



## Conservatism as an unjustifiable justification for the recognition of paraphyletic taxa: the case of Alopoglossidae

PEDRO PELOSO<sup>1</sup>, MARCELO JOSÉ STURARO<sup>2</sup>, PEDRO M. SALES NUNES<sup>3</sup>,  
SEBASTIAN LOTZKAT<sup>4</sup> & CRISTIAN HERNÁNDEZ MORALES<sup>5</sup>

<sup>1</sup>Universidade Federal do Pará, Instituto de Ciências Biológicas, Rua Augusto Corrêa, 01, Guamá, CEP 66075–110, Belém, Pará, Brazil. ✉ [pedropeloso@gmail.com](mailto:pedropeloso@gmail.com); <https://orcid.org/0000-0003-0127-8293>

<sup>2</sup>Universidade Federal de São Paulo, Departamento de Ecologia e Biologia Evolutiva, Av. Professor Artur Riedel, 275, Jardim Eldorado, CEP 09972-270, Diadema, São Paulo, Brazil. ✉ [marcelosturaro@gmail.com](mailto:marcelosturaro@gmail.com); <https://orcid.org/0000-0002-3157-2488>

<sup>3</sup>Universidade Federal de Pernambuco, Departamento de Zoologia, Centro de Biociências, Av. Professor Moraes Rego s/n, Cidade Universitária 50670–901, Recife, Pernambuco, Brazil. ✉ [pedro.nunes@gmail.com](mailto:pedro.nunes@gmail.com); <https://orcid.org/0000-0002-2635-9703>

<sup>4</sup>Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, 70191 Stuttgart, Germany. ✉ [lotzkat@yahoo.com](mailto:lotzkat@yahoo.com); <https://orcid.org/0000-0001-8171-9321>

<sup>5</sup>Department of Biology, The University of Texas at Arlington, Arlington, Texas 76019-0498, USA. ✉ [nandezsendo@gmail.com](mailto:nandezsendo@gmail.com); <https://orcid.org/0000-0001-9964-9173>

### conservatism (*noun*)

1

commitment to traditional values and ideas with opposition to change or innovation. e.g., “proponents of theological conservatism”

### conservatively (*adverb*)

1

in a sober and conventional way.

2

in a cautious way that seeks to avoid potential risks.

In a recent publication, Ribeiro-Júnior *et al.* (2020a) described and named a new species of alopoglossid lizard from Brazil. The species was assigned to the genus *Alopoglossus* but the authors chose not to use the generic arrangement proposed in Hernández-Morales *et al.* (2020), their main argument being:

“While some recent studies have been published (e.g., Hernández-Morales *et al.*, 2020), the study of Goicoechea *et al.* (2016) remains the most comprehensive phylogenetic study with *Gymnophthalmoidea* based on molecular data. We thus opted to conservatively consider *Ptychoglossus* as a valid genus, sharing the diagnostic apomorphies suggested by Harris (1994).”

Herein, we discuss why this argument is flawed, unjustified, and based on unnecessary conservatism (i.e., opposition to change).

### Goicoechea *et al.* (2016) did not test the monophyly of *Ptychoglossus*

It is indisputable that Goicoechea *et al.* (2016) did in fact provide the most comprehensive phylogenetic study of *Gymnophthalmoidea*. However, the study did not provide any comprehensive analysis of the relationships between *Alopoglossus* and *Ptychoglossus* (which together form the Alopoglossidae). Goicoechea *et al.* (2016) included a single species of *Ptychoglossus* (*P. brevifrontalis*) and therefore were unable to test the monophyly of the genus. The authors did include several species of *Alopoglossus* in their analyses and recovered the genus both as monophyletic and as the sister clade of

*P. brevifrontalis*. In fact, the monophyly of Alopoglossidae, with a sister taxon relationship between *P. brevifrontalis* and a monophyletic *Alopoglossus*, has been recovered multiple times before (Pellegrino *et al.* 2001; Castoe *et al.* 2004; Torres-Carvajal & Lobos 2014; Colli *et al.*, 2015). This was never disputed by Hernández-Morales *et al.* (2020) or any study before that. What Hernández-Morales *et al.* (2020) (and us, herein) disputed was the severity of previous tests, including that of Goicoechea *et al.* (2016). *Ptychoglossus*, as understood prior to Hernández-Morales *et al.* (2020), contains 14 named species, and all previous studies based on DNA sequence data had included only a single species.

Monophyly is a fundamental concept in phylogenetic systematics that relies deeply on the Darwinian ideas of ancestry and divergence (Hennig, 1966). Abandoning the search for a taxonomy based on monophyly and instead preferring a paraphyletic arrangement with the argument of acting “conservatively” (i.e., in a cautious way to avoid potential risks), as done by Ribeiro-Júnior *et al.* (2020a), is not only non-scientific, but also likely a result of their own biased personal views of how systematics should work. Resisting change based on opinion, and not evidence, is reckless and shows very poor judgement. Unfortunately, this behavior is not new to systematists who seem to like phylogenies only when the results are convenient to their own agendas (see Frost *et al.*, 2008).

### Invitation for additional phylogenetic evidence

Taxonomy is a discipline full of traditions and values and is probably the area of the biological sciences that is most sensitive to historical interpretations of old work. Ribeiro-Júnior *et al.* (2020a) invoked the monumental opus of Harris (1994) to further justify recognition of *Alopoglossus* and *Ptychoglossus* as valid, therefore implying that Harris’ work has provided *diagnostic apomorphies* for both genera. However, Harris (1994) failed to provide unambiguous synapomorphies for all species in each genus. When examined in detail, the so-called apomorphies mentioned by Ribeiro-Júnior *et al.* (2020a) are reduced to only a couple of characters, neither of which apply to all species. It is also worth mentioning that the work of Harris (1994), while doubtlessly a fundamental standard in alopoglossid taxonomy and systematics, is not phylogenetic and none of the evidence treated therein was evaluated in light of a phylogenetic hypothesis. This is not a demerit to Harris (1994), as he used the available evidence in the best way possible with the goals and tools he had.

Regardless of intention, Harris’s (1994) taxonomic arrangement is based on similarity and not on phylogeny. On the other hand, Hernández-Morales *et al.* (2020) arrangement is based on the most comprehensive phylogeny of Alopoglossidae to date. When arbitrarily choosing to retain *Alopoglossus* and *Ptychoglossus* as separate taxa without providing any new evidence to suggest that these genera constitute two distinct evolutionary units, Ribeiro-Júnior *et al.* (2020a) chose to ignore a massive amount of evidence (both genomic and phenotypic) that strongly suggests otherwise. The dataset of Hernández-Morales *et al.* (2020) is composed of a combined matrix of DNA sequence data (both mitochondrial and nuclear genes) and an extensive phenotypic matrix of 143 characters covering all the morphological character diversity employed and partially established in Harris (1994). Whereas Harris’s (1994) analyses were restricted to external morphology and hemipenis with a focus on variation within *Ptychoglossus*, the matrix of Hernández-Morales *et al.* (2020) includes external morphology, hemipenis, and osteology for both nominal genera.

The monophyly of *Alopoglossus* and *Ptychoglossus* (Alopoglossidae) is supported by at least 10 phenotypic synapomorphies. Curiously, the clade containing all species of *Alopoglossus sensu* Ribeiro-Júnior *et al.* (2020a) is supported by nine phenotypic synapomorphies. This would have been enough justification the authors limit their discussion and comparisons of their new species to members of this clade. It is not, however, a reason to ignore the fact that *Alopoglossus* was recovered as deeply embedded in *Ptychoglossus*. Hernández-Morales *et al.* (2020) recognized this fact, but also revealed that retaining *Ptychoglossus* (junior synonym) as valid and separate from *Alopoglossus* (senior synonym) would necessitate a complete overhaul of the taxonomy of Alopoglossidae (including the recognition of multiple new genera). Ribeiro-Júnior *et al.* (2020a) did not provide any new evidence to the contrary, and most certainly did not undertake the necessary steps to suggest an updated monophyletic taxonomy for the family. Instead, they chose the easy way out—to simply ignore the fact that *Alopoglossus* and *Ptychoglossus* cannot be treated as separate taxa anymore without accepting further taxonomic changes.

Tradition (conservatism) and fear of change (to act conservatively) often lead to bad taxonomic decisions and delays in progress (Frost *et al.*, 2009; Peloso *et al.*, 2017). The study of Hernández-Morales *et al.* (2020) represents the only phylogenetic analysis to include a meaningful taxon sampling among both *Alopoglossus* and *Ptychoglossus*—all but a single species recognized at the time of publication. Moreover, it also includes anatomical data as an additional source of evidence making it the most severe test of the monophyly of both genera to date. *Voilà!* The monophyly of *Ptychoglossus* is rejected (Hernández-Morales *et al.* 2020).

We thus invite Ribeiro-Júnior *et al.* (2020a) to gather additional evidence to produce a new/improved phylogeny and taxonomy for Alopoglossidae. We are certain that the authors are entirely capable of doing so, as they have collected further morphological and genetic evidence on alopoglossid species not available to Hernández-Morales *et al.* (2020) at the time of their analyses (see Ribeiro-Júnior *et al.*, 2020b). The addition of these new data, and perhaps novel analytical methods for phylogenetic inference, could provide further insights into the taxonomy and phylogenetic diversity of this very interesting but neglected clade of lizards. Until then, we suggest that the taxonomy provided by Hernández-Morales *et al.* (2020) should be used. Simply ignoring their well-supported results may make it easier for one to name new species of *Alopoglossus* and “*Ptychoglossus*”, but it definitely won’t solve the problem. We urge Ribeiro-Júnior *et al.* (2020a) not to kick that can further down the road.

## Acknowledgements

PP and PMSN are supported by fellowships from Conselho Nacional de Desenvolvimento Científico e Tecnológico (respectively PQ 302501/2019-3 and PQ 313622/2018-3).

## References

- Castoe, T.A., Doan, T.M. & Parkinson C.L. (2004) Data partitions and complex models in Bayesian analysis: the phylogeny of gymnophthalmid lizards. *Systematic Biology*, 53, 448–469. <https://doi.org/10.1080/10635150490445797>
- Colli, G.R., Hoogmoed, M.S., Cannatella, D.C., Cassimiro, J., Oliveira, J.G., Ghellere, J.M., Nunes, P.M.S., Pellegrino, K., Salerno, P., Marques, S.S. & Rodrigues, M.T. (2015) Description and phylogenetic relationships of a new genus and two new species of lizards from Brazilian Amazonia, with nomenclatural comments on the taxonomy of Gymnophthalmidae (Reptilia: Squamata). *Zootaxa*, 4000 (1), 401–427. <https://doi.org/10.11646/zootaxa.4000.4.1>
- Frost, D.R., Grant, T., Faivovich, J., Bain, R.H., Haas, A., Haddad, C.F.B., De Sá, R.O., Channing, Wilkinson, A., M., Donnellan, S.C., Raxworthy, C.J., Campbell, J.A., Blotto, B.L., Moler, P., Drewes, R.C., Nussbaum, R.A., Lynch, J.D., Green, D.M. & Wheeler, W.C. (2008) Is the Amphibian Tree of Life really fatally flawed? *Cladistics*, 24, 385–395. <https://doi.org/10.1111/j.1096-0031.2007.00181.x>
- Frost, D.R., Mediarmaid, R.W., And Mendelson, J.R. (2009) Response to the *Point of View* of Gregory B. Pauly, David M. Hillis, & David C. Cannatella, by the Anuran Subcommittee of the SSAR/HL/ASIH Scientific and Standard English Names List. *Herpetologica*, 65, 136–153. <https://doi.org/10.1655/09-009R1.1>
- Goicoechea, N., Frost, D.R., De La Riva, I., Pellegrino, K.C.M., Sites, J., Rodrigues, M.T. & Padial, J.M. (2016) Molecular systematics of teioid lizards (Teioidea/Gymnophthalmoidea: Squamata) based on the analysis of 48 loci under tree-alignment and similarity-alignment. *Cladistics*, 2016, 1–48. <https://doi.org/10.1111/cla.12150>
- Harris, D.M. (1994) Review of the teiid lizard genus *Ptychoglossus*. *Herpetological Monographs*, 8, 226–275. <https://doi.org/10.2307/1467082>
- Henning, W. (1966) *Phylogenetic systematics*. Translated by D. D. Davis and R. Zangerl. University of Illinois Press, Chicago, Illinois, 263 pp.
- Hernández-Morales, C.M., Sturaro, J., Nunes, P.M.S., Lotzkat, S. & Peloso, P.L.V. (2020) A species-level total evidence phylogeny of the microteiid lizard family Alopoglossidae (Squamata: Gymnophthalmoidea). *Cladistics*, 36, 301–321. <https://doi.org/10.1111/cla.12407>
- Pellegrino, C. M., Rodrigues, M.T., Yonenaga-Yassuda, Y. & Sites, J.W. (2001) A molecular perspective on the evolution of microteiid lizards (Squamata, Gymnophthalmidae), and a new classification for the family. *Biological Journal of the Linnean Society*, 74, 315–338. <https://doi.org/10.1006/bijl.2001.0580>
- Peloso, P.L.V., Raxworthy, C.J., Wheeler, W.C. & Frost, D.R. (2017) Nomenclatural stability does not justify recognition of paraphyletic taxa: a response to Scherz *et al.* (2016). *Molecular Phylogenetics and Evolution*, 111, 56–64. <https://doi.org/10.1016/j.ympev.2017.03.016>
- Ribeiro-Júnior, M.A., Meiri, S. & Fouquet, A. (2020a) A new species of *Alopoglossus* Boulenger (1885) (Squamata, Alopoglossidae) from the Lowlands of the Eastern Guiana Shield, with assessment of the taxonomic status of *A. copii surinamensis*. *Journal of Herpetology*, 54, 427–445. <https://doi.org/10.1670/20-032>
- Ribeiro-Júnior, M.A., Choueri, E., Lobos, S., Venegas, P., Torres-Carvajal, O. & Werneck, F. (2020b) Eight in one: morphological and molecular analyses reveal cryptic diversity in Amazonian alopoglossid lizards (Squamata: Gymnophthalmoidea). *Zoological Journal of the Linnean Society*, 190, 227–270. <https://doi.org/10.1093/zoolinnean/zlz155>
- Torres-Carvajal, O. & Lobos, S.E. (2014) A new species of *Alopoglossus* lizard (Squamata, Gymnophthalmidae) from the tropical Andes, with a molecular phylogeny of the genus. *ZooKeys*, 410, 105–120. <https://doi.org/10.3897/zookeys.410.7401>

