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Variations in ornamentation of wings and palpi of *Anopheles (Cellia) subpictus* Grassi collected from northwest India

Jagbir S. Kirti* & Jagdish Kaur

Department of Zoology, Punjabi University, Patiala, India; jskirti@pbi.ernet.in

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Studies have been conducted on the wings and palpi of *Anopheles (C) subpictus* Grassi to observe variations. As many as 10 types of variations have been observed in wings and palpi of this species. These variations have been described and illustrated in this paper.

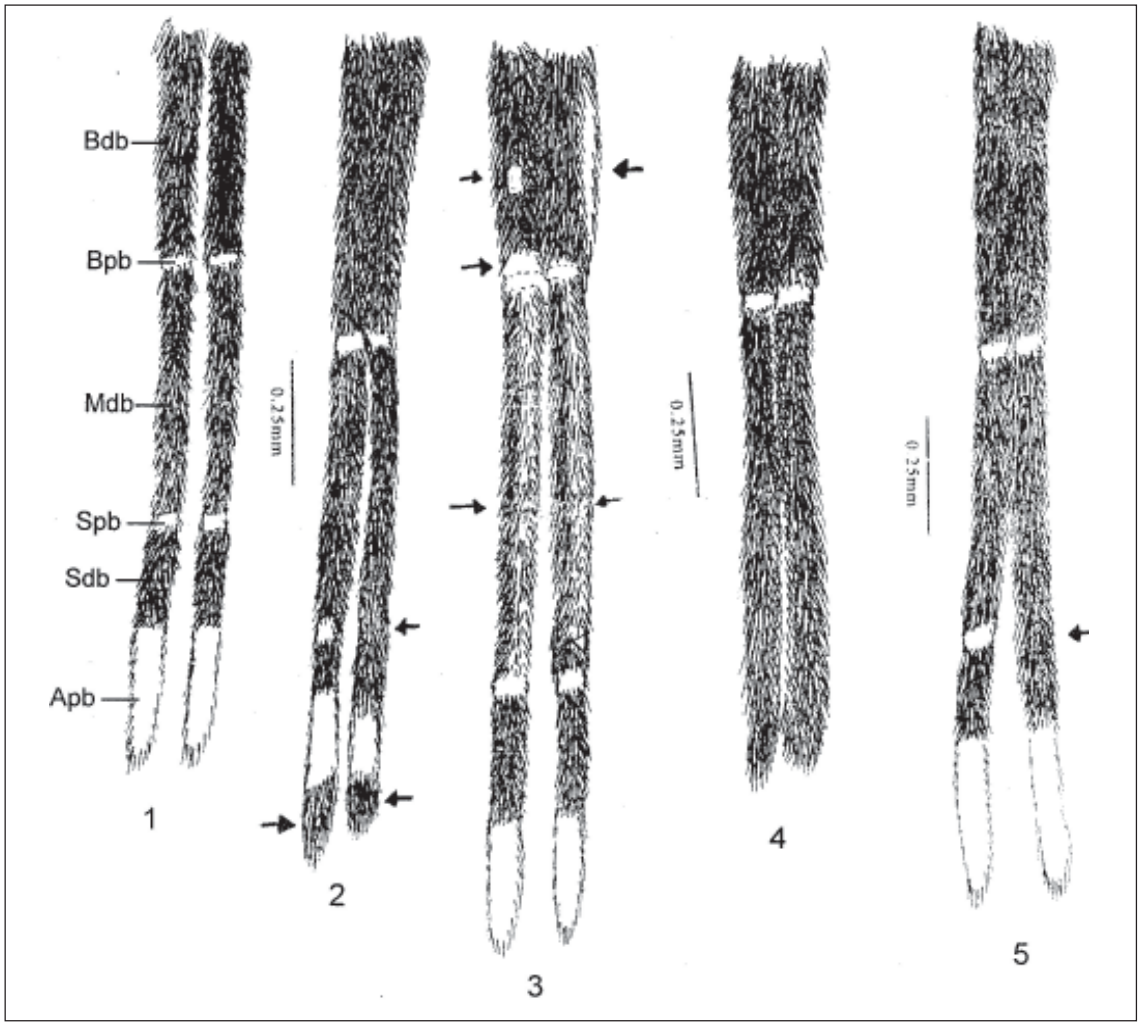
An. subpictus Grassi is a dominant species in Haryana and Uttaranchal states. Though it is a non-vector species but recently infected specimens with malarial parasite have been reported from India, Indonesia and Java[1]. This species is distributed throughout India, Afghanistan, Borneo, China, Malaysia, Myanmar, Philippines, Sri Lanka, Java and Indonesia. Morphological variations have been recorded in Indian anophelines since 1933. Christophers[2] first recorded the variations from type form in genus *Anopheles* Meigen. It was followed by Ramakrishna[3] and Rehman *et al*[4], who observed an extra dark band on the palpi of female *An. fluviatilis* James. An extra dark band on the palpi in *An. subpictus* Grassi and *An. pallidus* Theobald was observed by Subramanian & Nagendra[5]. Incomplete development of anal vein in *An. stephensi* Liston was noted by Bhatnagar *et al*[6] Rajagopal & Chakraborty[7] recorded variations in the palpi, hind tarsi and wings of *An. annularis* Van der Wulp from Dhanbad. Nagpal & Sharma[8,9] recorded variation in wings and palpi of *An. vagus* Donitz and variations in palpi of *An. sundaicus* Rodenwaldt. Nagpal[10] reported morphological variations in *An. stephensi* Liston. From the above it becomes crystal clear that no worker recorded variations in palpi and wings of *An. subpictus* Grassi except Subramanian and Nagendra[5], who reported single variation in palpi of this species. However, the present authors have been able to record 10 types of morphological variations in wings and palpi of *An. subpictus* from field collected specimens. These variations have been described and illustrated in the present paper.

Intensive and extensive collection-cum-survey tours were conducted in different localities falling in the states of Punjab, Haryana, Himachal Pradesh, Uttaranchal, Jammu and Kashmir, Delhi and Union Territory of Chandigarh. A large number of adult mosquitoes were collected with the help of suction tube and torch from different resting places—cattlesheds, human dwellings, mixed dwellings, vegetation, etc. Besides collecting adult specimens, the immature stages such as larvae and pupae were collected with the help of dropper and glass tube from different breeding places, such as paddy fields, stagnant water bodies, water coolers, tree holes, rock pools, rivulets, tyres, unused water boats, gutters and other natural as well as man-made containers. These immature stages were

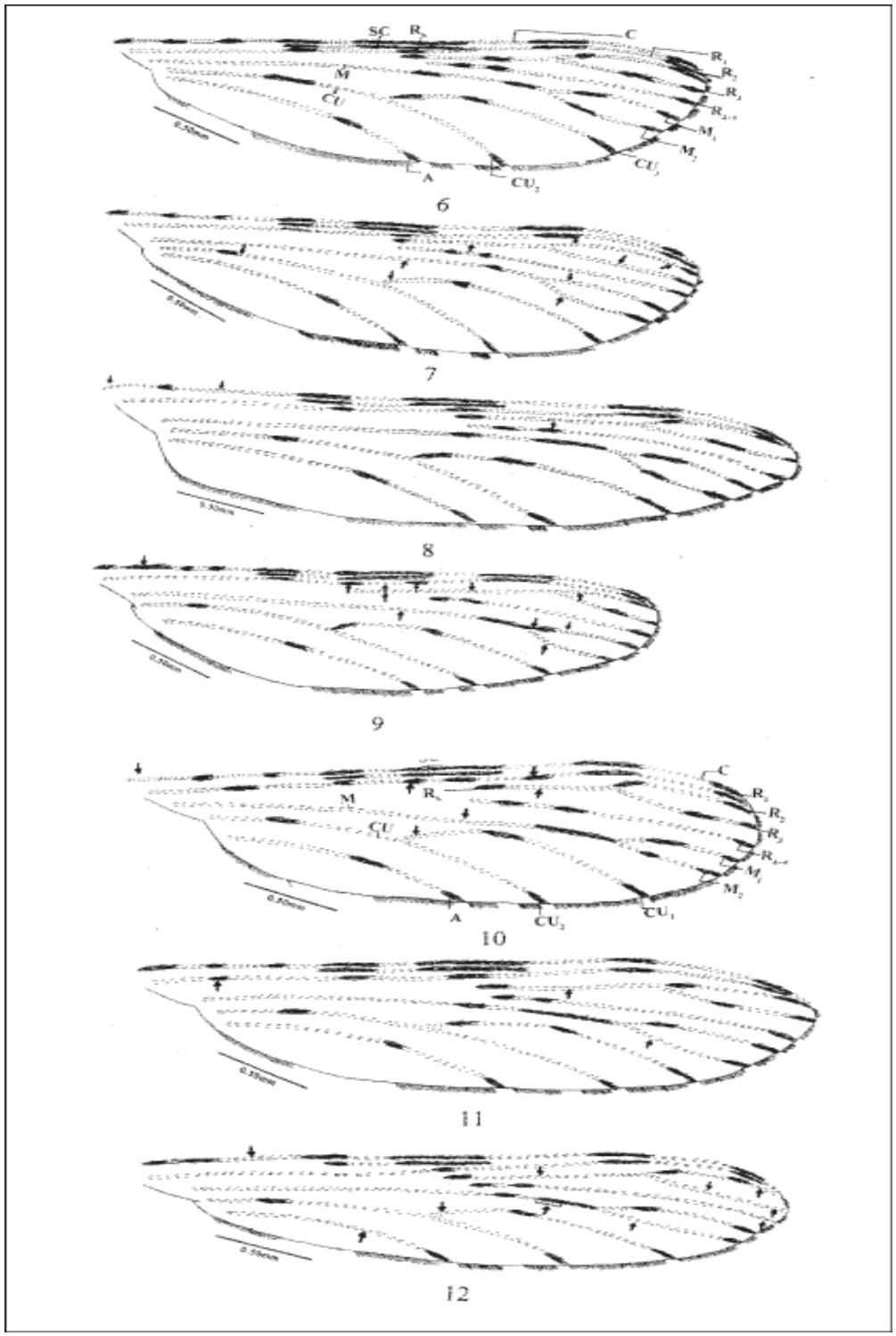
**Corresponding author*

brought to the laboratory and reared for the emergence of adults. The adult specimens were killed with ethyl acetate vapours. The freshly killed specimens were fixed either on entomological pins or on the tip of paper triangles with mounting glues. The triangles were supported with large entomological pins. The pinned specimens were preserved in the air tight and properly fumigated boxes of insect cabinets. The data on locality, source, altitude, date of collection, etc. were recorded on the field labels. The present species has been identified by following the keys of Puri[11]; and Wattal & Kalra[12]. The comparison was made with the identified collection of National Institute of Communicable Diseases, Delhi.

As many as 141 specimens of the present species were collected from different localities of northwest India during 1997–2000. In total 10 types of morphological variations have been observed in the speckling, banding pattern and size of band in palpi and ornamentation of wings. Out of these six variations have been recorded in wings and four in palpi. The details of collection date, site of collection, number of collected specimens and morphological variations have been given in Figs. 1 to 12 and Table 1.



Figs. 1–5 : Anopheles (Cellia) subpictus Grassi (1: Palpi of type form; 2–5: Variations in palpi; Bdb – Basal dark band; Bpb – Basal pale band; Mdb – Middle dark band; Spb – Subapical pale band; Sdb – Subapical dark band; Apb – Apical pale band)



Figs. 6–12: *Anopheles (Cellia) subpictus* Grassi (6: Wings of type form; 7–12: Variations in wings; C – Coasta; CU – Cubitus; CU_1 – Cubitus one; CU_2 – Cubitus two; M – Media; M_1 – Media one; M_2 – Media two; R_1 – Radius one; R_2 – Radius two; R_3 – Radius three; R_{4+5} – Radius four-plus-five; Rs – Radial sector; SC – Subcosta)

Table 1. Morphological variations in the palpi and wings of *Anopheles (Cellia) subpictus* Grassi

Sl. No.	Date of collection	Site of collection	No. of specimens collected	Description of variation from the type form
Variations in palpi				
1.	1 August 1999	Dehria, Nainital	27	Tips of both palpi dark; one palpus lacking sub-apical pale band (Fig. 2).
2.	-do-	-do-	27	Middle dark area bearing pale scales in centre all over; basal dark area with pale scales on outer side on one of palpi; one palpus carrying a rounded white spot at basal dark area (Fig. 3).
3.	18 August 1998	Ismilepur, Dehradun	7	Apical and subapical pale areas absent on both palpi (Fig. 4).
4.	1 September 1998	Indira Nagar, Kurukshetra	10	One of the palpi lacking subapical pale band (Fig. 5).
Variations in wings				
5.	1 August 1999	Dehria, Nainital	27	R_s lacking one dark spot; R_2 and R_3 pale except dark tips; dark spot at base of M_1 & M_2 absent; vein M bearing one dark spot only; Cu_1 lacking a dark spot at base (Fig. 7).
6.	-do-	-do-	27	Presector, prehumeral and basal dark spots at costa absent; median dark spot of R_s absent (Fig. 8).
7.	-do-	-do-	27	Base of costa largely dark; dark sopt of R_1 below middle dark mark of cost misplaced; R_s lacking both of the dark spots; R_2 with one dark spot only; M and M_2 lacking one dark spot each (Fig. 9).
8.	-do-	-do-	27	Costa with bask dark spot missing; R_s lacking one dark spot; R_1 with an extra small dark spot below middle dark spot of costa; M lacking one dark spot; dark spot at fork of Cu absent (Fig. 10).
9.	2 August 1999	Tilpuri, Udham Singh Nagar	36	R_1 with additional dark spot; R_s bearing single dark spot only; basal dark spot of vein M_2 lacking (Fig. 11).
10.	-do-	-do-	36	Costa with large humeral pale spot; R_s lacking one spot; R_3 totally pale; R_{4+5} lacking dark spot at tip; dark spot at base M_2, near fork at Cu_1 and middle of anal vein absent (Fig. 12).

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