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## **New records of *Culex (Culex) pipiens* Linn. from Manipur India**

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### **Abstract**

The studies on diversity of the mosquito is very urgent as they are quickly adapting to the changing environment and becoming deadlier than before. The diversity studies of mosquitos from Manipur is very scanty, but their impacts on the inhabitants are enormous. For preparing a shield against them a precise identification of each species is a much. For this purpose, larvae from domestic sewage drains and common water canals were procured/caught and reared in the laboratory till adults emerged and identification of the larvae and adults were done using appropriate keys. The present study reports the occurrence of *Culex (Culex) pipiens* Linn. in Manipur. *Culex (Culex) quinquefasciatus* which is a symapatric to *pipiens* had been reported but not the *pipiens*. In future the procurement of the two species and differentiation through cytotoxonomy, molecular and whole life cycle studies would be a decisive one for ascertaining the true identities and existence of the species *Culex (Culex) pipiens*. The diversity of the mosquitoes from the state is encouraging with the present studies and more exploration will be positive in finding more new records and prepare some strategies to counteract against them to protect ourselves.

**Keywords:** Manipur, mosquitoes, new records, *Culex (Culex) pipiens*, Imphal

### **1. Introduction**

Emergence of new environmental changes most of the organisms adapted and survive which is the ultimate goal of every being. The mosquito is the most rapidly evolving in the sense of habitat as well as the morphology. Preparation for the worse of the climatic change, each and every mosquito should be thoroughly identified for proper preventive measures.

The mosquito exploration from the state was 9 *Anopheles* [1-4] which came up to 16 [5] again in 1983 the total species of the state is reported to be 23 [6]. Rajput and Singh [7] reported 99 species of mosquitoes from the state, Manipur. More recent reports indicate the presence of fifty-five species of mosquitoes under ten genera. Out of the seventeen species of *Anopheles* species recorded three species are new records from the state along with four species of *Culcines* totalling the new records from the state [8]. All these observations point out the diversity of mosquito species of the state. The main aim of the present study is to explore diversity of the mosquitoes to ascertain the ground realities of the diversity of mosquitoes in Manipur for precise preparation of preventive measures for the mosquito related diseases.

### **2. Materials and Methods**

Larval stages of mosquito were collected from three breeding ground of Imphal- Kids' Foundation, Keishamthong and DM College Campus during 29<sup>th</sup> March and 1<sup>st</sup> April, 2018. The immature larval stages were reared with appropriate foods in beakers till the emergence of adults and identification of the species were done from larvae and adults of both the male and female individuals. The taxonomic keys followed were Harbach [9] Walter and Harbach [10] and Tyagi *et al.*, [11].

### **3. Results**

In total 25 larvae and 9 adults (5 males + 4 females) were randomly selected for the present study. Lateral view of the anal parts with 4 gills, paddle and siphon could be seen easily (Fig. 1). Some of the keys used to identify the larval stages according to Harbach [9] are as follows: Siphon with pecten, Comb scales arising from unsclerotized integument, Siphon with at least 3

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Figure 1. The larval structures of *Culex pipiens*: A) Siphon and paddle of the IV instar larvae, B) the enlarged view of siphon with 2 lateral setae and other setae in double row, C) Pecten tooth with 4 spines arising proximally, D) All scales of comb evenly fringed at sides and apex, E) the single setae 1-X. Bar represents 0.5 mm.

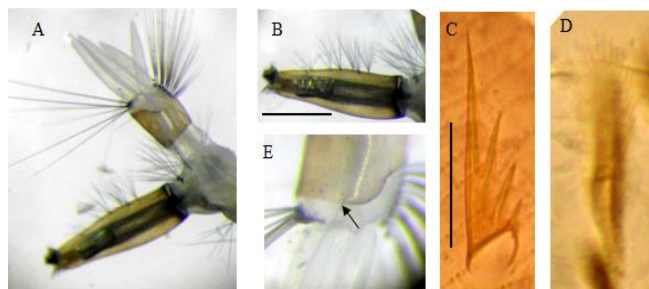


Fig 1

pairs of seta 1-S, usually more, Saddle shorter than siphon, Pecten not extending to apex of siphon, antenna longer than half length of head (2) Siphon without laterally- aligned setae adjacent to pecten, setae 5- and 6-C long and conspicuous, much thicker and longer than 4-C, A.(1) Siphon with 1-3 lateral setae, (2) Other setae in single or double row B. If no lateral seta, then all setae are in 2 posterolateral rows, Siphon otherwise, sides nearly parallel, gently tapered or only slightly convex, all scales of comb evenly fringed at sides and apex, Distal pecten spines with 2-5 denticles of different sizes arising proximally, Seta 1-C thin, scarcely if at all thicker than branches of seta 5-C, A. (1) with 1-3 lateral pairs, (2) with 2-4 posterolateral pairs and B. (3) sometimes with 1 pair arising before end of pecten, (1) Seta 1-S (at least some elements) longer than diameter of siphon at point of attachment, usually in 4 pairs (2) Seta 6-VI normally double, (1) Seta I-III-V usually with 1 or 2 branches (sum of their branches on 1 side of abdomen not exceeding 10, usually 6 or less) (2) Seta 1-X usually single. The adult male and female individuals are studied and the distinctive features are hindtarsus small and inconspicuous, pulvilli present and subcosta intersects costa at or beyond level of furcation of  $R_{2+3}$  (Fig. 2 A). All these observations points that the specimens in the present studies is *Culex (Culex) pipiens* Linn.

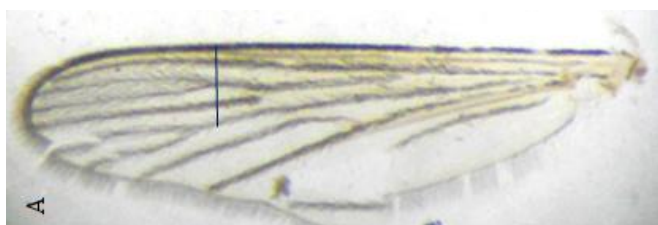


Fig 2A: Adult structures of *Culex (Culex) pipiens*: A) the wing showing subcostal intersects costa at or beyond level of furcation of  $R_{2+3}$ .

#### 4. Discussion

Recent reports of presence of fifty-five species of mosquitoes under ten genera from Manipur totaling the species composition of the state eighty-three under thirteen genera. Out of the seventeen species of Anopheles species recorded three

species are new records from the state along with four species of Culcines totaling the new records from the state<sup>[8]</sup>. This data is a boost to the present studies on biodiversity assessment of the mosquitoes from the state of Manipur particularly the valley region of the state before the hilly mountainous surroundings. Dutta *et al.*,<sup>[8]</sup> reports 17 *Culex* species under sub genus *Culex* and *Cx. (Cx.) quinquefasciatus* Say was mentioned not the *Cx. (Cx.) pipiens*.

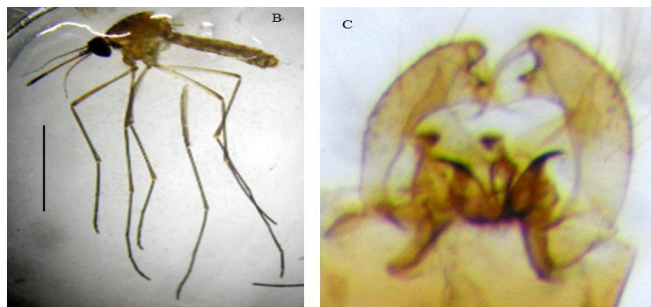
*Culex pipiens* complex is considered cosmopolitan species. At present the *Cx. pipiens* complex includes five species: *Cx. (Cx.) pipiens* Linnaeus, *Cx. (Cx.) quinquefasciatus* Say, *Cx. (Cx.) pipiens pallens* Coquillett, *Cx. (Cx.) australicus* Dobrotworsky and Drummond and *Cx. (Cx.) globocoxitus* (Dobrotworsky and Drummond) in New Zealand but the complex consists of *Cx. (Cx.) quinquefasciatus* Say, *Cx. (Cx.) pipiens pallens* Coquillett and *Cx. (Cx.) pipiens molestus* in Japan<sup>[11]</sup>. While in the Americas, it is composed of two main species, *Culex (Culex) quinquefasciatus* Say, which is adapted to tropical zones and *Cx. pipiens* L., which is found in temperate zones. The present reports of *Cx. (Cx.) pipiens* is contradictory to the reports of *Cx. (Cx.) quinquefasciatus* Say by other researchers<sup>[8, 12, 13]</sup>.

The *Culex pipiens* complex has been the subject of intensive study in Europe, America, Africa, and Australia as a result of which many interesting facts have come to be known which throw light on the various aspects of its study<sup>[13]</sup>. But still many issues need clarification. No attempt has been so far made to study this species complex in the Indian subregion where *C. pipiens fatigans*, an important member of this group, is a very common widespread domestic mosquito and is the classical vector of filariasis in many parts of the area. At least three intraspecific forms of this subspecies are known to occur in the Ethiopian region<sup>[15]</sup>. Nothing is known about the existence or otherwise of such forms in the area under discussion. Only a large scale dissection of male terminalia and measurement of male palps and a sustained study of the larval characters will reveal the truth about it<sup>[13]</sup>.

*Culex quinquefasciatus* is a member of globally distributed *Culex pipiens* species complex. Additionally, the *Culex pipiens* species complex has many related species, ecotypes and hybrids which are situated in geographical introgression zones on multiple continents<sup>[16]</sup>. *Culex quinquefasciatus* was first described in 1823 by Thomas Say from a specimen collected along the Mississippi River in the southern United States. At that time, a number of similar species around the world like *Culex fatigans*<sup>[17]</sup> from the Old World tropics were used synonymous to *Cx. quinquefasciatus*<sup>[18, 19]</sup>. Females of *Culex pipiens* and *Cx. quinquefasciatus* are morphologically indistinguishable and hybrid zones for the two species are well documented. Owing to this, *Culex quinquefasciatus* has been considered and designated as a subspecies of *Cx. pipiens* with the name *Culex pipiens quinquefasciatus*<sup>[20]</sup>. Studies have indicated that *Culex pipiens* and *Cx. quinquefasciatus* are two distinct sympatric mosquito populations<sup>[21]</sup> and they also exhibit a distinct and clear genetic difference<sup>[22]</sup> which led to the elevation of *Cx. quinquefasciatus* to a species status.

According to Dehghan *et al.*,<sup>[23]</sup> the main distinguishing features of the two taxa included were shape of siphon: wide in middle and number of branches in seta 1a-S and 1b-S is between 4-12 and 3-10 in *Cx (Cx.) quinquefasciatus* while it is 2-6 in *pipiens* in larval stage. In adult stage former had dorsal

arms which were pointed nearly parallel; ventral arms were leaf shape (broad and long) but latter has the male genitalia showing broad dorsal arms truncate at the apex and narrow and sharply curved ventral arms (fig 2 B and C). In future the procurement



**Fig B and C**

Figure 2. Adult structures of *Culex (Culex) pipiens*: A) the wing showing subcostal intersects costa at or beyond level of furcation of R<sub>2+3</sub>, B) Lateral view of adult female with foreungus simple and C) the male genitalia showing broad dorsal arms truncate at the apex and narrow and sharply curved ventral arms. Bar represents 0.5 cm. of the two species and differentiation through cytotaxonomy, molecular and whole life cycle studies would be decisive ones for ascertaining the true identities and existence of species *Culex (Culex) pipiens*.

## 5. Conclusion

The present study reports the first record of *Culex (Culex) pipiens* Linn., from Manipur. But instead of this species the sympatric one *Cx (Cx) quinquefasciatus* had been reported so far. In future the procurement of the two species and differentiation through cytotaxonomy, molecular and whole life cycle studies would be decisive ones for ascertaining the true identities and existence species *Culex (Culex) pipiens*.

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