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New Record of Armature in the Genital Atria of Female Sandflies of Pakistan to Discriminate Species of Phlebotomine Sandflies (Diptera, Psychodidae)

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Abstract: During an extensive taxonomic study for the identification of species of sandflies prevalent in the whole of the Balochistan Province conducted in 1996-2001, specific armatures were observed in the atria of eight sandflies species viz., *Ph. papatasi, Ph. sergenti, Ph. bergeroti, Ph. salehi, Ph. alexandri, Ph. nuri, S. freetownensis* var. and *S. clydei.* This is to the author's knowledge the first report of armature in the atria of phlebotomine sandflies of Pakistan as previously this character was never explored in Pakistanese sandflies. The shape, size and pattern of armature were found to be specific and constant and also quite different between species. A simple method is presented to identify an unknown specimen as above cited eight species using the present morphological character of armature of genital atria. This character allows separation and may be helpful of species identification in cases where during dissection and mounting of female genitalia, spermathecae become lost. It is suggested that considering other features, this extra taxonomic character of the species may also be taken into account and considered valid while identifying the species of sandflies.

Key words: Phlebotomine sandflies, genital armature, atria, taxonomic characters

INTRODUCTION

The taxonomic significance of the armature in genital atria of Phlebotomine sandflies were first examined by Madulo-Leblond *et al.*[1] when they noticed that the length of the spines of the armature in the genital atrium of ♀ *Phlebotomus papatasi* and *Ph. dubosqi* were not the same. Pesson *et al.*[2] showed that these two species can be distinguished by this taxonomic character. Killick-Kendrick *et al.*[3] have shown that morphology of the genital atria of Kenyan species of *Larroussius* can be a distinguishing character and suggested that genital armature is more useful than the pharyngeal armature. Valenta *et al.*[4] proved that genital atrium is a good taxonomic character to distinguish between species of sandflies from Venezuela. Male flies can easily be identified by the morphology of the aedeagus, paramere, style and position of spines on the style whereas females some times have been considered difficult to distinguish. Previously, this character has never been examined in Pakistanese sandflies, therefore, to fill this gap, the present paper describes genital armature of the female flies, which may facilitate species identification.

MATERIALS AND METHODS

Collection of phlebotomine sandflies were made by the author from the whole of the Balochistan Province (indoors and out doors) through sticky traps and CDC light trap during 1996–2001. Flies were collected, processed, preserved, dissected and mounted according to the conventional methods especially those adopted by Johnson *et al.*[5], Lewis[6] and Killick-Kendrick[7]. For species identification, keys furnished by and Lewis[8-10] and Artemiev[11] were consulted. All the diagrams were drawn with the help of camera lucida and are to the given scales. Measurements are in millimeter unless otherwise indicated. Specimens are housed with the Author's Collection of Sandflies, Department of Zoology, University of Balochistan, Quetta, Pakistan.

RESULTS AND DISCUSSION

By the light microscope, the armature of the genital atria of ♀ phlebotomine sandflies were seen to lie between the arms of the furca. The spines of the armature were found pointing towards the opening of the atrium. The length and width of bands of the spines, shape of anterior and posterior edges of band of spines, number of spines in groups and rows of spines were observed variable among species.

Morphometric measurements of genital atria and armatures of phlebotomine sandflies are given in Table 1. Within the population of ♀ *Phlebotomus papatasi,* the specimens from Duki showed a sharply concave anterior and posterior edges of band of spine, respectively and

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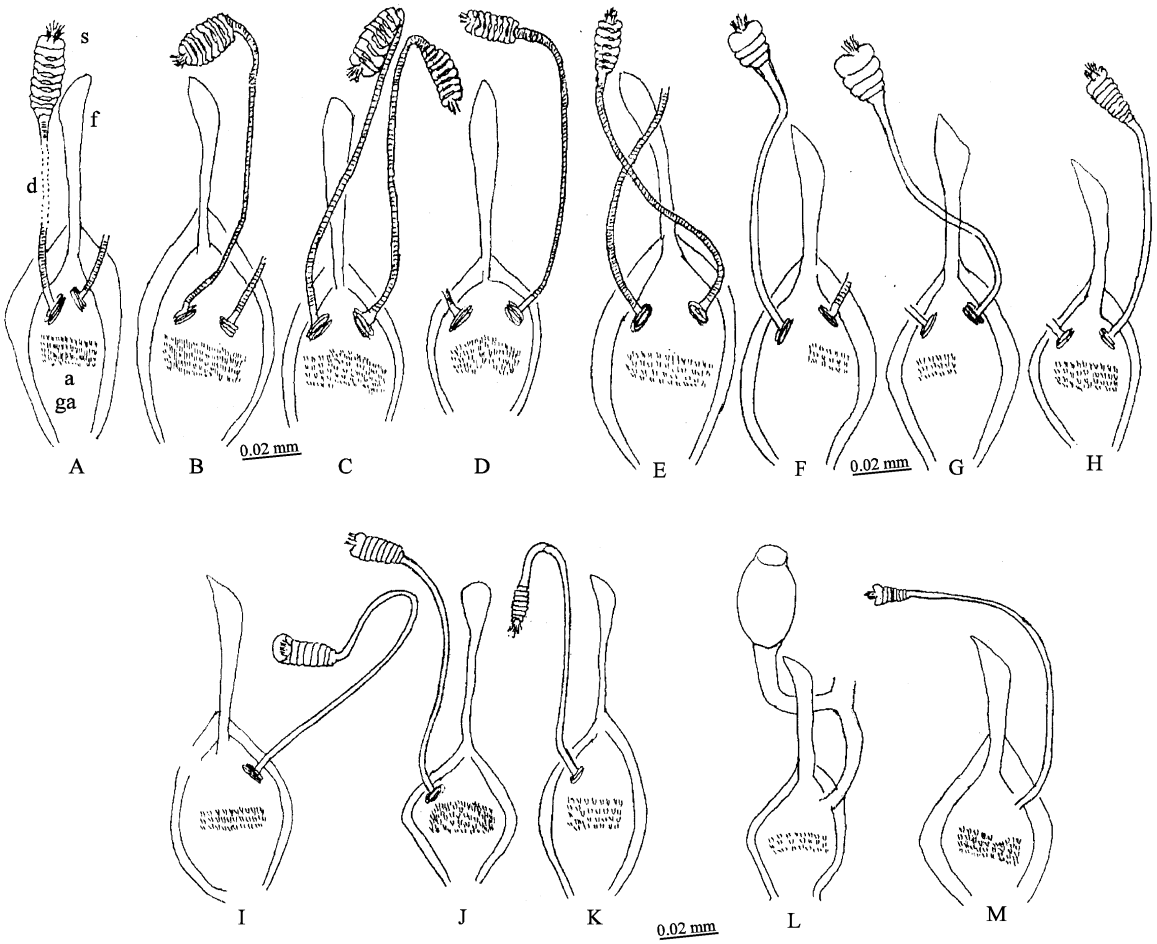

Fig. 1: Camera Lucida drawings of spermatheca and associated parts of ♀ *Ph. papatasi* from Pakistan showing: spermathecae (s), spermathecal ducts (d), furca (f), genital atrium (ga) and armature (a), (A) from Bela, (B) from Chaman, (C) from Pishin, (D) from Duki and (E) and from Uthal. (F) *Ph. sergenti* from Quetta, (G) from Kohlu, (H) *Ph. salehi* from Bela, (I) *Ph. bergeroti* from Turbat, (J) *Ph. alexandri* from Khuzdar, (K) *Ph. nuri* from Quetta, (L) *S. freetownensis* Sinton var. from Bela, (M) *S. clydei* from Panjgour

also spines in group of 2-3 or 2-4. This character may probably be a deviation from the normal pattern "anterior and posterior edges of spines slightly concave and convex in line, respectively and spines in groups of 2-3" as observed in individuals of this species from Bela, Chaman, Pishin and Uthal localities.

The other species of the subgenus *Phlebotomus* i.e. *Ph. bergeroti* and *Ph. salehi* showed a quite different pattern of band of spine as compared with that of *Ph. papatasi*. In both species anterior and posterior edges of band of spine were found almost in a straight line. However, significant differences were noted in the length of genital fork and breadth of genital atrium of *Ph. bergeroti* (0.076, 0.06 mm) and *Ph. salehi* (0.084, 0.052 mm), respectively. Further, 4 rows of spines were noted in genital atrium of *Ph. salehi* and 3 in *Ph. bergeroti.*

Similarly, in between species of subgenus *Paraphlebotomus,* interesting differences were noted in the shape of anterior and posterior edges of band of spines and pattern of arrangement of groups of spines. The notable character observed in *Ph. sergenti* was that the band of genital armature did not extend from one arm of the furca to the other, but was located nearly at only one side of the furca. On the basis of characteristically sharply curved both arms of furca, *Ph. alexandri* can easily be differentiated from *Ph. nuri*. However, *S. clydei*

Table 1: Morphometric measurements (mm) of genital atria and armature in female Phlebotomine sandflies from Pakistan

Name of species and place of collection	Length of genital fork	Breadth of genital atrium	Band of spine	Shape of anterior and posterior edges of band of spine	Spines in group of	Row of spine
Ph. papatasi						
Bela (A)	0.100	0.044	0.036 long 0.012 broad	Very slightly concave anteriorly but convex posteriorly.	2-3	4-5
Chaman (B)	0.096	0.064	0.052 long 0.016 broad	----------do----------	--do--	--do--
Pishin (C)	0.096	0.056	0.048 long 0.017 broad	Concave anteriorly but convex posteriorly.	--do--	--do--
Duki (D)	0.104	0.056	0.048 long 0.018 broad	Sharply concave anteriorly but convex posteriorly.	–do--	--do--
Uthal (E)	0.096	0.056	0.04 long 0.016 broad	Very slightly concave anteriorly but convex posteriorly.	---do--	--do--
Ph. sergenti						
Quetta (F)	0.096	0.056	0.032 long 0.012 broad	Less broader band of spine at the side of arms of furca.	2	3
Kuhlu (G)	0.1	0.052	0.02 long 0.014 broad	----------do----------	--do--	--do--
Ph. bergeroti						
Turbat (H)	0.076	0.06	0.044 long 0.011 broad	Almost in straight line.	2	3
Ph. salehi						
Bela (I)	0.084	0.052	0.036 long 0.012 broad	----------do----------	2	4
Ph. alexandri						
Khuzdar (J)	0.096	0.054	0.028 long 0.017 broad	Anterior edge of armature slightly concave whereas posterior edge almost straight, arms of furca characteristically sharply curved.	2	5
Ph. nuri						
Quetta (K)	0.090	0.048	0.04 long 0.02 broad	Both edges of spine almost in straight line. [Group of spine not in compact manner but loosely arranged]	2	4
***S. freetownensis* var.**						
Bela (L)	0.08	0.044	0.028 long 0.016 broad	Anterior edge of armature slightly concave but posterior margin convex. [Group of spine arranged at some distance and not compactly]	2	3
S. clydei						
Panjgour (M)	0.096	0.048	0.036 long 0.018 broad	Anterior edge of armature with a deep median indentation whereas posterior margin slightly concave. [Group of spine closely arranged]	2	4

can also be identified on the basis of anterior edge of armature with a deep median indentation whereas posterior margin in a slight concave line.

Pesson *et al.*[2] suggested that in sandflies, the function of genital armature is presumably to assist the movement of eggs as they are laid.

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