



<http://dx.doi.org/10.11646/zootaxa.3919.1.1>

<http://zoobank.org/urn:lsid:zoobank.org:pub:218630EE-6BF7-4E35-A8F6-9E8260D60FA0>

Taxonomic review of the chironomid genus *Cricotopus* v.d. Wulp (Diptera: Chironomidae) from Australia: keys to males, females, pupae and larvae, description of ten new species and comments on *Paratrichocladius* Santos Abreu

NICK DRAYSON¹, PETER S. CRANSTON^{2,4} & MATT N. KROSCH³

¹7 Park Walk, Brigstock, Northants NN14 3HH, UK

²Evolution, Ecology and Genetics, Research School of Biology, The Australian National University, Canberra, A.C.T. 2601, Australia

³Centre for Water in the Minerals Industry, Sustainable Minerals Institute, The University of Queensland., Brisbane, QLD 4072, Australia

⁴Corresponding author

Drayson: [urn:lsid:zoobank.org:author:B568A060-A52A-4440-8CC1-D81506B3902A](http://zoobank.org/urn:lsid:zoobank.org:author:B568A060-A52A-4440-8CC1-D81506B3902A)

Cranston: [urn:lsid:zoobank.org:author:C068AC61-DF1D-432A-9AB7-52B5D85C6C79](http://zoobank.org/urn:lsid:zoobank.org:author:C068AC61-DF1D-432A-9AB7-52B5D85C6C79)

Krosch: [urn:lsid:zoobank.org:author:C7DD7291-27F0-4216-80B2-90BD9F0CDFAB](http://zoobank.org/urn:lsid:zoobank.org:author:C7DD7291-27F0-4216-80B2-90BD9F0CDFAB)

Table of contents

Abstract	1
Introduction	2
Methods and material	3
<i>Cricotopus acornis</i> Drayson & Cranston, sp.n.	5
<i>Cricotopus albitarsis</i> Hergstrom sp. n.	6
<i>Cricotopus annuliventris</i> (Skuse)	8
<i>Cricotopus brevicornis</i> Drayson & Cranston sp.n.	10
<i>Cricotopus conicornis</i> Drayson & Cranston sp.n.	11
<i>Cricotopus hillmani</i> Drayson & Cranston, sp. n.	13
<i>Cricotopus howensis</i> Cranston sp.n.	15
<i>Cricotopus parbicinctus</i> Hergstrom sp.n.	16
<i>Cricotopus tasmania</i> Drayson & Cranston sp. n.	18
<i>Cricotopus varicornis</i> Drayson & Cranston sp. n.	20
<i>Cricotopus wangi</i> Cranston & Krosch sp. n.	21
Key to adult males of Australian <i>Cricotopus</i>	22
Key to adult females of Australian <i>Cricotopus</i>	35
Key to pupae of Australian <i>Cricotopus</i>	35
Key to larvae of Australian <i>Cricotopus</i> & <i>Paratrichocladius</i>	36
Discussion	37
Acknowledgements	38
References	38

Abstract

The Australian species of the Orthocladiinae genus *Cricotopus* Wulp (Diptera: Chironomidae) are revised for larval, pupal, adult male and female life stages. Eleven species, ten of which are new, are recognised and keyed, namely *Cricotopus acornis* Drayson & Cranston **sp. nov.**, *Cricotopus albitarsis* Hergstrom **sp. nov.**, *Cricotopus annuliventris* (Skuse), *Cricotopus brevicornis* Drayson & Cranston **sp. nov.**, *Cricotopus conicornis* Drayson & Cranston **sp. nov.**, *Cricotopus hillmani* Drayson & Cranston, **sp. nov.**, *Cricotopus howensis* Cranston **sp. nov.**, *Cricotopus parbicinctus* Hergstrom **sp. nov.**, *Cricotopus tasmania* Drayson & Cranston **sp. nov.**, *Cricotopus varicornis* Drayson & Cranston **sp. nov.** and *Cricotopus wangi* Cranston & Krosch **sp. nov.** Using data from this study, we consider the wider utility of morphological and molecular diagnostic tools in untangling species diversity in the Chironomidae. Morphological support for distinguishing *Cric-*

otopus from *Paratrichocladus* Santo-Abreu in larval and pupal stages appears lacking for Australian taxa and brief notes are provided concerning this matter.

Key words: Orthoclaadiinae, *Cricotopus*, new species, taxonomy, *Paratrichocladus*

Introduction

Cricotopus (Diptera: Chironomidae) is a near worldwide genus of midges that show diversity in colour pattern of the adult, often with characteristic yellow or white bands on the otherwise dark legs and abdomen. The immature stages are encountered in nearly all aquatic monitoring schemes. The genus was described originally by van der Wulp (1874) from adult males of eight Palaearctic species. The type species, *Chironomus tibialis* Meigen (type locality not given), was designated subsequently by Coquillett (1910: 528). Included species were: *Chironomus bicinctus* Meigen, *Chironomus tricinctus* Meigen, *Chironomus annulipes* Meigen, *Tipula motitator* Linnaeus, *Chironomus unifasciatus* Macquart, *Tipula sylvestris* Fabricius and *Chironomus ornatus* Meigen. Currently, with 180 species described (Ashe & O'Connor 2012), *Cricotopus* is one of the most speciose genera in the subfamily Orthoclaadiinae. The great majority of species described are Palaearctic and Nearctic. The Palaearctic members of the genus were reviewed by Hirvenoja (1973), who recognised 71 species in two subgenera and 17 species-groups, based on a manual cladistic analysis using 61 characters, derived mainly from adults but including several pupal and larval characters. The subgenera recognised by Hirvenoja (1973) were *Cricotopus* (*Cricotopus* van der Wulp) and *Cricotopus* (*Isocladus* Kieffer), groups treated previously as genera. Subsequently four additional subgenera have been proposed: *C. (Nostococladus)* by Ashe and Murray (1980) from the Nearctic region (elevating Hirvenoja's *lygropis*-group to subgeneric status; type species *C. lygropis* Edwards); *C. (Marius)* by Lehmann (1981) from the Afrotropical region (type species *C. kisantuensis* Goetghebuer), *C. (Pseudocricotopus)* by Nishida (1987) from Japan and the Nearctic region (type species *C. montana* Tokunaga) and the Neotropical *Oliveiriella* Weidenbrug & Fittkau (1997) recently synonymised with *Cricotopus* (with type species *O. almeidai* Olivier) is treated as a sixth subgenus by Andersen *et al.* (2013).

Two Australian taxa have been allocated to *Cricotopus*, namely *Cricotopus albitibia* (Walker) and *C. annuliventris* (Skuse) (Freeman 1961). Described originally from Sierra Leone in Africa as *Chironomus albitibia* Walker, the species was reassigned to *Cricotopus* by Freeman (1956). Specimens from New South Wales, Australian Capital Territory and Western Australia were treated as conspecific by Freeman (1961). Likewise *C. annuliventris* was described first as an *Orthocladus* by Skuse, from Lawson in the Blue Mountains of New South Wales, and reassigned to *Cricotopus* by Freeman (1961). Both species descriptions conform to subgenus *Cricotopus* (s.s.) according to the keys and diagnoses of Hirvenoja (1973) and Cranston *et al.* (1989) for adult males. Specimens of both species examined by Freeman, now in the Australian National Insect Collection (ANIC), Canberra, have been examined. Although these are pinned rather than slide mounted, identification can be made using the identification keys presented below.

Published formal descriptions of both Australian species of *Cricotopus* are of male and female only. Although description from the adult male is traditional, descriptions of the larvae and pupae of chironomids are of greater value to freshwater biologists. Thus Hirvenoja (1973) included, where possible, descriptions of all life stages in his revision of Palaearctic *Cricotopus* and most others follow this practice.

In an unpublished thesis, Hergstrom (1974) reported four new Australian species of *Cricotopus* as well as the two species described previously. Hergstrom gave 'manuscript names' to four new taxa, namely *Cricotopus albitarsis*, *C. parbicinctus*, *C. phaesomatus* and *C. hirtellus*. Keys to the adults of the six species of *Cricotopus*, brief descriptions of the larva and pupa of one of her new species and keys to the larvae and pupae of three species were included. Hergstrom's descriptions are formally unpublished, but her thesis and many specimens are available and we discuss her descriptions of *Cricotopus* here. Two of her species, *C. albitarsis* and *C. parbicinctus* are recognised readily, and here we redescribe them in all stages, and assign to her the authorship dating from this publication.

This project started in 1987 when the 2nd author (Cranston) arrived in Australia with a remit to document the Australian Chironomidae fauna. First modern collections that included individual rearings and slide-mounts of many orthoclaadiines including *Cricotopus* commenced immediately and continued since (as seen from Material examined). Geographic foci included Northern Territory assisting in biomonitoring of a Uranium mine, the Murray

References

- Andersen, T., Sæther, O.A., Cranston, P.S. & Epler, J.H. (2013) The larvae of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic region — 9. Keys and diagnoses. In: Andersen, T., Cranston, P.S. & Epler, J.H. (Eds.), *Chironomidae of the Holarctic Region: Keys and diagnoses, Part 1: Larvae. Insect Systematics and Evolution Supplements*, 66, pp. 137–144. [571 pp.]
- Ashe, P. & O'Connor, J.P. (2012) *A World Catalogue of Chironomidae (Diptera) Part 2. Orthoclaadiinae*. The Irish Biographical Society and National Museum of Ireland, Dublin, 968 pp.
- Ashe, P. & Murray, D.A. (1980) *Nostococcladius*, a new subgenus of *Cricotopus* (Diptera: Chironomidae), In: Murray, D.A. (Ed.), *Chironomidae – Ecology, Systematics, Cytology & Physiology*. Pergamon Press, Oxford, pp. 105–111. [total page number 354 pp.]
- Brundin, L. (1966) Transantarctic relationships and their significance, as evidenced by chironomid midges with a monograph of the subfamilies Podonominae and Aphroteniinae and the austral Heptagytiae. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 11, 1–472.
- Coffman, W.P., Cranston, P.S., Oliver, D.R. & Sæther, O.A. (1986) Keys and diagnoses of the pupae of the subfamily Orthoclaadiinae (Diptera, Chironomidae). *Entomologica Scandinavica Supplement*, 28, 147–296.
- Coquillett, D.W. (1910) The type-species of the North American genera of Diptera. *Proceedings of the United States National Museum*, 37, 499–649.
- Cranston, P.S. (1994) *Morphology. Chironomidae*. In: Armitage, P.D., Cranston, P.S. & Pinder, L.C.V. (Ed.), *Biology and Ecology of Non-Biting Midges*, Chapman & Hall, London, pp. 11–30.
- Cranston, P.S. (1996) *Identification Guide to the Chironomidae of New South Wales. AWT Identification Guide*, Number 1, 1–376. [Australian Water Technologies Pty Ltd, Sydney]
- Cranston, P.S. (2013) *The larvae of the Holarctic Chironomidae (Diptera: Chironomidae) — 2. Morphological terminology and key to subfamilies*. In: *Chironomidae of the Holarctic Region: Keys and diagnoses, Part 1: Larvae*. Editors: Trond Andersen, Peter S. Cranston & John H. Epler. *Insect Systematics and Evolution Supplements*, 66, pp. 13–24. [total page number: 571 pp.]
- Cranston, P.S., Oliver, D.R. & Sæther, O.A. (1983) Keys and diagnoses of the larvae of the subfamily Orthoclaadiinae (Diptera, Chironomidae) of the Holarctic Region. *Entomologica Scandinavica Supplement*, 19, 149–291.
- Cranston, P.S., Oliver, D.R. & Sæther, O.A. (1989) Keys and diagnoses of the adult males of the subfamily Orthoclaadiinae (Diptera, Chironomidae). *Entomologica Scandinavica Supplement*, 34, 165–352.
- Cranston, P.S., Dillon, M., Pinder, L.C.V. & Reiss, F.R. (1989) Keys and diagnoses of the adult males of the subfamily Chironominae (Diptera, Chironomidae). *Entomologica Scandinavica Supplement*, 34, 353–502.
- Cranston, P.S. & Krosch, M.N. (submitted) A review of the chironomid genus *Paratrichoccladius* Santos-Abreu (Diptera: Chironomidae): evidence for taxonomic change from austral taxa and DNA sequences. *Invertebrate Systematics*.
- Drayson, N. (1992) *A taxonomic revision of the Australian Cricotopus (Diptera: Chironomidae)*. Unpublished MSc thesis, Division of Botany and Zoology, Australian National University, Canberra. [total page number unknown]
- Freeman, P. (1956) A study of the Chironomidae (Diptera) of Africa south of the Sahara. Part II. *Bulletin of the British Museum (Natural History)*, *Entomology*, 4, 285–368
- Freeman, P. (1961) The Chironomidae (Diptera) of Australia. *Australian Journal of Zoology*, 9, 611–737.
<http://dx.doi.org/10.1071/ZO9610611>
- Hergstrom, I. (1974) *The taxonomy and general biology of some southern Australian Chironomidae (Diptera: Nematocera)*. Unpublished PhD thesis, University of South Australia. [total page number unknown]
- Hirvenoja, M. (1973) Revision der Gattung *Cricotopus* van der Wulp und ihrer Verwandten (Diptera: Chironomidae). *Annales Zoologici Fennici*, 10, 1–363.
- International Commission on Zoological Nomenclature (1999) *International Code of Zoological Nomenclature. 4th Edition*. The International Trust for Zoological Nomenclature, London, 306 pp.
- Krosch, M.N. & Cranston, P.S. (2012) Non-destructive DNA extraction, including of fragile pupal exuviae, extends analysable collections and enhances vouchering. *Chironomus*, 25, 22–27.
- Krosch, M.N., Schutze, M.K., Armstrong, K.F., Boontop, Y., Boykin, L.M., Chapman, T.A., Englezou, A., Cameron, S.L. & Clarke, A.R. (2013) Piecing together an integrative taxonomic puzzle: microsatellite, wing shape and aedeagus length analyses of *Bactrocera dorsalis* s.l. (Diptera: Tephritidae) find no evidence of multiple lineages in a proposed contact zone along the Thai/Malay Peninsula. *Systematic Entomology*, 2–13.
<http://dx.doi.org/10.1111/j.1365-3113.2012.00643.x>
- Krosch, M.N., Baker, A.M., Cranston, P.S. & Vink, S. (submitted) Molecular data extend Australian *Cricotopus* midge (Chironomidae) species diversity and provide a phylogenetic hypothesis for biogeography and freshwater monitoring. *Zoological Journal of the Linnean Society*.
- Lehmann, J. (1981) Chironomidae (Diptera) aus Fließgewässern Zentralafrikas. II. Die Region um Kisangami, Zentralzair. *Spixiana Supplement*, 5, 1–85.
- Lesage, L. & Harrison, A.D. (1981) Taxonomy of *Cricotopus* species (Diptera: Chironomidae) from Salem Creek, Ontario. *Proceedings of The Entomological Society of Ontario*, 111, 57–114.
- McKie, B.G. & Cranston, P.S. (2005) Size matters: systematic and ecological implications of allometry in the responses of

- chironomid midge morphological ratios to experimental temperature manipulations. *Canadian Journal of Zoology*, 83, 553–568.
<http://dx.doi.org/10.1139/z05-051>
- Nishida, H. (1987) *Pseudocricotopus*, a new subgenus of the genus *Cricotopus* (Diptera: Chironomidae) from Japan. *Kontyu, Tokyo*, 55, 459–476.
- Sæther, O.A. (1977) Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. *Bulletin of the Fisheries Research Board of Canada*, 197, 1–211.
- Sæther, O.A. (1980) A glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica Scandinavica Supplement*, 14, 1–51.
- Silva, F.L., Ekrem, T. & Fonseca-Gessner, A.A. (2013) DNA barcodes for species delimitation in Chironomidae (Diptera): a case study on the genus *Labrundinia*. *The Canadian Entomologist*, 145, 589–602.
<http://dx.doi.org/10.4039/tce.2013.44>
- Silva, F.L. & Wiedenbrug, S. (2014) Integrating DNA barcodes and morphology for species delimitation in the *Corynoneura* group (Diptera: Chironomidae: Orthoclaadiinae). *Bulletin of Entomological Research*, 104, 65–78.
<http://dx.doi.org/10.1017/s0007485313000515>
- Simpson, K.W., Bode, R.W. & Albu, P. (1982) Keys for the genus *Cricotopus* adapted from "Revision der Gattung *Cricotopus* van der Wulp und ihrer Verwandten (Diptera, Chironomidae)" by M. Hirvenoja. *New York State Museum Bulletin*, 450, 1–133.
- Sinclair, C.S. & Gresens, S.E. (2008) Discrimination of *Cricotopus* species (Diptera: Chironomidae) by DNA barcoding. *Bulletin of Entomological Research*, 98, 555–563.
<http://dx.doi.org/10.1017/s0007485308005865>
- Skuse, F.A.A. (1889) Diptera of Australia. Part VI. The Chironomidae. *Proceedings of the Linnean Society of New South Wales*, 2, 215–311.
- Wiedenbrug, S. & Fittkau, E.J. (1997) *Oliveiriella almeidai* (Oliveira, 1946), gen. nov., comb. nov., from South America with description of the pupae (Diptera, Chironomidae, Orthoclaadiinae). *Spixiana*, 20, 167–172.
- Wulp, F.M. van der (1874) Dipterologische aanteekeningen. *Tijdschrift voor entomologie*, 17, 109–148.