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TAXONOMIC NOTES ON SOUTH AMERICAN COLOSTETHUS WITH DESCRIPTIONS OF TWO NEW SPECIES (AMPHIBIA, DENDROBATIDAE)

BY STEPHEN R. EDWARDS
University of Kansas, Lawrence, Kansas 66044

The family Dendrobatidae can be divided into two groups—those species lacking maxillary teeth (*Dendrobates*) and those species having maxillary teeth (*Phyllobates* and *Colostethus*). Savage (1968) studied Central American dendrobatids and separated *Phyllobates* from *Colostethus* as follows: *Phyllobates* has scattered "punctations" of black pigment in the flesh; the dorsal and ventral ground color is black; and the skin is poisonous. *Colostethus* lacks black pigmentation in the flesh; the dorsal ground color is dark brown, and the venter is white to yellow (males of some species have a black wash on the throat); and the skin is non-poisonous. The criteria of ventral coloration utilized by Savage to distinguish *Colostethus* must be amended to include species with extensive black coloration of the venter. Some of those species that Savage considered to be in the genus *Colostethus* were named in the genera *Prostherapis* and *Hylochilus*, both of which are now placed in synonymy of *Colostethus*. Therefore, by implication, all those South American species originally described in *Prostherapis* and *Hylochilus* also must be referred to *Colostethus*. Savage also indicated that many South American species named in the genus *Phyllobates* belong in *Colostethus*. Examination of type specimens, study of preserved specimens, and critical analysis of original descriptions has led me to refer the following 43 nominal species to the genus *Colostethus* (the original generic allocation is given in parentheses):
alagoanus (Phyllobates) Bokermann, 1967
alboguttatus (Phyllobates) Boulenger, 1903
anthonyi (Phyllobates) Noble, 1921
beebei (Hyloxalus) Noble, 1923
bocagei (Hyloxalus) Jiménez de la Espada, 1871
bromelicola (Phyllobates) Test, 1956
brunneus (Prostherapis) Cope, 1887
capixaba (Phyllobates) Bokermann, 1967
carioca (Phyllobates) Bokermann, 1967
chochoenstis (Hyloxalus) Boulenger, 1912
collaris (Hyloxalus) Boulenger, 1912
dunni (Prostherapis) Rivero, 1961
festae (Prostherapis) Peracca, 1904
fuliginosus (Hyloxalus) Jiménez de la Espada, 1871
granalicentris (Hyloxalus) Boulenger, 1919
herminae (Prostherapis) Boettger, 1893
infraguttatus (Phyllobates) Boulenger, 1898
inguinalis (Prostherapis) Cope, 1868
intermedius (Phyllobates) Andersson, 1945
kingsburyi (Phyllobates) Boulenger, 1918
latinus (Phyllobates) Cope, 1869
mandolorum (Phyllobates) Schmidt, 1932
marcesianus (Phyllobates) Melin, 1941
mertensi (Phyllobates) Cochran and Goin, 1964
neblina (Prostherapis) Test, 1956
olfersioides (Eupemphix) Lutz, 1925
palmatus (Phyllobates) Werner, 1899
peruvianus (Phyllobates) Melin, 1941
pratti (Phyllobates) Boulenger, 1899
pulchellum (Phyllobates) Jiménez de la Espada, 1871
ranoides (Dendrobatidae) Boulenger, 1918
riocosangae (Phyllobates) Andersson, 1945
riceroi (Prostherapis) Donoso-Barros, 1964
shrevei (Prostherapis) Rivero, 1961
subpunctatus (Prostherapis) Cope, 1899
sylvatica (Phyllobates) Barbour and Noble, 1920
taeniatus (Phyllobates) Andersson, 1945
trilineatus (Phyllobates) Boulenger, 1913
trinitatus (Phyllobates) Garman, 1888

variabilis (Prostherapis) Wied
vergeli (Hyloxalus) Hellmayr
vertebralis (Phyllobates) Boulenger
whelperi (Prostherapis) Boulenger

The purpose of this paper is to describe two new species of Colostethus, C. vertebralis (Boulenger) and C. variabilis (Wied), considered together because of the restricted distribution of both species, which is limited to the high Andean, southern Ecuadorian Andes. Further study is needed to evaluate the significance of the paucity of information available on C. vertebralis and C. variabilis. Recent collecting shows, however, that these species are not synonyms, and that there is considerable variation of a number of characteristics.

Colostethus variabilis
(Figs. 1a, b, 2a, b)

Holotype: KU 120540, from a tree frog collected on 9 June 1968 by John D. Lynch.
Paratypes: KU 120515–539, o. f. C. vertebralis from 9 km S E Loja, Loja Province, Ecuador, D. Lynch.

Diagnosis: The following number of diagnostic characters distinguish Colostethus, 18.0 to 25.7 mm long. (1) postaxial disc (2) sexual dimorphism in coloration; males more brightly colored than females and laterally, smooth ventral surface; (3) tympanic fold heavy, covering distal end of second finger longer than second; (4) tympanic folds expanded; (5) third finger of male without subarticular tubercles; (6) first and second fingers of male without subarticular tubercles; (7) third finger of male with very short subarticular tubercles; (8) third finger of male with subarticular tubercles; (9) third finger of female with subarticular tubercles; (10) palmar disc present; (11) lateral fold faint; (12) lateral stripe yellow to gray-white; (13) other skin coloration as described; (14) ground color pale yellow-gray to gray-white, bordered above and below by irregular gray band; (15) small, body length 11.2 to 14.2 (mean 13.2) mm in stages 1 to 4; (16) throat relatively large, almost covering anterior part of body; (17) intercostal folds not subterete; (18) toes not subterete; (19) tooth rows...
variabilis (Protheroides) Werner, 1899
vergeli (Hylocoelurus) Hellmich, 1940
vertebralis (Phylodroma) Boulenger, 1899
whimperi (Protheroides) Boulenger, 1882

The purpose of this paper is to establish a working foundation of specific taxonomy in the genus Colostethus in South America, to describe two new species, and to redescribe Colostethus vertebralis (Boulenger). The three species are considered together because of their similar distributions in high Andean, southern Ecuador. In the past there has been a paucity of information available on the widespread species, C. vertebralis. Recent collections from throughout the range of this species now make it possible to consider the geographic variation of a number of characters.

Colostethus elachyistus new species
(Figs. 1a, 2a, 3, 4, and 6)

Holotype: KU 120540, from Loja, Loja Province, Ecuador, 2150 m, collected on 9 June 1968 by John D. Lynch.

Paratypes: KU 120515–539, collected with the type; and KU 120541, from 9 km E, Loja, Loja Province, Ecuador, 2600 m, collected by John Lynch, 1958.

Typically 18 mm, 1944 n.m. 1935

Diagnosis: Goin, 1964

- Anterior narial opening of tympanum distinct (Fig. 1a).
- Tympanum absent.
- Skin granular dorsally.
- Finger discs subequal in size, not exostatic.
- Finger I absent.
- Finger II equal.
- Finger III slightly larger than finger II.
- Finger IV smaller than finger III.
- Finger V slightly smaller than finger IV.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
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- Finger I-V all absent.
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- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
- Finger I-V all absent.
- Finger I-V all present.
- Finger I-V all distinct.
- Finger I-V all equal in size.
Fig. 2. (a) Palmar surface of hand of *Colostethus elachyhistus* (KU 120534), (b) plantar surface of foot of *C. elachyhistus* (KU 120525), × 7.8.

Length of eye greater than or equal to distance from eye to nostril; tympanum oval, distinct; ratio of tympanum width to eye diameter 0.516–0.678 (mean 0.595); supraocular field heavy, covering dorsal two-thirds of tympanum; tongue short, not lobed, or lobes bent; posterior third of forelimb free; choanae large, round, partially hidden by maxillae when viewed from above; males having conspicuous elongate vocal slits and median subgular vocal sac.

Skin of dorsum and flanks granular (rarely smooth) becoming more tuberculate around vent; ventral and dorsal surface of thighs smooth; anal opening unmodified; forearm lacking tubercles; outer palmar tubercle round, slightly raised, larger than, or equal to, oval inner palmar tubercle; subarticular tubercles round, distinctly raised; simple; fingers lacking webbing and lateral fringes; width of digital pad of third finger one-
fourth diameter of tympanum; first finger longer than second; third finger of males not swollen.

Ratio of shank to snout-vent length 0.378-0.548 (mean 0.500); inner tarsal fold short, oblique, present on distal half of tarsus, thickened and curving abruptly near end of fold; inner metatarsal tubercle ovoid; outer metatarsal tubercle conical, subequal in size to inner metatarsal tubercle; supernumerary tubercles absent; subarticular tubercules simple, round; digital pads slightly expanded, larger than those of fingers; webbing between toes vestigial; lateral fringes extending to bases of discs along both margins of all toes; webbing and lateral fringes indistinct or absent in juveniles.

Coloration: In preservative, dorsal ground color of adults pale yellow-gray to green-black with irregular black blotches in two parallel rows extending laterally just anteriorly, moderately separated, slightly closer to eyes than to midline at about midlength of body; caudal and anal regions pale yellow-gray to gray-white, extending from upper eyelid to groin, with pale stripe of same color along anterior surface of thigh; oral stripe bordered above and below by dark gray to black reticulation, extending below upper eye; snout gray or with gray to black superciliary, orbital, and postocular markings, extending medially across cheeks; yellow patch on chin and in groin in some specimens.

In preservative, juveniles having a more pastular dorsal ground color, with dark gray to black ground color on anterior margins; lower parts white or with gray to black spots; head and body with fainter reticulation; dark gray to black on snout; legs with gray to black spots; body and limbs with gray to black spots; throat gray; hind limbs yellowish; snout gray; limbs yellowish with black spots or bands; groin and light areas on hind limbs yellow to brown; ventral pale yellowish-green with white spots, or solid white, or without pale gray marking; lips bronze; iris coppery bronze with black reticulations.

The above description is based on specimens from Loja. Those specimens from 9 km E of Loja were similarly colored, except that they had a distinct black area above the dorsolateral stripe, and the throat was dull yellow.

Tadpoles: (Figs. 3 and 4). Description based on a series of tadpoles from developmental stages 31 to 41 (free-swimming). Developmental stages for embryos and tadpoles are based on the system proposed by Gosner (1960).

Body depressed, flattened ventrally for half body length; dorsal contour
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: longer than second; third finger

.378 - 0.548 (mean 0.500); inner tal half of tarsus, thickened and metatarsal tubercle ovoid; outer size to inner metatarsal tubercle; tubercles simple, round; than those of fingers; webbing extending to bases of discs along usual fringes indistinct or absent.

Of adults pale yellowish, with numerous tan to black, usually reticulated, diagonal bands along head and body; head often with light dorsal and ventral fin, typically ovoid; eyes large; snout rounded; tail rounded; body length: dorsal contour.

S. ephippium: body darker pale yellowish, with numerous tan to black, usually reticulated, diagonal bands along head and body; head often with light dorsal and ventral fin, typically ovoid; eyes large; snout rounded; tail rounded; body length: dorsal contour.

S. ephippium: body darker pale yellowish, with numerous tan to black, usually reticulated, diagonal bands along head and body; head often with light dorsal and ventral fin, typically ovoid; eyes large; snout rounded; tail rounded; body length: dorsal contour.

South American Colostethus

Fig. 3. Lateral view of free-swimming tadpole of Colostethus histus (one of series KU 121377), x 7.2.
South American Colostethus

The specimen from the wet Pacific lowlands (MCZ 3214, Rio Chanchan, Chimborazo Province, Ecuador) is indistinguishable from C. inguinalis.

Colostethus anthracinus new species

(Figs. 1b, 5, and 6)

Holotype: KU 190639, from Páramo de Arajuno, 12 km S Cuchil, Morona-Santiago Province, Ecuador, 3440 m, collected 15 June 1968 by John D. Lynch.

Paratypes: KU 190640-658, collected with the holotype.

Diagnosis: (1) Small Colostethus, 17.2 to 19.9 (mean 18.3) mm snout-vent length; (2) sexual dimorphism exhibited in ventral coloration of males; (3) skin granular and dorsi-dorsally, pustular to areolate in area around vent and on dorsal surfaces of thighs; (4) tympanum indistinct, completely covered in some males; (5) supratympanic fold well developed; (6) first finger longer than second; (7) discs of fingers not expanded; (8) third finger of males not swollen; (9) digital glands distinct, with emulsion white pigmentation; (10) tarsal fold sigmoid, not associated with inner metatarsal tubercle; (11) webbing and lateral fringes of toes absent; (12) discs of toes not expanded; (13) dorsolateral stripe yellow to gray, narrow, most conspicuous in females; (14) dorsolateral stripe pale gray to dark brownish black; (15) ventral yellow to creamy white in females, dark gray to solid black with yellow groin in males; (16) limbs colored like dorsum, with or without dark bars restricted to thighs.

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Description and variation: (Figs. 1b, 5a, 5b, and 6). Head wider than long, same width as body; ratio of head width to snout-vent length 0.335-0.403 (mean 0.369); snout rounded, blunt, slightly projecting in lateral profile; canthus rostrals obtusely angular, slightly constricted; loreal lobe well defined, not never concealing the distance from the nostril to the eye; tympanum noticeable, but not very distinct; dorsal surface of finger and toe discs scaly; dorsum finely granulated anteriorly; dorsal ridges of fold absent; skin surrounding vent and on dorsal surfaces of thighs coarsely granular; venter smooth; anal opening unmodified; forearms lacking tubercles; two palmar tubercles; outer tubercle rounded to subtriangular; inner tubercle oval, equal in size to outer tubercle; subarticular tubercles round, simple, larger proximally; first finger longer than second; third finger of males not swollen.

Skin of dorsal fin nearly granular anteriorly; dorsal ridges of fold absent; skin surrounding vent and on dorsal surfaces of thighs coarsely granular; venter smooth; anal opening unmodified; forearms lacking tubercles; two palmar tubercles; outer tubercle rounded to subtriangular; inner tubercle oval, equal in size to outer tubercle; subarticular tubercles round, simple; larger proximally; first finger longer than second; third finger of males not swollen.

Coloration: In preservative, males: from Morona-Santiago Province solid dark gray to black dorsally; indistinct black vertebral stripe visible in paler specimens; dorsal coloration of single male from Loja Province pale gray with large black spots at level of scapula; black lateral stripe in this specimen extending from groin to level of arm, being separated from black flanks by a narrow, dorsolateral creamy white stripe extending anteriorly from groin.

Females from both localities paler dorsally; dorsal ground color dark brown with black vertebral stripes (Morona-Santiago Province) or gray with dorsal black blotches (Loja Province); distinct dorsolateral stripe of light yellow present on all females; black caudal stripe, extending around snout, present in all females and single male from Loja Province; upper lip and labial area yellow with white spots in all females and some males from Morona-Santiago Province; remaining males having black lips; upper surface of limbs dark gray to black in all males from both localities; females with yellow-gray to black forearms (Morona-Santiago Province) or pale gray with darker transverse bars along dorsal thighs and shanks (Loja Province); anterior surface of arms yellow in some females.

Ventral coloration sexually dimorphic, irrespective of locality; females having yellow-white venter, with gray wash on ventral surfaces of limbs; males having varying degrees of uniform black pigmentation on chin, throat, and chest as isolated spots (lighter specimens), or extending over entire venter, excluding groin and proximal portion of ventral thighs.
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South American Colostethus

Fig. 5. Diagrammatic ventral views of Colostethus anthracinus showing extremes in ventral coloration in males.

(darker specimens); ventral parts of hands, feet, arms, and distal portion of legs black in all males examined; palmar and plantar tubercles unpigmented.

In life, dorsum deep chocolate brown (Morona-Santiago Province), yellow brown (females from Loja Province), or bronze brown (males from Loja Province) with varying amounts of flecking or spotting; dorsolateral stripe creamy bronze, posterior half of stripe bordered dorsally by black in all specimens from Morona-Santiago Province and females from Loja Province; males from Loja Province with reddish bronze labial stripe; flanks of all specimens blue-gray to black with blue or green flecking; venters of males from both localities black, with orange on ventral surface of thighs and in groin; venters of females yellow to orange; axillae of both males and females orange; thighs variably black to brown with black flecking; iris reddish bronze.

Etymology: From the Latin anthracinus meaning “coal-black,” in reference to the ventral coloration in the males.

Natural history: The type locality, at an elevation of 3400 m, is in páramo; the vegetation consists of short grasses and cushion plants. All specimens in the KU collections were collected from beneath stones along streams, during cold, rainy conditions, with 100% overcast skies. A second locality, 500 m lower in elevation, in páramo with vegetation consisting of small bushes and grasses. Specimens were found under rocks adjacent to a small, water-filled ditch. There was no sign of breeding activity.
Distribution: Colostethus anthracinus has an Andean distribution in southern Ecuador at elevations between 2500 and 3500 m, and 3 degrees S and 4 degrees S latitude. Specimens examined: ECUADOR: Morona-Santiago: Páramo de Raranga, 12 km S Cutchil, KU 126039 (holotype), KU 126040-658 (paratypes); Loja: 13 to 14 km E Loja (by road), KU 126035-638; Azuay: vicinity of Guayllabamba, CAS 94772.

Comparisons: Colostethus anthracinus can be distinguished from all previously described species in the genus except C. talamancae, nubicola, and pratti (all of Central America) on the basis of the black ventral coloration in the males. Colostethus nubicola can be distinguished on the basis of the reduced ventral coloration, and inconsistency in the color dimorphism; Savage (1968) described the ventral of males as being immaculate in some specimens. Colostethus pratti differs in having the third finger of the males swollen, and a motting on the throat. Colostethus talamancae is larger (males to 22 mm and females to 24 mm snout-vent length) and lacks a tarsal fold; furthermore, the nostril lies one-half the distance between the eye and the tip of the snout, and the dorsum is smooth.

Colostethus vertebrae (Boulenger)


(Figs. 1c and 6)

Diagnosis: (1) Small to medium, Colostethus, 14.6 to 19.7, (mean 17.1) mm. (2) Sexual dimorphism is size; males being smaller, Ear females; (3) Skin smooth dorsally, becoming achromatic around vent in some specimens; (4) Tympanum distinct, (5) Supratympanic fold heavy, covering dorsal half of tympanum; (6) First finger equal to or slightly longer than second; (7) Subdigital discs absent; (8) Discs of all fingers elongate; (9) Fingers with webbing; (10) Toes with webbing; (11) Dorsal coloration with gray, yellow to black; (12) Ventral coloration with black spots on chest.

Description and variation: (Figs. 1c; 6) Table 1. Males smaller than females; head width equal to or narrower than body width; to snout-vent length 1.30. Dorsal coloration with gray, yellow to black; ventral coloration with black spots on chest; (16) Thighs and shanks colored as dorsum with black flecks, tarsi and feet with indistinct dark gray bars.
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has an Andean distribution in 2500 and 3500 m, and 3 degrees of 6
examined: ECUADOR: Morona-
Cutchil, KU 120639 (holotype),
13 to 14 km E Loja (by road),
alagoa, CAS 94772.

can be distinguished from all
except C. talamancae, rubicola,
s the basis of the black ventral
rubicola can be distinguished on

s, and inconsistency in the color
the ventor of males as being im-

prati differs in having the
s motting on the throat. Col-

22 mm and females to 24 mm
old; furthermore, the nostril lies
tip of the snout, and the

s (Boulenger)


and Noble, Bull. Mus. Comp.

ad 6)

Colostethus 14.6 to 19.7 (mean 17.1)
as being smaller than females;
olate around vent in some speci-

specimens.

Table 1. Intraspecific variation from different localities to show 

<table>
<thead>
<tr>
<th>Locality</th>
<th>Sex</th>
<th>N</th>
<th>Elev. (ms)</th>
<th>Snout-vent length (mm)</th>
<th>Shank</th>
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<tr>
<td>Cuenca, Azuay Province</td>
<td>♂ ♂</td>
<td>6</td>
<td>2540</td>
<td>15.6-17.6</td>
<td>0.430-0.493</td>
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<td>8</td>
<td>3040</td>
<td>14.6-17.2</td>
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<td>Sauli Province</td>
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<td>♀ ♀</td>
<td>7</td>
<td>15.8-18.5</td>
<td>0.403-0.453</td>
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<td>(16.3)</td>
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<td>♀ ♀</td>
<td>6</td>
<td>16.9-19.6</td>
<td>0.413-0.443</td>
<td>(18.3)</td>
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lateral profile, canthus rostralis moderately well
delimited; (8) third fingers and toes

specimens.

width to snout-vent length 

dorsal view, blunt in lateral 

specimens. (8)
present; subarticular tubercles round, distinct, larger proximally; fingers lacking webbing or lateral fringes; digital pads slightly expanded; dorsal digital glands distinct; digital pad of third finger about half diameter of tympanum; first finger equal to or slightly longer than second.

Ratio of Shank to snout-vent length 0.405-0.493 (mean 0.448); tarsal fold indistinct, extending from inner metatarsal tubercle, bending abruptly at midpoint; outer metatarsal tubercle conical, equal to inner metatarsal tubercle; subarticular tubercles of toes simple, round, larger proximally; toe pads slightly expanded, more so than pads of fingers; toes lacking webbing or lateral fringes.

Citations: In preservative, dorsal ground color of adult yellowish-gray to brownish-black, lighter brown color occurs in specimens from Laguna de Zurucuchu and Caencu; specimens from 8-9 km N San Lucas darker; specimens from 8 km S Cutchil exhibit both extremes in coloration; middorsal thin, creamy white stripes present in darker specimens; canthal stripe solid black; lips colorless; gold stripe extending below eye in all specimens; flanks flecked with light to dark gray.

Dorsolateral stripes distinct, broad, greenish-yellow, extending from posterior margin of eye to groin where it expands slightly; dorsolateral stripes extending across upper eyelid to tip of snout or not, forming a dorsal border to black canthal stripe; forearm colorless in lighter specimens and mottled with dark gray in darker specimens; upper arm colored as forearm, with white femoral stripe at elbow; thighs and shanks pale yellow; ears brown, with varying amounts of dark flecking; tarsi and feet indistinctly barred in lighter specimens; ventral greenish-yellow with gray to black flecking extending mediolaterally across throat and chest from flanks; two distinct black spots on chest at level of pectoral girdle in most specimens from Laguna de Zurucuchu; chest spots absent in all other specimens.

In life, dorsum pale rose to light brown; specimens from 8-9 km N San Lucas with black vertebral and paravertebral stripes, with or without a creamy white middorsal stripe; specimens from 8 km S Cutchil have black, irregular spots on dorsum; dorsolateral stripe broad, creamy white, expanding in groin as bright lemon yellow flash color in all specimens; flanks pale blue-gray to blue-green; sides of head chocolate brown, labial stripe white to bronze; specimens from 8 km S Cutchil have yellow throat and pale green-yellow venter; specimens from 8-9 km N San Lucas have off-white throat and venter, with pale gray wash; posterior surface of thighs pale green to creamy yellow with brownish-gray reticulations; iris bronze, lacking reticulation.

Natural history: Specimens of Colostethus vertebrales were found under rocks or in open areas, usually near small streams, and at high altitudes. Actively calling males were observed only at 8-9 km N San Lucas, Loja Province, by day.

Distribution: Colostethus vertebrales has an inter-Andean distribution from 2 degrees 30' S to 40 degrees S latitude at elevations between 2500 m and 3200 m. Specimens examined: ECUADOR: Loja: 8-9 km N San Lucas, Ku 120545-569. Azuay: San Pedro, Ku 120612-631. M 120570-602. Chimborazo: 30 m

Fig. 6: Locality records (squares), and C. vertebrales (circles)
distinct, larger proximally; fingers and pads slightly expanded; dorsal second finger about half diameter of minimally longer than second.

403-0.493 (mean 0.448) tarsal tubercle, bending abruptly conical, equal to inner metatarsal simple, round, larger proximally; fan pads of fingers; toes lacking

Brown color of adults yellow-gray occurs in specimens from Laguna from 8-9 km N San Lucas darker; both extremes in coloration; mid-ventral in darker specimens; caudal stripe extending below eye in all

Greenish yellow, extending from it expands slightly; dorsolateral tip of snout or not, forming a cream colorless in lighter specimens; upper arm colored a longitudinal stripe at elbow; thighs with varying amounts of darkened in lighter specimens; venter lacking extending medially across black spots on chest at level from Laguna de Zurucucu; chest brown; specimens from 8-9 km N vertebral stripes, with or without San Lucas have lateral stripe broad, creamy white, yellow flash color in all specimens; lines of head chocolate brown, labial 8 km S Catchil have yellow throat 8-9 km N San Lucas have grey wash; posterior surface of with brownish-grey reticulations;

*Colostethus vertebralis* were found under all streams, and at high altitudes. Only at 8-9 km N San Lucas, Loja

has an inter-Andean distribution altitude at elevations between 2500

**ECUADOR: Loja:** 8-9 km N San

**South American Colostethus**

![Locality records for *C. elachyhistus* (circles), *C. anthracinus* (squares), and *C. vertebralis* (triangles)—open symbols denote type localities.](image)


**Comparisons:** Absence of toe webbing distinguishes *C. vertebralis* from those species which possess webbing (for species involved see "Comparisons" under *C. elachyhistus*). Of those species which lack toe webbing, all but four can be distinguished from *vertebralis* on the bases of their larger size (greater than 20.0 mm snout-vent length) and/or the distinct difference in lengths of the first and second fingers. These species are: *anthonyi, bromelicola, infraguitatus, intermedius, kingsburyi, marchesiensis, nubicola, osectoridus, ranoides, talamancae,* and tricolor.

The remaining four species can be separated from *Colostethus vertebralis* as follows: 1) *Colostethus ricosangae* and *taeniatus,* from the Amazonian slopes of the Andes, are slightly larger. The legs are distinctly barred, and the dorsal color pattern consists of a series of blotches or elongate spots. The skin of the dorsum is smooth. 2) *Colostethus pratti,* from Panamá and Colombian Choco, has a swollen third finger and a gray wash on the throat in males. 3) *Colostethus brunneus,* from the
THE FROG GENUS...

BY W. RONALD

Department of Biology

Identification of the fr has always been compl names. Recent collection of type material now allo determination of the genus. The purpose of this report is the that have been used for me to present information on one of us (Peters) during 1968.

The following curators formation concerning type name follows in part of Natural Sciences, Philad Instituto "José de Acosta" Ciencias Naturales, Madrid Grandison, British Museum (BMNH); and Greta Veste Section for Vertebrates. The abbreviation used for N specimens is USNM; mater lection, which is deposited for work in Ecuador by Peters Science Foundation, Grant was done while he was a Na trainee at the Universit

LITERATURE CITED


