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**Sumodan PK**

Post-Graduate and Research,  
Department of Zoology,  
Government College Madappally,  
Vatakara, Kerala, India

# Mosquito fauna (diptera: culicidae) of Kerala, India: An update

**Sumodan PK**DOI: <https://doi.org/10.22271/23487941.2024.v11.i2a.768>**Abstract**

A complete list of mosquito species in the South Indian state of Kerala has been compiled for the first time since the beginning of the mosquito-faunal studies in 1901. A total of 151 species under 18 genera have been recorded from the state to date. This includes 20 vector species of six mosquito-borne diseases, viz., Lymphatic Filariasis, Malaria, Japanese Encephalitis, Dengue, Chikungunya, West Nile Virus, and Zika under 4 genera. The state also contributed to the world's mosquito fauna in the form of 17 newly described species under 9 genera. This compilation is hoped to be of tremendous use to the researchers, policymakers, as well as public health officials of the state.

**Keywords:** *Anopheles*, *Culex*, *Aedes*, *Mansonia*, Malaria, Lymphatic Filariasis, Japanese Encephalitis, Dengue, Chikungunya, West Nile Virus, Zika

**Introduction**

Kerala, the southwestern state in India, has been witnessing an upward trend in mosquito-borne diseases in recent times. Currently, the state is under the threat of seven mosquito-borne diseases, viz., Lymphatic Filariasis (Both bancroftian and brugian), Malaria, Japanese Encephalitis, Dengue, Chikungunya, West Nile Virus, and Zika <sup>[1, 2]</sup>. The state is also home to a rich and diverse fauna of mosquitoes. The studies on mosquito fauna of Kerala were pioneered by the English workers Giles and Theobald separately in 1901. The former described three species from Kollam, viz., *Ficalbia minima*, *Mansonia annulifera* and *Ma. uniformis* <sup>[3]</sup>. The latter described *Cx. bitaeniorhynchus* and *Cx. tritaeniorhynchus* from Travancore (exact locality not mentioned) <sup>[4]</sup>. The mosquito fauna of the state is amply represented in the two volumes on the mosquito fauna of British India compiled by Christopher <sup>[5]</sup> and Barraud <sup>[6]</sup>. Christopher reported 16 Anopheline species and Barraud 41 species under Culicinae and Toxorhynchitinae. Iyengar reported 72 species of mosquitoes from the state while studying the epidemiology of Filariasis in Travancore <sup>[7]</sup>. In the post-independence period, Tewari and Hiriyani described two new species of *Aedes* from the state, viz., *Ae. agastyai* and *Ae. rubenae* <sup>[8]</sup>. Hiriyani *et al.* surveyed a Japanese encephalitis endemic area in Kerala and reported 21 species of mosquitoes <sup>9</sup>. Subsequently, Arunachalam *et al.* reported 18 species of mosquitoes during a study for determining the vectors of Japanese encephalitis <sup>[10]</sup>. Rajavel *et al.* reported 17 species of mosquitoes from the Mangrove forests of Kannur in North Kerala <sup>[11]</sup>. In 2009 Tyagi *et al.* described a new species viz., *Anopheles pseudosundaicus* from Kollam <sup>[12]</sup>. In 2012 Sumodan reported breeding of 12 species of mosquitoes in latex collecting containers in the rubber plantations of Kerala <sup>[13]</sup>. Subsequently, in 2013, Balasubramanian and Nikhil reported 44 species of mosquitoes under 11 genera from Alappuzha and Kottayam districts <sup>[14]</sup>. There was an attempt to list the mosquito species recorded from Kerala in 2014 but it was not complete <sup>[15]</sup>. The present paper is intended to provide an updated list of all the mosquito species recorded from the state since 1901 and their vectorial status.

**Methodology**

The data on the mosquito species reported from Kerala has been compiled by extensive literature surveys, both offline and online. Only morphospecies were considered for the compilation.

**Corresponding Author:****Sumodan PK**

Post-Graduate and Research,  
Department of Zoology,  
Government College Madappally,  
Vatakara, Kerala, India

The taxonomy of the genus *Aedes* was based on Wilkerson *et al.* [16].

## Results

Mosquito species reported so far from Kerala have been compiled under the following five tables. The first four tables are of vector genera (*Aedes*, *Anopheles*, *Culex* and *Mansonia*) and the fifth one is that of non-vector genera. Species originally

described from the geographical limits of the state are compiled in the sixth table.

### *Aedes* Meigen, 1818

As can be seen in Table 1, so far 31 *Aedes* species have been reported from Kerala. The list includes three vectors of Dengue, Chikungunya and Zika, viz. *Ae. aegypti*, *Ae. albopictus*, and *Ae. vittatus*.

**Table 1:** *Aedes* species of Kerala

S. No.	Species	Reference for distribution in Kerala	Vector status
1.	<i>Ae. aegypti</i> Linnaeus, 1762 (Subgenus: <i>Stegomyia</i> )	Barraud (1934) [6]	Dengue, Chikungunya, Zika
2.	<i>Ae. agastyai</i> Tewari & Hiriyan, 1992 [8] (Subgenus: <i>Tewarius</i> )	Tewari and Hiriyan (1992) [8]	
3.	<i>Ae. albopictus</i> (Skuse), 1894 (Subgenus: <i>Stegomyia</i> )	Barraud (1934) [6] Iyengar (1938) [7] Rajavel <i>et al.</i> (2006) [11]	Dengue, Chikungunya, Zika
4.	<i>Ae. barraudi</i> (Edwards), 1934 (Subgenus: <i>Paraedes</i> )	Tewari and Hiriyan (1992) [8]	
5.	<i>Ae. caecus</i> (Theobald), 1901 (Subgenus: <i>Aedimorphus</i> )	Barraud (1934) [6]	
6.	<i>Ae. chrysolineatus</i> (Theobald), 1907 (Subgenus: <i>Hulecoeteomyia</i> )	Barraud (1934) [6] Iyengar (1938) [7] Sumodan (2012) [13]	
7.	<i>Ae. cogilli</i> Edwards, 1922 (Subgenus: <i>Phagomyia</i> )	Sumodan (2012) [13]	
8.	<i>Ae. desmotes</i> Giles, 1904 (Subgenus: <i>Stegomyia</i> )	Barraud (1934) [6]	
9.	<i>Ae. greenii</i> Theobald, 1903 (Subgenus: <i>Bruceharrisonius</i> )	Iyengar (1938) [7] Balasubramanian & Nikhil (2013) [14]	
10.	<i>Ae. gubernatoris</i> (Giles), 1901 (Subgenus: <i>Phagomyia</i> )	Sumodan (2012) [13]	
11.	<i>Ae. harveyi</i> Barraud, 1923 (Subgenus: <i>Hulecoeteomyia</i> )	Sumodan (2012) [13]	
12.	<i>Ae. iyengari</i> Edwards, 1923 (Subgenus: <i>Petermattinglyius</i> )	Iyengar (1938) [7]	
13.	<i>Ae. jamesi</i> Edwards, 1914 (Subgenus: <i>Aedimorphus</i> )	Iyengar (1938) [7]	
14.	<i>Ae. kanarensis</i> Barraud, 1934 [6] (Subgenus: <i>Dendroskusea</i> )	Barraud (1934) [6]	
15.	<i>Ae. khazani</i> Edwards, 1922 (Subgenus: <i>Phagomyia</i> )	Barraud (1934) [6] Iyengar (1938) [7]	
16.	<i>Ae. macdougalli</i> Edwards, 1922 (Subgenus: <i>Collessius</i> )	Thankachan and Gopinath (2017) [17]	
17.	<i>Ae. mediopunctatus</i> Theobald, 1905 (Subgenus: <i>Stegomyia</i> )	Barraud (1934) [6]	
18.	<i>Ae. menoni</i> Mattingly 1958 (Subgenus: <i>Paraedes</i> )	Mattingly (1958) [18]	
19.	<i>Ae. niveus</i> (Ludlow, 1903) (Subgenus: <i>Downsiomyia</i> )	Thankachan <i>et al.</i> (2023) [19]	
20.	<i>Ae. novalbopictus</i> Barraud, 1931 (Subgenus: <i>Stegomyia</i> )	Rajavel <i>et al.</i> (2006) [11]	
21.	<i>Ae. ostentatio</i> (Leicester), 1908 (Subgenus: <i>Paraedes</i> )	Barraud (1934) [6]	
22.	<i>Ae. pipersalatus</i> (Giles), 1902 (Subgenus: <i>Aedimorphus</i> )	Iyengar (1938) [7]	
23.	<i>Aedes prominens</i> Barraud, 1923. (Subgenus: <i>Phagomyi</i> )	Rajavel <i>et al.</i> (2011) [20]	
24.	<i>Ae. Pseudoalbopictus</i> (Subgenus: <i>Stegomyia</i> )	Thankachan and Gopinath (2017) [17]	
25.	<i>Ae. pseudotaeniatus</i> (Giles), 1901 (Subgenus: <i>Collessius</i> )	Iyengar (1938) [7]	
26.	<i>Ae. rubenae</i> Tewari & Hiriyan, 1992 [8] (Subgenus: <i>Tewarius</i> )	Tewari and Hiriyan (1992) [8]	
27.	<i>Ae. subalbopictus</i> Barraud, 1931 (Subgenus: <i>Stegomyia</i> )	Sumodan (2012) [13]	
28.	<i>Ae. vexans</i> (Meigen), 1830 (Subgenus: <i>Aedimorphus</i> )	Rajavel <i>et al.</i> (2006) [11]	
29.	<i>Ae. vittatus</i> (Bigot), 1861 (Subgenus: <i>Fredwardsius</i> )	Barraud, (1934) [6] Iyengar (1938) [7] Rajavel <i>et al.</i> (2006) [11]	Dengue, Chikungunya, Zika
30.	<i>Ae. w-albus</i> Theobald, 1905 (Subgenus: <i>Stegomyia</i> )	Balasubramanian & Nikhil (2013) [14]	
31.	<i>Ae. wardi</i> Reinert, 1976 (Subgenus: <i>Rhinoskusea</i> )	Rajavel <i>et al.</i> (2006) [11]	

### *Anopheles* Meigen, 1818

There are 39 *Anopheles* species in the state including 5 principal vectors (*An. culicifacies*, *An. dirus*, *An. fluviatilis*, *An. minimus* and *An. stephensi*) and 3 secondary vectors

(*An. annularis*, *An. philippinensis* and *An. varuna*) of malaria (Table 2). The *Anopheles* species of Kerala belong to two subgenera viz., *Anopheles* and *Cellia*.

**Table 2:** *Anopheles* species of Kerala

S. No.	Species	Reference for distribution in Kerala	Vector status
1.	<i>An. aconitus</i> Doenitz, 1902 (Subgenus: <i>Cellia</i> )	Christophers (1933) [5] Iyengar (1938) [7]	Secondary vector of malaria
2.	<i>An. aikenii</i> James, 1903 (Subgenus: <i>Anopheles</i> )	Iyengar (1938) [7] Nagpal and Sharma (1995) [21]	
3.	<i>An. annandalei</i> Prasad 1918 (Subgenus: <i>Anopheles</i> )	Iyengar (1938) [7]	
4.	<i>An. annularis</i> Van der Wulp, 1884 (Subgenus: <i>Cellia</i> )	Christophers (1933) [5] Iyengar (1938) [7]	
5.	<i>An. barbirostris</i> Van der Wulp, 1884 (Subgenus: <i>Anopheles</i> )	Christophers (1933) [5] Iyengar (1938) [7]	Primary vector of Malaria
6.	<i>An. culicifacies</i> Giles, 1901 (Subgenus: <i>Cellia</i> )	Christophers (1933) [5] Iyengar (1938) [7]	
7.	<i>Anopheles crawfordi</i> Reid, 1953 (Subgenus: <i>Anopheles</i> )	Rajavel <i>et al.</i> (2011) [20]	
8.	<i>An. culiciformis</i> Cogill, 1903 (Subgenus: <i>Anopheles</i> )	Christophers (1933) [5]	Primary vector of Malaria
9.	<i>An. dirus</i> Peyton & Harrison, 1979 (Subgenus: <i>Cellia</i> )	Nagpal and Sharma (1995) [21]	

10.	<i>An. elegans</i> (James), 1903 (Subgenus: <i>Cellia</i> )	Nagpal and Sharma (1995) <sup>[21]</sup>	Primary vector of Malaria	
11.	<i>An. fluviatilis</i> James, 1902 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup>		
12.	<i>An. gigas</i> Giles, 1901 (Subgenus: <i>Anopheles</i> )	Radhakrishnan (2019) <sup>[22]</sup>		
13.	<i>An. insulaeflorum</i> (Swell. & Swell.), 1919 (Subgenus: <i>Anopheles</i> )	Nagpal and Sharma (1995) <sup>[21]</sup> Iyengar (1938) <sup>[7]</sup>		
14.	<i>Anopheles interruptus</i> Puri, 1929 (Subgenus: <i>Anopheles</i> )	Rajavel <i>et al.</i> (2011) <sup>[20]</sup>		
15.	<i>An. jamesi</i> Theobald, 1901 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup>		
16.	<i>An. jeyporiensis</i> James, 1902 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup>		
17.	<i>An. karwari</i> (James), 1903 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Covell and Singh (1939) <sup>[23]</sup>		
18.	<i>An. kochi</i> Doenitz, 1901 (Subgenus: <i>Cellia</i> )	Radhakrishnan (2019) <sup>[22]</sup>		
19.	<i>An. leucosphyrus</i> Donitz, 1901 (Subgenus: <i>Cellia</i> )	Iyengar (1938) <sup>[7]</sup>		
20.	<i>Anopheles lindesayi</i> Giles, 1900 (Subgenus: <i>Anopheles</i> )	Rajavel <i>et al.</i> (2011) <sup>[11]</sup>		
21.	<i>An. maculatus</i> Theobald, 1901 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup>		
22.	<i>An. majidi</i> Young and Majid, 1928 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup>		
23.	<i>An. minimus</i> Theobald, 1901 (Subgenus: <i>Cellia</i> )	Nagpal and Sharma (1995) <sup>[21]</sup>		Primary vector of Malaria
24.	<i>An. mirans</i> Sallum & Peyton, 2005 (Subgenus: <i>Cellia</i> )	Rajavel <i>et al.</i> (2011) <sup>[11]</sup>		
25.	<i>An. moghulensis</i> Christophers, 1924 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup>		
26.	<i>An. nigerrimus</i> Giles, 1900 (Subgenus: <i>Anopheles</i> )	Iyengar (1938) <sup>[7]</sup> Nagpal and Sharma (1995) <sup>[21]</sup>		
27.	<i>An. pallidus</i> Theobald, 1901 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup>		
28.	<i>An. peditaeniatus</i> (Leicester), 1903 (Subgenus: <i>Anopheles</i> )	Arunachalam <i>et al.</i> (2004) <sup>[10]</sup>	Secondary vector of malaria	
29.	<i>An. philippinensis</i> Ludlow, 1902 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup>		
30.	<i>An. pseudosundaicus</i> Tyagi <i>et al.</i> , 2009 (Subgenus: <i>Cellia</i> )	Tyagi <i>et al.</i> (2009) <sup>[12]</sup>		
31.	<i>Anopheles pseudowillmori</i> Theobald, 1910 (Subgenus: <i>Cellia</i> )	Rajavel <i>et al.</i> (2011) <sup>[11]</sup>	Primary vector of Malaria	
32.	<i>An. sinensis</i> (Wiedemann), 1828 (Subgenus: <i>Anopheles</i> )	Balasubramanian & Nikhil, 2013 <sup>[14]</sup>		
33.	<i>An. sintoni</i> Puri, 1929 (Subgenus: <i>Anopheles</i> )	Christophers (1933) <sup>[5]</sup>		
34.	<i>An. splendidus</i> Koiduzmi, 1920 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup>		
35.	<i>An. stephensi</i> Liston, 1901 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup>		
36.	<i>An. subpictus</i> Grassi, 1899 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup>	Primary vector of Malaria	
37.	<i>An. tessellatus</i> Theobald, 1901 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup>		
38.	<i>An. vagus</i> Doenitz, 1902 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup>		
39.	<i>An. varuna</i> Iyengar, 1921 (Subgenus: <i>Cellia</i> )	Christophers (1933) <sup>[5]</sup> Iyengar (1938) <sup>[7]</sup>	Secondary vector of malaria	

### *Culex* Linnaeus, 1758

There are 31 *Culex* species in Kerala including vectors of Japanese Encephalitis (*Cx. bitaeniorhynchus*, *Cx. gelidus*, *Cx.*

*vishnui*, *Cx. pseudovishnui* and *Cx. tritaeniorhynchus*.) and Bancroftian Lymphatic Filariasis (*Cx. quinquefasciatus*) (Table 3).

**Table 3:** *Culex* species of Kerala

S. No.	Species	Reference for distribution in Kerala	Vector status
1.	<i>Culex bicornutus</i> Theobald, 1910 (Subgenus: <i>Lophoceraomyia</i> )	Rajavel <i>et al.</i> (2011) <sup>[11]</sup>	Japanese encephalitis
2.	<i>Cx. bitaeniorhynchus</i> Giles, 1901 (Subgenus: <i>Oculeomyia</i> )	Giles (1901) <sup>[3]</sup> Iyengar (1938) <sup>[7]</sup>	
3.	<i>Cx. brevipalpis</i> (Giles), 1902 (Subgenus: <i>Eumelanomyia</i> )	Iyengar (1938) <sup>[7]</sup> Mariappan <i>et al.</i> (1996) <sup>[24]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup> Sumodan (2012) <sup>[13]</sup>	
4.	<i>Cx. cinctellus</i> Edwards, 1922 (Subgenus: <i>Lophoceraomyia</i> )	Barraud (1934) <sup>[6]</sup>	
5.	<i>Cx. cornutus</i> Edwards, 1922 (Subgenus: <i>Oculeomyia</i> )	Mariappan <i>et al.</i> (1997) <sup>[35]</sup>	
6.	<i>Cx. epidemus</i> (Theobald), 1910 (Subgenus: <i>Oculeomyia</i> )	Mariappan <i>et al.</i> (1997) <sup>[35]</sup>	
7.	<i>Cx. fuscocephala</i> Theobald, 1907 (Subgenus: <i>Culex</i> )	Arunachalam <i>et al.</i> (2004) Iyengar (1938) <sup>[7]</sup>	
8.	<i>Cx. gelidus</i> Theobald, 1901 (Subgenus: <i>Culex</i> )	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup>	Japanese encephalitis
9.	<i>Cx. infantulus</i> Edwards, 1922 (Subgenus: <i>Lophoceraomyia</i> )	Rajavel <i>et al.</i> (2006) <sup>[11]</sup>	
10.	<i>Cx. infula</i> Theobald, 1901 (Subgenus: <i>Oculeomyia</i> )	Arunachalam <i>et al.</i> (2004)	
11.	<i>Cx. khazani</i> Edwards, 1922 (Subgenus: <i>Eumelanomyia</i> )	Edwards (1922) <sup>[25]</sup>	
12.	<i>Cx. malayi</i> Leicester, 1908 (Subgenus: <i>Eumelanomyia</i> )	Iyengar (1938) <sup>[7]</sup> Balasubramanian & Nikhil, 2013 <sup>[14]</sup>	
13.	<i>Cx. mammifer</i> Leicester, 1908 (Subgenus: <i>Lophoceraomyia</i> )	Barraud (1934) <sup>[6]</sup>	
14.	<i>Cx. mimeticus</i> Noe, 1899 (Subgenus: <i>Culex</i> )	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup>	
15.	<i>Cx. mimuloides</i> Barraud, 1924 (Subgenus: <i>Culex</i> )	Balasubramanian & Nikhil, 2013 <sup>[14]</sup>	
16.	<i>Cx. mimulus</i> Edwards, 1915 (Subgenus: <i>Culex</i> )	Barraud (1934) Iyengar (1938) <sup>[7]</sup>	
17.	<i>Cx. minor</i> (Leicester), 1908 (Subgenus: <i>Lophoceraomyia</i> )	Iyengar (1938)	

18.	<i>Cx. minutissimus</i> (Theobald), 1907 (Subgenus: <i>Lophoceraomyia</i> )	Iyengar (1938) <sup>[7]</sup> Mariappan <i>et al.</i> (1997) <sup>[35]</sup>	
19.	<i>Cx. modestus</i> Ficalbi, 1890 (Subgenus: <i>Barraudius</i> )	Mariappan <i>et al.</i> (1997) <sup>[35]</sup>	
20.	<i>Cx. nilgircus</i> Edwards, 1916 (Subgenus: <i>Culex</i> )	Iyengar (1938) <sup>[7]</sup>	
21.	<i>Cx. pallidothorax</i> Theobald, 1905 (Subgenus: <i>Culiciomyia</i> )	Iyengar (1938) <sup>[7]</sup> Balasubramanian & Nikhil, 2013 <sup>[14]</sup>	
22.	<i>Cx. pluvialis</i> Barraud, 1924 (Subgenus: <i>Eumelanomyia</i> )	Iyengar (1938) <sup>[7]</sup>	Japanese encephalitis
23.	<i>Cx. pseudovishnui</i> Colles, 1957 (Subgenus: <i>Culex</i> )	Rajavel <i>et al.</i> (2006) <sup>[11]</sup>	
24.	<i>Cx. quinquefasciatus</i> Say, 1823 (Subgenus: <i>Culex</i> )	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup>	Bancroftian filariasis
25.	<i>Cx. sinensis</i> Theobald, 1903 (Subgenus: <i>Oculeomyia</i> )	Balasubramanian & Nikhil, 2013 <sup>[14]</sup>	
26.	<i>Cx. sitiens</i> Wiedemann, 1828 (Subgenus: <i>Culex</i> )	Iyengar (1938) <sup>[7]</sup> Mariappan <i>et al.</i> (1997) <sup>[35]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup>	
27.	<i>Cx. tritaeniorhynchus</i> Giles, 1901 (Subgenus: <i>Culex</i> )	Giles (1901) Iyengar (1938) <sup>[7]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup>	Japanese encephalitis
28.	<i>Cx. uniformis</i> Theobald, 1905 (Subgenus: <i>Eumelanomyia</i> )	Iyengar (1938) <sup>[7]</sup> Sumodan (2012) <sup>[13]</sup>	
29.	<i>Cx. univittatus</i> Theobald, 1901 (Subgenus: <i>Culex</i> )	Mariappan <i>et al.</i> (1997) <sup>[35]</sup>	Japanese encephalitis
30.	<i>Cx. vishnui</i> Theobald, 1901 (Subgenus: <i>Culex</i> )	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup>	
31.	<i>Cx. whitmorei</i> (Giles), 1904 (Subgenus: <i>Culex</i> )	Barraud (1934) <sup>[6]</sup>	

### **Mansonia Blanchard, 1901**

*Mansonia* is a small genus with only three species (Table 4).

All these species are vectors of Brugian filariasis.

**Table 4:** *Mansonia* species of Kerala

S. No.	Species	Reference for distribution in Kerala	Vector status
1.	<i>Ma. annulifera</i> (Theobald), 1901 (Subgenus: <i>Mansonioides</i> )	Theobald (1901) <sup>4</sup> Iyengar (1938) <sup>[7]</sup>	Brugian filariasis
2.	<i>Ma. indiana</i> Edwards, 1930 (Subgenus: <i>Mansonioides</i> )	Iyengar (1932) <sup>[26]</sup> Iyengar (1938) <sup>[7]</sup>	Brugian filariasis
3.	<i>Ma. uniformis</i> (Theobald), 1901 (Subgenus: <i>Mansonioides</i> )	Theobald (1901) Iyengar (1938) <sup>[7]</sup>	Brugian filariasis

### **Non-vector genera**

There are 47 non-vector species in the state under 14 genera viz., *Armigeres* (7 species), *Coquillettidia* (1 species), *Ficalbia* (1 species), *Heizmannia* (5 species), *Hodgesia* (1 species),

*Lutzia* (1 species), *Malaya* (1 species), *Mimomyia* (3 species), *Orthopodomyia* (2 species), *Uranotaenia* (13 species), *Topomyia* (1 species), *Tripteroides* (2 species), *Toxorhynchites* (2 species) and *Verrallina* (7 species) (Table 5).

**Table 5:** Non-vector mosquito species of Kerala

Genus	Species	Reference for distribution in Kerala
<i>Armigeres</i> Theobald, 1901	<i>Ar. annulipalpis</i> (Theobald), 1910 (Subgenus: <i>Leicesteria</i> )	Barraud (1934) <sup>[6]</sup>
	<i>Ar. aureolineatus</i> (Leicester), 1908 (Subgenus: <i>Armigeres</i> )	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup>
	<i>Ar. digitatus</i> (Edwards), 1914 (Subgenus: <i>Leicesteria</i> )	Iyengar (1938) <sup>[7]</sup>
	<i>Ar. flavus</i> (Leicester), 1908 (Subgenus: <i>Leicesteria</i> )	Barraud (1934) <sup>[6]</sup>
	<i>Ar. omissus</i> (Edwards), 1914 (Subgenus: <i>Leicesteria</i> )	Iyengar (1938) <sup>[7]</sup>
	<i>Ar. subalbatus</i> (Coquillett), 1898 (Subgenus: <i>Armigeres</i> )	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup>
	<i>Ar. theobaldi</i> Barraud, 1934 <sup>[6]</sup> (Subgenus: <i>Armigeres</i> )	Iyengar (1938) <sup>[7]</sup>
<i>Coquillettidia</i>	<i>Cq. crassipes</i> van der Wulp, 1892 (Subgenus: <i>Coquillettidia</i> )	Samuel <i>et al.</i> (2004) <sup>[27]</sup> Balasubramanian & Nikhil, 2013 <sup>[14]</sup>
<i>Ficalbia</i>	<i>Fi. minima</i> (Theobald), 1901	Theobald (1901) Iyengar (1938) <sup>[7]</sup>
<i>Heizmannia</i>	<i>Hs. chandi</i> Edwards, 1922 (Subgenus: <i>Heizmannia</i> )	Edwards (1922)
	<i>He. discrepans</i> (Edwards), 1922 (Subgenus: <i>Mattinglyia</i> )	Edwards (1922)
	<i>Hs. greeni</i> (Theobald), 1905 (Subgenus: <i>Heizmannia</i> )	Barraud (1934) <sup>[6]</sup>
	<i>Hs. indica</i> (Theobald), 1905 (Subgenus: <i>Heizmannia</i> )	Barraud (1934) <sup>[6]</sup> Balasubramanian & Nikhil, 2013 <sup>[14]</sup>
	<i>Hs. viridis</i> Barraud, 1929 (Subgenus: <i>Heizmannia</i> )	Iyengar (1938) <sup>[7]</sup>
<i>Hodgesia</i>	<i>Hodgesia bailyi</i> Barraud, 1929.	Rajavel <i>et al.</i> (2005) <sup>28</sup>
<i>Lutzia</i>	<i>Lt. fuscana</i> (Wiedemann), 1820 (Subgenus: <i>Metalutzia</i> )	Barraud (1934) <sup>[6]</sup>
<i>Malaya</i>	<i>Ml. genurostris</i> Leicester, 1908	Iyengar (1938) <sup>[7]</sup>
<i>Mimomyia</i>	<i>Mi. chamberlaini</i> (Ludlow), 1904 (Subgenus: <i>Mimomyia</i> )	Iyengar (1938) <sup>[7]</sup> Menon and Tambi (1959) <sup>29</sup>
	<i>Mi. hybrida</i> (Leicester), 1908 (Subgenus: <i>Mimomyia</i> )	Menon (1936) <sup>30</sup> Iyengar (1938) <sup>[7]</sup>
	<i>Mi. luzonensis</i> (Ludlow), 1905 (Subgenus: <i>Etorleptomyia</i> )	Balasubramanian & Nikhil, 2013 <sup>[14]</sup>
<i>Orthopodomyia</i>	<i>Or. anopheloides</i> (Giles), 1903	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup>
	<i>Or. flavithorax</i> Barraud, 1927	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup>
<i>Topomyia</i>	<i>To. aureoventer</i> (Theobald), 1910 (Subgenus: <i>Topomyia</i> )	Theobald, 1910 <sup>31</sup> Barraud (1934) <sup>[6]</sup>
<i>Toxorhynchites</i>	<i>Tx. splendens</i> (Wiedemann), 1819 (Subgenus: <i>Toxorhynchites</i> )	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup>

	<i>Toxorhynchites</i>	
	<i>Tx. tyagii</i> Krishnamoorthy <i>et al.</i> , 2013 (Subgenus: <i>Toxorhynchites</i> )	Unpublished (Personal communication)
<i>Tripteroides</i>	<i>Tp. affinis</i> (Edwards), 1913 (Subgenus: <i>Rachionotomyia</i> )	Balasubramanian & Nikhil, 2013 <sup>[14]</sup>
	<i>Tp. indicus</i> (Barraud), 1929 (Subgenus: <i>Tripteroides</i> )	Iyengar (1938) <sup>[7]</sup>
<i>Uranotaenia</i>	<i>U. alboannulata</i> (Theobald), 1905 (Subgenus: <i>Uranotaenia</i> )	Barraud (1934) <sup>[6]</sup>
	<i>U. annandalei</i> Barraud, 1926 (Subgenus: <i>Uranotaenia</i> )	Balasubramanian & Nikhil (2013) <sup>[14]</sup>
	<i>U. atra</i> Theobald, 1905 (Subgenus: <i>Pseudoficalbia</i> )	Mariappan <i>et al.</i> (1997) <sup>[35]</sup> Rajavel <i>et al.</i> (2006) <sup>[11]</sup>
	<i>U. bimaculata</i> Leicester, 1908 (Subgenus: <i>Pseudoficalbia</i> )	Balasubramanian & Nikhil (2013) <sup>[14]</sup>
	<i>U. christophersi</i> Barraud, 1926 (Subgenus: <i>Uranotaenia</i> )	Balasubramanian & Nikhil (2013) <sup>[14]</sup>
	<i>U. hebes</i> Barraud, 1931 (Subgenus: <i>Uranotaenia</i> )	Barraud (1934) <sup>[6]</sup>
	<i>U. luteola</i> Barraud, 1934 <sup>[6]</sup> (Subgenus: <i>Pseudoficalbia</i> )	Barraud (1934) <sup>[6]</sup> Iyengar (1938) <sup>[7]</sup>
	<i>U. maculipleura</i> Leicester, 1908 (Subgenus: <i>Pseudoficalbia</i> )	Balasubramanian & Nikhil (2013) <sup>[14]</sup>
	<i>U. orientalis</i> Barraud, 1926 (Subgenus: <i>Uranotaenia</i> )	Iyengar (1938) <sup>[7]</sup> Mariappan <i>et al.</i> (1997) <sup>[35]</sup>
	<i>Uranotaenia pseudostricklandi</i> Natarajan, Rajavel & Jambulingam, 2018 (Subgenus: <i>Pseudoficalbia</i> )	Natarajan, Rajavel & Jambulingam, 2018 <sup>32</sup>
	<i>U. recondita</i> Edwards, 1922 (Subgenus: <i>Pseudoficalbia</i> )	Iyengar (1938) <sup>[7]</sup>
	<i>U. stricklandi</i> Barraud, 1926 (Subgenus: <i>Pseudoficalbia</i> )	Iyengar (1938) <sup>[7]</sup>
	<i>U. testacea</i> Theobald, 1905 (Subgenus: <i>Uranotaenia</i> )	Mariappan <i>et al.</i> (1997) <sup>[35]</sup>
	<i>Verrallina</i>	<i>Ve. agrestis</i> (Barraud), 1931 (Subgenus: <i>Neomacleaya</i> )
<i>Ve. andamanensis</i> (Edwards), 1922 (Subgenus: <i>Neomacleaya</i> )		Barraud, (1934) <sup>[6]</sup>
<i>Ve. butleri</i> (Theobald), 1901 (Subgenus: <i>Verrallina</i> )		Barraud (1934)
<i>Ve. cauta</i> (Barraud), 1928 (Subgenus: <i>Neomacleaya</i> )		Barraud (1934) <sup>[6]</sup>
<i>Ve. lugubris</i> (Barraud), 1928 (Subgenus: <i>Verrallina</i> )		Rajavel <i>et al.</i> (2006) <sup>[11]</sup>
<i>Ve. seculata</i> (Menon), 1950 (Subgenus: <i>Neomacleaya</i> )		Menon (1950) <sup>33</sup>
<i>Ve. uniformis</i> (Theobald), 1910 (Subgenus: <i>Harbachius</i> )		Barraud (1934) <sup>[6]</sup>

**Mosquito species originally described from Kerala**  
17 species under 9 genera viz., *Aedes*, *Anopheles*, *Culex*, *Ficalbia*, *Heizmannia*, *Mansonia*, *Topomyia*, *Uranotaenia*, and

*Verrallina* were originally described from Kerala from 1901 to 2024 (Table 6).

**Table 6:** Mosquito species originally described from Kerala

S. No.	Species	Type locality
1.	<i>Ae. menoni</i> Mattingly, 1958	Travancore
2.	<i>An. jamesi</i> Theobald, 1901	Kollam
3.	<i>Ae. rubenae</i> Tewari & Hiriyan, 1992 (Subgenus: <i>Tewarius</i> )	Silent Valley
4.	<i>An.pseudosundaicus</i> Tyagi <i>et al.</i> 2009	Kollam
5.	<i>Cx. khazani</i> Edwards, 1922	Pudupadi
6.	<i>Cx. tritaeniorhynchus</i> Giles 1901	Travancore
7.	<i>Cx. bitaeniorhynchus</i> Giles, 1901	Travancore
8.	<i>Fi. minima</i> (Theobald), 1901	Kollam
9.	<i>Hs. Chandi</i> Edwards, 1922	Pudupadi
10.	<i>Hs. discrepens</i> (Edwards), 1922	Pudupadi
11.	<i>Ma. annulifera</i> (Theobald), 1901	Kollam
12.	<i>Ma. uniformis</i> (Theobald), 1901	Kollam
13.	<i>To. auroventer</i> (Theobald), 1910	Pallode
14.	<i>U. alboannulata</i> (Theobald), 1905	Travancore
15.	<i>U. luteola</i> Barraud, 1934 <sup>[6]</sup>	Malabar
16.	<i>Ve. seculata</i> (Menon), 1950	Pathanamthitta
17.	<i>Ve. uniformis</i> (Theobald), 1910	Pallode

## Conclusion

As many as 151 species of mosquitoes under 18 genera have been reported from the state, viz., *Aedes* (31 species), *Anopheles* (39 species), *Armigeres* (7 species), *Coquillettidia* (1 species), *Culex* (31 species), *Ficalbia* (1 species), *Heizmannia* (5 species), *Hodgesia* (1 species), *Lutzia* (1 species), *Malaya* (1 species), *Mansonia* (3 species), *Mimomyia* (3 species), *Orthopodomyia* (2 species), *Uranotaenia* (13

species), *Topomyia* (1 species), *Tripteroides* (2 species), *Toxorhynchites* (2 species) and *Verrallina* (7 species). The total number of mosquito species in India is a little over 400 <sup>34</sup>. Hence, the number of species in Kerala comes to approximately 38% of the species recorded so far from the entire country. Of the 151 species 17 were originally described from the state under 9 genera. The list includes 20 known vector species of six mosquito-borne diseases viz., Lymphatic

Filariasis, Malaria, Japanese Encephalitis, Dengue, Chikungunya, West Nile Virus, and Zika.

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### References

1. Vanaja C, Sumodan PK. Mosquito-borne diseases in Kerala, India: An update. *Int. J Mosq. Res.* 2020;7(4):45-58.
2. Lekshmi R, Nayar AM, Sumodan PK. A rapid entomological reconnaissance during the first Zika outbreak in Thiruvananthapuram city, Kerala, India. *Int. J Mosq. Res.* 2021;8(6):20-23.
3. Giles GM. A plea for the collective investigation of Indian Culicidae, with suggestions as to moot points for enquiry and a prodromus of species known to the author. *Journ Bomb Nat Hist Soc.* 1901;13:592-610.
4. Theobald FV. A monograph of the Culicidae or mosquitoes. London. 1901;1:424.
5. Christophers, S. R. Fauna of British India including Ceylon and Burma. Tribe Anopheline. Taylor and Francis, London, 1933, 4.
6. Barraud, P.J. The Fauna of British India including Ceylon and Burma. Diptera. Vol. V. Family Culicidae. Tribes Megarhini and Culicini. Taylor and Francis, London; 1934.
7. Iyengar MOT. Studies on the epidemiology of filariasis in Travancore. *Indian Med Res Memoirs.* Pp 179; 1938.
8. Tewari SC, Hiriyani J. Description of two new species of *Aedes* (*Diceromyia*) from South India (Diptera: Culicidae). *Mosq Syst.* 1992;24(2):154-175.
9. Hiriyani J, Arunachalam N, Philip Samuel P, Thenmozhi V, Gajanana A, Satyanarayana K, *et al.* Studies on the mosquito fauna in a Japanese encephalitis prone area in Kerala, India. *Entomon.* 2003;28:139.
10. Arunachalam N, Philip Samuel P, Hiriyani J, Thenmozhi V, Gajanana A. Japanese Encephalitis in Kerala, South India: Can *Mansonia* (Diptera: Culicidae) play a Supplemental Role in Transmission? *J Med Entomol.* 2004;41(3):456-461.
11. Rajavel AR, Natarajan R, Vaidyanathan K. Mosquitoes of the mangrove forests of India: part six- Kundapur, Karnataka and Kannur, Kerala. *J Am Mosq Control Assoc.* 2006;22(4):582-585.
12. Tyagi BK, Hiriyani J, Samuel P, Tewari SC, Ayanar, K *et al.* Description of a new species, *Anopheles pseudosundaicus* (Diptera: Culicidae) from Kerala, India. *Zootaxa.* 2009;2219:49-60.
13. Sumodan PK. Species diversity of mosquito breeding in the rubber plantations of Kerala, India. *J Am Mosq Control Assoc.* 2012;28(2):114-115.
14. Balasubramanian R, Nikhil TL. Mosquito (Diptera: Culicidae) fauna of Alappuzha and Kottayam districts of Kerala state, South India. *J Entomol Zool Stud.* 2013;1(6):134-137.
15. Sumodan PK. Mosquitoes in Kerala: Diversity and Public Health Implications. *Proceedings of Insects diversity of Western Ghats: An approach to modern conservative strategies*, Sir Syed College, Taliparamba, Kerala; c2014. p. 28-37.
16. Wilkerson RC, Linton YM, Fonseca D, Schultz T, Price D, Strickman D. Making mosquito taxonomy useful: A stable classification of tribe Aedini that balances utility with current knowledge of evolutionary relationships. *PLoS One.* 2015;10(7):e0133602.
17. Thankachan M, Gopinath A. Diversity of mosquito species in plantation areas of Mananthavady, Wayanad district of Kerala. *Int J Mosq Res.* 2017;4(2):24-26.
18. Mattingly PF. A revision of *Paraedes* Edwards and *Canraedes* Edwards (Diptera: Culicidae). *Proc R Entomol Soc London (B).* 1958;27:76-83.
19. Thankachan M, Surya P, Sebastian CD. Molecular Identification and phylogenetic analysis of mosquito vectors from Mananthavady Taluk, Wayanad, Kerala, India. *J Vector Borne Dis.* 2023;60:88-93.
20. Rajavel AR, Natarajan R, Vaidyanathan K, Jambulingam P. Systematic list of species added to the mosquito museum at the Vector Control Research Centre, Pondicherry, India. *J Am Mosq Control Assoc.* 2011;27(1):8-14.
21. Nagpal BN, Sharma VP. *Indian Anophelines.* New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.; c1995.
22. Radhakrishnan A. Study on mosquito (Diptera: Culicidae) diversity in Ernakulam district of Kerala state, South India. *Int J Mosq Res.* 2019;6(1):01-05.
23. Covell G, Singh H. Malaria in Wayanad, South India. *J Malar Inst India.* 1939;2:341-376.
24. Mariappan T, Arunachalam N, Reddy CMR, Sabesan S, Panicker KN. Brackish water mosquito problem of Vypeen Island, Cochin, Kerala. *Southeast Asian J Trop Med Public Health.* 1996;27(1):145-148.
25. Edwards FW. A synopsis of adult oriental Culicinae. *Indian J Med Res.* 1922;10:249-293.
26. Iyengar MOT. Filariasis in North Travancore. *Ind Journ Med Res.* 1932;20:671-672.
27. Samuel PP, Arunachalam N, Hiriyani J, Thenmozhi V. Host feeding pattern of *Coquillettidia* (*Coquillettidia*) *crassipes* (van der Wulp) from Kerala, India. *J Med Entomol.* 2004;41(3):442-446.
28. Rajavel AR, Natarajan R, Vaidyanathan K, Soniya VP. A list of mosquitoes housed in the mosquito museum at the Vector Control Research Centre, Pondicherry, India. *J Am Mosq Control Assoc.* 2005;21(3):243-251.
29. Menon MAU, Tampi MRV. Notes on the feeding and egg-laying habits of *Ficalbia* (*Mimomyia*) *chamberlaini*, Ludlow, 1904 (Diptera: Culicidae). *Indian J Malariol.* 1959;13(1):13-18.
30. Menon MAU. The egg of *Ficalbia* (*Mimomyia*) *hybrida* Leicestor. *J Malar Inst India.* 1935;1:185-187.
31. Theobald FV. Second report on the collection of Culicidae in the Indian Museum, Calcutta, with descriptions of new genera and species. *Rec Indian Mus.* 1910;4:1-33.
32. Natarajan R, Rajavel AR, Jambulingam P. *Uranotaenia pseudostricklandi*, a new species in subgenus *Pseudoficalbia* (Diptera: Culicidae) from Kerala, India. *Zootaxa.* 2018;4429(1):181-188.
33. Menon MAU. The male of a new species of subgenus *Aedes* Meigen, 1818 (Diptera: Culicidae). *Proc R Ent Soc Lond;* c1950. p. 139-141.
34. Tyagi BK, Munirathinam A, Venkatesh A. A catalogue of Indian mosquitoes. *Int. J Mosq. Res.* 2015;2(2):50-97.