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India.

Morphological variations in natural populations of *Anopheles (Cellia) culicifacies* Giles collected from Northwest India

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Abstract

Studies have been conducted on the palpi and wings of *Anopheles (Cellia) culicifacies* Giles to observe variations. As many as 10 types of morphological variations have been studied and illustrated in this paper.

Keywords: Variations, Anopheles, Culicifacies, Northwest, populations

Introduction

Anopheles culicifacies is the major vector of malaria in India and neighbouring countries. This species is responsible for the transmission of 60-70% of the 2-3 million malaria cases reported annually [12]. This vector species is distributed all over India, Afghanistan, Bangladesh, Iran, Myanmar, Nepal, Pakistan, Southern China, Sri Lanka, Thailand, Laos & Vietnam. The species prefers to rest in cattle sheds where it feeds on cattle, though it breeds in river margins, rivulets, canal systems, rice fields and wells, etc. Since palpi and wings provide important taxonomical identification characters, 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. fluviatilis* James [11]; *A. philippinensis* Ludlow [1]; *A. annularis* Van der Wulp [10, 3]; *A. vagus* Donitz and *A. sundaicus* Rodenwaldt [7]; *A. stephensi* Liston [6]; *A. subpictus* Grassi [4] and *A. pulcherrimus* Theobald [5]. From the above it becomes crystal clear that no worker has recorded variations in wings and palpi of *A. culicifacies* Giles. However, the present author has been able to record 10 type of variations in this species. These variations have been described and illustrated in the present paper.

Material and methods

Extensive and intensive mosquito surveys were carried out in rural areas of Punjab, Uttaranchal, Himachal Pradesh and Jammu & Kashmir. The adult mosquitoes were collected with the help of suction tube both from the cattle sheds and human dwellings during day time. The collected specimens were killed with the ethyl acetate vapours, before these were pinned and preserved in air tight insect cabinets. Identifications were made using the relevant literature [2, 8, 9, 13]. 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.

Results and discussion

As many as 137 specimens of *Anopheles culicifacies* Giles were collected from various localities of Northwest India. A total of 10 type of morphological variations have been observed in the speckling, banding pattern and size of band in palpi and ornamentation of wings. Out of these eight variations have been recorded in wings and two in palpi. The details of collection date, site of collection, number of collected specimens and morphological variations have been given in Table 1 and Figs. 2-9 and 11-12. Figs.1 and 10 shows normal wing and palpus respectively.

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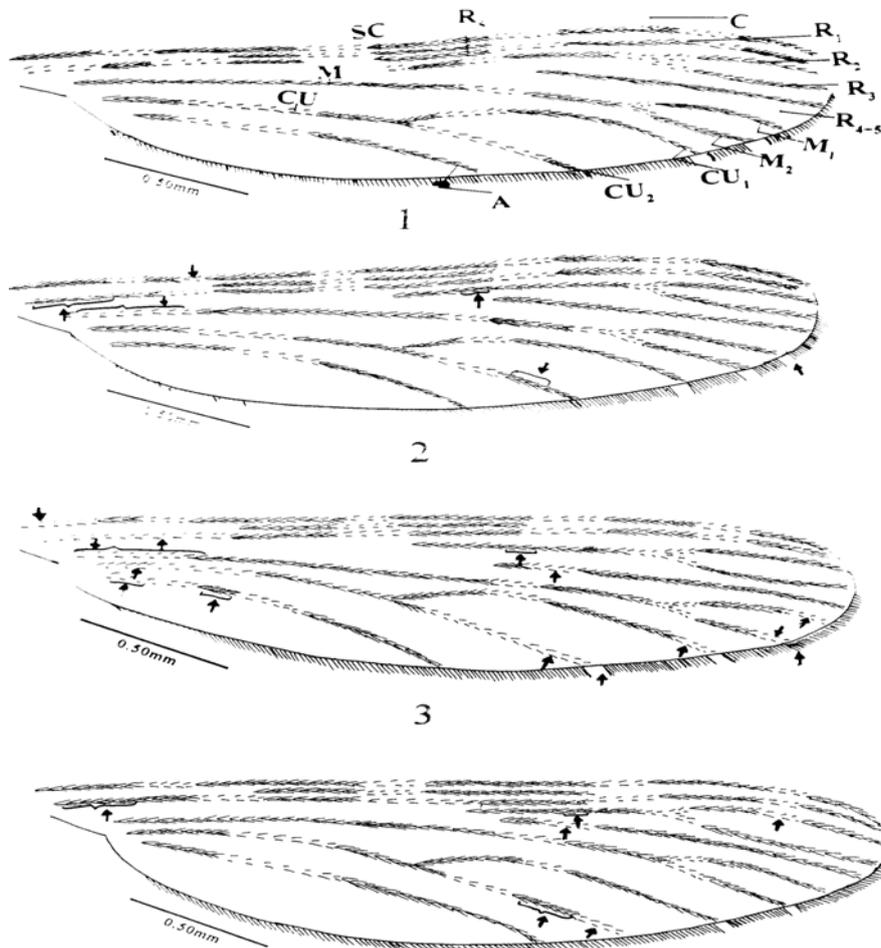
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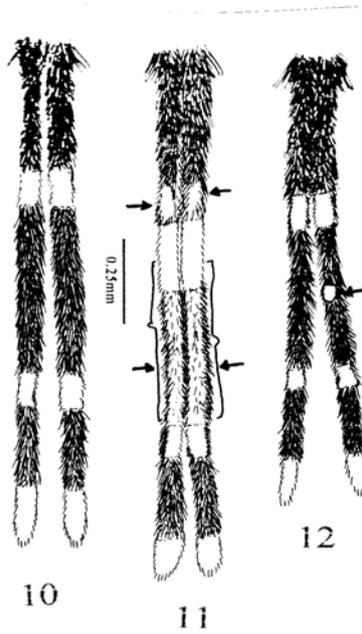
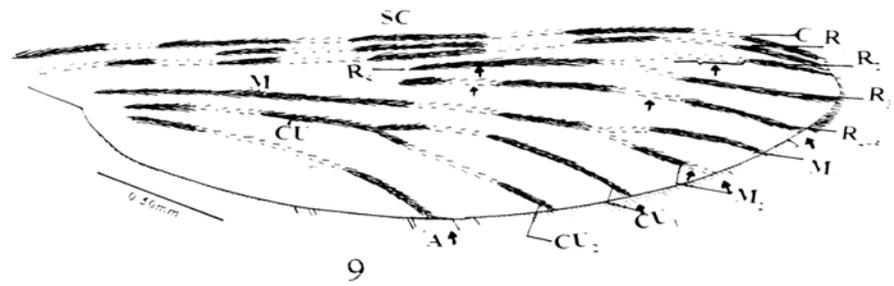
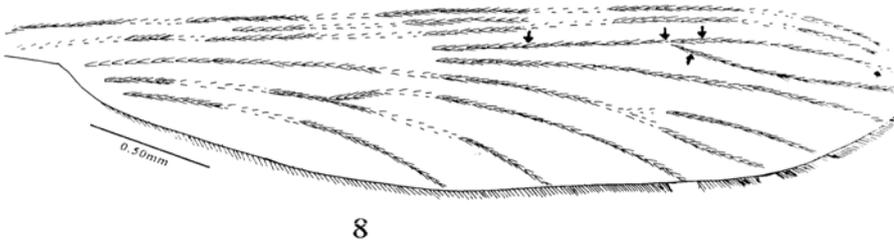
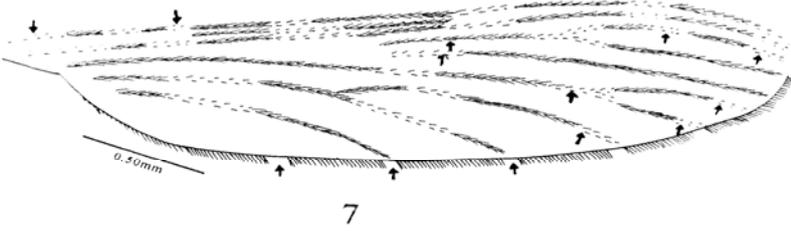
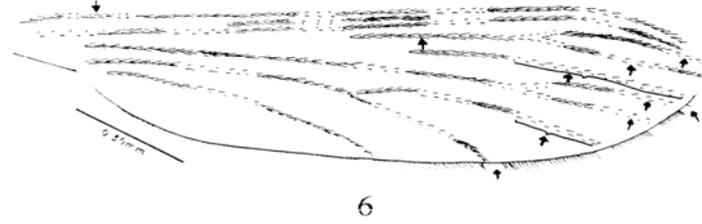
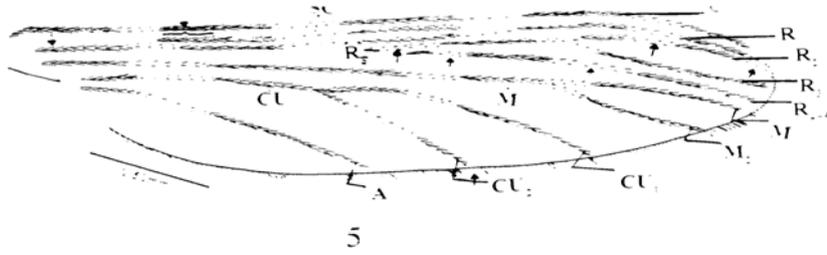
Table 1: Morphological variations in the palpi and wings of *Anopheles (Cellia) culicifacies* Giles

| Serial No. of variation | Date of collection | Site of collection | No. of specimens | Description of variation from the type form |
|-------------------------|--------------------|------------------------|------------------|---|
| 1. | 11.VII.1999 | Sodiwal, Dehradun | 4 | Prehumeral pale spot present; R1 & Rs lacking median pale spot; M pale at base; apical dark band of Cu2 larger; a fringe spot present at M1 (Fig.2) |
| 2. | 18.VIII.1998 | Ismailpur, Dehradun | 12 | Base of costa pale; subcostal lacking dark spot below first pale band of costa; Rs lacking middle pale spot; a pale spot near base of R4+5 present; apices of M1, M2, Cu1 and Cu2 pale; extreme base of M vein pale; pale fringe spot at M2 absent but at Cu2 present (Fig.3) |
| 3. | 11.VIII.1998 | Nangal, Punjab | 31 | Base of R1 dark; Rs dark; pale spot in middle of R2 present; R4+5 with pale band; Cu2 with pale tip and bearing a preapical dark spot (Fig.4) |
| 4. | 1.VIII.1998 | Nangal, Punjab | 31 | Large dark spot at base of Sc ; basal pale spot at R1 absent; Rs with basal pale band; R2 with pale area in middle and apex; middle 1/3 of R4+5 pale, latter bearing pale scales near base; fringe spot at M1 and Cu2 present (Fig.5) |
| 5. | 11.VIII.1998 | Nangal, Punjab | 31 | Basal pale spot at costa interrupted by a dark band; pale spot in middle of Rs absent; R2 & Rs with an extra pale band; Rs totally pale except a small dark area at base; R4+5 pale at distal half; M1 and M2 pale at apical half; Cu1 largely pale at distal part; fringe spot at M1 and Cu2 present (Fig.6) |
| 6. | 11.VIII.1998 | Nangal, Punjab | 31 | 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) |
| 7. | 15.VII.1999 | Asan Barrage, Dehradun | 25 | Veins Rs, R2 and R3 totally dark except some pale scales at apex of R2; apical dark spot of Cu2 triple in size than that of type (Fig.8) |
| 8. | 15.VII.1999 | Asan Barrage, Dehradun | 25 | Rs lacking median pale spot; R2 pale at basal half; R4+5 with two pale bands; M2 pale at apex; anal vein with median pale area large; fringe spot at M2 and Cu1 absent, rather R4+5 and anal vein bearing pale fringe (Fig.9) |
| 9. | 20.VIII.1998 | Rishikesh, Uttranchal | 9 | Apical half of basal dark band and whole of middle dark band pale with black scales on lateral sides. (Fig.11) |
| 10. | 11.VIII.1998 | Nangal, Punjab | 31 | Middle dark band of one palpus with a rounded pale spot (Fig.12) |

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.





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