**Catalogue of American Amphibians and Reptiles 924**

Ledesma, D. T. 2019. *Potomotyphlus*, *Potomotyphlus kaupii*.

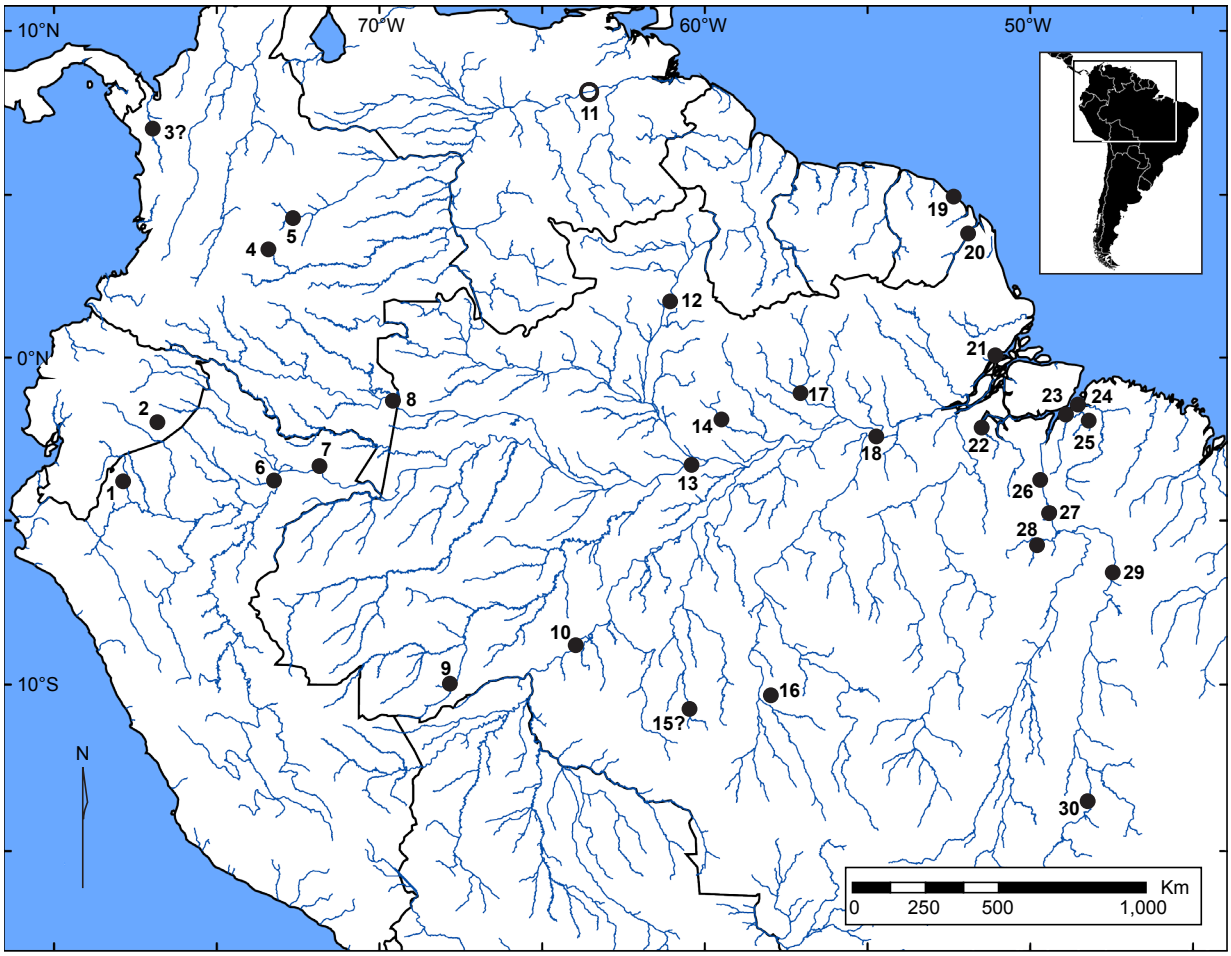
## *Potomotyphlus* Taylor
## Cecilia de Río (River Caecilian)

*Potomotyphlus* Taylor 1968:11, 256. Type species: "*Caecilia kaupii* (Berthold)," by designation.
*Potomotyphlops*: Taylor 1968:38. *Lapsus* (see **Nomenclatural History**).
*Potamotyphlus*: Taylor 1969a:600. *Lapsus* (see **Nomenclatural History**).
*Potomotuphus*: Ledesma 2019. *Lapsus*.
*Potomotyplus*: Ledesma 2019. *Lapsus*.

**CONTENT.** One species, *Potomotyphlus kaupii*, is recognized (see **Nomenclatural history**).

**DESCRIPTION.** *Potomotyphlus kaupii* is an aquatic caecilian endemic to much of northern South America. The longest known specimen of *Potomotyphlus kaupii* has a total length of 695 mm (Dunn 1942; Taylor 1968); total lengths for additional specimens range from 33–555 mm (Maciel and Hoogmoed 2011). Along the body, the number of primary annuli ranges 83–102. In the original description of the species, 104 primary annuli were reported (Berthold 1859), however, that count also may have included the collars (Taylor 1968). Nuchal grooves are positioned laterally and ventrally on the body (Maciel and Hoogmoed 2011). The primary annuli are interrupted dorsally and may not be well defined by distinct grooves (see **Remarks**). There are no secondary annuli present; however, pseudosecondaries may be visible (Nussbaum and Wilkinson 1989). The last three to six annuli are laterally distinct and no annuli are present from the approxi-

**Figure 1.** Body of *Potomotyphlus kaupii* (Museum of Vertebrate Zoology [MVZ] 173770) showing relative size of head and collar compared to body. Scale bar is 1 cm. Photographed by Simon Scarpetta.




**Map.** Geographic distribution of *Potomotyphlus kaupii*. The open circle represents the type locality, the question marks indicate uncertainty in the reported locality, and the black dots represent localities from the literature corresponding to the following: 1. Rio Santiago, La Poza, Peru (Catenazzi and Venegas 2012); 2. Pucayacú, Pastaza Province, Ecuador (Taylor and Peters 1974); 3?. Atrato River System, Colombia (Taylor 1968) (see **Geographic Distribution**); 4. Rio Guayabero, La Macarena, Meta, Colombia (Lynch 2000); 5. Rio Meta, Puerto Lòpez, Colombia (Lynch 2000); 6. Rio Itaya, San Antonio, Iquitos, Peru (Taylor 1968); 7. Rio Ampiyac, Iquitos, Peru (Taylor 1968); 8. Rio Caquetà, La Pedera, Amazonas, Colombia (Lynch 2000); 9. Rio Branco, Acre, Brazil (Maciel and Hoogmoed 2011); 10. Madeira River, municipality of Porto Velho, Rondônia, Brazil (Oliveira et al. 2012); 11. Cuidad Bolivar, Venezuela (Berthold 1859); 12. Cachoeira do Bem Querer, Roraima, Brazil (Maciel and Hoogmoed 2011); 13. Ilha Marchantaria, Amazonas, Brazil (Maciel and Hoogmoed 2011); 14. UHE Balbina, Presidente Figueiredo, Amazonas, Brazil (Maciel and Hoogmoed 2011); 15?. Mato Grosso, Brazil (*Chthonerpeton microcephalum*) (A. Miranda-Ribeiro 1937) (see **Geographic Distribution**); 16. Apiacás River, Mato Groso, Brazil (Alves-Silva et al. 2017); 17. Cachoeira Porteira, Oriximiná, Pará, Brazil (Maciel and Hoogmoed 2011); 18. Sanarém, Pará, Brazil (Maciel and Hoogmoed 2011); 19. "Cayenne", French Guiana (Taylor 1968); 20. Oyapock River, Saint-Georges-de-l'Oyapock, French Guiana (Marty et al. 2007a); 21. Rio Amazonas, municipality of Macapá, Amapá, Brazil (Caramaschi and Pombal 2000); 22. Rio Xingu, Melgaço, Pará, Brazil (Maciel and Hoogmoed 2011); 23. Abaetetuba, Pará, Brazil (Maciel and Hoogmoed 2011); 24. Belém, Pará, Brazil (Maciel and Hoogmoed 2011); 25. Acará, Pará, Brazil (Maciel and Hoogmoed 2011); 26. Tucuruí, Pará, Brazil (Maciel and Hoogmoed 2011); 27. Jacundá, Pará, Brazil (Maciel and Hoogmoed 2011); 28. Serra dos Carajás, Pará, Brazil (Maciel and Hoogmoed 2011); 29. Tocantins River, Estreito hydroelectric powerplant, Maranhão, Brazil (Cintra et al. 2010); 30. Usina Hidroeletrica Serra da Mesa, Goiás, Brazil (Maciel and Hoogmoed 2011). Map was created in part using ArcMap™ © Esri. Layers used include "World Countries (Generalized)" source Esri and "South American Rivers" source user madalynbotkin.

**Figure 2.** Head of *Potomotyphlus kaupii* (MVZ 173770) in lateral view. Scale bar is 5 mm. Photo by Simon Scarpetta.

mate level of the vent to the terminus (Maciel and Hoogmoed 2011). The head and collars of the animal are noticeably small, making them narrower in comparison with the portion of the body immediately posterior to the collars (Taylor 1968). The skull is slightly compressed dorsoventrally. A small specimen of *Potomotyphlus kaupii* (Carnegie Museum [CM] 2906) has head and body proportions that are the same as other typhlonectids of similar size, demonstrating ontogenetic variation in head size (Wilkinson and Nussbaum 1999). The tongue is completely attached to the mandibular mucosa anteriorly. There are two large narial plugs. The snout projects anteriorly beyond the mouth. The eye is not covered by bone and is usually visible (see **Remarks**) (Maciel and Hoogmoed 2011). There is intraspecific variation in whether the large, sub-triangular nares are visible when viewed dorsally. A small anterior tentacle is located below the nostrils, near the margin of the mouth, and cannot be seen dorsally (Maciel and Hoogmoed 2011).

The body is laterally compressed and possesses a dorsal free fold of skin (Wilkinson 1988) that is especially prominent on the posterior portion of the body (see **Remarks**). Additionally, some specimens have a ventral ridge that extends approximately 30 mm in front of the cloacal disk (Wilkinson and Nussbaum 1997). Dermal and subdermal scales are absent and paired anal papillae are variably present. In one study, paired anal papillae were present on two of the 57 male specimens examined (Maciel and Hoogmoed 2011). The vent disk is extended anteriorly and rounded posteriorly with a few anteromedial denticulations that may be elongated (Maciel and Hoogmoed 2011). The vent of males has been hypothesized to serve as a clasper used during copulation (Duellman and Trueb 1986, 1994; Taylor 1968; Taylor and Peters 1974; but see Wilkinson 1989). The vent disk is surrounded by fleshy folds of skin in both sexes and there is variation in whether the disk is depressed (Maciel and Hoogmoed 2011). Sexual dimorphism and ontogenetic variation are present in the vent region with males having a more sunken disk than females; smaller individuals lack a depression. The fleshy skin flap surrounding the cloacal disk may obscure the disk from view in larger female specimens. The shape of the terminus is dimorphic with

females having a narrower and more pointed terminus than males (Maciel and Hoogmoed 2011). The number of anal denticulations range from 7–11 with a similar number at the posterior and anterior edge of the vent (Maciel and Hoogmoed 2011). *Potomotyphlus kaupii* has a relatively large number of teeth that are tightly packed on relatively large dentigerous areas of tooth bearing bones (Wilkinson and Nussbaum 1997). There are four series of monocuspid teeth. In total, the maximum premaxillary-maxillary tooth count is 60 with no distinct variation in size. Prevomerine-palatine teeth have a maximum count of 53 and are smaller than the premaxillary-maxillary teeth. The dentary teeth number up to 64 and are approximately the same size as the premaxillary-maxillary teeth; however, the posterior dentary teeth are relatively smaller in size than the anterior teeth. Splenial teeth have a maximum number of 12 and are approximately the same size as the prevomerine-palatine teeth (Maciel and Hoogmoed 2011). Variation in the number of teeth was observed to be a function of size with larger specimens having more teeth than smaller ones (Taylor 1968).

In life, specimens of *Potomotyphlus kaupii* are described as grayish or brownish in color with darker annular grooves (Maciel and Hoodmoed 2011; Tapley et al. 2019). A recently deceased female individual was described as being blue-grey dorsally and white-blue ventrally with a pale head, though once placed in alcohol the blue dorsal surface turned dark brown and the white-blue ventral surface turned grey (Marty et al. 2007a). A photograph of an uncollected specimen shows the color of a live individual as being white ventrally with a gray dorsal coloring that transitions into a blue color on the head (Marty et al. 2007b).

Preserved specimens of *Potomotyphlus kaupii* were described as being similar to the blue-gray of *Typhlonectes natans* and darker color of *Typhlonectes compressicauda* (Wilkinson and Nussbaum 1997). The color of the annular grooves of some individuals of *Potomotyphlus kaupii* was described as being similar to the purple color of preserved specimens of *Nectocaecilia* (Wilkinson and Nussbaum 1997). The color of preserved *Potomotyphlus kaupii* has also been described as being dorsally gray-olive with the sides and

**Figure 3.** Head of *Potomotyphlus kaupii* (MVZ 173770) in ventral view. Scale bar is 5 mm. Photo by Simon Scarpetta.

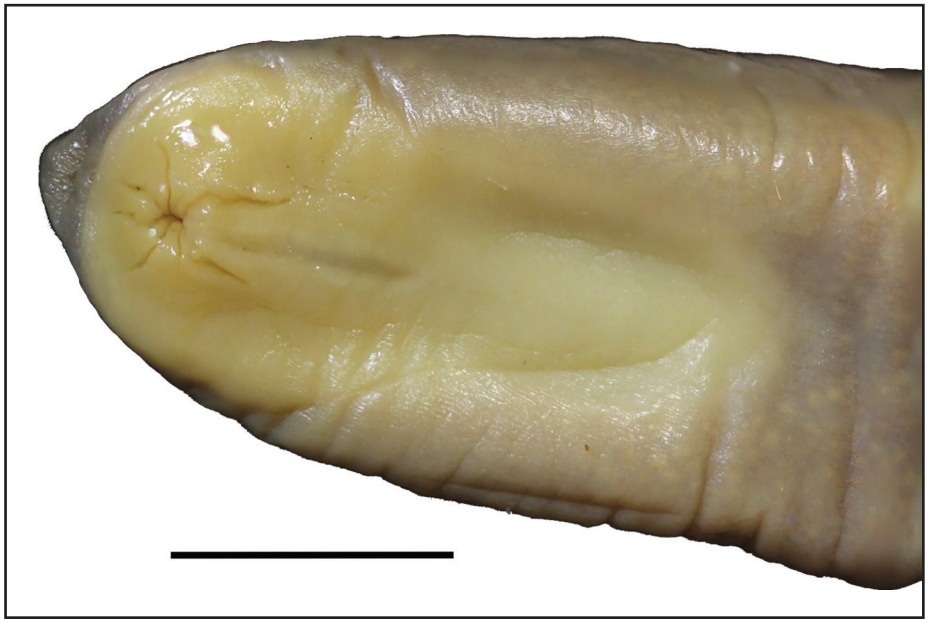


**Figure 4.** Terminus of *Potomotyphlus kaupii* (MVZ 173770) from ventral view showing cloacal disk. Scale bar is 5 mm. Photo by Simon Scarpetta.

venter having a yellowish-olive color with a cream-colored vent (Taylor 1968). The holotype for the now-synonymized species *Potomotyphlus melanochrus*, Naturhistorisches Museum, Wien [NMW] 9147, was described as being black throughout except for a lighter area around the eyes (Taylor 1968).

**DIAGNOSIS.** *Potomotyphlus kaupii* occurs sympatrically with other aquatic caecilians including *Typhlonectes compressicauda* in Colombia, French Guiana, and Brazil (Maciel and Hoogmoed 2011) and with *Atretochoana eiselti* in the Mosqueiro region and possibly the Cachoeira Santo Antônio area of Brazil (Hoogmoed et al. 2011). The shape of the vent (cloacal) disk in *Potomotyphlus kaupii*, elongate and narrow anteriorly while rounded posteriorly, is unique among typhlonectids (Wilkinson et al. 2011). In adult specimens of *Potomotyphlus kaupii*, the anterior region of the body, including the head and collars, is disproportionately small compared to the region just posterior, a feature that distinguishes the species from other caecilians (however see **Remarks**). The tentacular aperture of *Potomotyphlus* is located more posterior to the nares compared to *Nectocaecilia* and *Typhlonectes* and more anterior to the eye compared to *Chthonerpeton* (Wilkinson and Nussbaum 1997). *Potomotyphlus* is unique among typhlonectids in having partially fused choanal valves with a concealed aperture and differs from *Atretochoana* in having a line of fusion of the valves marked with a thickened ridge (Wilkinson and Nussbaum 1999). Within Typhlonectidae, the monotypic genera *Potomotyphlus* and *Atretochoana* have the greatest number of tooth positions on the dentary and the teeth of *Potomotyphlus* have a more conical shaft, narrow base, and a well-developed lateral flange (Wilkinson and Nussbaum 1999). The orientation and relative size of the nostrils, anteriorly directed and large in *Atretochoana eiselti* but not in *Potomotyphlus kaupii*, and the relatively flatter and wider head of *Atretochoana eiselti* compared to *Potomotyphlus kaupii* can be used to distinguish the two species (Hoogmoed et al. 2011).

**PHYLOGENETIC RELATIONSHIPS, PUBLISHED DESCRIPTIONS, ILLUSTRATIONS, DISTRIBUTION, FOSSIL RECORD,** and **PERTINENT LITERATURE.** See species account.

**Figure 5.** Body of *Potomotyphlus kaupii* showing a dorsal free fold. Live individual from the Sedgwick County Zoo, Kansas. Photo by Charles Withnell.

**NOMENCLATURAL HISTORY.** Both the generic name and the species were described by Taylor (1968:256 and 1968:257, respectively). The species *Potomotyphlus melanochrus* was also described in 1968 (Taylor 1968:263) but was subsequently synonymized with *Potomotyphlus kaupii* by Nussbaum and Wilkinson (1989).

The spelling "*Potamotyphlus*" was used by Taylor (1969a, 1969b) in the place of the originally assigned name by Taylor (1968), *Potomotyphlus*. The spellings used by Lescure et al. (1986) followed the spelling used by Taylor (1969a, 1969b) in that the root, "Potamo," appeared in the proposed epifamily "Potamotyphloidea," family "Potamotyphlidae," subfamily "Potamotyphlinae," and infrafamily "Potamotyphlilae." However, the tribe proposed by Lescure et al. (1986), "Potomotyphlini," follows the root of the original spelling of *Potomotyphlus* (Taylor). The taxonomy proposed by Lescure et al. (1986) was critically reviewed (Nussbaum and Wilkinson 1989) and the classification was not adopted by subsequent authors, with the exception of the use of Potomotyphlidae (Exbrayat 2000, Lescure and Renous 1988, Pefaur 1992, Renous and Gasc 1989) and the mention of Potamotyphloidea (Frost et al. 2006). An argument was made to regard the original spelling "*Potomotyphlus*" (Taylor) as the correct spelling (Wilkinson 1989) because Article 32.5.1. of the International Code of Zoological Nomenclature states that, "Incorrect transliteration or latinization, or use of an inappropriate connecting vowel, are not to be considered inadvertent errors" (International Commission on Zoological Nomenclature 1999:39). In other publications, however, the generic name *Potamotyphlus* was regarded as the correct spelling because that spelling appeared in the errata included in some editions of Taylor (1968) (e.g., Frost 2018). Additionally, the name "*Typhlonectus kaupii*" was used by Frost (2018) to reference a spelling purported to appear in Gines (1959), however, I can only

find "*Typhlonectes kaupii*" in Gines (1959:98) rather than the name used by Frost (2018).

**REMARKS.** The annuli of *Potomotyphlus kaupii* are often not defined with distinct grooves but may instead be marked by line glands and pigmentation that may be homologous to the grooves in other caecilians (Wilkinson and Nussbaum 1999; but see Nussbaum and Wilkinson 1989).

The visibility of the eye was reported to vary ontogenetically so that small specimens (100–200 mm in length) have a more visible eye compared to the eyes of larger specimens, which may be obscured or covered by skin (Taylor 1968). However, the visibility of the eye did not correlate with body size and in fact the eye was visible in a majority of specimens examined by Maciel and Hoogmoed (2011).

The use of the terms 'free fold' and 'ridge' follows definitions provided by Wilkinson (1988). Additionally, the distinctiveness of a free dorsal fold of skin may vary between live and preserved specimens (Wilkinson 1988).

The apomorphic condition found in *Potomotyphlus kaupii* of the head and collars being disproportionately small compared to the body was reported in the holotype of *Dermophis sertentrionalis* (Taylor 1968) (synonym of *Dermophis mexicanus*) and may represent a teratology in that holotype (Wilkinson and Nussbaum 1999).

**ETYMOLOGY.** The name *Potomotyphlus* appears to be derived from the Greek word *potamos* meaning river and the Greek word *tuphlos* meaning blind. The reference to a river seems to be connected to the aquatic lifestyle of the species and the reference to the word blind may be related to the origin of the name "caecilian" from the Latin word *caecus* meaning blind.

### ***Potomotyphlus kaupii* Berthold**
### **Kaup's Caecilian**

*Caecilia kaupii* Berthold 1859:181. Type locality "ex Angostura" [from Angostura] [=Ciudad Bolivar, Venezuela]. Holotype [by implication, Böhme and Bischoff 1984], Zoological Research Institute and Museum Alexander Koenig [ZFMK] 27684, collector and date of collection unknown. Not examined by author.

*Siphonops kaupii*: Keferstein 1867:361.

*Caecilia dorsalis* Peters 1877:459. Type locality "Angostura (Ciudad Dolivar {sic}) am Orinoco" [=Ciudad Bolivar, Venezuela in the Orinoco]. Holotype, Zoological Museum Berlin [ZMB] 9092 (Bauer et al. 1993; see **Remarks**), juvenile, collected by Dr. Sachs, date of collection unknown. Not examined by author.

*Typhlonectes dorsalis*: Peters 1880:941.

*Typhlonectes kaupii*: Boulenger 1891:457. Recognized synonymy of *Typhlonectes dorsalis* and *Siphonops kaupii*.

*Thyphlonectes dorsalis*: Fuhrmann 1914:124. *Lapsus*.

*Chthonerpeton microcephalum* A. de Miranda-Ribeiro 1937:64. No type given, only type locality "Matto-Grosso" (see **Geographic Distribution**). Holotype later designated by P. de Miranda-Ribeiro (1955): Museu Nacional, Rio de Janeiro, "M. N. n.° 539," no date of collection given. Collected by Rondon (Dunn 1942 ) or "Comissão Rondon" (Bokermann 1966). Not examined by author.

*Chthonefpton microcephalum*: Travassos 1955:XXXV. *Lapsus*.

*Chthonespton microcephalum*: P. de Miranda-Ribeiro 1955:392. *Lapsus*. (see **Remarks**).

*Potomotyphlus kaupii* Taylor 1968:11, 257. Type not specified (but see **Remarks).**

*Potomotyphlus melanochrus* Taylor 1968:263. Type locality "Brazil." Holotype, Naturhistorisches Museum, Wien, Austria [NMW] 9147. Collected in 1875 by unknown collector, additional tag number "II. 120" (Gemel et al. 2019). Not examined by author.

*Potomotyphlus kaupi*: Frank and Ramus 1995:26. *Lapsus*. (see **Nomenclatural History).**

**CONTENT.** There are no recognized subspecies.

**DESCRIPTION** and **DIAGNOSIS.** See generic account.

**PHYLOGENETIC RELATIONSHIPS.** *Potomotyphlus kaupii* is placed within the family Typhlonectidae (Taylor 1968) or, depending on the classification, within the subfamily Typhlonectinae (Frost et al. 2006). The species is monotypic within the epifamily Potamotyphloidea and numerous lower classifications therein proposed by Lescure et al. (1986). That classification was not widely adopted by other authors and the methods used in the study were rejected by Nussbaum and Wilkinson (1989) and Wilkinson (1989). Phylogenetic analyses including *Potomotyphlus kaupii*, based on morphological (Wilkinson and Nussbaum 1999) and molecular (Maciel et al. 2016) data, recovered the species as part of a clade consisting of aquatic and semi-aquatic typhlonectids including the genera *Atretochoana*, *Chthonerpeton*, *Nectocaecilia, Potomotyphlus*, and *Typhlonectes*. *Potomotyphlus kaupii* is the monotypic species for the genus and was hypothesized, based on shared morphology, to be the sister taxon of *Typhlonectes* (Wilkinson 1989). After the description of the monotypic genus *Atretochoana* (containing the lungless species *Atretochoana eiselti*), *Potomotyphlus* and *Atretochana* were recovered as sister taxa following an extensive morphological phylogenetic analysis (Wilkinson and Nussbaum 1999). However, a subsequent molecular phylogenetic analysis recovered *Potomotyphlus kaupii* as more closely related to species within the genus *Typhlonectes*, suggesting that the shared morphological characters of *Potomotyphlus* and *Atretochoana* may have a more complex history than previously hypothesized (Maciel et al. 2016) (see **Remarks**).

**PUBLISHED DESCRIPTIONS.** The species was originally described by Berthold (1859) and an additional description was provided by Kerferstein (1867). Descriptions of the external morphology were provided by Peters (1877, 1880). A description of *Potomotyphlus kaupii*, under the generic name *Typhlonectes,* was also published by Nieden (1913, 1965), and a description of the morphology of the internal organs, skin, and sagittal section of the head was provided by Fuhrmann (1914). Descriptions were also published by A. de Miranda-Ribeiro (1937, 1955), and Dunn (1942). A diagnosis and description of *Potomotyphlus kaupii* was provided by Taylor (1968). A description of the cranial osteology of the species was provided by Taylor (1969a) and a brief overview of the osteology of *Potomotyphlus* was given by Wake (2003). A description of the single specimen known from Ecuador was provided by Taylor and Peters (1974). Descriptions of trunk musculature of caecilians, including *Potomotyphlus kaupii*, were published by Nussbaum and Naylor (1982). Comprehensive descriptions of the osteology, myology, circulatory and respiratory morphology with comparisons to other typhlonectids were provided by Wilkinson and Nussbaum (1997, 1999) and an abstract on histological examination of the skin was published by Canepa et al. (1999). A description with comments on the natural history was provided by Marty et al. (2007a) and comments on the coloring of a live individual were given by Marty et al. (2007b). A morphological diagnosis of *Potomotyphlus* was given by Wilkinson and Nussbaum (2006) and Wilkinson et al. (2011). A description and diagnosis were given by Maciel (2009) and Maciel and Hoogmoed (2011).

**ILLUSTRATIONS. Color photographs** were published by Alves-Silva et al. (2017), Marty et al. (2007b), Oliveira et al. (2012), Pough et al. (2004), and Ruiz-Carranza et al. (1996). **Black-and-white photographs** of the skull were published by Sherratt et al. (2014) and Taylor (1969a, 1969b) (see **Remarks**). Black-and-white photographs of head and body were provided by Hillman et al. (2009), Marty et al. (2007a), Pough et al. (1998,

2001), Taylor (1968), and Wilkinson (1989). **Black-and-white illustrations** of the head, terminus, and body were published by Peters (1880). Illustrations of the head, body, and sagittal cross section of the head were published by Fuhrmann (1914) and illustrations of the head and terminal regions were published by Taylor (1968). **Black-and-white diagrammatic illustrations** of the cloacal disk, choanal valves, cranial bones, and lower jaws were presented by Wilkinson and Nussbaum (1997), illustrations of the nasopremaxilla, os basale, choanae, basibranchials, ceratobranchials, arytenoids, and cranial muscles were published by Wilkinson and Nussbaum (1999), and an illustration of a right anterior dentary tooth was presented by Wilkinson (1991). A **black-and-white scanning electron micrograph** of anterior dentary teeth was published by Wilkinson and Naussbaum (1997). An **x-ray photograph** was published by Taylor (1968).

**GEOGRAPHIC DISTRIBUTION.** This aquatic species has a distribution that covers areas in the Amazon and Orinoco drainage systems of South America, including the countries of Columbia, Ecuador, Peru, Venezuela, Brazil, and the territory of French Guiana (Alves-Silva et al. 2017; Lescure and Renous 1988; Maciel and Hoogmoed 2011; Oliveira et al. 2012). In Brazil, the species is known from the states of Acre, Amapà, Amazonas, Goiàs, Maranhão, Mato Groso, Parà, Rondônia, and Roraima (Caramaschi and Pombal 2000; Cintra et al. 2010; Oliveira et al. 2012). The presence of the species in Maranhão (Cintra et al. 2010) (locality 29 on distribution map) seems to have been overlooked in previously published distribution maps (e.g., Maciel and Hoogmoed 2011; Oliveira et al. 2012). The type locality of the synonymized species *Chthonerpeton microcephalum* was reported as Mato Grosso (A. Miranda-Ribeiro 1937) (see locality 15?), however, it was later noted that the specimen probably was collected in an area that was then the Federal Territory of Rondônia (now the state of Rondônia) (Bokermann 1966). Furthermore, in a correspondence reported by Dunn (1942:539), Dr. Joseph Bailey stated that the Mato Grosso collections "all came from the northern and western sections of the state" and it is likely that "most of it came from the Serra de Parecis or along what is now Rio Roosevelt." Specimens have since been reported from Mato Grosso (Alves-Silva et al. 2017) and from Rondônia (Oliveira et al. 2012) confirming the presence of the species in those areas. A specimen, Institut Royal des Sciences Naturelles de Belgique (IRSNB) 4544, was reported from "Cayenne", French Guiana, but the accuracy of that locality was questioned, and the species was not included in checklists for French Guiana (Lescure and Marty 2000). The subsequent discovery of a specimen in French Guiana (Marty et al. 2007a) confirmed the presence of the species in that area. A specimen, Academy of Natural Sciences (ANSP) 4927, was reported as having the locality datum "Guiana" (Taylor 1968). The single specimen known from Ecuador, United States National Museum (USNM) 811, was collected in "Pucayacú entre Montalvo et Sarayacú Río Bobonaza, Pastaza Province" (Taylor and Peters 1974:337). The locality information for American Museum of Natural History (AMNH) 49978 was described as needing confirmation because the specimen was reported from the Atrato River system in Colombia (see locality 3?) (Taylor 1968). A map detailing the distribution of the species in Colombia was provided by Lynch (2000). The southern distribution limit of the species is poorly known (Oliveira et al. 2012). The distribution of *Potomotyphlus kaupii* likely extends into northern Bolivia via connecting river systems. The species could also possibly be found in Suriname and Guyana (Frost 2018).

**FOSSIL RECORD.** None.

**PERTINENT LITERATURE.** Topics addressed in the literature include: **collections holdings/inventories** (Bauer et al. 1993;

Böhme 2010; Böhme and Bischoff 1984; Mendes-Pinto et al. 2011; P. de Miranda-Ribeiro 1955), **conservation status** (Coloma et al. 2011; ICMBio 2015; Maciel and Hoogmoed 2011; Stuart et al. 2008; Wilkinson et al. 2010), **diet** (Fuhrmann 1914; ICMBio 2015; Presswell et al. 2002), **disease** (Churgin et al. 2013; Flach et al. 2019; Hartigan et al. 2016 [myxozoan infections]; Rendle et al. 2015; Tamukai et al. 2014 [*Batrachochytrium dendrobatidis* detection]), **geometric morphometric analysis of the skull** (Bardua et al. 2019; Sherratt et al. 2014), **habitat, capture, and behavior** (Dunn 1942; ICMBio 2015; Kupfer et al. 2006; Maciel and Hoogmoed 2011; Marty et al. 2007a; Rendle et al. 2015; Taylor 1968), **juvenile forms and reproduction** (Murphy et al. 1977; Sedgwick County Zoo 2013; Wake 1992; Wilkinson and Nussbaum 1998, 1999, 2006), **molecular phylogenetic analysis and molecular data** (Maciel et al. 2016; San Mauro et al. 2014), **morphological evolution** (Wilkinson and Nussbaum 1997), **morphological comparisons with other typhlonectids** (Hoogmoed et al. 2011; Maciel et al. 2016; Nussbaum and Wilkinson 1989, 1995; Wilkinson 1988, 1989, 1996; Wilkinson et al. 1998), **morphometric data on body and vertebral proportions** (Renous and Gasc 1989), and **physiology** (Maddin and Sherratt 2014; Wells 2007; Wilkinson and Nussbaum 1997). Additional publications include a **brief listing or mention** for a given country: **Brazil** (Atadeu Moreira 2015; Bernarde 2012; Bokermann 1966; Brcko et al. 2013; de Fraga et al. 2018; de Souźa and Aveline 1994; Galatti et al. 2007; Himstedt 1996; ICMBio 2016; Leitão 1943; Moreira 2015; Neckel-Oliveira et al. 2012; Nussbaum and Wilkinson 1987; Pinheiro et al. 2012; Vaz-Silva et al. 2015; Vogt and Bernhard 2003), **Colombia** (Acosta-Galvis 2000; Galeano et al. 2006; Hernández-Cuadrado et al. 2008; Lynch 2000, 2006, 2007; Ruiz-Carranza et al. 1996; Señaris and Acosta-Galvis 2014), **Ecuador** (Almendáriz 1991; Coloma 1991; Miyata 1982), **Guianas** (Dewynter et al. 2008; Hollowell and Reynolds 2005; Hoogmoed 1979; Nussbaum and Hoogmoed 1979; Señaris and MacCulloch 2005), **Peru** (Catenazzi and Venegas 2012; Morales 1995), and **Venezuela** (Barrio Amorós 1998, 2004, 2009; Gines 1959; Gorzula and Señaris 1999; La Marca 1997; Pefaur 1992; Péfaur et al. 1992; Señaris 2004a, 2004b). Other accounts include a **brief listing or mention without a specific locality:** Acosta-Galvis et al. (2019), Azpelicueta et al. (1987), Bolaños et al. (2008), Boulenger (1891, 1968), Budzik and Żuwala (2011), Deban et al. (2001), Dubois (2005), Duellman (1981, 1993, 1999), Duellman and Trueb (1986, 1994), Dunaev (1999), Dünker et al. (2000), Frost (1985), Frost et al. (2006), Giri et al. (2004), Glaw et al. (1998, 2000a, 2000b), Gorham (1962, 1974), Gower et al. (2007), Harding (1983), Herrel and Measey (2010), Hofer (1998), Hofrichter (1998, 2000a, 2000b), Hutchins et al. (2003), Jared et al. (1999), Jenkins et al. (2007), Lavilla and Cei (2001), Maciel et al. (2015), Maerker et al. (2016), Matsui (1993), O'Reilly (1996), O'Reilly et al. (2002), Pinheiro (2001), Porter (1972), Pough et al. (2016), Pyron and Wiens (2011), W. Smith (1877), R. Smith and H. Smith (1973), Sokolov (1988), Teodecki et al. (1998), Vitt and Caldwell (2009, 2014), Warbeck (2002), Zhao et al. (1993, 1998), and Zug et al. (2001).

**NOMENCLATURAL HISTORY.** The spelling "*Potomotyphlus kaupi*," with a single "i" in the specific epithet, was used by Frank and Ramus (1995). The same spelling was used by Mitchell (2017) and Wrobel (2004).

**REMARKS.** The counts and measurements of the type of *Caecilia dorsalis* (Peters 1877) were reported to be close to those of the specimen "Berlin 9092" [=ZMB 9092] by Dunn (1942). Although the specimen "Berlin 10104" is labeled "type" for *Caecilia dorsalis*, both specimens should probably be considered cotypes (Dunn 1942).

The misspelling of *Chthonerpeton microcephalum* by P. de Miranda-Ribeiro (1955)

was first noted by Taylor (1968), however, the citation for P. de Miranda-Ribeiro (1955) was listed in error by Taylor (1968) under the name A. de Miranda-Ribeiro in the bibliography.

A type specimen was not specified by Taylor (1968) in his description of *Potomotyphlus kaupii*, however he described the species based on AMNH 42853, a male specimen collected from Iquitos, Peru. In a table of data and measurements given by Taylor (1968: 262) for *Potomotyphlus kaupii*, one specimen was listed as "Type Rio 539." This specimen is likely the type specimen for *Chthonerpeton microcephalum* because they have the same specimen number and the same reported length (A. de Miranda-Ribeiro 1955).

Morphological evolution between *Potomotyphlus* and *Atretochoana* is relatively unknown (Wilkinson and Nussbaum 1997).

Although black-and-white photographs of the skull were published by Taylor (1969a, 1969b), the same specimen (University of Illinois Museum of Natural History [UIM] 787) appears in both publications but has bone outlines that differ between photographs (Wake 2003).

Little information is known of the ecology and physiology of *Potomotyphlus kaupii*, however the left lung may serve as a hydrostatic organ and it is unlikely that this species burrows (Wilkinson and Nussbaum 1997).

*Potomotyphlus kaupii* has been inferred to be viviparous based on the reproductive mode in closely related taxa (Wilkinson and Nussbaum 1998). Viviparity and fetuses of *Potomotyphlus* have been reported (Wake 1992), however this was questioned on the basis that the report did not include documented fetuses of the species (Wilkinson and Nussbaum 1999). The presence of fused and sac-like fetal gills, a morphological character that supports the hypothesis of a monophyletic Typhlonectidae, is unknown for *Potomotyphlus* (Wilkinson and Nussbaum 2006); although the gill structure in neonates was reported to be similar to that in *Typhlonectes* (Tapley et al. 2019). There is video from the Sedgwick County Zoo (Kansas, United States) of a captive *Potomotyphlus kaupii* giving birth to live young (Sedgwick County Zoo 2013).

There is a specimen of *Potomotyphlus kaupii* discovered during a taxon search on VertNet, USNM 30534, that has a locality datum of "Belize" which is probably incorrect considering that Belize is well out of the known range for the species (VertNet 2019).

**ADDITIONAL VERNACULAR NAMES.** In English, vernacular names include Kaup's caecilian (Frank and Ramus 1995, Wrobel 2004) and (Kaup's) Retaw (Mitchell 2017). The name "Retaw" could be a reference to the aquatic lifestyle of the species because "retaw" is "water" spelled backwards. Other common names assigned to species that have backwards spellings were used by Mitchell (2017). In French, the vernacular name appears as Potamotyphle de Kaup (Wrobel 2004), in Spanish, it appears as Cecilia de Río (Wilkinson et al. 2010), in Brazilian Portuguese, it appears as cobra cega d´água (ICMBio 2015), and in Cyrillic, it appears as речные червяги = *Potomotyphlus* = "river worm" and амазонская червяга = *Potomotyphlus kaupii* = "Amazonian worm" (Sokolov 1988).

**ETYMOLOGY.** The name *kaupii* is in honor of Johann Jakob von Kaup (Beolens et al. 2013).

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## LITERATURE CITED


Acosta-Galvis, A. R. 2000. Ranas, salamandras y caecilias (Tetropoda: Amphibia) de Colombia. Biota Colombiana 1:289–319.

Acosta-Galvis, A. R., M. Torres, and P. Pulido-Santacruz. 2019. A new species of *Caecilia* (Gymnophiona, Caeciliidae) from the Magdalena valley region of Colombia. ZooKeys 884:135–157.

Almendáriz, A. 1991. Lista de vertebrados del Ecuador. Anfibios y Reptiles. Politecnica 16 (Biologia 3):89–162, Table 1, Figure 1.

Alves-Silva, K. R., M. P. Mercês, A. L. dos Santos, and L. C. Ramos. 2017. Note on the distribution of the caecilian *Potamotyphlus kaupii* (Berthold, 1859) (Gymnophiona: Typhlonectidae) in Brazil. Herpetology Notes 10:395–396.

Atadeu Moreira. M. 2015. A importância de se Levar em Conta a Lacuna Linneana no Planejamento de Conservação dos Anfíbios no Brasil. Unpublished Dissertation, Universidade Federal de Goiás, Goiânia, Goiás, Brazil. 63 pp.

Azpelicueta, M. De Las M., J. D. Williams, and E. Gudynas. 1987. Osteología y notas miológicas en la Cecilia Neotropical *Chthonerpeton indistinctum* (Reinhardt & Lutken, 1861), con una diagnosis de la família Typhlonectidae (Amphibia, Gymnophiona). Iheringia, Série Zoologia 66:69–81.

Bardua, C., M. Wilkinson, D. J. Gower, E. Sherratt, and A. Goswami. 2019. Morphological evolution and modularity of the caecilian skull. BMC Evolutionary Biology 19:30 [1–24 pp.].

Barrio Amorós, C. L. 1998. Sistematica y biogeografía de los anfibios (Amphibia) de Venezuela. Acta Biologica Venezuelica 18(2):1–93.

Barrio Amorós, C. L. 2004. Amphibians of Venezuela systematic list, distribution and references, an update. Revista Ecología Latino Americana 9(3):1–48.

Barrio Amorós, C. L. 2009. Riqueza y endemismo. Pp. 25–39 *in* Anfibios de Venezuela. Estado del Conocimiento y recomendaciones para su conservación (C. Molina, J. C. Señaris, M. Lampo, and A. Rial, editors). Ediciones Grupo TEI, Venezuela.

Bauer, A. M., D. A. Good, and R. Günther. 1993. An annotated type catalogue of the caecilians and salamanders (Amphibia: Gymnophiona and Caudata) in the Zoological Museum, Berlin. Mitteilungen aus dem Zoologischen Museum in Berlin 69:285–306.

Beolens, B., M. Watkins, and M. Grayson. 2013. The Eponym Dictionary of Amphibians. Pelagic Publishing, Exeter, England. xiii + 244 pp.

Bernarde, P. S. 2012. Anfíbios e Répteis. Introdução ao Estudo da Herpetofauna Brasileira. Anolis Books, Curitiba, Brazil. 318 pp.

Berthold, A. A. 1859. Einige neue Reptilien des akad. zoolog. Museums in Göttingen. Nachrichten von der Georg-Augustus-Universität und der k*öniglichen* Gesellschaft der Wissenschaften zu Göttingen, 1859:179–181.

Böhme, W. 2010. A list of the herpetological type specimens in the Zoologisches Forschungsmuseum Alexander Koenig, Bonn. Bonn zoological Bulletin 59:79–108.

Böhme, W. and W. Bischoff. 1984. Die Wirbeltiersammlungen des Museums Alexander Koenig. III. Amphibien und Reptilien. Pp. 151–213 *in* Die Wirbeltiersammlungen des Museums Alexander Koenig (G. Rheinwald, editor). Bonner Zoologische Monographien 19:151–213.

Bokermann, W. C. A. 1966. Lista Anotada das Localidades Tipo de Anfíbios Brasileiros. Impresso Pelo Serviço de Documentação, São Paulo, Brazil. 181 pp.

Bolaños, F., F. Castro, C. Cortez, I. de la Riva, T. Grant, B. Hedges, R. Heyer, R. Ibáñez, E. La Marca, E. Lavilla, D. L. Silvano, S. Lötters, G. P. Olea, S. Reichle, R. Reynolds, L. Rodríguez, G. S. Barrera, N. Scott,

C. Ubeda, A. Veloso, M. Wilkinson, and B. Young. 2008. Amphibians of the Neotropical realm. Pp. 92–105 *in* Threatened Amphibians of the World (S. N. Stuart, M. Hoffmann, J. S. Chanson, N. A. Cox, R. J. Berridge, P. Ramani, and B. E. Young, editors). Lynx Edicions, Barcelona, Spain; IUCN, Gland, Switzerland; and Conservation International, Arlington, Virginia, USA.

Boulenger, G. A. 1891. Notes on American batrachians. The Annals and Magazine of Natural History, Including Zoology, Botany, and Geology, Series 6, 8:453–457.

Boulenger, G. A. 1968 [1891]. Notes on American batrachians. Pp. 296–300 *in* G. A. Boulenger Contributions to American Herpetology.Collected Papers Part 7, 1891–1893. Society for the Study of Amphibians and Reptiles, Facsimile Reprints in Herpetology 22.

Brcko, I. C., M. S. Hoogmoed, and S. Neckel-Oliveira. 2013. Taxonomy and distribution of the salamander genus *Bolitoglossa* Duméril, Bibron & Duméril, 1854 (Amphibia, Caudata, Plethodontidae) in Brazilian Amazonia. Zootaxa 3686:401–431.

Budzik, K. and K. Żuwala. 2011. Biologia płazów beznogich (Gymnophiona) w świetle najnowszych badań. Kosmos 60:373–387.

Canepa, G., M. A. González-Elorriaga, and T. Martínez. 1999. Histología comparada de la piel de dos especies de anfibios Gymnophiona de la familia Typhlonectidae: *Typhlonectes* cir *natans* y *Potomotyphlus kaupii*. P. 42 *in* V° Congreso Latinoamericano de Herpetología. 12 al 17 de diciembre de 1999. Facultad de Ciencias, Montevideo, Uruguay. Museo National de Historia Natural Montevideo-Uruguay Publicacion Extra 50.

Caramaschi, U. and J. P. Pombal, Jr. 2000. *Potomotyphlus kaupii*. Herpetological Review 31:49.

Catenazzi, A. and P. J. Venegas. 2012. Anfibios y reptiles. Pp. 106–117, 350–367 *in* Perú: Cerros de Kampankis. (N. Pitman, E. R. Inzunza, D. Alvira, C. Vriesendorp, D. K. Moskovits, Á. del Campo, T. Wachter, D. F. Stotz, S. N. Sesén, E. T. Cerrón, and R. C. Smith, editors). Rapid Biological and Social Inventories Report 24. The Field Museum, Chicago, Illinois.

Churgin, S. M., B. L. Raphael, J. B. Pramuk, J. G. Trupkiewicz, and G. West. 2013. *Batrachochytrium dendrobatidis* in aquatic caecilians (*Typhlonectes natans*): A series of cases from two institutions. Journal of Zoo and Wildlife Medicine 44:1002–1009.

Cintra, C. E. D., H. L. R. Silva, F. A. Gonçalves, and N. J. Da Silva Jr. 2010. *Potomotyphlus kaupii*. Herpetological Review 41:242.

Coloma, L. A. 1991. Anfibios del Ecuador: Lista de Especies, Ubicación Altitudinal y Referencias Bibliográficas. EcoCiencia, Fundación Ecuatoriana de Estudios Ecológicos, Reportes Tecnicos 2. 46 pp.

Coloma, L. A., Guayasamin, J. M., and P. Guerrero-Menéndez (editors). 2011. *Potomotyphlus kaupii*. *In* NRL 2011. National Red List of Threatened Species. www.nationalredlist.org. Available at https://www.nationalredlist.org/species-information/?speciesID=198074. Archived by archive.today at http://archive.is/4mGWa on 17 September 2019.

Deban, S. M., J. C. O'Reilly, and K. C. Nishikawa. 2001. The evolution of the motor control of feeding in amphibians. American Zoologist 41:1280–1298.

de Fraga, R., A. P. Santos-Jr., E. Souza, R. A. Kawashita-Ribeiro, S. Ribeiro, and A. O. Maciel. 2018. Notes on the poorly known caecilian *Nectocaecilia petersii* (Gymnophiona: Typhlonectidae) of the Brazilian Amazon. Phyllomedusa 17:289–293.

de Souźa G. M. P. and L. C. Aveline (coordenadores). 1994. Sistema de Informação de Recursos Naturais e Meio Ambiente. Volume 3: Sistematização de Dados sobre a Fauna Brasileira. Tomo 3. Fauna

da Amazônia legal Brasileira: Amphibia – Resultados Parciais Preliminaries. Diretoria de Geociências, Departamento de Recursos Naturais e Estudos Ambientais, Fundação Instituto Brasileiro de Geografia e Estatística – IBGE, Rio de Janeiro, Brazil. 5–36 + 81 pp.

Dewynter, M., C. Marty, M. Blanc, P. Gaucher, N. Vidal, T. Frétey., J.-C. de Massary, and A. Fouquet. 2008. Liste des Amphibiens et des Reptiles de Guyane. 28 pp. Available at https://www.academia.edu/1621193/Liste_des_amphibiens_et_des_reptiles_de_Guyane. Archived by Internet Archive at https://web.archive.org/save/https://www.academia.edu/1621193/Liste_des_amphibiens_et_des_reptiles_de_Guyane on 29 September 2019.

Dubois, A. 2005. *Amphibia Mundi*. 1.3. Recent amphibians: suprageneric taxonomic additions (1967–2002). Alytes 23:70–80.

Duellman, W. E. 1981. Amphibia. Pp. 230–245 *in* Aquatic Biota of Tropical South America being a Compilation of Taxonomic Bibliographies for the Fauna and Flora of Inland Waters of the Tropical Portion of South America. Part 2. Anarthropoda (S. H. Hurlbert, G. Rodríquez, and N. D. dos Santos, editors). San Diego State University, San Diego, California.

Duellman, W. E. 1993. Amphibian species of the world: Additions and corrections. The University of Kansas Museum of Natural History, Special Publication 21:i–iii, 1–372.

Duellman, W. E. 1999. Distribution patterns of amphibians in South America. Pp. 255–328 *in* Patterns of Distribution of Amphibians. A Global Perspective (W. E. Duellman, editor). The Johns Hopkins University Press, Baltimore, Maryland.

Duellman, W. E. and L. Trueb. 1986. Biology of Amphibians. McGraw Hill Publishing Company, New York, New York. xvii + 670 pp.

Duellman, W. E. and L. Trueb. 1994. Biology of Amphibians. The Johns Hopkins University Press, Baltimore, Maryland. xxi + 670 pp.

Dunaev, E. A. [Дунаев, Е. А.]. 1999. Разнообразие Земноводных (по Материалам Экспозиции Зоологического Музея МГУ) [Diversity of Amphibians (According to the Materials of the Exposition of the Zoological Museum of Moscow State University)]. Издательство Московского Университета, Зоогический Музей МГУ [Moscow University Publishing House, Zoological Museum of Moscow State University]. 299 pp.

Dünker, N., M. H. Wake, and W. M. Olson. 2000. Embryonic and larval development in the caecilian *Ichthyophis kohtaoensis* (Amphibia, Gymnophiona): A staging table. Journal of Morphology 243:3–34.

Dunn, E. R. 1942. The American caecilians. Bulletin of the Museum of Comparative Zoölogy at Harvard College 91:439–540.

Exbrayat, J.-M. 2000. Les Gymnophiones. Ces Curieux Amphibiens. Societe Nouvelle des Editions Boubee, Paris, France. 443 pp.

Flach, E. J., Y. Feltrer, D. J. Gower, S. Jayson, C. J. Michaels, A. Pocknell, S. Rivers, M. Perkins, M. E. Rendle, M. F. Stidworthy, B. Tapley, M. Wilkinson, and N. Masters. 2019. Postmortem findings in eight species of captive caecilian (Amphibia: Gymnophiona) over a ten-year period. Journal of Zoo and Wildlife Medicine 50:879–890.

Frank, N. and E. Ramus. 1995. A Complete Guide to Scientific and Common Names of Reptiles and Amphibians of the World. N G Publishing Inc., Pottsville, Pennsylvania. 377 pp.

Frost, D. R. (editor). 1985. Amphibian Species of the World: A Taxonomic and Geographical Reference. Allen Press, Inc., and The Association of Systematics Collections, Lawrence, Kansas

Frost, D. R. 2018. *Potamotyphlus kaupii* (Berthold, 1859). Amphibian Species of the World 6.0, an Online Reference. American Museum of Natural History, New York, New York. Available at

http://research.amnh.org/vz/herpetology/amphibia/Amphibia/Gymnophiona/Typhlonectidae/Potamotyphlus/Potamotyphlus-kaupii. Archived by WebCite at http://www.webcitation.org/6xHPbPlIN on 16 February 2018.

Frost, D. R., T. Grant, J. Faivovich, R. H. Bain, A. Haas, C. F. B. Haddad, R. O. De Sá, A. Channing, M. Wilkinson, S. C. Donnellan, C. J. Raxworthy, J. A. Campbell, B. L. Blotto, P. Moler, R. C. Drewes, R. A. Nussbaum, J. D. Lynch, D. M. Green, and W. C. Wheeler. 2006. The amphibian tree of life. Bulletin of the American Museum of Natural History 297:1–370 + foldout phylogenetic tree.

Fuhrmann, O. 1914. Le genre *Thyphlonectes*. Pp. 112–138 *in* Voyage d'Exploration Scientieique en Colombie (by O. Fuhrmann and E. Mayor). Mémoires de la Société neuchâteloise des Sciences Naturelles 5.

Galatti, U., R. A. Estupiñán, A. de C. L Dias, and A. E. M. Travassos. 2007. Anfíbios da área de pesquisa ecológica do Guamá – Apeg e região de Belém, Pará. Pp. 75–95 *in* Mocambo. Diversidade e Dinâmica Biológica da Área de Pesquisa Ecológica do Guamá (Apeg) (J. I. Gomes, M. B. Martins, R. C. V. Martins-da-Silva, and S. S. Almeida, editors). Museu Paraense Emílio Goeldi and Embrapa Amazônia Oriental, Belém, Pará, Brasil.

Galeano, S. P., J. C. Urbina, P. D. A. Gutiérrez-C., M. Rivera-C., and V. P. Páez. 2006. Vertebrados terrestres u sus hábitats. a. Los anfibios de Colombia, diversidad y estado del conocimiento. Pp. 106–118 *in* Informe Nacional sobre el Avance en el Conocimiento y la Información de la Biodiversidad 1998 – 2004 Tomo II. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Bogotá D. C., Colombia.

Gemel, R., G. Gassner, and S. Schweiger. 2019. Katalog der Typen der Herpetologischen Sammlung des Naturhistorischen Museums Wien – 2018. Annalen des Naturhistorischen Museums in Wien. Serie B für Botanik und Zoologie 121:33–248.

Gines, H. 1959. Familias y generos de anfibios – Amphibia - de Venezuela. Memoria de la Sociedad de Ciencias Naturales La Salle 19:85–146.

Giri, V., D. J. Gower, and M. Wilkinson. 2004. A new species of *Indotyphlus* Taylor (Amphibia: Gymnophiona: Caeciliidae) from the Western Ghats, India. Zootaxa 739:1–19.

Glaw, F., J. Köhler, R. Hofrichter, and A. Dubois. 1998. Systematik der Amphibien: Liste der rezenten Familien, Gattungen und Arten. Pp. 252–258 *in* Amphibien. Evolution, Anatomie, Physiologie, Ökologie und Verbreitung, Verhalten, Bedrohung und Gefährdung (R. Hofrichter, editor). Weltbild Verlag GmbH, Augsburg, Germany.

Glaw, F., J. Köhler, R. Hofrichter, and A. Dubois. 2000a. Amphibian systematics: List of recent families, genera, and species. Pp. 252–258 *in* The Encyclopedia of Amphibians (R. Hofrichter, editor). Key Porter Books Limited, Toronto, Ontario, Canada.

Glaw, F., J. Köhler, R. Hofrichter, and A. Dubois. 2000b. Amphibian systematics: List of recent families, genera, and species. Pp. 252–258 *in* Amphibians: The World of Frogs, Toads, Salamanders and Newts (R. Hofrichter, editor). Firefly Books, Buffalo, New York.

Gorham, S. W. 1962. Liste der rezenten Amphibien und Reptilien. Gymnophiona. Das Tierreich 78. x + 25 pp.

Gorham, S. W. 1974. Checklist of World Amphibians Up To January 1, 1970 / Liste de Amphibiens du Monde d'apres l'Etat du 1er Janvier 1970. The New Brunswick Museum, Saint John, New Brunswick, Canada. 172 + [1] pp.

Gorzula, S. and J. C. Señaris. 1999 "1998". Contribution to the Herpetofauna of the Venezuelan Guayana: I. A Data Base. Scientia Guaianae (Caracas, Venezuela) 8. xviii + 269 pp. + 129 photographs.

Gower, D. J., M. Dharne, G. Bhatta, V. Giri,

R. Vyas, V. Govindappa, O. V. Oommen, J. George, Y. Shouche, and M. Wilkinson. 2007. Remarkable genetic homogeneity in unstriped, long-tailed *Ichthyophis* along 1500 km of the Western Ghats, India. Journal of Zoology 272:266–275.

Harding, K. A. 1983. Catalogue of New World Amphibians. Pergamon Press, Oxford, England. xiv + 406 pp.

Hartigan, A., M. Wilkinson, D. J. Gower, J. W. Streicher, A. S. Holzer, and B. Okamura. 2016. Myxozoan infections of caecilians demonstrate broad host specificity and indicate a link with human activity. International Journal for Parasitology 46:375–381.

Hernández-Cuadrado, E. E., C. V. Zapata, and D. Hernández-Vélez. 2008. Historia de la vida de Typhlonectes natans (Amphibia: Gymnophiona) en América del Sur: Aplicaciones potenciales / Life history of *Typhlonectes natans* (Amphibia: Gymnophiona) in South America: Potential applications. Revista Colombiana de Ciencia Animal 1:50–57.

Herrel, A. and G. J. Measey. 2010. The kinematics of locomotion in caecilians: Effects of substrate and body shape. Journal of Experimental Zoology 313A:301–309.

Hillman, S. S., P. C. Withers, R. C. Drewes, and S. D. Hillyard. 2009. Ecological and Environmental Physiology of Amphibians. Oxford University Press Inc., New York, New York. xii + 469 pp.

Himstedt, W. 1996. Die Blindwühlen. Die Neue Brehm-Bücherei 630. Westarp Wissenschaften, Magdeburg, Germany. 160 pp.

Hofer, D. 1998. Blindwühlen im Freiland und in Gefangenschaft. Beobachtungen aus 20-jähriger Amateurforschung (Amphibia: Gymnophiona) / Caecilians in the wild and in captivity. Observations from 20 years of amateur research (Amphibia: Gymnophiona). Herpetozoa 11:37–46.

Hofrichter, R. 1998. Systematik der Amphibien. Pp. 36–63 *in* Amphibien. Evolution, Anatomie, Physiologie, Ökologie und Verbreitung, Verhalten, Bedrohung und Gefährdung (R. Hofrichter, editor). Weltbild Verlag GmbH, Augsburg, Germany.

Hofrichter, R. 2000a. Amphibian systematics. Pp. 36–63 *in* Amphibians: The World of Frogs, Toads, Salamanders and Newts (R. Hofrichter, editor). Firefly Books, Buffalo, New York.

Hofrichter, R. 2000b. Amphibian systematics. Pp. 36–63 *in* The Encyclopedia of Amphibians (R. Hofrichter, editor). Key Porter Books Limited, Toronto, Ontario, Canada.

Hollowell, T. and R. P. Reynolds (editors). 2005. Checklist of the Terrestrial Vertebrates of the Guiana Shield. Bulletin of the Biological Society of Washington 13. x + 98 pp.

Hoogmoed, M. S. 1979. The herpetofauna of the Guianan region. Pp. 241–279 *in* The South American Herpetofauna: Its Origin, Evolution, and Dispersal (W. E. Duellman, editor). The University of Kansas Museum of Natural History Monograph 7.

Hoogmoed, M. S., A. O. Maciel, and J. T. Coragem. 2011. Discovery of the largest lungless tetrapod, *Atretochoana eiselti* (Taylor, 1968) (Amphibia: Gymnophiona: Typhonectidae), in its natural habitat in Brazilian Amazonia. Boletim do Museu Paraense Emílio Goeldi. Ciências Naturais 6:241–262.

Hutchins, M., W. E. Duellman, and N. Schlager (editors). 2003. Grzimek's Animal Life Encyclopedia. Second Edition. Volume 6. Amphibians. Gale Group, Farmington Hills, Michigan. xvi + 507 pp.

ICMBio (Instituto Chico Mendes de Conservação da Bioversidade). 2015. Plano de Manejo da Área de Proteção Ambiental (Apa) do Igarapé Gelado. Ministério do Meio Ambiente, Instituto Chico Mendes de Conservação da Biodiversidade, Governo Federal, Pátria Educadora, Brasil. iv + xvii + 2 + 21 + 109 + 75 + 15 + 9 + 2 + 33 + 5 + [68] pp.

ICMBio (Instituto Chico Mendes de Conser-

vação da Bioversidade). 2016. Plano de Manejo da Floresta Nacional de Carajás. Volume 1 - Diagnóstico. Ministério do Meio Ambiente, Instituto Chico Mendes de Conservação da Biodiversidade, Governo Federal, Pátria Educadora, Brasil. ix + 190 pp.

International Commission on Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature. xxix + 306 pp.

Jared, C., C. A. Navas, and R. C. Toledo. 1999. An appreciation of the physiology and morphology of the Caecilians (Amphibia: Gymnophiona). Comparative Biochemistry and Physiology Part A 123:313–328.

Jenkins, F. A., Jr., D. M. Walsh, and R. L. Carroll. 2007. Anatomy of *Eocaecilia micropodia*, a limbed caecilian of the early Jurassic. Bulletin of the Museum of Comparative Zoology 158:285–365.

Keferstein, W. 1867. Ueber einige neue oder seltene Batrachier aus Australien und dem tropischen Amerika. Nachrichten von der Königliche Gesellschaft der Wissenschaften und der Georg-Augusts-Universität zu Göttingen 18:341–361.

Kupfer, A., P. Gaucher, M. Wilkinson, and D. J. Gower. 2006. Passive trapping of aquatic caecilians (Amphibia: Gymnophiona: Typhlonectidae). Studies on Neotropical Fauna and Environment 41:93–96.

La Marca, E. 1997. Lista actualizada de los anfibios de Venezuela. Pp. 103–120 *in* Vertebrados Actuales y Fósiles de Venezuela (E. La Marca, editor). Museo de Ciencia y Tecnología de Mérida, Venezuela.

Lavilla, E. O. and J. M. Cei. 2001. Amphibians of Argentina. A Second Update, 1987–2000. Museo Regionale di Scienze Naturali Torino Monografie 28. 177 pp., 8 plates.

Ledesma, D. T. 2019. AmphibiaWeb 2019 *Potomotyplus kaupii*: Kaup's Caecilian. University of California, Berkeley, California. Available at https://amphibiaweb.org/species/1960. Archived by archive.today at http://archive.fo/RhJRY on 23 September 2019.

Leitão, C. de M. 1943. Fauna Amazônica. Revista Brasileira de Geografia 5(3):343–370.

Lescure, J and C. Marty. 2000. Atlas des amphibiens de Guyane. Patrimoines Naturels 45. Museum National d'Histoire Naturelle, Institut d'eÉcologie et de Gestion de la Biodiversité, Service du Patrimoine Naturel. [2] + 388 + [2] pp.

Lescure, J. and S. Renous. 1988. Biogéographie des amphibiens gymnophiones et histoire du Gondwana. Comptes Rendus des Séances de la Société de Biogéographie 64:19–40.

Lescure, J., S. Renous, and J.-P. Gasc. 1986. Proposition d'une nouvelle classification des amphibiens gymnophiones. Mémoires de la Société zoologique de France 43:145–177 + 1 foldout table.

Lynch, J. D. 2000 "1999." Una aproximación a las culebras ciegas de Colombia (Amphibia: Gymnophiona). Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales 23 (Suplemento Especial):317–337.

Lynch, J. D. 2006. The amphibian fauna in the Villavicencio region of eastern Colombia / La fauna anfibia en la región de Villavicencio en el este de Colombia. Caldasia 28:135–155.

Lynch, J. D. 2007. Anfibios. Pp. 163–166 *in* Diversidad biológica y cultural del sur de la Amazonia colombiana – Diagnóstico (S. L. Ruiz, E. Sánchez, E. Tabares, A. Prieto, J. C. Arias, R. Gómez, D. Castellanos, P. García, and L. Rodríguez, editors). Corpoamazonia, Instituto Humboldt, Instituto Sinchi, UAESPNN, Bogotá D. C., Colombia.

Maciel, A. O. 2009. Taxonomia dos anfíbios da ordem Gymnophiona da Amazônia Brasileira. Dissertação apresentada ao Programa de Pós-graduação em Zoologia, Curso de Mestrado, do Museu Paraense Emílio Goeldi e Universidade Federal Do Pará, Bélem, Pará, Brazil. x + 142

pp.
Maciel, A. O. and M. S. Hoogmoed. 2011. Taxonomy and distribution of caecilian amphibians (Gymnophiona) of Brazilian Amazonia, with a key to their identification. Zootaxa 2984:1–53.
Maciel, A. O., J. M. Leite, R. R. S. Leite, J. R. S. A. Leite, and P. Cascon. 2015. A new species of *Chthonerpeton* Peters 1880 (Amphibia: Gymnophiona: Typhlonectidae) from the state of Piauí, northeastern Brazil. Journal of Herpetology 49:308–313.
Maciel, A. O., M. I. C. Sampaio, M. S. Hoogmoed, and H. Schneider. 2016. Phylogenetic relationships of the largest lungless tetrapod (Gymnophiona, *Atretochoana*) and the evolution of lunglessness in caecilians. Zoologica Scripta 46:255–263.
Maddin, H. C. and E. Sherratt. 2014. Influence of fossoriality on inner ear morphology: Insights from caecilian amphibians. Journal of Anatomy 225:83–93.
Maerker, M., S. Reinhard, P. Pogoda, and A. Kupfer. 2016. Sexual size dimorphism in the viviparous caecilian amphibian *Geotrypetes seraphini seraphini* (Gymnophiona: Dermophiidae) including an updated overview of sexual dimorphism in caecilian amphibians. Amphibia-Reptilia 37: 291–299.
Marty, C., E. Ravet, D. Bordage, and J. Lescure. 2007a. Redécouverte de *Potomotyphlus kaupii* (Berthold, 1859) (Amphibia, Gymnophiona, Typhlonectidae) en Guyane française. Bulletin de la Société Herpétologique de France 121:35–38.
Marty, C., D. Baudain, and J. Lescure. 2007b. Complément à la note "Redécouverte de *Potomotyphlus kaupii* (Berthold, 1859) (Amphibia, Gymnophiona, Typhlonectidae) en Guyane française" de Marty *et al*. (2007). Bulletin de la Société Herpétologique de France 122:38–39.
Matsui, M. [執筆：松井正文]. 1993. アシナシイモリ・サンショウウオほか [Caecilians, salamanders and others]. Pp. 5–32 *in* 動物たちの地球 [World of animals] 97. 長塚進吉　Asahi Newspaper Company, Tokyo, Japan.
Mendes-Pinto, T. J., R. Bernhard, R. Vogt, R. C. L. C. Pedrett, and R. S. Garcia. 2011. A collection of amphibians and reptiles of the National Institute of Research of the Amazon / Una colección de los anfibios y reptiles del Instituto Nacional de Pesquisas de la Amazônia / A coleção de anfíbios e répteis do Instituto Nacional de Pesquisas da Amazônia. Revista Colombiana de Ciencia Animal 3:238–252.
Miranda-Ribeiro, A. de. 1937. Alguns batrachios novos das collecções do Museo Nacional. O Campo (Rio de Janeiro, Brasil), Maio 1937:66–69.
Miranda-Ribeiro, A. de. 1955. Alguns batrachios novos das collecções do Museo Nacional. Arquivos do Museu Nacional (Rio de Janeiro, Brasil) 42:LXIV–LXII. [Reprint of 1937 paper in *O Campo*]
Miranda-Ribeiro, P. de. 1955. Tipos das espécies e subespécies do Prof. Alipio de Miranda Ribeiro depositados no Museu Nacional. Arquivos do Museu Nacional (Rio de Janeiro, Brasil) 42:389–417.
Mitchell, D. W. 2017. Amphibians of the World: The Nature Lover's Life List. Including Many New and More Systematic English Names. Privately Published [No place of publication provided]. xvi, 33–571 + [2] pp.
Miyata, K. 1982. A Check List of the Amphibians and Reptiles of Ecuador with a Bibliography of Ecuadorian Herpetology. Smithsonian Herpetological Information Service 54:1–70.
Morales, V. R. 1995. Checklist and Taxonomic Bibliography of the Amphibians from Perú. Smithsonian Herpetological Information Service 107:1–20.
Moreira, M. A. 2015. A Importância de se Levar em Conta a Lacuna Linneana no Planejamento de Conservação dos Anfíbios no Brasil. Dissertação Apresentada ao Programa de Pós-Gruduação em Ecologia e Evolução, do Instituto de Ciências Biológicas da Universidade Federal de Goiás, Universidade Federal De Goiás,

Goiânia, Brazil. 63 pp.
Murphy, J. B., H. Quinn, and J. A. Campbell. 1977. Observations on the breeding habits of the aquatic caecilian *Typhlonectes compressicaudus*. Copeia 1977:66–69.
Neckel-Oliveira, S., U. Galatti, M. Gordo, L. C. Pinheiro, and E. G. F. Maschio. 2012. Anfíbios. Pp. 68–83 *in* Fauna da Floresta Nacional de Carajás. Estudos sobre Vertebrados Terrestres (F. D. Martins, A. F. Castilho, J. Campos, F. M. Hatano, and S. G. Rolim, organizadores). Nitro Imagens, São Paulo, Brasil.
Nieden, F. 1913. Gymnophiona (Amphibia apoda). Das Tierreich 37. Verlag von R. Friedländer und Sohn, Berlin, Germany. x + 31 pp.
Nieden, F. 1965. Gymnophiona (Amphibia apoda). Das Tierreich 37. Verlag von J. Cramer, Weinheim, Germany. x + 31 pp. [Reprint of 1913 Das Tierreich 37].
Nussbaum, R. A. and M. S. Hoogmoed. 1979. Surunam caecilians, with notes on *Rhinatrema bivittatum* and the description of a new species of *Microcaecilia* (Amphibia, Gymnophiona). Zoologische Mededelingen 54:217–235, Plates 1–2.
Nussbaum, R. A. and B. G. Naylor. 1982. Variation in the trunk musculature of caecilians (Amphibia: Gymnophiona). Journal of Zoology (London) 198:383–398.
Nussbaum, R. A. and M. Wilkinson. 1987. Two new species of *Chthonerpeton* (Amphibia: Gymnophiona: Typhlonectidae) from Brazil. Occasional Papers of the Museum of Zoology, The University of Michigan 716:1–15.
Nussbaum, R. A. and M. Wilkinson. 1989. On the classification and phylogeny of caecilians (Amphibia: Gymnophiona), a critical review. Herpetological Monographs 3:Frontispiece, 1–42.
Nussbaum, R. A. and M. Wilkinson. 1995. A new genus of lungless tetrapod: A radically divergent caecilian (Amphibia: Gymnophiona). Proceedings of the Royal Society of London B: Biological Sciences 261:331–335.
Oliveira, U. S. C., D. Meneghelli, M. R. Messias, I. B. S. R. Gomes, and J. T. Coragem. 2012. First record of *Potomotyphlus kaupii* (Berthold, 1859) (Gymnophiona: Typhlonectidae) for the state of Rondônia, Brazil. Herpetology Notes 5:155–156.
O'Reilly, J. C. 1996. Keeping caecilians in captivity. Pp. 39–45 *in* Advances in Herpetoculture (P. D. Strimple, editor). Special Publications of the International Herpetological Symposium, Inc., Number 1.
O'Reilly, J. C., S. M. Deban, and K. C. Nishikawa. 2002. Derived life history characteristics constrain the evolution of aquatic feeding behavior in adult amphibians. Pp. 153–190 *in* Topics in Functional and Ecological Vertebrate Morphology (P. Aerts, K. D'Août, A. Herrel, and R. Van Damme, editors). Shaker Publishing, Maastricht, The Netherlands.
Pefaur, J. E. 1992. Checklist and Bibliography (1960–85) of the Venezuelan Herpetofauna. Smithsonian Herpetological Information Service 89:1–54.
Péfaur, J. E., N. Sierra, R. Pérez, and F. Godoy. 1992. Aspectos biológicos de una población de cecílidos de los Andes venezolanos. Pp. 67–74 *in* Actas del I Congreso Argentino y I Congreso Sudamericano de Herpetología. Acta Zoologica Lilloana 41.
Peters, W. 1877. Über die von Hrn. Prof. Dr. K. Möbius 1874 auf den Maskarenen und Seychellen, sowie über die von Hrn. Dr. Sachs im vorigen Jahr in Venezuela gesammelten Amphibien. Monatsberichte der Königlich Preussischen Akademie des Wissenschaften zu Berlin, Juli 1877:455–460, 1 plate.
Peters, W. 1880 ("1879"). Über die Eintheilung der Caecilien und insbesondere über die Gattungen *Rhinatrema* und *Gymnopis*. Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin, November 1879:924–943, 1 plate.
Pinheiro, S. R. 2001. Class Amphibia (amphibians): Frogs, toads. Pp. 3–8 *in* Biology, Medicine, and Surgery of South

American Wild Animals (M. E. Fowler and Z. S. Cubas, editors). Iowa State University Press, Ames, Iowa.

Pinheiro, L. C., Y. O. da C. Bitar, U. Galatti, S. Neckel-Oliveira, and M. C. dos Santos-Costa. 2012. Amphibians from southeastern state of Pará: Carajás Region, northern Brazil. Check List 8:693–702.

Porter, K. R. 1972. Herpetology. W. B. Saunders Company, Philadelphia, Pennsylvania. xi + 524 pp.

Pough, F. H., R. M. Andrews, J. E. Cadle, M. L. Crump, A. H. Savitzky, and K. D. Wells. 1998. Herpetology. Prentice-Hall, Inc., Upper Saddle River, New Jersey. xi + 577 pp.

Pough, F. H., R. M. Andrews, J. E. Cadle, M. L. Crump, A. H. Savitzky, and K. D. Wells. 2001. Herpetology. Second Edition. Prentice-Hall, Inc., Upper Saddle River, New Jersey. xi + 612 pp.

Pough, F. H., R. M. Andrews, J. E. Cadle, M. L. Crump, A. H. Savitzky, and K. D. Wells. 2004. Herpetology. Third Edition. Pearson Education, Inc., Pearson Prentice Hall, Upper Saddle River, New Jersey. ix + 726 pp.

Pough, F. H., R. M. Andrews, M. L. Crump, A. H. Savitzky, K. D. Wells, and M. C. Brandley. 2016. Herpetology. Fourth Edition. Sinauer Associates, Inc., Sunderland, Massachusetts. [1] + xv + 591 + G-1-8, LC-1-92, TI-1-12, SI-1-16 pp.

Presswell, B., D. J. Gower, O. V. Oomen, G. J. Measey, and M. Wilkinson. 2002. Scolecophidian snakes in the diets of south Asian caecilian amphibians. Herpetological Journal 12:123–126.

Pyron, R. A. and J. J. Wiens. 2011. A large-scale phylogeny of Amphibia including over 2800 species, and a revised classification of extant frogs, salamanders, and caecilians. Molecular Phylogenetics and Evolution 61:543–583.

Rendle, M., B. Tapley, M. Perkins, G. Bittencourt-Silva, D. J. Gower, and M. Wilkinson. 2015. Itraconazole treatment of *Batrachochytrium dendrobatidis* (*Bd*) infection in captive caecilians (Amphibia: Gymnophiona) and the first case of *Bd* in a wild neotropical caecilian. Journal of Zoo and Aquarium Research 3:137–140.

Renous, S. and J. P. Gasc. 1989. Body and vertebral proportions in Gymnophiona (Amphibia): Diversity of morphological types. Copeia 1989:837–847.

Ruiz-Carranza, P. M., M. C. Ardila-Robayo, and J. D. Lynch. 1996. Lista actualizada de la fauna de Amphibia de Colombia. Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales 20:365–415.

San Mauro, D., D. J. Gower, H. Müller, S. P. Loader, R. Zardoya, R. A. Nussbaum, and M. Wilkinson. 2014. Life-history evolution and mitogenomic phylogeny of caecilian amphibians. Molecular Phylogenetics and Evolution 73:177–189.

Sedgwick County Zoo. 2013. New Arrivals: Kaup's Caecilian Birth on Video. YouTube. Available at https://www.youtube.com/watch?list=UU4wYOOkmFyDK-k2QMITJX-Xg&v=4kx3EpviVck.

Señaris, J. C. 2004a. Herpetofauna del golfo de Paria y delta del Orinoco, Venezuela / Herpetofauna of the Gulf of Paria and Orinoco Delta, Venezuela. Pp. 103–113 and 246–256 *in* Evaluación Rápida de la Biodiversidad y Aspectos Sociales de los Ecosistemas Acuáticos del Dalta del Río Orinoco y Golfo de Paria, Venezuela / Rapid Assessment of the Biodiversity and Social Aspects of the Aquatic Ecosystems of the Orinoco Delta and the Gulf of Paria, Venezuela (Lasso, C. A., L. E. Alonso, A. L. Flores, and G. Love, editors). RAP Bulletin of Biological Assessment / Boletín RAP de Evaluación Biológica 37. Conservation International. Washington, D.C.

Señaris, J. C. 2004b. Lista de especies de anfibios y reptiles registados en el golfo de Paria y delta del Orinoco, Venezuela / List of species of amphibians and reptiles recorded in the Gulf of Paria and Orinoco Delta, Venezuela. Pp. 347–351 *in* Evaluación Rápida de la Biodiversidad y Aspec-

tos Sociales de los Ecosistemas Acuáticos del Dalta del Río Orinoco y Golfo de Paria, Venezuela / Rapid Assessment of the Biodiversity and Social Aspects of the Aquatic Ecosystems of the Orinoco Delta and the Gulf of Paria, Venezuela (Lasso, C. A., L. E. Alonso, A. L. Flores, and G. Love, editors). RAP Bulletin of Biological Assessment / Boletín RAP de Evaluación Biológica 37. Conservation International. Washington, D.C.

Señaris, J. C. and A. R. Acosta-Galvis. 2014. Anfibios. Pp. 132–138 *in* Serie Recursos Hidrobiológicos y Pesqueros Continentales de Colombia. X. Humedales Interiores de Colombia: Identificación, Caracterización y Establecimiento de Límites según Criterios Biológicos y Ecológicos (C. A. Lasso, F. D. P. Gutiérrez, and D. Morales-Betancourt, editores). Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Bogotá, Colombia.

Señaris, J. C., and R. MacCulloch. 2005. Amphibians. Pp. 9–23 *in* Checklist of the Terrestrial Vertebrates of the Guiana Shield (T. Hollowell and R. P. Reynolds, editors). Bulletin of the Biological Society of Washington 13.

Sherratt, E., D. J. Gower, C. P. Klingenberg, and M. Wilkinson. 2014. Evolution of cranial shape in caecilians (Amphibia: Gymnophiona). Evolutionary Biology 41:528–545.

Smith, W. H. 1877. The Tailed Amphibians, Including the Caecilians. A Thesis: Presented to the Faculty of Michigan University, Ann Arbor, Michigan. Printed at Herald Publishing House, Detroit, Michigan. 158 pp.

Smith, R. B. and H. M. Smith. 1973. Nominal taxa of recent amphibians and reptiles. I. Gymnophiona. Transactions of the Kansas Academy of Science 75:52–99.

Sokolov, V. E. [Соколова, В. Е.] (editor). 1988. Пятиязычный Словарь Названий Животных. Амфибии и Рептилии. Латинский, Русский, Английский, Немецкий, Французский. [Dictionary of Animal Names in Five Languages. Amphibians and Reptiles. Latin, Russian, English, German, French]. Русский Язык Москва. [Russkiy Yazyk Publishers, Moscow, Russia]. 554 pp.

Stuart, S. N., M. Hoffmann, J. S. Chanson, N. A. Cox, R. J. Berridge, P. Ramani, and B. E. Young (editors). 2008. Threatened Amphibians of the World. Lynx Editions, Barcelona, Spain; IUCN, Gland, Switzerland; and Conservation International, Arlington, Virginia, USA. xv + 758 pp.

Tamukai, K., Y. Une, A. Tominaga, K. Suzuki, and K. Goka. 2014. *Batrachochytrium dendrobatidis* prevalence and haplotypes in domestic and imported pet amphibians in Japan. Diseases of Aquatic Organisms 109:165–175.

Tapley, B., D. J. Gower, C. J. Michaels, A. Barbon, M. Goetz, J. Lopez, A. Bland, G. Garcia, N. A. Nelson, and M. Wilkinson. 2019. EAZA Amphibian Taxon Advisory Group Best Practice Guidelines for typhlonectid caecilians – Version 1. European Association of Zoos and Aquariums, Amsterdam, The Netherlands. 47 pp.

Taylor, E. H. 1968. The Caecilians of the World. A Taxonomic Review. University of Kansas Press, Laurence, Kansas. xiv + 848 pp. [1 page errata sent with some copies of this volume].

Taylor, E. H. 1969a. Skulls of Gymnophiona and their significance in the taxonomy of the group. The University of Kansas Science Bulletin 48:585–687.

Taylor, E. H. 1969b. A new family of African Gymnophiona. The University of Kansas Science Bulletin 48:297–305.

Taylor, E. H. and J. A. Peters. 1974. The caecilians of Ecuador. The University of Kansas Science Bulletin 50:333–346.

Teodecki, E. E., E. D. Brodie, Jr., D. R. Formanowicz, Jr., and R. A. Nussbaum. 1998. Head dimorphism and burrowing speed in the African caecilian *Schistometopum thomense* (Amphibia: Gymnophiona). Herpetologica 54:154–160.

Travassos, L. 1955. Prof. Alípio de Miranda Ribeiro. Arquivos do Museu Nacional (Rio de Janeiro, Brasil) 42(1):XI–XXXVI.

Vaz-Silva, W., R. M. Oliveira, A. F. N. Gonzaga, K. C. Pinto, F. C. Poli, T. M. Bilce, M. Penhacek, L. Wronski, J. X. Martins, T. G. Junqueira, L. C. C. Cesca, V. Y. Guimarães, and R. D. Pinheiro. 2015. Contributions to the knowledge of amphibian and reptiles from Volta Grande do Xingu, northern Brazil. Brazilian Journal of Biology 75(3, Supplement):S205–S218.

VertNet.org. 2019. Specimen metadata for USNM 30534, *Potomotyphlus kaupii*. http://portal.vertnet.org/o/usnm/amphibians-reptiles?id=http-n2t-net-ark-65665-31dd69249-b15c-485a-be94-9ff1bdb116bf. Specimen page archived at http://archive.fo/ewm4Z on 24 October 2019.

Vitt, L. J. and J. P. Caldwell. 2009. Herpetology. Third Edition. Academic Press, San Diego, California. xiv + 697 pp.

Vitt, L. J. and J. P. Caldwell. 2014. Herpetology. An Introductory Biology of Amphibians and Reptiles. Fourth Edition. Academic Press, San Diego, California. xiv + 757 pp.

Vogt, R. C. and R. Bernhard. 2003. Biodiversidade e Biogeografia de Répteis e Anfíbios da Amazônia. Instituto Amazônia, Caderno de Ciência, Manaus, Brasil. [3] + [44] pp.

Wake, M. H. 1992. Reproduction in caecilians. Pp. 112–120 *in* Reproductive Biology of South American Vertebrates (W. C. Hamlett, editor). Springer-Verlag, New York, New York.

Wake, M. H. 2003. The osteology of caecilians. Pp. 1809–1876 *in* Amphibian Biology. Volume 5. Osteology (H. Heatwole and M. Davies, editors). Surrey Beatty & Sons, Chipping Norton, New South Wales, Australia.

Warbeck, A. 2002. Chemische Kommunikation bei der aquatischen Blindwühle *Typhlonectes natans* (Fischer 1879) (Amphibia: Gymnophiona). Unpublished Ph.D. Dissertation, Universität Hamburg, Hamburg, Germany. 88 + [1] pp.

Wells, K. D. 2007. The Ecology & Behavior of Amphibians. The University of Chicago Press, Chicago, Illinois. xi + 1148 pp.

Wilkinson, M. 1988. The status of *Nectocaecilia cooperi* Taylor, with comments on the genus *Nectocaecilia* Taylor (Amphibia: Gymnophiona). Journal of Herpetology 22:119–121.

Wilkinson, M. 1989. On the status of *Nectocaecilia fasciata* Taylor, with a discussion of the phylogeny of the Typhlonectidae (Amphibia: Gymnophiona). Herpetologica 45:23–36.

Wilkinson, M. 1991. Adult tooth crown morphology in the Typhlonectidae (Amphibia: Gymnophiona). A reinterpretation of variation and its significance. Zeitschrift für zoologische Systematik und Evolutionsforschung 29:304–311.

Wilkinson, M. 1996. Resolution of the taxonomic status of *Nectocaecilia haydee* (Roze) and a revised key to the genera of the Typhlonectidae (Amphibia: Gymnophiona). Journal of Herpetology 30:413–415.

Wilkinson, M. and R. A. Nussbaum. 1997. Comparative morphology and evolution of the lungless caecilian *Atretochoana eiselti* (Taylor) (Amphibia: Gymnophiona: Typhlonectidae). Biological Journal of the Linnean Society 62:39–109.

Wilkinson, M. and R. A. Nussbaum. 1998. Caecilian viviparity and amniote origins. Journal of Natural History 32:1403–1409.

Wilkinson, M. and R. A. Nussbaum. 1999. Evolutionary relationships of the lungless caecilian *Atretochoana eiselti* (Amphibia: Gymnophiona: Typhlonectidae). Zoological Journal of the Linnean Society 126:191–223.

Wilkinson, M., and R. A. Nussbaum. 2006. Caecilian phylogeny and classification. Pp. 39–78 *in* Reproductive Biology and Phylogeny of Gymnophiona (Caecilians). Volume 5 of Series: Reproductive Biology and Phylogeny (J.-M. Exbrayat, editor).

Science Publishers, Enfield, New Hampshire.

Wilkinson, M., A. Sebben, E. N. F. Schwartz, and C. A. Schwartz. 1998. The largest lungless tetrapod: report on a second specimen of *Atretochoana eiselti* (Amphibia: Gymnophiona: Typhlonectidae) from Brazil. Journal of Natural History 32:617–627.

Wilkinson, M., J. Measey, E. La Marca, L. A. Coloma, S. Ron, and F. Castro. 2010. *Potomotyphlus kaupii*. The IUCN Red List of Threatened Species 2010: e. T59589A11955756. Available at http://www.iucnredlist.org/details/59589/0. Archived by WebCite at http://www.webcitation.org/6xHTKWaas on 16 February 2018.

Wilkinson, M., D. San Mauro, E. Sherratt, and D. J. Gower. 2011. A nine-family classification of caecilians (Amphibia: Gymnophiona). Zootaxa 2874:41–64.

Wrobel, M. (compiler). 2004. Elsevier's Dictionary of Amphibians in Latin, English, German, French and Italian. Elsevier B.V., Amsterdam, The Netherlands. ix + 396 pp.

Zhao, E.-m., Y.-m. Jiang, Q.-y. Huang, S.-c. Hu, L. Fei, and C.-y. Ye. 1993. 拉汉英两栖爬行动物名称 [La Han Ying Liang qi pa xing Dong Wu Ming Cheng] [Latin-Chinese-English Names of Amphibians and Reptiles]. 科学出版社 北京 [Ke Xue chu ban She Bei Jing] [Science Press, Beijing]. v + 329 pp.

Zhao, E.-m., Y.-m. Jiang, Q.-y. Huang, S.-c. Hu, L. Fei, and C.-y. Ye. 1998. 拉汉英两栖爬行动物名称 [La Han Ying Liang qi pa xing Dong Wu Ming Cheng] [Latin-Chinese-English Names of Amphibians and Reptiles]. 科学出版社 北京 [Ke Xue chu ban She Bei Jing] [Science Press, Beijing]. v + 329 pp.

Zug, G. R., L. J. Vitt, and J. P. Caldwell. 2001. Herpetology. An Introductory Biology of Amphibians and Reptiles. Second Edition. Academic Press, San Diego, California. xiv + 630 pp.

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