Comparative morphometric study on eight seed bug tribes of subfamily Rhyparochrominae (Hemiptera-Lygaeoidea- Rhparochromidae)

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Abstract: The detailed morphological characters of *Remaudiereana annuilpes* (Baerensprung) (tribe: Myodochini) are given as a model of the subfamily Rhyparochrominae, also the scanning electron microphotographs were presented to the metathoracic scent gland, abdominal trichobothria and armature of fore leg to this species. The following species *Emblethis gracilicornis* Puton [Gonianotini], *Lethaeus lethierryi* (Puton) [Lethaeini], *Lamprodema maura* (Fabricius) [Megalonotini], *Remaudiereana annulipes* (Baerensprung) [Myodochini], *Marmottania simonis* Puton [Ozophorini], *Phasmosomus priesneri* (Wagner) [Phasmosomini], *Dieuches mucronatus* (Stal) [Rhyparochromini] and *Stygnocoris breviceps* Wagner [Stygnocorini] were investigated to clear the comparative morphometric study of this subfamily. The results are arranged in tables and clarifiedwith labelled drawings and colored pictures to facilitate the determination of the main taxonomic differences between the eight tribes through their representatives in Egypt.
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Key words: Rhyparochromin tribes, scanning microphotographs, *Remaudiereana annulipes* (Baerensprung) [Myodochini], colored pictured.

Introduction

Subfamily Rhyparochrominae, the small dull seed bugs constitutes the largest numbers and the most diverse species of the family Rhyparochromidae, superfamily Lygaeoidea, order Hemiptera (Aukema & Rieger, 2001); (Dobbs & Brambila, 2004) and Brailovsky (2009). It is a fertile field for investigation owing to the host associations of most species, many interesting cases of mimicry, ecological differentiation, are unknown and the degree of host-specificity is poorly understood (Schuh and Slater, 1995); (Cassis & Gross, 2002); (Wheeler,2003); (Cervantes & O'donnell, 2009) & (Namyatova et al, 2011).

Rhyparochromins are characteristically ground bugs living in seed litter below plants, there is a variable degree of host specificity and certainly great differences in habitat, but all species in this subfamily are seed feeders, some climbing herbaceous vegetation when seeds are available. Many species, difficult to collect in the field, frequently come to light (Slater & Baranowski, 1990). This large family can reduce 60-90% of fig seed germination depending on the species and the host species (Cervantes & Carranza, 2008).

The systematic of this subfamily is complex, based on difficult characters such as the position of the abdominal spiracles and of the trichobothria [Slater and Baranowski, 1990]. So the comparative morphological works provide an impetus for clear identification and classification of this subfamily.

2. Material and Methods

Materials for the investigations were collected by light traps, aerial nets and pitfall traps from El Gabal El Asfar (Qalubyia); Abu Rawash & Kafr Hakim (Giza); Qena and Saint Katharine (Southern Sinai). Some specimens were pinned and labeled indicating the date and site of collection, other specimens were preserved in 70% glyceride – ethanol for dissecting purposes. In order to prepare the genitalia, genital capsule (pygophore) was carefully removed from the body, softened in hot water for 10 minutes, and then transferred to warm 10% KOH solution, (Ashlock, 1963 and Slater, 1963). Drawings were made from parts mounted on microscopic slides or preserved in alcohol and glycerin, using binocular microscope and light microscope. Scanning electron microphotographs were presented to reveal the metathoracic scent gland, abdominal trichobothria and armature of fore leg in *Remaudiereana annulipes* (Baerensprung) (tribe: Myodochini). These structures were dissected, dehydrated in ethanol. After drying the materials mounted on stubs, coated with gold and photographed with aid of JEOL JEM-100 scanning electron microscope operating at an accelerating voltage of 25 Kv. Scanning was carried out in the

Central Laboratory, Faculty of Science, Ain Shams University.

3. Results and Discussion

General morphological characters (Fig.1):

Body length 5.5-6 mm, subovoid in shape, brownish yellow in color and wholly punctured.

Head and head appendages (Figs. 2-6):

Head capsule of the opistognathous type, with **vertex** slightly concave; **clypeus** slightly raised apically at middle; **juga** triangular in shape and shorter than **clypeus**. **Compound eyes**: laterally bulging. **Ocelli** two in number and lie much closer to eyes. **Antennae:** four-segmented, antennal tubercle 0.25 x as long as compound eyes, 1st - 3rd segments with long sparse spines, the 1st segment the thickest and shortest one, 2nd segment the longest one and 4th segment fusiform with dense large spines. **Mouth parts:** piercing sucking with **labrum** flap like extension; **stylets** hollow and look like slender tubes; **labium** four segmented proboscis provided with a dorsal groove which harbors the **stylets** when not used.

Thorax (Figs. 7-20). Dorsal side (Figs. 7&8). Pronotum large, exceeding in size any other body segment(Fig.7). **Mesonotum** consists of a median marginal **phragma**,

A subrectangular **prescutum**, a narrow **scutum** and a triangular **scutellum**, which is surrounded by a narrow **postscutellum**. The **Anterior** and **Posterior notal processes** are situated on **scutum** and **scutellum** respectively. Only **prescutum** is provided with one **middle suture** and two lateral **convergent sutures** (Fig.8). **Ventral side (Fig.9, 11-16).** Ventral side in each of prothoracic, mesothoracic and metathoracic segments is differentiated into lateral pleura and middle sternum. **Sternum** consists of a middle **basisternum** ending in a **sternellum**. Metathoracic segment with two scent glands, which are represented by an external **ostiolar pertreme** or **auricle** and surrounded by an **evaporative area**.

Legs (Fig. 10, 17&18). clothed with bristles and spines; **Coxae** short or truncate, cone shaped; fore **coxa** skull-like, with a basal arm on each side; **trochante**r one segmented; fore **femora** swollen with 4 strong arms on ventrolateral side, middle and hind **femora** simple; **tibiae** cylindrical and apically toothed with strong setae; **tarsi** three segments, the 1st segment the longest one and the 3rd segment ends in two sclerotized sickle shaped **claws** and two distinct pulvilli.

Wings (Figs. 19&20) Fore wing (Fig.19) of the hemelytra type, divided into a triangular **corium**; a narrow **clavus** and a distal part or a **membrane**. Its veins: **costa**, **subcosta**, **radius**, **median**, **cubitus** and **vannal**. **Axillary sclerites** three in number. The first and second ones broad and nearly of equal size while the third sclerite narrow and forked. **Hind wing (Fig. 20)** membranous and characterized with an oblong **discal** cell. Its veins: **costa**, **subcosta**, **hamus**, **radius**, **median**, **intervannal**, **cubitus, vannal** and **juga**. **Axillary sclerites** are four in number. The first, second and third ones broad, second and third ones nearly of the same size while the fourth sclerite is narrow.

Abdomen (Figs. 21-33): Ten segmented, with the first seven segments differentiated into: **Terga (Figs. 21&22):** provided with rudiments of two median abdominal scent glands and limited laterally by **connexivum**; **Sterna (Figs 23-28):** abdominal sterna with incomplete suture between 4th & 5th segment and characterized by presence of large spiracle, with 28 abdominal **trichobothria** , each **trichobothria** consists of cuticular filiform hair surrounded by circular area of dense papilli-like structures.

Genital segments: the eighth and ninth segments don't show distinct terga and sterna and are considered as genital segments, the tenth segment reduced into a very small ring carrying the anus.

Male genital segments (Figs. 29-31): Consist of: **Pygophore** sclerotized capsule derived from the ninth segment and overlapped by the ring like eighth segment (Fig.29). **Parameres** two symmetrical sclerotized structures attached posteriorly to the **pygophore**. Each paramere consists of a basal **shank** and an apical **blade** (Fig.30). **Aedeagus** (Fig. 31) contained in the **pygophore** and differentiated into:

Basal plate sac like body, horse-shoe shaped (**Conjunctiva)** with a delicate membranous part limited posteriorly with the **ejaculatory reservoir**, (**vesica**) consists of a proximal ejaculatory reservoir and a distal tubular part (**vesical tube**).

Female genital segments (Figs. 32 & 33): represented by an elbow like **ovipositor** connected to a **spermatheca**. **Ovipositor:** composed of a pair of **ventral valves** and a pair of **dorsal valves (Fig. 32)**. **Ventral valves** arising from the eighth segment and consist of a triangular **first gonocoxa** attached posteriorly to a narrow **first gonapophysis**. The valve is supported anteriorly with a cylindrical **gonangulum** and laterally with the **first armus**. **Dorsal valves** arising from the ninth segment and consist of a crescent shaped **second gonocoxa** attached posteriorly to the **second gonapophysis** and supported laterally with the **second armus**. The attachment of the **dorsal** and **ventral valves** takes place by the inter locking of the first and second rami to each other. **Spermatheca:** composed of an apical **spermathecal bulb** connected posteriorly to a longitudinal **spermathecal duct** (Fig. 33).

Sexual dimorphism:

Male smaller than female with body 5.5mm in length, trichobothria arranged on the abdominal sternites as follows: 6 trichobothria in two anterolateral groups on 3rd and 4th sterna, 6 trichobothria in two lateral groups on 5th and 6th sterna and 4 trichobothria in two lateral groups on 7th sternum. Apex of abdomen with rounded pygophore. **Female** larger than male with body 6mm in length, trichobothria arranged on the abdominal sternites as follows: 8 trichobothria in two anterolateral groups on 3rd sternum, 6 trichobothria in two anterolateral groups on 4th sternum, 4 trichobothria in two lateral groups on 5th sternum, 6 trichobothria in two lateral groups on 6th sternum and 4 trichobothria in two lateral groups on 7th sternum. Apex of abdomen narrow with ovipositor bends on 7th sternum.

Comparative morphometric study of the eight tribes in Tables(I-VIII)& Figs(34-95).

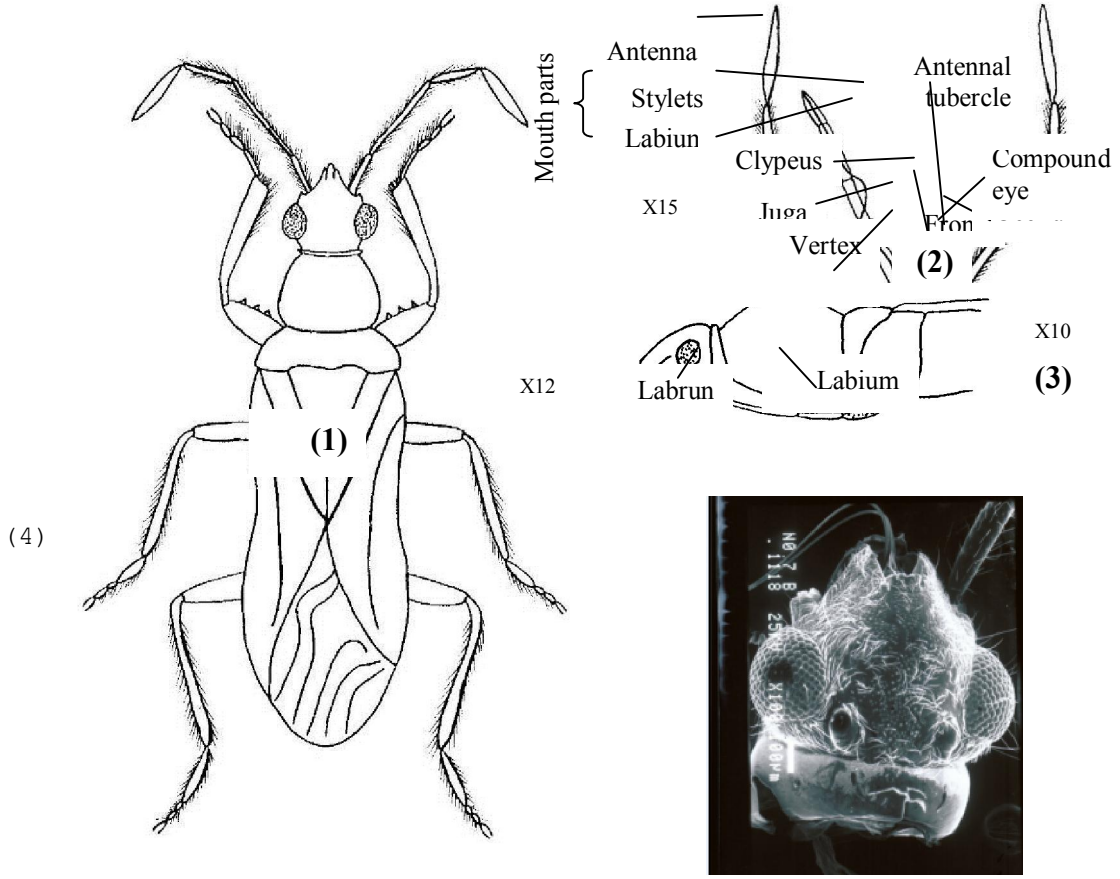
The comparative morphometric study of the 8 tribes of the subfamily Rhyparochrominae in Egypt are: Gonianotini, Lethaeini, Megalonotini, Myodochini, Ozophorini, Phasmosomini, Rhyparochromini and Stygnocorini were investigated through their representative bugs, ***Emblethis gracilicornis*** Puton, ***Lethaeus lethierryi*** (Puton), ***Lamprodema maura*** (Fabricius), ***Remaudiereana annulipes*** (Baerensprung), ***Marmottania simonis*** Puton, ***Phasmosomus priesneri*** (Wagner), ***Dieuches mucronatus*** (Stal) and ***Stygnocoris breviceps*** Wagner, respectively.

So the general morphological characters shared with the representative species of the 8 rhyparochromin tribes are: ocelli two in number; antennae 4- segmented; membrane of hemelytra with 4 or 5 veins; tarsi 3- segmented; ventral suture between 4th and 5th abdominal segments, not reaching to the connexival margin; abdomen with rudiments of 2 or 3 scent glands on tergum 3-5; abdominal trichobothria 28 in number in both sexes, arranged on the sternites 3-7 and female ovipositor, elbow-like. These results indicated that the mentioned characters are distinctive for the subfamily Rhyparochrominae as previously reported by Slater, 1964 and Schuh & Slater, 1995.

On the other hand, the differences in characters among the species represented 8 tribes, which facilitate the differentiation between them are labium slender, tapering, with 4th segments not extending beyond the hind coxae, except in the tribe Phasmosomini where labium with the 4th segment extending beyond hind coxae. Shape of pronotum varies in the 8 tribes and is characterized by, lamelliformed lateral margins in Gonianotini and Rhyparochromini;being broad and flat in Lethaeini, Megalonotini and Stygnocorini; strongly constructed behind middle in Myodochini; little sinuate at middle in Ozophorini and Phasmosomini. Abdominal spiracles vary in position in the different tribes. In Gonianotini the spiracles are dorsally placed only on segment 4; while in Lethaeini, Ozophorini, Phasmosomini and Stygnocorini, all spiracles are ventrally placed. On the other hand, the spiracles on segments 3 and 4are dorsally placed in Megalonotini, Myodochini and Rhyparochromini. Aedeagus, particularly basal plate and vesical parts have characteristic features at tribal level. Tribe Lethaeini characterized by free-floating wings of the ejaculatory reservoir, while in other tribes wings contiguous with body. Structure of ovipositor constant in the 8 tribes, but differs in size as it is distinctly, narrow and elongated in Megalonotini, Myodochini, Rhyparochromini Phasmosomini and Ozophorini; on the other hand it is wide and short in Gonianotini and Lethaeini. These findings supported the results reaches by those of Puton and Leithery, 1887;. Wagner (1958) & (1959); Scudder (1957); Sweet (1967); Harrington (1980); Linnavuori (1994); Schuh & Slater (1995); Cassis & cross (2002); Brailovsky (2009) and Cervantes & O'donnell (2009) . Spermatheca are known to show high degree of variation which is very important for differentiation at the specific level (Scudder, 1957 & 1959 and Sweet, 1967). In the present investigation it was found that, the shape of spermathecal bulb varies from triangular-shape in Gonianotini; to cap-like in Lethaeini; funnel-shaped in Megalonotini; kidney-shaped in Myodochini; spherical in Ozophorini and Stygnocorini; bladder-like in Phasmosomini and oblong heart-shaped in Rhyparochromini.

Accordingly, the relationships between the 8 tribes could be concluded as follows: Ozophorini and Phasmosomini show a degree of resemblance in shape of pronotum (little sinuate at middle), position of abdominal spiracles (all spiracles ventrally placed) and long ovipositor. Meanwhile the different structure in, inner laterotergites, abdominal scent glands, aedeagus of male and spermatheca of female can easily differentiated between the two tribes. Megalonotini and Myodochini also show a degree of similarity, especially in the position of abdominal spiracles (3 & 4 dorsally placed) and elongated ovipositor but differ in, the shape of pronotum, inner laterotergites which present in Megalonotini but absent in Myodochini and the shape of aedeagus, so that the two tribes are not related. Gonianotini, Lethaeini, Rhyparochromini and Stygnocorini are placed in unique position. These suggestions are confirmed by the opinions of Sweet (1967), Harrington (1980), Linnavuori (1994).

Moreover, scanning electron microscope examination of metathoracic scent gland and abdominal trichobothria of ***Remaudiereana annulipes*** (Baerensprung) reveled that, trichobothria consists of cuticular filiform mechanoreceptor hair, surrounded by circular area of dense papilli-like structures, that may be play a role in responding to air currents and sound as mentioned by Keil (1997) in his study on the functional morphology of insect mechanoreceptors. On the other hand evaporative area of metathoracic scent gland are found to be consists of two types of microsculptures, a limited area of rod-like microsculptures and a wide area of mushroom-like microsculptures. The main function of the adult scent glands appears to be defensive, although sexual alarm and aggregation functions may also exist (Remold, 1963). The variable types of microsculptures detected in the present investigation may be responsible for the performance of the function of the evaporative area suggested by Carayon (1971) and Carver (1990). They reported that evaporative area increase the effectiveness of the scent secretion in defense and also serve in restricting spread of the scent fluids to a circumscribed area of the body because the scent fluids are known to be toxic to the bugs that secrete them as well as to potential predators.



(Figs. 1-33): *Remaudiereana annuilpes* (Baerensprung(1): General characters of adults (male and female); (2): Dorsal side of head; (3): Lateral side of head and thorax; (4): Dorsal side of head (Scanning photographe)

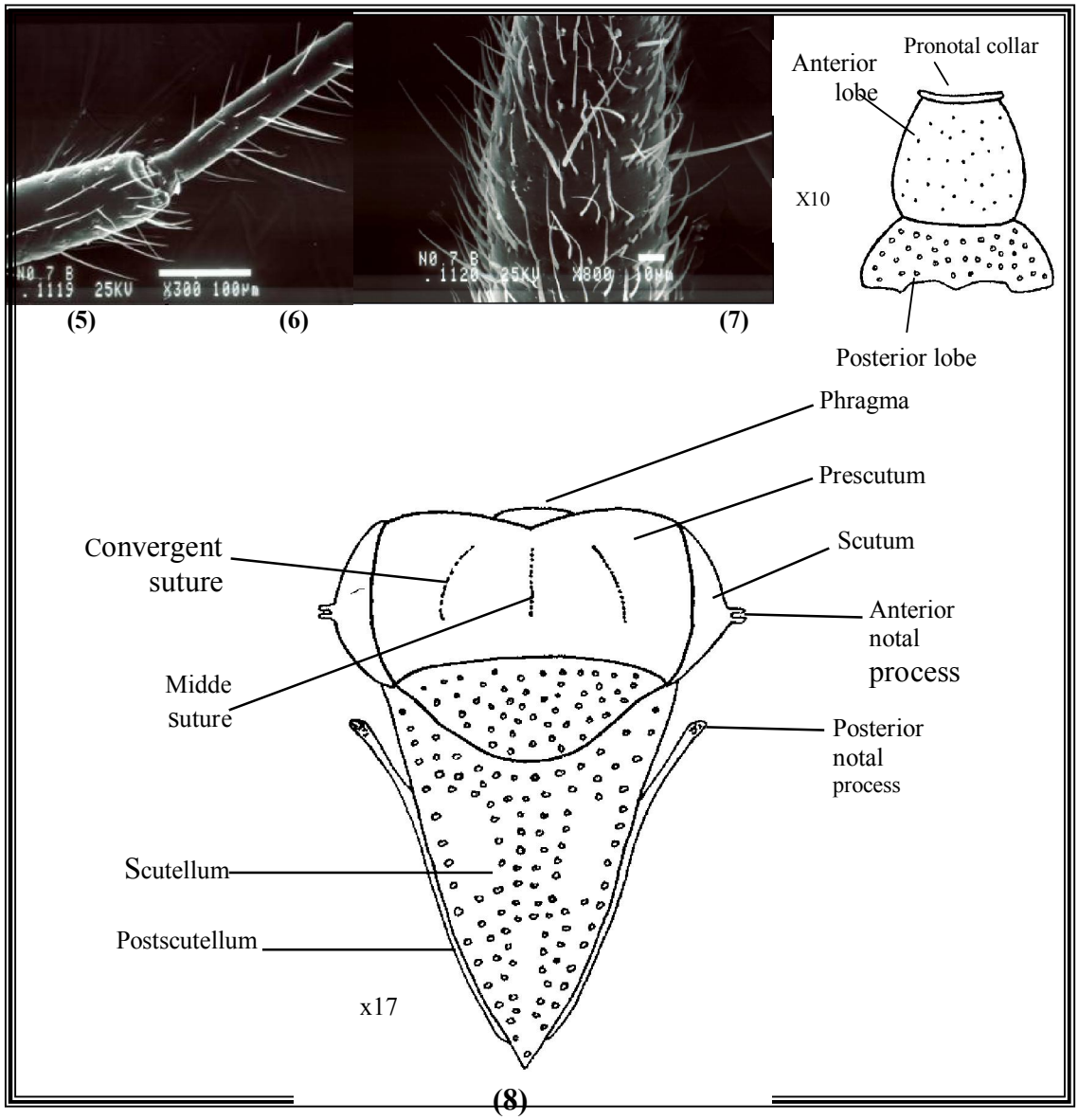
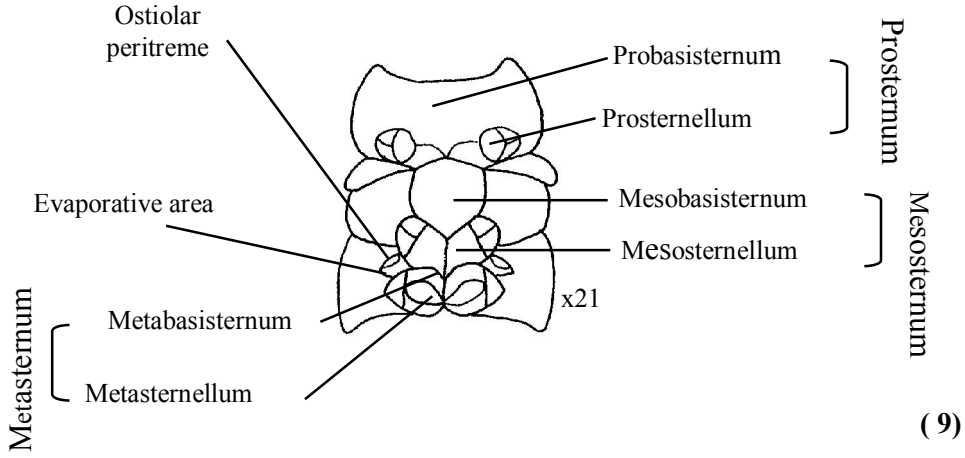


Fig. (5): 1st & 2nd antennal segments; (6): 4th antennal segment; (7): Pronotum; (8): Dorsal side of mesonotum.



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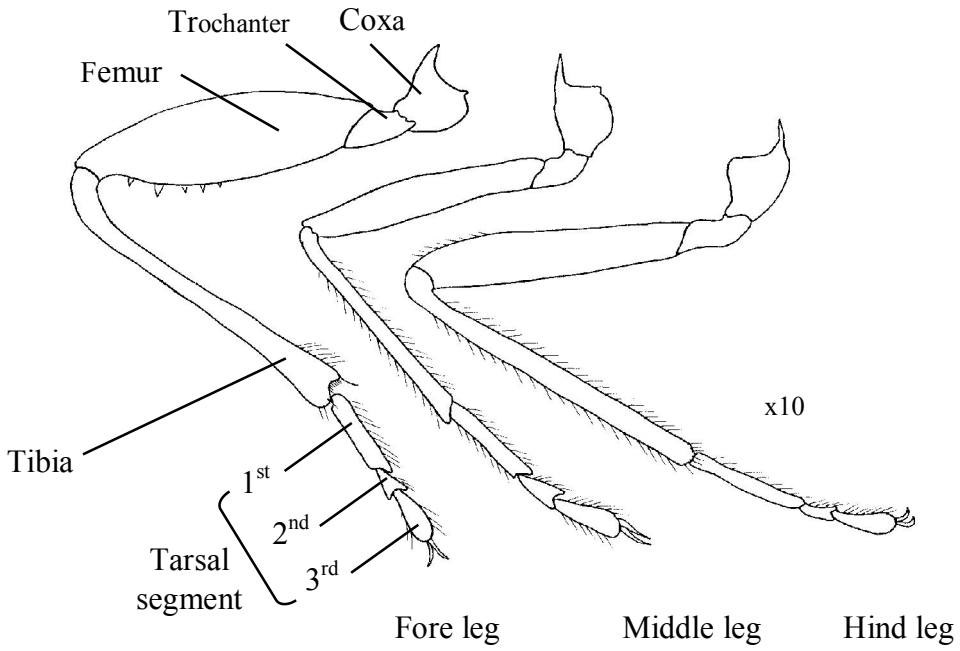
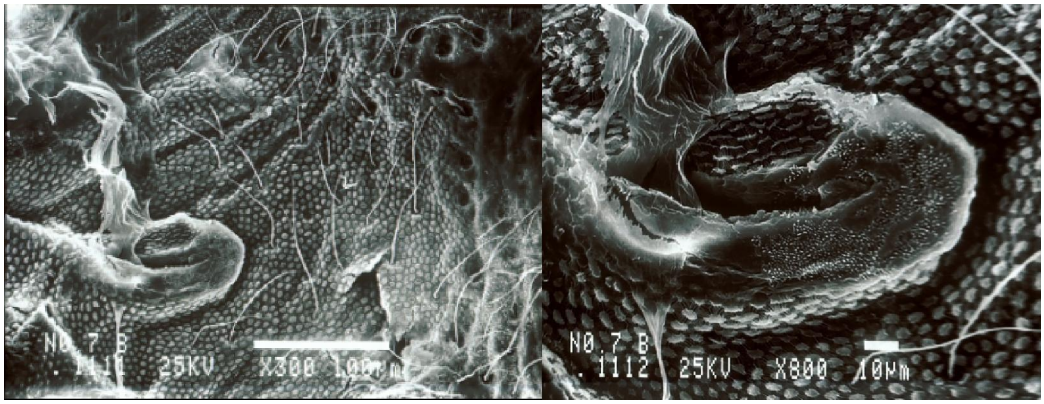
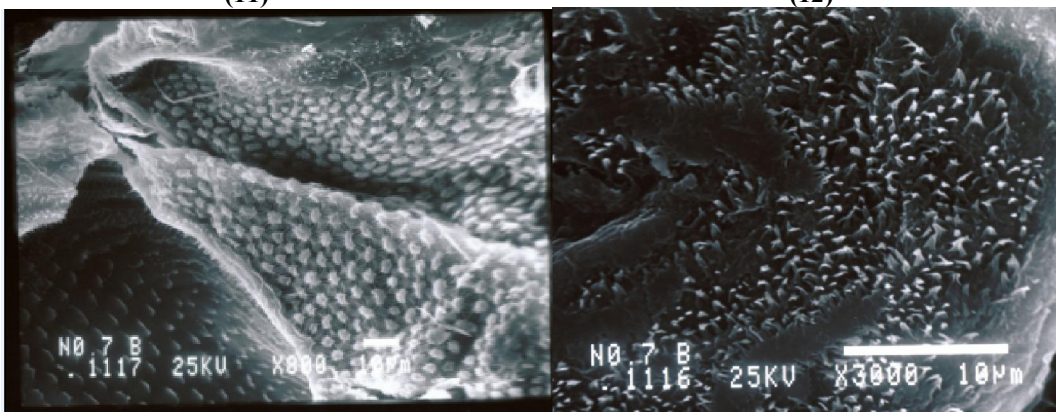


(10)

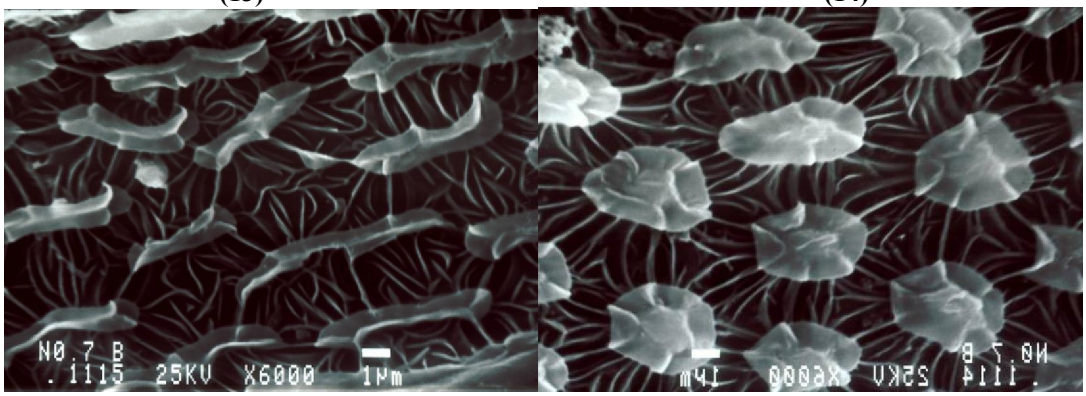
(Fig. (9): Ventral side of thorax; (10): Legs.



(11) (12)



(13) (14)

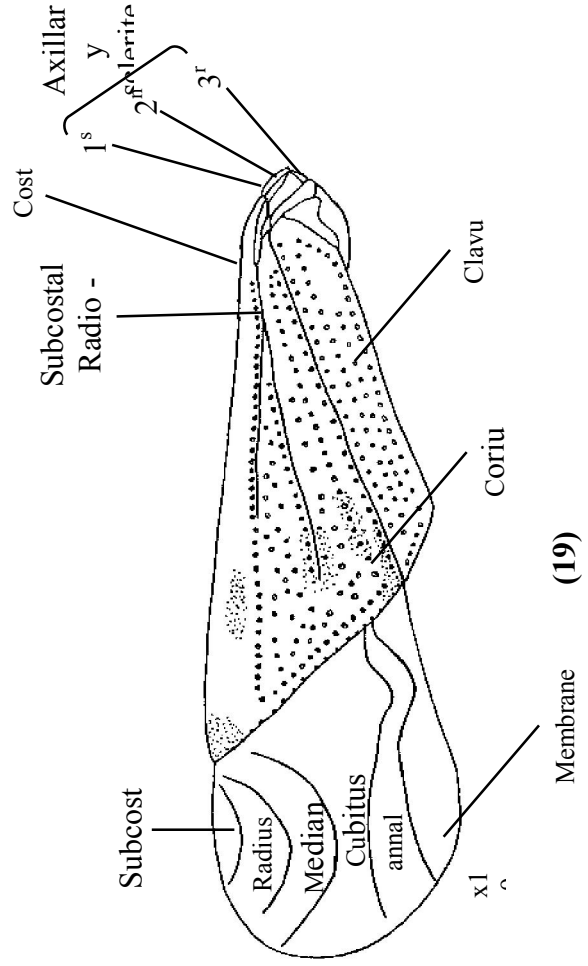


(15) (16)

Fig.(11): Metathoracic scent gland,X300; (12): Metathoracic scent gland,X800 (13): Canal of metathoracic scent gland; (14): Apex of auricle of metathoracic scent gland; (15) Rod-like microsculpture Evaporative area; (16): Mushroom-like microsculpture.

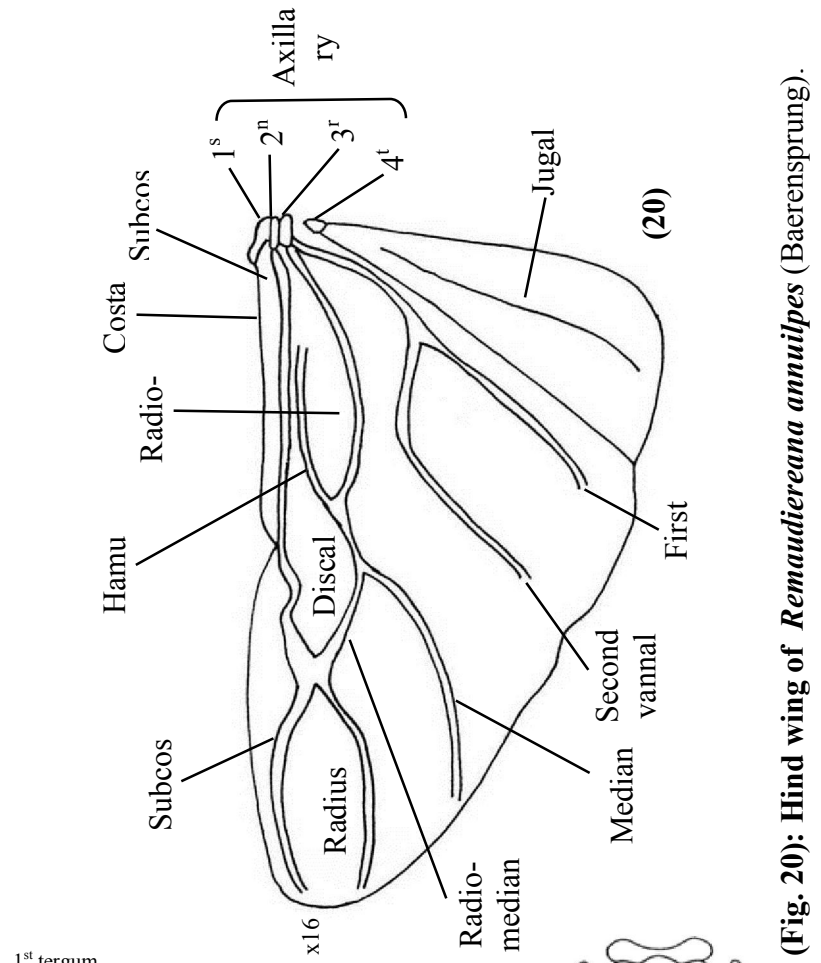
(17) For leg coxal arm

(18) For leg femoral arms.

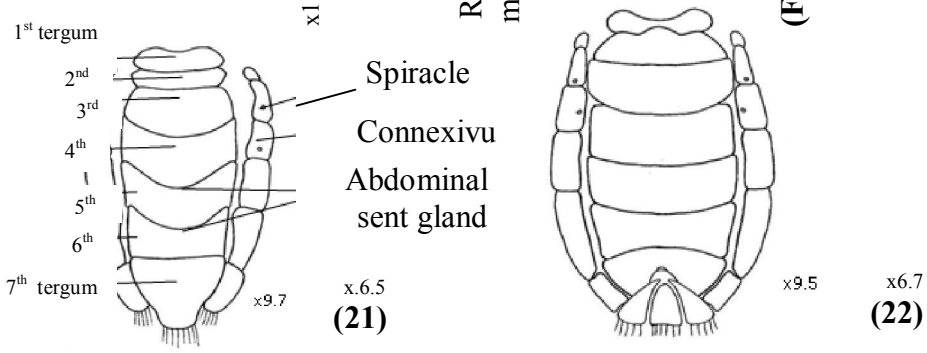


(19)

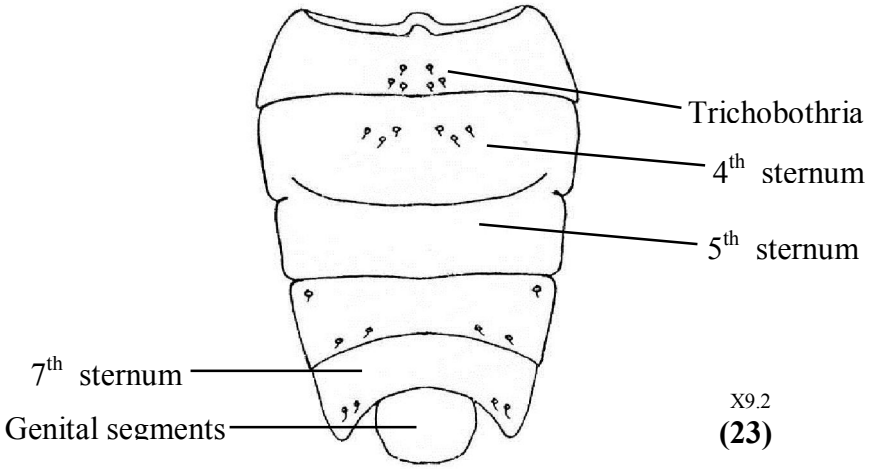
(Fig. 19): Fore wing of *Remaudiereana annuilpes* (Baerensprung).



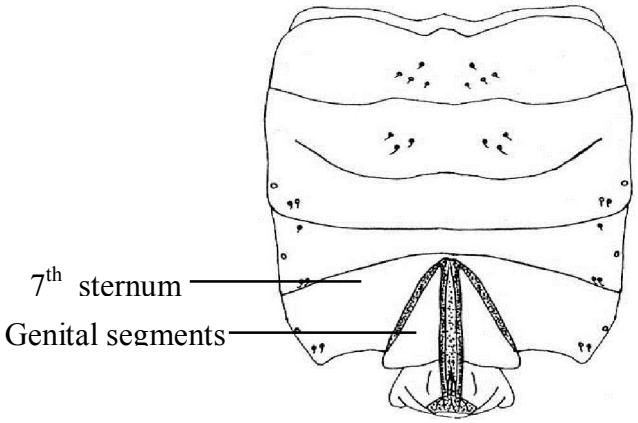
(Fig. 20): Hind wing of *Remaudiereana annuilpes* (Baerensprung).



Abdomen dorsally (21): Male; (22): Female.

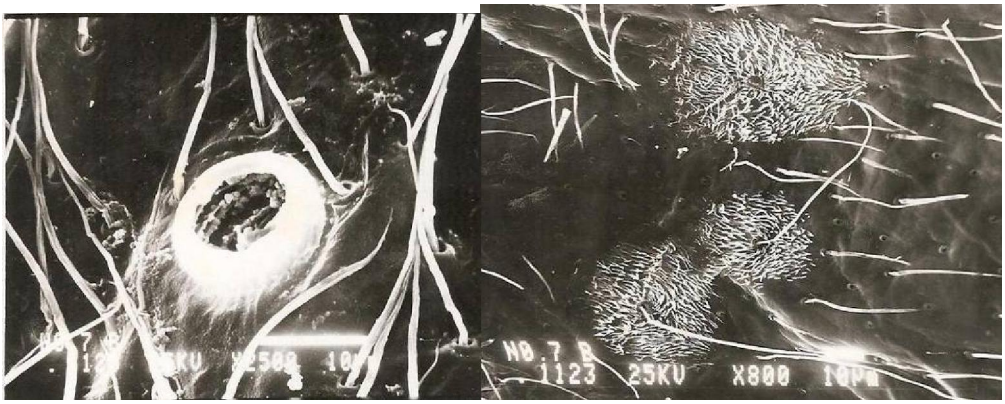


X9.2
(23)

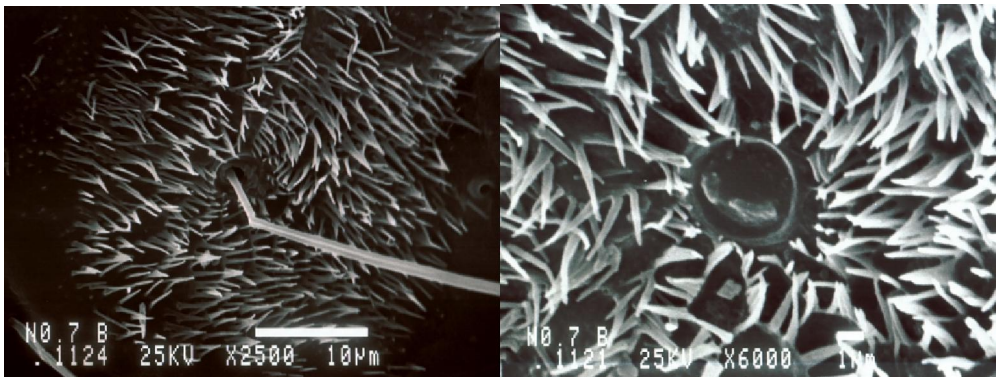


X8.9
(24)

Abdomen ventrally, **(23): Male; (24): Female**.



(25): Spiracle of abdominal segment; (26). Abdominal trichobothria



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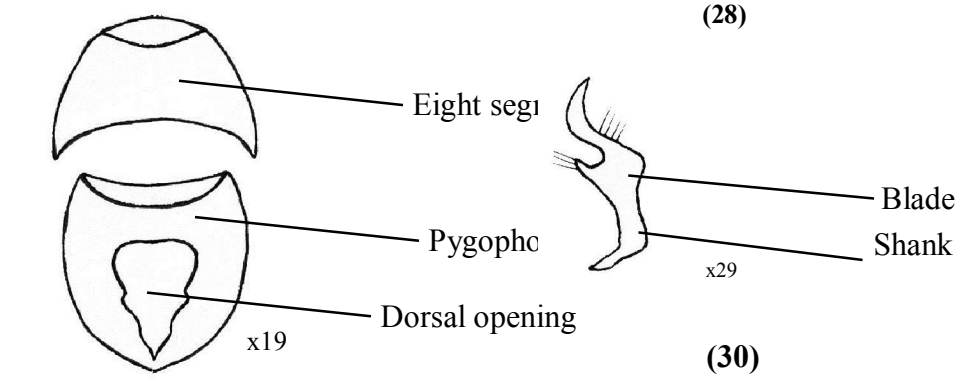
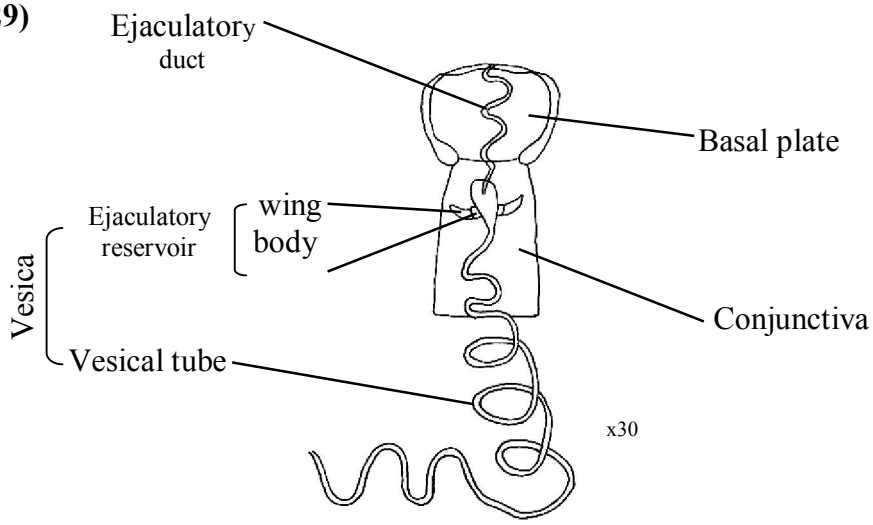
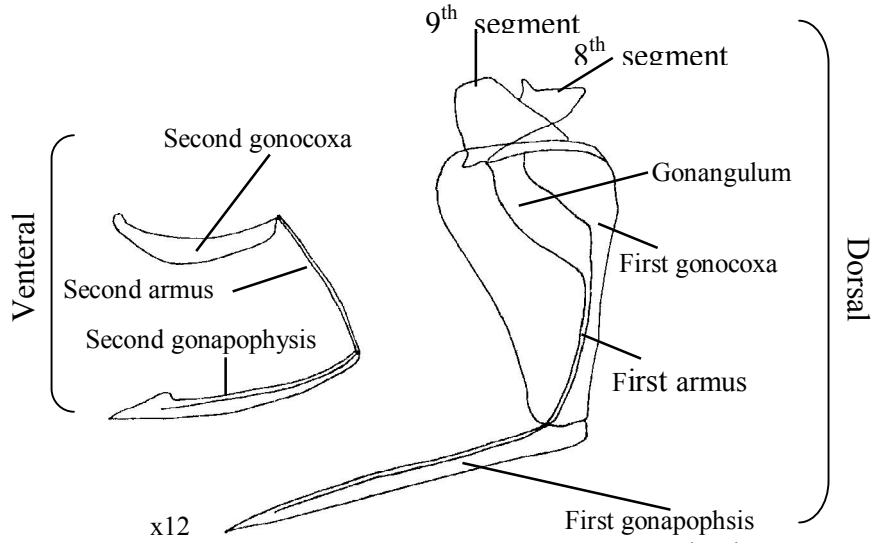


(29) **(30)**



(31)

Figs(27),(28): Abdominal trichobothria; Figs (29-31): Male genitalia, (29): Pygophore; (30): Paramere; (31): Aedeagus.



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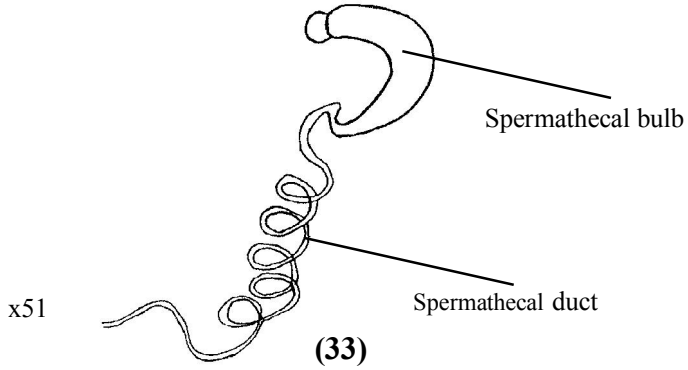


(33)

(Figs. 32 & 33): Female genitalia, (32): Valves of ovipositor; (33): Spermatheca.

Table I: General characters of Adults (Males & Females)

Tribe	Gonianotini	Lethaeini	Megalonotini	Myodochini	Ozophorini	Phasmosomini	Rhyparochromini	Stygnocorini
Species	***Emblethis gracilicornis*** Puton	***Lethaeus lethierryi*** Puton	***Lamprodema maura*** Fabricius	***Remaudiereana annuilpes*** (Baerensprung)	***Marmottania simonies*** Puton	***Phasmosomus priesneri*** (Wagner)	***Dieuches mucronatus*** (Stal)	***Stygnocoris breviceps*** Wagner
Length	7.5-8 mm.	6.5-7 mm.	4-4.5 mm.	5.5-6 mm.	4.5-5.5 mm.	7-8 mm.	11-11.5 mm.	4-4.5 mm.
Width	2-2.5 mm.	2-2.5 mm.	1.3 mm	2 mm.	1-1.2 mm.	2mm.	3-3.5 mm.	1.5-2 mm.
Form	Slender.	Oblong ovate.	Acromion, weal like.	Subovoid.	Elongated, narrow, somewhat ant-like.	Elongated, glabrous.	Cylindrical, elongated.	Slender.
Color	Yellowish with brown punctures.	Brownish.	Bronze metallic.	Brownish yellow.	Brownish yellow, brilliant.	Yellow to dark brown.	Reddish brown marked with yellowish white.	Grayish brown.
Upper Surface	Wholly punctated.	With strong punctures.	With strong punctures.	Wholly punctated.	Wholly punctated.	Wholly punctated.	Wholly punctated.	Wholly punctated.

Table II: Lateral side of Head

Tribe		Gonianotini	Lethaeini	Megalonotini	Myodochini	Ozophorini	Phasmosomini	Rhyparochromini	Stygnocorini
Species		***Emblethis gracilicornis*** Puton	***Lethaeus lethierryi*** Puton	***Lamprodema maura*** Fabricius	***Remaudiereana annuilpes*** (Baerensprung)	***Marmottania simonies*** Puton	***Phasmosomus priesneri*** (Wagner)	***Dieuches mucronatus*** (Stal)	***Stygnocoris breviceps*** Wagner
Labrum		As long as 1st labial segment.	As long as 1st labial segment.	Shorter than 1st labial segment.	Shorter than 1st labial segment.	Nearly as long as 1st labial segment.	Shorter than 1st labial segment.	As long as 1st labial segment.	Shorter than 1st labial segment.
Labium	1st segment	Shorter than head.	Shorter than head.	As long as head.	Nearly as long as head.	Shorter than head.	Shorter than head.	Slightly longer than head.	Longer than head.
	2nd segment	Extending to fore coxae.	Extending between fore coxae.	Extending between fore coxae.	Extending before fore coxae.	Extending to mesosternum.	Extending to middle coxae.	Extending between fore coxae.	Extending between fore coxae.
	3rd segment	Extending to mesosternum.	Extending between middle coxae.	Extending to middle coxae.	Extending behind fore coxae.	Extending to middle coxae.	Extending to hind coxae.	Extending to mesosternum.	Extending between middle coxae.
	4th segment	Extending between middle coxae.	Extending to metasternum.	Extending to metasternum.	Extending to mesosternum.	Extending to hind coxae.	Extending behind hind coxae.	Extending between middle coxae.	Extending to metasternum.

Table III: Dorsal side of Thorax

Tribe		Gonianotini	Lethaeini	*Megalonotini*	Myodochini	Ozophorini	Phasmosomini	*Rhyparochromini*	Stygnocorini
Species		***Emblethis gracilicornis*** Puton	***Lethaeus lethierryi*** Puton	***Lamprodema maura*** Fabricius	***Remaudiereana annuilpes*** (Baerensprung)	***Marmottania simonies*** Puton	***Phasmosomus priesneri*** (Wagner)	***Dieuches mucronatus*** (Stal)	***Stygnocoris breviceps*** Wagner
Pronotum		Flat, lateral margin lamelliform.	Flat.	Broad, flat.	Strongly constricted behind middle.	Slightly constricted at middle.	Slightly constricted at middle.	Elongated, lateral margin lamelliform.	Broad, flat.
Scutellum		Shorter than pronotum with pointed apex.	Nearly as long as pronotum with pointed apex.	Longer than pronotum with pointed apex.	Longer than anterior lobe of pronotum with pointed apex.	Shorter than pronotum with pointed apex.	Shorter than pronotum with pointed apex.	Shorter than pronotum with pointed apex.	Nearly as long as pronotum with rounded apex.
Hemelytra	clavus	With 2 regular rows of punctures and another scattered punctures.	With 2 regular rows of punctures and another scattered punctures between them.	With 4 rows of regular punctures.	With 4 rows of regular punctures.	With 2 regular rows of punctures and another scattered punctures between them.	With 3 rows of punctures, median row irregular.	With 2 regular rows of punctures and another scattered punctures.	With 4 rows of regular punctures.
	membrane	With 5 veins.	With 4 veins.	With 4 bright veins.	With 5 veins.	With 4 veins.	With 4 veins.	With 5 veins.	With 4 veins.

Table IV: Dorsal side of Abdomen (Terga)

Tribe	**Gonianotini**	**Lethaeini**	Megalonotini	**Myodochini**	**Ozophorini**	**Phasmosomini**	Rhyparochromini	Stygnocorini
Species	***Emblethis gracilicornis*** Puton	***Lethaeus lethierryi*** Puton	***Lamprodema maura*** Fabricius	***Remaudiereana annuilpes*** (Baerensprung)	***Marmottania simonies*** Puton	***Phasmosomus priesneri*** (Wagner)	***Dieuches mucronatus*** (Stal)	***Stygnocoris breviceps*** Wagner
Position of spiracles	Abdominal spiracle 4 only located dorsally.	All abdominal spiracles located ventrally.	Abdominal spiracle 3&4 located dorsally.	Abdominal spiracle 3&4 located dorsally.	All abdominal spiracles located ventrally.	All abdominal spiracles located ventrally.	Abdominal spiracle 3&4 located dorsally.	All abdominal spiracles located ventrally.
Connexivum	5 segments.	5 segments.	6 segments.	6 segments.	6 segments.	6 segments.	6 segments.	6 segments.
Inner laterotergites	Present.	Present.	Present.	Absent.	Absent.	Present.	Present.	Present.
Scent gland scars	2	2	3	2	3	3	2	3

Table V: Male genital segments (Pygophore & Paramere)

Tribe		Gonianotini	Lethaeini	Megalonotini	Myodochini	Ozophorini	Phasmosomini	Rhyparochromini	Stygnocorini
Species		*Emblethis gracilicornis* Puton	*Lethaeus lethierryi* Puton	*Lamprodema maura* Fabricius	*Remaudiereana annuilpes* (Baerensprung)	*Marmottania simonies* Puton	*Phasmosomus priesneri* (Wagner)	*Dieuches mucronatus* (Stal)	*Stygnocoris breviceps* Wagner
Pygophore	shape	Rounded.	Quadrate.	Spherical.	Rounded.	Quadrate.	Spherical.	Rounded.	------
	Dorsal opening	Cylindrical.	Inverted bell-shaped.	Narrow with dented at lateral sides.	Inverted cup-shaped.	Diamond-shaped.	Rounded, wide.	Heart-shaped.	-------
Blade of paramere		Straight with rounded apex.	Straight with rounded apex.	Curved with rounded apex.	Curved with pointed apex.	Straight with rounded apex.	Curved with rounded apex.	Straight with rounded apex.	-------

Table VI: Male genital segments (Aedeagus)

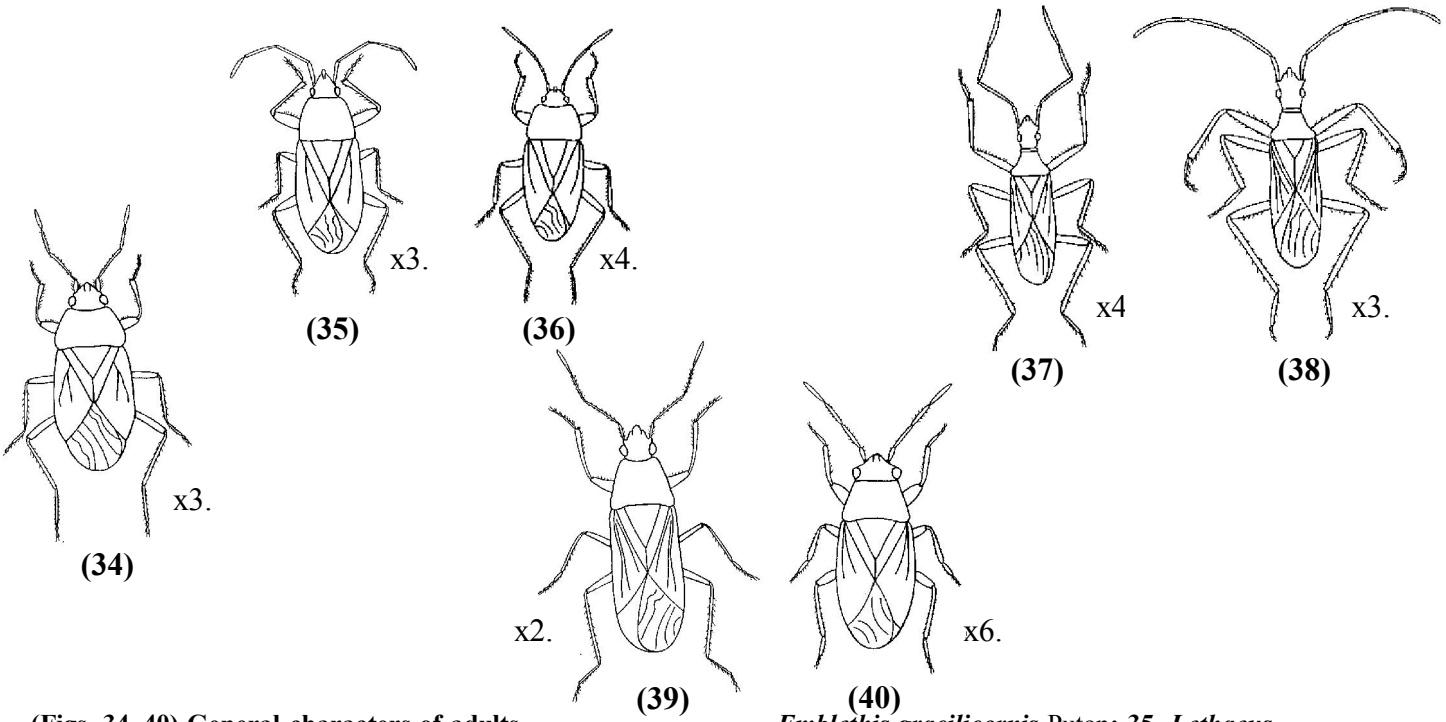
Tribe	Gonianotini	Lethaeini	Megalonotini	Myodochini	Ozophorini	Phasmosomini	Rhyparochromini	Stygnocorini
Species	***Emblethis gracilicornis*** Puton	***Lethaeus lethierryi*** Puton	***Lamprodema maura*** Fabricius	***Remaudiereana annuilpes*** (Baerensprung)	***Marmottania simonies*** Puton	***Phasmosomus priesneri*** (Wagner)	***Dieuches mucronatus*** (Stal)	***Stygnocoris breviceps*** Wagner
Shape of Basal plate	Rounded.	Subquadrate.	Triangular.	Rounded.	Quadrate.	Rounded.	Subquadrate.	Quadrate.
Body	Cup-shaped.	Kidney-shaped.	Small, rectangular.	Ball like.	Ball like.	Cylindrical.	Small, rectangular.	Rounded.
Wing	Spindle-shaped.	Triangular.	Ear-like.	Cup-shaped.	Cup-shaped.	Cup-shaped.	Triangular.	Cup-shaped.
Vesical tube	Long and coiled.	Short and coiled.	Short and uncoiled.	Long and coiled.	Long and coiled.	Long and coiled.	Long and coiled.	Long and coiled.

Table VII: Female genitalia (Valves of ovipositor)

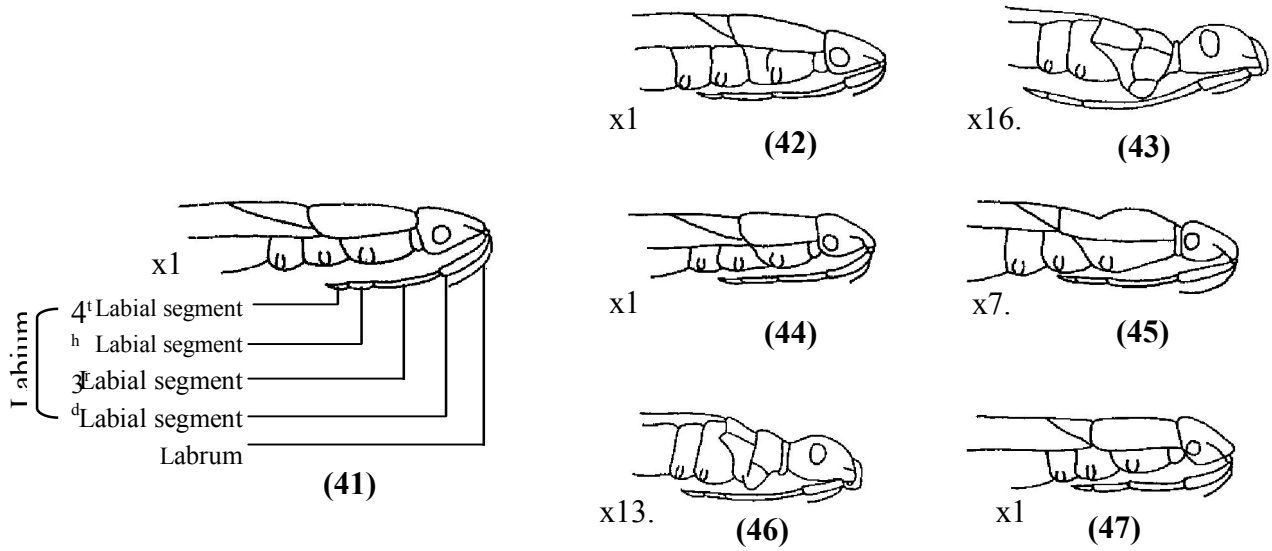
Tribe	Gonianotini	Lethaeini	Megalonotini	Myodochini	Ozophorini	Phasmosomini	Rhyparochromini	Stygnocorini
Species	***Emblethis gracilicornis*** Puton	***Lethaeus lethierryi*** Puton	***Lamprodema maura*** Fabricius	***Remaudiereana annuilpes*** (Baerensprung)	***Marmottania simonies*** Puton	***Phasmosomus priesneri*** (Wagner)	***Dieuches mucronatus*** (Stal)	***Stygnocoris breviceps*** Wagner
First gonocoxa	Flat and longer than 1st gonapophysis.	Flat and longer than 1st gonapophysis.	Narrow and shorter than 1st gonapophysis.	Flat and shorter than 1st gonapophysis.	Narrow and as long as 1st gonapophysis.	Narrow and shorter than 1st gonapophysis.	Narrow and shorter than 1st gonapophysis	--------
First gonapophysis	Narrow and insinuate.	Wide and sinuate.	Narrow and insinuate.	Narrow and insinuate.	Narrow and insinuate.	Narrow and insinuate.	Narrow and sinuate.	--------
Second gonapophysis	Wide with acute apex.	Wide with rounded apex.	Narrow with rounded apex.	Narrow with acute apex.	Narrow with rounded apex.	Narrow with acute apex.	Narrow with rounded apex.	--------

Table VIII: Female genitalia (Spermatheca)

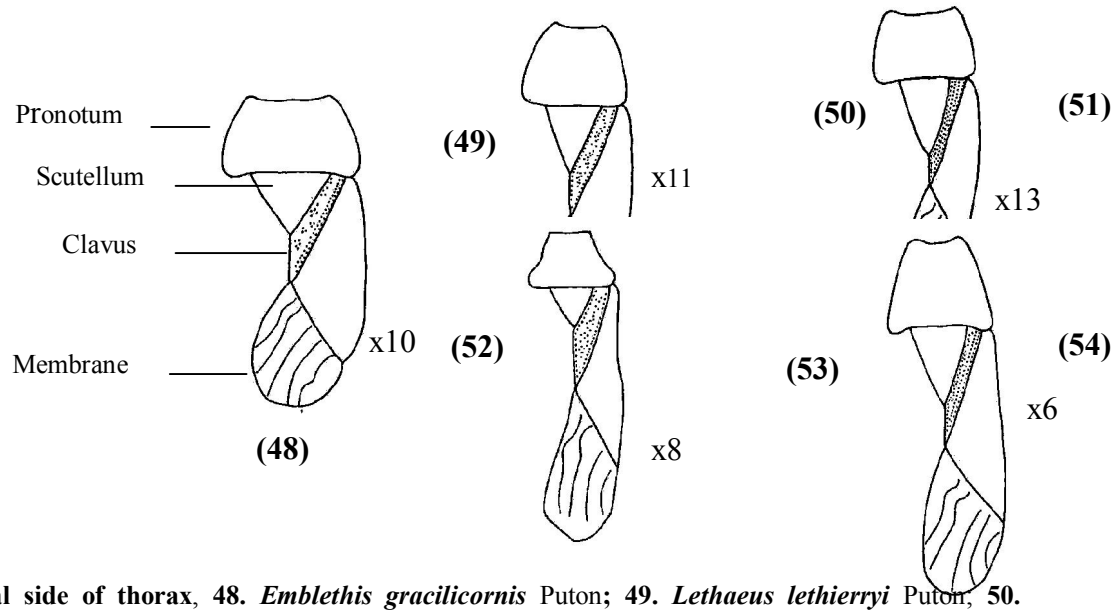
Tribe	Gonianotini	Lethaeini	Megalonotini	Myodochini	Ozophorini	Phasmosomini	Rhyparochromini	Stygnocorini
Species	*Emblethis gracilicornis* Puton	*Lethaeus lethierryi* Puton	*Lamprodema maura* Fabricius	*Remaudiereana annuilpes* (Baerensprung)	*Marmottania simonies* Puton	*Phasmosomus priesneri* (Wagner)	*Dieuches mucronatus* (Stal)	*Stygnocoris breviceps* Wagner
Spermathecal pulp	Triangular-shape.	Cap-like.	Funnel-shaped.	Kidney- shaped.	Spherical.	Bladder-like.	Oblong heart-shaped.	Spherical.
Spermathecal duct	Long and coiled.	Short and uncoiled.	Short and uncoiled.	Long and coiled.	Long and coiled.	Short and uncoiled.	Long and uncoiled.	Long and coiled.



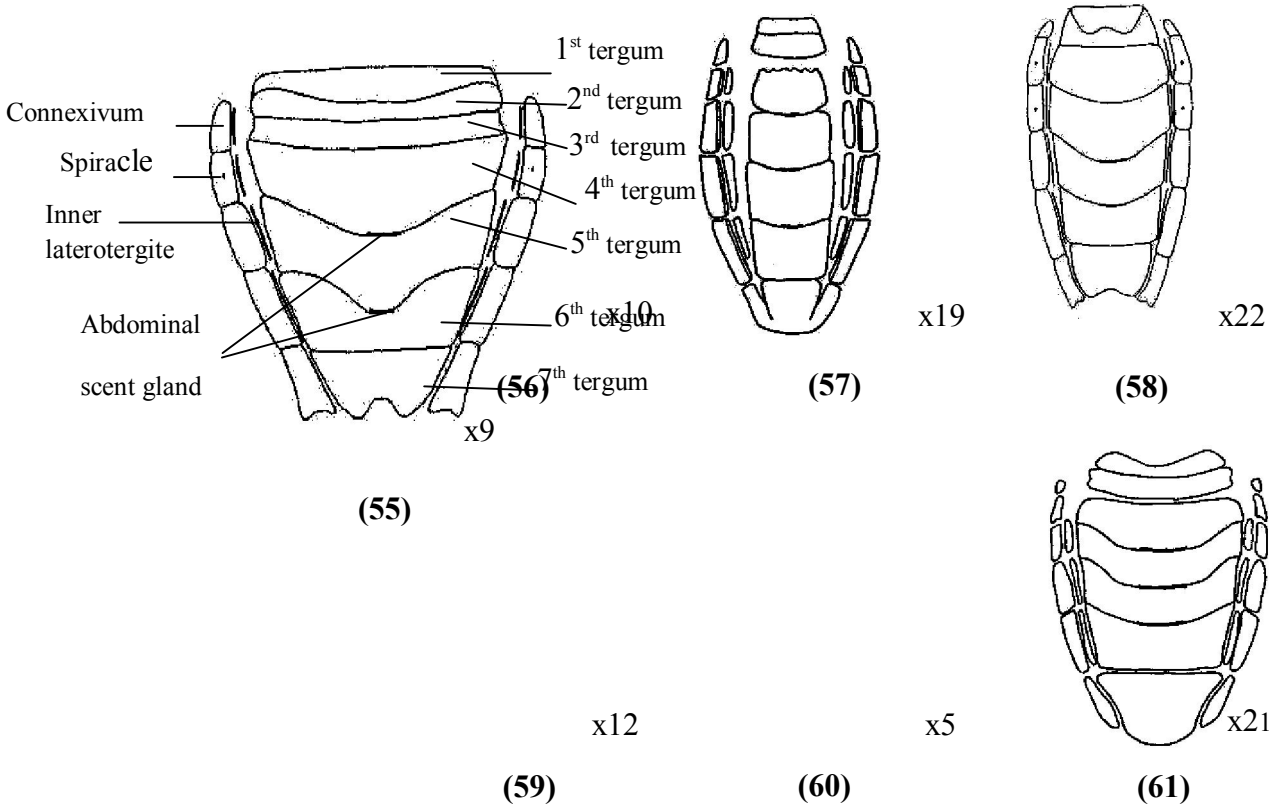
(Figs. 34–40) General characters of adults (Male& Female), 34. *Emblethis gracilicornis* Puton**; 35. *Lethaeus lethierryi*** Puton; **36. *Lamprodema maura*** Fabricius; **37. *Marmottania simonis*** Puton; **38. *Phasmosomus priesneri*** (Wagner); **39. *Dieuches mucronatus*** (Stal); **40. *Stygnocoris breviceps*** Wagner.



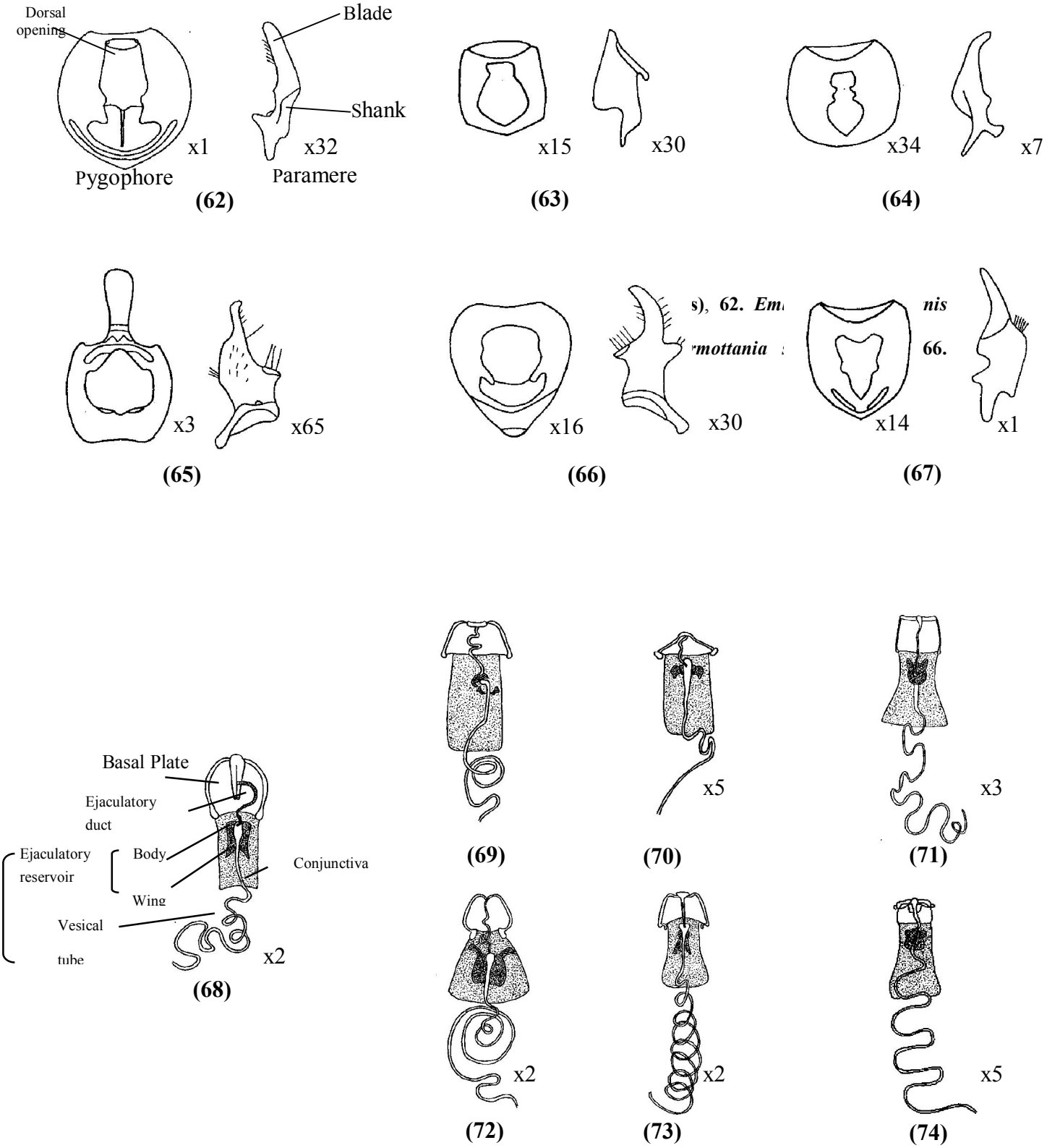
(Figs. 41-47) Lateral side of head and thorax, 41. *Emblethis gracilicornis* Puton**; 42. *Lethaeus lethierryi*** Puton; **43. *Lamprodema maura*** Fabricius; **44. *Marmottania simonis*** Puton; **45. *Phasmosomus priesneri*** (Wagner); **46. *Dieuches mucronatus*** (Stal); **47. *Stygnocoris breviceps*** Wagner.



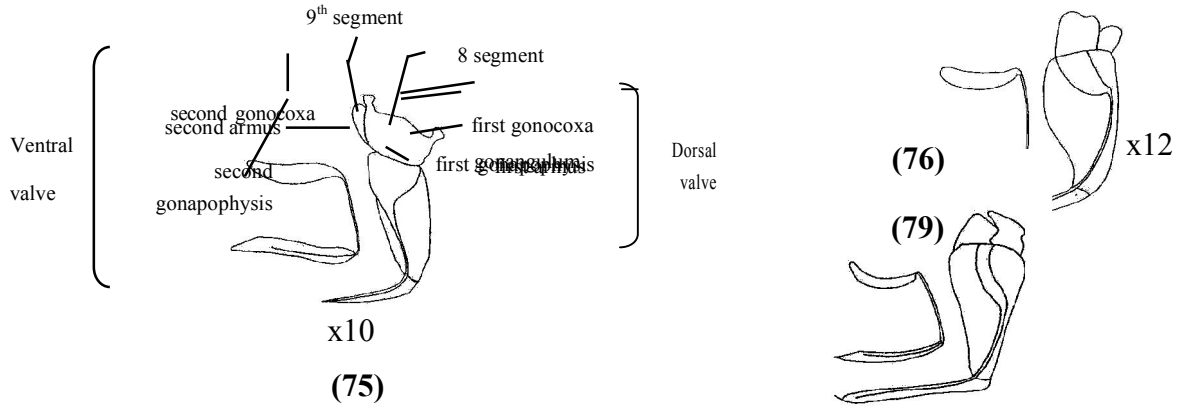
(Figs. 48-54) Dorsal side of thorax, **48.** ***Emblethis gracilicornis*** Puton**; 49.** ***Lethaeus lethierryi*** Puton; **50.** ***Lamprodema maura*** Fabricius; **51.** ***Marmottania simonis*** Puton; **52.** ***Phasmosomus priesneri*** (Wagner); **53.** ***Dieuches mucronatus*** (Stal); **54.** ***Stygnocoris breviceps*** Wagner.



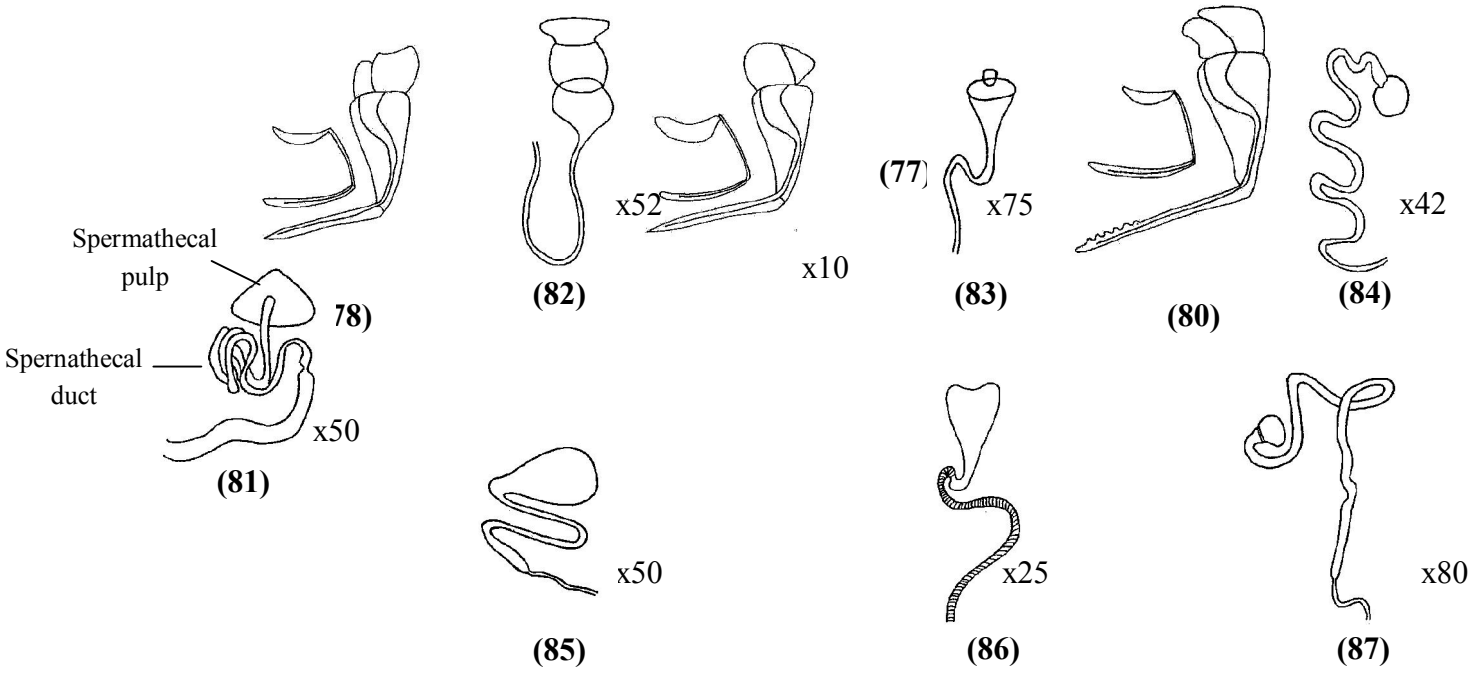
(Figs. 55–61) Dorsal side of abdomen (Terga), **55.** ***Emblethis gracilicornis*** Puton**; 56.** ***Lethaeus lethierryi*** Puton; **57.** ***Lamprodema maura*** Fabricius; **58.** ***Marmottania simonis*** Puton; **59.** ***Phasmosomus priesneri*** (Wagner); **60.** ***Dieuches mucronatus*** (Stal); **61.** ***Stygnocoris breviceps*** Wagner.



(Figs. 68–74) Male genital segments (Aedeagus), **68.** ***Emblethis gracilicornis*** Puton; **69.** ***Lethaeus lethierryi*** Puton; **70.** ***Lamprodema maura*** Fabricius; **71.** ***Marmottania simonis*** Puton; **72.** ***Phasmosomus priesneri*** (Wagner); **73.** ***Dieuches mucronatus*** (Stal); **74.** ***Stygnocoris breviceps*** Wagner (After Sweet, 1967).



(Figs. 75–80) Valves of ovipositor (female), **75.** ***Emblethis gracilicornis*** Puton**; 76.** ***Lethaeus lethierryi*** Puton; **77.** ***Lamprodema maura*** Fabricius; **78.** ***Marmottania simonis*** Puton; **79.** ***Phasmosomus priesneri*** (Wagner); **80.** ***Dieuches mucronatus*** (Stal).



(Figs. 81–87) Female spermatheca, **81.** ***Emblethis gracilicornis*** Puton**; 82.** ***Lethaeus lethierryi*** Puton; **83.** ***Lamprodema maura*** Fabricius; **84.** ***Marmottania simonis*** Puton; **85.** ***Phasmosomus priesneri*** (Wagner); **86.** ***Dieuches mucronatus*** (Stal); **87.** ***Stygnocoris breviceps*** Wagner (After Sweet, 1967).

Fig.(88): *Emblethis gracilicorius* Puton (Gonianotini); (89): *Lethaeus lethierryi* Puton (Leyhaeini); (90): *Lamprodema Maura* (Fabricius) (Megalonotini); (91): *Remaudiereana annulipes* (Baerensprung) (Myodochini).

Fig.(92): *Marmottania simonies* Puton (Ozophorini); (93): *Phasmosomus priesneri* (Wagner) (Phasmosomini); (94) *Dieuches mucronatus* (Stall) (Rhyparochromini); (95): *Stygnocoris breviceps* Wagner (Stygnocorini).

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