



<http://dx.doi.org/10.11646/zootaxa.3811.3.2>

<http://zoobank.org/urn:lsid:zoobank.org:pub:EBF66C8E-41D3-4ABA-8502-9EF3A56A6089>

Species of the subgenus *Chaetolabis*, Townes 1945 of the genus *Chironomus*, Meigen 1803 (Diptera: Chironomidae), from a cytogenetic perspective

JON MARTIN

Department of Genetics, The University of Melbourne, Melbourne, Australia E-mail: j.martin@unimelb.edu.au

Abstract

The polytene chromosomes of three North American species in the subgenus *Chaetolabis* of the genus *Chironomus* are described and compared to the published karyotypes of two Palearctic species. *Chironomus (Chaetolabis) atroviridis* has four polytene chromosomes, like the Palearctic *C. globulus*, while *C. ochreatus* and the North American populations of *C. bitumineus* each have three chromosomes due to tandem fusion of arm G to arm E, as in the Palearctic populations of *C. bitumineus*. The results support the existence of distinct species, particularly clarifying that the names *C. atroviridis*, *C. bitumineus* and *C. ochreatus* cannot be synonyms, as was suggested by some previous workers. The question of whether *Lobochironomus* "sp. Ya6" might be conspecific with *C. macani* is also discussed.

Key words: *Chironomus*, *Chaetolabis*, Karyosystematics, Polytene chromosomes, Inversion polymorphism

Introduction

Chaetolabis was created by Townes (1945) as a subgenus of the genus "*Tendipes*" (now *Chironomus* Meigen 1803). Townes included two species that he named *Tendipes (Chaetolabis) atroviridis* (type of the subgenus) and *T. (Chaet.) ochreatus*. The former name was proposed for material he thought had been misidentified as *Chironomus viridicollis* van der Wulp, 1859 by various North American workers. Since then, *Chaetolabis* has been treated as a valid subgenus practically unanimously. Yamamoto (1987) has suggested raising it to generic level, on the basis of the characteristics of the antepnotum, but this has not been accepted. The present paper does not aim to address this issue, but to look at some other questions to which analysis of polytene chromosomes may provide answers.

To date five species have been recognized as valid in *Chaetolabis*: *C. atroviridis*, Townes 1945, *C. ochreatus* Townes, 1945, *C. macani* Freeman, 1948, *C. globulus* Filinkova and Belyanina, 1993 and *C. bitumineus* Langton and Vallenduuk, 2013. The polytene chromosomes have been described for only two of these species, *C. bitumineus* (as *C. macani*) by Wülker (1987) (see Langton and Vallenduuk, 2013) and *C. globulus* in the original description of that species. Wülker (1987) made reference to *C. atroviridis* having four polytene chromosomes, and *C. ochreatus* only three, based on my earlier unpublished work. This paper will describe and figure the polytene chromosomes of these latter North American species, expanding on the brief descriptions in Proulx *et al.* (2013), and will describe the chromosomes of North American larvae assigned to *C. bitumineus* by Langton and Vallenduuk (2013). The results are then used to evaluate whether the named species are all distinct, and whether *C. bitumineus* truly has a Holarctic distribution, as has been surmised from larval external morphology.

The major taxonomic problem in this subgenus is that the males are so similar that it has been uncertain how many species there are. Thus Wiederholm (1979), for example, queried whether *C. atroviridis*, *C. ochreatus*, and *C. macani* might be synonyms for a single species, and at the same time misapplied the name *C. macani* to material now identified as *C. bitumineus* (Langton & Vallenduuk 2013). In North America, the late J.E. Sublette (unpublished data) was unable to distinguish the adult males of *C. atroviridis* from those of an undescribed species, although associated larvae showed four polytene chromosomes in one species versus three in the other. This led to both species being called "*C. nr. atroviridis*" but distinguished as cytospecies "2h" and "2i" (see Martin 2014), until Langton and Vallenduuk (2013) proposed that sp. 2h was *C. bitumineus*, with 3 polytene chromosomes. That

particularly to those of *C. atroviridis* as described in this paper. This comparison shows considerable similarity between the banding patterns in *C. atroviridis* and sp. Ya6. Arms C and F appear to be identical in the two species; arm G is very similar and has the N and two BRs in the same relationship. The remaining arms differ by inversions that do not correspond to the intraspecific polymorphisms in each of the species and may differ by several inversion steps. Nevertheless, the existence of similar banding patterns in at least two arms would indicate that sp. Ya6 is closer to *C. atroviridis* than it is to any of the three *Lobochironomus* species studied by Ryser *et al.* (1985). Consequently, it is quite conceivable that Langton and Vallenduuk (2013) were correct in assuming that the larvae they had sent for karyological examination were those of *C. macani*, i.e. that sp. Ya6 actually is *C. macani*.

Whatever the appropriate subgeneric placement of *C. sp. Ya6*, one thing is certain: the current perception that larvae of *Chaetolabis* and *Lobochironomus* differ in the absence versus presence of posterolateral tubules (= lateral tubules of Sæther 1980) of body segment 10, such that *Chaetolabis* have a thummi-type larva (without such tubules), while *Lobochironomus* have a plumosus-type larva (with such tubules), must be treated with extreme caution, since the larvae of sp. Ya6 from the Netherlands are thummi-type (Langton & Vallenduuk 2013), while those from Yakutia are plumosus-type (Kiknadze *et al.* 1996b), indicating that this character is an intraspecific polymorphism, as it is in some species of the subgenus *Chironomus* (Proulx *et al.* 2013).

The overall conclusion from this study is that, despite the noted similarity in morphology (Wiederholm 1979), the species *C. atroviridis*, *C. bitumineus* and *C. ochreatus* are distinct species. Furthermore, if sp. Ya6 really is *C. macani*, then this species is also distinct on karyosystematic grounds.

Acknowledgements

This study was begun during the tenure of a Canadian National Research Fellowship in Ottawa in 1966, and continued during subsequent periods of study leave and with other support from The University of Melbourne. I am grateful to Prof. Iya Kiknadze, Dr. Albina Istomina and Prof. Paraskewa Michailova for their helpful comments on the comparison of the chromosome banding patterns of *C. atroviridis* and *C. sp. Ya6*; and to Dr. Martin Spies for many helpful comments on the manuscript.

References

- Dévai, G., Miskolczi, M. & Wülker, W. (1989) Standardization of chromosome arms B, C, D in *Chironomus*, Diptera, Chironomidae. *Acta Biologica Debrecina Supplementum, Oecologica Hungarica*, 2, 79–92.
- Filinkova, T.N. & Belyanina, S.I. (1993) A new species of the genus *Chironomus* (Diptera, Chironomidae) from some reservoirs of the Arctic Ural Mountains and Yamal. *Zoologicheskii Zhurnal*, 72 (4), 80–87. [in Russian]
- Keyl, H.-G. (1962) Chromosomenevolution bei *Chironomus* II. Chromosomenumbauten und phylogenetische Beziehungen der Arten. *Chromosoma*, 13, 464–514.
<http://dx.doi.org/10.1007/bf00327342>
- Kiknadze, I.I., Butler, M.G., Aimanova, K.G., Gunderina, L.I. & Cooper K. (1996a) Geographic variation in polytene chromosome banding pattern of the Holarctic midge *Chironomus (Camptochironomus) tentans* (Fabricius). *Canadian Journal of Zoology*, 74, 171–191.
<http://dx.doi.org/10.1139/z96-022>
- Kiknadze, I.I., Istomina, A.G., Gunderina, L.I., Salova, T.A., Aimanova, K.G. & Savvinov, D.D. (1996b) *Kariofondy khironomid kriolitozony Yakutii: Triba Chironomini*. Nauka, Novosibirsk, 166 pp. [in Russian]
- Kiknadze, I.I., Siirin, M.T., Kerkis, I.E. & Aimanova, K.T. (1993) Unusual cytochrome complex in the chironomids. *Tsitologiya*, 35, 46–52. [in Russian]
- Langton, P. & Vallenduuk, H. (2013) The karyotype and morphology of all stages of *Chironomus (Chaetolabis) macani* Freeman, 1948 and *Chironomus (Chaetolabis) bitumineus* nom. nov. for *C. (C.) macani* Wiederholm, 1997 nec Freeman. *Lauterbornia*, 76, 11–18.
- Martin, J., Andreeva, E.N., Kiknadze, I.I. & Wülker, W.F. (2006) Polytene chromosomes and phylogenetic relationships of *Chironomus atrella* (Diptera: Chironomidae) in North America. *Genome*, 49, 1384–1392.
<http://dx.doi.org/10.1139/g06-095>
- Martin, J. (2014) North American species of the genus *Chironomus*. Available from: <http://genetics.unimelb.edu.au/Martin/NACyfiles/NACHiron.html> (accessed 22 April 2014)
- Proulx, I., Martin, J., Carew, M. & Hare, L. (2013) Using various lines of evidence to identify *Chironomus* species in eastern Canadian lakes. *Zootaxa*, 3741 (4), 401–458.

<http://dx.doi.org/10.11646/zootaxa.3741.4.1>

- Ryser, H.M., Wülker, W. & Scholl, A. (1985) Revision der Gattung *Chironomus* Meigen (Diptera). X. *Lobochironomus* n. subg. (*C. montuosus* n. sp., *C. storai* Goetgh., *C. mendax* Storå). *Revue Suisse de Zoologie*, 92, 385–404.
- Sæther, O.A. (1980) Glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica Scandinavica Supplement*, 14, 1–51.
- Shobanov, N.A., Shilova, A.I. & Belyanina, S.I. (1996) Content and structure of the genus *Chironomus* Meigen (Diptera: Chironomidae): review of world fauna, pp. 44–96, *In*: Shobanov, N.A. & Zinchenko, T.D. (Eds.), *Ekologiya, Evolutsiya y Systematika Khironomd.* Institute for Biology of Inland Waters & Institute for Ecology of the Volga Basin, Russian Academy of Sciences, Tolyatti, Borok, Russia, 178pp. [in Russian]
- Townes, H.K. Jr. (1945) The Nearctic species of Tendipedini [Diptera, Tendipedidae (= Chironomidae)] *American Midland Naturalist*, 34, 1–206.
- <http://dx.doi.org/10.2307/2421112>
- Webb, C.J., Martin, J. & Wülker, W. (1987) Ultrastructure of larval ventromental plates of European and North American representatives of *Chironomus* Meigen (subgenus *Chaetolabis* Townes) (Diptera: Chironomidae). *Entomologica Scandinavica*, 18, 205–211.
- Wiederholm, T. (1979) Morphology of *Chironomus macani* Freeman, with notes on the taxonomic status of subg. *Chaetolabis* Town. (Diptera: Chironomidae). *Entomologica Scandinavica Supplement*, 10, 145–150.
- Wülker, W.F. (1987) Der Karyotyp von *Chironomus (Chaetolabis) macani* (Diptera: Chironomidae). *Entomologica Generalis*, 12, 281–286.
- <http://dx.doi.org/10.1127/entom.gen/12/1987/281>
- Wülker, W.F. (2010) The role of chromosomes in chironomid systematics, ecology and phylogeny. *In*: Ferrington, L.C. Jr. (Ed.), *Proceedings of the XV International Symposium on Chironomidae*. Chironomidae Research Group, University of Minnesota, Saint Paul, Minnesota, pp. 1–13.
- Yamamoto, M. (1987) Notes on the genus *Chaetolabis* Townes status nov., with a redescription of *C. macani* (Freeman) (Diptera: Chironomidae). *Esakia*, 25, 149–154.