

Catalogue of American Amphibians and Reptiles.

Gerald, G.W. 2006. *Isthmohyla zeteki*.

***Isthmohyla zeteki* (Gaige)
Zetek's Bromeliad Frog**

Hylella fleischmanni: Picado 1913:234. **See Comment.**

Hyla zeteki Gaige 1929:4. Type-locality, "collected from a bromeliad in the Caldera Valley, above Boquete, Chiriqui Province, Panama." Holotype, University of Michigan Museum of Zoology (UMMZ) 63875, collected by H.T. Gaige on 27 February 1923 (not examined by author).

Isthmohyla zeteki: Faivovich et al. 2005:103.

• **CONTENT.** *Isthmohyla zeteki* is a monotypic species.

• **DEFINITION.** *Isthmohyla zeteki* is a small hylid with males reaching 24 mm and females reaching 27 mm standard length. Individuals are characterized by having short, stout fingers containing large finger disks one and one-half times the diameter of the tympanum and a subarticular tubercle on finger IV. The thumb of adult males contains white rounded nuptial pads. Fingers are slightly webbed at the base with a webbing formula of I 3-3 II 2-3 III 3+--2+ IV. The toes are two-thirds webbed with a formula of I 2-3 II 2-3+ III 2-3 IV 3-2 V. Specimens typically have a smooth dorsum, the venter and ventral surface of the thighs strongly granular, a rounded snout, broad head, terminal nostrils, and a distinct tympanum with a diameter one-third of the eye length. Individuals are golden tan with iridescent sides and a yellowish white venter with the peritoneum visible. Nostrils are protuberant, located "about four-fifths of the distance from the eyes to the tip of the snout" (Duellman 1970). A dermal fold extends posteriorly above the tympanum. Males possess paired vocal slits and an internal subgular vocal sac. According to Gaige (1929), the eyes are brownish red; a thin red dorsal stripe and a narrow, dark spectacle-like mark around each eye joins at the snout. However, Dunn (1937) and Myers and Duellman (1982) reported that individuals from Costa Rica or Panama lacked the red dorsal markings. The markings around the eyes that meet at the snout are not distinct, eye diameter is greater than snout length, and finger disks are larger than toe disks in specimens from Isla Bonita, Heredia Province, Costa Rica (Taylor 1952). An additional pattern characteristic is the presence of a thin black "wrist" band (Duellman 1970, 2001, Savage 2002).

Tadpoles are small, reaching 21 mm in total length, gray, dorsoventrally compressed, and shaped like a guitar if viewed from above. The larvae are characterized by having a bluntly rounded snout, small eyes, and a dorsal mouth. The oral disk contains an outer row of denticles completely encircling the mouth and a single row of large denticles present above the



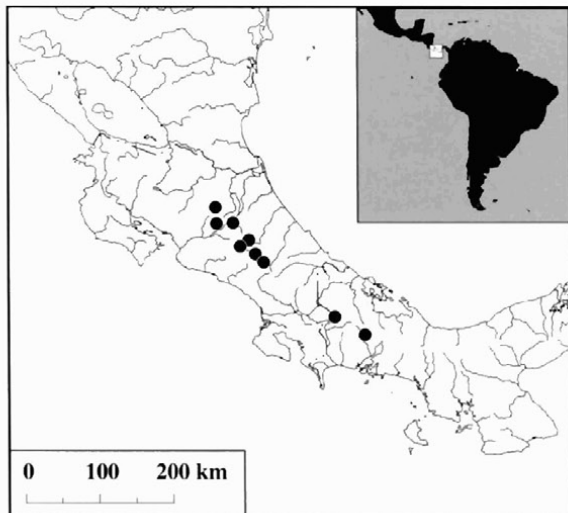
Figure 1. *Isthmohyla zeteki* (AMNH 94901) from Chiriqui, Fortuna Dam site, Panama, 1000 m (photograph by Charles W. Myers).

beak. Fins are shallow, but deepen posteriorly. The dorsal fin is absent on the anterior one-fourth of the tail. The call of *Isthmohyla zeteki* is unknown.

• **DIAGNOSIS.** *Isthmohyla zeteki* is the only member of the genus in Costa Rica and Panama with a dorsolaterally positioned oblique tympanum. *Isthmohyla zeteki* is broadly sympatric with the closely related *I. picadoi*. Although tadpoles of both species develop in bromeliads, *I. picadoi* tadpoles possess a terminal mouth whereas *I. zeteki* tadpoles have dorsal mouths. *Isthmohyla picadoi* is found at higher elevations (1900–2500 m) than *I. zeteki* (600–1800 m). *Isthmohyla picadoi* is larger (males 27–32 mm body length, females 34–35 mm) than *I. zeteki*. *Isthmohyla picadoi* also possesses a pair of odontoids at the tip of the lower jaw, vestigial finger webbing, and dark pigment covering the dorsum, lips, and supratympanic fold. In contrast, *I. zeteki* possesses a single odontoid at the lower jaw tip, greater finger webbing, and a well-defined tympanum. In addition, the quadratojugal present in *I. picadoi* is absent in *I. zeteki*.

• **DESCRIPTIONS.** Gaige (1929) described the holotype. Dunn (1937) described the larvae and discussed variation in adult coloration. Discussions on morphological variation in adults, along with brief descriptions of adults and larvae appear in Duellman (1970, 2001), Myers and Duellman (1982), Savage (2002), Savage and Heyer (1969), and Taylor (1952, 1958). An additional description of the larvae appears in Starrett (1960). Duellman (1970, 2001), Savage (1980, 2002), Savage and Heyer (1969), and Savage and Villa (1986) provided dichotomous keys to the anurans of Costa Rica. Duellman (2001) included diagnostic features of *I. zeteki* tadpoles.

• **ILLUSTRATIONS.** Taylor (1952) provided a life-size black-and-white drawing of an adult female from Costa Rica. Duellman (1970, 2001) provided both black-and-white and colored illustrations of an adult *Isthmohyla zeteki* as well as drawings of the hand, foot, and tadpole. Savage and Heyer (1969) provided illustrations of a dorsal and lateral view of the head showing the oblique tympanum. Savage (2002) pro-



Map. Distribution of *Isthmohyla zeteki*. Dots mark known locality records. The type-locality is too imprecise to plot.

vided a colored photograph of an adult and drawings of the body and mouthparts of the tadpole. Dunn (1937) and Starrett (1960) also provided illustrations of tadpoles.

• **DISTRIBUTION.** *Isthmohyla zeteki* is confined to the mountains of the Cordillera Central and Cordillera de Talamanca of Costa Rica with additional localities located in western Panama. Costa Rican localities occur primarily on the Caribbean slopes (Savage and Villa 1986) with one locality near Las Tablas, Puntarenas Province, situated on the Pacific slope (Savage 2002). However, Myers and Duellman (1982) reported that local populations of *Isthmohyla zeteki* inhabit the Pacific slopes in western Panama at elevations of 1000–1170 m. Savage and Heyer (1969) described the distribution and several localities within Costa Rica and Panama. *Isthmohyla zeteki* resides in subtropical rainforests and wet forests at elevations ranging from 600–1500 m and in lower montane wet forests at 1500–1800 m in elevation (Campbell 1999). However, *Isthmohyla zeteki* may occur primarily in the upper ranges of the 600–1500 m zone, thereby appearing only marginally in the subtropical wet and rain forest zones. The distribution of this species was also discussed by Martinez-Cortes (1982) with additional information on the species' distribution in Panama provided by Ibáñez et al. (2000).

• **FOSSIL RECORD.** None.

• **PERTINENT LITERATURE.** Leenders (2001) briefly mentioned the use of bromeliads by *I. zeteki* for egg-laying and tadpole development. Dunn (1937) related *I. zeteki* to other Central American hylids with reduced finger webbing and vomerine teeth situated posterior to the nares. These hylids were termed the "*Hyla punctariola*" group and were considered closely related to *Hyla glandulosa*. Duellman (1970, 2001), Savage (2002), and Savage and Heyer (1969) deter-

mined that *I. zeteki* is morphologically closely related to *I. picadoi* and they refer to these two species together as the "*Hyla zeteki*" group. Duellman (2001) suggested that speciation occurred between *Isthmohyla zeteki* and *I. picadoi* as a result of altitudinal isolation or by geographic separation in the Cordillera Central and Cordillera de Talamanca. He also suggested that the behavior of depositing eggs in bromeliads by these two species probably evolved from ancestral pond breeders. Duellman (2001) recently assigned the "*Hyla zeteki*" group to a bromeliad-breeding clade within the "*Hyla pictipes*" group and suggested that this group was a sister group of the "*Hyla lancasteri*" and "*Hyla rivularis*" groups. Dunn (1937) described the exact locations of *I. zeteki* eggs, tadpoles, and adults within bromeliads, and determined that eggs are laid on the leaves of the bromeliad, out of the water contained within the plant. Upon hatching, tadpoles develop within the water-filled bromeliad. Dunn (1937) also suggested that tadpoles were oophagous, after examining tadpole stomachs that contained only conspecific eggs. Taylor (1958) collected a gravid female that was found to contain 24 large eggs (Savage 2002). After comparing its known life history traits to the life history of *Anotheca spinosa*, a relatively well known oophagous Costa Rican hylid, Savage (2002) suggested that *I. zeteki* is obligatorily oophagous. Duellman (2001) noted that the reduced number of tooth rows in tadpoles was a modification for oophagy. Polis and Myers (1985) included *I. zeteki* in a review of intraspecific predation in amphibians, and Crump (1983) in a similar review of cannibalism in amphibian larvae. Myers and Duellman (1982) noted that *I. zeteki* is particularly adapted for life in bromeliads due to its small size, flattened body, and disruptive coloring of the iris; combined with the fact that individual *I. zeteki* have been observed crawling backwards into leaf axils, these specific adaptations may pose a distinct form of crypsis against potential predators. Taylor (1958) mentions infection with subcutaneous larvae of a dipteran insect for two male *I. zeteki*. Scott (1976) discussed its relative position in a tropical forest litter community. Summaries of the life history of *Isthmohyla zeteki* occur in Duellman (1970, 2001) and Savage (2002). Checklists include Scott et al. (1983).

• **ETYMOLOGY.** This species is named after entomologist James Zetek, the former director of research on Barro Colorado Island in Panama (Gauge 1929).

• **COMMENT.** According to Dunn (1937) and Savage (2002), Picado (1913) used *I. zeteki* as the basis for describing *Hylella fleischmanni*. Faivovich et al. (2005) erected the genus *Isthmohyla* to include this species after revising the systematics of the family Hylidae based on evidence from mitochondrial and nuclear DNA.

Lips (1999) conducted a survey of anuran populations at Reserva Forestal Fortuna, Chiriquí, Panama during 1997. Although she found evidence of population declines in several anuran species, populations of *Isthmohyla zeteki* were found in stable numbers.

Relative to other species of frogs in Panama, *Isthmohyla zeteki* may not be greatly affected by exotic fungal infections (Lips 1999). IUCN listed *Isthmohyla zeteki* as 'vulnerable' based on its relatively small distribution and the level of habitat destruction occurring within this range (IUCN et al. 2004).

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