

An annotated checklist of the mosquitoes (Diptera: Culicidae) of the Danube Delta Biosphere Reserve

Florian-Liviu Prioteasa and Elena Falcuta

Medical Entomology Unit, “Cantacuzino” National Institute for Research and Development for Microbiology and Immunology, 103 Splaiul Independenței, 050096 Bucharest, Romania E-mail: lprioteasa@cantacuzino.ro ; florianliviu@yahoo.com

Abstract

A revised checklist of the mosquito fauna of the Danube Delta Biosphere Reserve is reported. The latest nomenclatorial and taxonomic changes are reflected in the checklist. Thirty-one species belonging to 10 genera including five new records are listed.

Key words: Danube Delta Biosphere Reserve, mosquitoes, checklist, new records

Introduction

Founded in August 1990, the Danube Delta Biosphere Reserve (DDBR) was, in 1991, added to the UNESCO World Natural Heritage list. With an area of 5,800 km², DDBR includes the delta area situated between the Danube's river branches (3,150 km²), the Razim-Sinoe lakes complex (1,145 km²), the marine coastal waters (1,030 km²), the Danube flood plain between Isaccea and Tulcea (13 km²) and the Romanian side of the Danube Channel between Cotul Pisicii and Ceatalul Chiliei (102 km²) (Gastescu & Stiuca, 2006).

The significant ecological diversity (30 types of ecosystems identified) and the existence of many areas where human impact is absent, produces a recorded biodiversity with more than 1,800 species of flora and over 3,500 species of fauna. The mosquito fauna is very well represented. Nevertheless, research on mosquitoes in this area is limited, due mainly to local transportation problems. Many areas can be reached only by boat, which makes transportation of research teams and equipment difficult.

Using existing data of culicid records on the country, Nicolescu *et al.* (2002, 2003a, b) published the distribution of mosquitoes in Romania. They named 26 species belonging to seven genera occurring in the territories of the DDBR. Since then, some changes in nomenclature and taxonomy have been proposed and are reflected in the current checklist.

Collections made by the authors between 2006 and 2009 revealed five additional species for the area (indicated * in the checklist), one of which, *Acartomyia zammitii*, was the first authenticated record for Romania. One species has been eliminated from the 26 reported by

Nicolescu *et al.* and six species have been added (one of which, *Oc. cantans*, is not a new record – see Note 6), so the present report increases the number of the species occurring in the DDBR to 31, belonging to 10 genera (Table 1). Notes are added to explain the reasons for either including / eliminating species or for changes in nomenclature.

The organisation of this list takes into account the systematic classification used in the reference work *A Catalog of the Mosquitoes of the World* (Knight & Stone, 1977) and its supplements (Knight, 1978; Ward, 1984; Ward, 1992) and more recent literature by Reinert *et al.* (2006, 2009).

Table 1. Checklist of the mosquitoes of DDBR (new records denoted by asterisk).

Subfamily Anophelinae

Genus *Anopheles*

Subgenus *Anopheles*

1. *atroparvus* van Thiel, 1927
2. *claviger* (Meigen, 1804) (?) (**Note 1**)
3. *hyrcanus* (Pallas, 1771)
4. *maculipennis* Meigen, 1818
5. *messeae* Falleroni, 1926
(**Note 2**)

Subfamily Culicinae

Tribe Aedini

Genus *Acartomyia*

6. *zammitii** (Theobald, 1903) (**Note 3**)

Genus *Aedes*

7. *cinereus* Meigen, 1818

Genus *Aedimorphus*

8. *vexans* (Meigen, 1830) (**Note 4**)

Genus *Dahlia*

9. *geniculata* (Olivier, 1791) (**Note 5**)

Genus *Ochlerotatus*

Subgenus *Woodius*

10. *intrudens* (Dyar, 1919)

Unassigned to subgenus

11. *annulipes* (Meigen, 1830)
12. *cantans* (Meigen, 1818) (**Note 6**)
13. *caspius* (Pallas, 1771)
14. *detritus* (Haliday, 1833)
15. *dorsalis* (Meigen, 1830)
16. *excrucians* (Walker, 1856)
17. *flavescens* (Muller, 1764)
18. *leucomelas* (Meigen, 1804)
19. *pulcritarsis* (Rondani, 1872)

Tribe Culicini

Genus *Culex*

Subgenus *Barraudius*

20. *modestus* Ficalbi, 1890

Subgenus *Culex*

21. *pipiens* Linnaeus, 1758
22. *theileri* Theobald, 1903
23. *torrentium** Martini, 1925 (**Note 7**)

Subgenus *Neoculex*

24. *martinii* Medschid, 1930
25. *territans* Walker, 1856

Tribe Culisetini

Genus *Culiseta*

Subgenus *Allotheobaldia*

26. *longiareolata** (Macquart, 1938) (**Note 8**)

Subgenus *Culiseta*

- 27. *alaskaensis** (Ludlow, 1906) (Note 9)
- 28. *annulata* (Schrank, 1776)
- 29. *subochrea** (Edwards, 1921) (Note 10)

Tribe **Mansoniini**

Genus *Coquillettidia*

- 30. *richiardi* (Ficalbi, 1889)

Genus *Uranotaenia*

- 31. *unguiculata* Edwards, 1913

Notes

Note 1. We question the occurrence of *Anopheles claviger* because it was recorded on the territory of the DDBR only once, 100 years ago (Leon, 1910). This species has not been found in this area since.

Note 2. *Anopheles sacharovi* was found in Romania only in a limited area in Dobrogea, along the Black Sea coast. It represented the main malaria vector in the area. This species disappeared from Romania as a result of drainage and intensive use of insecticides during the anti-malaria campaign. Dupont *et al.* (1974) indicated the drastic reduction of this species from 1960 to 1962 and its disappearance since 1963. Further research in areas formerly occupied by *Anopheles sacharovi* did not record its presence (Bilbîe *et al.*, 1978; Falcuta *et al.*, 2008); hence, it has been removed from the list of mosquitoes from the DDBR.

Note 3. We note for the first time in Romania the presence of the species *Acartomyia zammitii* (= *Aedes zammitii*, prior to Reinert *et al.*, 2006, 2009) based on the capture of 12 females in the Grindul Lupilor area, within the DDBR (Prioteasa *et al.*, 2010).

Note 4. Reinert *et al.* (2009) elevated the subgenus *Aedimorphus* to generic rank, so the former *Aedes vexans* is now *Aedimorphus vexans*.

Note 5. The former *Ochlerotatus geniculatus* became *Dahlia geniculata* after being transferred to the new genus (Reinert *et al.*, 2006).

Note 6. *Ochlerotatus cantans* was recorded in the Danube Delta by Zotta (1932). Nicolescu *et al.* (2002, 2003a,b) omitted including this area within the distribution area of this species in Romania. We captured two *Oc. cantans* females on human bait in Grindul Lupilor on 19 May and 2 June 2009 and include this species in the list of mosquitoes from the DDBR.

Note 7. *Culex torrentium* was found in Gridul Lupilor in 2008. Two males were identified as *Culex torrentium* by the morphology of the genitalia. The differentiation between the females and preimaginal stages belonging to these two species is practically impossible based on their morphology. *Culex torrentium* is sympatric with *Culex pipiens* in the Danube Delta but the latter is more abundant.

Note 8. *Culiseta longiareolata* is also recorded for the first time in the DDBR. A male and female were captured on 19 May 2006 using a CDC light trap near a fish polder in Salcioara village, which belongs to the lacustrine complex Razim–Sinoe. Another female belonging to this species was found on 22 March 2007 in a pigsty in Grindul Lupilor.

Note 9. On 22 June 2006, in Mila 26 (an area situated on Sulina branch - delta) three *Culiseta alaskaensis* females were captured on human bait, and this species was added to the list of mosquitoes from the DDBR (Prioteasa *et al.*, 2007).

Note 10. Prior to our study, *Culiseta subochrea* was recorded only in the larval stage (Nicolescu, 1986; 2000). Most larvae of this species were discovered south of the DDBR, in localities situated along the coast of the Black Sea. Two females of this species were captured, the first one on 19 June 2008 using a bird-baited trap placed on a poplar plantation on the shore of Crisan-Caraorman channel and the second one on 17 November 2008 in a house adjacent to the Sulina branch in the Mila 26 area.

Conclusion

The list of Culicidae recorded in the DDBR includes 31 species. Since the DDBR has an area of approximately 5,800 km², and most of it remains to be investigated for the mosquito fauna, the list of culicid species in this area remains open to further recording.

Acknowledgements

We kindly thank Marinov Mihai and Botond Kiss from the Danube Delta National Institute for their help and support during the entire study period. This study was funded by EU grant GOCE-2003-010284 EDEN and is catalogued by the EDEN Steering Committee as EDEN0220 (www.eden-fp6project.net). The contents of this publication are the sole responsibility of the authors and do not necessarily reflect the views of the European Commission.

References

- Bîlbîe, I., Cristescu, A., Enescu, A., Tăcu, V., Giurcă, I. & Nicolescu, G. (1978) Up to date entomological aspects in the previously endemic areas of malaria in the Danube Plain and Dobrudja. *Archives Roumaines de Pathologie Experimentale et de Microbiologie* **37**, 389–397.
- Duport, M., Lupascu, G., Sandulescu, M., Cristescu, A., Sandulescu, I., Combiescu, I., Enescu, A., Tacu, V., Durbaca, S., Gheorghiu, G., Vişan, M., Voiculescu, A., Petrescu, S., Scarlat, M., Schirer, E., & Cheles, N. (1974) Impact des insecticides sur les anopheles vecteurs en Roumanie. *Archives Roumaines de Pathologie Experimentale et de Microbiologie* **33**, 79–86.

- Falcuta, E., Prioteasa, F.-L. & Nicolescu, G. (2008) Investigations of the anopheline (Diptera: Culicidae) fauna from three areas belonging to the Danube Delta Biosphere Reserve in order to evaluate the risk of malaria re-emergence. *Danube Delta National Institute Scientific Annals* **14**, 15-20.
- Gastescu, P. & Stiuca, R. (2006) *Delta Dunarii Rezervatie a Biosferei*. Ed. Dobrogea, Constanta.
- Knight, K.L. (1978) Supplement to A catalog of the mosquitoes of the world (Diptera: Culicidae). *Thomas Say Foundation, Supp.* **6**, 107 pp.
- Knight, K.L. & Stone, A. (1977) A Catalog of the Mosquitoes of the World (Diptera: Culicidae). 2nd ed. *Thomas Say Foundation* **6**, 611 pp.
- Leon, N. (1910) *Contributiuni la studiul Culicidelor din Romania*. (Contributions to the study of culicids in Romania). Carol Gobl. Bucuresti. 274 pp.
- Nicolescu, G. (1986) Tantarii, pp. 18-103. In: *Insecte vectoare si generatoare de disconfort*. I. Bilbîe and G. Nicolescu (eds.) Editura Medicala, Bucuresti.
- Nicolescu, G. (2000) Culicidele din România: sistematică, distribuție geografică, biologie, rol epidemiologic, combatere integrată. [Culicids in Romania: systematics, geographical distribution, biology, epidemiological role, integrated control]. PhD thesis. *Universitatea București*, Bucharest.
- Nicolescu, G., Vladimirescu, A. & Ciolpan, O. (2002) The distribution of mosquitoes in Romania (Diptera: Culicidae). Part I: *Anopheles*, *Aedes* and *Culex*. *European Mosquito Bulletin* **13**, 17–26.
- Nicolescu, G., Vladimirescu, A. & Ciolpan, O. (2003) The distribution of mosquitoes in Romania (Diptera: Culicidae). Part II: *Culiseta*, *Coquillettidia*, *Ochlerotatus*, *Orthopodomyia* and *Uranotaenia*. *European Mosquito Bulletin* **14**, 1-15.
- Nicolescu, G., Vladimirescu, A. & Ciolpan, O. (2003) The distribution of mosquitoes in Romania (Diptera: Culicidae). Part IV: Detailed maps for *Culiseta*, *Coquillettidia*, *Ochlerotatus*, *Orthopodomyia* and *Uranotaenia*. *European Mosquito Bulletin* **15**, 16-27.
- Prioteasa, F.L., Falcuta, E., Marinov, M. & Nicolescu, G. (2007) Mosquitoes (Diptera: Culicidae) in Mila 26 – Maliuc area (Danube Delta, Romania) – preliminary data. *Danube Delta National Institute Scientific Annals* **13**, 89-96.
- Prioteasa, F.L., Falcuta, E., Nicolescu, G., Teodorescu, I. & Reiter, P. (2010) Confirmation of the presence of *Ochlerotatus zammitii* (Diptera: Culicidae) in Romania. *Romanian Journal of Biology – Zoology* **55**, 43-48.
- Reinert, J.F., Harbach, R.E. & Kitching, I.J. (2006) Phylogeny and classification of *Finlaya* and allied taxa (Diptera: Culicidae: Aedini) based on morphological data from all life stages. *Zoological Journal of the Linnean Society* **148**, 1-101.
- Reinert, J.F., Harbach, R.E. & Kitching, I.J. (2009) Phylogeny and classification of tribe Aedini (Diptera: Culicidae). *Zoological Journal of the Linnean Society* **157**, 700–794.
- Ward, R.A. (1984) Second Supplement to “A Catalog of the Mosquitoes of the World” (Diptera: Culicidae). *Mosquito Systematics* **16**, 227-270.
- Ward, R.A. (1992) Third Supplement to “A Catalog of the Mosquitoes of the World” (Diptera: Culicidae). *Mosquito Systematics* **24**, 177-230.
- Zotta, G. (1932), Etudes sur le paludisme dans le delta du Danube. (I. Anophelisme sans paludisme). *Archives Roumaines de Pathologie Experimentale et de Microbiologie* **5**, 133-176.