

First record of invasive *Stenochrus portoricensis* Chamberlin, 1922 (Arachnida: Schizomida: Hubbardiidae) from the Southern region of Brazil

Fabio Akashi Hernandez^{1,3}; James Craig Cokendolpher^{2,4} & Luiz Carlos Pinho^{1,5}

¹ Universidade Federal de Santa Catarina (UFSC), Centro de Ciências Biológicas (CCB), Departamento de Ecologia e Zoologia (ECZ). Florianópolis, SC, Brasil.

² Museum of Texas Tech University, Natural Science Research Laboratory. Lubbock, TX, United States.

³ ORCID: [0000-0003-3504-2609](https://orcid.org/0000-0003-3504-2609). E-mail: abakashi@gmail.com (corresponding author)

⁴ ORCID: [0000-0002-1618-3855](https://orcid.org/0000-0002-1618-3855). E-mail: cokendolpher@aol.com

⁵ ORCID: [0000-0002-9153-9997](https://orcid.org/0000-0002-9153-9997). E-mail: luiz.pinho@ufsc.br

Abstract. Herein we report for the first time a schizomid for the Southern region of Brazil, *Stenochrus portoricensis* Chamberlin, 1922 (Schizomida: Hubbardiidae), found in association with termite nests. This is the southernmost record of any schizomid for the Neotropical region. We hypothesize that the species was recently introduced by the sudden population growth of Florianópolis – along with the intense touristic activity – which might have contributed to the inadvertent transportation of this species.

Keywords. Schizomida; Hubbardiidae; Southernmost record; Arachnida; Neotropical.

INTRODUCTION

The Order Schizomida (Arachnida: Tetrapulmonata) – the shorttailed whipscorpions – currently includes about 345 extant plus 16 fossil species (Monjaraz-Ruedas *et al.*, 2019, 2020; Giribet & Moreno-González, 2021). They have a worldwide distribution mostly in tropical and subtropical areas (Reddell & Cokendolpher, 1995).

In Brazil, approximately 20 schizomid species have been reported so far (Reddell & Cokendolpher, 1995; Adis *et al.*, 1999; Cokendolpher & Reddell, 2000; Peres *et al.*, 2006; Bonaldo & Pinto-da-Rocha, 2007; Santos *et al.*, 2008; Santos & Pinto-da-Rocha, 2009; Santos *et al.*, 2013; Oliveira & Ferreira, 2014; Giupponi *et al.*, 2016; Pinto-da-Rocha *et al.*, 2016; Salvatierra, 2018; Ruiz & Valente, 2017, 2019).

The most widespread and frequently reported species, *Stenochrus portoricensis* Chamberlin, 1922, was previously recorded on Brazilian States belonging to four out of five administrative regions: Northern (Pará: Villarreal *et al.*, 2023; Tocantins: Kury *et al.*, 2010), Northeastern (Bahia: Santos *et al.*, 2008; Rodrigues *et al.*, 2017; Villarreal *et al.*, 2023; Pernambuco: Souza & Lira, 2015; Villarreal *et al.*, 2023), Central-Western (Goiás: Gallão *et al.*, 2015; Bichuette *et al.*, 2019), and

Southeastern (Rio de Janeiro: Tourinho & Kury, 1999; Villarreal *et al.*, 2023; São Paulo: Santos *et al.*, 2008; Minas Gerais: Villarreal *et al.*, 2023).

Herein, we report the southernmost record of Schizomida in the Neotropical region, and the first record of a schizomid – *Stenochrus portoricensis* – in the Southern region of Brazil, in Florianópolis, Santa Catarina State.

MATERIAL AND METHODS

Specimens were collected from leaf litter and wood debris colonized by termite *Nasutitermes* sp. (Blattodea: Termitidae) in an anthropized forest fragment (Fig. 1E) at Santa Catarina Island (Florianópolis, Santa Catarina state, Brazil). The region is located in the Atlantic Forest biome with a moist subtropical climate. The specimens were stored in 80% ethanol, and the adult was put in 30% lactic acid at room temperature for 24 hours for clearing and visualization of the spermatheca. The voucher specimens are deposited at Zoological Collection of Universidade Federal de Santa Catarina (UFSC). The distribution map was created using SimpleMappr (Shorthouse, 2010).

Pap. Avulsos Zool., 2023; v.63: e202363043

<https://doi.org/10.11606/1807-0205/2023.63.043>

<https://www.revistas.usp.br/paz>

<https://www.scielo.br/paz>

Edited by: Carlos José Einicker Lamas

Received: 14/10/2023

Accepted: 14/11/2023

Published: 17/11/2023

ISSN On-Line: [1807-0205](https://doi.org/1807-0205)

ISSN Printed: [0031-1049](https://doi.org/0031-1049)

ISNI: [0000-0004-0384-1825](https://doi.org/0000-0004-0384-1825)



RESULTS

Arachnida Lamarck, 1801
Schizomida Petrunkevitch, 1945
Hubbardiidae Cook, 1899
***Stenochrus* Chamberlin, 1922**
***Stenochrus portoricensis* Chamberlin, 1922**
Figs. 1-2

Stenochrus portoricensis Chamberlin, 1922: 11-12; Reddell & Cokendolpher, 1995: 110-114.

Material examined: BRAZIL: Santa Catarina, Florianópolis, Campus UFSC, 27°35'48"S, 48°30'51"W, 1♀, 2 nymphs, 18.VII.2022, L.C. Pinho col., from leaf litter and wood debris (Fig. 1E).

Diagnosis: The main distinguishing features of *S. portoricensis* include: propeltidium with anterior process bearing one pair of setae medially (longitudinally) aligned and two setal pairs (Fig. 1B); a short spur present on trochanter of pedipalps (Fig. 1C); flagellum short with 3 annuli; metapeltidium entire; spermathecae with two pairs of wrinkled lobes, the outer lobes shorter, and laterals about 4-5 times shorter than the median ones (Fig. 1D).

DISCUSSION

The southernmost occurrences of schizomids were recorded just slightly south of the Tropic of Capricorn. Such records include *Megaschizomus zuluanus* (Lawrence, 1947), from Zululand, South Africa, around 27°53'S

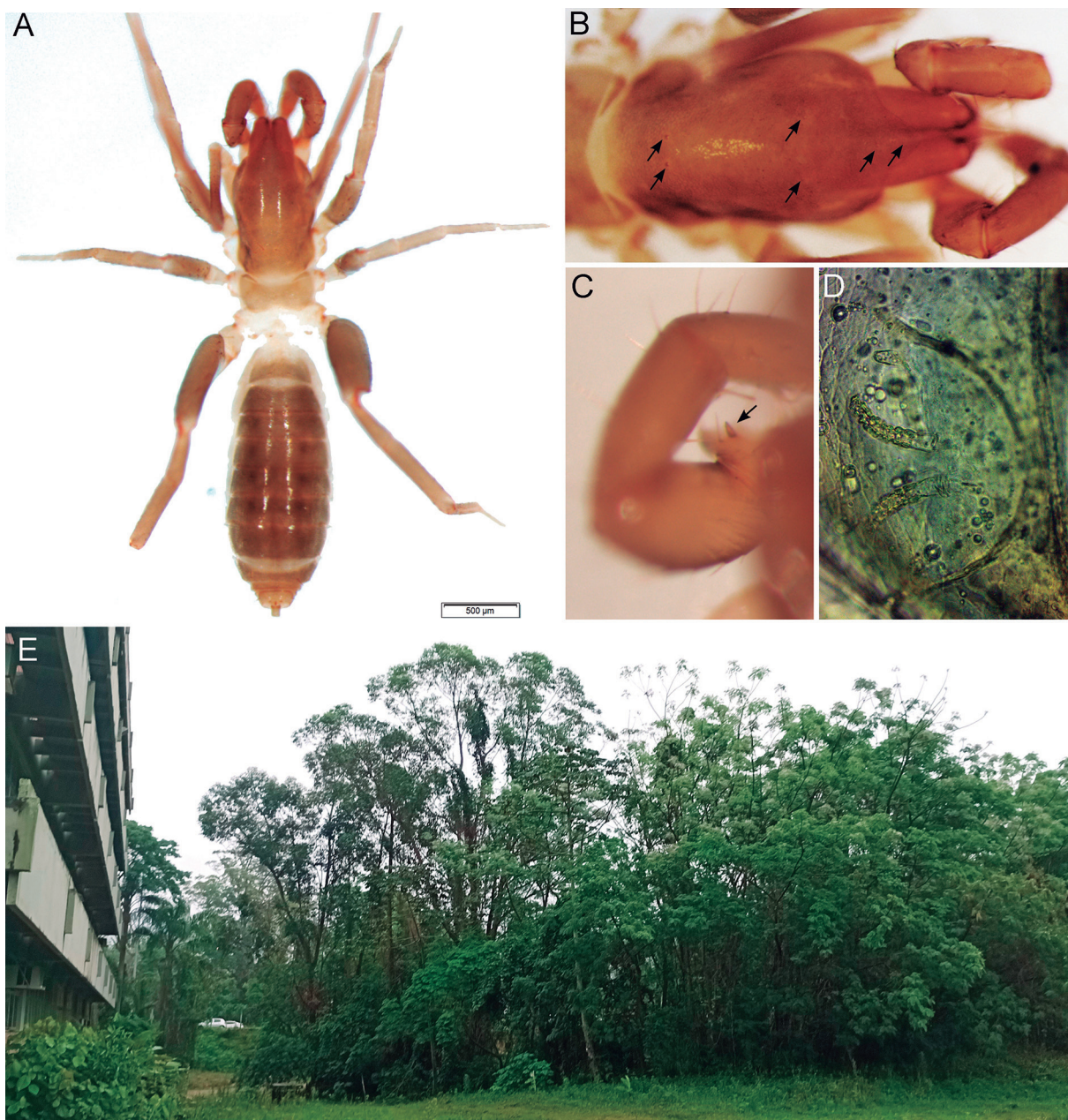


Figure 1. *Stenochrus portoricensis* Chamberlin, 1922 (Schizomida: Hubbardiidae), female. (A) habitus, dorsal view. (B) dorsal view of prosoma (arrows point to setal locations). (C) pedipalpal spur on trochanter (arrow points to spur). (D) spermatheca, dorsal view, rotated so anterior is to left side; (E) habitat where the specimens were collected from, Campus of the UFSC.

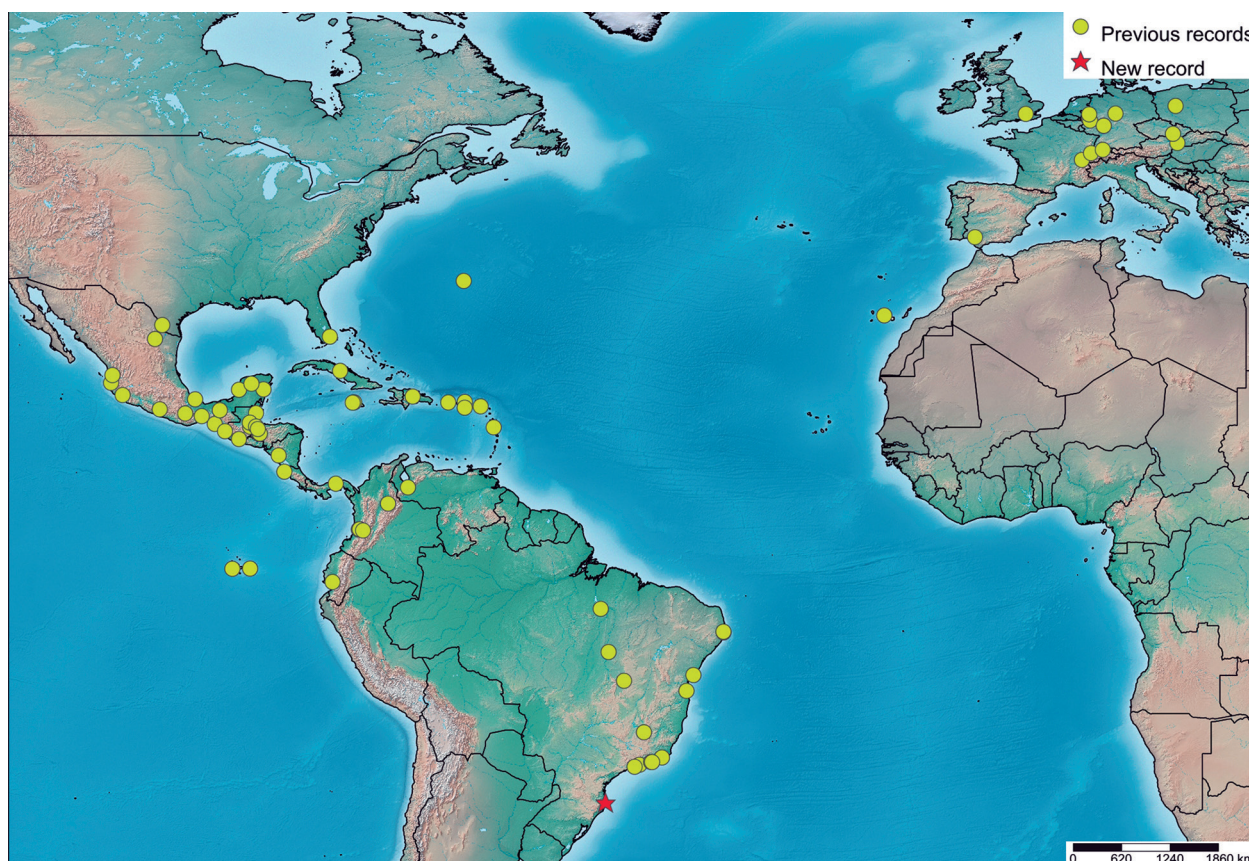


Figure 2. World distribution of *Stenochrus portoricensis* Chamberlin, 1922 (Schizomida: Hubbardiidae). (red star = new record).

(Reddell & Cokendolpher, 1995), and *Brignolizomus woodwardi* (Harvey, 1992) and *B. walteri* Harvey, 2000, from Queensland, Australia, at around 27°34'S (Harvey, 2000). In the Americas, the southernmost record of a schizomid previously published was a single female of *Stenochrus portoricensis* from Ubatuba, São Paulo State, Brazil, at 23°26'S (Santos *et al.*, 2008). Our record herein is from slightly further south in the Americas at 27°35'48"S in Brazil.

First described in the West Indies, *Stenochrus portoricensis* has been reported worldwide (Fig. 2), including several localities in Europe, *e.g.*, Canary Islands (Martín & Oromí, 1984; Oromí & Martín, 1992), Spain (Barranco *et al.*, 2014), Czech Republic (Korenko *et al.*, 2009), Germany (Armas & Rehfeldt, 2015; Lauterbach *et al.*, 2020), Slovakia (Christophoryová *et al.*, 2013), England (Cloudsley-Thompson, 1949), Switzerland (Krajcovicova *et al.*, 2021), and Poland (Zawierucha *et al.*, 2013). Most of those records consisted of specimens collected from greenhouses, suggesting that the specimens may have been transported along with soil or cultivated pot plants (Monjaraz-Ruedas *et al.*, 2022). Villarreal *et al.* (2023) first recorded the species on bromeliads.

According to Reddell & Cokendolpher (1995), *S. portoricensis* is facultatively parthenogenetic, with males being rare or even absent from numerous populations. Presumably, this reproductive strategy has facilitated the introduction of this species worldwide. It has been previously found in association with ants (Reddell & Cokendolpher, 1995) and termite nests (Santos *et al.*, 2008).

Florianópolis is a popular touristic destination in Brazil, currently attracting thousands of visitors from various parts of the country and around the world each year. Furthermore, over the past 33 years, the city's population has doubled (DATASUS, 2023). It is possible that *S. portoricensis* was inadvertently introduced by the recent population growth, in addition to the intense touristic activity, which might have contributed to the casual transportation of this species.

The specific location where these specimens were collected used to function as a composting center for the Federal University of Santa Catarina (UFSC). For many years, this center collected organic waste from gardening activities across the entire campus. Additionally, other factors like agricultural practices, the sale of ornamental plants and soil materials, in addition with the parthenogenetic strategy of the species, might also have contributed to the introduction of *Stenochrus portoricensis* further south in the neotropics.

AUTHORS' CONTRIBUTIONS: FH, LP: Data curation, Investigation, Writing – original draft. FH, LP, JC: Writing – review & editing. All authors actively participated in the discussion of the results; they reviewed and approved the final version of the paper.

CONFLICT OF INTEREST: Authors declare there are no conflicts of interest.

FUNDING INFORMATION: This project did not use any external financial support.

ACKNOWLEDGMENTS: To Jana Christophoryová (Faculty of Natural Sciences, Comenius University, Slovakia) and Kátia R. Benati (Universidade Católica do Salvador – UCSAL, Salvador, Brazil) for sharing important information and literature.

REFERENCES

- Adis, J.; Reddel, J.; Cokendolpher, J. & Morais, J.W. 1999. Abundance and phenology of Schizomida (Arachnida) from a primary upland forest in Central Amazonia. *The Journal of Arachnology*, 27(1): 205-210. <https://repositorio.inpa.gov.br/handle/1/19203>.
- Armas L.F. de & Rehfeldt, S. 2015. *Stenochrus portoricensis*, *Zomus bagnallii* and a new genus of schizomids (Schizomida: Hubbardiidae) from a greenhouse in Frankfurt am Main, Germany. *Arachnologische Mitteilungen*, 49: 55-61. <https://doi.org/10.5431/aramit4906>.
- Barranco, P.; Mayoral, J.G. & García, G.A. 2014. Primer registro de esquizómidos en la península ibérica (Arachnida, Schizomida). *Boletín de la Asociación Española de Entomología*, 38(3-4): 295-301.
- Bichuette, M.E.; Simões, L.B.; Zepon, T.; Schimonsky, D.M. & Gallão, J.E. 2019. Richness and taxonomic distinctness of cave invertebrates from the northeastern state of Goiás, central Brazil: a vulnerable and singular area. *Subterranean Biology*, 29: 1-33. <https://doi.org/10.3897/subtbiol.29.30418>.
- Bonaldo, A. & Pinto-da-Rocha, R. 2007. A new species of *Surazomus* (Arachnida, Schizomida) from Brazilian Oriental Amazonian. *Revista Brasileira de Zoologia*, 24(2): 323-326. <https://doi.org/10.1590/S0101-81752007000200009>.
- Chamberlin, R.V. 1922. Two new American arachnids of the order Pedipalpidia. *Proceedings of the Biological Society of Washington*, 35: 11-12.
- Christophoryová, J.; Šestáková, A.; Krumpál, M. & Fend'a, P. 2013. First record of a schizomid, *Stenochrus portoricensis* (Schizomida: Hubbardiidae) in Slovakia. *Arachnologische Mitteilungen*, 45: 25-29. <https://doi.org/10.5431/aramit4506>.
- Cloudsley-Thompson, J.L. 1949. Notes on Arachnida. 11. Schizomida in England. *Entomologists' Monthly Magazine*, 85(1025): 261.
- Cokendolpher, J.C. & Reddell, J.R. 2000. New and rare Schizomida (Arachnida: Hubbardiidae) from South America. *Amazoniana*, 16(1-2): 187-212.
- Departamento de Informática do Sistema Único de Saúde (DATASUS). *Tecnologia da Informação a Serviço do SUS*. Available: <http://tabnet.datasus.gov.br/cgi/tabcgi.exe?ibge/cnv/popSC.def>. Access: 14/10/2023.
- Gallão, J.E.; Bichuette, M.E. & Giupponi, A.P.L. 2015. First record of *Stenochrus portoricensis* Chamberlin, 1922 (Arachnida: Schizomida: Hubbardiidae) for caves in Brazil: evidence for a troglophile status of an exotic species. *Check List*, 11(1): 1546. <https://doi.org/10.15560/11.1.1546>.
- Giribet, G. & Moreno-González, J.A. 2021. Notes on brooding in the arachnid order Schizomida. *Journal of Arachnology*, 49: 410-414. <https://doi.org/10.1636/JoA-5-20-091>.
- Giupponi, A.P.L.; Miranda, G.S. & Villarreal, O.M. 2016. *Rowlandius dumitrescoae* species group: new diagnosis, key and description of new cave-dwelling species from Brazil (Schizomida, Hubbardiidae). *Zookeys*, 632: 13-34. <https://doi.org/10.3897/zookeys.632.9337>.
- Harvey, M.S. 2000. *Brignolizomus* and *Attenuizomus*, new schizomid genera from Australia (Schizomida Hubbardiidae). *Memorie della Società Entomologica Italiana*, 78(2): 329-338.
- Korenko, S.; Harvey, M. & Pekár, S. 2009. *Stenochrus portoricensis* new to the Czech Republic (Schizomida, Hubbardiidae). *Arachnologische Mitteilungen*, 38: 1-3. <https://doi.org/10.5431/aramit3801>.
- Krajcovicova, K.; Gilgado, J.D.; Bobbitt, I. & Christophoryová, J. 2021. New cases of introduction of *Stenochrus portoricensis* in Switzerland (Schizomida). *Biharean Biologist*, 15(1): 69-70. <https://biozoojournals.ro/bihbiol/index.html>.
- Kury, A.; Giupponi, A.; Chagas-Jr., A. & González, A. 2010. Amblypygi, Opiliones, Schizomida, Scorpiones and Chilopoda, Tocantins, Brazil. *Check List*, 6(4): 564-571. <https://doi.org/10.15560/6.4.564>.
- Lauterbach, S.; Hören, T. & Bauer, T. 2020. *Stenochrus portoricensis* neu für Nordrhein-Westfalen, mit Anmerkungen zur Verbreitung und Habitaten weiterer eingeschleppter Zwerggeißelskorpionarten in Europa (Arachnida: Schizomida). *Arachnologische Mitteilungen: Arachnology Letters*, 60(1): 50-54. <https://doi.org/10.30963/aramit6010>.
- Martín, J.L. & Oromí, P. 1984. Consideraciones sobre la presencia de *Schizomus portoricensis* (Chamberlin, 1922) (Arach. Schizomida) en cuevas de Tenerife (Islas Canarias). *Boletín de la Asociación española de Entomología*, 8: 265-270.
- Monjaraz-Ruedas, R.; Francke, O. & Prendini, L. 2020. Integrative systematics untangles the evolutionary history of *Stenochrus* (Schizomida: Hubbardiidae), a neglected junkyard genus of North American short-tailed whipscorpions. *Biological Journal of the Linnean Society*, 130(3): 458-479. <https://doi.org/10.1093/biolinnean/blaa039>.
- Monjaraz-Ruedas, R.; Francke, O. & Prendini, L. 2022. World travelers: parthenogenesis and ecological tolerance enable multiple colonization events by the widespread short-tailed whipscorpion, *Stenochrus portoricensis* (Schizomida: Hubbardiidae). *Insect Systematics and Diversity*, 6(1): 1-17. <https://doi.org/10.1093/isd/ixab032>.
- Monjaraz-Ruedas, R.; Prendini, L. & Francke, O.F. 2019. Systematics of the short-tailed whipscorpion genus *Stenochrus* Chamberlin, 1922 (Schizomida: Hubbardiidae), with descriptions of six new genera and five new species. *Bulletin of the American Museum of Natural History*, 435: 1-91. <https://doi.org/10.1206/0003-0090.435.1.1>.
- Oliveira, M.P.A. & Ferreira, R.L. 2014. Aspects of the behavior and activity rhythms of *Rowlandius potiguar* (Schizomida: Hubbardiidae). *PLoS ONE*, 9(3): 109, e91913. <https://doi.org/10.1371/journal.pone.0091913>.
- Oromí, P. & Martín, J.L. 1992. The Canary Islands subterranean fauna: characterization and composition. In: Camacho, A.I. (Ed.) *The natural history of biospeleology*. Madrid, Museo Nacional de Ciencias Naturales, Consejo Superior de Investigaciones Científicas. Cap. 12, p. 528-567.
- Peres, M.C.L.; Benati, K.R. & Oliveira-Alves, A. 2006. Primer registro de Hubbardiidae (Arachnida: Schizomida) encontrado en un fragmento de Floresta Atlântica em el Nordeste brasileiro (Recife-Pernambuco-Brasil). *Sitientibus*, 6(2): 92-94. <https://doi.org/10.13102/scb8161>.
- Pinto-da-Rocha, R.; Andrade, R. & Moreno-González, J.A. 2016. Two new cave-dwelling genera of short-tailed whip-scorpions from Brazil (Arachnida: Schizomida: Hubbardiidae). *Zoologia*, 33: 1-9. <https://doi.org/10.1590/S1984-4689zool-20150195>.
- Reddell, J.R. & Cokendolpher, J.C. 1995. Catalogue, bibliography, and generic revision of the order Schizomida (Arachnida). *Texas Memorial Museum Speleological Monographs*, 4: 1-170.
- Rodrigues, V.E.O.; Santos, M.T.E.; Melo, T.S.; Carvalho, A.O.; Benati, K.R.; Peres, M.C.L. 2017. Ocorrência de *Stenochrus portoricensis* (Chamberlin, 1922) (Schizomida: Hubbardiidae) em um fragmento urbano de Mata Atlântica (Salvador, Bahia). In: Congresso Latino-Americano de Aracnologia, 5º. *Resumos*. Caeté-Minas Gerais, Sociedade Brasileira de Aracnologia, Universidade Federal de Minas Gerais.
- Ruiz, G.R.S. & Valente, R. 2017. The first schizomid from a dry forest in South America (Arachnida: Schizomida). *Zootaxa*, 4311: 081-095. <https://doi.org/10.11646/zootaxa.4311.1.5>.
- Ruiz, G.R.S. & Valente, R.M. 2019. Description of a new species of *Surazomus* (Arachnida: Schizomida), with comments on homology of male flagellum and mating march anchorage in the genus. *PLoS ONE*, 14(3): e0213268. <https://doi.org/10.1371/journal.pone.0213268>.
- Salvatierra, L. 2018. A new species of *Surazomus* Reddell and Cokendolpher, 1995 (Arachnida: Schizomida) from Rondônia, Brazil. *Turkish Journal of Zoology*, 42(1): 107-112. <https://doi.org/10.3906/zoo-1708-38>.
- Santos, A.J. & Pinto-da-Rocha, R. 2009. A new micro-whip scorpion species from Brazilian Amazonia (Arachnida, Schizomida, Hubbardiidae), with the description of a new synapomorphy for Uropygi. *Journal of Arachnology*, 37: 39-44. <https://doi.org/10.1636/H07-80.1>.

- Santos, A.J.; Ferreira, R.L. & Buzatto, B.A. 2013. Two new cave-dwellings of the short-tailed whipscorpion genus *Rowlandius* (Arachnida: Schizomida: Hubbardiidae) from Northeastern Brazil, with comments on male dimorphism. *PLoS ONE*, 8(5): e63616. <https://doi.org/10.1371/journal.pone.0063616>.
- Santos, J.A.; Dias, S.C.; Brescovit, A.D. & Santos, P.P. 2008. The arachnid order Schizomida in the Brazilian Atlantic Forest: a new species of *Rowlandius* and new records of *Stenochrus portoricensis* (Schizomida: Hubbardiidae). *Zootaxa*, 1850: 53-60. <https://doi.org/10.11646/zootaxa.1850.1.4>.
- Shorthouse, D.P. 2010. *SimpleMappr*, an online tool to produce publication-quality point maps [online]. Available: <https://www.simplemappr.net>. Access: 05/10.2023.
- Souza, A.M. & Lira, A.F.A. 2015. First record of *Stenochrus portoricensis* Chamberlin, 1922 (Arachnida: Schizomida: Hubbardiidae) for the Pernambuco state, Brazil. *Brazilian Journal of Biology*, 75(3): 766-767. <https://doi.org/10.1590/1519-6984.21113>.
- Tourinho, A.L.M. & Kury, A.B. 1999. The southernmost record of Schizomida in South America, first records of Schizomida for Rio de Janeiro and of *Stenochrus* Chamberlin, 1922 for Brazil (Arachnida, Schizomida, Hubbardiidae). *Boletim do Museu Nacional*, 405: 1-6. <https://mndi.museunacional.ufrj.br/aracnologia/aracnopdfs/Zool405.pdf>.
- Villarreal, O.; Sánchez, N.; Ascenção, A.; Carvalho, L.S.; Delgado-Santa, L. & Moreno-González, J.A. 2023. The alien species *Stenochrus portoricensis* (Schizomida: Hubbardiidae): decreasing the Wallacean shortfall in the New World. *Iheringia Série Zoologia*, 113:1-9. <https://doi.org/10.1590/1678-4766e2023005>.
- Zawierucha, K.; Szymkowiak, P.; Dabert, M. & Harvey, M.S. 2013. First record of the schizomid *Stenochrus portoricensis* (Schizomida: Hubbardiidae) in Poland, with DNA barcode data. *Turkish Journal of Zoology*, 37(3): 357-361. <https://doi.org/10.3906/zoo-1210-9>.