Türk. entomol. derg., 1990, **14** (4) : 195-206
ISSN 1010-6960

Systematic studies on the **Bruchus** species (Bruchidae, Coleoptera) *

Orhan MERGEN** Neşe ÇAĞATAY**

Summary

In the present study, B. hamatus Mill., B. lentis Fröl., B. pisorum L., B. emarginatus All., B. viciae Oliv., B. affinis Fröl., B. rufimanus Bohem. were examined. The brief description of the body and distribution of them were given with the diagnostic key. And also the male genitalia which imply very important taxonomic characters, were illustrated.

Introduction

Thirtyfour species of Bruchus L. are presently known from the palaearctic region. Previously 24 species were recorded from Turkey by different authors; Alkan (1966), Zampetti (1981), Borowiec (1984), Decelle and Lodos (1989). Several Bruchus species are known to be economically important and studies on their biology, host plants, population dynamics and control measures (Keyder, 1945; Karman ve Erakay, 1970; Atak, 1975; Dörtbudak, 1975 and Seçkin, 1981). External morphology of these species has been studied by Hoffman in France (1945), Lukjanovitsh and Ter-Minassian in Russia (1957) and Calderon in Israel (1962). Many species are variable in body colour and vestiture so quite difficult to distinguish them. Hoffman illustrated the genitalia, his figures are of only the external profiles of the male organs with no internal structures shown.

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* This study is a part of MSc thesis which was submitted to Hacettepe University, Institute of Science in 5.2.1989.

** Hacettepe University, Faculty of Science, Department of Biology, Ankara, Turkey.

Alınış (Received) : 12.03.1990

The shape of aedeagus and lateral lobe and difference between the species in the arrangement and the structure of armature sclerits, which were included by internal sac, were dependable taxonomic characters. In this paper, the morphology of the bodies and the male genitalia examined and taxonomic significance was discussed with the figures.

Material and Method

The material for the present study studied was collected from Ankara and the surrounding areas between May 1987 and July 1988. For the study of male genitalia the technique and terminology follows that proposed by Kingslover (1970). The figures were drawn by using cameralucida and stereoscobic microscobe.

Results

Key to the species of Bruchus

1. Hind tibiae with conspiciuous apical tooth 8
- Hind tibae without conspiciuous apical tooth 2
2. 1 st. tibiae expanded towards to apical and slightly curved (♂); pygidium with a indistinct black spot 3
- 1 st tibiae not expanded, straight (♂); pygidium with distinct dark-coloured spots 6
3. Elytra with patches of dense grey-brown hairs, without band 4
- Elytra with yellowish- grey hairs, having a longitudinal whitish patch on median line and oblique whitish transvers band anteriorl .... signaticornis Gyllenhal
4. 2nd.tarsi black;lateral tooth of pronotum medially situated 5
- 2nd. tarsi reddish-brown; lateral tooth of pronotum medio-distally situated 7
5. 5th. antennal segmentith apical projection (♂); lateral tooth of pronotum strong and pointed, between tooth and posteior-lateral angle excavated; male genitalia as in figs 22, 23 ..... hamatus Miller
- Antennal segments without apical projection; lateral tooth of pronotum weak and blunt, between tooth and posterior-lateral angle not excavated almost straight ..... brachialis Fahraeus
6. 2nd. femur entirely black; elytra without band; male genitalia as in figs 24, 25 ..... lentis Frölich
- 2nd. femur reddish-brown, basally dark coloured; elytra with whitish oblique band posteriorly ..... ervi Frölich
7. Sides of pronotum behind lateral tooth almost parallel; with right postero-lateral angle; male genitalia as in figs 28, 29 .... emarginatus Allard
- Sides of pronotum behind lateral tooth posteriorly diverging; with acute postero-lateral angles; male genitalia as in 26, 27 .... pisorum Linnaeus
8. Pronotum with a deep emargination between lateral tooth and posterior corner; 2nd. tibiae slightly curved, without carinae (♂) 9
- Pronotum with almost parallel sides between lateral tooth and posterior corner; 2nd. tibiae prominantly curved, with carinae (♂) 11
9. All legs black; male genitalia as in fig 32 ..... viciae Olivier
- 1 st. legs reddish-brown, others black 10
10. Outher margin of 3rd. tibiae with distinct longitudinal carina; elytra with slightly distinct band anteriorly ..... mulkaki Luk. and ter-M.
- Outher margin of 3rd. tibiae with slight longitudinal carina or without it; elytra with prominantly distinct band anteriorly; male genitalia as in figs 30, 31 ..... affinis Frölich

11. 3rd. femur considerably wide; 2nd. legs black; sides of elytra more or less parallel 12
- 3rd. femur moderately wide; 2nd. legs partially reddish-brown; sides of elytra convex 13
12. Elytra covered with fairly sparse hairs and having white patches; 2nd. tibiae moderately curved at the basal third (♂), with a longitudinal depression on the ventral side; male genitalia as in fig 33 .... rufimanus Boheman
- Elytra covered with dense hairs, with large round black spot posteriorly; 2nd. tibiae slightly curved (♂), without any depression .... dentipes Baudi
13. Pygidium with two brownish spots; 2nd. tibiae prominently curved ..... incurvatus Motschulsky
- Pygidium with greyish unicolour hairs; 2nd. tibae slightly curved ..... atomarius Linnaeus

Bruchus hamatus Miller, 1881

Body black to dark brown; head black, postocular lobe with short white hairs; antennae reddish-brown in male, 5th segment with sharp pointed apical projection (Fig. 1); prothorax broader than long, with sparse white hairs, a strong lateral tooth anteriorly situated, behind of it almost parallel; scutellum quadrate, with whitish hairs; elytra with lateral margin slightly convex, whitish patches formed by grey hairs, humeral callosity prominent; front legs reddish-brown excepting coxa and femur with black basal parts; middle and hind legs black, middle tibiae with a preapical fine tooth at inner margin, hind femur bicarinate ventrally with a medium sized tooth distally, first hind tarsomere 0.5 times as long as hind tibiae; pygidium with moderately dense whitish hairs and hardly visible two black patches basally placed; 2.5-4 mm in lenght.

Aedeagus 5-6 times as long as broad, medially narrowed; ventral valve isosceles-shaped, noticeably long, slightly curved toward ventral aspect, with acute apex parth, basally 0.35 times as wide as distal of aedeagus; sclerites of median lobe mainly denticle shaped and also spineshaped others among them, medio-distal ones forming two parallel rows of denticle while other denticles and spines sparsely scattered on main body (Fig. 22); lateral lobes long, broadly expanded at apex liketriangle, with sparse and long setae apically, dense and short hairs at inner sides anteriorly, cleft to about 0.8 their lenght (fig. 23).

Material examined : Ankara (Ayaş), 28.6.1988, 5 males 3 females; (Çubuk), 18.5.1988, 3 males 2 females.

Bruchus lentis Frölich, 1799

Body black; head black, postocular lobe with sparse whithish hair; 1 to 5 antennal segments reddish-brown, remaining segments brown to black (fig 2); prothorax subrectangular with parallel sides behind the small lateral tooth, disk slightly convex with sparse silvary-greyish hairs (Fig. 8); elytra densely covered with greyish hairs except small whitish patches scattered over the surface; scutellum quatrate with quite dense whithish hairs; colour of front legs as in B. hamatus,

middle legs red-orange excepting black coxa and femur, tibiae with small preapical tooth at inner margin in males (Fig. 13); hind legs black, femur bicarinate ventrally, with a slight distal tooth; pygidium ashy; 3-3.5 mm in lenght.

Aedeagus approximately 4-5 times as long as broad, slightly narrowing to distal; ventral valve equilateral triangular-shaped, slightly curved to ventral aspect, narrowly rounded at apex, base of ventral valve 0.35 times as wide as apex of aedeagus; internal sac densely covered with long, strongly pointed denticles (Fig. 24); lateral lobes noticeably narrow, not expanded at apex, apex long and fine setae, inner sides with sparse short and fine hairs distally, cleft to about 0.5 their lenght (Fig. 25).

Material examined : Ankara (Güdül), 29.6.1988, 12 males, 17 females; (Çubuk), 22.7.1987, 8 males 13 females; (Beytepe) 24.6.1987, 6 males, 4 females.

Bruchus pisorum Linnaeus, 1758

Syn. Dermestes pisorum Linnaeus, 1758; Laria salicis Scopoli, 1763; Bruchus pisi Linnaeus, 1767; Bruchus sparsus Fabricius, 1801.

Body dark brown; head black, postocular lobe with sparse light brown and whitish hairs; 1-5 antennal segments reddish-brown, apical six black (Fig.3); prothorax subrectangular, disk convex with light-brown sparse hairs, sides behind the lateral tooth diverging posteriorly, posterio-lateral angel acute (Fig. 9); elytra about 0.50 times as long as broad, broader anteriorely with dark brown and white pubescence, on irregular white transverse band in the anterior half; scutellum quadrate, with light brown hairs; humeral callosity slight; colour of front and middle legs as in B. lentis, middle tibiae with a preapical tooth at inner margin (Fig. 14); hind legs black with a conspicuous distal tooth (Fig. 18); pygidium with whitish hairs and two patches of black hairs; 4.5-5 mm in lenght.

Aedeagus 5-6 times as broad as long; ventral valve triangular-shaped, straight not curving to ventral aspect, sides straight, narrowly rounded at apex, base of ventral valve 0.35 times as wide as distal of aedeagus; internal sac with denticle-shaped sclerits, mediodistal ones forming two concave mass, other on main body moderately dense but more densely placed at sides and base (Fig. 26); lateral lobes expanded at apex in spatula-shaped, internal sides with fine and straight hairs, cleft to about 0.75 their lenght (Fig. 27).

Material examined : Ankara (Beytepe), 7.6.1988, 3 males 2 females; (Çubuk), 22.7.1987, 4 females, 3 females, 18.5.1988, 1 male 3 females; (Gölbaşı), 24.6.1988, 5 males, 7 females.

Bruchus emarginatus Allard, 1868

Body black, head black, postocular lobe with sparse whitish hair; antennae reddish-brown, apical margins of segments 6 to 9 brown to black in males; basal four and apical margins of 11th segment reddish, remaining segments black in females (Fig. 4); prothorax subrectangular, with a strong lateral tooth situated anterior to medial, disk convex; sides behind tooth almost parallel postero-lateral angles right

(Fig 10); elytra about 1.5 time as long as broad, lateral margins slightly convex, dorsal surface with brown and white hairs, patches of dense white hairs situated on 3 th. striae medially and also white transverse band on anterior half; humeral callosity prominent; colour of legs as in B. pisorum, in males middle tibiae slightly curved and with as preapical small tooth at inner margin; hind femur with a conspicuous distal tooth and an emargination behind it (Fig. 21); pygidium with two patches of black hairs at base; 3-3.8 mm in lenght.

Aedeagus about 4 times as long as broad; ventral valve equilateral triangle-shaped, straight, with convex sides and acute apex, base of ventral valve 0.50 times as wide as apex of aedeagus; internal sac with long and basally narrow denticle-shaped sclerites, medio-distal ones forming two convex mess, others on main body prominantly dense and uniformly dispersed (Fig. 28); lateral lobes long and comperatively narrow, apex expanded like a triangle with 10 long setae, anterior part of inner sides densely covered with short hairs, cleft to about 0.75 their lenght (Fig. 29).

Material examined : Ankara (Ayaş), 26.6.1988, 1 male, 1 female; (Bayındır Barajı), 1.7.1988, 1 female; (Beytepe), 7.6.1988, 2 males, 3 females; (Çubuk), 22.7.1987, 5 males, 5 females.

Bruchus viciae Olivier, 1795

Syn. Bruchus punctellus Boheman, 1829; Bruchus nigripes Gyllenhal, 1833

Body black; head black, 1 to 3 antennal segments reddish-brown, apical eight black (Fig. 5); prothorax with a strong lateral tooth, situated just anterior to medial, disk slightly convex with sparse whitish hairs (Fig. 11); scutellum quadrate, with greyish hairs; elytra almost square, with slightly convex lateral margin, dorsal surface with medial longitudinal sparse bands made of whitish hairs, humeral callosity silght; all lags black, 2nd. tibiae in males broader, slightly curved, with a sharp internal tooth just anterior to terminal tooth (Fig. 15); hind femur with a sharp distal tooth; tibiae with 3 carina and an apical sharp tooth at inner margin (Fig. 19); pygidium with two patches of black hairs at base; 2.8-3.5 mm in lenght.

Aedeagus about 5 times as long as broad, somewhat pressed distally; ventral valve strait, sides convex, with acute apex, base of ventral valve 0.50 times as wide as apex of aedeagus; internal sac with basally wide denticle-shaped sclerits, medio-distal ones forming two slighthly concave mass others on main body quite dense, but more densely scattered at sides (Fig. 32); lateral lobes prominantly long, silghtly expanded at apex, apex with two rows of sparse setae, apical 0.35 of inner sides densely covered with short hairs, cleft to about 0.50 their lenght.

Material examined : Ankara (Ayaş), 28.6.1988, 3 males 2 females; (Çubuk), 18.5.1988, 3 males 1 female.

Bruchus affinis Frölich, 1799

Syn. Bruchus flavimanus Boheman, 1833; Bruchus obscuritarsis Motshulsky, 1874; Bruchus ruthenicus Becker, 1892; Bruchus monticola Bedel, 1901.

Body black; 1 to 4 antennal segments reddish-brown, apical seven black (Fig. 6); prothorax subrectangular, 2 times as broad as long, lateral tooth medially situated, sides behind tooth diverging posteriorly, dorsal surface convex with sparse whitish hairs (Fig. 12); elytra with convex lateral margins, dorsal surface convex, whitish patches at 3 rd, 5 th, 7 th, 9 th, stria on posterior half and a whitish longitudional band on median line of each elytron covering 1st and 2nd striae; front and middle legs red-orange excepting coxa and femur with black basal part, middle tibiae with sharp internal tooth just anterior to terminal tooth in males (Fig. 16); hind legs black; pygidium with sparse yellowish hairs without patches; 3.2-4 mm in lenght.

Aedeagus 4 or 5 times as long as broad, prominantly narrowing to distal before apical round mass; ventral valve triangle obtus shaped, straight, narrowly round at apex, sides convex, base of ventral valve about 0.35 times as wide as distal of aedeagus; internal sac with short basally wide denticle shaped sclerites, medio-distal ones forming two mass, others on main body denselly placed distally and proximally (Fig. 30); lateral lobes spatula-like expanded at apex, apex with sparse long setae, inner sides covered with comperatively long hairs; cleft to about 0.75 their lenght (Fig. 31).

Material examined : Ankara (Ayas), 11.5.1988 3 males 1 female; (Çubuk), 18.5.1988, 1 male; (Beytepe), 10.6.1988, 1 male 3 females.

Bruchus rufimanus Boheman, 1833

Body black; 1 to 4 antennal segments and basal margins of 5 th. segment reddish-brown, remaining ones black (Fig. 7); prothorax with sharp, moderately prominent lateral tooth, behind of it excaveted, posterior angel acute; elytra oval elongate, dorsal surface silghtly convex and covered with light brown-yellowish hairs, sparsely scattered at anterior part; front legs reddish-brown excepting coxa and femur with black basal part; middle and hind legs black, middle femur thickened, basal third of middle tibae broaden in the males, with a longitudinal depression on ventral surface and a preapical small tooth at inner margin (Fig.17); hind femur bicarinate ventrally with a blunt distal tooth; tibiae with long inner apical tooth (Fig. 20); pygidium with ashy-grey hairs and light-brown hardly visible patches; 4-4.5 mm in lenght.

Aedeagus 5 times as long as broad, distally pressed oval-shaped more than round; ventral valve equilateral triangle-shaped, sides convex, with acute apex, base of ventral valve 0.50 times as wide as distal of aedeagus; internal sac with long basally wide denticle shaped sclerites, medio distal ones forming two somewhat spherical mass, others on main body prominantly dense and much denser at sides (Fig. 33); lateral lobes spatula like expanded at apex, apex with sparse long setae, cleft to about 0.75 their lenght.

Material examined : Ankara (Ayaş), 11.5.1988, 3 males, 1 female; (Çubuk), 18.5.1988, 1 male; (Beytepe), 10.6.1988, 1 male, 3 females.

Discussion

Bruchus is distinguished from the other genera with presence of a tooth at the lateral margin of pronotum, absence of sexual dimorphism

in antennae and in males presence of teeth at the preapical of inner margin of the middle tibiae. The basic structural taxonomic characters of the male genitalia of the genus Bruchus were as fololws : more or less oval-shaped median lobe at the distal portion, absence of dorsal valve, expanding of lateral lobe toward the apical, presence of sparse hairs at the apex and existance of armature sclerits as a denticles with expanded base in the species examined.

B. pisorum and B. emarginatus are morphologically similar and also have similar genital structure, however B. emarginatus is distinguished by broader ventral valve, densely distribution of sclerits and ordering of sclerites as a convex shaped cluster at the distal part; in B. pisorum lateral lobes are axpanded apically at medial portions like a convex structures at both sides of the aedeagus while they are expanded upward to the distal in B. emarginatus. Small ventral valve of B. viciae; very narrow distal part of median lobe and sparsely distributed sclerits of B. affinis; apically subacute ventral valve, sparsely distributed spine sclerites near the dentically and triangle- shaped structure at the apical portion of lateral lobe of B. hamatus; nearly oval-shaped cluster of denticle at the mediodistal region of median lobe of B. rufimanus; and a dark pigmented band at the distal part of median lobe of B. lentis are taxonomic difference of examined species. Distal part of median lob e and apical part of lateral lobes fit the schmetaze figures in Hoffmann (1945); but the blowing toward the medial part of median lobe wasn't observed in B. pisorum and the dark pigmented band placed at the distal region in B. lentis was shown as a seperate part by Hoffmann (1945). It can be concluded that the differences in the structure of ventral valve; distribution of armature sclerits; the shape of clusters at the distal portion of the median lobe and the structure of lateral lobes include discrimitive species characters in the genus Bruchus.

Özet

Bruchus türleri üzerine sistematik çalışmalar (Bruchidae, Coleoptera)

Bruchus cinsi türlerinin ele alındığı bu araştırmada B. hamatus Mill., B. lentis Fröl., B. pisorum L., B. emarginatus All., B. viciae Oliv., B. affinis Fröl., B. rufimanus Bohem., türlerinin tanımları, tür tanı anahtarı, erkek genital organı morfolojisi ve taksonomik önemi ile yayılışları verilmiştir.

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Illustration of Figures

Figures B. hamatus Mill. : 1. Antenna, 22. Aedeagus (dorsal view), 23. Lateral lobe (ventral view)

Figures B. lentis Frol. : 2. Antenna, 8. Pronotum, 13. Middle leg in male, 24. Aedeagus (dorsal view), 25. Lateral lobe (ventral view)

Figures B. pisorum L. : 3. Antenna, 9. Pronotum, 14. Middle leg in male, 18. Hind leg, 26. Aedeagus (dorsal view), 27. Lateral lobe (ventral view)

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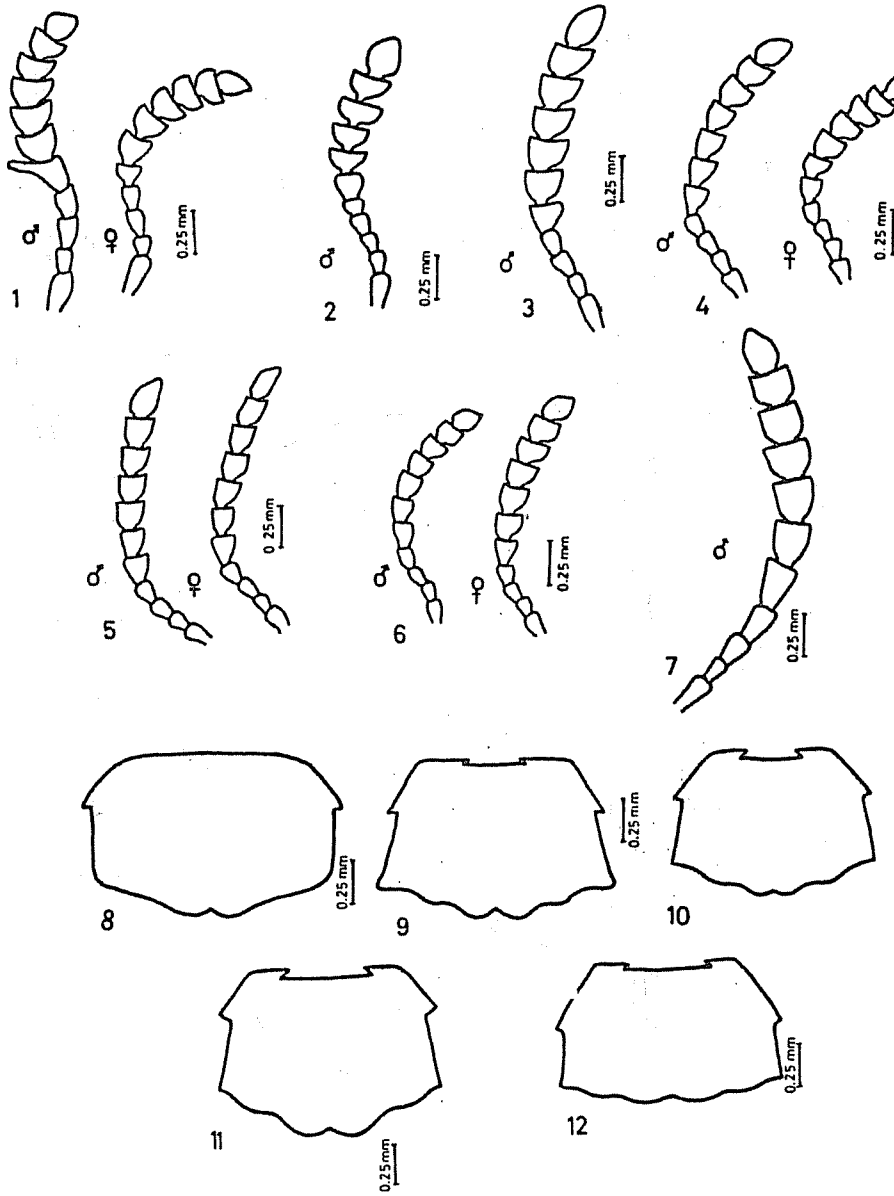
Figures B. viciae Oliv. : 5. Antenna, 11. Pronotum, 15. Middle leg in male, 19. Hind leg 32. Aedeagus and Lateral lobe (dorsal view)

Figures B. affinis Fröl. : 6. Antenna, 12. Pronotum, 16. Middle leg in male, 30b Aedeagus (dorsal view), 31. Lateral lobe (ventral view)

Figures B. rufimanus Boh. : 7. Antenna, 17. Middle leg in male, 20. Hind leg, 33. Aedeagus and Lateral lobe (dorsal view)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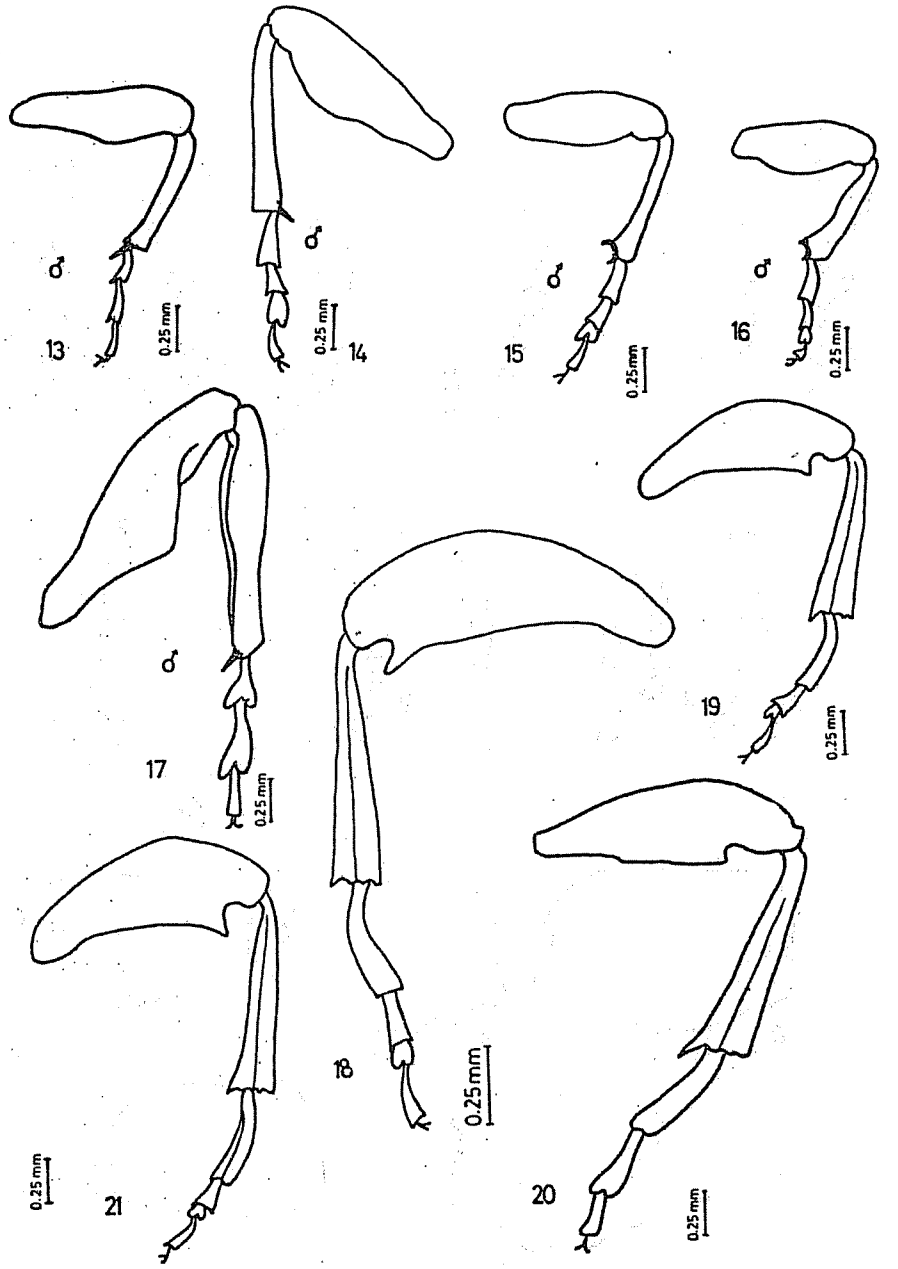
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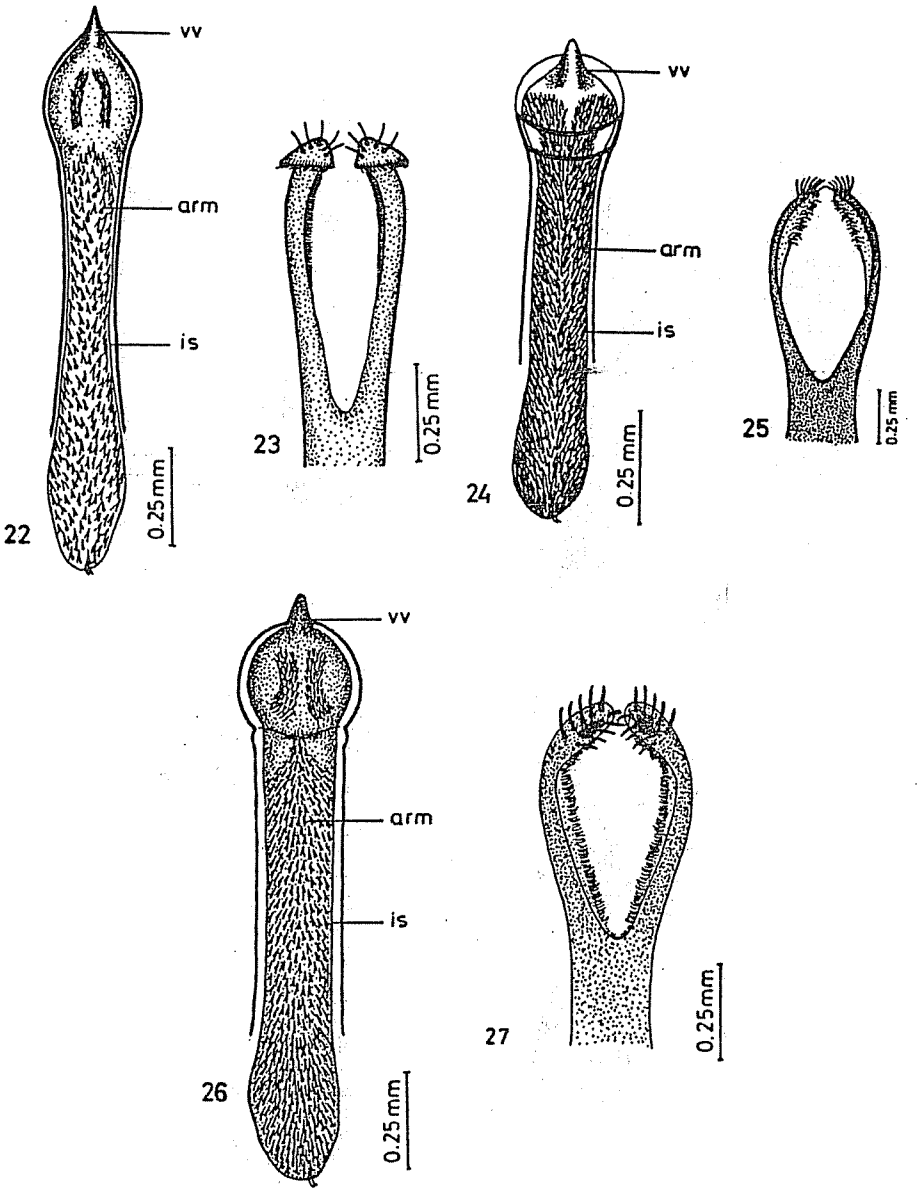
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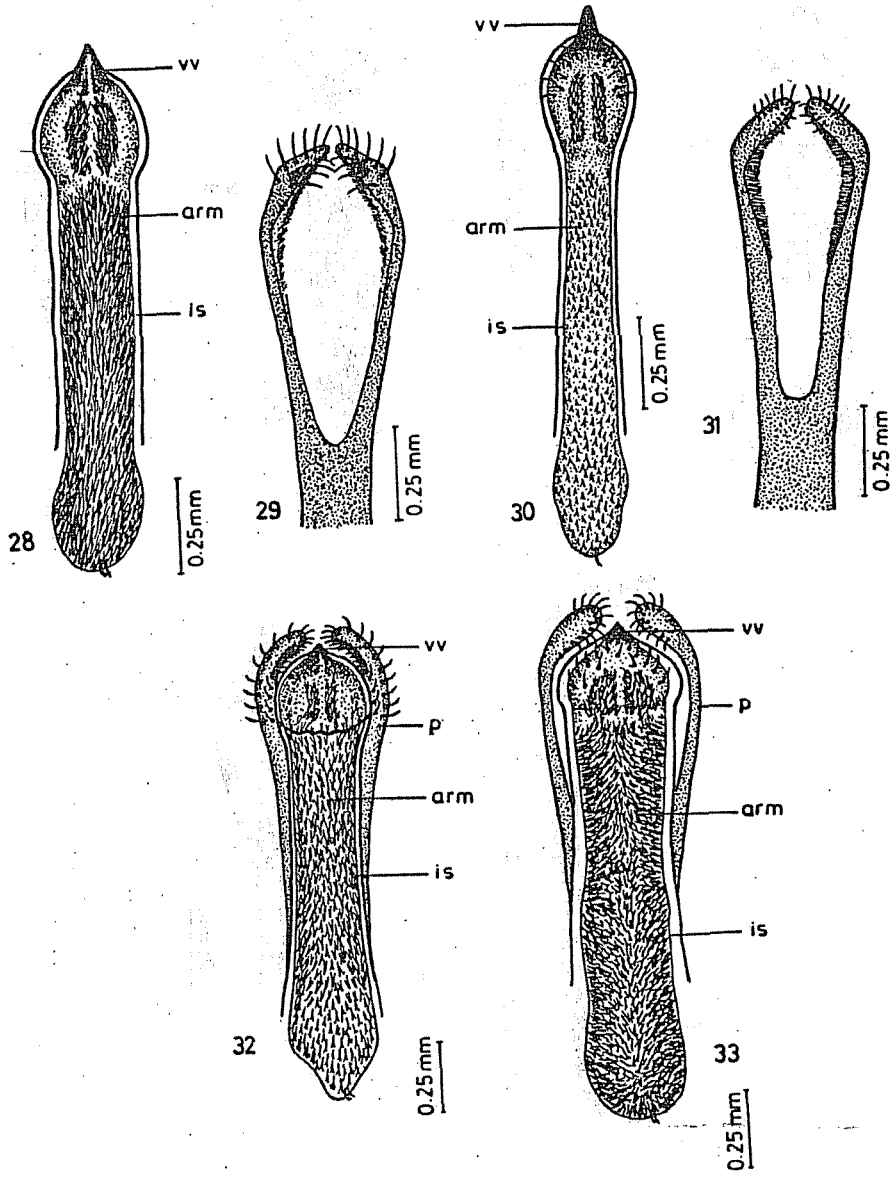
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