Phyllomedusa 17(2):289–293, 2018

ISSN 1519-1397 (print) / ISSN 2316-9079 (online)
doi: http://dx.doi.org/10.11606/issn.2316-9079.v17i2p289-293

Short Communication

Notes on the poorly known caecilian *Nectocaecilia petersii* (Gymnophiona: Typhlonectidae) of the Brazilian Amazon

Rafael de Fraga,[1] Alfredo P. Santos-Jr.,[2,3] Erika Souza,[2,3] Ricardo A. Kawashita-Ribeiro,[3,4] Síria Ribeiro,[2,5] and Adriano O. Maciel[6]

[1] Programa de Pós-Graduação em Recursos Naturais da Amazônia, Universidade Federal do Oeste do Pará. Av. Mendonça Furtado, 2440, Aldeia, 68040-050, Santarém, PA, Brazil. E-mail: r.defraga@gmail.com.

[2] Laboratório de Ecologia e Comportamento Animal, Universidade Federal do Oeste do Pará. Rua Vera Paz, s/n, Salé, 68040-255, Santarém, PA, Brazil.

[3] Programa de Pós-Graduação em Biodiversidade, Universidade Federal do Oeste do Pará, Unidade Amazonas. Av. Mendonça Furtado, 2946, Fátima, 68040-050, Santarém, PA, Brazil.

[4] Instituto de Ciências e Tecnologia das Águas, Universidade Federal do Oeste do Pará, Unidade Amazonas. Av. Mendonça Furtado, 2946, Fátima, 68040-050, Santarém, PA, Brazil.

[5] Programa de Pós-Graduação em Recursos Naturais da Amazônia. Rua Vera Paz, Salé, 68135-110, Santarém, PA, Brazil.

[6] Programa de Pós-Graduação em Genética e Biologia Molecular, Universidade Federal do Pará. R. Augusto Corrêa, 1, Guamá, 66075-110, Belém, PA, Brazil.

Keywords: Alter do Chão, body size, geographic distribution, stream.

Palavras-chave: Alter do Chão, distribuição geográfica, igarapé, tamanho corporal.

Accuracy in species geographic range is fundamental to understanding mechanisms and processes affecting biodiversity at different ecological levels and spatial scales (e.g., Qian and Ricklefs 2012). Heterogeneous environments in the Neotropics harbor caecilian species for which the range is not yet well documented and does not extend much further from the type locality (e.g., *Oscaecilia equatorialis*, *Epicrionops lativittatus*). A lack of accuracy in the range data reflects a lack of sampling in remote locations, low detection probability, or a combination of both (Fraga *et al*. 2014). In this note we expand the geographic range of the poorly sampled *Nectocaecilia petersii* (Boulenger, 1882) by introducing a new record in the forest-savanna mosaics of the central-eastern Brazilian Amazon. Caecilians are often under-sampled, which is why 44% of the 32 species on the Brazilian Red List have been assessed as "Deficient Data" (ICMBio 2018).

Currently 17 valid species of caecilians are reported from the Amazon region of Brazil. These species are allocated to four families and eight genera (Maciel and Hoogmoed 2011, Frost 2018). Species diversity is underestimated

Received 06 September 2018
Accepted 04 December 2018
Distributed December 2018

because undescribed species have been recently found by sampling remote areas (e.g., Moraes *et al*. 2017). Additionally, assigning specimens to a particular species may be problematic because molecular data may be required to delimit morphologically similar species (e.g., Moraes *et al*. 2017). *Nectocaecilia* is a monotypic genus of Typhlonectidae, which makes identifying species using morphology easier. *Nectocaecilia petersii* is aquatic and often uses eel burrows near the banks of streams (Gorzula and Señaris 1998) and roots of floating vegetation (Maciel and Hoogmoed 2011). The known geographic range (Maciel and Hoogmoed 2011) is based on only three localities: one in Venezuela (Cerro Yapacana, 106 m a.s.l.) and two in the northwestern region of Amazonian Brazil (44 and 81 m a.s.l.).

On 15 April 2018 we found an adult female *N. petersii* (Figure 1) in the village of Alter do Chão (02°30'56" S, 54°57'40" W, 4.6 m a.s.l.), Santarém, Pará state, Brazil. The region is covered by patches of secondary forest interspersed with savannas and anthropic areas. The individual was active at the surface of the water near the border of a clear stream at night, apparently foraging. RF manually caught it, and killed it using a 2% benzocaine odontological topical anesthetic. We deposited the specimen (preserved in 70% ethanol after fixation in 10% formalin) in the herpetological collection of Laboratório de Ecologia e Comportamento Animal (LECAN), Universidade Federal do Oeste do Pará, Santarém, Brazil (UFOPA-H 1231).

Morphological characters were congruent with those of *Nectocaecilia* given by Wilkinson and Nussbaum (2006) and Maciel and Hoogmoed (2011), which distinguish this genus from the other four genera of Typhlonectidae as follows: cylindrical, not laterally compressed body (laterally compressed body in *Atretochoana*, *Potomotyphlus*, and *Typhlonectes* spp.), absence of dorsal "fins" (present in *Atretochoana*, *Potomotyphlus*, and *Typhlonectes* spp.), and tentacles very close to nostrils (tentacles more intermediate in position between eye and nostril in *Chthonerpeton* spp.). Further, the number of primary annuli of our specimen (141) falls within the known range (131 to 145) for *Nectocaecilia petersii*.

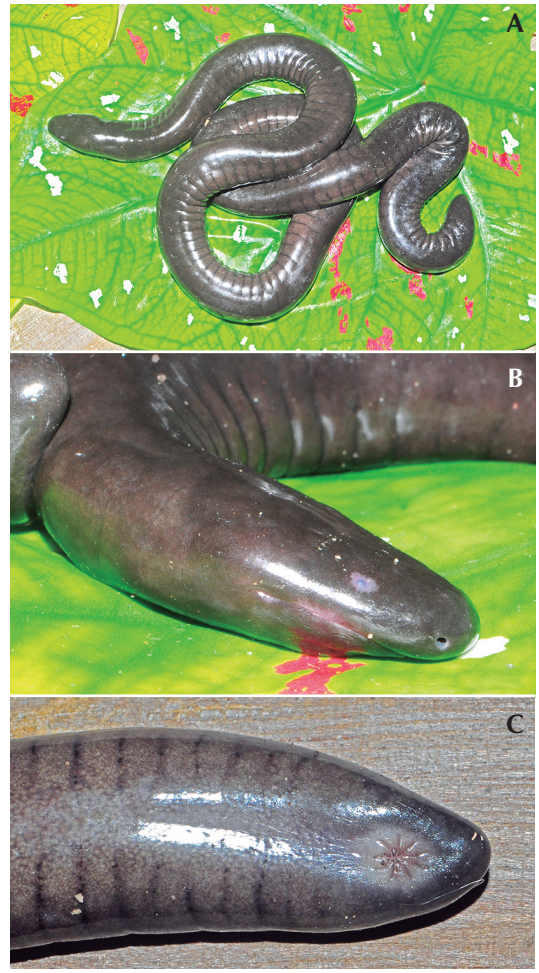

Figure 1. Overview (**A**) and details of the head (**B**) and cloaca (**C**) of an adult female *Nectocaecilia petersii* (UFOPA-H 1231) from Alter do Chão, Pará, Brazil.

Our record extends the known geographic range of *N. petersii* 1,105 km east (straight line) from the nearest locality (Mamirauá Reserve, Amazonas state) in the previously known range.

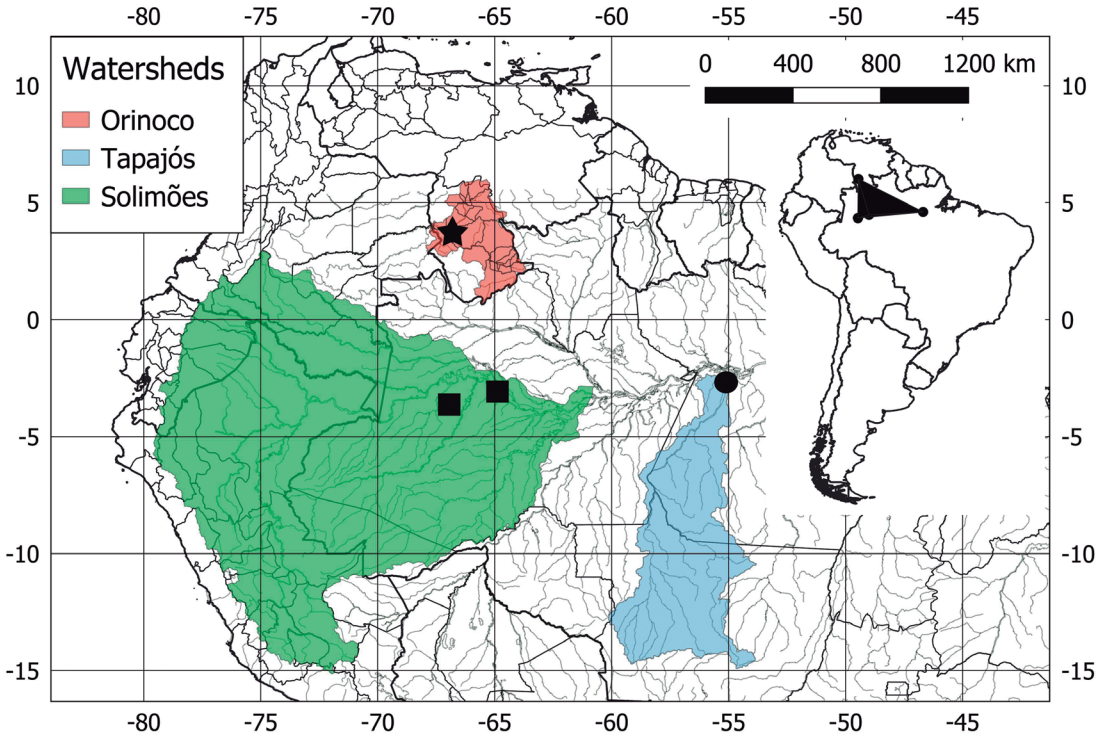

Figure 2. Geographic range of *Nectocaecilia petersii* in the Amazon lowlands. Star = type-locality, squares = Maciel and Hoogmoed (2011), circle = this study. The inset map shows a Delaunay triangulation.

It is also the first state record (Pará) and the largest specimen (body length 720 mm) compared to literature data (590 mm; see Maciel and Hoogmoed 2011). We plotted the updated range on a sat-based layer of main watersheds in the Amazon for a rapid assessment of connectivity among sampling locations (Figure 2).

The updated range of *N. petersii* suggests that the species may be widely distributed throughout the Amazon, although sampling gaps are large. For instance, the species is expected to occur in Peru (Aguilar *et al*. 2010) and Colombia (Mijares *et al*. 2004), although voucher specimens have not been obtained. The current range covers four distinct watersheds (Orinoco, Negro, Solimões, and Tapajós), which are mainly connected by the Amazon River. This finding suggests that the Amazon River has played an important role as a corridor to dispersal and gene flow, despite the need for further studies to test this hypothesis. The lack of data with which to base range maps on is not uncommon for Neotropical caecilians (see accounts for *Caecilia gracilis*, *Caecilia tentaculata* and *Potomotyphlus kaupii*; Maciel and Hoogmoed 2011). Current distributions of many caecilians underestimate the extent of their habitat requirements. For instance, the locality (Alter do Chão) added to the range map of *N. petersii* by this study has considerably lower levels of annual precipitation (1,985 mm) compared to the western portion of the previous

species range (2,739–3,279 mm). Precipitation is thought to be a relevant factor affecting the distribution of aquatic caecilians because it determines food availability, and consequently, growth rates (Measey and Wilkinson 1998). Additionally, we showed that the species occupies a large altitudinal gradient (4.6–106 m a.s.l.), which may encompass high levels of habitat heterogeneity (e.g., vegetation cover type, soil drainage capacity; Chauvel *et al.* 1987). These findings suggest that *N. petersii* may show low specificity regarding habitat requirements, although additional data are required to test this hypothesis.

Despite a lack of data for most species, caecilian populations may be undergoing declines, primarily due to habitat degradation (Gower and Wilkinson 2005). Specifically, *N. petersii* has been assessed as Least Concern (Mijares *et al.* 2004), and its range overlaps with several protected areas in the western portion of its range (Maciel and Hoohmoed 2011). However, the conservation assessment is out-of-date, and we do not have enough data to update it. We used Delaunay triangulation to calculate the extent of occurrence (EOO) for the current range at 531,035.79 km^2, which suggests low risk because of the low probability of populations experiencing adverse effects across the full extent of the distribution. However, the distribution is based on fewer than five locations, suggesting some degree of threat to populations (IUCN 2011). Additional data are required to evaluate such inconsistencies and provide a more accurate conservation status assessment.

Acknowledgments.—We thank IBAMA/SISBIO for the collecting permit number 24072-1 (A. P. Santos Jr.). Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - CAPES provided a PNPD postdoc grant to R. de Fraga. We thank Janalee Caldwell for the English review.

References

Aguilar, C., C. Ramirez, K. Siu-Ting, J. Suarez, and C. Torres. 2010. Anfibios andinos del Perú fuera de Áreas Naturales Protegidas: amenazas y estado de conservación. *Revista Peruana de Biología 17:* 5–28.

Chauvel, A., Y. Lucas, and R. Boulet. 1987. On the genesis of the soil mantle of the region of Manaus, Central Amazonia, Brazil. *Experientia 43:* 234–241.

Fick, S. E. and R. J. Hijmans. 2017. Worldclim 2: new 1-km spatial resolution climate surfaces for global land areas. *International Journal of Climatology 37:* 4302–4315.

Fraga, R., A. J. Stow, W. E. Magnusson, and A. P. Lima. 2014. The costs of evaluating species densities and composition of snakes to assess development impacts in Amazonia. *PLoS ONE 9:* e105453.

Frost, D. R. 2018. Amphibian species of the world: an online reference. Version 6.0. Eletronic database accessible at http://research.amnh.org/herpetology/amphibia/index.html. Captured on 19 August 2018.

Gorzula, S. and J. C. Señaris. 1998. Contribution to the herpetofauna of the Venezuelan Guayana I. A database. *Scientia Guaiane 8:* 1–270.

Gower, D. J. and M. Wilkinson. 2005. Conservation biology of caecilian amphibians. *Conservation Biology 19:* 45–55.

ICMBio/MMA. *2018. Livro Vermelho da Fauna Brasileira Ameaçada de Extinção*. ICMBio/MMA, Brasília. 492 pp.

IUCN Standards and Petitions Subcommittee. 2011. Guidelines for using the IUCN Red List categories and criteria. Version 9.0. Available at http://www.iucnredlist.org/documents/RedListGuidelines.pdf. Captured on 13 November 2018.

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

Measey G. J. and M. Wilkinson. 1998. Lines of arrested growth in the caecilian, *Typhlonectes natans* (Amphibia: Gymnophiona). *Amphibia-Reptilia 19:* 91–95.

Mijares A., H. La Marca, and M. Wilkinson. 2004. *Nectocaecilia petersii*. The IUCN Red List of threatened species 2004. Available at www.iucnredlist.org. Captured on 12 July 2018.

Moraes, L. J. C. L., A. P. Almeida, R. Fraga, R. R. Rojas, R. M. Pirani, A. A. A. Silva, V. T. Carvalho, M. Gordo,

and F. P. Werneck. 2017. Integrative overview of the herpetofauna from Serra da Mocidade, a granitic mountain range in northern Brazil. *ZooKeys 715:* 103–159.

Qian, H. and R. E. Ricklefs. 2012. Disentangling the effects of geographic distance and environmental dissimilarities on global patterns of species turnover. *Global Ecology and Biogeography 21:* 341–351.

Wilkinson, M. and R. A. Nussbaum. 2006. Caecilian phylogeny and classification. Pp. 39–78 *in* J. M. Exbrayat (ed.), *Reproductive Biology and Phylogeny of Gymnophiona (Caecilians)*. Vol. 5. Plymouth, U.K. Science Publishers Inc.

Editor: Jaime Bertoluci