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## REDESCRIPTION OF THE GENUS *AELIOMORPHA* STÅL (PENTATOMIDAE: PENTATOMINAE: AELIINI) FROM INDO-PAKISTAN SUBCONTINENT WITH SPECIAL REFERENCE TO MALE AND FEMALE GENITALIA

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*Aeliomorpha* Stål is redescribed along with its three species *A. fletcheri* Distant, *A. lineaticollis* (Westwood) and *A. pusana* Distant from Indo-Pakistan Subcontinent with special reference to their metathoracic scent gland complex, and male and female genitalia. The above species are keyed and the relationships of the included taxa are briefly discussed.

**Key words:** Redescription, *Aeliomorpha*, Genitalia, Indo-Pakistani taxa.

### Introduction

Stål [11] described *Aeliomorpha* to accommodate his species *A. simulans* from Africa. Distant [2] accommodated *Pentatoma lineaticollis* Westwood under the genus *Aeliomorpha* from Bengal and Bombay and gave the dorsal view diagram, metathoracic scent gland complex and venter of the abdomen. Distant [3] reported *A. fletcheri* Distant and a new species *A. pusana* from S. India and Srilanka and Jalendhar, Punjab respectively and extended the distributional range of *A. lineaticollis* to Bihar, S. India and Srilanka. He gave no illustration of his species *A. pusana*. Kirkaldy [4] listed twelve species; ten from Africa, one from Madagascar and only *A. lineaticollis* from India (Stichel [14]: 748, reported it from Syria) Linnavuori (1965, Ann. Ent. Fenn. 31:237) added *A. sheanensis* from Israel differentiating it from *A. lineaticollis* but it could very well be its synonym. Recently Zheng and Liu (1987, Acta Zootaxonomica Sinica 12: 181-191) described *A. yunnanensis* from Yunnan, South China; Linnavuori (1975, Bol. Soc. Port. Cienc. Nat. 15: 5-128) keyed all the African Species except *A. viridis* Reuter from Madagascar. Abbasi [5] reported *A. fletcheri*, *A. lineaticollis* and *A. pusana* three species of *Aeliomorpha* from different areas of Pakistan but he only drew the dorsal view diagram of *A. fletcheri*; his descriptions and diagrams on other morphological aspects including those of genitalia need corrections and reinterpretations.

Ahmad *et al.* [6] gave the distribution, seasonal emergence and food plants of *A. fletcheri*, *A. lineaticollis* and *A. pusana*. Ahmad [7,8] listed the above species, and in the former work in a discussion on the phylogeny commented on the taxonomic position of Aeliini within Pentatominae. In the light of the above it is clear that the aspects of genitalia of the above species need immediate attention and necessitate the present study in a solution of the phylogenetic position of *Aeliomorpha* within Aeliini.

Presently, *Aeliomorpha* along with its three species are redescribed with special reference to their metathoracic scent

gland complex, and male and female genitalia. For the inflation of aedeagus the technique of Ahmad [9] was followed. For dissection of the spermatheca, and for measurements, diagrams and descriptions the methods of Zaidi and Ahmad [10] were generally followed. All measurements are given in mm and diagrams are to the given scales.

*Aeliomorpha* Stål 1858

*Aeliomorpha* Stål [11]: 313; [12]: 79; Atkinson [13]: 37; Distant [2]: 138; [3]: 127; Kirkaldy [4]: 76; Stichel [14]: 748; Puchkov [15]: 198; Linnavuori [16]: 39; [17]: 87; Ahmad *et al.* [6]: 45; Ahmad [7]: 33; [8]: 135. *Tetratoma* Signoret [22]: 339; *Pentatoma* subgenus *Aeliomorpha* Stål [1]: 173. Type species: *Aeliomorpha simulans* Stål.

**Head.** Deflected, usually broader than long; paraclypei always as long as clypeus; antenniferous tubercles not visible from above; antennae with 1st segment shortest; labium distinctly passing beyond hind coxae; 1st segment almost reaching to posterior margin of head; ocelli of moderate size.

**Thorax.** Length of pronotum as long as or shorter than length of head, anterior angles with denticles, anterior margin concave or sinuate, posterior margin almost straight; scutellum as long as or slightly longer than broad with distinct apical lobe; metathoracic scent gland complex well developed, with large ostiole, elongate peritreme, distinct evaporatoria.

**Abdomen.** Usually longer than broad or as long as broad; 7th abdominal sternum deeply concave or round, lateral margins of sternites acute.

**Male genitalia.** Pygophore usually as long as broad, ventroposterior margin usually sinuate, lateral lobes usually round, paramere F-shaped; inflated aedeagus with or without pair of thecal appendages, one or two pairs of membranous conjunctival appendages, vesica always short.

**Female genitalia.** First gonocoxae usually apically round, not touching each other; 2nd gonocoxae usually broader than long; 9th paratergites elongate, usually not reaching to posterior margin of fused 8th paratergites; spermatheca with

proximal spermathecal duct longer than distal spermathecal duct.

*Comparative note.* *Aeliomorpha* is closely related to *Adria* in having paraclypei almost as long as clypeus and never enclosing the latter in front but can easily be separated by anterior margin of pronotum concave and meso- and metasternum carinate; *Adria* has the anterior margin of pronotum sinuate and meso- and metasternum slightly sulcate. Key to the species of *Aeliomorpha*

1. Head length almost as long as pronotum, labium just passing beyond hind coxae, dorsoposterior margin of pygophore toothed..... *fletcheri* (Dist).

Head length longer than pronotum, labium distinctly passing beyond hind coxae, reaching 3rd abdominal venter, dorsoposterior margin of pygophore convex or medially concave..... 2

2. Scutellum almost as long as broad, more than 1 1/4x longer than head length, pygophore quadrangular, proximal spermathecal duct more than 2 1/2x longer than distal spermathecal duct ..... *pusana* Distant.

Scutellum broader than long, distinctly shorter than head length, pygophore broader than long, proximal spermathecal duct distinctly longer than distal spermathecal duct..... *lineaticollis* (Westwood).

*Aeliomorpha fletcheri*. Distant (Figs. 1,4,7,10,13,14,19, 22).

*Aeliomorpha fletcheri* Distant, [18]:22; [3]: 127; Ahmad *et. al.* [6]: 45; Ahmad, [7]: 43; [8]: 135.

*Colouration:* Body green except head, lateral margins and middle of pronotum, middle of scutellum, eyes and ocelli ochraceous; elongate spot from base to apex on pronotum and elongate spot at base on lateral margins of pronotum greenish black.

*Head.* Almost as long as pronotum; lateral margin of paraclypei medially deeply concave, almost as long as clypeus; anteocular distance slightly longer than remainder of head; antennae with 2nd segment as long as 3rd, length of antennal segments (I) 0.25-0.30, (II) 0.4-0.6, (III) 0.4-0.6, (IV) 0.45-0.70, (V) 0.6-0.8; antennal formula 1<2=3<4<5; labium passing beyond hind coxae, 3rd segment more than 2x shorter than 2nd; length of labial segments (I) 0.7-0.9, (II) 0.8-1.1, (III) 0.3-0.5, (IV) 0.5-0.6, labial formula 3<4<1<2; length anteocular distance 0.65-0.70; length of remainder of head 0.5-0.6, width 1.4-1.6; interocular distance 0.9-1.2; interocellar distance 0.6-0.8.

*Thorax.* Width of pronotum more than 2x wider than length; humeral angles subacute, lateral margins sinuate, length of pronotum 1.1-1.35, width 2.5-3.0; scutellum slightly longer than broad, distinctly longer than head length, apex of apical lobe acute; length of scutellum 1.5-1.95, width 1.4-

1.85; metathoracic scent gland ostiole (Fig. 2) small, peritreme elongate, sword like; membrane of hemelytra distinctly longer than abdomen; base of scutellum-apex of clavus 1.0-1.1 apex of clavus-apex of corium 0.9-1.35; apex of corium-apex of abdomen including membrane 0.8-1.3; apex of scutellum-apex of abdomen including membrane 1.3-1.6.

*Abdomen.* Slightly broader than long; 7th abdominal sternum concave; connexiva distinctly exposed at repose; total body length, male 5.05-5.5, female 5.7-6.2.

*Male genitalia.* Pygophore (Fig. 7) slightly broader than long, dorsoposterior margin sinuate, lateral lobes broadly round, ventroposterior margin sinuate; paramere (Fig.10) F-shaped, apex of blade rod-like, outer margin with tooth; inflated aedeagus (Figs.13,14) with pair of lobe-like lateral thecal appendages, pair of ventral membranous conjunctival appendages, penial lobes H-shaped, vesica short, not reaching margin of ventral membranous conjunctival appendages.

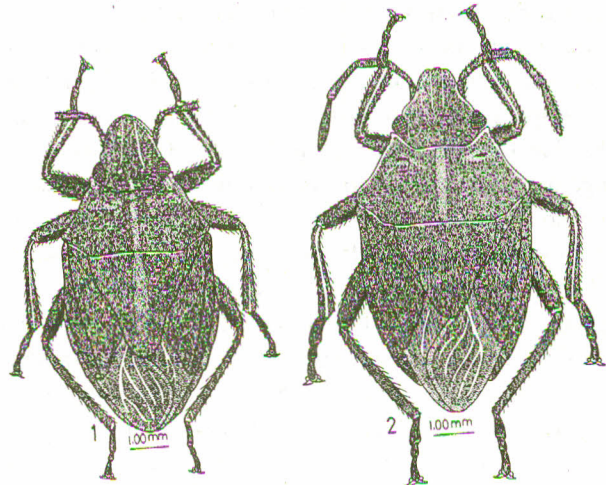


Fig. 1-2

1. *Aeliomorpha fletcheri* Distant (dorsal view), 2. *Aeliomorpha lineaticollis* (Westwood) (dorsal view).

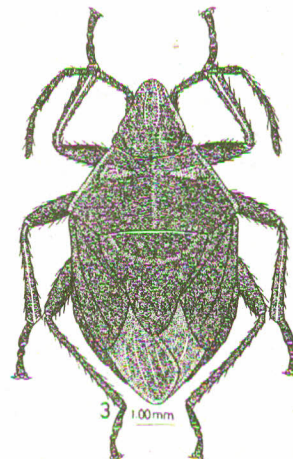


Fig. 3. *Aeliomorpha pusana* Distant (dorsal view).

*Female genitalia.* (Fig. 19). First gonocoxae lobe-like with posterior margin entire; 2nd gonocoxae short; 8th paratergites triangular; 9th paratergites elongate not reaching to fused posterior margin of 8th paratergites; arcus oval with posterior margins round; spermatheca (Fig. 22) with proximal spermathecal duct distinctly more than 3 1/2x longer than distal spermathecal duct, pump region slightly longer than distal spermathecal duct, spermathecal bulb round.

*Material examined.* Holotype Srilanka: Hambantota, leg Bainbrige Fletcher, in BMNH. Other material: 49 male, 10 female, Pakistan (Northern areas), Gilgit; (Punjab), Islamabad, Rawalpindi, Chunion, Changamanga, Rahimyar Khan, Faisalabad; (Sind), Karachi, (Malir), Hyderabad, Mianiforest, Tandojam, Wah, Sakrand, (Baluchistan), Quetta, Pishin, Urak, Turbat, 17.9.1963, 17.19.23.8.25, 27.11, 1967, 17.4, 23.9.1968, 14., 21,-6-1979, 1.7. 1.11.1970, 1.9.1972, 27.5, 10.7.1973, 10.3, 10.4, 15.5.1974, 4.7.1975, 12.4, 8.5.1976, 26.7.1983, leg. F. Ahmad, M. Shadab, I. Ahmad, A.A. Khan, M. Aslam, A. Ramzan, and S. Kamaluddin, in NHMUK, NHM, Switzerland and in Ahmad's collection.

*Comparative note.* This species is closely related to *pusana* in general body shape but can easily be separated by very small body, head length almost as long as pronotum and labium usually reaching to hind coxae. In *pusana* head is

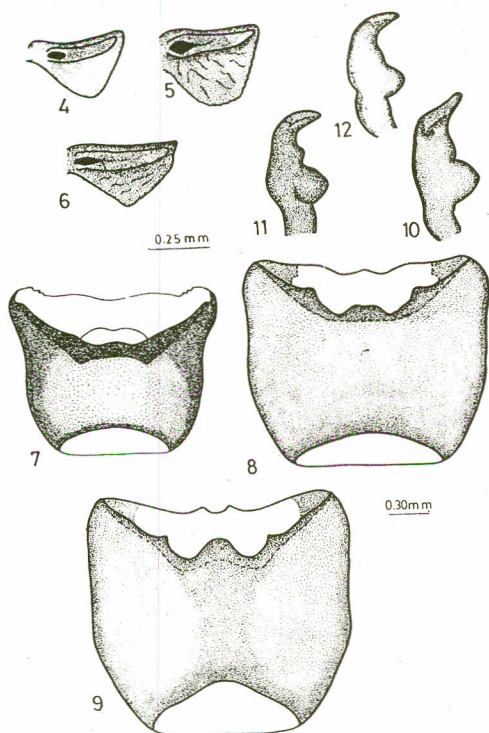


Fig. 4-12

4. Scent Gland (ventral view), 5. Scent gland (ventral view), 6. Scent gland (ventral view), 7. Pygophore (dorsal view), 8. Pygophore (dorsal view), 9. Pygophore (dorsal view), 10. Paramere (inner view), 11. Paramere (inner view), 12. Paramere (inner view).

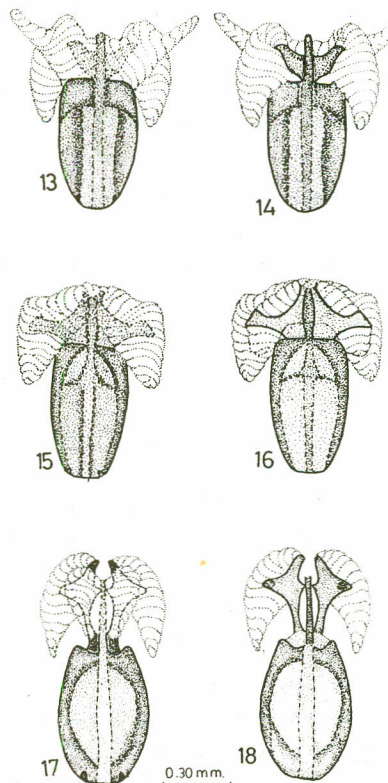


Fig. 13-18

13. Aedeagus (dorsal view), 14. Aedeagus (ventral view), 15. Aedeagus (dorsal view), 16. Aedeagus (ventral view), 17. Aedeagus (dorsal view), 18. Aedeagus (ventral view).

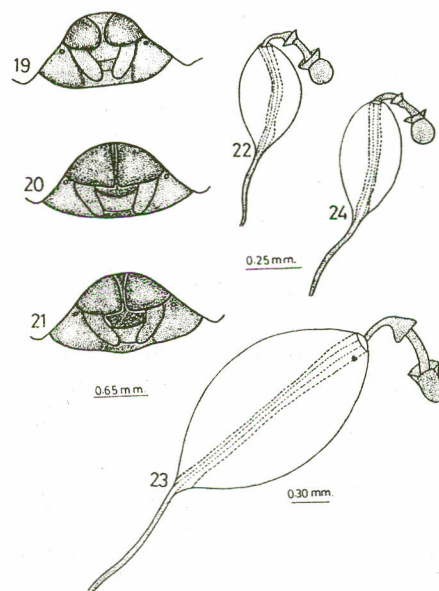


Fig. 19-24

19. Female terminalia (ventral view), 20. Female terminalia (ventral view), 21. Female terminalia (ventral view), 22. Spermatheca (dorsal view), 23. Spermatheca (dorsal view), 24. Spermatheca (dorsal view).

longer than pronotum and labium passing beyond hind coxae. *Aeliomorpha lineaticollis* (Westwood) (Fig. 2, 5, 8, 11, 15, 16, 20 and 23).

*Pentatoma lineaticollis* Westwood [19]: 36, *Aeliomorpha lineaticollis* Atkinson, [13]: 37; Distant [2]: 139; Kirkaldy, [4]: 76; Stichel [14]: 748; Chceema *et. al.* [20]: 49; Ahmad *et. al.* [6]: 45; Ahmad [7]: 33; [8]: 135.

**Colouration.** Body ochraceous, except antennae brown, lateral margins of clypeus and paraclypei, elongate stripe in middle and elongate stripe from base to apex near lateral margins of pronotum, elongate spot near basal angles of scutellum, and clavus of hemelytra light green and eyes black.

**Head.** Distinctly longer than pronotum; lateral margins of paraclypei sinuate, as long as clypeus; antecular distance distinctly longer than remainder of head; antennae with 2nd segment distinctly longer than 3rd, length of antennal segments (I) 0.4-0.5, (II) 1.1-1.2, (III) 0.8-1.0, (IV) 0.85-1.15, (V) 0.9-1.0, antennal formula  $1 < 3 < 4 < 5 < 2$ ; labium reaching to 3rd abdominal sternum, 3rd segment distinctly shorter than 2nd; length of labial segments I 1.0-1.1, II 1.10-1.1, III 0.7-0.8, IV 0.7-0.8, labial formula  $3 = 4 < 1 = 2$ ; length of antecular distance 0.9-0.9-1.0; length remainder of head 0.65-0.80, width 1.6-1.9; interocular distance 1.1-1.4; interocellar distance 0.8-0.9.

**Thorax.** Width of pronotum distinctly more than 2x wider than length; anterior angles toothed, directed anteriorly, anterior margin concave, humeral angles subround, lateral margins straight, length of pronotum 1.4-1.6, width 3.2-3.75; scutellum as long as broad, distinctly longer than length of head, apex of apical lobe round; length of scutellum 2.2-2.4, width 2.2-2.4; metathoracic scent gland ostiole (Fig. 5) small, boat-like; peritreme elongate; membrane of hemelytra as long as abdomen; length, base of scutellum-apex of clavus 1.6-1.8; apex of clavus-apex of corium 1.1-1.2; apex of corium-apex of abdomen including membrane 0.9-1.2; apex of scutellum-apex of abdomen including membrane 1.3-1.5.

**Abdomen.** Slightly longer than broad; 7th abdominal sternum round; connexiva slightly exposed at repose; total body length, male 6.1-6.25, female 7.3-7.5.

**Male genitalia.** Pygophore (Fig. 8) almost as long as broad; dorsoposterior margin straight, medially toothed; lateral lobes round, ventroposterior margin sinuate, medially convex; paramere (Fig. 11) F-shaped, blade with round apex, outer margin with tooth-like processes, inner margin with broad lobe-like structure; inflated aedeagus (Fig. 15, 16) with pair of lobe-like lateral thecal appendages, elongate dorsal membranous conjunctival appendage with pair of membranous lobes, pair of broad ventral membranous conjunctival appendages, vesica short, not reaching to posterior margin of dorsal conjunctival appendage.

**Female genitalia** (Fig. 20): First gonocoxae broad, round; 2nd gonocoxae almost as long as broad; 8th paratergites triangular, with posterior margin convex; 9th paratergites elongate, not reaching to fused posterior margin of 8th paratergites; spermatheca (Fig. 23) with proximal spermathecal duct distinctly longer than distal spermathecal duct, pump region distinctly shorter than distal spermathecal duct, spermathecal bulb elongate.

**Material examined.** Holotype *Pentatoma lineatipes* Benglad in Oxford Museum. Other materials: 26 male 29 female Pakistan: (Sind), Karachi Tandojam, Hyderabad, Thatta, Kohsarfarm, Sujawal, Sakrand, Mianiforest, Shadi Pali; (Punjab) Islamabad, C.D. Nursery, Shahdra, Chunian, Rawalpindi, 25.11.1967, 11, 12.9.1968, 14, 19, 25, 26.10; 1.11.1970, 10.7.1973, 4, 11.5, 28.8, 23.9, 16.10, 2.11.1975, 12.4, 20.7, 24.9, 22.11, 11.12.1976, 2.5, 24, 26.6, 14.10.1977, 12.4.1978, 27.9.1979, 28.7, 1.8.1983, 22.8.1984, leg. I Ahmad, A. Khan, N.A. Khan, S. Kamaluddin, A.A. Khan, M. Moizuddin, M. Shadab, M. Rahim, Q.A. Abbasi, N.A. Rana, in NHMUK, BMNH and in Ahmad's collection.

**Comparative note.** This species is closely related to *pusana* in having head length longer than pronotum and labium distinctly passing beyond hind coxae; it can easily be separated from *pusana* by scutellum broader than long, distinctly shorter than length of head and pygophore broader than long. In *pusana* scutellum almost as long as broad, more than 1 1/4x longer than head and pygophore quadrangular.

*Aeliomorpha pusana* Distant (Fig. 3, 6, 9, 12, 17, 18, 21, 24)

*Aeliomorpha pusana* Distant [3]: 128; Kumar [21]: 52; Ahmad *et. al.* [6] 46; Ahmad [7]: 38.

**Colouration.** Body ochraceous except large spot in middle of pronotum, elongate spot from base to apex on scutellum and hemelytra green; clypeus, callosities and lateral region of pronotum brownish ochraceous.

**Head.** Slightly longer than pronotum; lateral margins of paraclypei sinuate, as long as clypeus; antecular distance slightly longer than remainder of head; antennae with 2nd segment distinctly shorter than 3rd, length of antennal segments I 0.4-0.5, II 0.5-0.65, III 0.7-0.8, IV 0.65-0.85, V 0.9-1.0; antennal formula  $1 < 2 < 4 < 3 < 5$ ; labium reaching 3rd abdominal venter, 2nd segment slightly more than 1 1/2x longer than 3rd; length of labial segments, I 0.8-0.9, II 1.1-1.4, III 0.65-0.80, IV 0.55-0.65; labial formula  $4 < 3 < 1 < 2$ ; length of antecular distance 0.8-0.9, length of remainder of head 0.6-0.8, width, 1.6-1.9; interocular distance 1.1-1.4; interocellar distance 0.8-1.0.

**Thorax.** Width of pronotum more than 2x wider than length; humeral angles acute, lateral margins straight; length of pronotum 1.45-1.7, width 3.1-3.8; scutellum almost as long as broad, more than 1 1/4x longer than length of head, apex of

apical lobe round, length scutellum 2.05-2.5, width 2.0-2.5; metathoracic scent gland ostiole (Fig. 6) small, membrane of hemelytra only slightly longer than abdomen; base of scutellum-apex of clavus 1.6-1.7; apex of clavus-apex of corium 1.4-1.6; apex of corium-apex of abdomen including membrane 0.6-1.1; apex of scutellum-apex of abdomen including membrane 1.0-1.65.

*Abdomen.* Distinctly broader than long; connexiva slightly exposed at repose; 7th abdominal sternum concave; total body length, male 6.1-6.3, female, 7.3-7.55.

*Male genitalia.* Pygophore (Fig. 9) quadrangular, dorsoposterior margin medially deeply convex, lateral lobes subround, ventroposterior margin entire; paramere (Fig 12) F-shaped, apex of blade curved, outer margin with tooth; inflated aedeagus (Fig. 17,18) without lateral thecal appendages, pair of ventral membranous conjunctival appendages, dorsal membranous conjunctival appendage with pair of membranous lobes, penial lobes H-shaped, vesica short, not reaching to posterior margin of ventral membranous conjunctival appendages.

*Female genitalia.* (Fig. 21) First gonocoxae triangular, with posterior margins sinuate; 2nd gonocoxae short; 8th paratergites triangular; 9th paratergites elongate, lobe-like, reaching to fused posterior margin of 8th paratergites; arcus short, with posterior margins concave; spermatheca (Fig 24) with proximal spermathecal duct more than 2 1/2x longer than distal spermathecal duct, pump region as long as distal spermathecal duct, spermathecal bulb round.

*Material examined.* Holotype punjab: Jalendhar in BMNH. Other material: 100 male and 90 female PAKISTAN (Sind), Karachi, Hyderabad, Tandojam, Thatta, Mianiforest, Kohsarfarm, Kotlalloo, Nawabshah, Bandmurad; (Punjab), Rawalpindi, Islamabad, C.D. Nursery, Wahgarden, Chunian; (Baluchistan), Sibi, (Kashmir) Muzaffarabad, 10.8.1967, 15.18.1, 19.8.1968, 23.3.1969, 7.6, 14.8, 12, 19, 25, 26, 31.10, 1, 17, 23.11.1970, 22.2, 14, 19.4, 29.7, 31.10.1971, 28.2.1972, 1.3, 10, 16.7.1973, 23.8, 15.12.1974, 9.11, 19.1.8.4, 14.6, 23, 26.8, 30.9, 5, 24.10.1975, 12.4, 27.7, 18.8, 16, 22, 26, 31.10, 7.11, 5.7, 22.12.1976, 1.5, 8, 24.9, 14.10, 5.12.1977, 15.3, 14.10.1978, 27.9.1979, 1.11, 22.7.1984, leg N.A. Rana, M. Mohsin, A.A. Khan, N. Ahmad, I. Ahmad, M. Moizuddin, M. Aslam, A. Khan, S. Kamaluddin and R.H. Zaidi in NHMUK, in USNM and in Ahmad's collection.

*Comparative note.* This species is closely related to *lineaticollis* in having the labium distinctly passing beyond hind coxae and dorsoposterior margin of pygophore convex or medially concave; it can easily be separated from *lineaticollis* by scutellum almost as long as broad and pygophore quadrangular. In *lineaticollis* scutellum is broader than long and pygophore broader than long.

*Relationships of the included taxa.* Species of the genus *Aeliomorpha* and *Adria* appear to form a sister group in the tribe Aeliini with the synapomorphy of an elongate spermatheca in female genitalia. Those of *Aeliomorpha* appear isolated with the autapomorphy of lateral margins of paraclypei medially depressed and anterior margin of pronotum sinuate. *A. pusana* and *A. lineaticollis* form a sister group with the synapomorphy of the scutellum as long as broad, which is an uncommon condition in Aeliini. *A. fletcheri* appears isolated with the autapomorphy of the lateral margins of paraclypei markedly sinuate and the 1st gonocoxae in the female genitalia ovate.

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