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Carpocorini) from Oriental region

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A revision of the genus *Palomena* MULSANT & REY
(Pentatominae: Carpocorini) from Oriental region

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The genus *Palomena* MULSANT & REY is revised from Oriental region. Five species including a new one are keyed and are described in detail with special reference to their metathoracic scent gland complex, male and female genitalia, with a brief note on their relationships.

INTRODUCTION

The carpocorine stinkbug genus *Palomena* MULSANT & REY is Ethiopian, Oriental and Palaearctic in distribution. Presently its four Oriental species are redescribed in addition to a new one from Balakot in N.W.F.P. province of Pakistan with special reference to metathoracic scent gland complex, male and female genitalia. The above species are keyed and in the light of the above characters their relationships are briefly reviewed.

METHODS

For the inflation of aedeagi the technique of AHMAD (1986) was followed. For the dissection of female spermatheca and for descriptions, measurements and diagrams, the conventional techniques used by the present authors (1989) were generally followed. Measurements are given in millimetres and diagrams to the given scales.

The following abbreviations are used for the museums: Natural History Museum, University of Karachi (NHMUK); Natural History Museum, Pakistan Agricultural Research Council (NIM, PARC); British Museum of Natural History, London (BMNH); Natural History Museum Basel, Switzerland (NHM).

DESCRIPTIONS

Palomena MULSANT & REY

Palomena MULSANT & REY, 1866: 194; ATKINSON, 1888: 27; STÅL, 1872: 37; PUTON, 1881: 51; DISTANT, 1902: 155; KIRKALDY, 1909: 51; PUSHKOV, 1965: 246; STICHEL, 1960-62: 573; LINNAVUORI, 1984: 9; HALÁSZFY, 1959: 259; FUENTE, 1974: 156; AHMAD *et al.*, 1974: 42.

Type species: Palomena viridissima (PODA)

Head usually broader than long, paraclypei slightly longer or as long as clypeus; labium passing beyond middle coxae. Pronotum with anterior angles toothed, anterior margin concave, lateral margins crenulate; sctuellum always

longer than broad; metasternum carinate; metathoracic scent auricle well developed, evaporatoria distinct. Abdomen usually broader than long but in some cases almost as long as broad; 7th abdominal sternum usually concave or round.

Male genitalia: Pygophore usually longer than broad; paramere F-shaped; inflated aedeagus with one or two pairs of membranous conjunctival appendages, in some species apically sclerotized, versica long.

Female genitalia: First gonocoxae broad, wide apart, 9th paratergites elongate or lobe-like, passing beyond fused posterior margins of 8th paratergites; spermathecal bulb with 2 or 3 finger-like processes.

Comparative note: This genus is closely related to *Kamaliana* A. & Z. in having lateral margins of pronotum crenulate but it can easily be separated from the same by absence of spots adjacent to callosities.

Key to the Oriental species of the *Palomena*

1. Humeral angles of pronotum produced, width of pronotum almost 3× greater than its length 2
 - Humeral angles of pronotum not as above, width of pronotum distinctly less than 3× greater than its length. 3
2. Head length remarkably shorter than its width, labium slightly passing beyond middle coxae, membrane of hemelytra shorter than abdomen
 - *spinosa* DISTANT
 - Head length only slightly shorter than its width, labium passing beyond hind coxae, membrane of hemelytra longer than abdomen
 - *unicolor* (WESTWOOD)
3. Paraclypei almost as long as clypeus, 1st labial segment reaching to posterior margin of head *reuteri* DISTANT
 - Paraclypei longer than clypeus, 1st labial segment not as above 4
4. Anteocular distance almost as long as remainder of head, dorsoposterior margin of pygophore sinuate, medially knob-like, outer margin of paramere with a hump. *balakotensis* sp. n.
 - Anteocular distance remarkably longer than remainder of head, dorsoposterior margin of pygophore convex, outer margin of paramere without a hump. *viridissima* (PODA)

Palomena balakotensis sp. n. (Figs. 1, 6, 11, 14 & 17)

Colouration: Body light green except base of head, lateral margins of pronotum, exposed connexiva light pink; apex scutellum slightly yellowish; ocelli dark; eyes and elongate spot near eyes black.

Head: Anteocular distance almost as long as remainder of head; length of antennal segments I 0.5, II 0.9, III 1.0, IV and V mutilated; length of labial segments I 1.5, II 1.6, III and IV mutilated; length anteocular distance 1.05; length remainder of head 1.0; width 2.4; interocular distance 1.6; interocellar distance 0.9.

Thorax and abdomen: Width of pronotum distinctly more than 2× its length, humeral angles sub-round, length of pronotum 2.4, width 6.1; scutellum

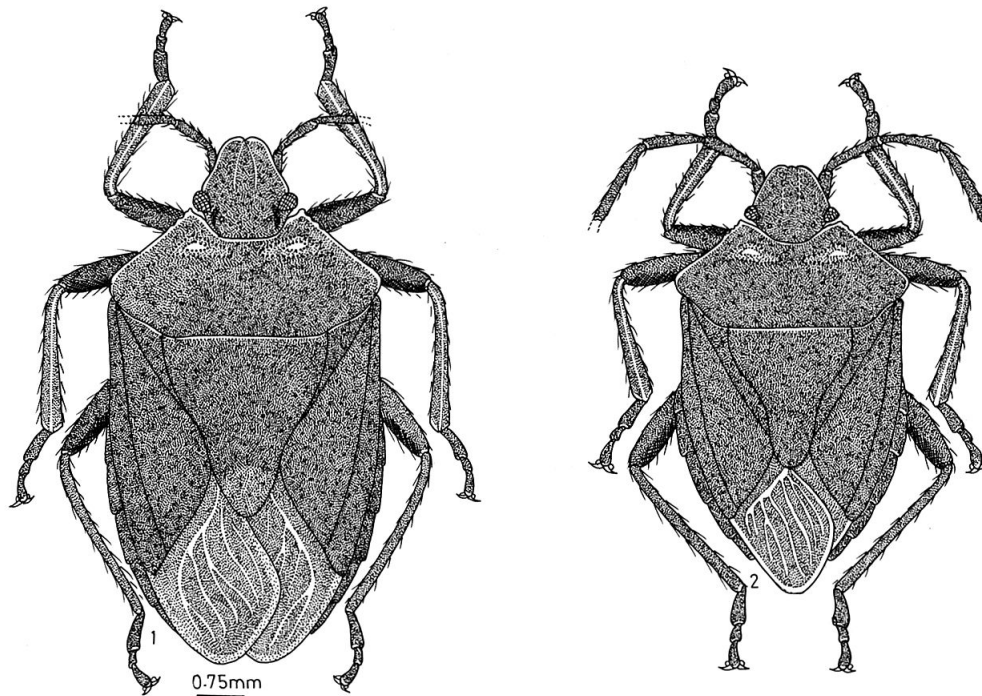


Fig. 1-2. Dorsal views of *Palomena balakotensis* sp. n. (1) and *P. reuteri* DISTANT (2).

longer than broad, length 4.0, width 3.7; metathoracic scent gland ostiole (Fig. 6) small, ovate, peritreme elongate, just passing beyond $\frac{1}{2}$ of the evaporatoria; length base scutellum-apex clavus 3.1; apex clavus-apex corium 2.5; apex corium-apex abdomen including membrane 1.3; apex scutellum-apex abdomen including membrane 2.5. Abdomen broader than long; total length, male 10.85.

Male genitalia: Pygophore (Fig. 11) almost as long as broad, dorso-posterior margin sinuate; paramere (Fig. 14) F-shaped, blade with acute apex, inflated aedeagus (Fig. 17) with a dorsal membranous conjunctival appendage and pair of ventral membranous conjunctival appendages, apically sclerotized, vesica slightly passing beyond dorsal membranous conjunctival appendage.

Material examined: Holotype 1 male, Pakistan: (N.W.F.P.), Balakot, on Grass, 14.9.1968, leg. I. AHMAD in NHMUK.

Comparative note: This species is closely related to *P. viridissima* in having paraclypei longer than clypeus but it can easily be separated from the same by antecular distance almost as long as remainder of head and outer margin of paramere with a hump.

Palomena reuteri (DISTANT)
(Figs. 2, 7, 12, 15, 18, 20 & 24)

Palomena reuteri DISTANT, 1879a: 122; 1902: 156; ATKINSON, 1888: 27; HORVATH, 1889: 31; KIRKALDY, 1909: 52; STICHEL, 1960-62: 752; HOBERLANDT, 1960: 57; PUSHKOV, 1965: 246; AHMAD *et al.*, 1974: 42; AHMAD, 1979: 50; 1980: 137.

Colouration: Body green, except 4th antennal segment pink; tarsi castaneous; eyes, membrane of hemelytra, ocelli, apices of labial segments black.

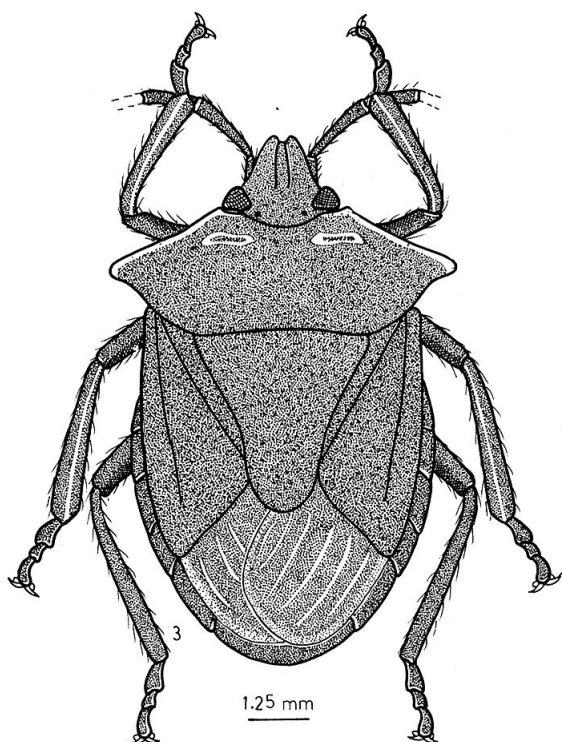


Fig. 3. Dorsal view of *Palomena spinosa* DISTANT.

Head: Anteocular distance slightly longer than remainder of head; length of antennal segments I 0.4, II 0.9–1.0, III 0.9–1.0, IV 1.2, V mutilated; length of labial segments I 1.3–1.4, II 1.4–1.5, III 1.0–1.1, IV 0.85–0.95; length anteocular distance 1.0; length remainder of head 1.1–1.15, width 2.3–2.35; interocular distance 1.5–1.6, interocellar distance 0.9.

Thorax and abdomen: Width of pronotum distinctly more than $2\times$ its length, humeral angles subacute, length of pronotum 2.2–2.25, width 5.7–6.4; length of scutellum 2.2–2.4, width 5.7–6.4; metathoracic scent gland ostiole (Fig. 7) small, ovate, peritreme elongate with pointed apex, passing beyond $\frac{1}{2}$ of evaporatoria; membrane of hemelytra slightly passing beyond abdomen; length base scutellum-apex clavus 3.1–3.2; apex clavus-apex corium 2.8–3.0; apex corium-apex abdomen including membrane 2.1–2.3; apex scutellum-apex abdomen including membrane 3.1–3.4. Abdomen broader than long, total length, male 9.5–11.0, female 9.85–11.8.

Male genitalia: Pygophore (Fig. 12) almost broader than long, dorsoposterior margin deeply sinuate; paramere (Fig. 15) F-shaped, blade with pointed apex; inflated aedeagus (Fig. 18) with a dorsal membranous conjunctival appendage, pair of bifurcated ventral conjunctival appendages, vesica distinctly passing beyond dorsal membranous conjunctival appendage.

Female genitalia (Fig. 20): First gonocoxae lobe-like; 9th paratergites elongate, passing beyond fused posterior margin of 8th paratergites; spermatheca (Fig. 24) with proximal duct more than $2\times$ longer than distal duct, bulb round with two finger-like processes.

Material examined: Holotype male, Punjab: Murree in BMNH; other material: 11 male and 6 female Pakistan: (N.W.F.P.) Ayubia, Swat, (Punjab) Mur-

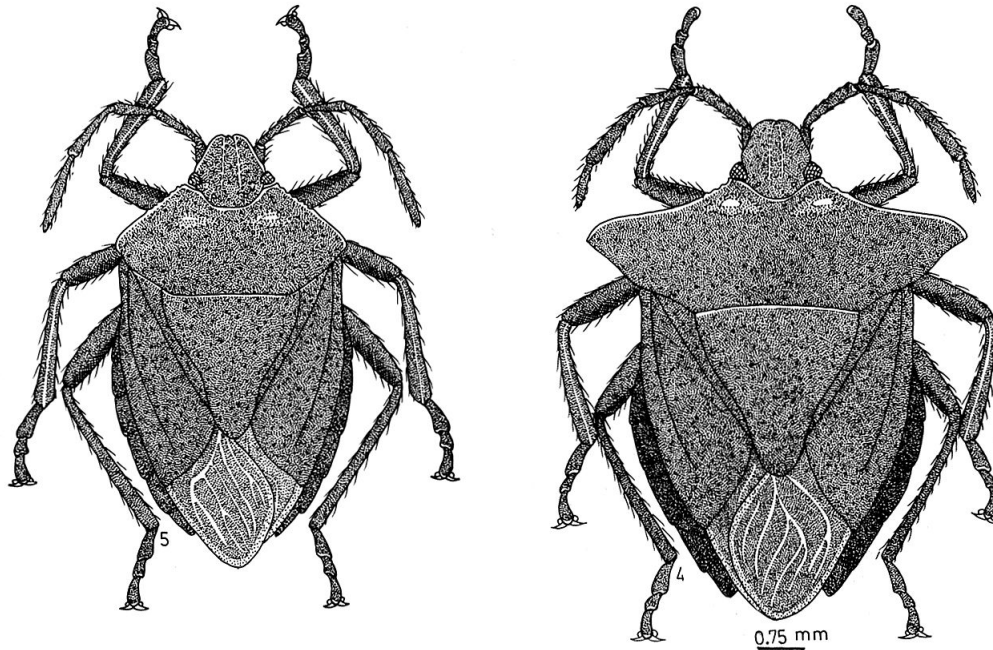


Fig. 4-5. Dorsal views of *Palomena unicolor* (WESTWOOD) (4) and *P. viridissima* (PODA) (5).

ree, 19.9.1968, 4.8.1975, 22.10.1977, 10.10.1978 leg A. A. KHAN, Q. A. ABBASI, I. AHMAD and M. U. SHADAB in NHMUK and NHM.

Comparative note: This species is closely related to *P. balakotensis* in general body shape, but it can easily be separated from the same in having paraclypei almost as long as clypeus and basal labial segment reaching posterior margin of head.

Palomena spinosa DISTANT
(Figs. 3, 8 & 21)

Palomena spinosa DISTANT, 1880: 149; 1902: 149; ATKINSON, 1888: 27; KIRKALDY, 1909: 52; STICHEL, 1960-62: 752; PUSHKOV, 1965: 246 AHMAD *et al.*, 1974: 42; AHMAD, 1979: 50; 1980: 37.

Colouration: Body green except base of 4th antennal segment and entire 5th, tarsi brown; apex of humeral angles, apex of labium black; membrane brassy, shining.

Head: Anteocular distance slightly longer than remainder of head; length of antennal segments, I 1.0, II 1.75, III 1.26, IV and V mutilated; length anteocular distance 1.25; length remainder of head 1.15; width 3.0; interocular distance 1.75, interocellar distance 1.25.

Thorax and abdomen: Width of pronotum more than 3 × its length; humeral angles produced, apically acutely reflexed, length of pronotum 3.0, width 9.5; length of scutellum 4.5, width 4.0; metathoracic scent gland ostiole (Fig. 8) small, ovate, peritreme elongate, passing beyond 1/2 of the evaporatoria; membrane of hemelytra slightly shorter than abdomen; length base scutellum-apex clavus 3.5; apex clavus-apex corium 3.0; apex corium-apex abdomen including membrane 2.5; apex scutellum-apex abdomen including membrane 3.75. Abdomen almost as long as broad; total length, female 13.75.

Female genitalia (Fig. 21): First gonocoxae broad; 9th paratergites hump-like, slightly passing beyond fused posterior margins of 8th paratergites; spermatheca mutilated.

Material examined: Holotype male, Pakistan: (Sind), 1880 Coll. DISTANT. In BMNH, London.

Comparative note: This species is closely related to *P. unicolor* in general body shape and in produced and reflexed humeral angles but can easily be separated from the same in having head length remarkably shorter than its width, and membrane of hemelytra shorter than abdomen.

Palomena unicolor (WESTWOOD)
(Figs. 4, 9, 22 & 25)

Pentatoma unicolor WESTWOOD, 1837: 41; DISTANT, 1900: 811. *Palomena unicolor* DISTANT, 1902: 157; AHMAD, 1979: 50. *P. unicolorella* KIRKALDY, 1909: 52.

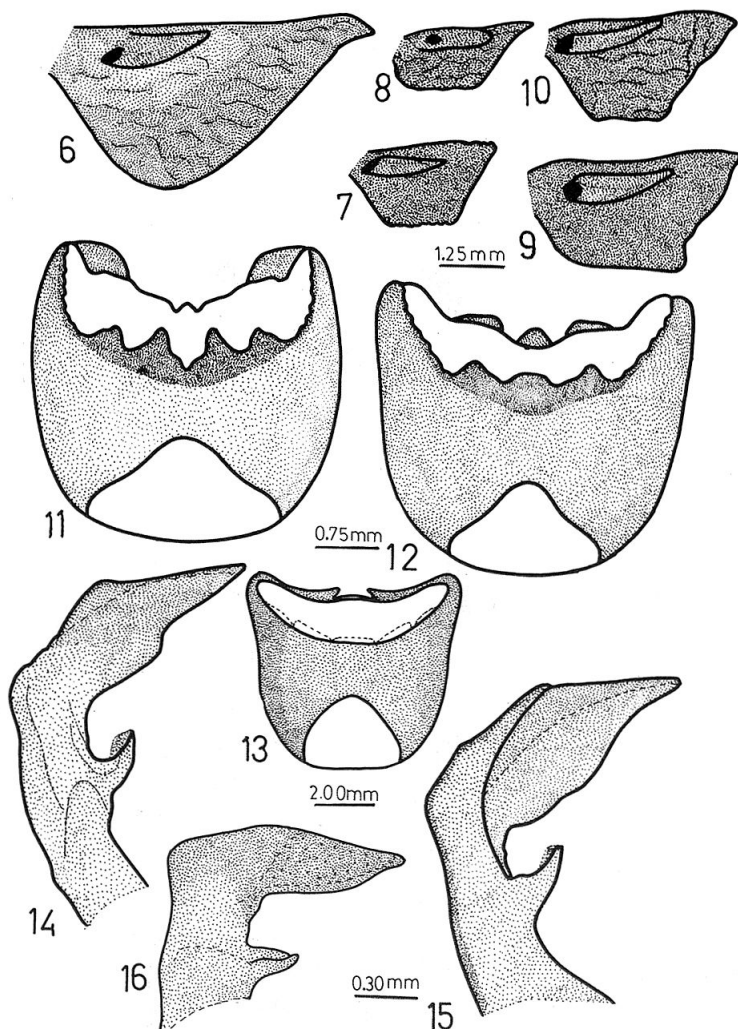


Fig. 6-16. *Palomena balakotensis*: 6 = scent gland, 11 = pygophore, 14 = paramere. *P. reuteri*: 7 = scent gland, 12 = pygophore, 15 = paramere. *P. spinosa*: 8 = scent gland. *P. unicolor*: 9 = scent gland. *P. viridissima*: 10 = scent gland, 13 = pygophore, 16 = paramere. Scent glands = ventral view, pygophores = dorsal view, parameres = inner view.

Colouration: Body dark green, except $\frac{3}{4}$ th of the 4th antennal segment, tarsi castaneous; 2nd and 3rd antennal segments black.

Head: Anteocular distance as long as remainder of head; length of antennal segments I 0.55, II 1.5, III 1.1, IV 1.4, V mutilated; length of labial segments I 1.5, II 1.5, III 1.1, IV 1.0; length anteocular distance 1.2, length remainder of head 1.2; width 2.5, interocular distance 1.7, interocellar distance 1.1.

Thorax and abdomen: Width of pronotum more than $3 \times$ its length; humeral angles produced, apically pointed and reflexed, length of pronotum 3.1, width 9.3; length of scutellum 5.0, width 4.5; metathoracic scent gland ostiole (Fig. 9) small, round, peritreme elongate, passing beyond $\frac{1}{2}$ of evaporatoria; membrane of hemelytra longer than abdomen; length base scutellum-apex clavus 4.0, apex clavus-apex corium 3.2; apex corium-apex abdomen including membrane 2.5; apex scutellum-apex abdomen including membrane 4.0. Abdomen almost as long as broad, total length, female 14.6.

Female genitalia (Fig. 22): First gonocoxae triangular; 9th paratergites elongate, lobe-like, distinctly passing beyond fused posterior margins of 8th

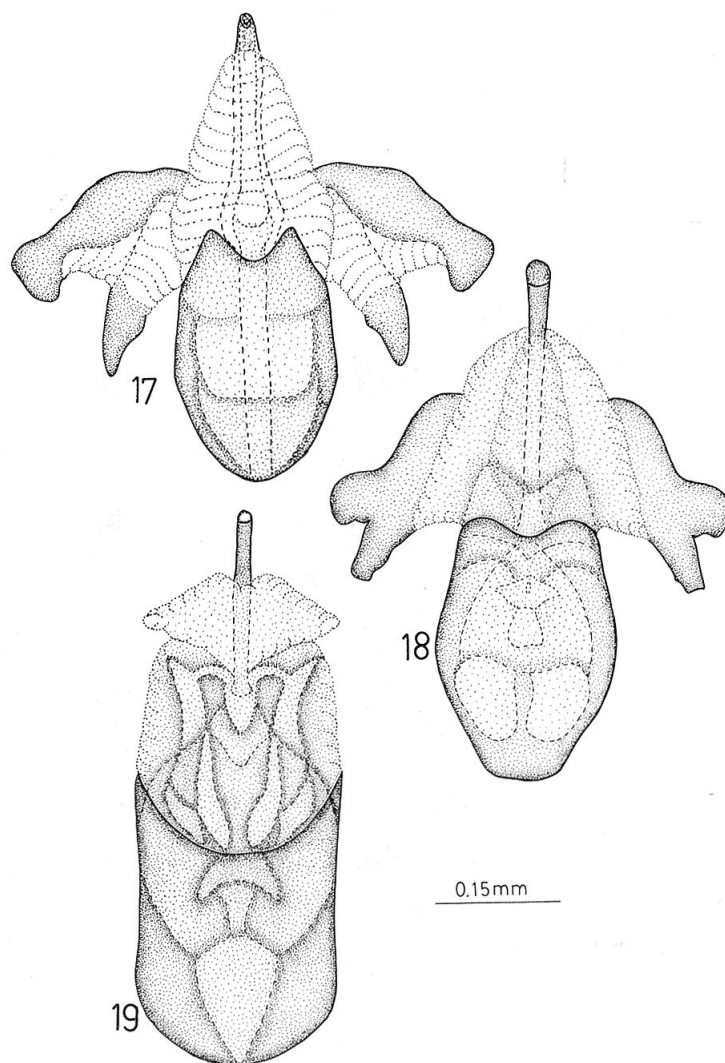


Fig 17-19. Aedeagus (dorsal view) of *Palomena balakotensis* (17), *P. reuteri* (18) and *P. viridissima* (19).

paratergites; spermatheca (Fig. 25) with proximal duct distinctly more than 5 × longer than distal duct, bulb round with 2 finger-like processes.

Material examined: Holotype female, Bengal, in Oxford Museum, 1 female India: Nainital, 6000–7000 ft, 4.7. 1937, leg. R. SARUP in NIM PARC.

Comparative note: This species is closely related to *P. spinosa* in general body shape but it can easily be separated from the same in having length only slightly shorter than its width and labium passing beyond hind coxae.

Palomena viridissima (PODA)
(Figs. 5, 10, 13, 16, 19, 23 & 26)

Cimex viridissimus PODA, 1761: 56; FERRARI, 1874: 130. *C. prasinus* FIEBER 1861: 339. *Pentatoma dissimilis* AMYOT et SERVILLE, 1843: 131. *P. viridissima* WESTWOOD 1837: 43. *Palomena viridissima* DISTANT, 1879b: 4; 1902: 156; PUTON, 1881: 63; ATKINSON, 1888: 28; KIRKALDY, 1909: 52; STICHEL, 1960–62: 753; PUSHKOV, 1965: 246; HOBERLANDT, 1968: 136; KIRITSHENKO & KERZHNER, 1972: 413; FUENTE 1974: 158; AHMED *et al.*, 1974: 42; AHMAD 1979: 51; 1980: 137.

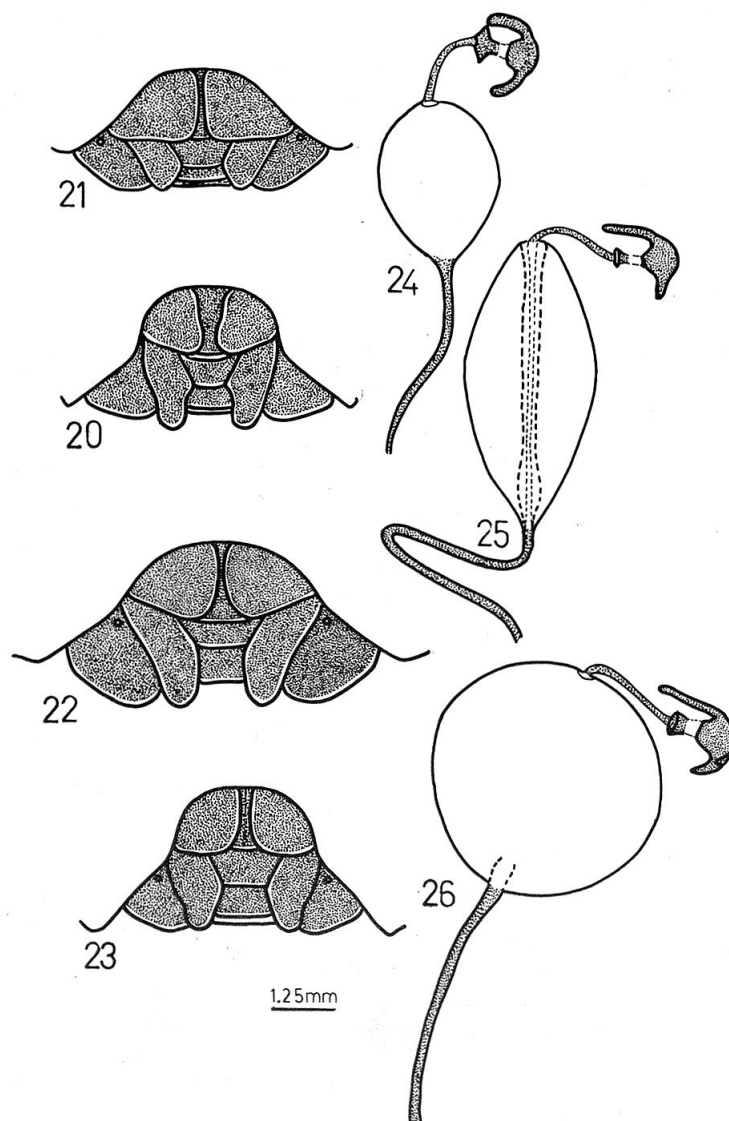


Fig. 20–26. Female terminalia (ventral view) of *Palomena reuteri* (20), *P. spinosa* (21), *P. viridissima* (23) and spermatheca (dorsal view) of *P. reuteri* (24), *P. unicolor* (25) and *P. viridissima* (26).

Colouration: Body green except legs yellowish green; tarsi castaneous; apex of 4th labial segment, eyes, membrane of hemelytra black.

Head: Anteocular distance shorter than remainder of head; length of antennal segments I 0.5, II 1.1, III 0.8, IV 1.2, V. 1.6; length of labial segments, I 1.2, II 1.3, III 1.1–1.2, IV 0.9–1.0; length anteocular distance 0.9, length remainder of head 1.2; width 2.4; interocular distance 1.6; interocellar distance 0.9. Width of pronotum distinctly more than $2 \times$ its length, humeral angles acute, length of pronotum 2.7, width 6.6–6.8; length of scutellum 4.2; width 4.0; metathoracic scent gland ostiole (Fig. 10) small, ovate, peritreme elongate with acute apex, directed upward, slightly passing beyond $\frac{1}{2}$ of evaporatoria; membrane of hemelytra distinctly passing beyond abdomen; length base scutellum-apex clavus 3.5; apex clavus-apex corium 2.55–2.6; apex corium-apex abdomen including membrane 2.4–2.5; apex scutellum-apex abdomen including membrane 3.5–3.7. Abdomen broader than long; connexiva exposed at repose; total length male, 12.5, female 12.7.

Male genitalia: Pygophore (Fig. 13) distinctly broader than long, paramere (Fig. 16) F-shaped, blade with acute apex, inflated aedeagus (Fig. 19) with a bilobed dorsal membranous conjunctival appendage, pair of bifurcated ventral membranous conjunctival appendages, vesica distinctly passing beyond dorsal membranous conjunctival appendage.

Female genitalia (Fig. 23): First gonocoxae quadrangular; 9th paratergites elongate, lobe-like, slightly passing beyond fused posterior margins of 8th paratergites; spermatheca (Fig. 26) with proximal duct more than $2 \times$ longer than distal duct, bulb with 3 finger-like processes.

Material examined: Holotype male "*Cimex viridissima*" Punjab: Murree in BMNH, London. Other material: 1 male, 1 female Czechoslovakia: Ruzomberok, 6.6.1932, leg BIEHY POTOK in the above museum as holotype.

Comparative note: This species is closely related to *P. balakotensis* in general body shape and longer paraclypei than clypeus but it can easily be separated from the same in having anteocular distance remarkably longer than remainder of head, and outer margin of paramere without a hump.

RELATIONSHIPS

Representatives of *Palomena* have the sister group relationship with those of *Kamaliana* AHMAD & ZAIDI in having lateral margins of pronotum crenulate and spermatheca with finger-like projections. These characters are considered here apomorphic following AHMAD *et al.* (1988). Those of *Palomena* appear isolated from their sister group in having thumb-like structure on the theca of aedeagus in male genitalia.

Representatives of the genus *Palomena* appear to follow two lines of evolution. The first line includes *P. reuteri* with the derived character of ventroposterior margin of pygophore medially more distinctly sinuate. *P. viridissima* has the apomorphic character of membrane of hemelytra shorter than abdomen (AHMAD *et al.*, 1988). *P. balakotensis* represents the derived character of each side of ventroposterior margin of pygophore serrate. *P. spinosa* and *P. unicolora* share the apomorphic character of thumb like structure on theca of male genitalia.

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