



Observations on the Breeding Behavior of the Hispaniolan Green Treefrog, *Hypsiboas heilprini*

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The Hispaniolan Green Treefrog (*Hypsiboas heilprini*) is a medium-sized arboreal frog found mostly in forested streams in mountainous areas of the island of Hispaniola. It was assigned to the genus *Hyla* until Faivovich et al. (2005) did a systematic revision of the family Hylidae and resurrected the genus *Hypsiboas*. It is considered vulnerable (IUCN SSC Amphibian Specialist Group 2013) and is the only member

of the genus present in the West Indies. Like most of the anuran fauna of the island (about 96% of which is endemic), its life history remains poorly known.

On 30 November 2013, several individuals of *Hypsiboas heilprini* were heard calling along a 250-m stretch of a tributary stream of the Río Socoa (N18.88650, W69.72879; 190 m asl) in the Parque de la Biodiversidad, Monte Plata



Fig. 1. Male walking toward the cave while engaged in “body inflation,” partial “leg extension,” and “body elevation.”

Province. At 2100 h, an unusual call from one individual attracted our attention. It was emitting a raspy, ascending-intensity, and prolonged sequence before ending with a shorter series of the usual “Kah” notes (Fig. 6). We located the caller (olive-green in color) and immediately thereafter saw another slightly smaller individual next to it (yellow-green), which we presumed to be a female. Male-biased sexual size dimorphism is known in mainland species of *Hypsiboas* (Hoogmoed 1979, Camurugi and Juncá 2013).

Visual signaling in courtship behavior has been reported in hylid frogs (Hartmann et al. 2004) and in other species of *Hypsiboas* (Lipinski et al. 2012). Toledo et al. (2007) commented that the use of visual signals among Neotropical anurans might be much more common than suggested by the current knowledge. Hödl and Amézquita (2001; table 10.2) listed the visual signal displays that have been described in anurans. This was subsequently reviewed by Hartmann et al. (2005, table I) and applied to Brazilian species.

We observed six different visual displays (Table 1) presumably intended for courtship. When not calling, the vocal sac of the male at times remained partially distended. We also observed the male frequently performing a heavy, slow “waddle” with its body in a slightly raised posture. The body

was quite inflated and oval in shape, giving the appearance of being much larger (Fig. 1). The barred pattern on the upper rear surfaces of the thighs was highly conspicuous as the male slowly walked toward the shoreline with hindlimbs somewhat extended (Fig. 1), while occasionally pausing and calling intermittently.

The encounter occurred in the middle of the stream, where the two frogs were sitting exposed on the base of a palm root mass 0.7 m from a stream-bank “cave” that was actually a burrow dug by an endemic freshwater crab (*Epilobocera haytensis*), which is common in forested streams. A small crab (2–3 cm carapace width) was submerged nearby in the stream. The entrance of the cave was above water level in the bank and measured 14 cm wide and approximately 7 cm high before becoming narrower and then widening at the bottom to form a chamber about 0.5 m from the opening. The chamber curved slightly downward and held water. The stream was 2 m wide at that point, with some shallow riffles and slow moving water in deeper areas.

Schwartz and Henderson (1991) reported a clutch of eggs in the wall of a streamside cave, and I had previously observed *H. heilprini* calling at the entrances of such burrows. Fong et al. (2012) reported predation on the semiaquatic



Fig. 2. Calling to attract the female into the “cave.”

Table 1. Visual signal displays observed in *Hypsiboas heilprini*. Terminology adapted from Hödl and Amézquita (2001) and Hartmann et al. (2005).

Body inflation	♂ Performed while moving to the cave from the stream (Fig. 1).
Leg extension (a variation)	♂ Moderately displayed while walking toward the cave, although to a great extent while floating in the flooded chamber. This rendered the femoral dark bars more conspicuous (Figs. 1 & 4). No rapid movements were observed; legs remained extended for seconds and did not revert to the initial position.
Body elevation	♂ Moderately displayed while walking toward the cave in combination with leg (hindlimb) extension and body inflation (Fig. 1).
Body lowering	♀ Performed initially when close to and face-to-face with the male inside the cave (Figs. 3, 4, & 5).
Finger trembling	♂ Performed when perched in roots at the cave entrance.
Vocal sac display	♂ Performed several times outside and inside the cave (Fig. 3).

Cuban frog *Eleutherodactylus cuneatus* by *Epilobocera* crabs, in one case inside a burrow, and commented that crabs seem to be opportunistic frog predators (including their eggs and tadpoles).

The displaying male continued moving toward the cave, and the female followed closely, almost making contact. Once inside the cave, the male perched in thin roots and performed a finger-trembling display. Such visual signaling has been described as a territorial display and a prelude to fight-

ing in mainland *Hypsiboas bischoffi*, *H. albopunctatus* (Toledo et al. 2007), and *H. albomarginata* (Hartmann et al. 2005). Hartmann et al. (2005) and Giasson and Haddad (2006) mentioned that visual signals were not observed during courtship in the latter species.

Harding (1982) first described visual courtship displays as a new form of communication in anurans, with leg kicking/foot flagging in a diurnal ranid frog exposing its bright pale-blue foot webbing contrasting sharply with its otherwise



Fig. 3. Female performing “body lowering” while facing the male. Male performing “vocal sac display” at the cave entrance.



Fig. 4. Male engaged in “leg extension” and female in “body lowering” while both in the water.

cryptic coloration. In life, *H. heilprini* also has vividly colored feet, especially the finger and toe webs, which are commonly some shade of chrome orange dorsally, and the digital pads, which are “electric” venetian blue ventrally (color terminology per Köhler 2012). I suspect these play a communicative role, as this video (<http://youtu.be/GxuHVievpJM>) of another male in the same area suggests, although no other frogs were in sight while taping the video.

The male and female faced each other once, and the female appeared to have touched the male’s snout with her own as she approached. The female lowered and flattened her body while raising her posterior (Fig. 3). The male entered the flooded chamber and extended its hindlimbs while floating (Figs. 4 & 5), exposing the usually concealed markings on the thighs and the toe colors. No further observations were possible since the frogs moved almost entirely out of view, both submerged in the flooded chamber. Despite the continuous use of headlamps and camera flashes, the pair did not seem to have been disturbed.

This event suggests that amplexus and ovipositioning might occur in such chambers. A combination of acoustic and visual signaling apparently served to maintain the interest

of a potential mate and attract it into the chamber. Schwartz and Henderson (1991) provided the only information available on mating for the species, noting that a pair was observed in less than 2.5 cm of water. Males of other species in the genus *Hypsiboas* are known to build nests from where they attract females (Kluge 1981).

No tadpoles were observed in the stream, which was under dense canopy cover. The observation lasted about 40 minutes. Air temperature was 20.7 °C under a clear sky with no moonlight. Interestingly, no other frog species were vocalizing, although we encountered several active individuals of *Eleutherodactylus inoptatus* and *E. weinlandi* on nearby trails. Earlier in the day, we had heard three *H. heilprini* calling during daytime (1700 h) in the same area.

Comprehensive studies to confirm nest site selection patterns and to better discern the possible interactions with freshwater crabs would be important contributions to our understanding of the reproductive biology and overall ecology of the species. The protected area Monumento Natural Salto de Socoa is an ideal site for such studies as it is in a relatively good state of conservation and geographically close to the country’s capital.



Fig. 5. Female performing “body lowering” while submerged.

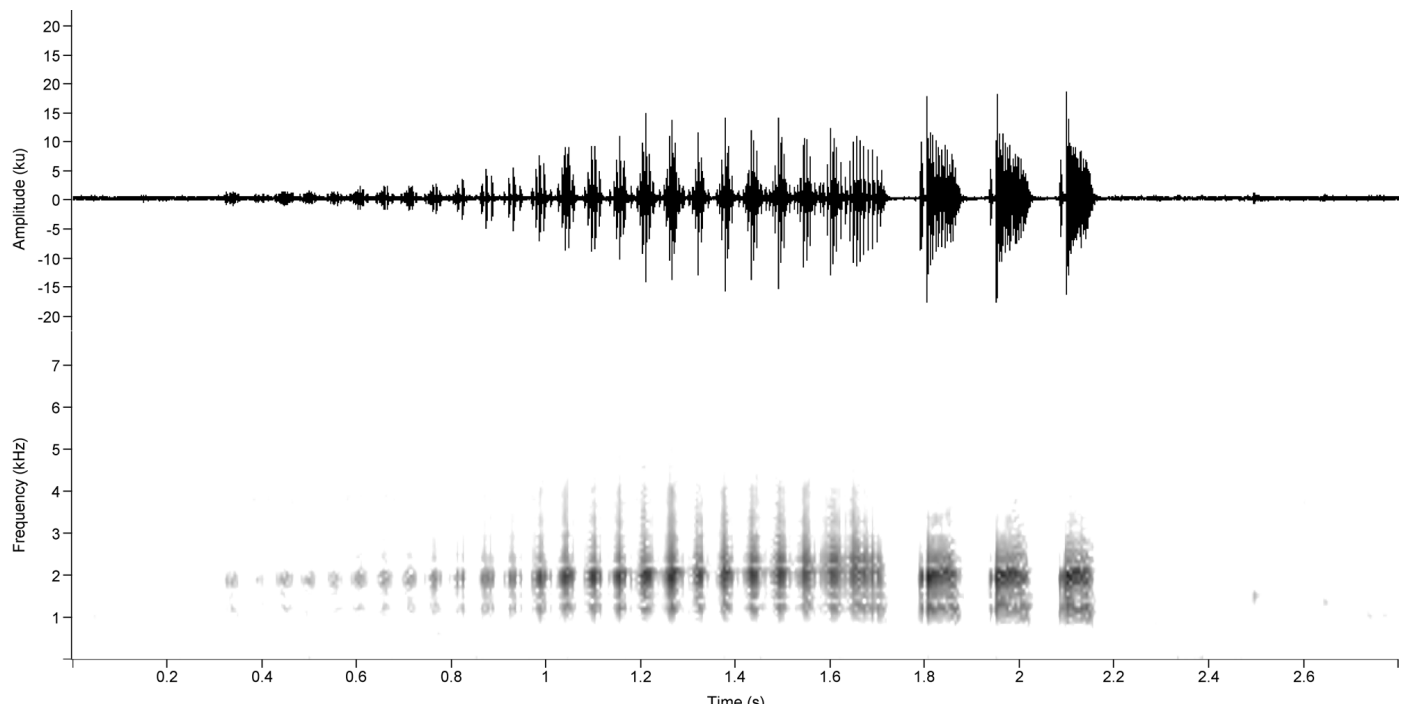


Fig. 6. Waveform and sonogram of the call of the Hispaniolan Green Treefrog (*Hypsiboas beilprini*) while outside the cave, showing the pulsatile structure at the beginning of the call. Call duration 1.84s, dominant frequency 1.9 khz. Olympus DM-620 voice recorder, audio format MP3.

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