

## Updated checklist of the mosquitoes (Diptera: Culicidae) of Hungary

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**Abstract:** The mosquito fauna of Hungary currently includes 54 taxa (53 species + 1 biotype). Four new species have been detected in the last seven years. One species was probably present earlier in the Hungarian fauna (*Aedes geminus*), but three new invasive species (*Ac. albopictus*, *Ac. japonicus japonicus*, *Ac. koreicus*) have been introduced or invaded recently.

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### Introduction

The latest checklist of the mosquitoes of Hungary was published in 2012. Tóth & Kenyeres (2012) summarised the history of the Hungarian mosquito research, and compiled the distribution maps of the known species, based on the published data. In recent years the continued presence of some invasive mosquito species has been reported throughout Europe, out of which three species have already been detected in Hungary: *Ac. japonicus japonicus* (Sztikler *et al.*, 2015), *Ac. koreicus* (Kurucz *et al.*, 2016), and *Ac. albopictus* (Seidel *et al.*, 2016). In addition, one native species, *Ac. geminus* was reported as new for the Hungarian fauna (Soltész, 2012). Here we provide an updated checklist of the Hungarian mosquito fauna.

### Current Checklist

A total of 54 mosquito taxa have been recorded in Hungary, belonging to 7 genera, as follows: *Aedes* (27 species), *Anopheles* (7), *Coquillettidia* (1), *Culex* (8), *Culiseta* (8), *Orthopodomyia* (1), *Uranotaenia* (1).

The checklist was compiled according to the current lists of Tóth & Kenyeres (2012), Wilkerson *et al.* (2015) and the Systematic Catalog of Culicidae

(<http://www.mosquitocatalog.org/>).

#### Family: CULICIDAE

##### Subfamily: ANOPHELINAE

Genus: *Anopheles* Meigen, 1818

Subgenus: *Anopheles* Meigen, 1818

- (1) *Anopheles (Anopheles) algeriensis* Theobald, 1903
- (2) *Anopheles (Anopheles) atroparvus* Van Thiel, 1927
- (3) *Anopheles (Anopheles) claviger* (Meigen, 1804)
- (4) *Anopheles (Anopheles) hyrcanus* (Pallas, 1771)
- (5) *Anopheles (Anopheles) maculipennis* Meigen, 1818
- (6) *Anopheles (Anopheles) messeae* Falleroni, 1926
- (7) *Anopheles (Anopheles) plumbeus* Stephens, 1828

##### Subfamily: CULICINAE

Genus: *Aedes* Meigen, 1818

Subgenus: *Aedes* Meigen, 1818

- (8) *Aedes (Aedes) cinereus* Meigen, 1818
- (9) *Aedes (Aedes) geminus* Peus, 1970 **Note 1**
- (10) *Aedes (Aedes) rossicus* Dolbeshkin, Goritzkaja & Mitrofanova, 1930  
Subgenus: *Aedimorphus* Theobald, 1903
- (11) *Aedes (Aedimorphus) vexans* (Meigen, 1830)  
Subgenus: *Dahlia* Reinert, Harbach & Kitching, 2006
- (12) *Aedes (Dahlia) geniculatus* (Olivier, 1791)  
Subgenus: *Hulecoeteomyia* Theobald, 1903
- (13) *Aedes (Hulecoeteomyia) japonicus japonicus* (Theobald, 1901) **Note 2**
- (14) *Aedes (Hulecoeteomyia) koreicus* (Edwards, 1917) **Note 3**  
Subgenus: *Ochlerotatus* Lynch Arribalzaga, 1891
- (15) *Aedes (Ochlerotatus) annulipes* (Meigen, 1830)
- (16) *Aedes (Ochlerotatus) cantans* (Meigen, 1818)
- (17) *Aedes (Ochlerotatus) caspius* (Pallas, 1771)
- (18) *Aedes (Ochlerotatus) cataphylla* Dyar, 1916
- (19) *Aedes (Ochlerotatus) communis* (De Geer, 1776)
- (20) *Aedes (Ochlerotatus) detritus* Haliday, 1833
- (21) *Aedes (Ochlerotatus) dorsalis* (Meigen, 1830)
- (22) *Aedes (Ochlerotatus) excrucians* (Walker, 1856)
- (23) *Aedes (Ochlerotatus) flavescens* (Müller, 1764)
- (24) *Aedes (Ochlerotatus) hungaricus* Mihályi, 1955
- (25) *Aedes (Ochlerotatus) leucomelas* (Meigen, 1804)
- (26) *Aedes (Ochlerotatus) nigrinus* (Eckstein, 1918)
- (27) *Aedes (Ochlerotatus) pulchritarsis* (Rondani, 1872)
- (28) *Aedes (Ochlerotatus) pullatus* (Coquillett, 1904)
- (29) *Aedes (Ochlerotatus) punctator* (Kirby, 1837)
- (30) *Aedes (Ochlerotatus) refiki* Medschid, 1928
- (31) *Aedes (Ochlerotatus) rusticus* (Rossi, 1790)
- (32) *Aedes (Ochlerotatus) sticticus* (Meigen, 1838)
- (33) *Aedes (Ochlerotatus) surcoufi* (Theobald, 1912)  
Subgenus: *Stegomyia* Theobald, 1903
- (34) [*Aedes (Stegomyia) albopictus* (Skuse, 1894)] **Note 4**

Genus: *Coquillettidia* Dyar, 1905

- Subgenus: *Coquillettia* Dyar, 1905  
 (35) *Coquillettia (Coquillettia) richiardii* (Ficalbi, 1889)  
 Genus: *Culex* Linnaeus, 1758  
 Subgenus: *Barraudius* Edwards, 1921  
 (36) *Culex (Barraudius) modestus* Ficalbi, 1890  
 Subgenus: *Culex* Linnaeus, 1758  
 (37) *Culex (Culex) mimeticus* Noé, 1899  
 (38) *Culex (Culex) pipiens pipiens* Linnaeus, 1758  
*Culex (Culex) pipiens pipiens* biotype *molestus* Forskal, 1775  
 (39) *Culex (Culex) theileri* Theobald, 1903  
 (40) *Culex (Culex) torrentium* Martini, 1924  
 Subgenus: *Maillotia* Theobald, 1907  
 (41) *Culex (Maillotia) hortensis* Ficalbi, 1890  
 Subgenus: *Neoculex* Dyar, 1905  
 (42) *Culex (Neoculex) martinii* Medschid, 1930  
 (43) *Culex (Neoculex) territans* Walker, 1856  
 Genus: *Culiseta* Felt, 1904  
 Subgenus: *Allotheobaldia* Broelemann, 1919  
 (44) *Culiseta (Allotheobaldia) longiareolata* (Macquart, 1838)  
 Subgenus: *Culicella* Felt, 1904  
 (45) *Culiseta (Culicella) fumipennis* (Stephens, 1825)  
 (46) *Culiseta (Culicella) morsitans* (Theobald, 1901)  
 (47) *Culiseta (Culicella) ochroptera* (Peus, 1935)  
 Subgenus: *Culiseta* Felt, 1904  
 (48) *Culiseta (Culiseta) alaskaensis* (Ludlow, 1906)  
 (49) *Culiseta (Culiseta) annulata* (Schrank, 1776)  
 (50) *Culiseta (Culiseta) glaphyroptera* (Schiner, 1864)  
 (51) *Culiseta (Culiseta) subochrea* (Edwards, 1921)  
 Genus: *Orthopodomyia* Theobald, 1904  
 (52) *Orthopodomyia pulcripalpis* (Rondani, 1872)  
 Genus: *Uranotaenia* Lynch Arribalzaga, 1891  
 Subgenus: *Pseudoficalbia* Theobald, 1912  
 (53) *Uranotaenia (Pseudoficalbia) unguiculata* Edwards, 1913

Square brackets = species not established in the country.

## Notes

### Note 1. *Aedes geminus*

In Hungary *Ae. geminus* was detected for the first time in an area of Pilis Mts, north-western to Budapest (Pilisszentlászló, Pilisszentlélek, Pilisszentkereszt). Soltész (2012) identified the species based on larvae and ex larvae adult male mosquitoes. Most likely the species remained unnoticed until 2012 (Kenyeres & Tóth, 2008), probably due to the lack of male genitalia investigation and thus the possible misidentification with its sibling species *Ae. cinereus*.

### Note 2. *Aedes japonicus japonicus*

*Aedes japonicus japonicus* has been reported for the first time in Hungary from around Felsőszőlőnk in August 2012 (Seidel *et al.*, 2016). During the examination of rainwater containers, larvae of the species were collected altogether with larvae of *Culex pipiens* and *Cx. hortensis*. Spreading of the species was detected by ovitrapping and larvae collections focusing on artificial containers in cemeteries in the region of Baja in 2015 (Sztikler *et al.*, 2015). The species now regularly occurs in the south-western region of the country. In addition, we detected the species in the region of Lake Balaton (on several occasions between April and December 2017 and again from April 2018) and the overwintering of the species has probably happened at

the egg stage (Sáringér-Kenyeres & Kenyeres, 2018). The local distribution of the species can be explained as a result of active but slow invasion.

### Note 3. *Aedes koreicus*

*Aedes koreicus* was detected for the first time by Kurucz *et al.* (2016) in the urban area of Pécs (south-western Hungary, June 2016), when three females were collected with CDC trap. The same authors regularly found low numbers of *Ae. koreicus* at different places but only downtown since then (2016-2017), which shows the species has overwintered in that area (G. Kemenesi, personal communication). The pathway of the introduction of the species into Hungary has not been identified.

### Note 4. *Aedes albopictus*

The first specimens of *Ae. albopictus* were detected in a forest edge near Baja in 2014 (Sztikler *et al.*, 2015) (two biting females). The species has been detected again by ovitrapping in the southern and south-western part of the country in 2015 (Sztikler *et al.*, 2015). Subsequent repeated investigation of the areas has not yielded any additional detections, neither by the authors of this article, nor by other researchers. To date there is no evidence of overwintering populations of *Ae. albopictus* in Hungary. According to our current knowledge the species is occasionally introduced into Hungary, but cannot yet be considered as a member of the Hungarian mosquito fauna.

### Note 5

Three other invasive mosquito species [*Aedes aegypti* (Linnaeus 1762), *Ae. atropalpus* (Coquillett, 1902), *Ae. triseriatus* (Say, 1823)] have been occasionally reported in Europe during recent decades (Medlock *et al.*, 2012). These species have not been found to date in Hungary according to our knowledge.

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