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**Jagdish Kaur**  
Department of Zoology, Post  
Graduate Government College,  
Sector 11, Chandigarh, Punjab,  
India.

## Reporting of morphological variations on wings and palpi of *Anopheles (Cellia) fluviatilis* James and *Anopheles (Cellia) vagus* Donitz

**Jagdish Kaur**

### Abstract

The wings of *Anopheles (Cellia) fluviatilis* James and wings and palpi of *Anopheles (Cellia) vagus* Donitz have been studied to observe variations. Six types of morphological variations on the wings of former species and seven types of wing and palpal variations in the latter species have been studied and illustrated in this paper.

**Keywords:** Wings, Palpi, Fluviatilis, Vagus, Variations

### 1. Introduction

*Anopheles (Cellia) fluviatilis* James and *Anopheles (Cellia) vagus* Donitz are widely distributed mosquito species in India especially in the foothill areas. These species prefer to rest indoors in cattlesheds and human dwellings. Since wings are important taxonomical identification characters at the species level of genus *Anopheles*, the variations in these structures may cause confusion in the correct and authentic identification. Thus an effort has been made to study these important taxonomic features in detail. The variations on these structures were earlier recorded in *A. vagus* Donitz [8], *A. stephensi* Liston [7], *A. fluviatilis* James [12], *A. philippinensis* Ludlow [1], *A. annularis* Van der Wulp [11, 4], *A. subpictus* Grassi [5], *A. pulcherrimus* Theobald [6], *A. lindesayi* Giles and *A. peditaeniatus* (Leicester) [13], *A. splendidus* and *A. willmori* [14], and *A. culicifacies* Giles [3]. The present author has been able to record 6 type of wing variations in *Anopheles (Cellia) fluviatilis* James and a total of 7 type of variations in wings and palpi of *Anopheles (Cellia) vagus* Donitz. These variations have been described and illustrated in Table 1 and Table 2 of this paper.

### 2. Material and methods

Mosquito surveys were carried out in foot hill areas of Punjab, Haryana, Uttarakhand and Himachal Pradesh. The adult mosquitoes were collected with the help of suction tube from the cattle sheds, human dwellings and mixed dwellings in early morning hours. The collected specimens were killed with the ethyl acetate vapours, then these were pinned and preserved in air tight insect cabinets. Identifications were made using the keys [2, 9, 10, 15]. The comparison was made with the identified collection of National Institute of Communicable Diseases, Delhi. The diagrams of palpi and wings showing variations were drawn with the help of rotting pens. The specimens have been preserved in the laboratory as reference material.

### 3. Results and discussion

56 specimens of *Anopheles (Cellia) fluviatilis* James and 15 adult females of *Anopheles (Cellia) vagus* Donitz were collected from various localities of Punjab, Haryana, and Himachal Pradesh and Uttarakhand states of India during 1997-2000. A total of 13 type of morphological variations have been observed in the ornamentation of wings and palpi. The details of collection date, site of collection, number of collected specimens and morphological variations have been given in Table 1 and Table 2 and Figs. 2-7; 9-12; 14-16. Figs. 1, 8 and 13 shows normal wing and palpus.

Since, both species of *Anopheles* are potential vectors of malaria, so it is considered worthwhile to study and describe the morphological variations encountered in some specimens of these species. It was observed that the collected specimens of *Anopheles (Cellia) fluviatilis* James did not show resemblance to the type specimen and differs markedly from the original description [2]. The variations in the palpi of this species have been earlier recorded [12], but the

### Correspondence

**Jagdish Kaur**  
Department of Zoology, Post  
Graduate Government College,  
Sector 11, Chandigarh, Punjab,  
India.

variations in the ornamentation of wings are reported for the first time, which are described in this communication. The morphological variations in banding pattern and size of band on the palpi of *Anopheles (Cellia) vagus* Donitz are totally

different from the earlier recorded variations [8]. Similarly the variations in the wings in respect to the dark and pale spots on various veins differs from the previous results [8].

**Table 1:** Morphological variations in the wings of *Anopheles (Cellia) fluviatilis* James

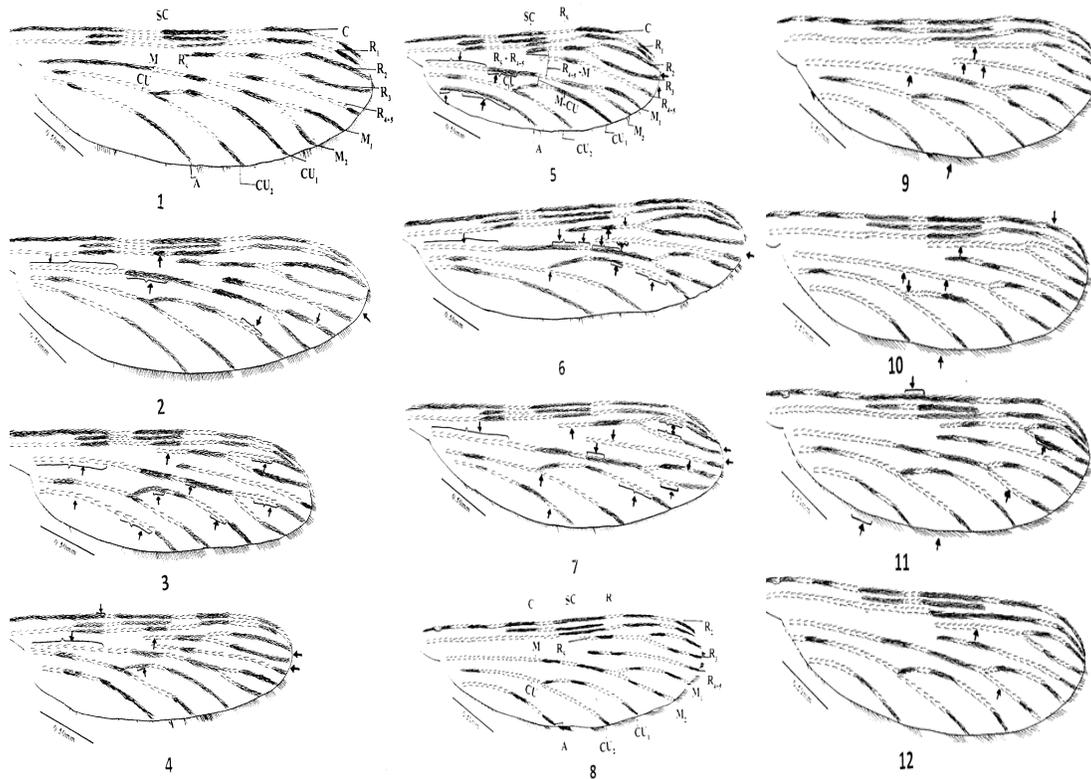
Variation No.	Date of collection	Site of collection	No. of specimens	Variations observed
1.	29.VII.1999	Saloti, Nainital	13	Less than basal half of M pale, one of pale spot absent; M1 with dark area interrupted by a pale spot; Cu1 bearing apical dark area half that of type; dark fringe between R3 and R4+5 absent (Fig.2)
2.	29.VII.1999	Saloti, Nainital	13	Rs lacking basal dark spot; R2 with large pale spot; R4+5 without dark spot at base; base of M pale, one of pale spot absent, apical dark mark larger; M1 bearing large pale spot; both of basal dark spot at Cu1 larger and apical much smaller; dark fringe spot between R3 and R4+5 absent (Fig.3)
3.	29.VII.1999	Saloti, Nainital	13	Pale spot between basal and middle dark area of costa very small; Basal dark spot at Rs absent; vein M pale at basal half; Cu1 lacking one of the dark spot at base, apical dark area larger; black fringe R2, R3 and R4+5 absent (Fig.4)
4.	18.VIII.1998	Ismailpur, Dehradun	11	Base of M pale, one of the pale spots absent; anal vein totally dark; dark fringe spot between R2, R3 and latter and R4+5 absent (Fig.5)
5.	11.VIII.1998	Bela Dhiani, Nangal, Punjab	3	Basal dark spot at Rs missing; basal half of M (Fig.6)
6.	11.VIII.1998	Bela Dhiani, Nangal, Punjab	3	Base of costa pale; posterior dark mark interrupted by a pale spot; Rs totally dark; pale spot at middle and apex of R2; base of R4+5 pale; apices of M1, M2 and Cu1 pale; a fringe spot at Cu2, anal and beyond the termination of anal vein present (Fig.7)

**Table 2:** Morphological variations in the wings and palpi of *Anopheles (Cellia) vagus* Donitz

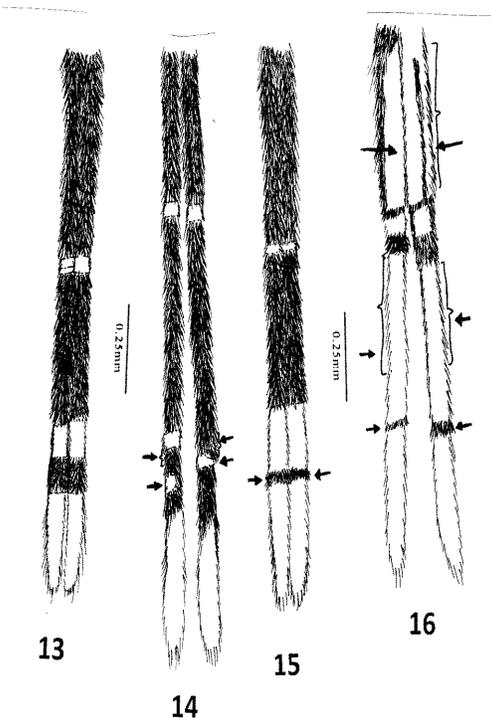
Variation No.	Date of collection	Site of collection	No. of specimens collected	Variation observed
1	1.IX.1998	Regional Engineering College, Kurukshetra	3	Rs and R4+5 totally pale except a very small dark spot at tip of R4+5; M lacking anterior dark spot; fringe spot between Cu2 and anal vein absent (Fig. 9)
2	2.VIII.1999	Tipuri, Udham Singh Nagar	5	Costa with an additional dark spot between apical and preapical dark spot; dark band of Rs, R2, R3, Cu1 and M2 absent; M totally white; dark band at middle of anal vein absent; fringe spot between Cu2 and anal vein absent (Fig. 10)
3	2.VIII.1999	Tipuri, Udham Singh Nagar	5	Presector and middle dark spot united to form a single large dark area; dark spot at R3 near bifurcation large to cover half of vein; M2 lacking a dark spot; fringe spot between Cu2 and anal vein absent; fringe beyond termination of anal vein continuously dark (Fig. 11)
4	2.VIII.1999	Tipuri, Udham Singh Nagar	5	Dark spot at vein Rs and base of M2 absent (Fig. 12)
5	1.IX.1998	Indira Nagar, Kurukshetra	3	Preapical dark band interrupted by a rounded white spot in one of palpi; middle pale spot of both palpi smaller (Fig. 14)
6	2.VIII.1999	Tipuri, Udham Singh Nagar	5	Subapical pale band almost half of apical pale band on both the palpi (Fig. 15)
7	2.VIII.1999	Tipuri, Udham Singh Nagar	5	Middle dark band almost pale except a small dark area near presector pale band; basal dark band also pale except some dark scales on lateral margins on both palpi (Fig. 16)

### Abbreviations

A:Anal vein, C:Costa, Cu:Cubitus, Cu1:Cubitus-one, Cu2:Cubitus-two, M:Media, M1:Media-one, M2:Media-two, R1:Radius-one, R2:Radius-two, R3:Radius-three, R4+5:Radius-four-plus-five, RS:Radial sector, SC:Subcosta.



**Fig 1:** Normal wing of *Anopheles (Cellia) fluviatilis* James.  
**Fig 2-7:** Wings of *Anopheles (Cellia) fluviatilis* James showing variations.  
**Fig 8:** Normal wing of *Anopheles (Cellia) vagus* Donitz.  
**Fig 9-12:** Wings of *Anopheles (Cellia) vagus* Donitz showing variations



**Fig 13:** Normal palpi of *Anopheles (Cellia) vagus* Donitz.  
**Fig 14-16:** Palpi of *Anopheles (Cellia) vagus* Donitz showing variations.

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