

## Notes on a Collection of Centrolenid Frogs from the Colombian Chocó

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**Abstract.**—Notes on a collection of centrolenid frogs from the Colombian Chocó by Marc P. Hayes and Priscilla H. Starrett, *Bull. Southern California Acad. Sci.*, 79(3):89-96, 1980. A collection of 30 Chocoan centrolenids comprising 7 species is reported. *Centrolenella albomaculata*, *C. chirripoi*, *C. euknemos*, *C. fleischmanni*, and *C. ilex* are first reports from Colombia. *C. chirripoi* is reported for the first time outside the type locality in Costa Rica. Prepollical spines found in *C. spinosa* are shown to lack sexually dimorphic character. A distinctive protuberance of the third metacarpal in centrolenids is advanced as an apparently unique familial character.

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In 1968 and 1971, Philip A. Silverstone visited the Colombian Chocó in the course of work on dendrobatid frogs. Silverstone (1973) gives a thorough description of the 1971 study site. During these visits, a small, but significant collection of centrolenid frogs was made. This assemblage of 31 frogs was subsequently deposited in the herpetological collection of the Los Angeles County Museum of Natural History (LACM).

It is the purpose of this paper to report on this collection, as several of the species are new to Colombia, and further, to comment on significant characters, augmenting existing knowledge of selected species and the family Centrolenidae. A single specimen is omitted from the following accounts, as it is being reserved for possible description as a new species in a separate account. Localities of individual specimens are summarized in the appendix following the discussion.

### *Centrolenella albomaculata* Taylor

**Specimens.**—LACM 72909.

**Remarks.**—This is the only specimen referable to this species and the first report from Colombia. We were struck by the superficial resemblance of this specimen to the Amazonian lowland slope form *C. medemi* (see Lynch and Duellman 1973). This specimen suggested a new species, were it not for some large-spotted variants in the Costa Rican collections at the University of Southern California. Specimens of *C. albomaculata* show an increasing size progression of spots from head to vent, the largest spots located on the upper surface of the thigh. Further, Costa Rican individuals examined exhibit considerable variation in spot size among individuals. However, thigh spots of this Colombian example attain maximum diameters of 2.5-3.0 mm, a condition found only in the Costa Rican specimens with the largest spots. In this respect, the Colombian specimen represents the extreme of pattern variants examined.



*Centrolenella chirripoi* (Taylor)

*Specimens*.—LACM 72929.

*Remarks*.—*C. chirripoi* was reviewed by Starrett and Savage (1973), who regarded it as a valid species. The only collections of this species are the holotype and paratype series from Río Cocolis, Provincia de Limón, Costa Rica (Taylor 1958). This single collection represents the first reported collection outside the type locality. We take this opportunity to emphasize the characters which separate *C. chirripoi* from its closest congeners, since centrolenids of the *fleischmanni* group (sensu Savage 1967) are notoriously difficult to separate in a preserved state. Starrett and Savage (1973) listed 8 characters, all of which are not equally important in characterizing this species. The characters most important are: 1) the distinctive webbing between fingers II and III, 2) the indentation between the nostrils when the head is viewed from above, 3) the only slightly protuberant eyes when viewed from above, 4) the slightly rounded nature of the snout when viewed in profile, 5) the long loreal region and 6) the weak canthus rostralis. The webbing character, perhaps the most distinctive, is superficially shared with *C. pulverata*. Figure 1 demonstrates the distinctive webbing in both species. The remarkable feature of this character is that it exhibits very little variation in all specimens examined. Starrett and Savage (1973) also noted that the color of the parietal pericardium was not known. Examination of the guanine distribution on this specimen and one of the paratype series (KU 36868) suggested that *C. chirripoi* has a transparent parietal pericardium. This was confirmed by Silverstone's field notes, taken on the specimen in life, which stated (quote): "bare heart." In this character and the indentation of the snout, *C. chirripoi* allies itself with *C. colymbiphyllum*.

*Centrolenella euknemos* Savage and Starrett

*Specimens*.—LACM 47066.

*Remarks*.—Savage and Starrett (1967) report this species from Costa Rica and Panama. This specimen represents the first published record from Colombia and extends the known range of the species over 400 km to the south and east.

*Centrolenella fleischmanni* (Boettger)

*Specimens*.—LACM 47067–9, 47071–4, 72930.

*Remarks*.—This is the most wide ranging of centrolenid species (Lynch and Duellman 1973), although some (Goin 1964; Starrett and Savage 1973) suggested that several cryptic species may be involved. Duellman (1973) reports the range as from Guerrero and Veracruz, Mexico to Surinam and Ecuador. Occurrence in Colombia is based on a statement of Goin (1964), where he postulates its presence based on geographic encirclement by documented localities. These collections, therefore, represent the first definitive records from Colombia.

*Centrolenella ilex* Savage

*Specimens*.—LACM 47063, 47070, 72910, 72914.

*Remarks*.—Starrett and Savage (1973) reported specimens from Costa Rica and Panama. Charles W. Myers (pers. comm.) recently informed us that the unlisted specimens of *C. ilex* reported by Lynch and Duellman (1973) are not referable to this species. These collections, therefore, represent the first definitive records



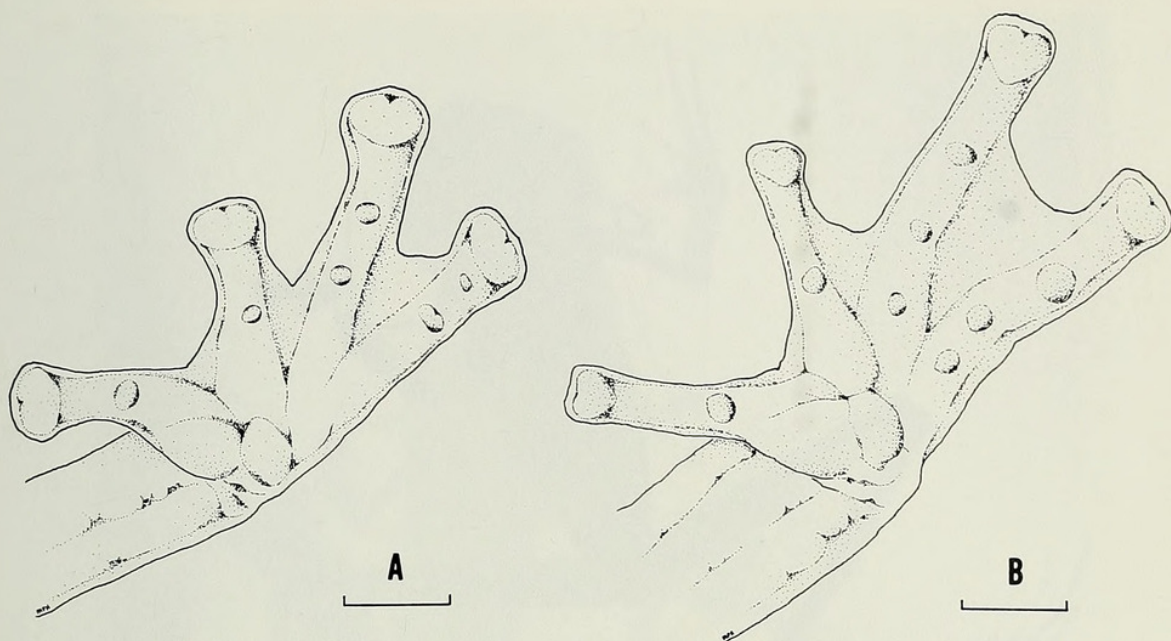


Fig. 1. A) Volar aspect of left manus of *Centrolenella chirripoi*. Drawn from specimen KU 36863. B) Volar aspect of left manus of *Centrolenella pulverata*. Drawn from specimen CRE 7155 (USC collections). Scale mark = 2 mm.

from Colombia. Radiographs of the males in this series confirm a previously unverified suspicion that the males of this species have distinctive humeral hooks (Fig. 2). Myers informs us that this is also the case in Panamanian *C. ilex*. The humeral hook in *C. ilex* is long, thin, lying parallel to the humerus and terminating in a sharp point (Fig. 3). It lies well-concealed by the arm musculature. This is in sharp contrast to the rather spatulate, flaring humeral hooks found in *C. prosoblepon*. Females have at most a small humeral boss, but no hook. We have also examined a specimen from Jaime Villa that was taken in the drainage of the Río Indio, Departamento Zelaya, Nicaragua, extending the known range north to this site.

*Centrolenella prosoblepon* (Boettger)

*Specimens*.—LACM 47065, 72923, 72925–6.

*Remarks*.—The three male specimens (LACM 72923, 72925–6) lack the dorsal and tibial spots characteristic of most Costa Rican *C. prosoblepon*. Lynch and Duellman (1973) comment on the apparent continuum of variation between spotted and unspotted dorsal patterns which forced them to synonymize *C. parabambae* with *C. prosoblepon*. Furthermore, snout shape in these specimens is the extreme of variants observed in Central American *C. prosoblepon*, the canthal platform being less pronounced. This variability in pigmentation, snout shape and our own observations on the shape and degree of flaring in humeral hooks did not permit separation of these specimens as a new species. As with *C. fleischmanni*, cryptic species may be involved, but this is not determinable at this time. Lynch and Duellman (1973) cite specimens referable to this species from Departamento Cauca, Colombia, but these collections are the first reported from Departamento del Chocó.





Fig. 2. Radiograph of a male *Centrolenella ilex* (LACM 72910), venter up. Dark arrow denotes metacarpal bulge and light arrow points to humeral hook. Specimen length = 29.5 mm.

*Centrolenella spinosa* Taylor

*Specimens*.—LACM 47064, 72911, 72913, 72917–8, 72920–2, 72924, 72927–8.

*Remarks*.—Taylor (1949) described this species from an all male series and speculated on the presence of reduced prepollical spines in females. In a later paper (Taylor 1951), he notes that the spine is entirely concealed and restates that females have a less well developed spine, although he cites no new specimens. Savage (1967) mentions that *C. spinosa* males have both a free prepollex and prepollical spine and adds that females have a prepollex while implying they lack a prepollical spine. This Colombian series of *C. spinosa* includes 11 adults, 3 females and 8 males. Radiographs of both this series and Costa Rican *C. spinosa*

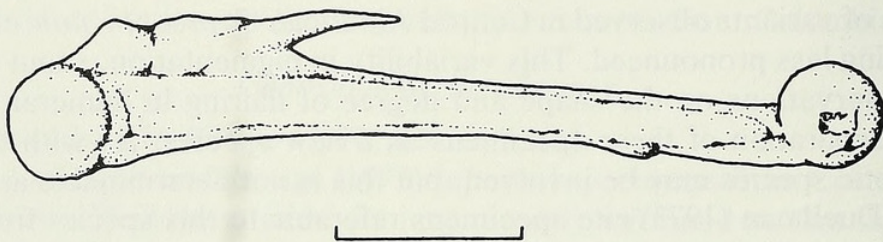


Fig. 3. Left humerus, ventral aspect of a male *Centrolenella ilex* (LACM 72910). Drawn from a radiograph. Scale mark = 2 mm.





Fig. 4. Radiograph of a female *Centrolenella spinosa* (LACM 72920), ventral aspect. Dark arrow denotes metacarpal bulge and light arrow points to the prepollical spine. Specimen length = 21.0 mm.

show that both males and females have a prepollex and prepollical spine (Figs. 4–5). Furthermore, the spine found in females is not significantly smaller than that found in males. Starrett and Savage (1973) report localities for this species from Costa Rica and Panama. Their addition that specimens examined from Colombia and Ecuador are referable to this species refers in part to the series being reported here. We concur with their determinations and confirm this series as the first definitive records of *C. spinosa* from Colombia.

#### Discussion

The species reported herein raise the total number of known Colombian centrolenids west of the Andean crest to 13, the others being *Centrolene geckoideum*, *Centrolenella antioquiensis*, *C. buckleyi*, *C. grandisonae*, *C. griffithsi* and *C. johnelsi* (Cochran and Goin 1970; Duellman and Lynch 1973). There is no reason to believe that the wet lowland tropical forest species, *C. pulverata* and *C. valerioi*, found in Panama (Starrett and Savage 1973), will not eventually be found in the Chocoan lowlands of Colombia. Similar predictions can be made for the mid-elevation Pacific slope species, *C. peristicta* and *C. ocellifera*, reported by Lynch and Duellman (1973) from Ecuador on biogeographic grounds. These species are expected in similar habitats on the Pacific slope of the Colombian Andes.



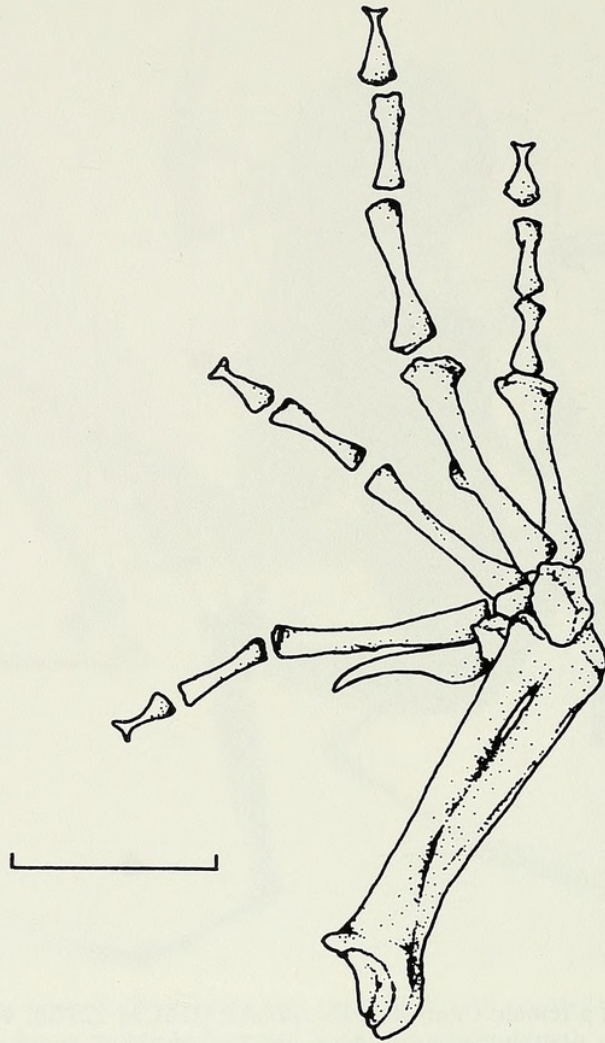


Fig. 5. Hard elements of left manus and forearm of a female *Centrolenella spinosa* (LACM 72920), ventral aspect. Drawn from a radiograph. Cartilaginous intercalated phalangeal elements are omitted. Scale mark = 2 mm.

Taylor (1951) defined the family Centrolenidae. His familial definition is based primarily on the nearly complete fusion of the astragalus and calcaneus, a fusion pattern shared only by the genus *Pelodytes* (Pelobatidae). Other characters used by Taylor are the presence of terminal T-shaped (or Y-shaped) phalanges, present in certain hyperoliids, leptodactylids, microhylids, rhacophorids and possibly bufonids (Trueb 1973; Liem 1970) and the digital intercalated cartilage, a character shared by the Hylidae, the Hyperoliidae and the African microhylid *Phrynomerus*. To this group, we add a character we believe will be useful in defining the family Centrolenidae. This is the presence of a distinct protuberance on the medial side of the third metacarpal (Figs. 2, 4 or 5). This protuberance was noted in all radiographed centrolenid material to date (both in *Centrolene* and 26 species of *Centrolenella*). This bulge, which varies in position from between two-thirds to one-third the distance from the distal end of the metacarpal, varies in size among species, protruding from  $\frac{1}{2}$  to 2 mm from its shaft. It was illustrated, but not discussed, in Eaton's anatomical study of *Centrolenella prosoblepon* (see Eaton 1958:466). Presumably, this feature was regarded as anomalous, as limited comparative material was then available. Radiographs of available dendrobatid, hylid,



leptodactylid, pelobatid and ranid material show that, at least in the material examined, the metacarpal protuberance is absent. Liem (1970) discusses a bony knob on the third metacarpal of some rhacophorids and hyperoliids. His illustration (see Liem 1970:39) clearly shows this structure an extended expansion of the dorsolateral tip of the metacarpal, analogous to, but differing from the protuberance of centrolenids located on the midlateral metacarpal. Notably, the bony knob in rhacophorids and hyperoliids is associated with a slip of the humerodorsalis muscle in what Liem suggests as being the most derived condition of this muscle. In this condition, the muscle has two metacarpal slips inserting on the third and fourth digits. Liem suggests this condition is associated with arboreal life, noting the modification probably both increases extension efficiency of these digits and enables independent extension. A muscle dissection of *Centrolenella prosoblepon* shows the humerodorsalis with insertions with patterns paralleling those found in Liem's derived rhacophorids and hyperoliids. Further, the slip on metacarpal three apparently inserts on the protuberance previously described. Realizing the very arboreal nature of all members of the family Centrolenidae, we suggest that the condition of the humerodorsalis found in *C. prosoblepon* is an independently acquired adaptation to an arboreal life mode. The presence of the metacarpal protuberance suggests that the pattern of insertion of the humerodorsalis may be a character which is uniform throughout the family. We reserve judgment, however, upon examination of the balance of the family. We believe careful examination of anuran families, particularly those with arboreal members, will support the apparent unique state of the metacarpal protuberance found in the Centrolenidae.

#### Acknowledgments

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#### Appendix of Specimens Examined

Large series of Costa Rican material from the collections at USC were used as comparative material. This material is not listed here since Starrett and Savage (1973) give a thorough listing. All material is listed by country first and then province, both in alphabetical order.

*Centrolenella albomaculata*.—COLOMBIA: Chocó: Camino de Yupe in the drainage of the Río Opogadó, 420 m, LACM 72909.



*Centrolenella chirripoi*.—COLOMBIA: Chocó: upper Río Opogadó between Río Merendó and Río Yupe, 75 m, LACM 72929. COSTA RICA: Limón: Río Cocolis, near Suretka, KU 36862–4, 36866–70.

*Centrolenella euknemos*.—COLOMBIA: Antioquia: Río Arquia at Finca Los Llanos (above Vegaez), 100–200 m, LACM 47066.

*Centrolenella fleischmanni*.—COLOMBIA: Antioquia: Río Arquia, Finca 5 km w of Finca Chibiquí (40 km wsw of Urrao), 350–400 m, LACM 47067–9. Chocó: upper Río Opogadó above Ríos Yoto and Angostura, 60 m, LACM 47071–4; upper Río Opogadó, 75–120 m, LACM 72930.

*Centrolenella ilex*.—COLOMBIA: Antioquia: Belén, Río Arquia upstream from Vegaez, 100 m, LACM 47063. Chocó: trail between upper Río Napipí (near its juncture with Río Merendó) and upper Río Opogadó at 60–130 m, LACM 47070; Camino de Yupe, 420 m, LACM 72910, 72914. NICARAGUA: Departamento Zelaya: Río Indio, 75 m.

*Centrolenella prosoblepon*.—COLOMBIA: Antioquia: Belén, Río Arquia upstream from Puerto Palacios (also above Vegaez), 100 m, LACM 47065. Chocó: Camino de Yupe, 420 m, LACM 72923, 72925–6.

*Centrolenella spinosa*.—COLOMBIA: Antioquia: Río Arquia at Belén (upstream from Vegaez), 100 m, LACM 47064. Chocó: Camino de Yupe, 420 m, LACM 72911, 72913, 72917–8, 72920–2, 72924, 72927–8.

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