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## ***Serromyia diabolica*, a new biting midge species from Lebanon (Diptera: Ceratopogonidae)**

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### **Abstract**

A new darkly-pigmented species of *Serromyia*, closely related to *S. subinermis* Kieffer, is described from both sexes based on morphological characters and COI gene sequence analyses.

**Key words:** Ceratopogonidae, *Serromyia*, new species, COI gene sequence, Lebanon

### **Introduction**

The genus *Serromyia* Meigen, 1818, with 35 extant and 7 fossil species (Borkent 2015), can not be placed among the most species-rich genera of the tribe Ceratopogonini, but certainly it is one of the easiest to recognize because of the enlarged and spiny hind femora present in adults of both sexes. Members of this rather quite recently evolved genus are nearly worldwide distributed, but are not known from the Neotropical region (Szadziewski 1988). Although most of the extant species are reported from the Afrotropics and the Palaearctic, de Meillon & Wirth (1983) suggested that the number of species actually occurred in the latter region is lower than the number of species described from there. Afterwards, Borkent & Bissett (1990) proposed nine new junior synonyms for the *Serromyia* midges from Europe, gave detailed information on the diagnostic features and provided the keys to the Holarctic species. Nevertheless, identification of some Palaearctic species remains problematic, especially when only females are available for study. On the contrary to the Afrotropical fauna represented by relatively easily distinguishable species (de Meillon & Wirth 1983), an intraspecific diversity within *Serromyia* from the Palearctic region seems to be high, causing difficulties for accurate identification. However, among valid species there are still those which look very much alike, and differ only in few characters. The most accurate example are males of *S. morio* (Fabricius) and *S. atra* (Meigen), with the same armature of genitalia but showing differences in a distribution of the strong spines on fore femora, general coloration of legs and in the length of antennal flagellomeres 10<sup>th</sup> and 11<sup>th</sup>. Molecular studies can be helpful in such very similar morphology between species, and in particular DNA barcoding approach (Hebert *et al.* 2003) had been increasingly used since the last decade. Within the family Ceratopogonidae, studies combining morphological and molecular approaches had been mostly implemented to redefine the taxonomy of several species of the genus *Culicoides* (Ander *et al.* 2013, Bellis *et al.* 2013, Pagès *et al.* 2009, Sarvašová *et al.* 2014). Outside this latter genus, Beckenbach & Borkent (2003) used the Cytochrome oxidase subunit 2 to investigate the phylogeny of Ceratopogonidae. Recently, Stur & Borkent (2014) combined morphology and DNA barcoding to accurately describe the Norwegian Ceratopogonidae fauna. Within *Serromyia*, only two studies had provided molecular data, from *S. femorata* (Meigen) (Stur & Borkent 2014) and from an unidentified species (Wenk *et al.* 2012).

In the Middle East the biting midges of the genus *Serromyia* are poorly studied. To date, only two species were reported from here, both pale-colored, and these are *S. mangrovi* Delécolle & Braverman (Delécolle & Braverman 1987) described from Egypt and *S. arabica* Szadziewski, Gwizdalska-Kentzer & Gilka (Szadziewski *et al.* 2011)

We decided to not present phylogenetic tree here because of the success to sequence only a short fragment of COI region and of the availability of COI sequences of only one identified species of the genus *Serromyia* (i.e. *S. femorata*). Further collection would be required to evaluate the phylogenetic relationships between *S. diabolica* and *S. subinermis*, and the extent to other species would allow to investigate relationships within the genus *Serromyia*.

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## References

- Ander, M., Troell, K. & Chirico, J. (2013) Barcoding of biting midges in the genus *Culicoides*: a tool for species determination. *Medical and Veterinary Entomology*, 27, 323–331.  
<http://dx.doi.org/10.1111/j.1365-2915.2012.01050.x>
- Beckenbach, A.T. & Borkent, A. (2003) Molecular analysis of the biting midges (Diptera: Ceratopogonidae), based on mitochondrial cytochrome oxidase subunit 2. *Molecular Phylogenetics and Evolution*, 27, 21–35.  
[http://dx.doi.org/10.1016/S1055-7903\(02\)00395-0](http://dx.doi.org/10.1016/S1055-7903(02)00395-0)
- Bellis, G.A., Dyce, A.L., Gopurenko, D. & Mitchell, A. (2013) Revision of the Immaculatus Group of *Culicoides* Latreille (Diptera: Ceratopogonidae) from the Australasian Region with description of two new species. *Zootaxa*, 3680, 15–37.  
<http://dx.doi.org/10.11646/zootaxa.3680.1.4>
- Borkent, A. (2015) *World species of biting midges (Diptera: Ceratopogonidae)*. Available from: <http://www.inhs.uiuc.edu/cee/FLYTREE/CeratopogonidaeCatalog.pdf> (Accessed 11 February 2015)
- Borkent, A. & Bissett, B. (1990) A revision of the Holarctic species of *Serromyia* Meigen (Diptera: Ceratopogonidae). *Systematic Entomology*, 15, 153–217.  
<http://dx.doi.org/10.1111/j.1365-3113.1990.tb00311.x>
- Dallas, J.F., Cruickshank, R.H., Linton, Y.M., Nolan, D.V., Patakakis, M., Braverman, Y., Capela, R., Capela, M., Pena, I., Meiswinkel, R., Ortega, M.D., Baylis, M., Mellor, P.S. & Mordue Luntz, A.J. (2003) Phylogenetic status and matrilineal structure of the biting midge, *Culicoides imicola*, in Portugal, Rhodes and Israel. *Medical and Veterinary Entomology*, 17, 379–387.  
<http://dx.doi.org/10.1111/j.1365-2915.2003.00454.x>
- Delécolle, J.-C. & Braverman, Y. (1987) Description de *Serromyia mangrovi* n. sp. du Sinai (Dipt. Ceratopogonidae). *Bulletin de la Société Entomologique de France*, 92, 57–65.
- de Meillon, B. & Wirth, W.W. (1983) Subsaharan Ceratopogonidae (Diptera) XI. The genus *Serromyia* Meigen. *Annals of the Natal Museum*, 25, 383–402.
- Dominiak, P., Alwin, A. & Gilka, W. (2014) New records of predaceous midges from the Middle East, with the description of two new species (Diptera: Ceratopogonidae). *Zootaxa*, 3753 (2), 133–145.  
<http://dx.doi.org/10.11646/zootaxa.3753.2.3>
- Folmer, O., Black, M., Hoeh, W., Lutz, R. & Vrijenhoek, R. (1994) DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology*, 3, 294–299.
- Hebert, P.D.N., Ratnasingham, S. & de Waard, J.R. (2003) Barcoding animal life: cytochrome c oxidase subunit I divergences among closely related species. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, 270, Supplement 1, 96–99.  
<http://dx.doi.org/10.1098/rsbl.2003.0025>
- Pagès, N., Munoz-Munoz, F., Talavera, S., Sarto, V., Lorca, C. & Nunez, J.I. (2009) Identification of cryptic species of *Culicoides* (Diptera: Ceratopogonidae) in the subgenus *Culicoides* and development of species-specific PCR assays based on barcode regions. *Veterinary Parasitology*, 165, 298–310.  
<http://dx.doi.org/10.1016/j.vetpar.2009.07.020>
- Sarvašová, A., Kočíšová, A., Halán, M., Delécolle, J.-C. & Mathieu, B. (2014) Morphological and molecular analysis of the

- genus *Culicoides* (Diptera: Ceratopogonidae) in Slovakia with five new records. *Zootaxa*, 3872 (5), 541–560.  
<http://dx.doi.org/10.11646/zootaxa.3872.5.6>
- Stur, E. & Borkent, A. (2014) When DNA barcoding and morphology mesh: Ceratopogonidae diversity in Finnmark, Norway. *ZooKeys*, 463, 95–131.  
<http://dx.doi.org/10.3897/zookeys.463.7964>
- Szadziewski, R. (1988) Biting midges (Diptera, Ceratopogonidae) from Baltic amber. *Polish Journal of Entomology*, 58, 3–283.
- Szadziewski, R., Gwizdalska-Kentzer, M. & Gilka, W. (2011) Order Diptera, family Ceratopogonidae. In: Sheikh Tahnoon Bin Zayed Al Nahyan, H.H. (patron) & van Harten, A. (Eds.), *Arthropod fauna of the United Arab Emirates. Vol. 4*. Dar Al Ummah Printing, Publishing, Distribution & Advertising, Abu Dhabi, UAE, pp. 636–653.
- Tamura, K., Stecher, G., Peterson, D., Filipowski, A. & Kumar, S. (2013) MEGA6: Molecular Evolutionary Genetics Analysis version 6.0. *Molecular Biology and Evolution*, 30, 2725–2729.  
<http://dx.doi.org/10.1093/molbev/mst197>
- Thompson, J.D., Higgins, D.G. & Gibson, T.J. (1994) CLUSTAL W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position-specific gap penalties and weight matrix choice. *Nucleic Acids Research*, 22, 4673–4680.  
<http://dx.doi.org/10.1093/nar/22.22.4673>
- Wenk, C.E., Kaufmann, C., Schaffner, F. & Mathis, A. (2012) Molecular characterization of Swiss Ceratopogonidae (Diptera) and evaluation of real-time PCR assays for the identification of *Culicoides* biting midges. *Veterinary Parasitology*, 184, 258–266.  
<http://dx.doi.org/10.1016/j.vetpar.2011.08.034>