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A new species of *Microcaecilia* Taylor, 1968 (Amphibia: Gymnophiona: Siphonopidae) from Amazonian Brazil

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Abstract

A new species of siphonopid caecilian, *Microcaecilia butantan* **sp. nov.**, is described based on four specimens from Belterra, in the State of Pará, Brazil. The new species differs from all other *Microcaecilia* in having a combination of more than 135 primary annuli and long premaxillary-maxillary tooth series that extend posteriorly beyond the choanae. Some specimens were dug from soil in a cupuaçu (*Theobroma grandiflorum*) plantation suggesting that this form of agriculture provides an environment suitable for at least some caecilians.

Key words: caecilians, South America, systematics, taxonomy

Introduction

Upon its first description, the Neotropical caecilian genus *Microcaecilia* Taylor, 1968 included only three nominal species of relatively small Neotropical caecilians with the eyes covered by bone. *Microcaecilia* has subsequently expanded substantially both through the descriptions of new species (Taylor 1969; Nussbaum and Hoogmoed 1979; Wilkinson *et al*. 2009; 2013a, Wilkinson & Kok 2010; Maciel & Hoogmoed 2011a,b, 2013; Donnelly & Wake 2013) and through acts of of synonymy at the generic level (Wilkinson *et al*. 2013b, 2014). *Microcaecilia* currently comprises 15 species making it the second most speciose South American genus of caecilians (and the third most speciose genus globally behind *Caecilia* L. and *Ichthyophis* Fitzinger, 1843). Here we describe a further new species of *Microcaecilia* from Brazil. The species is identified as a *Microcaecilia* on the basis of it being a South American species with eyes under bone, tentacular apertures closer to the eyes than the nares, and no diastemata between the vomerine and palatine tooth series (Wilkinson *et al.*, 2011; 2013b).

Material and methods

Animals were obtained by digging with bladed hoes, exclusively during daylight hours. Specimens were killed by anaesthesia (MS222) or accidentally during digging, fixed in 5% formalin for at least two days, washed in water and stored in 70% ethanol. Total lengths and circumferences were measured to the nearest millimetre (mm) with a ruler, the latter by wrapping a piece of string around the body. Other measurements were made to the nearest 0.1 mm with dial callipers. Observations and counts of teeth were facilitated by the Nussbaum technique, i.e. using a directed steam of compressed air to temporarily dry and shrink the gingivae (Wilkinson *et al*. 2013a). Dermal and subdermal scales were examined and sought respectively with the methods described by Wilkinson *et al*. (2013a). Sex was determined by direct examination of gonads. Vertebrae of the holotype were counted from an X-radiograph. Condition of the orbit was assessed by probing with a fine pin and by X-radiography.

Following Kamei *et al.* (2009, 2013), Wilkinson & Kok (2010), Kotharambath *et al*. (2012) and Agarwal *et al*. (2013) we refer to the fleshy margins of the upper and lower jaws that form the edges of the mouth as lips and use the following abbreviations for anatomical features and ratios of measurements: AG = annular groove; AM =

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anteromedial limit of the mouth on the upper jaw; CM = corner of the mouth; C1 = first collar; C2 = second collar; NG1 = first nuchal groove; NG2 = second nuchal groove; NG3 = third nuchal groove; OM = outer mandibular (or 'dentary') tooth; PA = primary annulus; PAG = primary annular groove; PM = premaxillary-maxillary tooth; SAG = secondary annular groove; ST = snout tip; TA = tentacular aperture; TG = transverse groove on dorsal surface of collar; TT = terminus tip, the posteriormost point of the body; VP = vomeropalatine tooth; L/H = total length divided by head length; L/W = total length divided by midbody width. Distances involving nuchal grooves refer to a point on the groove directly behind the CM. Following Wilkinson *et al*. (2013a) distances between structures or points of reference are indicated with a dash (e.g. CM–ST). The first PAG is taken to be the AG at the posterior margin of the first PA. Observations were made with the assistance of a dissecting microscope.

We have examined type material of all described species of *Microcaecilia* except for the recently described species *M. savagei* Donnelly and Wake, 2013 for which we have depended entirely upon the the literature.

***Microcaecilia butantan* sp. nov.**

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Figs. 1–2; Table 1

Holotype. Museu de Zoologia, Universidade Sao Paulo (MZUSP) 143389, a female with small (c. 0.5 mm) non-yolky eggs, collected by Carlos Jared and Marta Maria Antoniazzi, dug from soil in a cupuaçu (*Theobroma grandiflorum*) plantation within APA (Área de Proteção Ambiental) Aramanaí [237'57.96"S, 5457'44.16"W, 152m asl], municipality of Belterra, Pará, in October 2010, maintained in captivity until fixed in December 2010.

Paratypes (n = 3). MZUSP 153204–6 collected by Carlos Jared and Marta Maria Antoniazzi, dug from soil at or near the type locality (within the same plantation) in May 2010 or May 2011.

Diagnosis. A *Microcaecilia* that differs from *M. albiceps* (Boulenger, 1882)*, M. nicefori* (Barbour, 1928)*, M. supernumeraria* Taylor, 1970 and *M. unicolor* (Duméril, 1863) in having elongate PM series that extend posterior to the level of the choanae, and from all other *Microcaecilia* (*M. dermatophaga* Wilkinson, Starace, Gower & Sherratt, 2013*, M. iwokramae* (Wake & Donnelly, 2010)*, M. iyob* Wilkinson & Kok, 2010*, M. grandis* Wilkinson, Nussbaum & Hoogmoed, 2010*, M. marvaleewakeae* Maciel & Hoogmoed, 2013*, M. pricei,* (Dunn, 1944) *M. rabei* (Roze & Solano, 1963)*, M. rochai* Maciel & Hoogmoed, 2011*, M. savagei* Donnelly & Wake, 2013*, M. taylori* Nussbaum & Hoogmoed, 1979 and *M. trombetas* Maciel & Hoogmoed, 2011) in having more than 135 PAs.

Description of the holotype. Some morphometric and meristic data are in Table 1. Good condition, a 3 mm midventral incision c. 65 mm behind ST, a 9 mm midventral incision c. 35 mm anterior of TT, an opened scale pocket posteriorly, some skin damaged anteriorly by search for subdermal scales.

Body subcylindrical, slightly dorsoventrally flattened throughout (width and depth at midbody 4.0 x 3.7 mm), fairly uniform, slightly narrower anteriorly, narrowing posteriorly from just in front of the vent; L/W c. 40. In dorsal view, head intermediate between U- and V-shaped; sides of head fairly straight, converging gently from posterior to level of TAs, more curved and converging more strongly to level of nares, ST moderately pointed. In lateral view, top of head slightly convex; upper lip slightly concave, somewhat downturned anteriorly from just in front of TAs; ridge bearing vomeropalatine teeth visible close to CM; lower jaw robust, two-thirds the height of upper jaw at levels of CM and TA. In ventral view, snout projects strongly beyond recessed mouth, anterior margins of upper and lower jaws much more blunt than ST. Eyes not visible. TAs very slightly elevated, on indistinct, broad low papillae that are just visible dorsally and ventrally, much closer to CMs than to nares, distinctly above imaginary lines between nares and CMs. Nares small, dorsolateral, superficially they are ovate depressions, longer than wide/high, each with deeper, more ovate, wider than long, aperture anteriorly. Nares closer to ST than to level of AM, about one and a half times as far from bottom than from top of snout and from ST in lateral view, not visible from below.

Teeth pointed, gently recurved, lacking serrations or blade like flanges, last few elements of outer series much smaller posteriorly. OMs and PMs monocuspid, the former a little larger; VPs smaller, more uniform in size, bicuspid, vomerine series broadly rounded anteromedially, palatines extending posteriorly slightly further than premaxillary-maxillary series. Distance between vomeropalatine and premaxillary-maxillary series anteriorly much less (approximately half) AM–ST in ventral view; upper series extending posteriorly distinctly beyond choanae. Palate strongly arched transversely and longitudinally. Choanal apertures subcircular, separated from each

other by about twice width of single choana, anterior margins approximately level with TAs. Tongue somewhat pointed at tip, attached anteriorly, smooth except for a medial longitudinal groove posteriorly.

FIGURE 1. MZUSP 143389, holotype of *Microcaecilia butantan* **sp. nov.** Scale bars in mm. Photo by Harry Taylor (Natural History Museum, London).

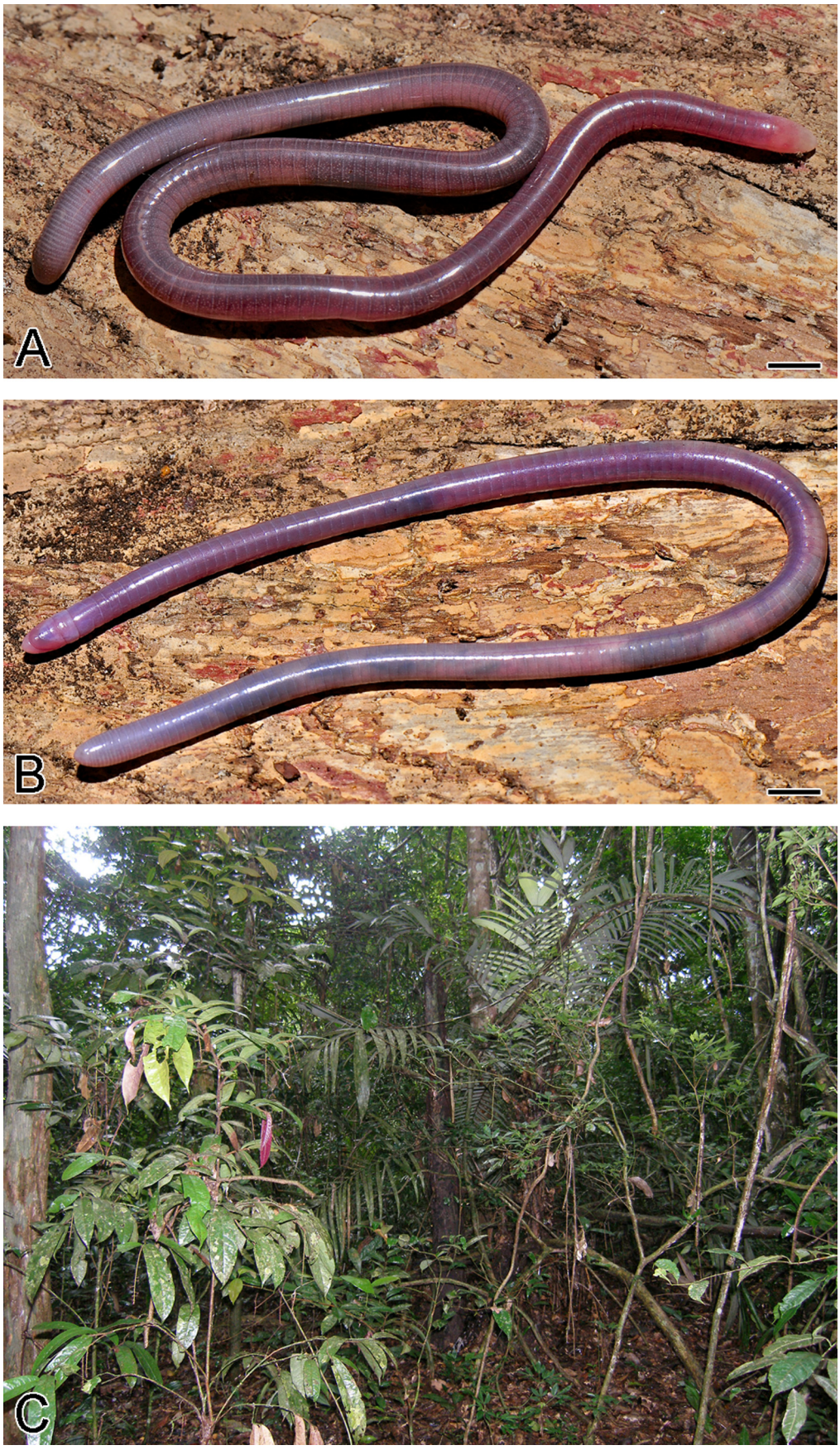

FIGURE 2. *Microcaecilia butantan* **sp. nov.** (A) Specimen in life dorsal view. Bar = 5 mm. (B) Specimen in life ventral view. Bar = 5 mm. (C) Habitat at type locality.

TABLE 1. Morphometric (in mm) and meristic data for the type series of *Microcaecilia butantan* **sp. nov.** * = holotype. Tooth counts for the paratype specimens are approximate and tentative. Empty cells are missing data. L = lip; N = naris; other abbreviations given in text.

	MZUSP 143389*	MZUSP 153205	MZUSP 153206	MZUSP 153204
Sex	F	M	M	M
Length	159	208	191	202
Width at mid-body	4.0	4.5	3.7	3.3
Circumference	13	16	14	17
PAGs (= PAs)	157	143	145	143?
First PA with SAG	139	129	116	116
Last PA with SAG	155	142	143	
SAGs	17	14	26	c. 25
SAGs complete ventrally	0	0	3	3 or 4
Vertebrae	162			
CM–ST	3.5	4.5	4.2	4,0
NG1–ST	4.5	5.5	4.8	5.2
Width at occiput	3.2	3.5	3.3	3.1
Depth at occiput	2.7	2.8	2.4	2.3
Width at vent	2.4	2.7	2.8	2.9
Length of body behind vent	1.0	1.3	1.3	1.3
AM–ST	1.1	1.2	1	1.2
N–N	1.2	1.1	1.3	1.2
CM–N	3.0	4	3.6	3.7
L–N	1.0	0.9	0.9	0.9
N–TA	1.8	2	2	2.1
TA–TA	2.6	2.9	2.8	2.9
CM–TA	1.3	1.7	1.7	1.7
L–TA	0.5	0.4	0.4	0.4
Length of C1	1.3	1.8	1.4	1.5
Length of C2	1.5	1.9	2	1.8
PMs	22	21	18	20
VPs	24			
OMs	19		13	16

Nuchal region a little wider than adjacent body. Two nuchal collars clearly marked by three nuchal grooves; NG1 and NG2 completely encircling body, NG3 widely incomplete and curving posteriorly on the venter. NG1 notably oblique laterally; substantial TG on C2, visible laterally; much shorter TG on C1. TGs, NG2 and NG3 bending slightly anteromedially on dorsum. NG1 with a ventral transverse groove a little longer than that on the dorsum. A small mid-ventral crease extends from between the CMs to just past the ventral TG on C1. Behind collars, 157 PAGs, mostly complete or very narrowly incomplete dorsally, mostly narrowly incomplete ventrally except for approximately the anteriormost 20 and posteriormost 12; PAs longest at midbody, shorter anteriorly and more so posteriorly. First SAG short, dorsolateral on 139th PA; SAGs dorsally complete from 142nd PA; more posterior SAGs gradually extending further ventrolaterally, none complete ventrally; SAGs absent from last two PAs, last PA (155th) divided by a SAG slightly in front of the level of the vent; last PAG just posterior to vent. AGs slightly raised in places. Vent region interrupts last four PAGs. Body ends in a short terminal cap c. 1.5 times the length of the last PA (viewed laterally), approximately the same length as the last PA with a SAG, a little shorter

than midbody PAs. Body terminus slightly acuminate in lateral view, more so in dorsal view, narrowing only over last five PAs. In lateral view, ventral surface strongly upturned behind vent. Vent rather transverse, with perhaps five main denticulations anterior and four posterior, but with some irregular subdivisions, the interdenticular creases shorter anteriorly; vent slighty elevated but not in an obvious 'disc' and seemingly without papillae. Distinct terminal keel on dorsal surface of terminal cap. Scales in shallow (< 0.5 mm deep, less than half length of PA in this region) pockets in posteriormost AGs, a single main row plus occasional supernumerary scales both anterior and posterior to the main row. No indications of scales in subdermal connective tissue. Three vertebrae in the nuchal region, no post-cloacal vertebrae.

In preservative, body mostly faint tan, with slightly darker middorsal band (3 mm wide), fairly abrupt transition to much paler lateral flanks and more gradual transition to slightly darker venter. Little regional differentiation in colour, darker dorsal coloration extends a little more ventrally on posteriormost annuli especially where there are SAGs. Head and ventral surface of nuchal region pale, almost pigmentless. Paler (whitish) immediately anterior to and around vent and on ventral surface of terminal cap. AGs with whitish edge and more or less well-developed adjacent line of darker pigment, appear darker than the intervening skin macroscopically. Numerous whitish glands visible scattered in the skin with many large glands aligned along AGs.

Variation and additional information from paratypes. Variation in some meristics and morphometrics is summarised in Table 1. The paratypes, which are all males, are similar in most respects to the holotype except for notably fewer PAs (143–145), narrower bodies at the level of the vent and smaller heads, all of which might be indicative of sexual dimorphism. Only one (the last) terminal PA lacks a SAG in MZUSP 153205. MZUSP 153206 has three SAGs that are complete ventrally just anterior to the vent (on PAs 139, 140, and 141). In life, body colour is pink to purple (Fig. 2A).

Remarks. A total of 21 specimens of this species were encountered at the type locality or in nearby forests within the limits of APA Aramana in three expeditions: May 2010 (16 specimens, in three days, including eight in approximately four hours on the first day, and six in about two and a half hours on the second day) and 2011 (four specimens) during the rainy season and October 2010 (the holotype) during the dry season. Only four of these specimens were fixed for use as taxonomic vouchers. Some other specimens are being used in histological studies at the Instituto Butantan.

Etymology. The specific epithet is in honour of the Instituto Butantan, which enabled the discovery of the species through the Butantan na Amazônia (Butantan in Amazon) project. To promote stability the species epithet is considered to be noun in apposition for nomenclatural purposes.

Suggested English name. Butantan microcaecilia.

Discussion

Caecilian taxonomy is renowned for the difficulties due to the seeming lack of reliable morphological characters and the fact that many species are known from very small samples such that natural variation is not well understood. Species of the Neotropical genus *Microcaecilia* are distinguished primarily on the basis of numbers of primary and secondary annular grooves together with colour and some few dental and squamation characters (Wilkinson *et al*. 2013b). The rapid recent increase in numbers of recognised species of *Microcaecilia* suggests that this might be a highly speciose caecilian genus. The admittedly limited current knowledge of species distributions (many of which are known only from type localities) perhaps suggests that most species do not have large ranges. *Microcaecilia butantan* **sp. nov.** is readily diagnosed by its distinctive combination of dental and annulation characters. However, if many additional species of *Microcaecilia* are discovered, we might anticipate that effective taxonomy based on the rather small set of characters relied upon hitherto will become more difficult. Thus we highlight the need for further study aimed at identifying additional characters that can be used to distinguish phenotypically similar but distinct taxa. We expect that molecular data will play an increasingly important role in helping to identify distinct lineages.

Although known only from a small area, the presence of *Microcaecilia butantan* **sp. nov.** in both native forest and cupuau plantation within a protected area, together with the relatively short time required to find specimens during the rainy season, suggests that the species can be locally abundant and is not under any immediate conservation threat in this area.

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References

Agarwal, I., Wilkinson, M., Mohapatra, P.P., Dutta, S.K., Giri, V. & Gower, D.J. (2013) The first teresomatan caecilian (Amphibia: Gymnophiona) from the Eastern Ghats of India—a new species of *Gegeneophis* Peters, 1880. *Zootaxa*, 3693 (4), 534–546.
http://dx.doi.org/10.11646/zootaxa.3693.4.7

Donneley, M.A. & Wake, M.H. (2013) A new species of *Microcaecilia* (Amphibia: Gymnophiona) from Guyana, with comments on *Epicrionops niger*. *Copeia,* 2013, 223–231.
http://dx.doi.org/10.1643/ch-12-094

Kamei, R.G., Wilkinson, M., Gower, D.J. & Biju, S.D. (2009) Three new species of striped *Ichthyophis* (Amphibia: Gymnophiona: Ichthyophiidae) from the northeast Indian states of Manipur and Nagaland. *Zootaxa,* 2267, 26–42.

Kamei, R.G., Gower, D.J., Wilkinson, M. & Biju, S. (2013) Systematics of the caecilian family Chikilidae (Amphibia: Gymnophiona) with the description of three new species of *Chikila* from northeast India. *Zootaxa*, 3666 (4), 401–435.
http://dx.doi.org/10.11646/zootaxa.3666.4.1

Kotharambath, R., Wilkinson, M., Oommen, O.V., George, S., Nussbaum, R.A. & Gower, D.J. (2012) On the systematics, distribution and conservation status of *Ichthyophis longicephalus* Pillai, 1986 (Amphibia: Gymnophiona: Ichthyophiidae). *Journal of Natural History*, 46, 2935–2959.
http://dx.doi.org/10.1080/00222933.2012.717972

Maciel, A.O. & Hoogmoed, M.S. (2011a) Taxonomy and distribution of caecilian amphibians (Gymnophiona) of Brazilian Amazonia, with a key to their identification. *Zootaxa*, 2984, 1–53.

Maciel, A.O. & Hoogmoed, M.S. (2011b) Notes on the Vertebrates of northern Pará, Brazil: a forgotten part of the Guianan Region, III. A new species of *Microcaecilia* (Amphibia: Gymnophiona: Caeciliidae). *Boletim do Museu Paraense Emílio Goeldi Série Ciências Naturais*, 6, 67–72.

Maciel, A.O. & Hoogmoed, M.S. (2013) A new species of *Microcaecilia* (Amphibia: Gymnophiona: Siphonopidae) from the Guianan region of Brazil. *Zootaxa* 3693 (3), 387–394.
http://dx.doi.org/10.11646/zootaxa.3693.3.9

Nussbaum, R.A. & Hoogmoed, M.S. (1979) Surinam caecilians, with notes on *Rhinatrema bivittatum* and the description of a new species of *Microcaecilia* (Amphibia, Gymnophiona). *Zoologische Mededelingen Leiden*, 54, 217–235.

Taylor, E.H. (1968) *The caecilians of the World: a taxonomic review*. Lawrence: University of Kansas Press, 848 pp.

Taylor, E.H. (1969) A new caecilian from Brazil. *The University of Kansas Science Bulletin*, 48, 307–313.

Wilkinson, M., Nussbaum, R.A. & Hoogmoed, M.S. (2009) A new species of *Microcaecilia* (Amphibia: Gymnophona: Caeciliidae) from Suriname. *Herpetologica*, 65, 413–418.
http://dx.doi.org/10.1655/08-030.1

Wilkinson, M. & Kok, P.J.R. (2010) A new species of *Microcaecilia* (Amphibia: Gymnophiona: Caeciliidae) from Guyana. *Zootaxa*, 2719, 35–40.

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

Wilkinson, M., Sherratt, E., Starace, F. & Gower, D.J. (2013a) A new species of skin-feeding caecilian and the first report of reproductive mode in *Microcaecilia* (Amphibia: Gymnophiona: Siphonopidae). *PLoS ONE*, 8 (3), e57756.
http://dx.doi.org/10.1371/journal.pone.0057756

Wilkinson, M., O'Connor, A. & Nussbaum, R.A. (2013b) Taxonomic status of the neotropical caecilian genera *Brasilotyphlus* Taylor, 1968, *Microcaecilia* Taylor, 1968 and *Parvicaecilia* Taylor, 1968 (Amphibia: Gymnophiona: Siphonopidae). *Occasional Papers of the Museum of Zoology, University of Michigan*, 744, 1–12.