

A NEW SPECIES OF THE GENUS *CAECILIA* LINNAEUS, 1758 (AMPHIBIA: GYMNOPTIONA: CAECILIIDAE) FROM CAQUETÁ, COLOMBIA

UNA NUEVA ESPECIE DEL GÉNERO *CAECILIA* LINNAEUS, 1758 (AMPHIBIA: GYMNOPTIONA: CAECILIIDAE) DE CAQUETÁ, COLOMBIA

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Resumen.— Describimos una nueva especie del género *Caecilia* de Caquetá, Colombia, la cual sobresale por su gran tamaño corporal, sus numerosos conteos de surcos primarios y secundarios, la presencia de escamas dérmicas a lo largo del cuerpo, la disposición y tamaño de los dientes mandibulares y la ausencia de un escudo terminal no segmentado. Sus conteos de surcos la asemejan a *C. disossea*, de la Amazonía ecuatoriana y peruana, pero difiere de esta por los caracteres previamente mencionados (entre otros).

Palabras clave.— Amazonía, cecilias, morfología, taxonomía, textura de la piel.

Abstract.— We here describe a new species of the genus *Caecilia* from Caquetá, Colombia, whose most salient characters are its large size, its very high counts of primary and secondary grooves, the presence of dermal scales throughout its body length, the size and arrangement of its mandibular teeth, and its lack of an unsegmented terminal shield. Groove counts are close to those of *C. disossea*, known from the Ecuadorian and Peruvian Amazon but these differ on the previously mentioned characters (among others).

Keywords.— Amazon, caecilians, morphology, skin texture, taxonomy.

INTRODUCTION

Caecilia Linnaeus, 1758 is the most species-rich caecilian genus in the Neotropic with 34 currently recognized species distributed in southern Central America and South America, these are closely related to *Osaecilia* Taylor, 1968, which share most morphological characters but their eyes are concealed under bone (Taylor, 1968; Frost, 2021; Fernández-Roldán et al., 2022). *Caecilia* is characterized (osteology-wise) by having an imperforate stapes, inner mandibular teeth, eyes surrounded by the maxillopalatine bone, and monocuspid teeth (Wilkinson et al., 2011). Their offspring develop completely within the egg, so that there is no aquatic stage (Funk et al., 2004; Pérez et al., 2009).

In Colombia, the bulk of the diversity within the genus *Caecilia* is Trans-Andean (a pattern further reinforced by the recent descriptions of *C. goweri* Fernández-Roldán & Lynch, 2021 and *C. pulchraserrana* Acosta-Galvis, Torres & Pulido-Santacruz, 2019) with only a few representatives found in the Amazon lowlands, namely *C. bokermanni* Taylor, 1968, *C. tentaculata* Linnaeus, 1758 and *C. sp.* (Lynch, 2000). An examination of the herpetological collections by Gonzalo Sánchez during his fieldwork in the Amazon forests of Tres Esquinas, Solano, Caquetá, Colombia, in 1991, has yielded a fourth Cis-Andean *Caecilia* which is here described.

MATERIALS AND METHODS

All groove counts were performed under a stereoscope and repeated at least twice for each individual. Entomological pins were used to demark and differentiate primary and secondary grooves in order to avoid misrepresenting their individual counts. Careful incisions to the mouth's commissure were performed using a razor blade in order to fully open the mouth and access dentition, choanae, and tongue when necessary. A sharp pin was used to open the pockets where the grooves concealed their dermal scales; once these were obtained, they were described in shape and size and put back in their respective positions so no material would be lost or damaged. Subdermal scales were searched by partial dissection of the annuli close to mid-body point and removing a section of epidermis to expose the connective tissue and determine their presence or absence. Sex was determined through direct examination of gonads by performing a ventral longitudinal incision posterior to the mid-body point and prior to the vent in order to look for testis in males and ovaries in females; If mature testis or ovaries were found these were considered to be adults. Diagnosis and description follow Fernández-Roldán & Lynch (2021) and Maciel & Hoogmoed (2018), phallodeum morphology and terminology follows Gower & Wilkinson (2002). All measurements were performed under a stereoscope; these were taken to the nearest 0.1 mm using a Neiko digital caliper and a metric measuring tape to determine total length. Comparisons of groove counts were made using Taylor's (1968) species accounts or their respective original descriptions for those species of *Caecilia* described after 1968.

Museum abbreviations are as follows: American Museum of Natural History, New York, NY, U.S.A. (AMNH), Colección de Herpetología, Escuela Politécnica Nacional, Quito, Ecuador (EPN), Colección de Anfibios, Instituto Alexander von Humboldt, Villa de Leyva, Boyacá, Colombia (IAvH), Colección de Anfibios, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, D.C., Colombia (ICN), Colección de Anfibios, Instituto SINCHI, Bogotá, D.C., Colombia (ISCA), Museo de Herpetología, Colección de Anfibios, Museo La Salle, Bogotá, D.C. Colombia (MLS), and Colección de Anfibios, Pontificia Universidad Javeriana, Bogotá, D.C., Colombia (MUJ).

RESULTS

Caecilia aprix sp. nov.

Holotype. MUJ 10965, an adult male obtained by Gonzalo Sánchez in vereda Tres Esquinas, municipio Solano, departamento

Caquetá, Colombia, 0° 43' 34.3" N, 75° 15' 08.2" W, 192 m a.s.l., 24 April 1991 (Fig. 1, Table 1).

Distribution. At the moment *Caecilia aprix* is known only from the humid tropical jungles of the type locality, on the alluvial plains of the Orteguzza River (a tributary of the Caquetá River), where small forest patches and pastures make up the current landscape of Solano, Caquetá (Fig. 2).

Diagnosis. *Caecilia aprix* differs from *C. attenuata* Taylor, 1968, *C. caribea* Dunn, 1942, *C. corpulenta* Taylor, 1968, *C. crassisquama* Taylor, 1968, *C. degenerata* Dunn, 1942, *C. guntheri* Dunn, 1942, *C. inca* Taylor, 1973, *C. occidentalis* Taylor, 1968, *C. orientalis* Taylor, 1968, *C. pachynema* (Günther, 1859), *C. pulchraserrana*, and *C. subdermalis* Taylor, 1968 because contrary to these species, it bears secondary grooves.

The remaining *Caecilia* that bear secondary grooves, namely *C. abitaguae* Dunn, 1942 (137–148 primary grooves and 0–5 secondary grooves), *C. albiventris* Daudin, 1803 (144–147 primaries and 45–53 secondaries), *C. antioquiaensis* Taylor, 1968 (171 primaries and 4 secondaries), *C. armata* Dunn, 1942 (186 primaries and 92 secondaries), *C. bokermanni* (180–192 primaries and 15–21 secondaries), *C. dunni* Hershkovitz, 1938 (124 primaries and 67 secondaries), *C. flavopunctata* Roze & Solano, 1963 (155 primaries and 27 secondaries), *C. goweri* (156–193 primaries and 7–20 secondaries), *C. gracilis* Shaw, 1802 (183–204 and 11–21 secondaries), *C. guntheri* (111–132 primaries and 0–10 secondaries), *C. isthmica* Cope, 1877 (131–147 primaries and 12–21 secondaries), *C. leucocephala* Taylor, 1968 (118–142 primaries and 17–48 secondaries), *C. mertensi* Taylor, 1973 (142 primaries and 48 secondaries), *C. museugoeldi* Maciel & Hoogmoed, 2018 (152 primaries and 26 secondaries), *C. nigricans* Boulenger, 1902 (154–189 primaries and 32–62 secondaries), *C. occidentalis* (191–221 primaries and 0–12 secondaries), *C. perdita* Taylor, 1968 (139–152 primaries and 64–83), *C. subnigricans* Dunn, 1942 (151–161 primaries and 17–31 secondaries), *C. subterminalis* Taylor, 1968 (170 primaries and 16 secondaries), *C. tentaculata* (122–137 primaries and 30–42 secondaries), *C. tenuissima* Taylor, 1973 (180 primaries and 10 secondaries), and *C. volcani* Taylor, 1969 (112–124 primaries and 14–32 secondaries), all have lower counts of primary grooves than the new species (234).

Based on groove counts alone, *C. disossea* Taylor, 1968 (216–252 primaries and 16–34 secondaries) and *C. thompsoni* Boulenger, 1902 (187–240 primaries and 26–41 secondaries) are the two most similar species to *C. aprix*, because these have overlapping counts of primary grooves with the new species, but these are considerably slenderer (length in width 54.2–132 times in *C.*

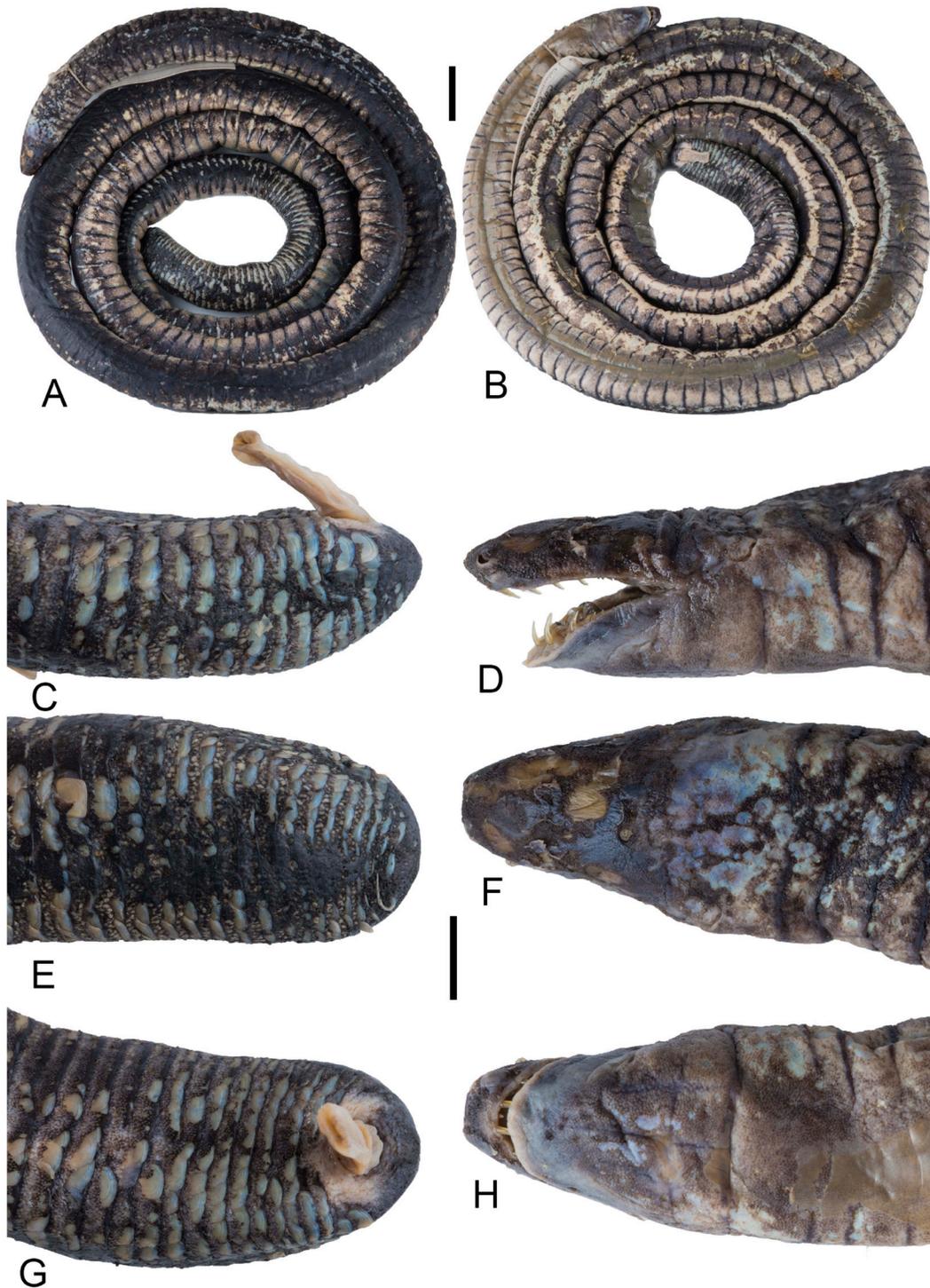


Figura 1. Holotipo de *Caecilia aprix* (MUJ 10965). A-B) Cuerpo en vistas dorsal y ventral; escala equivale a 10 mm. C, E, G) vistas lateral, dorsal y ventral del término, phalodeum y las últimas escamas dermales del cuerpo. D, F, H) vistas lateral, dorsal y ventral de la cabeza, collares y primeros surcos primarios; la escala equivale a 5 mm.

Figure 1. Holotype of *Caecilia aprix* (MUJ 10965). A-B) Body in dorsal and ventral views; scale equals 10 mm. C, E, G) lateral, dorsal, and ventral view of the terminus, phalodeum, and last dermal scales of the body. D, F, H) lateral, dorsal, and ventral view of the head, collars, and first primary grooves; scale equals 5 mm.

disossea and 62–100 times in *C. thompsoni*) than the new species (66 times). The counts of secondary grooves allow distinction among these three species because these are lowest in *C. disossea* (16–34), moderate in *C. thompsoni* (26–41), and highest in *C. aprix* (58). The shape and size of the vent, i.e. a large circular or disk-like structure in *C. disossea* (Taylor, 1968: 376, Fig. 197 E) differs from that of the new species, which is much more reduced (<1/3rd) and bears post-cloacal grooves (absent in *C. disossea*).

Caecilia disossea was diagnosed in its original description (Taylor, 1968) as a slender species that has 216–252 primary grooves, 16–34 secondary grooves, length in width 54.2–132 times, few dermal scales found at the posterior end of the body, and indistinct collars fussed dorsally and ventrally, with a small terminal shield or “cap”. *Caecilia aprix* has overlapping counts of primary grooves but higher counts of secondaries, dermal scales throughout its total length, i.e. from the first groove onto the last groove (only towards the last third of the TL near the terminus in *C. disossea*), no subdermal scales within the connective tissue of the skin (unlike *C. disossea*), has a pointed head in profile (rounded in *C. disossea*), lacks a terminal shield or cap (small in *C. disossea*), and has a different dental arrangement on the vomeropalatine and inner mandibular series; not in the amount of teeth per series but in the shape and size of the teeth on the lower jaw.

The dentary series has 7-1-7 teeth (vs 11-11 dentaries in *C. disossea*) but the anterior-most two are very large, recurved, and separated from the posterior 5, which are much smaller (approximately 1/3rd the size of the first two vomeropalatines); the inner mandibular teeth are short, thick, pointed straight dorso-ventrally, and placed very close together with 4 teeth on each side (vs 2-2 inner mandibulars in *C. disossea*). At the moment, *C. aprix* is the largest *Caecilia* known from the Colombian Amazon, easily surpassing the total length records of *C. disossea* (820 mm), *C. tentaculata* (800 mm), *C. bokermanni* (527 mm), and *C. sp.* (407 mm), with a remarkable total length of 1250 mm.

Description of the holotype. General condition is poor because the skin appears to be mostly damaged throughout the body or even missing in some parts of the head and collars. This skin condition exposes the numerous bluish dermal scales within the pockets of the grooves (see Remarks). Still, all the usual measurements and meristics can be taken. An adult male with a total body length of 1250 mm and a body width of 18.9 mm at mid-body point, length divided by width is 66.1 times. Head (10.5 mm) narrower than the body. In lateral view the top of the head is sloping (not straight), margins of the mouth curved and

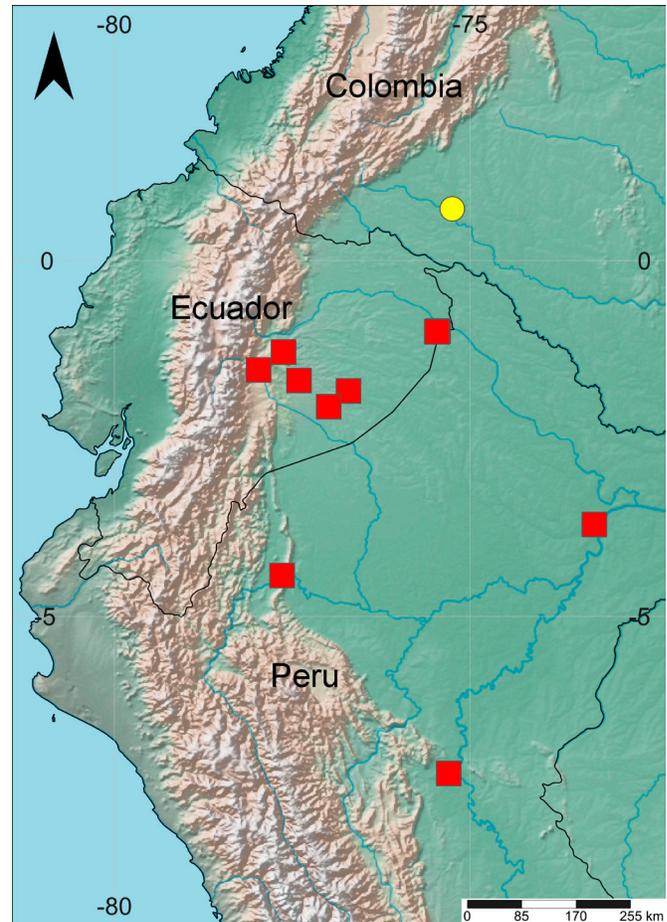


Figure 2. Distribución geográfica de *Caecilia aprix* (circulo amarillo) y *C. disossea* (cuadrados rojos).

Figure 2. Geographic distribution of *Caecilia aprix* (yellow circle) and *C. disossea* (red squares).

downturned from the commissure of the mouth to the anterior margin of the mouth. Snout truncated in dorsal and ventral view but rounded in profile; it projects 2.3 mm beyond the mouth. Nostrils clearly visible in dorsal view and in profile but not visible in ventral view; these are oval in shape and much closer to the tentacular opening than to the eye, the distance between the nostril and tentacular opening is 1.0 mm, that between the nostril and the eye is of 5.2 mm. Eyes very small, 0.4 mm in diameter, these are partially concealed by very translucent epidermis and resemble a purple dot. Distance between the eye and the commissure of the mouth 5.0 mm. Interorbital distance 7.3 mm, and the distance between snout tip and eye is 5.2 mm. Tentacular openings are oval in outline, slightly elevated above the skin, positioned below and posterior to the nostril, closer to the margin of the mouth than to the nostril; these are visible in ventral and lateral view but not visible in dorsal view.

Tabla 1. Mediciones y conteos del holotipo de *Caecilia aprix* (MUJ 10965).**Table 1.** Measurements and meristics of the holotype of *Caecilia aprix* (MUJ 10965).

Characters/Specimen	MUJ 10965
Total length (mm)	1250
Width at mid-body (mm)	18.9
Length/width (times)	66.1
Snout projection (mm)	2.3
Snout tip-eye level (mm)	5.2
Distance between the eyes (mm)	7.3
Eye-mouth's commissure distance (mm)	5.0
Eye-nostril distance (mm)	5.2
Eye-tentacular opening (mm)	5.0
Nostril-tentacular opening (mm)	1.0
Distance between the nostrils (mm)	3.9
First scale found at groove number	1
Primary grooves	234
Secondary grooves	58
Complete grooves towards terminus	14
Grooves interrupted by vent	4
Anterior denticulations on vent	4
Posterior denticulations on vent	5
Premaxillary-maxillary teeth	8-1-8
Vomeropalatine teeth	7-1-7
Dentary teeth	7-7
Inner mandibular teeth	4-4

First collar slightly smaller than the second, the skin surrounding the collars has been damaged, the third nuchal groove is complete dorso-laterally but incomplete ventrally. Width of body becoming stouter past the collars onto the third fifth of the total body length, it then tappers at the fourth fifth, but increases considerably prior to the terminus, which achieves a comparable width to that of the collars. The terminus is slightly stouter than the width of the head. Primary grooves 234, mostly complete but patches of missing skin towards the

terminus might conceal incomplete folds as complete ones, with 14 complete grooves at the posterior end of the body, secondary grooves 58, first secondary grooves are short and appear only dorsally, posterior secondary grooves occur mid-dorsally, and the last ones extend onto the ventral surfaces but are incomplete ventrally; all containing dermal scales. Vent transverse, small, situated in a slight depression, of the same white or cream color as surrounding skin, bearing small denticulations, 4 anteriorly and 5 posteriorly, no anal glands on the anterior margin of the vent.

The phalloseum has been partially (and badly) extruded and is now flat, allowing only for a very basic description, it is 11.8 mm in length, and 5.8 mm in width; it has an overall smooth texture, a cream or white color, and consists of an internal duct or chamber (urodeum) of a darker hue that is surrounded by two light-colored lateral folds (blind sacs) seemingly partially fused to the urodeum, the terminal "bulb" of the phallus appears to be structurally simple or non-ornate. Two large, well-developed, laterally placed, testis comprising oval lobes of yellow color adjacent to fat bodies. The posterior end of the body lacks an unsegmented terminal shield, given that it is interrupted by the last 4 short primary and secondary grooves and these extend onto the ventral surfaces of the terminus. Dermal scales first appear at the first primary groove, where these are small and rounded, but those found towards the terminus are large, subrectangular and slightly thicker at the posterior margin of the scale. Throughout the body, ventral dermal scales larger in size than dorsal dermal scales. No subdermal scales within the connective tissue of the skin.

All teeth are monocuspid, pointed, and recurved backwards; those on the premaxillary-maxillary and vomeropalatine series are smaller and in overall size than those on the dentary series, inner mandibular teeth are small but not concealed by the tongue or gums. The premaxillary-maxillary bears 8-1-8 teeth which are well spaced and large but decreasing in size posteriorly, the vomeropalatine series has 7-1-7 teeth, which also decrease their overall size posteriorly, the dentary has 7-7 teeth on each side and inner mandibulars are 4-4, very short, straight dorso-ventrally, pointed and grouped close together. Teeth on dentary series more recurved than those on premaxillary-maxillary and vomeropalatine series. Choanae oval transversally in shape and the space separating them is 1.3 mm, slightly larger in size than the maximum diameter of one choana 0.8 mm, tongue with protruding narial plugs, which are darker than the coloration of the tongue. Traces of teeth replacement or group shedding can be seen on the gums of the vomeropalatine series. Coloration in life is unknown. In preservative, main body coloration is

dark purple dorsally, flanks and ventral surfaces are cream, subdivided by black annuli. The terminus is dark purple dorsally but bright cream ventrally.

Etymology. The specific epithet is Greek, meaning ‘with closed teeth’ or ‘with fast, tight teeth’. The name seems to fit this species because its inner mandibular series consists of four short, thick, pointed teeth on each side of the mouth that are situated very close to one another.

Remarks. Even though we could not associate any field notes with this specimen, we think it is likely that the holotype of *Caecilia aprix* was found dead and then later preserved by the collector. The damaged skin (missing in parts of the head), faded body coloration, and the numerous exposed dermal scales throughout the body (Fig. 1) are signs of ‘Malacodermis’ or softening of the skin. JDF has encountered the same condition in other *Caecilia* specimens that were found dead in the field and later on preserved in formaldehyde at 10%, albeit with a markedly different skin texture than that of conspecifics that were captured alive, euthanized, and then preserved.

DISCUSSION

Caecilia aprix is known only from a single locality in the Colombian Amazon that currently faces one of the fastest rates of deforestation, and whose original vegetation consisted of pluristratified jungles with canopies surpassing 25 meters in height, and forests floors covered by a thick layer of leaf litter. The habitat of the new species is quickly being transformed into pastures as a result of logging, and given that deforestation and habitat transformation are well known causes of caecilian population decline (Gower & Wilkinson, 2005), we consider the new species could be threatened.

Taylor (1968) had diligently detected two paratypes of “*Oscacaecilia bassleri*” (AMNH 42832 & 42852) amid the type series of Dunn (1942), that had their eyes exposed on a socket, i.e. now allocated in the genus *Caecilia* as ‘*C. disossea*’. Apparently Dunn (1942) had a mixed series, and groove counts can overlap in *O. bassleri* and *C. disossea*, which makes us wonder if indeed *C. disossea* is so widely distributed in the Ecuadorian and Peruvian Amazon (Fig. 2), or if perhaps a portion of these records has been misidentified.

The Colombian Amazon remains a rather poorly known region, especially for caecilians; this is partly due to their fossorial habits, which makes collecting them a challenging endeavour, but also because of all the social unrest brought by

armed groups, which limits fieldwork in southern Colombia. Nonetheless, Mariela Osorno-Muñoz and her colleagues at Instituto SINCHI have recently conducted fieldwork in the ‘Andean-Amazon Piedmont’ of Caquetá and collected a series of *Caecilia orientalis* (ISCA 4174, 4189, 4208, 4328–29) in Belén de los Andaquíes, and one *Microcaecilia albiceps* (Boulenger, 1882) (ISCA 5666) in Florencia. Hopefully, as more expeditions and collections are made in this region of Colombia, more species (described or not) will be obtained and the diversity and distribution of the Amazonian Gymnophiona will be better understood (Appendix 1).

Acknowledgments.— Gonzalo Sánchez obtained the holotype of *Caecilia aprix* during his fieldwork in Tres Esquinas, Caquetá, in 1991, and without his efforts the description of this new species would not have been possible. We thank Mónica A. Guerra, curator of the herpetological collections at Escuela Politécnica de Ecuador in Quito, for kindly supplying us detailed photographs of paratypes of *Caecilia disossea*. Maria Alejandra Rodríguez Morales, collection manager at Universidad Javeriana, Bogotá, D.C. cordially assisted JDF during his multiple visits to the museum. Gustavo González-Durán at Wildlife Conservation Society, Bogotá, D.C., lent us his photographic equipment to take photos of the holotype of *C. aprix*. The comments and suggestions made by Santiago J. Sánchez-Pacheco and an anonymous reviewer, made for a stronger final version of this manuscript. Lastly, we thank Mariela Osorno-Muñoz for granting us access to the caecilians deposited at Instituto SINCHI Bogotá, D.C., and sharing the results of her recent fieldwork in Caquetá.

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APPENDIX 1. EXAMINED MATERIAL

Countries are indicated in bold capitals, departments and provinces in regular capitals, municipalities and localities in plain text. * Denotes specimens examined via photographs.

Caecilia aprix (n = 1): **COLOMBIA**: CAQUETÁ: Solano, Tres Esquina: MUJ 10965.

Caecilia bokermanni (n = 1): **COLOMBIA**: AMAZONAS: Parque Nacional Natural Amacayacu: IAvH 2123.

Caecilia disossea (n = 6*): **ECUADOR**: MONTALVO: Río Bobonaza: EPN 2353-54; NAPO-PASTAZA: Río Oglan: EPN 4185; Río Pucayacú: EPN 4000, región de Puyo: EPN 1681, 1683.

Caecilia orientalis (n = 14): **COLOMBIA**: CAQUETÁ: Belén de los Andaquíes: ISCA 4174, 4189, 4208, 4328-29; CAUCA: Santa

Rosa, Bota Caucana: IAvH 6741, ICN 58444; PUTUMAYO: Mocoa, vereda El Mirador: ICN 58443; transecto San Francisco-Mocoa: ICN 58407-08; Valle de Sibundoy: ICN 47816, 49647-49.

***Caecilia* sp.** (n = 3): **COLOMBIA**: VAUPÉS: Taraira, Río Apaporis, Estación Biológica Caparú: IAvH 5114, ICN 42090-91.

Caecilia tentaculata (n = 4): **COLOMBIA**: AMAZONAS: Araracuara, Puerto Santander: ICN 43176; PUTUMAYO: Orito: ICN 47954; Puerto Asís: MLS 13; Puerto Leguizamo: IAvH 5389.

Osaecilia bassleri (n = 3): **COLOMBIA**: AMAZONAS: La Pradera: IAvH 2563-64; PUTUMAYO: Puerto Asís: MLS 26.

