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A New Species of *Hyla* from Amazonian Ecuador

William E. Duellman

***Hyla cruentomma* is named from the upper Amazon Basin in Ecuador. The new species is characterized by vestigial webbing between the first and second toes, smooth skin dorsally, relatively short legs, a variable dorsal pattern usually consisting of irregular longitudinal dark brown marks on a tan ground color, and a horizontal red streak through the iris. The tadpoles are generalized pond types, and the mating call consists of a single, moderately long, pulsed note. The affinities of the new species seem to be with the *Hyla rubra* and *Hyla parkeri* groups.**

Field studies on the herpetofauna of the Río Aguarico drainage in eastern Ecuador have resulted in the collection of large series of anuran species, recordings of mating calls, and data on their life histories, behavior, and ecology. Among the first collections made at Santa Cecilia, Ecuador, were specimens of a small *Hyla* that superficially resembled *Hyla rubra* Laurenti; subsequent observations revealed that the species was distinct from *H. rubra*. Examination of a variety of Amazonian *Hyla*, including the

TABLE 1. COMPARISON OF SAMPLE STATISTICS OF *Hyla cruentomma* AND *Hyla baumgardneri*. (In each set of statistics observed range is given in first line and mean and one standard deviation in second.)

Species	*Hyla cruentomma*		*Hyla baumgardneri*	
Sex N	♂ 25	♀ 15	♂ 25	♀ 3
Snout-vent Length (SVL)	24.8 – 27.7 26.4±0.76	25.8 – 30.6 28.0±1.16	20.2 – 23.9 21.9±0.82	20.8 – 24.3 22.4
Tibia Length/SVL	0.43 – 0.50 0.46±0.03	0.44 – 0.52 0.48±0.05	0.44 – 0.50 0.47±0.03	0.42 – 0.49 0.46
Foot Length/SVL	0.37 – 0.43 0.40±0.03	0.39 – 0.42 0.40±0.06	0.36 – 0.42 0.39±0.02	0.38 – 0.39 0.39
Head Length/SVL	0.31 – 0.35 0.33±0.06	0.31 – 0.37 0.33±0.02	0.30 – 0.35 0.32±0.02	0.32 – 0.33 0.33
Head Width/SVL	0.31 – 0.35 0.33±0.09	0.30 – 0.34 0.32±0.02	0.29 – 0.34 0.31±0.01	0.30 – 0.32 0.31
Tympanum/Eye	0.34 – 0.52 0.44±0.17	0.39 – 0.68 0.48±0.07	0.40 – 0.60 0.47±0.04	0.38 – 0.48 0.43

extant types of the nominal species in the *Hyla rubra* group, showed that the unknown *Hyla* was different from any named species. In allusion to the horizontal red streak through the iris, I propose that the specific name be derived from the Greek—*cruentos*, meaning bloody, and *omma*, meaning eye:

*Hyla **cruentomma*** n. sp.

Holotype.—University of Kansas Museum of Natural History (KU) 126587, an adult male, from Santa Cecilia on the Río Aguarico, Provincia Napo, Ecuador (0° 02′ N–76° 58′ W), elevation 340 m; obtained on 2 May 1969, by William E. Duellman.

Paratopotypes.—KU 105157, 105163, 105167, 105180, 105182, 107022–4, 109508, 109512–17, 109519–21, 111923–60, 123098–113, 123129, 126588–608, UMMZ 129321 (8).

Diagnosis.—*Hyla cruentomma* is a moderately small species (snout-vent to 27.7 mm in males, 30.6 mm in females) having 1) a rounded snout, 2) relatively short, robust limbs, 3) no webbing on hand, 4) toes about one-half webbed, but webbing vestigial between first and second toes, 5) skin on dorsum smooth, 6) dorsum yellow, tan, or pale green usually with dark brown dorsal markings, most often consisting of a canthal stripe, interorbital bar, transverse bars on thighs and forearms, and irregular longitudinal marks on the body, 7) no bold vertical dark bars or mottling enclosing yellow spots on the posterior surfaces of thighs, 8) bright yellow vocal sac and no nuptial excrescences in breeding males, 9) silvery bronze iris with a median horizontal red streak, 10) green bones, 11) generalized pond-type tadpole with 2/3 tooth rows and a red streak through a pale golden eye, 12) mating call consisting of a single, moderately long, fast-pulsed note.

Superficially *Hyla cruentomma* resembles two other *Hyla* in the upper Amazon Basin—*Hyla rubra* Laurenti and *Hyla funerea* (Cope). Of the aforementioned characters, *H. cruentomma* shares 1, 2, 3, 4, 8, and 10 with both *H. rubra* and *H. funerea*; it differs from both in characters 9 and 11. *Hyla rubra* is slightly larger (snout-vent to 33.6 mm in males, 40.1 mm in females from Amazonian Ecuador); it is like *H. cruentomma* in having smooth skin on the dorsum, but differs from *H. cruentomma* by having a dorsal coloration of olive-green or brown longitudinal stripes on a pale green, gray, or tan ground color and by having bold dark brown or black mottling enclosing bright yellow or yellow-orange spots in the groin and on the posterior surfaces of the thighs. *Hyla funerea* is also slightly larger than *H. cruentomma* (snout-vent to 35.1 mm in males, 38.6 mm in females); it is very much like *H. cruentomma* in dorsal coloration, except that the pattern is always distinct in *H. funerea*, which differs from *H. cruentomma* by having small tubercles on the dorsum. In life the posterior surfaces of the thighs are uniform

TABLE 2. COMPARISONS OF MATING CALLS OF THREE SPECIES OF *Hyla*. (In each set of statistics observed range is given in first line and mean in second.)

Species	*H. cruentomma*	*H. baumgardneri*	*H rubra*
Locality	Santa Cecilia, Ecuador	Belém, Brazil	Santa Cecilia, Ecuador
N (individuals)	1	5	5
N (notes)	2	15	15
Note Repetition Rate (min.)	4	13–32	90–120
		22.7	108
Duration of Note (sec.)	0.35–0.37	0.53–0.70	0.12–0.15
	0.36	0.62	0.13
Pulse Rate (sec.)	160–170	170–180	61–65
	165	176	63
Dominant Frequency (hz.)	3200–3400	4100–4600	1545–1636
	3300	4413	1581

green in *H. cruentomma*, whereas they are yellow or pale green with dark brown or black spots or streaks in *H. funerea*. Members of the *Hyla parkeri* group (*H. parkeri* Gaige and *H. madeirae* Bokermann in the upper Amazon Basin and *H. baumgardneri* Rivero in the lower Amazon Basin) are smaller (males less than 24 mm snout-vent), have more acuminate snouts; these species have a greenish gray dorsum marked with continuous dorsolateral dark streaks, no markings on the posterior surfaces of the thighs, and no red streak in the iris.[1] *Hyla cruentomma* closely resembles *Hyla baumgardneri* in habitus, but the former has a different mating call (Tables 1 and 2, Fig. 4). The mating calls of *Hyla rubra* and its close relatives, such as *H. elaeochroa*, consists of series of short, slowly pulsed notes (Duellman, 1970), whereas calls of members of the *Hyla parkeri* group consist of a single longer, fast-pulsed note (pers. obs.); the call of *H. funerea* is unknown. The presence of a red horizontal streak in the iris is uniquely diagnostic of *H. cruentomma*. Members of the *Hyla parviceps* group in the upper Amazon Basin (*H. bokermanni* Goin, *H. parviceps* Boulenger, *H. rondoniae* Bokermann) have a pale silvery gray iris with a red ring around the pupil.

Description.—Based on the type series (see Table 1 for measurements and proportions): head about same width as body; snout slightly longer than length of eye, rounded in dorsal and lateral profiles, barely projecting beyond margin of lips; nostrils three-fourths distance from eyes to tip of snout, protuberant dorsolaterally; internarial area deeply depressed; canthus rostralis round; loreal region barely concave; lips thin, slightly flared; supratympanic fold weak, not or barely covering upper edge of tympanum; tympanic ring present; tympanum distinct, posteroventral to eye, separated from eye by distance about equal to length of tympanum; pupil horizontally elliptical.

Axillary membrane absent; forearms normal; ulnar fold and tubercles absent; dermal fold on wrist weak, fingers short, bearing discs slightly wider than long; width of disc on third finger equal to length of tympanum; subarticular tubercles large, conical; supernumerary tubercles few, low, indistinct, on proximal segments of digits; palmar tubercle low, elliptical; prepollex slightly enlarged, lacking nuptial excrescence in breeding males; webbing absent between fingers. Hind limbs relatively short, robust; heels of adpressed limbs overlapping by about one-fifth length of shank; tibiotarsal articulation extending no farther than middle of eye; transverse dermal fold on heel thin; calcar, tarsal folds or tubercles absent; inner metatarsal tubercle ovoid, flat, not visible from above; outer metatarsal tubercle absent; toes short, bearing discs slightly smaller than discs on fingers; subarticular tubercles moderately large, round; supernumerary tubercles small, low, indistinct, in one row on proximal segment of each digit,

[1] *Hyla baumgardneri* Rivero was named from Territorio Amazonas, Venezuela. The largest male in the type series has a snout-vent length of 29 mm, and the largest female, 32 mm—notably larger than specimens from Belém, Brazil, that I am using for comparison with *Hyla cruentomma*. I have compared topotypic *H. baumgardneri* with series from Belém and find no differences other than size.

Fig. 1. Dorsal coloration of *Hyla cruentomma* showing variation in pattern; from left to right: KU 126597, 126598, 126589, 126607, 126606. ×2.

webbing vestigial between first and second toes, extending from base of penultimate phalanx of second to middle of antepenultimate phalanx of third, from base or middle of penultimate phalanx of third to base of antepenultimate phalanx of fourth and on to middle or distal end of penultimate phalanx of fifth toe.

Anal opening directed posteroventrally near upper level of thighs; anal sheath short; tubercles and folds below anal opening absent; skin on belly and proximal posteroventral surfaces of thighs weakly granular; skin on other surfaces smooth. Tongue cordiform, shallowly notched posteriorly, barely free behind; dentigerous processes of prevomers short, transverse elevations between large triangular choanae; total number of prevomerine teeth 8–12 ($\bar{x}$ 10.6) in 25 males, 10–13 ($\bar{x}$ 11.5) in 15 females; vocal slits extending from midlateral base of tongue to angles of jaws; vocal sac single, median, subgular, extending laterally beyond margins of jaws when inflated.

Coloration in preservative (Fig. 1): Dorsal ground color pale creamy tan or gray, or brown; dorsal markings dark brown, showing the following variations (percentage of specimens in each category in parentheses): 1) dark mottling or irregular blotches on head and body; canthal stripe distinct; interorbital bar present; crossbars on shanks and forearms (36%); 2) dark canthal, supratympanic and short paravertebral stripes anteriorly; dark spots or longitudinal dashes posteriorly; interorbital bar present; crossbars on shanks and forearms (20%); 3) dark canthal, supratympanic, paravertebral, and broad dorsolateral stripes extending to groin; interorbital dark bar present; crossbars on shanks and forearms present or absent (25%); 4) dark canthal stripe present; dorsum covered with small dark flecks; weak crossbars on shanks and forearms (8%); 5) no dorsal pattern except for weak crossbars on shanks and forearms (12%). Flanks plain creamy white (48%) or marked with small brown spots (52%); dorsal surfaces of thighs pale, unmarked (12%), brown (48%), or brown with darker brown spots or mottling (40%); margin of upper lip pale brown (24%) or white with small brown flecks (76%), ventral surfaces immaculate.

Coloration in life (quoted from field notes): "When collected [at night] pale yellow above with indistinct tan dorsolateral stripes. Later [day] changed to tan with olive-brown markings. Vocal sac bright yellow. Iris pale bronze with median horizontal reddish copper streak. Palpebrum clear. Bones green." (W. E. Duellman; 25 Nov. 1966; KU 107022–4). "Dorsum varies from yellow to brown to tan to gray-green with or without distinct markings. Markings are brown to yellow-brown to greenish brown. Flanks yellow with or without brown spots. Iris silver with red horizontal streak. Posterior surfaces of thighs yellow-brown. Vocal sac deep yellow; venter pale yellow (males). Belly and throat of female white."

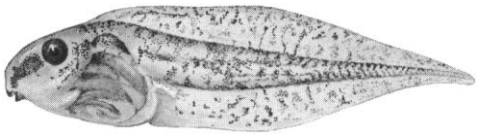

Fig. 2. Tadpole of *Hyla cruentomma*, KU 125932. × 2.5.

(John D. Lynch; 26 June 1967; KU 111930–54). "Yellow above indistinctly mottled with pale brown. Anterior and posterior surfaces of thighs, inner surfaces of limbs and most of venter unpigmented; some white pigment present in pectoral and midventral regions. Iris silvery bronze and darker dorsally than ventrally; there is a horizontal reddish streak. Bones green." (W. E. Duellman; 2 May 1969; KU 126587–holotype).

Tadpoles.—Tadpoles in developmental stages 21 to 44 are available. The following description is based on a typical tadpole in stage 30 (KU 125932) having a body length of 8.8 mm and a total length of 28.2 mm: Body widest at level of eyes, slightly deeper than wide; snout truncate, rounded laterally in dorsal profile, round in lateral profile; eyes moderately large, widely separated, directed anterolaterally, about midway between eyes and tip of snout; spiracle sinistral; spiracular opening directed posterodorsally at point just below midline at about two-thirds length of body; cloacal tube dextral. Caudal musculature slender, gradually tapering to end of tail; fins deep; dorsal fin deepest; at midlength of tail dorsal fin twice depth of caudal musculature; dorsal fin extending well onto body (Fig. 2).

Mouth anteroventral, small, less than one-half greatest width of body; lips folded laterally; median part of upper lip bare; two rows of papillae ventrolaterally; rest of lips bordered by single row of small papillae; secondary irregular row of papillae in lateral folds; two upper and three lower rows of teeth; first upper row just inside labial papillae; first and second rows equal in length, extending nearly to margins of lips, slightly longer than lower rows; second upper and first lower rows interrupted medially; other rows complete; upper beak bow-shaped, medial part massive, lateral processes slender; lower beak V-shaped, massive; both beaks bearing pointed serrations (Fig. 3).

Coloration in preservative: Body and caudal musculature creamy tan with brown

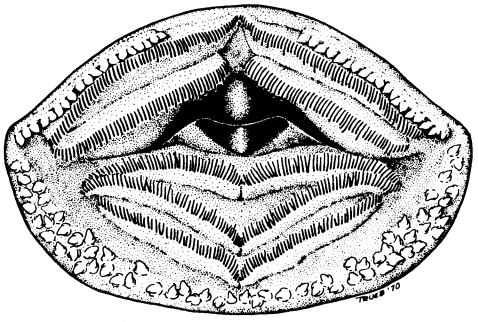

Fig. 3. Mouth of tadpole of *Hyla cruentomma*, KU 125932. × 20.

stripe from snout to eye, small clusters of brown pigment on body and tail, short, narrow brown stripes midlaterally and midventrally on anterior one-fifth of caudal musculature; fins transparent with small brown blotches and short brown streaks extending outward from musculature; belly clear.

Coloration in life (quoted from field notes): "Venter white with silvery sheen. Body pale olive-tan; musculature pale yellow and fins transparent, both with brown flecks. Iris bronze with red horizontal streak." (W. E. Duellman; 27 April 1969).

Pigmentation increases with age. Tadpoles in stage 21 have a dark stripe from the snout to the eye and small spots on the caudal musculature. Older tadpoles (stages 37–40) have brown streaks on the anterior one-half of the caudal musculature; dense spots and a dark network are present on the fins.

Four recently metamorphosed young have snout-vent lengths of 11.2–12.2 mm ($\bar{x}$ 11.7 mm). Dark brown canthal and supratympanic stripes are evident in preserved specimens. In life the young were olive-green with brown flecks dorsally. Diffuse creamy yellow dorsolateral stripes were present. The flanks were brown; the thighs were pale greenish yellow, and the venter was greenish white. The iris was bronze with a red horizontal streak.

Mating Call.—The call of *Hyla cruentomma* consists of a single moderately long, poorly modulated, fast-pulsed note. Only one analyzable recording is available (KU Tape 702; fig. 4). In this recording three notes are 15 and 17 seconds apart. Two analyzable notes have durations of 0.35 and 0.37 a sec, 8 and 10 harmonics at about 400 and 380 hz apart, and 160 and 170 pulses/

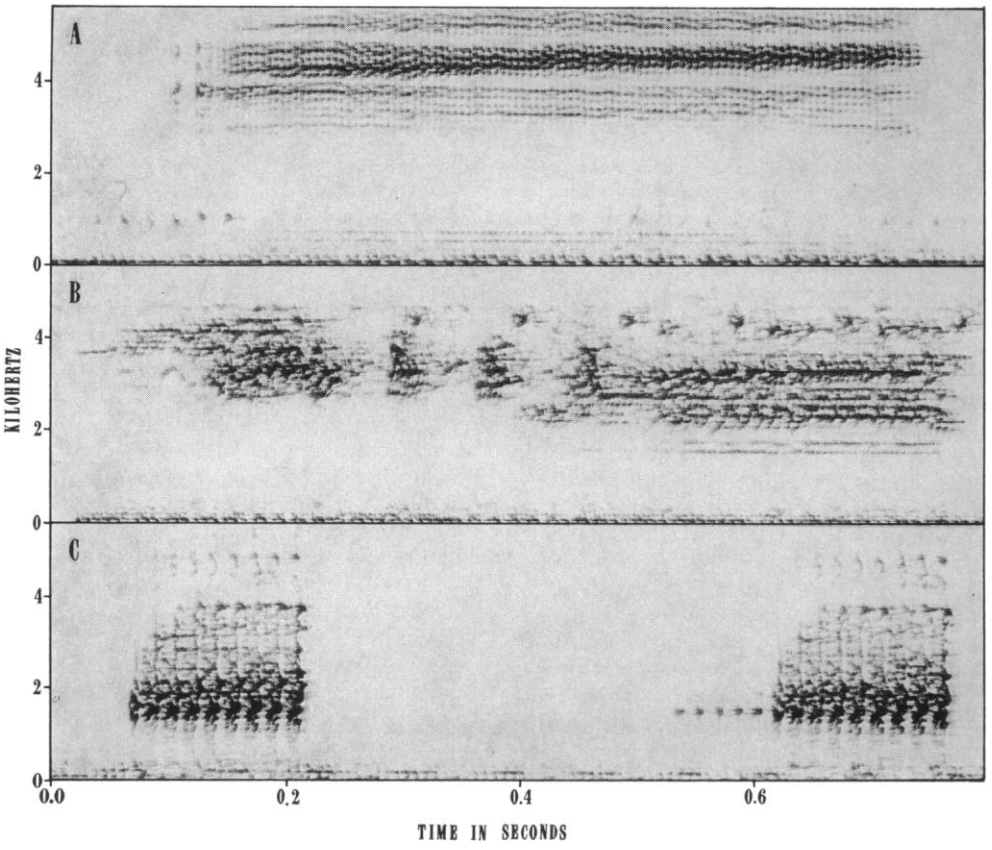

Fig. 4. Audiospectrograms of mating calls: A. *Hyla baumgardneri*, KU Tape 898. B. *Hyla cruentomma*, KU Tape 702. C. *Hyla rubra*, KU Tape 612.

sec. In the first note the sixth harmonic at about 3400 hz is dominant.

Behavior and Ecology.—Hyla cruentomma has been collected in March through November. Three individuals were found by day in coiled young leaves of wild plantains (Musaceae: *Heliconia*); another was in a bromeliad, and one on a bush. Two individuals were retrieved from felled trees. Many individuals were found on low trees or bushes in the rainforest at night. Breeding choruses were found at Santa Cecilia on 26 June 1967, 8 June 1968, 13 July 1968, 2 May 1969, 14 May 1969, and 19 May 1969.

Calling males were found at two sites at Santa Cecilia—a shallow grassy pond in a large clearing in the forest and a small *Heliconia*-choked swamp in the forest. At the former site *H. cruentomma* called at the same time as *H. bifurca, garbei, lanciformis, punctata, rubra,* and *triangulum*. In the *Heliconia* swamp, *H. cruentomma* was calling with *H. parviceps, rhodopepla, rondoniae,* and *sarayacuensis*. Calling males of *H. cruentomma* are extremely wary; they stop calling at the slightest disturbance and take refuge in dense vegetation. This behavior and their relative soft voice makes them extremely difficult to record. Males usually call head down on leaves or broad blades of grass that are covered by other leaves or blades; thus they usually are secluded when calling. A clasping pair was found on grass in the pond in the clearing on 19 May 1969.

Tadpoles were found in a shallow grassy pond in April, May, and June. The tadpoles swim just below the surface in shallow water. When disturbed they seek refuge amidst aquatic grasses. The amplectant pair obtained on 19 May 1969 was placed in a plastic bag containing water. The next morning approximately 80 eggs had been

deposited. The diameter of the ovum is 1.34–1.43 mm ($\bar{x}$ 1.38 mm; N = 10); the diameter of the envelope is 1.51–1.59 mm ($\bar{x}$ 1.56 mm). The eggs hatched on the night of 21 May 1969.

Distribution.—*Hyla cruentomma* is known from elevations of 150 to 1140 m in the rainforest of the upper Amazon Basin in Ecuador and Perú. Locality records for the 122 specimens examined are: ECUADOR: *Provincia Napo*: Lago Agrio, KU 126609–10; Limón Cocha, UIMNH 88000, 88032, 90053–4, 90106; Santa Cecilia, AUM 8100–1, 8103–10, 8112, 8122–3, 8135, KU 105157, 105163, 105167, 105180, 105182, 107022–4, 109508, 109515–7, 109515–21, 111923–60, 123098–113, 123129, 125928 (eggs), 125929–32 (tadpoles), 126587–608. *Provincia Pastaza*: Mera, KU 120976. PERÚ: *Departamento Loreto*: Colonia Calleria, Río Calleria, 15 km from Río Ucayali, CAS 93188; Pebas, CAS-SU 3161.

Remarks.—Probably no group of South American *Hyla* is so poorly understood taxonomically as the *Hyla rubra* complex, which includes such diverse assemblages as the *Hyla boulengeri* group, *Hyla catherinae* group, *Hyla parkeri* group, and the *Hyla rubra* group. *Hyla cruentomma* shares some characters with species classically placed in the *Hyla rubra* group (*sensu stricto*) and those in the *Hyla parkeri* group. The general structure and coloration of the adults and the characters of the tadpoles of *H. cruentomma* associate the species with the *Hyla rubra* group, whereas the mating call is more like that of species in the *Hyla parkeri* group (Table 2). Thus, *H. cruentomma* may represent a phylogenetic link between the *parkeri* and *rubra* groups; however, no conclusions can be reached until the adults, tadpoles, and mating calls of all members of both groups are known.

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