

**A revised checklist of European mosquitoes**

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**Abstract**

An updated list is presented of mosquitoes currently recognised in Europe.

**Introduction**

Since the publication of the list of mosquitoes recorded from Europe by Ramsdale & Snow (1999), a number of important developments have taken place which will be referred to briefly in chronological order, and incorporated into the revised list. Also a species from Cyprus, and several from Asiatic Turkey thought likely to occur in European Turkey, are included. Finally, a number of species from European territories outside of geographic Europe are noted.<sup>1</sup>

**Changes to the previous checklist**

Reinert (2000a) described *Fredwardsius*, a new subgenus of *Aedes*, to accommodate *Aedes vittatus* (Bigot, 1861) previously included in subgenus *Aedimorphus*. Reinert compared *Ae. vittatus* with currently recognised subgenera and genera in the tribe Aedini and found that the species possesses unique and unusual features. He therefore established the new subgenus *Fredwardsius*, named after Frederick Edwards, with *Ae. vittatus* as the type species.

The classification of the composite genus *Aedes* was comprehensively revised by Reinert (2000b) who divided the genus into two subgenera: *Aedes* and *Ochlerotatus*, on the basis of consistent primary characters of both the male and female genitalia. The elevation of subgenus *Ochlerotatus* to generic rank was accompanied by a reassignment of the remaining subgenera. Regarding the European fauna, this revision assigned subgenera *Aedes*, *Aedimorphus*, *Fredwardsius* and *Stegomyia* to the genus *Aedes* and placed subgenera *Finlaya*, *Ochlerotatus* and *Rusticoides* in the new genus *Ochlerotatus*. The transfer of species from *Aedes* to *Ochlerotatus* does not result in changing the endings of any of their names, as both generic names are masculine. The proposed two-letter abbreviation for the new genus is *Oc*.

The name *Ochlerotatus* was proposed by Lynch-Arribálzaga (1891) for a new genus and was adopted by authors in the early part of the last century. Thus, for example, Lang (1920) included "*Ochlerotatus annulipes*, *O. detritus* and *O. rusticus*" in his *Handbook* and so, apart from the change in generic abbreviation following the recent revision, is using current terminology. As a consequence of the resurrection of genus *Ochlerotatus*, one species in the following checklist (*Ochlerotatus echinus*) and another from the Canary Isles and Madeira mentioned below (*Oc. eatoni*) revert to their original name, both having been described by Frederick Edwards in the early decades of the 1900s.

Three exotic species of mosquito have been introduced into Europe through the used tyre trade: *Aedes albopictus*, *Ochlerotatus atropalpus* and *Oc. japonicus*. Additional to the last checklist is *Oc. japonicus* which was discovered in the Orne Departement of northern France (Schaffner *et al.*, 2003) and more recently in Belgium (Francis Schaffner, personal communication). This species is native to Korea, Japan, Taiwan and southern China, where larvae are found in a variety of natural and artificial containers. Prior to this first record of *Oc. japonicus* in Europe, it had been intercepted in 1993 in used tyres imported into New Zealand and in 1998 was discovered in New York and New Jersey. A study using DNA sequencing indicates that the specimens discovered in France and Belgium originated, almost certainly independently, from Japan (Francis Schaffner, personal communication).

The taxonomic status of *Anopheles subalpinus* Hackett & Lewis and *An. melanoon* Hackett were reviewed by Linton *et al.* (2002). Their data showed that mosquitoes reared from barred and mottled eggs identifiable as those of *An. subalpinus*, and those derived from melanic eggs typical of *An. melanoon* were genetically identical. The authors also quote reports of homosequential polytene chromosomes in these taxa and cross-matings that result in viable, fertile offspring to support the view that *An. melanoon* and *An. subalpinus* are conspecific. Linton *et al.* (2002) concluded that *An. subalpinus* and *An. melanoon* represented a single species that has polymorphic eggs and therefore formally placed *An. subalpinus* Hackett & Lewis, 1935 in synonymy with *An. melanoon* Hackett, 1934.

A new species, *Culex (Neoculex) europaeus* Ramos, Ribeiro & Harrison, 2003, previously known in Portugal as *Cx. territans*, has recently been recognised in Europe (Ramos *et al.*, 2003). The male, female, larva and pupa of *Cx. europaeus* are described following examination of material from Portugal and comparison with reared specimens of *Culex (Neoculex) territans* from North Carolina, USA. The features of the new taxon are discussed by the authors and identification keys to the male and female genitalia and pupa provided.

Peus (1972) placed *rossicus* as a subspecies of *Ae. esoensis*. This was recognized by Ward (1984) and *rossicus* is currently listed as a subspecies of *Ae. esoensis*. The taxon *rossicus* has now been returned to species by Gornostaeva (2003) following a review of the morphology and distribution of the taxa *cinereus*, *esoensis*, *rossicus* and *geminus* in Russia. The view of Gornostaeva is that *Ae. esoensis* Yamada, *Ae. rossicus* Dolbeskin, Gorickaja & Mitrofanova, *Ae. cinereus* Meigen, and *Ae. geminus* Peus should be regarded as separate species of subgenus *Aedes*. She is convinced that differences between the male genitalia and the absence of intermediate forms may be regarded as indisputable evidence for the non-conspecificity of the four species.

With the publication of the checklist of the mosquitoes of Cyprus by Hadjivassilis (2000), *Ochlerotatus phoeniciae* Coluzzi & Sabatini should be added to the wider European list. This species is also reported from Turkey by Ramsdale *et al.* (2001) but does not occur in European Turkey where the niche is occupied by the sibling species *Oc. zammitii* (Coluzzi *et al.*, 1974). The limits of *Oc. pulchritarsis* and *Culex tritaeniorhynchus*, also reported from Turkey by Ramsdale *et al.* (2001), are uncertain and are listed below indicated by an asterisk.

Finally, it should be noted that a number of faunal databases extend the area of Europe to include islands administered by European countries. Thus the forthcoming *Fauna Europaea* database includes *Ochlerotatus (Finlaya) eatoni* Edwards (Canary Isles and Madeira), *Culex (Maillotia) arbieeni* Salem (Canary Isles) and *Culiseta (Culiseta) atlantica* (Edwards) (Azores).

## Checklist of Culicidae recorded from Europe

Genus	Subgenus	Species
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*Anopheles* Meigen, 1818

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*algeriensis* Theobald, 1903  
*atroparvus* van Thiel, 1927  
*beklemishevi* Stegnii & Kabanova, 1976  
*claviger* (Meigen, 1804)  
*hyrcanus* (Pallas, 1771)  
*labranchiae* Falleroni, 1926  
*maculipennis* Meigen, 1818  
*marteri* Senevet & Prunelle, 1927  
*melanoon* Hackett, 1934  
*messeae* Falleroni, 1926  
*petragnani* Del Vecchio, 1939  
*plumbeus* Stephens, 1828  
*sacharovi* Favre, 1903

*Cellia* Theobald, 1902

- cinereus* Theobald, 1901
- multicolor* Cambouliu, 1902
- sergentii* (Theobald, 1907)
- superpictus* Grassi, 1899

*Aedes* Meigen, 1818

*Aedes* Meigen, 1818

- cinereus* Meigen, 1818
- geminus* Peus, 1970
- rossicus* Dolbeskin, Gorickaja & Mitrofanova, 1930

*Aedimorphus* Theobald, 1903

- vexans* (Meigen, 1830)

*Fredwardsius* Reinert, 2000

- vittatus* (Bigot, 1861)

*Stegomyia* Theobald, 1901

- aegypti* (Linnaeus, 1762)
- albopictus* (Skuse, 1894)
- cretinus* Edwards, 1921

*Ochlerotatus* Lynch-Arribáizaga, 1891

*Finlaya* Theobald, 1903

- echimus* Edwards, 1920
- geniculatus* (Olivier, 1791)
- gilcolladoi* Villa, Rodriguez & Llera, 1985
- japonicus* (Theobald, 1901)

*Ochlerotatus* Lynch-Arribáizaga, 1891

- annulipes* (Meigen, 1830)
- atropalpus* (Coquillett, 1902)
- behningi* (Martini, 1926)
- berlandi* (Séguy, 1921)
- cantans* (Meigen, 1818)
- caspius* (Pallas, 1771)<sup>2</sup>
  - caspius* species A (Cianchi, Urbanelli, Sabatini, Tordi & Bullini, 1980)
  - caspius* species B (Cianchi, Urbanelli, Sabatini, Tordi & Bullini, 1980)
- cataphylla* (Dyar, 1916)
- coluzzii* (Rioux, Guilvard & Pasteur, 1998)
- communis* (De Geer, 1776)
- cyprius* (Ludlow, 1919)
- detritus* (Haliday, 1833)
- diantaeus* (Howard, Dyar & Knab, 1912)
- dorsalis* (Meigen, 1830)
- duplex* (Martini, 1926)
- euedes* (Howard, Dyar & Knab, 1912)
- excrucians* (Walker, 1856)
- flavescens* (Müller, 1764)
- hexodontus* (Dyar, 1916)
- hungaricus* (Mihalyi, 1955)
- impiger* (Walker, 1848)
- intrudens* (Dyar, 1919)
- leucomelas* (Meigen, 1804)
- mariae* (Sergent & Sergent, 1903)
- nigrinus* (Eckstein, 1918)
- nigripes* (Zetterstedt, 1838)

*phoeniciae* (Coluzzi & Sabatini, 1968) \*  
*pionips* (Dyar, 1919)  
*pulcritarsis* (Rondani, 1872) \*  
*pullatus* (Coquillett, 1904)  
*punctodes* (Dyar, 1922)  
*punctor* (Kirby, 1837)  
*riparius* (Dyar & Knab, 1907)  
*sticticus* (Meigen, 1838)  
*surcoufi* (Theobald, 1912)  
*thibaulti* (Dyar & Knab, 1910)  
*zammitii* (Theobald, 1903)

*Rusticoides* Shevchenko & Prudkina, 1973  
*krymmontanus* (Alekseev, 1989)  
*lepidonotus* (Edwards, 1920)  
*quasirusticus* (Torres Cañamares, 1951)  
*refiki* (Medschid, 1928)  
*rusticus* (Rossi, 1790)  
*subdiversus* (Martini, 1926)

*Coquillettidia* Dyar, 1905

*Coquillettidia* Dyar, 1905  
*buxtoni* (Edwards, 1923)  
*richiardii* (Ficalbi, 1889)

*Culex* Linnaeus 1758

*Barraudius* Edwards, 1921  
*modestus* Ficalbi, 1890  
*pusillus* Macquart, 1850

*Culex* Linnaeus, 1758

*brumpti* Galliard, 1931  
*laticinctus* Edwards, 1913  
*mimeticus* Noé, 1899  
*perexiguus* Theobald, 1903  
*pipiens* Linnaeus, 1758  
*theileri* Theobald, 1903  
*torrentium* Martini, 1925  
*tritaeniorhynchus* Giles, 1901 \*

*Maillotia* Theobald, 1907

*deserticola* Kirkpatrick, 1925  
*hortensis* Ficalbi, 1889

*Neoculex* Dyar, 1905

*europaeus* Ramos, Ribeiro & Harrison, 2003  
*impudicus* Ficalbi, 1890  
*martinii* Medschid, 1930  
*territans* Walker, 1856

*Culiseta* Felt, 1904

*Allotheobaldia* Broelemann, 1919  
*longiareolata* (Macquart, 1838)

*Culicella* Felt, 1904

*fumipennis* (Stephens, 1825)  
*litorea* (Shute, 1928)  
*morsitans* (Theobald, 1901)  
*ochroptera* (Peus, 1935)

*Culiseta* Felt, 1904

*alaskaensis* (Ludlow, 1906)  
*annulata* (Schränk, 1776)  
*bergrothi* (Edwards, 1921)  
*glaphyoptera* (Schiner, 1864)  
*subochrea* (Edwards, 1921)

*Orthopodomyia* Theobald, 1904

*pulcripalpis* (Rondani, 1872)

*Uranotaenia* Lynch-Arribálzaga, 1891

*Pseudoficalbia* Theobald, 1912  
*unguiculata* Edwards, 1913

**Footnotes:**

<sup>1</sup> Checklists are ever changing and further research into the species already established in Europe using morphological and molecular techniques will reveal new species and modify their taxonomy, while further faunistic studies will elucidate new species, perhaps as a consequence of global climate change and international trade.

<sup>2</sup> *Ochlerotatus caspius* (Pallas, 1771) has been shown to comprise at least two unnamed species.

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