THE IDENTITIES OF SOME ECUADORIAN HYLID FROGS

WILLIAM E. DUELLMAN

ABSTRACT: The identities of eight nominal species of hylid frogs are discussed. These are recognized as comprising three species; each is redescribed on the basis of series of fresh material. Hyla quinquefasciata Fowler, 1913, is a member of the Hyla rubra group occurring on the Pacific lowlands of Ecuador and Colombia; it is most like the Central American Hyla elaeochroa, from which it differs in coloration. Hyla funerea (Cope, 1874) is known from the upper Amazon Basin in Eucador and Perú; it is a member of the Hyla rubra group (sensu lato); Hyla depressiceps Boulenger, 1882, and Hyla rubra inconspicua Melin, 1941, are junior synonyms. Hyla pellucens Werner, 1901, is a member of the Hyla albomarginata group occurring on the Pacific lowlands of Ecuador and Colombia and is most closely related to the Central America Hyla rubra furfitela, from which it differs in coloration and Goin, 1970, and Hyla guibei Cochran and Goin, 1970, are junior synonyms.

In the latter part of the nineteenth and early part of the twentieth centuries, several frogs were named from Eucador and Perú; some of these were based on single specimens which lacked precise locality data. Field work in Ecuador by myself and my associates resulted in series of specimens that are assignable to three species, which previously had been known only from the type specimens. I have examined all of these type specimens and compared them with freshly preserved material.

In the present paper diagnoses and descriptions of these poorly known species are provided; where appropriate, notes on the life histories, mating calls, and distributions are given. Ecuadorian localities are shown on the accompanying map (Fig. 1).

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FIG. 1. Map of Ecuador, showing localities mentioned in the text. Localities are numbered from northwest to southeast and listed here alphabetically within provinces: *Esmeraldas*: Carondelet (2), San Javier (3), San Lorenzo, (1); *Guayas*: Balao Chico (19), Bucay (18), Daule (15), Durán (17), Guayaquil (16); Los Ríos: Quevedo (11); Manabi: Palmer (7); Napo: Dureno (5), Limón Cocha (10), Santa Cecilia (4); Pastaza: Río Pastaza (13), Sarayacu (14); Pinchincha: Mindo (6), Santo Domingo de los Colorados (8), Tandapi (9); Tungurahua: Ambato (12).

Linda Trueb, and Charles F. Walker. I am further indebted to Linda Trueb for the illustrations.

Hyla quinquefasciata Fowler

Hyla quinquefasciata Fowler, 1913:160. Holotype ANSP 18115. From "Mountains above Chimbo, 10,000 to 10,800 feet elevation, Ecuador" (in error; see Remarks); Samuel N. Rhoads collector.

The holotype is an adult male having a snout-vent length of 30.0 mm. The specimen is moderately well preserved, and although faded, the color pattern of longitudinal marks on the dorsum is evident. On 29 March 1967 Linda Trueb and I obtained two specimens of a *Hyla rubra*-like frog at Santo Domingo de los Colorados, Ecuador. Subsequent collections from the Pacific lowlands of Ecuador resulted in 18 additional specimens. Comparison of these with the

holotype of *Hyla quinquefasciata* revealed that our specimens were the same species. Several additional specimens have been discovered in museum collections.

Hyla quinquefasciata is a moderately small (35 mm snout-vent length in both sexes) frog with a pale green or tan dorsum with five dark brown or olive-green irregular stripes and a T-shaped interorbital mark; the thighs are uniform pale green or greenish vellow. The snout is elongate and acutely rounded, and the webbing is vestigial between the first and second toes. Hula quinquefasciata is a member of the Hyla rubra group (sensu stricto). It differs from Hyla rubra Laurenti of Panamá and South America east of the Andes by lacking black mottling and yellow spots in the groin and on the posterior surfaces of the thighs. Hyla quinquefasciata is similar to the Central American Hyla elaeochroa Cope in size and coloration, but consistent differences obtain: the dorsal stripes are usually continuous in *quinquefasciata* (fragmented or absent in elaeochroa), a T-shaped dark mark is present on the head in quinquefasciata (triangular mark in elaeochroa), and the dorsal ground color is more brown or green in *quinquefasciata* (vellow in elaeochroa).

Description.—The following description is based on 17 adults from Santo Domingo de los Colorados, Ecuador; measurements and proportions of 11 males (means in parentheses) precede those of 6 females.

Size moderately small; snout-vent length 29.6-34.0 (32.0), 31.9-35.2 (34.4) mm; ratio of tibia length to snout-vent length 0.472-0.511 (0.497), 0.456-0.507 (0.488); ratio of foot length to snout-vent length 0.412-0.450 (0.430), 0.385-0.446 (0.419); ratio of head length to snout-vent length 0.324-0.351 (0.336), 0.329-0.342 (0.336); ratio of head width to snout-vent length 0.318-0.338 (0.330), 0.310-0.342 (0.324); ratio of interorbital distance to head width 0.238-0.290 (0.266), 0.246-0.277 (0.258); ratio of length of tympanum to length of eye 0.467-0.645 (0.531), 0.472-0.567 (0.519).

Head no wider than body; snout half again length of eye, depressed, acutely rounded in dorsal and lateral profiles, protruding beyond edge of lip; nostrils three-fourths distance from eyes to tip of snout, noticeably protuberant laterally; internarial region depressed; canthus rostralis round, barely evident; loreal region slightly concave; lips moderately thin and flared; supratympanic fold thin, barely obscuring 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; arms slender; ulnar fold and tubercles absent; dermal fold on wrist weak; fingers long, bearing wide, slightly truncate discs; width of disc on third finger greater than length of tympanum, subarticular tubercles low, round, none bifid; supernumerary tubercles small, present in single row on proximal segment of each digit; palmar tubercle large, deeply bifid; pollical tubercle elongate; prepollex moderately enlarged, not bearing nuptial excrescence in breeding males; webbing absent between first and second fingers, vestigial between other fingers. Hind limbs moderately short, robust; heels of adpressed limbs overlapping by about one-half length of shank; tibiotarsal articulation extending to point between middle and anterior edge of eye; thin transverse dermal fold on heel; calcar, tarsal tubercles, and



FIG. 2. Upper, Hyla quinquefasciata, KU 121013. Lower, Hyla funerea, KU 123122. Both $2 \times .$

tarsal folds absent; inner metatarsal tubercle small, conical; toes moderately long; discs slightly smaller than those on fingers; subarticular tubercles moderate in size, round; supernumerary tubercles large, conical, in single row on proximal segment of each digit; toes about two-thirds webbed; webbing vestigial between first and second toes, extending from middle of penultimate phalanx of second to distal end of antepenultimate phalanx of third, from distal end of penultimate phalanx of third to distal end of antepenultimate phalanx of fourth and onto distal end of penultimate phalanx of fifth toe.

Anal opening directed posteriorly at level of upper edge of thighs; anal flap short; skin on belly and proximal posteroventral surfaces of thighs granular; skin on other surfaces smooth. Tongue elliptical, shallowly notched posteriorly, barely free behind; dentigerous processes of prevomers weakly arched, widely separated elevations between posterior margins of small ovoid choanae; total number of prevomerine teeth 9–12 ($\bar{x} = 10.8$) in 11 males, 12–13 ($\bar{x} = 12.3$) in 6 females; vocal slits long, extending posterolaterally from posterolateral base of tongue, vocal sac single, median, subgular, and greatly distensible.

Coloration (in preservative): Dorsum tan to grayish brown with dark



TIME IN SECONDS

FIG. 3. Audiospectrograms of mating calls: (A) Hyla quinquefasciata, KU Tape No. 610, band width 40 hertz; recorded at Santo Domingo de los Colorados, Ecuador, 31 March 1967; air temperature 20.5 C. (B) Hyla pellucens, KU Tape No. 609, band width 40 hertz; recorded at Santo Domingo de los Colorados, Ecuador, 29 March 1967; air temperature 24 C.

brown markings (narrowly outlined by creamy tan in some individuals); dorsal markings consisting of: (1) a T-shaped mark on head with arms of T terminating on anterolateral edges of eyelids and base terminating in occipital region; (2) median dark stripe extending from mid-scapular region to point between sacrum and vent (continuous with base of T in two specimens; fragmented into spots posteriorly in three specimens); (3) dorsolateral dark stripe extending from point immediately posteromedial to eyelid to sacrum (confluent with lateral stripe in some specimens); (4) lateral dark stripe extending from tip of snout along canthus to eye and thence from posterior corner of eye to groin (irregular posteriorly in some specimens). Dorsal surfaces of limbs grayish brown with faint, narrow, darker brown transverse marks in some specimens; anterior and posterior surfaces of thighs uniform dull brown (irregularly shaped cream mark on proximal posterior surfaces in two specimens); webbing gray; ventral surfaces, flanks, and margin of upper jaw creamy white (Fig. 2).

Coloration (in life): Dorsum pale green or tan with brown or olive-green markings; anterior and posterior surfaces of thighs uniform pale green or greenish yellow; venter pale yellow in females, white in males; vocal sac bright yellow; iris reddish bronze, usually paler ventrally; palpebrum clear; bones green.

Mating Call.—The call consists of a series of short, pulsed notes. Audiospectrographic analysis of one recording reveals a note repetition rate of 72 notes per minute. In four notes the duration of notes is 0.14–0.15 ($\bar{x} = 0.145$) of a second, 60–70 ($\bar{x} = 65$) pulses per second. There are 8 harmonics; the fundamental frequency is about 650 hertz, and the dominant frequency is about 1300 hertz (Fig. 3a).

Remarks.—All specimens from the vicinity of Santo Domingo de los Colorados were obtained in disturbed areas. Males were calling

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from a clump of bamboo on the night of 31 March 1967, and from stems of herbs in a banana grove on the night of 4 August 1968. On 29 March 1967, one individual was obtained from a bromeliad by day. On 8 July 1970, John D. Lynch found eight individuals on vegetation in banana and cacao fields near Quevedo. Two specimens (USNM 142252–142253) have distended vocal sacs and undoubtedly were calling; they were obtained by G. P. Frymire on 29 January 1960. T. Papenfuss obtained calling males on 4 March 1964.

Fowler (1913:160) stated that the holotype came from the "mountains above Chimbo, 10,000 to 10,800 feet elevation." The specimen was collected by Samuel N. Rhoads, whose field label in the jar with the holotype is inscribed "Hyla Duran, Ec., 2/12/1911." Durán is in Guayas Province, just east of Guayaquil. Hyla quinquefasciata is a member of the Hyla rubra group, members of which are confined to lowlands, usually at elevations of less than 1500 m. The only hylids known from elevations over 10,000 ft (3080 m) in Ecuador are species in the Gastrotheca marsupiata complex. Fowler apparently erred in his statement of the type locality of Hyla quinquefasciata; there is no reason to challenge Rhoads' label. The type locality of Hyla quinquefasciata is Durán, Guayas Province, Ecuador.

One specimen (USNM 164300) apparently has erroneous locality data, "Ambato: stream below Villa Hidalgo, Ecuador," a locality in the Ecuadorian Andes. This specimen is included in a collection made by Cecil Warren in 1967; other specimens of *Hyla* in the collection are from Guayas Province.

Eight specimens from various localities in the Intendencia de Chocó, Colombia, differ slightly from the Ecuadorian specimens. In the Colombian specimens the T-shaped mark on the head is not distinct. I have not seen living specimens from Colombia, but preserved specimens are quite similar to *Hyla elaeochroa* Cope. That species is known from humid forested lowlands in Nicaragua, Costa Rica, and extreme western Panamá. Intensive collecting in central and eastern Panamá has not revealed *Hyla elaeochroa* in that part of Panamá, which is inhabited by the related *Hyla rubra*.

Ten specimens of a Hyla rubra-like frog from the Pacific lowlands of Ecuador are not Hyla quinquefasciata. These specimens (USNM 164305-11, 7 km S Daule; USNM 16422, 40 km E Durán; USNM 164334-5, 15 km W Guayaquil) have snout-vent lengths of 25-26 mm, a mottled pattern on the posterior surfaces of the thighs, and a dorsal pattern reminiscent of that of the Middle American Hyla staufferi Cope. These may be juveniles of Trachycephalus jordani (Stejneger and Test) or they may represent a distinct species. I prefer not to associate a name with them until additional specimens and biological data are available.

Specimens Examined.—Fifty-three, as follows: COLOMBIA:

Intendencia Chocó: Andagoya, BMNH 1915.10.21.71; Arquía, Río Atrato, LACM 47092–5; Puerto Palacios, Río Arquía, LACM 47096– 97; Quibdó, LACM 47091. ECUADOR. Provincia Esmeraldas: Carondelet, Río Bogotá, UIMNH 53585; San Javier, BMNH 1907.3. 29.65; San Lorenzo, UIMNH 63137–8. Provincia Guayas: Bucay, USNM 142252–3; Durán, ANSP 18115; 10 km E Guayaquil, MVZ 77191–3; 70 km E Guayaquil, MVZ 77194–96. Provincia Los Ríos: 4 km N Quevedo, KU 130131–38. Provincia Pichincha: Hacienda Espinosa, 9 km W Santo Domingo de los Colorados, CAS-SU 10557– 59; Santo Domingo de los Colorados, KU 109524–25, 121013–26; Tandapi, KU 111891. Provincia Tungurahua: Ambato, stream below Villa Hidalgo, USNM 164300 (erroneous locality).

Hyla funerea (Cope)

Scytopis funereus Cope, 1874:123. Syntypes ANSP 11396–97 from Moyobamba, Departamento San Martín, Perú; James Orton collector.

Hyla funerea-Boulenger, 1882:404.

Hyla depressiceps Boulenger, 1882:402. Syntypes BMNH RR 1947.
2.13.52–53 from "Ecuador"; Mr. Buckley collector. New synonymy.
Hyla rubra inconspicua Melin, 1941:34. Holotype NHMG 480 from Roque, Departamento San Martín, Perú; Douglas Melin collector.

New synonymy.

The syntypes of *Scytopis funereus* are adult females having snoutvent lengths of 40.1 and 40.5 mm. The types are faded and rubbed dorsally, but structural characters and general color pattern are evident. A series of frogs corresponding to the types of *Scytopis funereus* was collected at Santa Cecilia, Provincia Napo, Ecuador. Subsequent comparison of fresh specimens with the type of *Scytopis funereus*, *Hyla depressiceps*, and *Hyla rubra inconspicua* indicates that all are representatives of a single species.

Hyla funerea is a member of the Hyla rubra group as evidenced by its acuminate snout, short robust legs, and vestigial webbing between the first and second toes. It differs from members of the boulengeri subgroup by having less tuberculate skin dorsally and by lacking vertical dark bars on the thighs. Hyla funerea differs from Hyla rubra by lacking black reticulations enclosing yellow or orange spots in the groin and on the posterior surfaces of the thighs. In general appearance, Hyla funerea resembles H. catherinae of southeastern Brasil, but funerea is less tuberculate and lacks the blue or deep yellow flash colors of catherinae.

Description.—The following description is based on 31 adults from Santa Cecilia, Ecuador; measurements and proportions of 16 males (means in parentheses) precede those of 15 females.

Size moderate; snout-vent length 28.7-35.1 (32.4), 34.2-38.6 (36.1); ratio of tibia length to snout-vent length 0.470-0.549 (0.510), 0.504-0.532 (0.515);

ratio of foot length to snout-vent length 0.409-0.444 (0.425), 0.391-0.455 (0.417); ratio of head length to snout-vent length 0.330-0.380 (0.356), 0.354-0.380 (0.365); ratio of head width to snout-vent length 0.321-0.352 (0.336), 0.334-0.353 (0.344); ratio of interorbital distance to head width 0.231-0.283 (0.253), 0.229-0.266 (0.248); ratio of length of tympanum to length of eye 0.473-0.613 (0.541), 0.526-0.733 (0.594).

Head slightly wider than body, except in gravid females; snout half again as long as eye, acutely rounded in dorsal and lateral profiles, protruding beyond margin of lip; nostrils three-fourths distance from eyes to tip of snout; slightly protuberant dorsolaterally; internarial area noticeably depressed; canthus rostralis round; loreal region deeply concave; lips thin, flared; supratympanic fold thin, barely covering upper edge of tympanum; tympanic ring present; tympanum distinct, posteroventral to eye, separated from eye by distance slightly less than length of tympanum; pupil horizontally elliptical.

Axillary membrane absent, forearms normal; ulnar fold and tubercles absent; dermal fold lacking on wrist; fingers moderately long; discs wider than long; width of disc on third finger slightly greater than length of tympanum; subarticular tubercles large, round; none is bifid; supernumerary tubercles small, in one row on proximal segments of digits; palmar tubercle cordiform; prepollex only slightly enlarged, lacking horny nuptial excrescence in breeding males; webbing absent between first and second fingers, vestigial between other fingers. Hind limbs short, robust; heels of adpressed limbs overlapping by nearly one-third length of shank; tibiotarsal articulation extending to middle of eve; thin transverse dermal fold on heel; calcar absent; row of low tubercles on outer edge of tarsus; inner metatarsal tubercle ovoid, elevated, visible from above; outer metatarsal tubercle elliptical; supernumerary tubercles large, round; supernumerary tubercles small, conical, in one row on proximal segments of digits; discs ovoid, smaller than those on fingers; first and second toes webbed basally; webbing extending from distal end of penultimate phalanx of second toe to base of penultimate phalanx of third, from distal end of penultimate phalanx of third to base of penultimate phalanx of fourth toe and on to distal end of penultimate phalanx of fifth toe.

Anal opening directed posteroventrally near upper level of thighs; anal sheath short; anal opening bordered below by vertical rows of small tubercles; skin on belly and proximal posteroventral surfaces of thighs granular; skin on other surfaces smooth with small, low tubercles on head, body, shanks, and forearms. Tongue ovoid, shallowly notched anteriorly and posteriorly, not free behind; dentigerous processes of prevomers small, transverse elevations, narrowly separated medially, lying between large ovoid choanae; total number of prevomerine teeth 9–14 ($\bar{x} = 10.6$) in 16 males and 12–16 ($\bar{x} = 13.8$) in 15 females; vocal slits large, extending from midlateral base of tongue to angle of jaws; vocal sac bilobate, subgular, distending laterally beyond margin of jaws.

Coloration (in preservative): Dorsal surfaces pale grayish brown to yellowish tan with dark brown markings; flecks on all dorsal surfaces except upper arms and shanks; interorbital bar; pair of elongate marks in scapular region (interconnected medially in 3 of 43 specimens), pair of elongate marks in sacral region (interconnected medially in one specimen), and broad canthal stripes narrowly separated medially on snout; bold spots on upper lips, three transverse bars each on thigh, shank, and tarsus; flanks creamy yellow with one or two irregular longitudinal brown stripes or series of dashes; posterior surfaces of thighs yellowish tan with dark brown spots and/or longitudinal bar; webbing mottled tan and dark brown; venter immaculate creamy yellow, except for small brown flecks on anterior part of chin in eight males. Juveniles colored like adults (Fig. 2). Coloration (in life): Dorsum pale green to greenish tan with olive-brown to dark brown markings; flanks and posterior surfaces of thighs yellow with dark brown markings; ventral surfaces creamy yellow; iris greenish bronze with black flecks; palpebrum clear; limb bones green.

Justification of Synonymy.—Although I have not directly compared the types of Hyla funerea, H. depressiceps, and H. rubra inconspicua, I have compared each of them with fresh material from Santa Cecilia, Ecuador, and I do have extensive notes, drawings, and photographs of each of the types.

The syntypes of Scytopis funereus Cope are females having snout-vent lengths of 40.1 and 40.5 mm, 14 and 15 prevomerine teeth, and basal webbing between the second, third, and fourth fingers. The specimens are soft; the loose skin on the feet gives the appearance of a tarsal fold, but this probably is an artifact of preservation. The syntypes of Hyla depressiceps Boulenger are well preserved; both are females having snout-vent lengths of 37.3 and 41.0 mm, 12 and 13 prevomerine teeth, and only vestigial webbing on the hand. There is no tarsal fold. The holotype of Hyla rubra inconspicua is a male having a snout-vent length of 44.7 mm, 11 prevomerine teeth, webbing vestigial on hand, and no tarsal fold. In structural features these five specimens are alike and differ from those from Santa Cecilia by being slightly larger. However, the differences in size are not extraordinary by comparison with known geographic variation in size in some other Amazonian Hyla.

The distinctive coloration of the population at Santa Cecilia is evident in the syntypes of *Hyla depressiceps* and in the type of *Hyla rubra inconspicua*. The syntypes of *Scytopis funereus* are so faded that the dorsal color pattern is invisible; however, the markings on the flanks and posterior surfaces of the thighs are like those of the syntypes of *Hyla depressiceps* and the specimens from Santa Cecilia.

Remarks.—Individuals of *Hyla funerea* have been found on bushes and low trees in tropical rainforest in March through August. Males with distended vocal sacs were found in April and May, but the frogs have not been observed to call. Recently metamorphosed young were found in July.

Specimens Examined.—Seventy-one, as follows: ECUADOR: No specific locality, BMNH 1947.2.13.52–53. *Provincia Napo*: Dureno, UIMNH 63139; Limón Cocha, KU 99221–22, UIMNH 53895, 54137, 63095, 80717, 88582, 90067, 90075, 90094, 90105; Santa Cecilia, KU 109522–23, 111929, 111970, 123121–28, 125949, 126393–97, UMMZ 129320. *Provincia Pastaza*: Río Pastaza, CAS-SU 5063, 5087; Río Pastaza watershed, NHRM 1954 (5); Sarayacu, ZMB 10172. PERÚ: *Departamento San Martín*: Moyobamba, ANSP 11396–97; Roque, NHMG 480.

Hyla pellucens Werner

- Hyla pellucens Werner, 1901:600. Holotype ZMB 16590 from "Palmar (100 m, westliche der Anden)" (? = Palmar, on Río Chila, Provincia Manabi), Ecuador; Richard Haensch collector.
- Hyla pulicaria Werner, 1901:601. Holotype ZMB 16591 from "Ecuador"; Richard Haensch collector. New synonymy.
- Hyla rubracyla Cochran and Goin, 1970:229. Holotype USNM 157820 from Rio Calima, near Córdoba, Departamento Valle, Colombia; Federico Medem and Coleman J. Goin collectors. New synonymy.
- Hyla guibei Cochran and Goin, 1970:233. Holotype FMNH 54773 from Pueblorico, Santa Cecilia, Departamento Caldas, Colombia; Kjell von Schneidern collector. New synonymy.

The holotype of Hyla pellucens is a small male (38.3 mm in snout-vent length). Although somewhat faded and desiccated, it can be associated with a known population on the Pacific lowlands of Ecuador and Colombia. Linda Trueb and I obtained a series of frogs at Santo Domingo de los Colorados, Pichincha Province, Ecuador, on 29-30 March 1967. Subsequent comparison of these specimens was made with the holotype of Hyla pellucens. Additional specimens were found in museum collections. John D. Lynch obtained three specimens of a small green Hula with dorsolateral white stripes at Santo Domingo de los Colorados on 3 and 4 August 1968. Comparison of these specimens with the holotype of Hyla pulicaria revealed that they are alike in morphological characters and in color pattern. In July 1970, Lynch obtained specimens at Quevedo, Ecuador, which suggest that Hyla pulicaria is an immature H. pellucens. Examination of Colombian specimens designated as the holotypes of Hyla rubracyla and Hyla guibei revealed that they are the same as H. pellucens.

Hyla pellucens is a moderately large (males to 52 mm, females to 61 mm snout-vent length) member of the Hyla albomarginata group with a projecting prepollical spine in males and predominately green dorsum. Green bones and peritoneum are characters shared with the Central American Hyla rufitela Fouquette. The latter has red webbing, blue flanks, and a green dorsum with scattered brown and black flecks and a few silvery white spots, whereas *H. pellucens* has dull yellow or pale orange webbing, white flanks with pale red flecks or spots, and a green dorsum variously marked with dark olive-brown transverse bars, reddish brown flecks, and creamy white spots narrowly bordered by red.

Size moderately large; snout-vent length 43.0-52.0 (47.2), 50.2-61.0 (57.8);

Description.—The following description is based on 28 adults from Santo Domingo de los Colorados, Ecuador; measurements and proportions of 21 males (means in parentheses) precede those of 7 females.

ratio of tibia length to snout-vent length 0.486-0.570 (0.527), 0.499-0.571 (0.533); ratio of foot length to snout-vent length 0.368-0.435 (0.403), 0.388-0.434 (0.412); ratio of head length to snout-vent length 0.333-0.370 (0.351), 0.333-0.363 (0.346); ratio of head width to snout-vent length 0.333-0.371 (0.351), 0.328-0.359 (0.346); ratio of interorbital distance to head width 0.237-0.284 (0.255), 0.219-0.274 (0.238); ratio of length of tympanum to length of eye 0.422-0.590 (0.533), 0.472-0.625 (0.549).

Head as wide as body; snout twice as long as eye, flat, round in dorsal and lateral profiles, barely protruding beyond edge of lip; nostrils four-fifths distance from eyes to tip of snout, slightly protuberant laterally; internarial region noticeably depressed; canthus rostralis round; loreal region concave; lips thin, slightly flared; supratympanic fold thin, barely obscuring upper edge of tympanum; tympanic ring present; tympanum distinct, posterior to eye, separated from eye by distance slightly less than length of tympanum; pupil horizontally elliptical.

Axillary membrane absent; forearms moderately robust; ulnar fold present; dermal fold on wrist weak; fingers moderately short, bearing round discs; width of disc on third finger equal to length of tympanum; subarticular tubercles small, flat; distal tubercle on fourth finger usually bifid; supernumerary tubercles minute, arranged in two rows on proximal segments of digits; palmar tubercle single; prepollex enlarged; prepollical spine present in males, recurved, projecting in some specimens; nuptial excrescence absent; webbing vestigial between first and second fingers, extending from middle of penultimate phalanx of second to middle of antepenultimate phalanx of third, from base of penultimate phalanx of third to base of penultimate phalanx of fourth finger. Hind limbs moderately long; heels of adpressed limbs overlapping by about one-fifth length of shank; tibiotarsal articulation extending to middle of eve; thin transverse dermal fold on heel; small calcar present; tarsal folds and tubercles absent; inner metatarsal tubercle small, elliptical, flat, visible from above, outer metatarsal tubercle absent; subarticular tubercles small, round; supernumerary tubercles minute in one row on proximal segments of digits; discs smaller than those on fingers; toes about three-fourths webbed; webbing extending from base of disc of first toe to base of penultimate phalanx of second, from base of disc of second to base of penultimate phalanx of third, from base of disc of third to base of penultimate phalanx of fourth and on to base of disc of fifth toe.

Anal opening directed posteriorly at upper level of thighs; anal flap short; vertical rows of tubercles below anal opening; skin on belly and proximal posteroventral surfaces of thighs granular; skin on other surfaces smooth. Tongue cordiform, shallowly notched posteriorly, not free behind; dentigerous processes of prevomers narrowly separated anteromedially, angulate, anterior transverse portions short, posterolateral portions long, lying between and posterior to small elliptical choanae; total number of prevomerine teeth 18–24 ($\bar{x} = 19.9$) in 21 males, 25–27 ($\bar{x} = 26.1$) in 7 females; vocal slits long, extending from midlateral base of tongue along inner margin of jaw nearly to angle of jaws; vocal sac single, median, subgular, moderately distensible.

Coloration (in preservative): Dorsum creamy tan with small dark brown flecks on head, body, and dorsal surfaces of limbs (absent on thighs in one specimen); dorsal markings variable (number of specimens in series of 28 having markings in parentheses), dark brown interorbital chevron-shaped bar with apex posteriorly (19), one or two dark brown transverse bars on body (15), irregular brown spots on body (10); dark brown canthal stripe (24), dark brown transverse bars on shank (14), dark brown transverse bars on thighs (7), white spots in addition to other markings on body (8). Flanks creamy white with large reddish brown spots in all females and six males.



FIG. 4. Hyla pellucens. Upper, subadult pattern, KU 121010, $2 \times .$ Lower, adult pattern, KU 109554, $1.5 \times .$

Ventral surfaces creamy white; reddish brown spots on anteroventral surfaces of thighs in all females and on ventral surfaces of shanks in two females. Anal area dark brown, bordered above and laterally by white stripe; webbing creamy white or dark brown (Fig. 4).

Coloration (in life): Dorsum green, variously marked with dark olivebrown transverse bars, reddish brown flecks, and creamy white spots, usually narrowly bordered by red; axilla and groin blue; flanks creamy white to bluish white with pale red flecks or spots. Posterior surfaces of thighs pale green with or without reddish brown flecks, or bluish white with reddish brown spots; webbing dull yellow flecked with brown in some individuals; ventral surfaces of limbs pale green; belly creamy white in males, creamy yellow in females; throat white with green flecks in females, green in males; iris pale golden yellow with fine black reticulations; palpebrum clear; limb bones green.

Ontogenetic Change.—Three metamorphosing young (KU 130143) have snout-vent lengths of 18.5, 20.0, and 20.5 mm. In life the dor-

sum was green washed with brown and edged dorsolaterally by rusty brown in the larger specimens. A pale yellow dorsolateral stripe was bordered below by pale green on the head and pale yellow on the flanks. The throat was pale blue, and the venter was white. The iris was pale cream washed with bronze. The coloration (in preservative) of three subadults (KU 121010–12 having snoutvent lengths of 28.7, 29.6, and 33.6 mm) is: pale creamy tan above, slightly paler below with small reddish-brown flecks in sacral region, on dorsal surfaces of head, especially eyelids, shanks and forearms; white stripe across snout below nostrils, along canthus, edge of eyelid, supratympanic fold, and dorsolateral edge of flanks to point anterolateral to anus (continuous with stripe on other side above anus in one specimen); on head narrow reddish brown line above white stripe; flanks, upper arms, thighs, hands and feet lacking markings (Fig. 4).

Coloration (in life): Dorsum of body and limbs pale green; flanks and thighs paler green; ventral surfaces very pale green; stripe from snout to anus yellow, bordered above by narrow red line; pale yellow spots in anal region; peritoneum enamel-white through body wall; bones green; iris pale rose or creamy white with rose wash; palpebrum clear.

In the juveniles and subadults there are no red spots on the flanks and thighs. In some of the smaller adults there are remnants of the dorsolateral red stripe in the form of a longitudinal series of dashes. There are no structural differences between the subadults and the adults.

Mating Call.—The call of Hyla pellucens consists of a series of short, poorly modulated notes. In one recording obtained at Santo Domingo de los Colorados, two call groups consist of seven and nine notes. The call repetition rate is 27.5 notes per minute. The notes at the end of each series are noticeably louder than those at the beginning. An audiospectrographic analysis of three notes (Fig. 3b) reveals that the duration of the notes is 0.20–0.22 ($\bar{x} = 0.207$) of a second, and there are 130–150 ($\bar{x} = 140$) pulses per second. The fundamental frequency at about 800 hertz is the dominant frequency; seven harmonics are present above the fundamental.

Comparisons.—By virtue of its green coloration, angulate dentigerous processes of the prevomers, and prepollical spine in males, *Hyla pellucens* is a member of the *Hyla albomarginata* group, consisting of *Hyla rufitela* Fouquette in lower Central America and northwestern Colombia, *Hyla albomarginata* Spix in northeastern South American and eastern Brasil, and three additional species in southeastern Brasil (*H. albofrenata* A. Lutz, *H. albosignata* A. Lutz and B. Lutz, and *H. musica* B. Lutz). The only one of these species having red markings is *Hyla rufitela*, which has uniformly red webbing, but lacks red spots on the flanks and thighs and red flecks on the dorsum.

The only other predominately green Hyla on the lowlands of Ecuador and Colombia is Hyla albopunctulata Boulenger (including *H. palmeri* Boulenger). This species is smaller (to 41 mm snoutvent length), lacks red spots and flecks, and lacks a prepollical spine in males.

Justification of Synonymy.—Except for its inclusion in checklists (Nieden, 1923; Peters, 1955), Hyla pellucens has not been discussed since its original description (Werner, 1901); Werner named Hyla pulicaria in the same paper. Cochran and Goin (1970) renamed the species twice from the Pacific lowlands of Colombia. I examined all of the type specimens and concluded that they all are representatives of one taxon for which Hyla pellucens Werner is the earliest name.

The holotype of Hyla pulicaria (ZMB 16591) is a subadult of undetermined sex having a snout-vent length of 21.6 mm. The specimen is poorly preserved and partly desiccated, but the distinctive color pattern of dorsolateral light stripe bordered above by a narrow dark line is apparent. Three specimens from Santo Domingo de los Colorados (KU 121010–12) are like the holotype in coloration and morphological characters. As shown in the preceding section on ontogenetic change, these specimens are subadults of Hyla pellucens.

Hyla rubracyla was named on the basis of two specimens, a male having a snout-vent length of 50.5 mm (holotype, USNM 157820 from Rio Calima, near Cordoba, Departamento Valle, Colombia) and a female having a snout-vent of 59.0 mm (paratype, FMNH 81922 from Agua Clara, Intendencia Chocó, Colombia). Structurally these specimens are like specimens of Hyla pellucens from Santo Domingo de los Colorados. The dentigerous processes of the prevomers are alike; the total number of prevomerine teeth in the Colombian specimens is 28 and 29 respectively. Despite Cochran and Goin's (1970:229) statement to the contrary, small tubercle-like calcars are present. The details of the hands and feet agree with those of *H. pellucens*. A minor difference in color pattern exists; the two specimens named H. rubracyla have no transverse dark markings on the body; instead there is a series of dark dashes dorsolaterally. One specimen lacks a white anal stripe; in the other a faint interrupted stripe is present. In the series from Santo Domingo de los Colorados all specimens have a white anal stripe, although it is faint in some individuals. The dorsal pattern in the specimens from Santo Domingo de los Colorados is highly variable; although in some specimens the spots tend to be linear dorsolaterally, none has a distinct dorsolateral series of dashes. The similarities between *rubracyla* and *pellucens* are much stronger than

the differences; consequently, I consider *rubracyla* to be a synonym of *pellucens*.

Cochran and Goin (1970:229) grouped Hyla rubracyla and guibei with Hyla granosa Boulenger, a widespread Amazonian species. These authors overlooked the description of Hyla pellucens and the similarities of Hyla rubracyla and guibei with the Hyla albomarginata group.

The holotype of *Hyla guibei* (FMNH 54773) is a female having a snout-vent length of 61.4 mm, 27 prevomerine teeth, and a distinct calcar. The coloration is identical to that of specimens from Santo Domingo de los Colorados. By overlooking the description of *Hyla pellucens*, Cochran and Goin inadvertently named the species again as *Hyla guibei*.

Remarks.—On the nights of 29 and 30 March 1967, many individuals of *Hyla pellucens* were found around artificial pools in a garden at Santo Domingo de los Colorados, Ecuador. Males were calling from the concrete walls of pools and from lily pads in the pools. One amplectant pair was depositing eggs in a film on the surface of the water. Three subadults were found on low vegetation at Santo Domingo on 3 and 4 August 1968. Males were calling along a stream, 4 km N Quevedo on the night of 8 July 1970. Three metamorphosing young were found on low vegetation along the same stream.

The relationships of Hyla pellucens seem to be with Hyla rufitela. The mating calls of these two species have some basic similarities but are distinctly different. Data on recordings of three rufitela from Barro Colorado Island, Panama Canal Zone, reveal that the note repetition rate is 22–63 ($\bar{x} = 38$) notes per minute, and the notes have a duration of about 0.05 of a second. The fundamental frequency is about 400 hertz, and the dominant frequency about 1600 hertz (Duellman, 1970). Thus, the call of Hyla rufitela differs from that of pellucens by having a faster note repetition rate, shorter notes, and higher dominant frequency. Differences in coloration were noted in a preceding section on comparisons.

Hyla pellucens is known from northwestern Ecuador northward to Agua Clara in west-central Colombia. Hyla rufitela occurs on the Caribbean lowlands of Central America from Nicaragua to central Panamá. Specimens from the broad hiatus of Darién, Panamá, and northern Chocó, Colombia, are needed before further comment on the relationships between these two species are justified.

Specimens Examined.—Fifty-three, as follows: COLOMBIA: Departamento Caldas: Pueblorico, near Santa Cecilia, FMNH 54773; north of Santa Cecilia, LACM 50175. Intendencia Chocó: Agua Clara, FMNH 81922. Departamento Valle: Río Calima, Córdoba, USNM 157820. ECUADOR: No specific locality, USNM 14050(2), ZMB 16591. Provincia Guayas: Hacienda Balao Chico, HERPETOLOGICA

Río Frío, UMMZ 123905. Provincia Los Ríos: 4 km N Quevedo, KU 130139–42, 130143 (young). Provincia Manabi: Palmer ZMB 16590. Provincia Pichincha: Hacienda Espinsoa, 9 km W Santo Domingo de los Colorados, CAS 10560–62; Mindo, UMMZ 55519; Santo Domingo de los Colorados, KU 109528–56, 117985–87, 121010–12.

TAXONOMIC SUMMARY

1. Hyla depressiceps Boulenger, 1882, is a junior synonym of Hyla funerea (Cope, 1874).

2. Scytopis funereus Cope, 1874, is a Hyla belonging to the rubra group (sensu lato).

3. Hyla guibei Cochran and Goin, 1970, is a junior synonym of Hyla pellucens Werner, 1901.

4. Hyla pellucens Werner, 1901, is a valid species occurring on the Pacific lowlands of Colombia and Ecuador.

5. Hyla pulicaria Werner, 1901, is a junior synonym of Hyla pellucens Werner, 1901.

6. *Hyla quinquefasciata* Fowler, 1913, is a valid species occurring on the Pacific lowlands of Colombia and Ecuador.

7. Hyla rubra inconspicua Melin, 1941, is a junior synonym of Hyla funerea (Cope, 1874).

8. Hyla rubracyla Cochran and Goin, 1970, is a junior synonym of Hyla pellucens Werner, 1901.

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Museum of Natural History, University of Kansas, Lawrence, Kansas 66044