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Amphibia, Centrolenidae, *Centrolene ilex, Centrolene litorale, Centrolene medemi, Cochranella albomaculata, Cochranella ametarsia:* Range extensions and new country records

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The anuran family Centrolenidae is a monophyletic group (Ruíz-Carranza and Lynch 1991; Darst and Cannatella 2004) that currently contains three genera and 138 species (Ruíz-Carranza and Lynch 1991; IUCN et al. 2004). Most of the species diversity of glass frogs is located in the tropical Andes of South America, especially in Colombia (73 species) and Ecuador (32 species; Coloma 2005).

Although several studies have focused on the glass frogs of Ecuador (e.g., Lynch and Duellman 1973; Duellman 1980; 1981; Flores 1985; Flores and McDiarmid 1989, Wild 1994; Guayasamin and Bonaccorso 2004), our knowledge of their distribution, ecology, and natural history is still incomplete. Herein, we report for the first time the presence of the following species in Ecuador: *Centrolene ilex, C. medemi, Cochranella albomaculata,* and *C. ametarsia.* Also, we report a second locality for *Centrolene litorale.*

During this study, we examined alcohol-preserved specimens from the herpetological collections at the Museo de Zoología of the Pontificia Universidad Católica del Ecuador (QCAZ), The University of Kansas Natural History Museum (KU), Museum of Comparative Zoology (MCZ), Division de Herpetología of the Museo Ecuatoriano de Ciencias Naturales (DHMECN), Universidad San Francisco de Quito (DFCH-USFQ), and Instituto de Ciencias Naturales of the Universidad Nacional de Colombia (ICN). For the generic placement of the species, we follow the classification proposed by Ruíz-Carranza and Lynch (1991).

Centrolene ilex (Savage 1967). This species was previously known from eastern Nicaragua to western Panama and western Colombia, and also from the caldera of the Río Grande de Tárcoles of central Costa Rica on the Pacific versant (IUCN et al. 2004). Herein, we report *C. ilex* from the following localities in Ecuador: Provincia Esmeraldas: Reserva Biológica Canandé (0˚27'04" N; 78˚08'55" W, 700 m), DHMECN 2620–26 (Figure 1A); Río Tululbí (1˚02'12" N; 78˚36'31" W, 180 m), DHMECN 3199–03; Cantón San Lorenzo, parroquia Santa Rita, recinto Ventanas (0˚53'53" N, 78˚37'3" W, 200 m), DHMECN 3204 (Figure 1B); Provincia de Pichincha: Hacienda La Joya, km 109 on the Calacalí–Nanegalito–P.V.Maldonado road, next to the town of San Vicente de Andoas (0˚04'59.9" S; 78˚58'58.8" W, 750–800 m), DFCH-USFQ D260–61. All the localities where *C. ilex* has been found are within the Chocó Ecoregion (Evergreen Lowland Forest formation, according to Cerón *et al.* 1999) at elevations between 180 and 800 m (Figure 2).

Individuals were on the upperside of leaves next to streams during the night. On 10 November 1999, one male (DFCH-USFQ D261) was calling and two females (DFCH-USFQ D260, D262) were gravid, suggesting reproductive activity.

Centrolene ilex can be easily distinguished from similar species by the following characteristics: (1) in life, dorsum uniform green; (2) white

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ventral parietal peritoneum; (3) adult males with sharp, pointed humeral spine embedded in arm musculature; (4) prepollical spine not separated from Finger I; (5) iris ivory white with black reticulum; and (6) SVL 27.0–29.0 mm in adult males, 28.0–34.0 mm in adult females (Savage 2002).

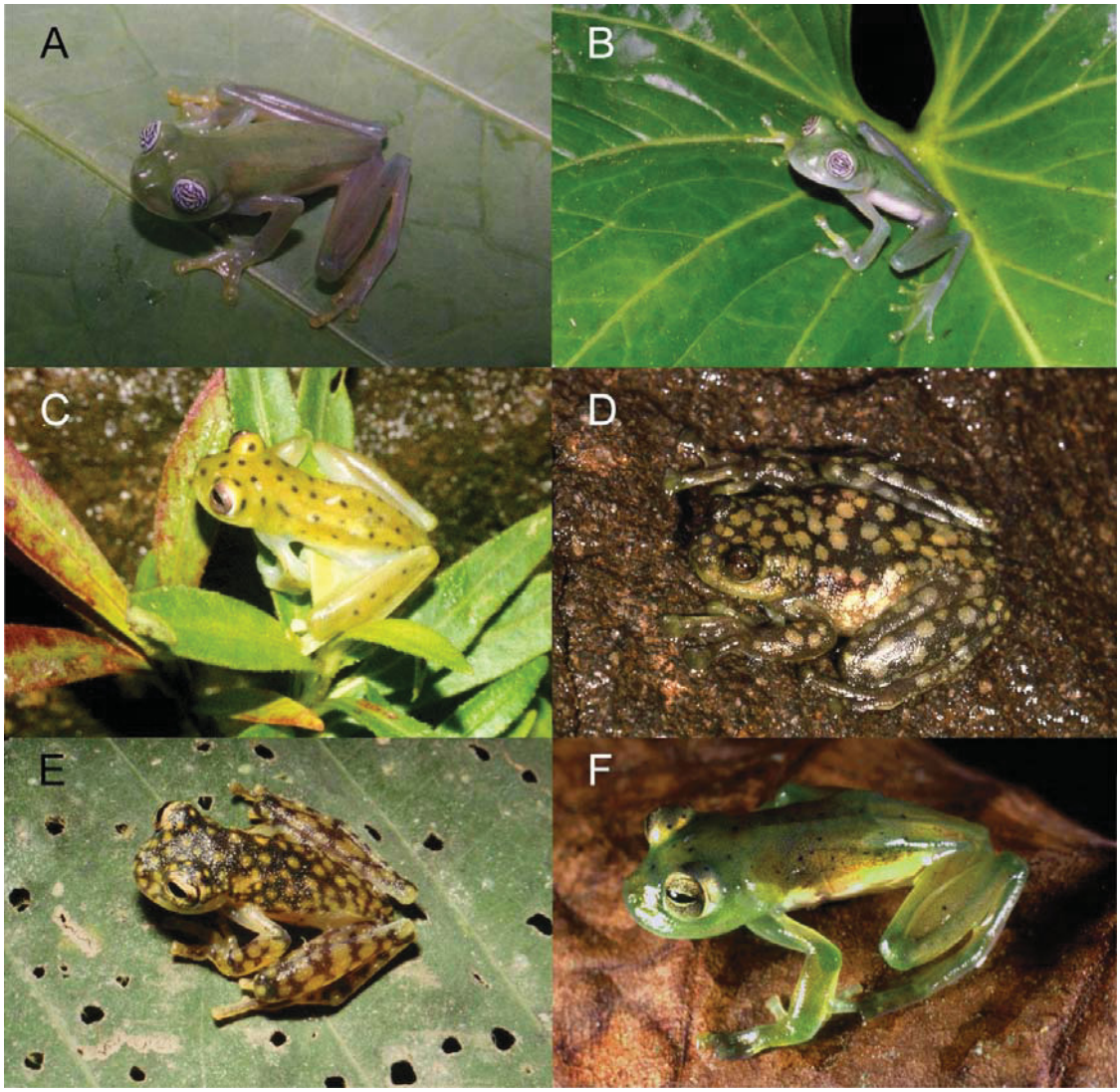

Figure 1. New records of glass frogs in Ecuador. (A) *Centrolene ilex,* Reserva Biológica Canandé, Provincia Esmeraldas, DHMECN 2623; (B) *C. ilex,* Recinto Ventanas, Provincia Esmeraldas, DHMECN 3204; (C) *Centrolene litorale,* Río Cachabí, Provincia Esmeraldas, DHMECN 3198; (D) *Centrolene medemi,* 2 km SSW of the junction between Río Reventador and Baeza-Lumbaqui road, Provincia Napo, KU 164493, photo by W. E. Duellman; (E) *Cochranella albomaculata,* 6 km SE of Lita, Provincia Imbabura, QCAZ 4324; (F) *Cochranella ametarsia,* Puerto Bolívar, Provincia Sucumbíos, QCAZ 28138.

Centrolene litorale Ruíz-Carranza and Lynch 1996. *Centrolene litorale* was described from La Guayacana (1˚49'48" N, 78˚46'12" W, 100 m), a locality at the Pacific lowlands of Colombia. The presence of *Centrolene litorale* (Figure 1C) in Ecuador was first mentioned by Grant and Morales (2004) from Tsejpu, Rio Zapallo (0˚43'59.9" N, 78˚55'59.9" W, 150 m, in the Provincia Esmeraldas. Herein we report the second locality in Ecuador: Provincia Esmeraldas: Río Cachabí (1˚01'59.9" N, 78˚46'00" W, 200 m),

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2 km NE Urbina on the San Lorenzo–Lita road, DHMECN 3198 (Figure 3).

Centrolene litorale can be identified by the combination of the following characteristics: (1) in life, dorsum yellowish green with dark gray spots; (2) white ventral parietal peritoneum; (3) adult males with visible small humeral spine; (4) prepollical spine clearly separated from Finger I; (5) iris gray without evident dark reticulation; and (6) SVL 20.0 mm in one adult male (ICN 13821).

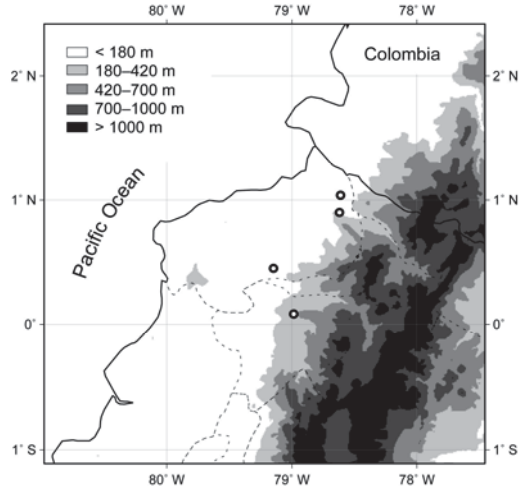

Figure 2. Distribution of *Centrolene ilex* in Ecuador (open circles).

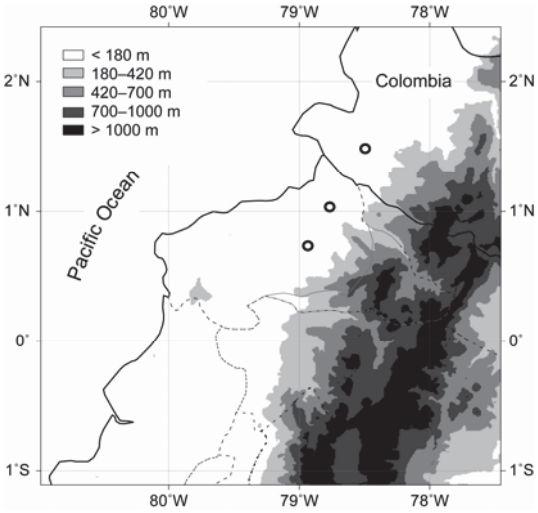

Figure 3. Distribution of *Centrolene litorale* in Colombia and Ecuador (open circles).

Centrolene medemi (Cochran and Goin 1970). In Colombia, this species (Figure 1D) has been registered from several localities on the eastern slope of the Cordillera Oriental (Departamento de Caquetá: Municipio de Florencia: 21.7–55 km NNW of Florencia on the Florencia–Guadalupe road, 790–1370 m; Suárez-Mayorga 1999) and one locality from the western slope of the Cordillera Oriental (Departamento de Tolima: Iconouz; IUCN et al. 2004). Ruíz-Carranza et al. (1996) rejected records from Amazonian Colombia (Cochran and Goin 1970). Herein, we report *C. medemi* from one locality on the Amazonian slopes of the Ecuadorian Andes: Provincia Napo: 2 km SSW of junction between Río Reventador and Baeza-Lumbaqui road (0˚06'00" S, 77˚36'00" W, 1490 m), KU 164493–94 (Figure 4). The Ecuadorian specimen was collected by W. E. Duellman on 19 March 1975; since then, no additional individuals have been found in Ecuador.

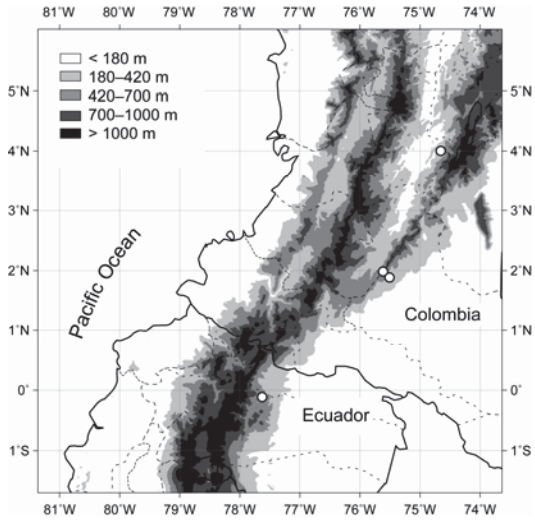

Figure 4. Distribution of *Centrolene medemi* in Colombia and Ecuador (open circles).

Centrolene medemi can be identified by the combination of the following characteristics: (1) in life, dorsal surfaces of head, body, and limbs olive green to grayish brown with large cream spots; (2) white ventral parietal peritoneum; (3) adult males with large humeral spine; (4) prepollex not separated from Finger I; (5) iris grayish brown with dark reticulation; and (6) SVL 25.5–31.0 mm in adult males, 34.7–44.3 mm in adult females.

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Cochranella albomaculata (Taylor 1949). This species (Figure 1E) is known from humid lowlands and premontane slopes from north-central Honduras to western Colombia (IUCN et al. 2004). Herein, we report *C. albomaculata* from the following localities within the Chocó ecoregion in Ecuador: Provincia Imbabura: 6 km SE of Lita (0˚47'41" N, 78˚25'43" W), QCAZ 4324–25. Provincia Esmeraldas: Estero Vicente, an affluent of the Río San Miguel 0˚47'32" N, 79˚11'52" W, 225–275 m), QCAZ 11369–70; Reserva Biológica Canandé (0˚27'4" N, 79˚08'45" W, 700 m), DHMECN 2618–19 (Figure 5).

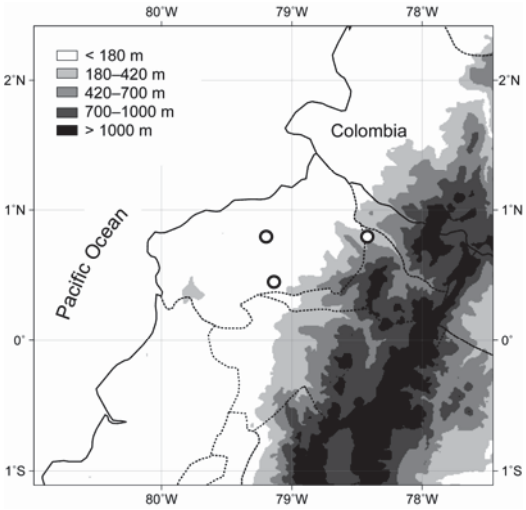

Figure 5. Distribution of *Cochranella albomaculata* in Ecuador (open circles).

Cochranella albomaculata can be distinguished from other glass frogs by the following characteristics: (1) in life, dorsal surfaces of head, body, and limbs green with yellow spots; (2) white ventral parietal peritoneum; (3) adult males lack humeral spine; (4) prepollex not separated from Finger I; (5) iris grayish white with dark reticulation; and (6) in two adult males, SVL 22.2–24.0 mm; in three adult females, SVL 27.1–28.6 mm. It is important to note that, as currently recognized, *Cochranella albomaculata* may represent several species; for example, individuals from Colombia and Ecuador present larger spots on the dorsum than individuals from Central America. A detailed study of the morphological, acoustic, and genetic variation of *C. albomaculata* across its distribution is necessary to identify possible cryptic species.

Cochranella ametarsia (Flores 1987). This species (Figure 1F) is known only from two localities in Amazonian Colombia (Departamento de Amazonas: 70 km NNE Puerto Nariño, the headwaters of Río Caiwima, a tributary of the Río Amayaca-Yacu, ca. Amazonas, ca. 3˚20' S, 70˚20' W; near Leticia ca. 4˚15' S, 69˚95' W). In Ecuador, we have found *C. ametarsia* in the Amazonian lowlands at elevations between 210 and 240 m. Localities in Ecuador include: Provincia Orellana: Estación de Biodiversidad Tiputini (0˚39'00" S; 76˚07'58.8" W, 210 m), DFCH-USFQ D162; Provincia Sucumbíos: Puerto Bolívar (0˚05'19" S; 76˚08'31.3" W, 240 m), QCAZ 28138 (Figure 6). One male of *Cochranella ametarsia* (DFCH-USFQ D162) was found on the trunk of a *Ceiba* sp., 7 m above ground level.

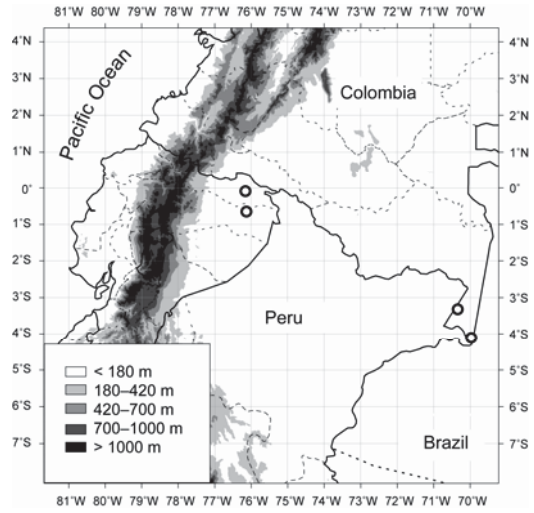

Figure 6. Distribution of *Cochranella ametarsia* in Colombia and Ecuador (open circles).

Cochranella ametarsia can be distinguished from other glass frogs by the combination of the following characteristics: (1) in life, dorsum green with dark spots; (2) white ventral parietal peritoneum; (3) adult males lack humeral spine; (4) tip of prepollex separated from Finger I; (5) iris pale yellow with thin gray reticulation (Figure 1F); and (6) in one adult male, SVL 17.5 mm; in one adult female, SVL 19.7 mm.

The discovery of the above listed glass frogs elevates the total number of centrolenids in Ecuador to 37 species (updated from Coloma

2005). Further research is still necessary in relatively unexplored regions, such as the southern Andes and the Chocó region.

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Literature Cited

Cerón, C., W. Palacios, R. Valencia, and R. Sierra. 1999. Las formaciones naturales de la costa del Ecuador. Pp. 55–78. In R. Sierra (ed.), Propuesta Preliminar de un Sistema de Clasificación de Vegetación para el Ecuador Continental. Proyecto INEFAN/GEF-BIRF and EcoCiencia. Quito, Ecuador.

Coloma, L. A. 2005. Anfibios de Ecuador. Version 2.0 (29 October 2005). Museo de Zoología, Pontificia Universidad Católica del Ecuador. Quito, Ecuador. Accessible at: http://www.puce.edu.ec/zoologia/vertebrados/amphibiawebec/index.html. Captured on 24 January 2006.

Darst, C. R. and D. C. Cannatella. 2004. Novel relationships among hyloid frogs inferred from 12S and 16S mitochondrial DNA sequences. Molecular Phylogenetics and Evolution 31: 462–475.

Duellman W. E. 1980. The identity of *Centrolenella grandisonae* Cochran and Groin (Anura: Centrolenidae). Transactions of the Kansas Academy of Sciences 83: 26–32.

Duellman W. E. 1981. Three new species of centrolenid frogs from the pacific versant of Ecuador and Colombia. Occasional Papers, Museum of Natural History, University of Kansas 88: 1–9.

Flores, G. 1985. A new *Centrolenella* (Anura) from Ecuador, with comments on nuptial pads and prepollical spines in *Centrolenella.* Journal of Herpetology 13: 313–320.

Flores, G. 1987. A new *Centrolenella* from the Amazonian lowlands of Colombia. Journal of Herpetology 21: 185–190.

Flores G. and R. W. McDiarmid. 1989. Two new species of South American *Centrolenella* (Anura: Centrolenidae) related to *C. mariae.* Herpetologica 45: 401–411.

Grant, T. and M. Morales. 2004. *Centrolene litorale*. In: IUCN 2004. 2004 IUCN Red List of Threatened Species. Accessible at: http://www.redlist.org. Captured on 18 December 2005.

Guayasamin, J. M. and E. Bonaccorso. 2004. A new species of glass frog (Centrolenidae: *Cochranella*) from the lowlands of northwestern Ecuador, with comments on the *Cochranella granulosa* group. Herpetologica 60: 85–94.

IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. Accessible at: http://www.globalamphibians.org. Captured on 15 January 2006.

Lynch, J. D. and W. E. Duellman. 1973. A review of the centrolenid frogs of Ecuador, with descriptions of new species. Occasional Papers, Museum of Natural History, University of Kansas 16: 1–66.

Ruíz-Carranza, P. M. and J. D. Lynch. 1991. Ranas Centrolenidae de Colombia I: propuesta de una nueva clasificación genérica. Lozania 57: 1–30.

NOTES ON GEOGRAPHIC DISTRIBUTION

Savage, J. M. 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna between Two Continents, between Two Seas. USA: The University of Chicago Press.

Wild, E. R. 1994. Two new species of centrolenid frogs from the Amazonian slope of the Cordillera Oriental, Ecuador. Journal of Herpetology 28: 299–310.

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ERRATUM

After the acceptance of proofs the present article was published in March 2006 with an incorrect pagination (22-24). Therefore, we provided a new and correct one: 70-75.

We apologize and are grateful for your comprehension,

The editorial board.

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