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The genus *Triozocera* Pierce, 1909 (Insecta: Strepsiptera: Corioxenidae) in South America

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Abstract

A new species of *Triozocera* from the Brazilian Amazon basin was found in a sample of male Strepsiptera from the collection of the Instituto Nacional de Pesquisas da Amazonia (INPA—Manaus, Amazonas, Brazil). *Triozocera buehrheimi* sp.n. is described and the status of *T. paulistana* Kogan, 1958, the first strepsipteran described from Brazil, is reviewed, with additional diagnostic characters used to reinstate the species based on comparative analyses to the other three species occurring in southern US, Mexico, and Central America: *T. mexicana* Pierce, 1909, *T. tecpanensis* Brailowsky and Márquez, 1974, and *T. vernalis* Kifune and Brailowsky, 1987. A key to those species is included.

Key words: Brazil, Strepsiptera, host specificity, intraspecific size variability

Resumo

Uma nova espécie de *Triozocera* da Amazônia brasileira foi descoberta em uma pequena amostra de Strepsiptera machos da coleção do Instituto de Pesquisas da Amazônia (INPA—Manaus, Amazonas, Brasil). *Triozocera buehrheimi* sp.n. é descrita neste trabalho, e a validade de *T. paulistana* Kogan, 1958, o primeiro strepsíptero descrito do Brasil, é restaurada com base em vários caracteres diagnósticos usados em análise comparativa com as outras 3 espécies que ocorrem no sul dos Estados Unidos, México, e América Central: *T. mexicana* Pierce, 1909, *T. tecpanensis* Brailowsky and Márquez, 1974, and *T. vernalis* Kifune and Brailowsky, 1987. Uma chave destas espécies é incluída.

Palavras-chave: Brasil, Strepsiptera, especificidade de hospedeiros, variabilidade intraespecífica do tamanho do corpo

Introduction

A recent review of the Corioxenidae (Insecta: Strepsiptera) (Cook and Tribull, 2013), listed 24 species in the genus *Triozocera* Pierce, 1909. As stated in that review, the current geographic distribution of the genus probably reflects the intensity of the effort to collect Strepsiptera in a given region, rather than dominance in species richness. The following zoological regions are represented in order of the number of *Triozocera* species recorded to date: Australian—9; Afrotropic—6; Oriental (Indo-Malasian)—4; northern Neotropical and southern Nearctic—3 or 4 species, depending on the validation of *T. texana* Pierce, 1911; and Palearctic—2. The single record of the genus in the southern Neotropical region to date was omitted in that review. That record was *T. paulistana* Kogan, 1958, a species placed in the synonymy of *T. mexicana* Pierce, 1909, by Kinzelbach (1971).

A small sample of Strepsiptera from the Brazilian state of Amazonas included two specimens of *Triozocera* representing a new species that is described herein. For the differentiation of this species we obtained high definition photos of the head and terminalia of the *T. paulistana* holotype deposited in the insect collection of the

the nature of which is beginning to be unraveled (Hayward *et al.*, 2011). What seems certain, however, is that Strepsiptera distribution depends on suitable host availability (Kathirithamby, 2009).

We conclude that *T. paulistana* differs from *T. mexicana* in various morphological characters (apomorphies), but we deemphasize the importance of differences in body size and disjunct distribution of the two species. The key differential characters are: a) profuse and long inter-eyelets pubescence; b) shape and structure of the vertex plates with wide separation of the plates anteriorly; c) shape of the antefrons (frontal tubercle); d) apparent lack of an R₄ vein off of the R₅; and, e) subtle differences in the terminalia. The absence in South America of *Pangaeus bilineatus*, host of *T. mexicana*, may also be of significance in support of the revalidation of *T. paulistana*.

Key to Nearctic and Neotropical species of *Triozocera*

1. Antefrons triangular; vertex plates clearly separated by post-frons and occiput 2
- Antefrons rounded anteriorly; vertex plates nearly touching each other anteriorly 4
2. Vertex plates wrapping around eyes and pointed posteriorly near edge of eyes; R₂ vein moderately curved; proctiger (10th tergite) posterior margin either clearly rounded or straight edged 3
- Vertex plates elliptical; R₂ vein straight; proctiger posterior margin mildly curved; total length average for genus (2.8 mm) Mexico, USA. *Triozocera vernalis* Kifune and Brailovsky, 1987
3. Inter-eyelet areas covered by densely packed and long trichomes; integument of vertex plates densely dimpled; R₅ vein not branched out from R₄; aedeagus gradually pointed apically; proctiger posterior margin rounded; total length average for genus (ca. 2.8 mm long); Brazil *Triozocera paulistana* Kogan, 1958
- Inter-eyelet area covered by densely packed, very short trichomes (microtrichia); integument of vertex plates smooth, not dimpled; R₅ vein branched out from R₄; aedeagus sharply narrowed from half its length to sharply pointed apex; proctiger posterior margin straight edged; large species (over 3 mm long); Brazil. *Triozocera buehrheimi* sp. n.
4. Proctiger posterior margin slightly indented medially; R₅ vein not branched out from R₄; total length average for genus (ca. 2.7 mm); Mexico. *Triozocera tecpanensis* Brailovsky and Márquez, 1974
- Proctiger posterior margin mildly curved; R₅ vein branched out from R₄; total length mostly below average for genus (ca. 2.6 mm); Cuba, Guatemala, Mexico, Puerto Rico, USA *Triozocera mexicana* Pierce, 1909

References

- Bohart, R.M. (1941) *A revision of the Strepsiptera with special reference to the species of North America*. University of California, Publications in Entomology, University of California Press, Berkeley, California, USA 7, 91–160.
- Brailovsky, H.A. & Márquez, M.C. (1974) Una nueva especie Mexicana de *Triozocera* Pierce (Strepsiptera, Mengeidae). *Anales del Instituto de Biología de la Universidad Nacional Autónoma de México, Ser. Zoología*, 45, 105–109.
- Cook, J.L. (2000) Size relationship between adult male *Caenocholax fenyesi* (Strepsiptera: Myrmecolacidae) and its host, *Solenopsis invicta* (Hymenoptera: Formicidae). *Texas Journal of Science*, 52, 145–152.
- Cook, J.L. & Tribull, C.M. (2013) A New Genus and Species of Corioxenidae (Strepsiptera) from Madagascar, with a Review of the Current Genera. *Annals of the Entomological Society of America*, 106, 313–322.
- Cushman, J.H., Lawton, J.H. & Manly, B.F.J. (1993) Latitudinal patterns in European ant assemblages: variation in species richness and body size. *Oecologia*, 95, 30–37.
- Cook, J.L., Johnston, J.S., Gold, R.E. & Vinson, S.B. (1997) Distribution of *Caenocholax fenyesi* (Strepsiptera: Myrmecolacidae) and the habitats most likely to contain its stylopized host, *Solenopsis invicta* (Hymenoptera: Formicidae). *Environmental Entomology*, 26, 1258–1262.
- Cushman, J.H., Lawton, J.H. & Manly, B.F.J. (1993) Latitudinal patterns in European ant assemblages: variation in species richness and body size. *Oecologia*, 95, 30–37.
- Escola Superior de Agronomia Luiz de Queiroz - Universidade de São Paulo [ESALQ - USP] (2004) *Pangaeus* (Hemiptera: Cydnidae). Museu de Entomologia. Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo. Available from: <http://www.lea.esalq.usp.br/me/nc.php>. (accessed 31 August 2013)
- Fox, J.W. & Fox, R.M. (1964) A new species of *Triozocera* (Mengeidae: Strepsiptera) from Liberia, West Africa. *Annals of the Entomological Society of America*, 57, 402–405.
- Honěk, A. (1987) Regulation of body size in a heteropteran bug, *Pyrrhocoris apterus*. *Entomologia Experimentalis et Applicata*, 44, 257–262.
<http://dx.doi.org/10.1111/j.1570-7458.1987.tb00553.x>
- Hayward, A., McMahon, D.P. & Kathirithamby, J. (2011) Cryptic diversity and female host specificity in a parasitoid where the sexes utilize hosts from separate orders. *Molecular Ecology*, 20 (7), 1508–1528.
<http://dx.doi.org/10.1111/j.1365-294x.2011.05010.x>

- Kathirithamby, J. (1989) Review of the order Strepsiptera. *Systematic Entomology*, 14 (1), 41–92.
<http://dx.doi.org/10.1111/j.1365-3113.1989.tb00265.x>
- Kathirithamby, J. (1990) Descriptions of Corioxenidae (Strepsiptera) from Australia, and a checklist of world genera and species of Corioxenidae. *Invertebrate Taxonomy*, 3, 469–481.
<http://dx.doi.org/10.1071/it9890469>
- Kathirithamby, J. (1993) Descriptions of Strepsiptera (Insecta) from Southeast Asia, with a checklist of the genera and species occurring in the region. *Raffles Bulletin of Zoology*, 41, 173–201.
- Kathirithamby, J. (2005) Partial List of Strepsiptera Species. *Tree of Life Web Project*. Available from: http://tolweb.org/notes/?note_id=2978 (accessed 14 February 2014)
- Kathirithamby, J. (2009) Host-parasitoid associations in Strepsiptera. *Annual Review of Entomology*, 54, 227–249.
<http://dx.doi.org/10.1146/annurev.ento.54.110807.090525>
- Kathirithamby, J. & Hughes, D.P. (2002) *Caenocholax fenyesi* (Strepsiptera: Myrmecolacidae) parasitic in *Camponotus planatus* (Hymenoptera: Formicidae) in Mexico: Is this the original host? *Annals of Entomological Society of America*, 95, 558–563.
[http://dx.doi.org/10.1603/0013-8746\(2002\)095\[0558:cfsmpi\]2.0.co;2](http://dx.doi.org/10.1603/0013-8746(2002)095[0558:cfsmpi]2.0.co;2)
- Kathirithamby, J. & Johnston, J.S. (1992) Stylopization of *Solenopsis invicta* (Hymenoptera: Formicidae) by *Caenocholax fenyesi* Strepsiptera: Myrmecolacidae) in Texas. *Annals of the Entomological Society of America*, 85, 293–297.
- Kifune, T. & Brailovsky, H. (1987) Two new species of the Mexican Strepsiptera in the collection of the Instituto de Biología, Universidad Nacional Autónoma de México (Notulae Strepsipterologicae-XVIII). *Kontyu*, 55, 132–138.
- Kifune, T. & Hirashima, Y. (1979) Two new species of Strepsiptera from Thailand (Notulae Strepsipterologicae-V). *Esakia*, 14, 61–71.
- Kinzelbach, R.K. (1966) Zur Kopfmorphologie der Fächerflügler (Strepsiptera, insecta). *Zoologische Jahrbücher. Abteilung für Anatomie und Ontogenie der Tiere*, 84, 559–684.
- Kinzelbach, R.K. (1970) *Loania canadensis* n. gen. s. sp. und die Untergliederung der Callipharixenidae. *Senckenbergiana Biologica*, 51, 99–107.
- Kinzelbach, R.K. (1971) Morphologische Befunde an Fächerflüglern und ihre Phylogenetische Bedeutung (Insecta: Strepsiptera). *Originalabhandlungen aus dem Gesamtgebiet der Zoologie*, 119 (2), 129–256.
- Kogan, M. (1958) A new species of the genus *Triozocera* Pierce from Brazil (Mengeidae, Strepsiptera). *Studia Entomologica*, 1, 421–426.
- Lis, J.A., Becker, M & Schaefer, C.W. (2010) Burrower Bugs (Cydnidae). In: Schaefer, C.W., & Panizzi, A.R. (Eds.), *Heteroptera of Economic Importance*. CRC Press, Boca Raton, FL, pp. 405–419.
- Luna de Carvalho, E. (1967) Terceira contribuição para o estudo dos Estrepsipteros angolenses (Insecta Strepsiptera). *Publicações Culturais da Companhia de Diamantes de Angola*, 77, 13–56.
- Luna de Carvalho, E. (1978) Contribution à l'étude des Strèpsiptères du Brésil. *Revue Suisse de Zoologie*, 85, 353–360.
- McLain, D.K. (1985) Male size, sperm competition, and the intensity of sexual selection in the Southern green stink bug, *Nezara viridula* (Hemiptera: Pentatomidae). *Annals of the Entomological Society of America*, 78, 86–89.
- Miyamoto, S. & Kifune, T. (1984) Descriptions of a new genus and two new species of the Strepsiptera parasitic on Japanese Heteroptera (Strepsiptera, Corioxenidae). *Kontyu*, 52, 137–149.
- New, T.R. (1994) Order Strepsiptera. Australian Biological Resources Study: Australian Faunal Directory [Online]. Available from: <http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/taxa/STREPSIPTERA> (accessed 14 February 2014)
- Oliveira, S.J.D. & Kogan, M. (1959) A contribution to the knowledge of the Brazilian Strepsiptera (Insecta). *Memórias do Instituto Oswaldo Cruz*, 57, 219–233.
- Pierce, W.D. (1908) A preliminary review of the classification of the order Strepsiptera. *Proceedings of the Entomological Society of Washington*, 9, 75–85.
- Pierce, W.D. (1909) A monographic revision of the twisted winged insects comprising the order Strepsiptera Kirby. *Proceedings of the US National Museum, Smithsonian Institute*. Washington, D.C., 66, 1–232.
- Pierce, W.D. (1911) Notes on insects of the order Strepsiptera, with descriptions of new species. Smithsonian Institute. *Proceedings of the US National Museum*, 40, 487–511.
- Pierce, W.D. (1913) "Strepsiptera." *Genera Insectorum*, 121, 1–54.
- Pierce, W.D. (1918) The comparative morphology of the order Strepsiptera together with records and descriptions of insects. *Proceedings of the US National Museum, Smithsonian Institute*, 54, 391–501.
- Pohl, H. & Beutel, R.G. (2005) The phylogeny of Strepsiptera. *Cladistics*, 21, 328–374.
<http://dx.doi.org/10.1111/j.1096-0031.2005.00074.x>
- Pohl, H., Katbeh-Bader, A. & Schneider, W. (1996) Description of a new genus and two new species of Corioxenidae from Jordan (Insecta: Strepsiptera). *Zoology of the Middle East*, 13, 107–119.
<http://dx.doi.org/10.1080/09397140.1996.10637712>
- Quinn, M. (2009) Strepsiptera - ♂ - Dick Nichols District Park, Austin, Travis County, Texas, USA. July 30, 2009. Available from: <http://bugguide.net/node/view/313474/bgpape> (accessed 14 February 2014)
- Reeves, W.K. & Cook, J.L. (2005) First record of *Triozocera vernalis* Kifune and Brailowsky (Strepsiptera: Corioxenidae) from the United States, with additional records for Strepsiptera in South Carolina. *Entomological News*, 116, 191–192.