

New species of *Oropezella* Collin (Diptera, Hybotidae, Ocydromiinae) from Brazil and Costa Rica, with comments on the relationships among species-groups

ROSALY ALE-ROCHA^{1,3} & RAFAEL AUGUSTO PINHEIRO DE FREITAS-SILVA^{1,2}

¹Coordenação de Biodiversidade, Instituto Nacional de Pesquisas da Amazônia, Av. André Araújo, 2936, Petrópolis, CEP 69067-375, Manaus, Amazonas, Brazil

²Fellowship CNPq; Graduate Program in Entomology; E-mail: rfreitas.silva@yahoo.com.br

³Corresponding author: Fellowship PQ/CNPq; E-mail: aerocha@inpa.gov.br

Table of contents

Abstract	501
Introduction	502
Material and methods	502
Systematic account	503
<i>Oropezella</i> Collin, 1926	503
Key to the Neotropical and Andean species of <i>Oropezella</i>	504
<i>Oropezella amazonica</i> (Rafael & Ale-Rocha) comb. nov.	505
<i>Oropezella aquila</i> sp. nov.	506
<i>Oropezella arcuata</i> sp. nov.	506
<i>Oropezella bicolor</i> sp. nov.	509
<i>Oropezella bipunctata</i> sp. nov.	511
<i>Oropezella clavata</i> sp. nov.	512
<i>Oropezella costaricensis</i> sp. nov.	513
<i>Oropezella falcata</i> sp. nov.	515
<i>Oropezella flavida</i> sp. nov.	516
<i>Oropezella granulosa</i> sp. nov.	518
<i>Oropezella longifrons</i> sp. nov.	520
<i>Oropezella planti</i> sp. nov.	522
<i>Oropezella plaumanni</i> sp. nov.	523
<i>Oropezella rafaeli</i> sp. nov.	525
<i>Oropezella spathula</i> sp. nov.	526
<i>Oropezella uncata</i> sp. nov.	527
<i>Oropezella undulata</i> sp. nov.	529
Characters used in the cladistic analysis	533
Results and discussion of the cladistics analysis	533
Acknowledgements	538
References	538
Checklist of the species of <i>Oropezella</i> Collin	539

Abstract

The following sixteen new species of *Oropezella* from Brazil and Costa Rica are described and illustrated: *Oropezella aquila* sp. nov., *O. arcuata* sp. nov., *O. bicolor* sp. nov., *O. bipunctata* sp. nov., *O. clavata* sp. nov., *O. costaricensis* sp. nov., *O. falcata* sp. nov., *O. flavida* sp. nov., *O. granulosa* sp. nov., *O. longifrons* sp. nov., *O. planti* sp. nov., *O. plaumanni* sp. nov., *O. rafaeli* sp. nov., *O. spathula* sp. nov., *O. uncata* sp. nov. and *O. undulata* sp. nov. A new combination is proposed: *Oropezella amazonica* (Rafael & Ale-Rocha, 1990) is transferred from *Ocydromia*. Additionally, an identification key to all 25 Neotropical and Andean species of *Oropezella* is provided. A cladistic analysis of *Oropezella* using 29 species from the Neotropical, Andean, Palearctic and Neozelandic regions is performed and its results and implications discussed.

Key words: Empidoidea, predaceous flies, phylogeny, Neotropical Region, Chile, Amazonia

The results show that a full analysis including all genera of Ocydromiinae is required to better assess the scope of *Oropezella*, as well as elucidate its relationship with the other genera of Ocydromiinae. In order to preserve the stability of the genus, we consider it is best at this time do not propose any change in the classification or status of *Oropezella* until the relationship among the genera of the entire Ocydromiinae are more clearly understood.

Acknowledgements

We thank the *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq) for support to the authors through the fellowship and grant provided to the project “Sistemática morfológica de Hybotidae (Diptera, Empidoidea) com ênfase nas espécies neotropicais de Ocydromiinae e Hybotinae”, Edital Universal n. 471616/2011-7, as well to *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES) and *Fundação de Amparo à Pesquisa do Estado do Amazonas* (FAPEAM) by the grant provided to the project “Incremento do conhecimento da diversidade, formação e fixação de especialistas em Sistemática de Diptera (Insecta) na Amazônia”. We are in debt to the curators who kindly loaned specimens used in this study: Augusto Loureiro Henriques (INPA), Carlos José E. Lamas (MZSP), Jeff Cumming (CNC), Trevor Crosby (NZAC) and Manuel Zumbado (INBIO). We are also grateful to Adrian Plant (National Museum Wales), Bradley Sinclair (CNC) and an anonymous referee who made useful suggestions on the manuscript.

References

- Ale-Rocha, R. (2001) Descrição de *Oropezella pseudotetraocellata* sp.n. (Diptera, Empididae, Ocydromiinae). *Iheringia, Série Zoologia*, 91, 85–88.
- Ale-Rocha, R. (2007) Redescription of *Oropezella abdominalis* Collin from Chile with description of the male and a key to the Neotropical genera of Ocydromiinae (Diptera, Hybotidae). *Revista Brasileira de Entomologia*, 51, 410–412.
<http://dx.doi.org/10.1590/S0085-56262007000400003>
- Bremer, K. (1994) Branch support and tree stability. *Cladistics*, 10, 295–304.
<http://dx.doi.org/10.1006/clad.1994.1019>
- Collin, J.E. (1926) Notes on the Empididae (Diptera) with additions and corrections to the British List. *Entomologist's Monthly Magazine*, 62, 213–219.
- Collin, J.E. (1928) *New Zealand Empididae*. British Museum (Natural History), London, 110 pp.
- Collin, J.E. (1933) *Diptera of Patagonia and South Chile. Part IV. Empididae*. British Museum (Nat. Hist.) & Oxford University Press, London, 334 pp.
- Cumming, J.M., Sinclair, B.J. & Wood, D.M. (1995) Homology and phylogenetic implications of male genitalia in Diptera—Eremoneura. *Entomologica Scandinavica*, 26, 121–152.
<http://dx.doi.org/10.1163/187631295X00143>
- Cumming, J.M. & Wood, D.M. (2009) Adult morphology and terminology. In: Brown, B.V., Borkent, A., Cumming, J.M., Wood, D.M., Woodley, N.E. & Zumbado, M.A. (Eds.), *Manual of Central American Diptera. Vol. I*. NRC Research Press, Ottawa, pp. 9–50.
- Goloboff, P.A. (1993) Estimating character weights during tree search. *Cladistics*, 9 (1), 83–91.
<http://dx.doi.org/10.1006/clad.1993.1003>
- Goloboff, P.A., Farris, J.S. & Nixon, K.C. (2008) TNT: a free program for phylogenetic analysis. *Cladistics*, 24 (5), 774–786.
<http://dx.doi.org/10.1111/j.1096-0031.2008.00217.x>
- Loew, H. (1873) *Beschreibung europäischer Dipteren. Systematische Beschreibung der bekannten europäischen zweiflügeligen Insecten, von Johann Wilhelm Meigen*. Vol. 3. Zehnter Theil oder vierter Supplementband. Halle, 320 pp.
- Melander, A.L. (1928) Diptera, Fam. Empididae. In: Wytsman, P. (Ed.), *Genera Insectorum, Fasc. 185* (1927). Louis Desmet-Verteneuil, Bruxelles, 434 pp.
- Miller, D. (1923) Material for a monograph on the Diptera fauna of New Zealand: Part III family Empididae. *Transactions of the New Zealand Institute*, 54, 437–464.
- Morrone, J.J. (2001) *Biogeografía de América Latina y El Caribe. Vol. 3. M & T-Manuales & Tesis SEA*, Sociedad Entomológica Aragonesa, Zaragoza, 150 pp.
- Morrone, J.J. (2002) Biogeographical regions under track and cladistics scrutiny. *Journal of Biogeography*, 29 (2), 149–152.
<http://dx.doi.org/10.1046/j.1365-2699.2002.00662.x>
- Nixon, K.C. (1999) The Parsimony Ratchet, a New Method for Rapid Parsimony Analysis. *Cladistics*, 15 (4), 407–414.
<http://dx.doi.org/10.1006/clad.1999.0121>
- Nixon, K.C. (2002) *WinClada ver. 10000*. Ithaca, New York.
- Plant, A.R. (1989) A revision of the Ocydromiinae (Diptera: Empidoidea: Hybotidae) of New Zealand with descriptions of new

- genera and species. *New Zealand Journal of Zoology*, 16(2), 231–241.
<http://dx.doi.org/10.1080/03014223.1989.10422573>
- Rafael, J.A. & Ale-Rocha, R. (1990) Primeiro registro do gênero *Ocydromia* Meigen na Região Neotropical e descrição de *O. amazonica*, sp. n. (Diptera, Empididae, Ocydromiinae). *Revista Brasileira de Entomologia*, 34 (4), 739–741.
- Sinclair, B.J. (1996) Review of the genus *Acarterus* Loew from southern Africa, with description of seven new species (Diptera: Empidoidea, Hybotinae). *Annals of the Natal Museum*, 37, 215–238.
- Sinclair, B.J. & Cumming, J.M. (2000) Revision of the genus *Apterodromia* (Diptera: Empidoidea), with a redefinition of the tribe Ocydromiini. *Records of the Australian Museum*, 52 (2), 161–186.
<http://dx.doi.org/10.3853/j.0067-1975.52.2000.1313>
- Sinclair, B.J. & Cumming, J.M. (2006) The morphology, higher-level phylogeny and classification of the Empidoidea (Diptera). *Zootaxa*, 1180, 1–172.
- Sinclair, B.J. & Cumming, J.M. (2007) *Leptopezella*, a new Southern Hemisphere genus of Ocydromiinae (Diptera: Empidoidea: Hybotidae). *Zootaxa*, 1629, 27–37.
- Smith, K.G.V. (1962) Studies on the Brazilian Empididae (Diptera). *Transactions of the Royal Entomological Society of London (B)*, 114 (7), 195–266.
<http://dx.doi.org/10.1111/j.1365-2311.1962.tb01079.x>
- Sorenson, M.D. & Franzosa, E.A. (2007) *TreeRot. Version 3*. Boston University, Boston, MA.
- Stuckenbergs, B.R. (1999) Antennal evolution in the Brachycera (Diptera), with a reassessment of terminology relating to the flagellum. *Studia dipterologica*, 6 (1), 1–16.
- Swofford, D.L. (2002) *PAUP*. Phylogenetic Analysis Using Parsimony (*and Other Methods)*, Version 4.0b10. Sinauer Associates, Sunderland, Massachusetts.
- Yang, D., Zhang, K., Yao, G. & Zhang, J. (2007) *World catalog of Empididae (Insecta: Diptera)*. China Agricultural University Press, Beijing, 599 pp.

Checklist of the species of *Oropezzella* Collin

- abdominalis* Collin, 1933: 4—Chile (Peulla).
- amazonica* (Rafael & Ale-Rocha, 1990: 739)—Brazil (Amazonas, Roraima).
- annulitarsis* Smith, 1962: 222—Brazil (Santa Catarina).
- antennata* Collin, 1928: 9—New Zealand (Otago, Manawatu-Wanganui, Waikato).
- aquila* sp. nov.—Brazil (Paraná, São Paulo).
- arara* Smith, 1962: 222—Brazil (Santa Catarina).
- arcuata* sp. nov.—Costa Rica (Heredia).
- bicolor* sp. nov.—Brazil (Amazonas).
- bifurcata* Collin, 1928: 11—New Zealand (Canterbury, Manawatu-Wanganui, Mt. Grey, Otago, Waikato).
- biloba* Smith, 1962: 220—Brazil (Santa Catarina, São Paulo).
- bipunctata* sp. nov.—Brazil (Paraná).
- clavata* sp. nov.—Brazil (Paraná, Santa Catarina).
- costaricensis* sp. nov.—Costa Rica (Puntarenas).
- diminulorum* Plant, 1989: 237—New Zealand (Canterbury, Gisborne, Manawatu-Wanganui, Waikato).
- falcata* sp. nov.—Costa Rica (San José).
- flavida* sp. nov.—Brazil (Paraná).
- granulosa* sp. nov.—Costa Rica (Puntarenas).
- longifrons* sp. nov.—Brazil (Amazonas).
- loripes* Plant, 1989: 235—New Zealand (Bay of Plenty, Little Barrier Is., Waikato).
- marginata* Smith, 1962: 221—Brazil (Santa Catarina).
- metallica* Smith, 1962: 221—Brazil (Santa Catarina).
- nigra* (Miller, 1923: 447)—New Zealand (Otago).
- planti* sp. nov.—Brazil (Goiás).
- plaumanni* sp. nov.—Brazil (Paraná, Santa Catarina).
- pseudotetraocellata* Ale-Rocha, 2001: 85—Brazil (Paraná, Rio de Janeiro, Santa Catarina, São Paulo).
- rafaeli* sp. nov.—Brazil (Paraná, Santa Catarina).
- spathula* sp. nov.—Brazil (Minas Gerais).
- sphenoptera* (Loew, 1873: 215)—Algeria, Austria, Belgium, Croatia, Czech, Denmark, England, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Poland, Russia, Slovakia, Spain, Sweden, Switzerland (*cit.* Yang *et al.* 2007).
- taquara* Smith, 1962: 219—Brazil (São Paulo).
- tanydera* Collin, 1928: 11—New Zealand (Chatham Is., Manawatu-Wanganui, Mt. Grey, Otago, Waikato).
- trucispicata* Plant, 1989: 232—New Zealand (Waikato).
- uncata* sp. nov.—Brazil (Amazonas).
- undulata* sp. nov.—Brazil (Amazonas).