VOCALIZATION AND HABITAT PREFERENCE OF THE JAMAICAN TREEFROG, *HYLA MARIANAE* (ANURA, HYLIDAE)

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ABSTRACT

Hyla marianae is an unusual species of hylid frog in that it lacks vocal slits and a vocal sac, yet it has a moderately high frequency (2400 Hz) trill call composed of 15-17 notes. Four calling males were traced to arboreal, narrow-leaved bromeliads *(Tillandsia)*. This habitat is not normally searched by collectors, which possibly explains the rarity of this species in museum collections.

INTRODUCTION

Most male anurans have characteristic advertisement calls usually given during the breeding season to attract mates or establish territory (Duellman and Trueb, 1986). Species that do not vocalize normally have the laryngeal apparatus that produces the sound but lack a vocal sac, an expandable pouch that acts as a sound resonator and radiator (Littlejohn, 1977; Watkins et al., 1970). It was thus not surprising when Trueb and Tyler (1974) found that the Jamaican treefrog *Hyla marianae* lacked a vocal sac: it was the only West Indian hylid frog not known to vocalize.

On the night of 13 January 1984, I heard an unfamiliar call near the end of a dirt road 8-9 km NW Troy, Jamaica, at the southern edge of the Cockpit Country. The call was a series of multiple notes or pulses, a type common among hylid frog species. The unknown call was coming from several locations on each of the nearby limestone hills and could be heard from a considerable distance (ea. 75-100 m). After several unsuccessful attempts to climb up into the forest, bordered by nearly vertical limestone rock, I drove to the eastern edge of the Cockpit Country, 0.8 km N Burnt Hill. Here, along the Barbecue Bottom road, I heard the same unfamiliar call coming from nearby forested limestone hills. After tracing the nearest call to a narrow-leaved bromeliad (Tillandsia) situated 3-4 m high in a small tree, I climbed the adjacent tree and waited about one meter away with my headlamp off. When the next call was given, I turned on my light and saw an adult male *H. marianae* (USNM 266470) perched on a horizontal leaf of the bromeliad. Immediately after I collected that individual, another began calling from a thin-leaved *Tillandsia* 3-4 m high in a tree only 5-10 m away. I was unable to get closer than 1 m from that bromeliad and could not see or collect the frog. I returned to the same locality on 22 September 1985 and recorded and collected another *H. marianae* (USNM 266471) calling from a *Tillandsia* about 3 meters above the ground in a tree. Another call was traced to a narrow-leaved *Tillandsia* in a tree nearby but the animal could not be seen or safely collected.

Since *Hyla marianae* lacks a vocal sac, there was no indication that either of the two frogs collected were actually calling (i.e., the usual

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indication of a vocalizing frog, an inflated vocal sac, was not observed). However, the moderately loud and distinctive sound seemed to be coming from the immediate area where those two animals were located and no other frogs were found within the bromeliads or nearby. Four other species of hylid frogs are known from Jamaica *(Calyptahyla crucialis, H. wilderi, Osteopilus brunneus,* and an undescribed species), but their calls are all distinctive and different from the one I recorded (Schwartz and Fowler, 1973; R. Crombie, pers. comm.; personal observations). Only three species of Jamaican *Eleutherodactylus* have relatively long, repetitious, multiple-note calls. *Eleutherodactylus gossei* has two distinctive calls, one of which is a continuous low-pitched whistle quite unlike the call described herein. The calls of the other two species, *E. junori* and *E. pentasyringos,* are only 6-9 notes long, and each note is sharp and discrete (not pulsed, as in *H. rnarianae).* Only a few species of birds vocalize at night and none are known to have such a call (R. Sutton, pers. comm.), and the sound is distinctly not insect-like. Also, both of the *H. marianae* collected were adult males in breeding condition (enlarged testes) and therefore I am confident that the call described herein is that of *Hyla marianae.*

Description of the Call

Two calls of *H. marianae* (USNM 266471) were recorded on a Sony TCM-5000 recorder. One call (Fig. 1) is composed of 15 notes, is 1.65 s in duration, and has a dominant frequency of 2400 Hz (terminology of Duellman and Trueb, 1986). The other call from the same individual (not shown) is similar in structure but was 17 notes and 1.75 s in duration. The note repetition rate decreases from 11.2 to 6.8 notes per second in the call shown. Two intervals between calls measured 47 s and 52 s (i. e., call rate = 1.21 calls per minute). A sharp transition occurs halfway through each call resulting in the final notes being more pulsed than the initial notes (Fig. 1). This can be further seen in a waveform diagram (Fig. 2) of the 9th and 10th notes. Compared with the calls of North American *Hyla* that I have heard, the call of *H. marianae* is about average in loudness or intensity.

Upon dissection, I was unable to locate a clearly defined vocal sac in either of the two specimens (USNM 266470-71), although several thin-walled structures observed in the throat region could possibly function as such. However, since both specimens lack vocal slits, it is doubtful that any functional vocal sac exists, as stated by Trueb and Tyler (1974). Since 19 of 115 hylid species from Middle America also lack vocal sacs and none of those species is known definitely to vocalize (Duellman, 1970), *H. marianae* appears to be unusal for a hylid species in its production of a "normal" advertisement call without a vocal sac.

Function of the Vocal Sac in Anurans

Experimental manipulations involving removal or deflation of vocal sacs in *Bufo* have suggested that the vocal sac functions primarily as a resonator, but may also cause the dominant frequency to be higher than the frequency generated by the vocal cords alone (Martin, 1972). In addition, the vocal sac is considered to function as a sound radiator by coupling acoustic energy to the environment (Bogert, 1960; Martin, 1972; Littlejohn, 1977; Watkins et al., 1970).

There is nearly a perfect association between the presence of a vocal sac and vocalization, suggesting that the vocal sac is an important, if not essential, structure for normal anuran vocalization. However, Duellman and Trueb (1986: 92) state: "a few male frogs that vocalize do not have vocal sacs." Species in which this has been documented include several bufonids (Martin, 1972), *Polypedates leucomystax* (Inger, 1954, 1956), and some species listed by Liu (1935) as lacking a vocal sac. In addition to those taxa and *H. marianae,* a recent systematic study of West Indian *Eleutherodactylus* (Joglar, 1986) revealed that at least 34 species lack vocal slits, and presumably vocal sacs. Of those taxa and several others examined by me and found to lack vocal slits, 28 have advertisement calls. This relatively large number of species presumably lacking vocal sacs yet having "normal" calls provides an opportunity to further examine the function of the vocal sac by comparing call characteristics of species with and without a vocal sac (Hedges, in preparation).

Ecology

Two species of Jamaican hylid frogs and their tadpoles *(Hyla marianae, H. wilderi)* are

found exclusively in bromeliads and a third species *(Osteopilus brunneus)* is nearly always associated with bromeliads (Dunn, 1926; Schwartz and Fowler, 1973; personal observations). Adult *Calyptahyla crucialis* frequently call from within hollow trees and bamboo thickets but adults and tadpoles have been found in bromeliads (Dunn, 1926; Garrick et al., 1985; personal observations).

My observations on calling male *H. marianae* suggest that this species may prefer a particular type of bromeliad, the narrow-leaved *Tillandsia* (probably *T. compressa* or *T. fasiculata).* The relatively few individuals of *Hyla marianae* that I have collected during the day have all come from the slightly larger and more accessible wide-leaved bromeliads with spiny edges that are common along roads and trails in the Cockpit Country. *Hyla wilderi* is an abundant species in this type of bromeliad, and one gets the impression that it is only a peripheral habitat for *H. marianae. Osteopilus brunneus* is a larger species and is most commonly associated with very large, wide-leaved "tank" bromeliads such as *Hohenbergia* (Dunn, 1926; Lynn, 1940; Schwartz and Fowler, 1973; Lanoo et al., in press; personal observations). The tadpoles of *O. brunneus* feed almost exclusively on anuran eggs (Dunn, 1926; Lanoo et al., in press) and this may be one reason why the two smaller hylids *(H. marianae* and *H. wilderi)* do not seem to frequent the larger tank bromeliads.

The relative scarcity of *Hyla marianae* in museum collections may be due to the fact that collectors generally seek the larger, wide-leaved bromeliads that hold more water and presumably more frogs than the narrow-leaved bromeliads. Certainly, the number of *H. marianae* heard calling in January and September gave the impression of an abundant species. However, the four localities where I have heard the call of *H. marianae* (the two mentioned above [both in Trelawny Parrish], 11 km WNW Quick Step [Trelawny], and 2 km W Mocho [St. James]) are all within undisturbed wet limestone forest (Asprey and Robbins, 1953), a rapidly vanishing habitat in Jamaica and in immediate need of protection.

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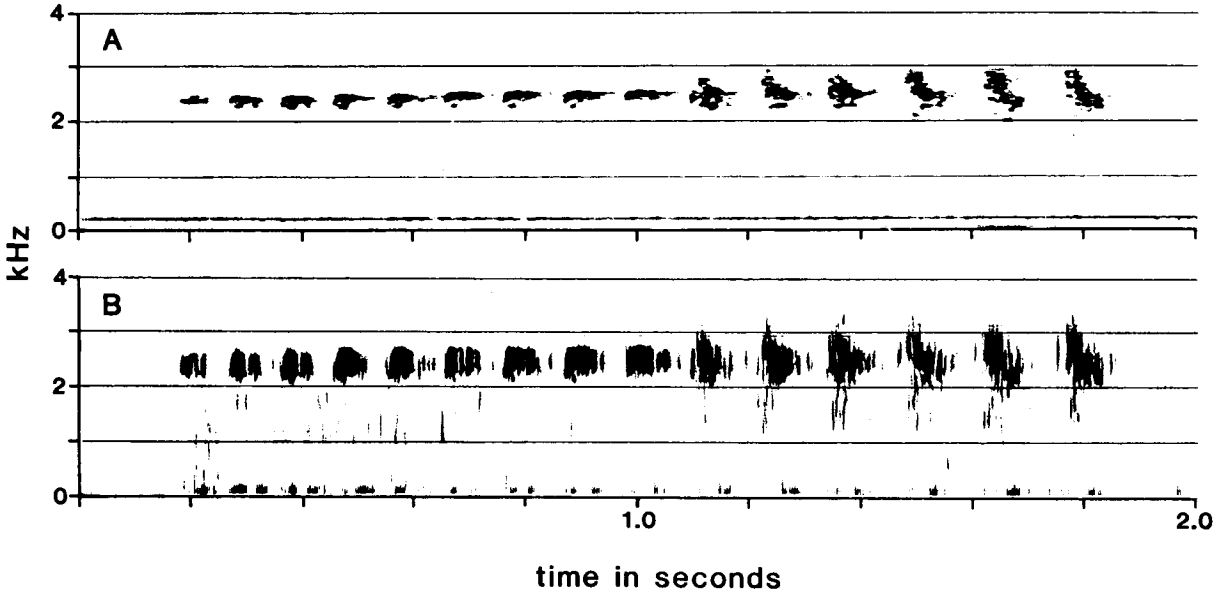

FIGURE 1. –Audiospectrograms of a single call of *Hyla marianae* (USNM 266471): A. 45 Hertz filter, B. 300 Hertz filter.

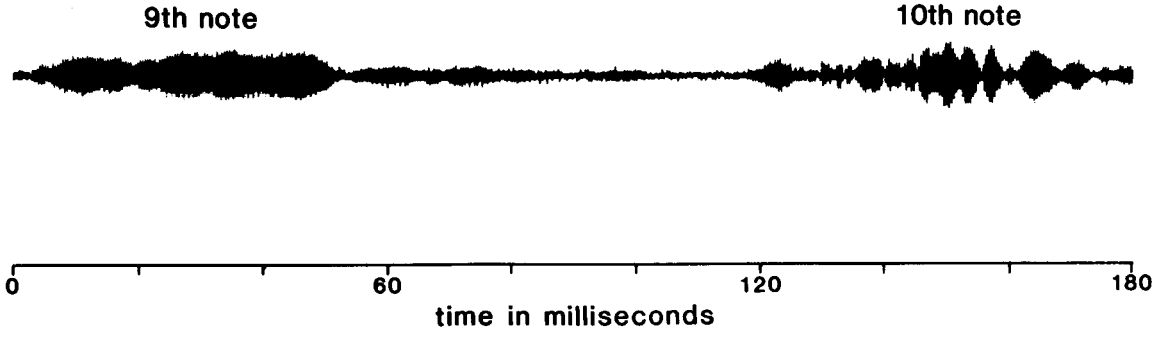

FIGURE 2. –Waveform diagram of the ninth and tenth notes of the *Hyla marianae* call shown in Fig. 1.