Rediscovery of the Green-striped Glass Frog *Hyalinobatrachium talamancae* (Anura: Centrolenidae) in Costa Rica

Brian Kubicki


**ABSTRACT.** The green-striped glass frog, *Hyalinobatrachium talamancae*, has been rediscovered in Costa Rica, more than 50 years after its last recognized collection. Four new populations were recently discovered in the Limón Province. This species is easily distinguished from all other centrolenids by the combination of the following morphological characteristics: a green mid-dorsal line, one lacking the pair of yellow paravertebral stripes characteristic of *H. vireovittatum*, and blood red heart visible in living specimens.

**RESUMEN.** La rana de vidrio de raya verde, *Hyalinobatrachium talamancae*, fue redescubierta en Costa Rica. Las últimas colecciones oficiales de esta especie son de más de 50 años. Cuatro poblaciones nuevas fueron encontradas en la Provincia de Limón. Esta especie puede ser distinguida fácilmente de las otras especies de ranas de vidrio por una combinación de las siguientes características: una raya verde medio dorsal, la cual carece de rayas amarillas que bordean ésta, y también por la presencia de un corazón rojo visible a través la piel del vientre.

**KEY WORDS.** Glass Frog, Centrolenidae, *Hyalinobatrachium talamancae*, Costa Rica, Rediscovery

In 1952 Edward H. Taylor described a small glass frog from the area of Moravia de Chirripó (1116 m.a.s.l.), Cartago Province, Costa Rica. He gave this new species the name *Cochranella talamancae* (Holotype: KUMNH No. 30887) (Taylor 1952). He later revisited the same locality and collected three more specimens (Paratypes: KUMNH Nos. 32936-32968) (Taylor 1958). This species was reported to have a canary yellow base coloration of the dorsum with a diffuse green median line on the back joined to a fine greenish reticulation forming a linear series of yellow spots paralleling the median line. Since the time of Taylor’s collections no other specimens of this species have been reported until now (Jay M. Savage pers. comm.). As it was known from just four specimens collected in the 1950’s from the area of Moravia de Chirripó (Taylor 1958, Starrett & Savage 1973, Savage 2002, Frost 2004) it has become viewed by many herpetologists as an enigmatic form. In 1991 the family Centrolenidae was reclassified, and this species was placed in the newly proposed genus *Hyalinobatrachium* (Ruiz-Carranza & Lynch 1991).

I surveyed the type locality of Moravia de Chirripó in 2000, and was unsuccessful in discovering *H. talamancae*. Starrett & Savage (1973) described a similar glass frog species, *H. vireovittatum*, from the Pacific versant of Costa Rica, that also has a green mid-dorsal stripe, but it differs from *H. talamancae* by having yellow stripes on both sides of the green median line. Furthermore, Starrett & Savage (1973) reported that of the 13 species of Costa Rican centrolenids the only two of which they were unable to witness a living specimen were *Hyalinobatrachium chirripoi* and *H. talamancae*. It is possible that *H. talamancae* no longer exists at the type locality of Moravia de Chirripó.

During a field survey in the area of Fila Asunción, Limón Province, Costa Rica on July 22nd, 2001, I was exploring a small seepage at roughly 03:00hr, and heard a soft long whistle from the vegetation above me. I instantly recognized the sound as something new for the area. After a short period of triangulating in on the call the frog was spotted on the underside of a leaf (*Philodendron* sp., Family: Araceae) growing up the trunk of a palm. The leaf was at a height of approximately 4 m above the ground. The frog blended almost perfectly with the color of the leaf, and the only noticeable sign of the frog was the darker coloration of the eyes. The palm was growing in the middle of a small seepage, with a depth of 2-3 cm. The seepage had a width of approximately 0.5 m. The substrate of the seepage was a mixture of mud, sand, and small pebbles.

The male called sporadically and waited from 30 seconds to several minutes between calls. This
sporadic calling was most likely due to the late hour of the encounter. Upon lowering the frog I instantly saw an evident green mid-dorsal line. On both sides of the mid-dorsal line were numerous irregular small canary yellow spots. The frog lacked the evident yellow lines on both sides of the green mid-dorsal stripe, that is characteristic of *H. vireovittatum* (Starrett & Savage 1973, Savage 2002). Upon viewing the ventral region of the frog a red heart was visible due to the lack of pigmentation in the parietal pericardium. In a recent review of the known museum specimens for *H. talamancae*, it was noted that this species lacks pigmentation in the parietal pericardium (McCranie & Wilson 1997), thus having a red heart visible in living specimens. The lack of a pigmented pericardial sack allies this species to the *H. chirripoi* sub-group (Ruiz-Carranza & Lynch 1998). The liver and organs of the digestive tract have a white visceral covering.

I have found the species to be relatively common at the site, especially along the main stream at a distance of 75 meters from where I encountered the first specimen. In the two years that followed additional populations of *H. talamancae* have been found at three other sites in the Limón Province, two in the area of Guayacán and also the area of Alegría.

*Hyalinobatrachium talamancae* (Taylor, 1952)

**General morphological characteristics.** This species is small-medium sized compared to other Costa Rican centrolenids, with an average snout-vent length (SVL) of 24-26 mm in adult males. The adult females have a slightly longer SVL of 25-27 mm. *H. talamancae* is reported to lack extensive webbing between fingers II-III (Taylor 1952, 1958, Starrett & Savage 1973, McCranie & Wilson 1997), (Fig. 1.) but I have found slight variations in this characteristic between some populations. Some specimens, especially from the two sites in Guayacán and also the area of Alegría have been found to have almost as extensive webbing between fingers II-III as between fingers III-IV (Fig. 2.). The webbing between fingers III-IV typically covers one-half to two-thirds the distance from the base to the tip of the fingers. The webbing between fingers II-III ranges from roughly one-fifth to one-half the distance from the base to the tip of the fingers, varying between populations and individual specimens. This species is unique in the family in having a more or less distinct green mid-dorsal stripe, lacking the bordering pair of yellow stripes reported for *H. vireovittatum* (Starrett & Savage 1973, Savage 2002), in combination with a red heart visible in living specimens.

**Coloration.** Color in life: The dorsal coloration of the head and body is canary yellow with a green reticulation (Fig. 3). The green reticulation gives the appearance of yellow spots on the dorsal surfaces of the head, back, arms, and legs. The yellow spots vary in size, with the spotting on the lower two-thirds of the back and dorsal regions of the legs and forearms being larger in size compared to those on the head and neck. The yellow spots on the dorsal parts of the arms and legs are slightly more diffuse than those of the body. In the center of the dorsum there is a distinct green mid-dorsal stripe that starts at the base of the head and travels along the axis of the body to the area just anterior to the vent. The mid-dorsal stripe lacks the bordering pair of paravertebral yellow stripes found on *H. vireovittatum* (Starrett & Savage 1973, Savage 2002). The iris coloration is golden with small dark spots. The dark spots are especially concentrated in the region directly surrounding the horizontal elliptical pupil. The tips of the fingers and toes are yellow. In the green reticulation numerous tiny black star-like spots are present, in some specimens a few may also be present in the yellow spots of the dorsum. *H. talamancae* lacks pigmentation in the parietal peritoneum, thus having a transparent venter (Fig. 4.). The heart lacks a white pigmented parietal pericardium, and is bright blood red in living specimens. The liver and other digestive organs contain white pigmentation in the visceral covering. A red ventral vein is visible starting just posterior of the liver, and traveling along the center of the abdomen to the area just anterior to the pelvis. The gall bladder is visible as a small spherical structure posterior to the liver. Some variation in gall bladder coloration is present among specimens. Most have a yellowish-white gall bladder, but a few individuals have a more transparent yellow gall bladder. The lungs are visible as clear inflated sacks on both sides of the anterior half of the ventral region. The bones are yellowish white in living specimens.
Natural History. Little information is available in regards to *H. talamancae*’s biology. In the book “Amphibians and Reptiles of Costa Rica (Savage 2002), no information is given regarding the biology of this species. Furthermore, the call and larvae are reported to as “unknown”. The only information regarding this species’ biology is; “The specimen was taken at night on a leafy plant growing out from the bank and over a small rivulet, the call is a low whistle” (Taylor 1952).

I have found *H. talamancae* reproducing along seepages and smaller to medium sized high-gradient lotic streams in areas of humid forest with little or no alteration. The males typically call from smooth-leaved plants overhanging moving water. The males normally call from the underside of the leaf, but on occasion they can be seen calling from the upper leaf surface. The majority of calling males, or those attending egg masses have been seen at heights between 2-5 meters above the water.

The call (fig. 5) consists of a long whistle “shhhhhhhhhnth”, that does not noticeably rise at the end like that of *H. fleischmanni*. The call has an average total duration of 0.3 seconds. The average initial frequency of the call is 4.3 kHz, but rises to 4.9 kHz after 0.08 seconds. The call remains at 4.9 kHz for roughly 0.18 seconds, and then drops to 4.6 kHz in the last 0.04 of a second. During periods of high activity males may call as frequently as every ten seconds.

The majority of amplexus behaviors I have seen with this species occurred in the first few hours of darkness. Males are often seen at night guarding egg masses. Males have also been seen guarding egg masses during the daylight hours.

Egg masses are deposited on the underside of the leaves, towards the center. The eggs are surrounded by a thin clear jelly mass. The eggs are held in a single layer, which was considered an additional trait of the *H. fleischmanni* species group (Ruiz-Carranza & Lynch 1998). Normally 20-30 eggs are found in a single clutch. In the first days of embryonic development the eggs are greenish white, but turn to a pinkish-tan as embryonic development continues (Fig. 6). The larvae normally hatch from the egg mass after a period of roughly 15 days.

GENERAL DESCRIPTIONS FOR THE FOUR ADDITIONAL SITES

Fila Asunción. N 9° 55’ 06.5” W 83° 09’ 42.4”.

The site has an altitude of 475 m.a.s.l., and is defined as Tropical Wet Forest (Holdridge 1967), with an average annual precipitation of approximately 4500mm (Barrantes et. al. 1985). It is located on the edge of a large contiguous section of primary forest, connected to the Talamanca biogeographical region. The site is referred to in Spanish as a “zona de recarga”, meaning that it is where a stream drainage starts from a swampy area. In the upper area of the site there is a series of small ponds. On the lower end of these ponds the excess water slowly drains through an area of muddy substrate, and starts forming a stream at a distance of approximately 75 meters from the ponds. The topography of the area is in the shape of a bowl. In the area of the lower ponds and swamp the terrain is quite flat, but where the stream forms the topography drops off abruptly through a small canyon most likely cut in the hydrological history of the site. The primary habitat for *H. talamancae* is where the stream forms, but on a smaller seepage that eventually connects to the main stream males are occasionally seen calling and guarding egg masses. The primary habitat is a high-gradient lotic stream, with a mixture of muddy substrate and larger rocks and boulders. Other glass frog species found at this site include *Cochranella granulosa* and *C. spinosa*. *H. talamancae* at times can be found quite abundantly at this site, especially where the main stream starts. The species could be considered locally common at this site.

Quebrada Ilex. N 10° 03’ 18.9” W 83° 33’ 05.2”.

This medium-gradient lotic stream is located in the private reserve of the Costa Rican Amphibian Research Center (C.R.A.R.C.), in the area of Guayacán de Siquirres. It is a smaller tributary of the Siquirres River. I refer to this stream as Quebrada Ilex due to the abundance of the Mountain Glass Frog (*Centrolenella ilex*) found along its course. The site has an altitude of roughly 500 m.a.s.l., and is located in the life zone defined as Tropical Premontane Rain Forest (Holdridge 1967). The area receives an average annual precipitation of around 6000mm (data provided via weather station on the C.R.A.R.C. reserve). The stream is surrounded by a mixture of secondary
and primary forest, and has an abundant supply of smooth leaved plants overhanging the water. Quebrada Ilex has a width of approximately 2 meters, and an average depth of 20-50 cm. The substrate of the stream mainly consists of large boulders and medium sized rocks of a volcanic origin. The water of the stream is extremely clean and clear. In some areas of the stream gravel and sand occur as a secondary substrate. Other glass frog species found along Quebrada Ilex include the following: Hyalinobatrachium fleischmanni, Cochranella albonaculata, C. granulosa, C. spinosa, and Centrolelilla ilex. H. talamancae has only been witnessed along this stream a couple times, thus it should be considered uncommon at this site.

Quebrada Talamancae. N 10° 03’ 04.4” W 83° 31’ 42.7”. This high-gradient lotic stream is also located in Guayacán de Siquirres, in the area known locally as Bajo Huacas. I refer to this stream as Quebrada Talamancae due to the abundance of this glass frog species along its course. Quebrada Talamancae is a tributary of Quebrada Quebradon, or known locally as Quebrada la Mona. Quebrada Talamancae is 2.5 kilometers due east of the Quebrada Ilex location. This site has altitude of 515 m.a.s.l, and is located in the life zone defined as Tropical Premontane Rain Forest (Holdridge 1967). The area likely receives around 6000 mm of annual precipitation (extrapolation from the nearby weather station at the C.R.A.R.C. reserve). This stream is surrounded by a mixture of secondary and primary forest, and has an abundant supply of smooth-leaved plants overhanging the water. The stream has an average width of 1-2 meters, and an average depth of 10-40 cm. This stream has a very steep gradient, and is often completely changed due to large rushes of water flowing through its course during heavy rains. The substrate of this stream consists of large and medium sized rocks of a volcanic origin. Other glass frogs species found at this site include Hyalinobatrachium fleischmanni and Cochranella granulosa. H. talamancae is the most abundant glass frog species seen along this stream, thus could be considered locally common.

Alegria. N 10° 04’ 38.4” W 83° 02’ 33.4”. The high-gradient small lotic stream at this fourth site remains unnamed for the time being. The stream is located on the private property of Erick Berlin, which is in the foothills above the small town known as Alegria. This site is on the Atlantic slopes of the Turrialba Volcano. The section of the stream where H. talamancae have been found is extremely steep, and requires one to literally climb in order to walk along the stream. I have only worked at this site a couple times, but one evening we found numerous calling males of H. talamancae and several of them were attending egg masses. The site is has an altitude of approximately 850 m.a.s.l, and is in the life zone defined as Tropical Premontane Rain Forest (Holdridge 1967). The area likely receives around 5000-6000 mm of annual precipitation. This high-gradient stream is surrounded by a mixture of secondary and primary forest, and has an abundant supply of smooth-leaved plants overhanging the water. The stream has an average width of 1 meter, and an average depth of 10-30 cm. The substrate consists of large moss covered rocks, with the water flowing around and under the large rocks. One other glass frog species has been seen along this stream, Centrolelilla prosoblepon. H. talamancae appears to be abundant along this stream, thus should be considered locally common.

LITERATURE CITED