dasypops schirchi* (present study), *Elaschistocleis bicolor* (Guérin-Méneville, 1838) (Scrocchi and Lavilla, 1990), *Gastrophryne carolinensis* (Holbrook, 1835) (Conaway and Metter, 1967), *G. olivacea* (Halloell, 1856) (Fitch, 1956; Stebbins, 2003), and *Hypopachus variolosus* (Cope, 1866) (Savage, 2002); and also African species of Brevicipididae: *Breviceps adspersus* Peters, 1882 and *Breviceps rosei* Power 1926 (Channing, 2001).

Because this amplexus type is reported in three not closely related taxa, i.e., two subfamilies (Gastrophryninae and Microhylinae, both Microhylidae) and the family (Brevicipididae) (see De Sá et al., 2012;

Figure 3. A dead couple of *Dasypops schirchi* with glue amplexus. The belly and chest skin of the male is glued to the dorsal skin of the female. Note the relatively short arm of the male.

Peloso et al., 2016), we presume this behaviour to be widely distributed. Possibly many species with this amplexus type are explosive breeding and not easy find due the short breeding season. This is true to *Dasypops schirchi*, which is rare in herpetological collections due its very restricted geographical distribution and short period of breeding activity despite being locally abundant, as observed in this study.

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