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2. The head (Figs. I and 2 B) :

1. Head capsule ;

The head of Cybister tripuctatus Oliv. is flattened and strongly sclerotized, the clypeus and labrum are clearly defined and visible from above. There is a distinct transverse suture running across the dorsal surface (Duporte 1946). On each side of this sulcus there is a short obique furrow (anterior tentorial pit) which leads on either side into the respective anterior tentorial arm.

The dorsal surface of the head back to the occipital suture the vertex is wide. Frons is a smooth sclerite located between the compound eyes. Each eye settles in a circuler ridge called the occular sclerite, separating it from the cranium by an occular suture. There is no trace of any ocellus in C. tripunctatus Oliv.

Ventrally the head is formed by the gula which is marked from the gena on either side by gular suture (Fig.1).The occiput is separated from the post gena and the vertex by an occipital suture, which arises lateral to the gula on the ventral side of the head. the posterior end of the head is marked by an opening called the occipital foramen. The two gular sutures diverge anteriorly and terminate laterally a short distance beyond the posterior tentorial pits leading into the posterior tentorial arms.

C . Tentorium : (Fig . 3)

The endoskeleton of the head is composed of three pairs of arms. The anterior tentorial arms (Pretentoria) arise from the anterior tentorial pits, the posterior centorial arms (metatentoria) are broad, thick plates lying in the ventral part of the head. the pits posterior tentorial arms arises from the posterior tentorial pits Ventrally, they are fused with the wall of the cranium along the lines of the gular sutures. Snodgrass (1935) emphasized the importance of studying the external depressions or pits at the tentorial roots considering them as landmarks in the head structure of insects. Comstock (1902) considered them as the lateral apodemes of the axillary segment.

b . Mandibles : (Fig. 6B)

Both mandibles are large, strongly sclerotized and symmetrical in shape. The upper surface of the mandible is curved forming a molar area and a retinaculum. Each mandible has a large bifid apical tooth (incisor) and a small sclerotized tubercle at the dorsal at the dorsal surface near the proximal margin. The mandibular articulations with the head are concealed beneath the clypeus. Each mandible has two articulatory processes on its proximal margin: the anterior process, the preartis (Stickney, 1923) and the posterior process, the postartis. The base of each mandible is attached to two apodemes: the inner is the adductor and the outer is the abductor; these are for the insertion of the adductor and abductor muscles, respectively.

c . Maxillae : (Fig. 6A)

Maxillae are formed of the usual structures, cardo, stipes, as basal pieces with 4-segmented glabrous maxillary palp lying in a deep groove on each side of the labium. Each maxillary palp is borne by a small basal piece, the palpifer. The galea of the maxillae is segmented into, the basigalea and the distigalea. The palp- like galea here is a characteristic feature of the Adephaga (Balfour-Brown, 1932).

The cardo and lacinia their inner surface setose. At the base of the cardo there are two apodemes that move the appendages, the inner is the adductor and the outer is the abductor. They serve for the insertion of the adductor and abductor muscles respectively.

d . Labium : (Fig. 5)

It is a combined structure as in other (Snodgrasee, 1935). It consists of a flat, median part. The labium being small with three segmented labial palps which, on other side, are supported by a basal piece, the palpiger. The postmentum is differntiated into a submentum and mentum. The prementum or the prelabium is retracted into the venral region and its base is attached to the mentum by an infolded membrane (Ali, 1967).

The dorsal tentorial arms are short and not reaching the dorsal bridge and from the posterior tentorial arms.

These are the body of the tentorium above which the alimentary canal passes in entering the head.

The corporotentrorium recognized by Stickney (1923) produced by the fusion of the mesal margins of the posterior arms in some Coleoptera, is not developed is Cybister tripunctatus Oliv. The cephalic bridge or the laminatentorium present in some generalized Coleoptera is found to be completely absent in this species.

3. Antennae : (Fig. 2A)

The Antenna is ll- segented, filiform in shape having a long scape with a short pedicel. The remaining joints are almost of equal sizes and are all glabrous. The scape is set into a small membranous area of the head called the antennal socket (Snodgrass, 1935). The rim of this socket is forming the antennal sclerite which is strengthened by an internal ridge. The antennal sclerite is marked off from the cranium by the antennal suture.

4. Mouthparts :

The mouth parts of Cybister tripunctatus Oliv. are of the usual mandibulate type and are formed of:

a. Labrum : (Fig. 4 A and B)

The labrum is a flat, broad piece with its front margin bilobed. There are series of fine bristles located at its anterior margin. It is attached to the lower margin of the clypeus by the clypeolateral suture which give mobility to the labrum.

The epipharyngeal wall of the preoral cavity is formed by the inner surface of the labrum continued with the membranous inner suface of the clypeal region of the head.

carried on the two wing processes. The alula is merely a basal lobe of the anterior wing. The membrane connecting the elytron to the tergum is the axillary membrane. In the axillary membrane, there are three irregular sclerites labelled, 1,2 and 3 respectively. On the inter-segmental membrane connecting the meso-and meta-nota, there is a small triangular sclerite called the yoke plate on either side of the pterothorax. Perhaps this small sclerite, which is apparantly peculiar to certain Coleoptera, represents the postnotum (Snodgrass, 1935). Both basalar and subalar are absent.

On each side of the mesonotum lie the pleura, these being composed of two pleurites, the mesepimeron and the meseepisternum. The former is triangular in shape reaching the mesocoxa on each side (The clssical characters of the Dytiscidae). The mesepisternum is quadrangular in shape extending forward to form the boundries of the mesosternum.

The mesosternum is small solid peice largely hollowed up posteriorly to fit for the coxae ofthe middle legs. The mesocoxal cavities are closed behind by the anterior border of the metasternum.

3. Metathorax : (Figs. 8 and 9)

The metanotum is large and composed of the same parts as those of the meoonotum. On each side there is a large scutum divided into two scutal plates by a transverse furrow; a character peculiar to Coleoptera (Balfour-Browne, 1932). In front of the scuta is the prescutum with its bilobed projecting backward processes. The apices of these processes reach to the posterior margin of the scuta. The prescutum bears the anterior notal wing processes on each side. The scutellum lies behind the scutum having a projecting process; this is fitting in between the posterior horns of the prescutum. Behind the scutellum lies a transverse piece extending on each side; this is called the postnotum. The hind wings are attached to the metathorax by the notal wing processes and the axillary membrane on which three axillary sclerites labelled 1,2, and 3 respectively are located. The first sclerite is the anterior hinge plate of the wing base, the anteror part of this plate is supported on the anterior notal wing process, while its inner margin posteriorly articulates with the tergal margin.

Williams (1938) mentioed that in some Coleoptera this ventral membrane becomes confluent with the mentum. The proximal part of the prementum bears the palpigers laterally. The anterior border of the prementum represents the ligula.

3. THE THORAX

1. Prothorax : (Fig. 7A and B)

There is on internal longitudinal ridge on each side with a midline distinct on the upper surface. An irregular transverse furrow is present at the anterior margin of the pronotum. The entire dorsal surface of the prothorax is occipied by pronotum each is a large transverse sclerite, twice and a half as wide as long. The entire upper is smooth, with its anterior angles tapering. The pronotal lateral margins are bright yellow while the remaining surface is dark green.

The pronotum is separated on either side from the pleuron by a notopleural suture. The pleuron consists of the two usual plates, the epimeron and the episternum. The latter is small and triangular in shape while the former extends behind the coxa on each side not reaching the prosternal process, Keeping the coxal cavities opened.

The prosternum is a narrow sclerite on the anterior edge of prothorax extending across to either side of the pronotum. The prosternum bears a median backwardly projecting piece, the prosternal process, the apex of which fits into a groove into the metasternum.

The prosternal process is smooth and spear - shaped in Cybister tripunctatus Oliv. This structure is of a taxonomic value among the Dytiscidae.

2. Mesothorax : (Figs. 8 and 9)

In the membrane between the pro and mesothorax, on each side of the dorsum, is the first pair of the thoracic spiracles. The mesonotum is comparatively small. A dark transverse peice, the prescutum is connected to the scutellum on its posterior edge. On each side of the scutellum is the scutum. The scutellum carries on its outer extremities, the axillary cord while the scutum carries the posterior notal wing process. On each side of the prescutum lies the anterior notal wing process. The wing (elytron) is

4. Tibia: Is relatively elongated about three times as long as broad having thick apical spurs above the emargination. The outer side of the tibia is granulated.

5. Tarsus: Is 5- segmented. In the male (Fig. 10 A), the basal three joints are dilated and heavily-covered with fine bristles beneath. This feature reveals a high degree of specialization among the Dytiscidae. In the female (Fig. 10B), the anterior tarsi are simple. In both sexes two equal claws are connected to the terminal border of the last tarsal segment.

ii . Mid - Legs : (Fig. 11A)

The mid-leg is composed of the same segments as in the fore-leg. The femur is nearly twice as long as broad provided with thick setae at the basal end.

The tibia is nearly as long as femur provided with longitudinal series of setae throughout its surface. The tibial spurs are tapering at the tip.

The tarsus is 5-segmented, the distal joint being the longest. The outer surface of the tarsal segments is furnished with long swimming setae and the inner surface is provided with hard spines. At the apical end of the tarsus two equal pointed claws are present.

iii . Hind - Legs : (Fig. 11 B)

The posterior coxa is in the form of a large plate fitting in behind the metasternum and fused with it and with opposite coxa.

The trochanter is small and triangular in shape.

Femur is about three times as long as broad with a glabrous surface.

The tibia is very short, thick and nearly as long as broad. Its outer surface is granulated while the inner one has two hard thick apical spurs.

The tarsus is 5- segmented, on the distal outer corner of each joint there is a hard tooth. The inner edge of each joint is furnished with long swimming setae. At the apical end of the distal tarsal joint a single hard pointed claw is present.

The anterior part of this sclerite is produced and associated with the base of the subcostal vein. Its outer margin articulates with the inner margin of the second sclerite, which is attached to the radial vein at its anterior end. The third sclerite is irregular and lies in the posterior part of the wing base and is irregular in shape. It articulates anteriorly with the posterior end of the second sclerite and posteriorly with the posterior notal wing process. Its outer margin is associated with the base of the anal vein. At the base of each wing near the median line of the metanotum lies a small piece called the basalar, this is the anterior epipleurite. In the membrane between the mesepisternum and the anterior margin of the metathorax, the second pair of the thoracic spiracles are located. Above the epimeron there is a more or less circular chitinous piece called the subalar, this act as a vertical support plate for the wing base (Balfour-Browne, 1932).

The metasternum is a large sclerite with asmall anterior projection in the middle line overlapping the backwardly projecting portion of the mesosternum. The anterior border of the metasternum fits round the bases of the mesocoxae so these are described as open ends behind. Anterior to the lateral sides of the metasternum (metasternal wing) lies metaepisternum, is triangular in shape. The metacoxae form a pair of large plates fitting in behind the metasternum and fused with it and with each other. The metacoxae project backwards in the median line forming the coxal processes.

The epimeron is not seen laterally unless the elytron is removed or raised. At the anterior wing process from the point of the posterior apex of the metaepisternum there is a vertical plate bent upwardly, this is the metepimeron.

a . The legs :

i . Fore - legs : (Fig. 10 A and B)

The fore- leg in Cybister tripunctatus Oliv. is formed of the usual following parts:

1. Coxa: Is rounded in shape fitting in a coxal cavity.

2. Trochanter: Is triangular in shape connecting femure to the coxa.

3. Femur: Is a thick, short part nearly twice as long broad, having spines on its lower side.

4 . The Abdomen : (Fig . 14A and B)

There are 8- visible terga in the abdomen of Cybister tripunctatus Oliv. These terga are bordered by the pleural membrane in which eight spiracles on each side are present. The first six terga are transverse and membranous in appearance, while the seventh and eighth are triangular in shape and darker in colour.

There are six visible sterna, the first (the true second) is divided into two by the backward projecting metacoxa. In Coleoptera the first abdominal strenum has completely disappeared leaving no trace (Jeannel, 1941). The visible second sternum is incompetely divided anteriorly by the metacoxae. The seventh abdominal sternum is retracted into the abdomen and it will be mentioned with the genetalia. The sixth (true seventh) sternum in both sexes is slightly rounded. All segments are glabrous.

a . Male Genitalia : (Fig . 15 A and B)

The innumberable variations in the male genital apparatus among beetles have been described and illustrated by Sharp and Muir (1912). Lindroth (1957) studied the male genital apparatus in some insects. Ali (1967) gave a detailed description of the male genitalia with the internal sac of Scarites eurytus Fish. (Carabidae).

The male genitalia in Cybister tripunctatus Oliv. Consist of a basal piece, a pair of lateral lobes called paramers and a median curved lobe a large sclerite covering the ventral side of the proximal end of the aedeogophore.

The lateral lobes are long curved and highly sclerotized sclerites tapering at their ends, they are reaching to the tip of the aedeagus. The distal inner margin of each paramer is fringed with long bristles. The two paramers are connected together at their ventral surface by a membranous region except for their apical ends where they appar quite separate. This connection of the lateral lobes does not exist in Colymbetes (Michener, 1944).

By pressing the basal part of the median lobe and pulling out the internal sac through the median orifice, it will be evaginated out. The internal sac appars as a white smooth membranous structure.

b . The wing :

i . The Elytra : (Fig. 12)

The elytra are dark green and less than twice as long as broad. They are of the same breadth as the pronotum at their basal end with a rather rounded margin tapering apically. Two longitudinal series of setae are present on the discal area of each elytron; the inner one having twelve setae at almost equal distances apart while the outer has only eight setae. The elytral margin is pale yellow heavily mashed with brownish foveae. The elytral surface is smooth and densely mashed with regular distributed foveae forming the elytral ornamentation. Each fovea is formed of a dark brown circle with a dark green dot in the centre.

The elytral epipleur is continuous from base to apex and is yellowish in colour.

ii . Hind wing : (Fig . 13)

The hind wing is fully developed and veins are named after Balfour-Browne (1934).

The costa, subcosta and the radius are continuous near their origin.

The radial sector and the media are fused together.

The cubitus is strongly convex, this vein is the media suggested by Comstock and Needham (1901).

The oblongum is relatively large and is completely closed.

The cubitus is divided into Cu1 and Cu2 which are further subdivided into two branches.

The first anal vein is weak and is connected to the cubitus. Forbes (1922) recognized only one cubitus. The same author regarded Cu2 as A1. In the anal field there is a triangular cell called cuneus or wedge cell. The second anal vein is branched into 1st A2 and 2nd A2, the former is fused distally with A1, while the latter runs freely to the edge. A3 is well developed as a single vein reaching the anal margin. A4 is weakly developed being located at the inner edge parallel to the axillary cord.

The stigma is present as a thickened marginal portion of the wing.

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b . Female genitalis : (Fig . 16A and B)

The female genitalia of Coleoptera have studied at the family level by Tanner (1927). Pomeroy (1932) discussed and figured the female genitalia of some African Carabidae. Arnett (1944) used the female genitalia as the basis for the separation of species in the family Sulphidae. Michener (1944) studied both male and female genitalia in both apterygotans and pterygotans of such kind of study in the taxonomy.

The ovipositor of Cybister tripunctatus Oliv. as in other Coleoptera is free rather than firmly articulated to the 8th and 9th abdominal segments. It consists of the 8th, 9th abdominal segments and their appenages. The latter include the coxites and the valvifers. Coxites are attached to the distal end of the 9th abdominal sternum. These are called the second valvifers by Michener (1944). The coxites of the 8th abdominal segment represent the first valvifers. Paraprocts are present representing the 10th tergum (Michener, 1944). The coxites of the 9th sternum and the 9th sternum bear no style. The median portion of the 9th sternum and the vulva are both membranous. The vulvar sclerites are one pair of chitinous structure situated ventrally to the vulva. Lindroth (1957) mentioned that these structures possibly transformed styli in Dytiscidae.

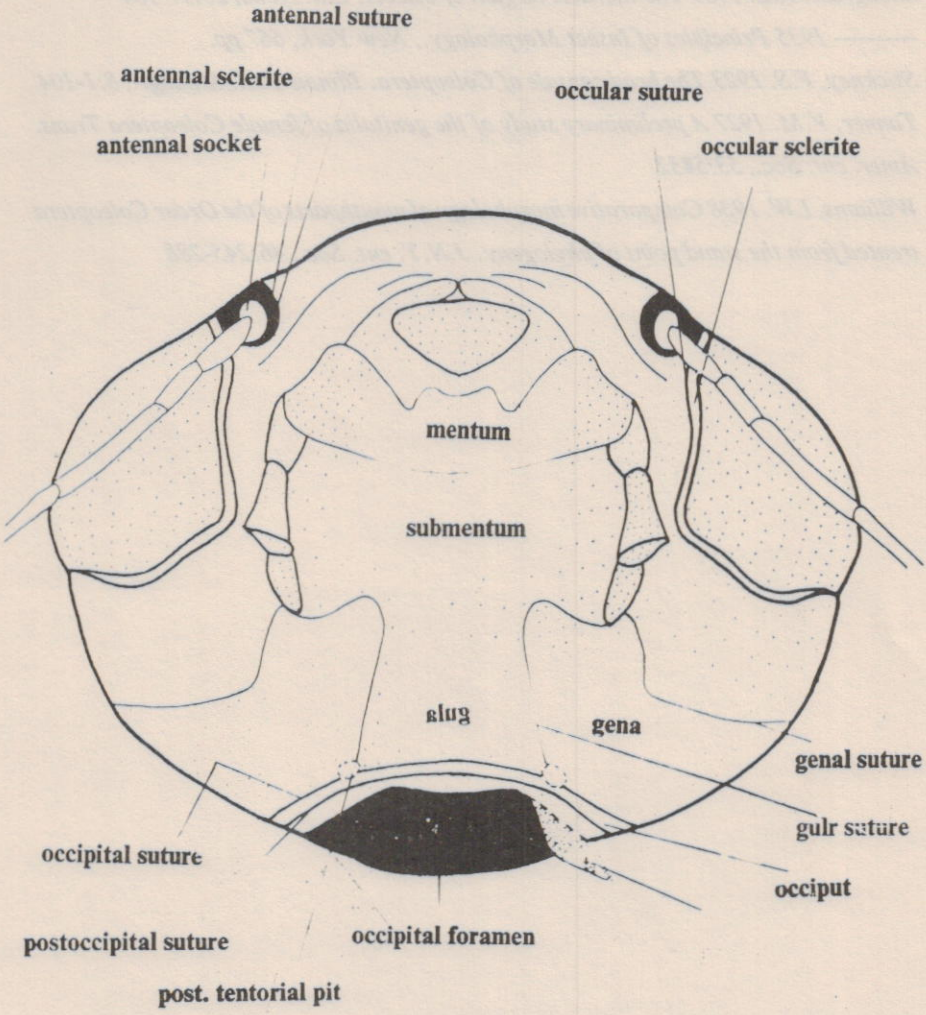

Fig . 1 Ventral view of head capsule

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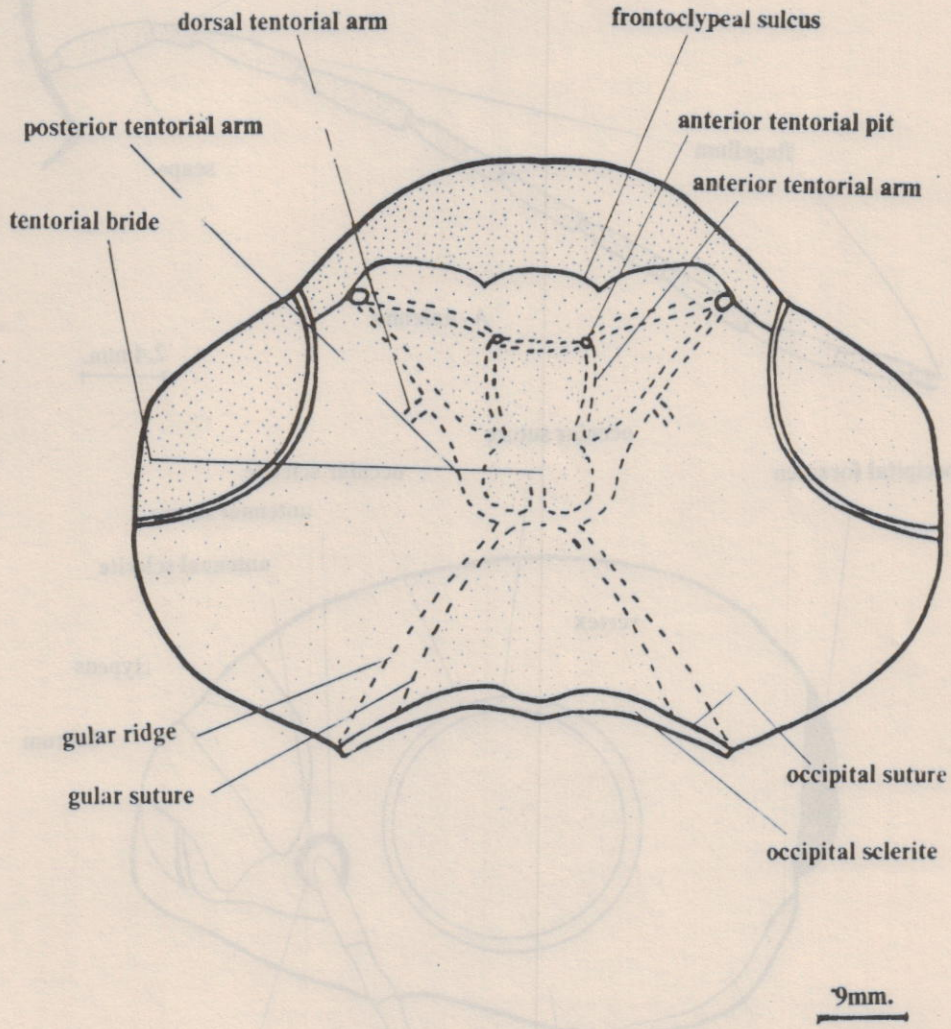


Fig. 3

'nternal Skeleton • of the head

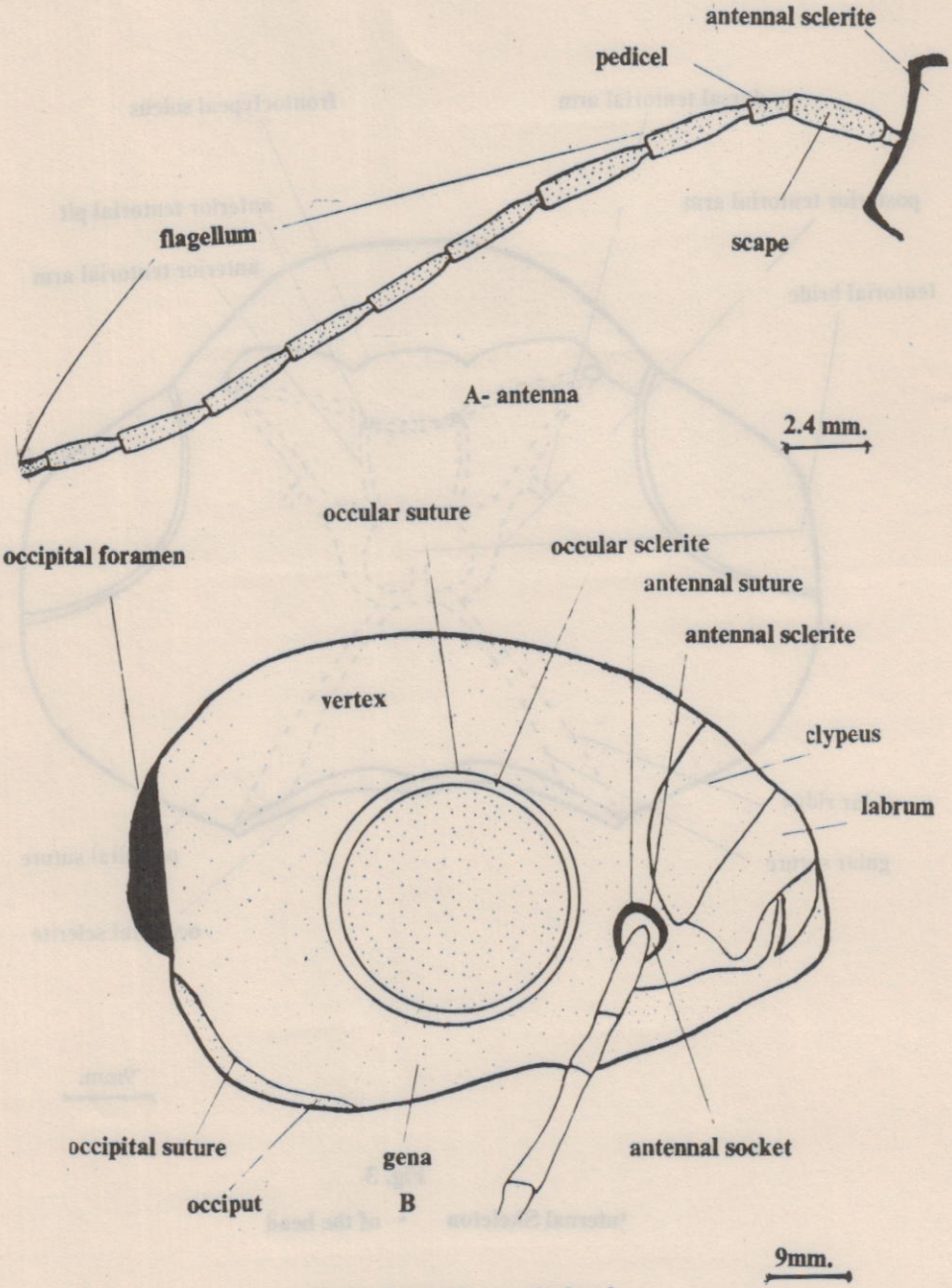


Fig.2 . Lateral the head

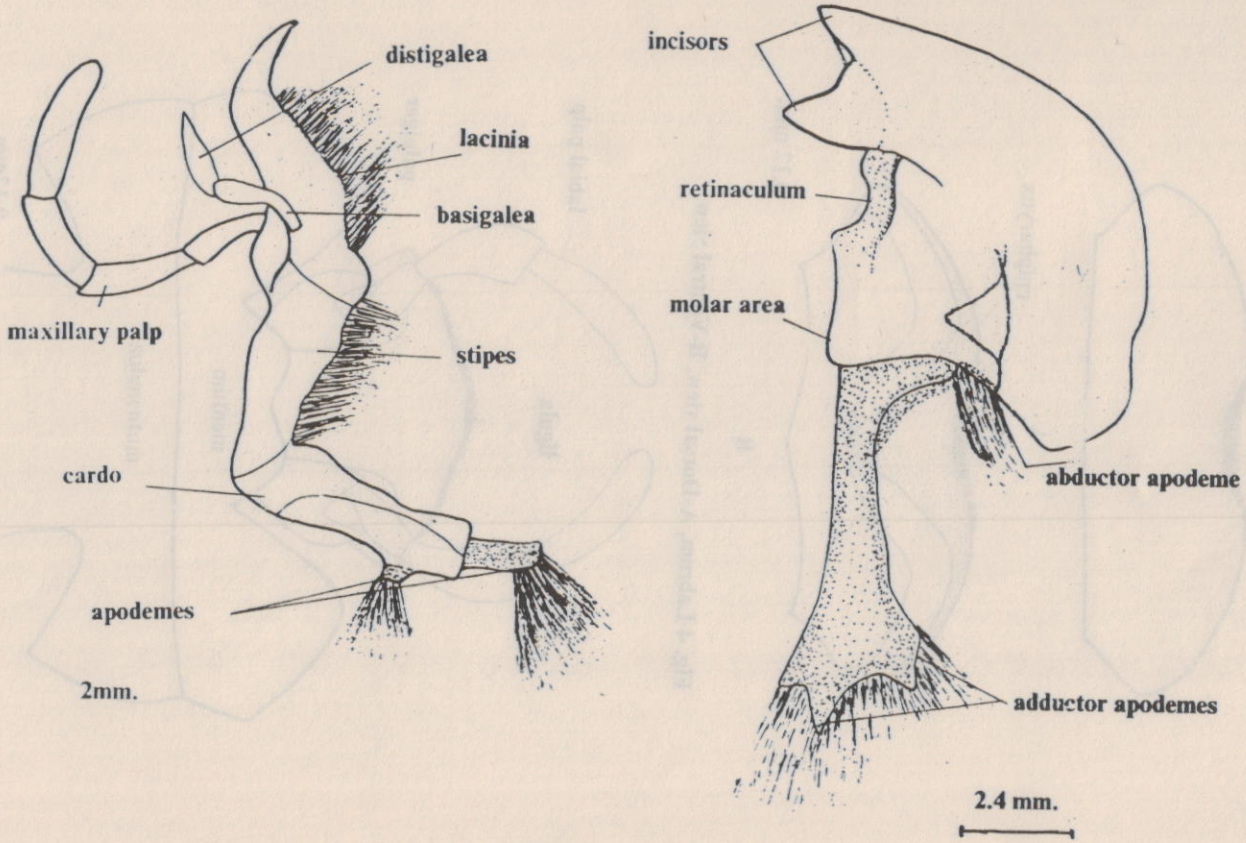


Fig. 6 A. Maxilla, B. Mandible

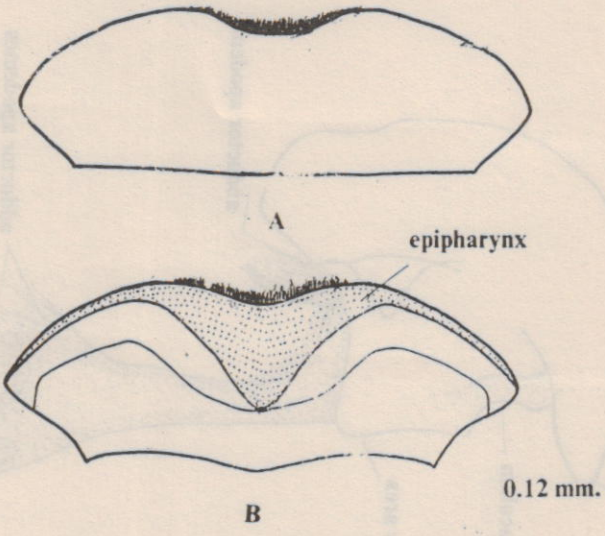


Fig. 4 Labrum, A-Dorsal view, B-Ventral view

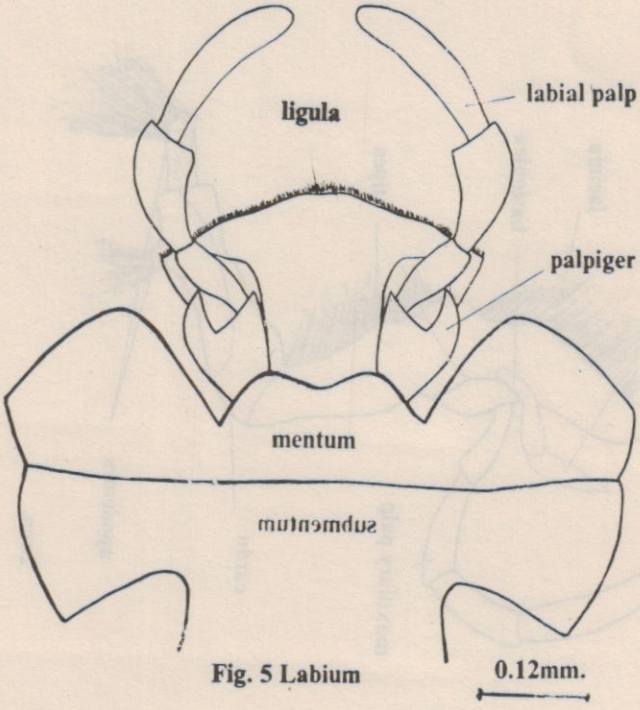


Fig. 5 Labium

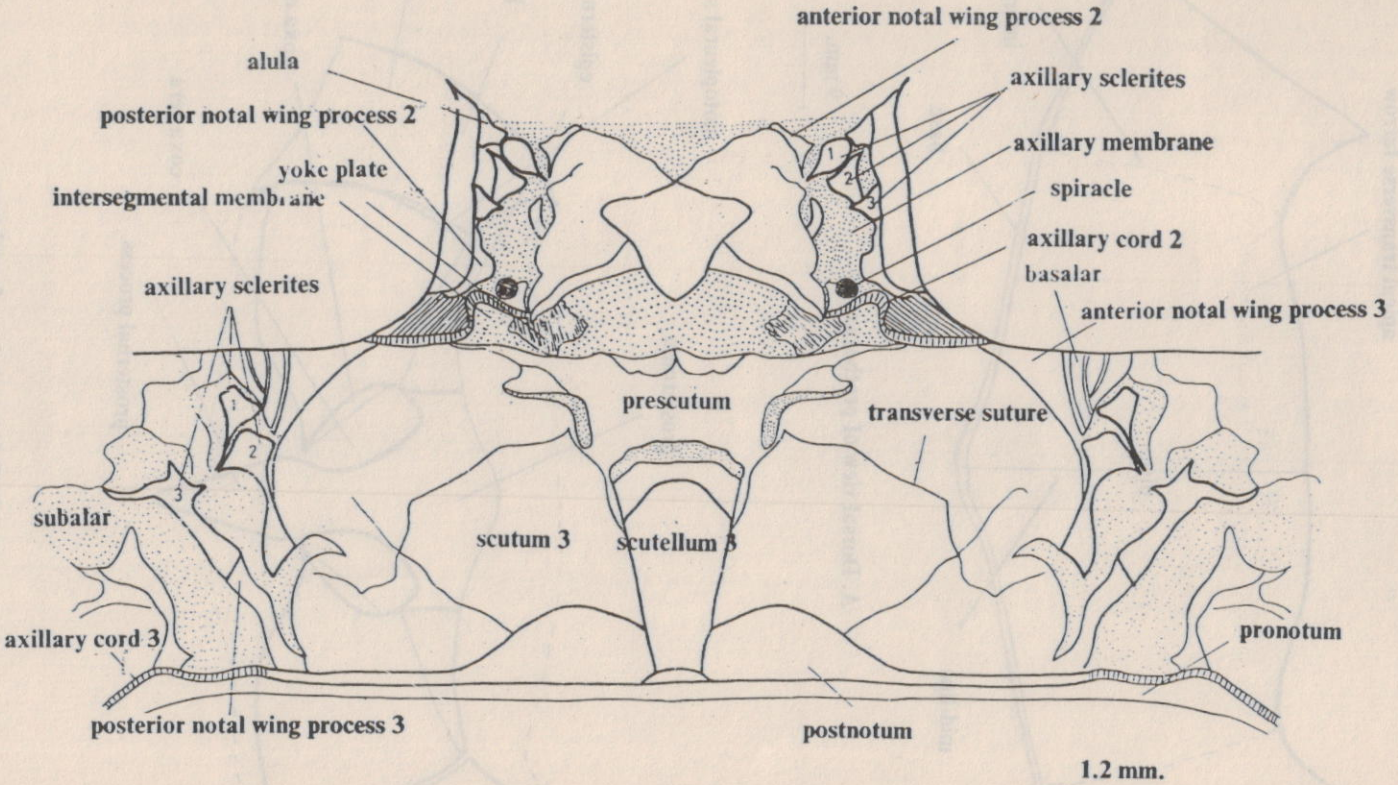
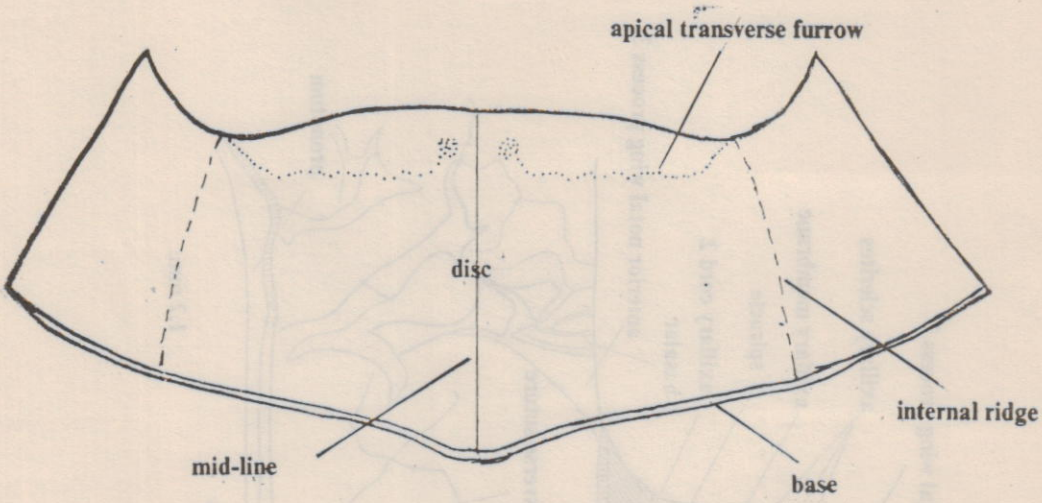


Fig. 8 Dorsal view Pterothorax



A. Dorsal view of prothorax

9 mm.

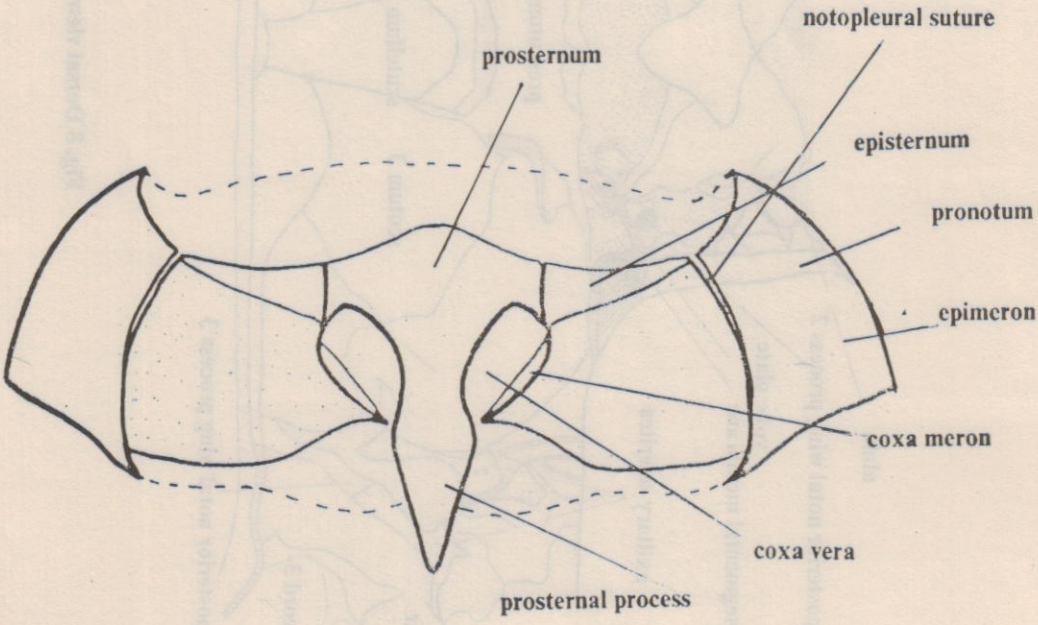


Fig. 7 . B Ventral view of prothorax

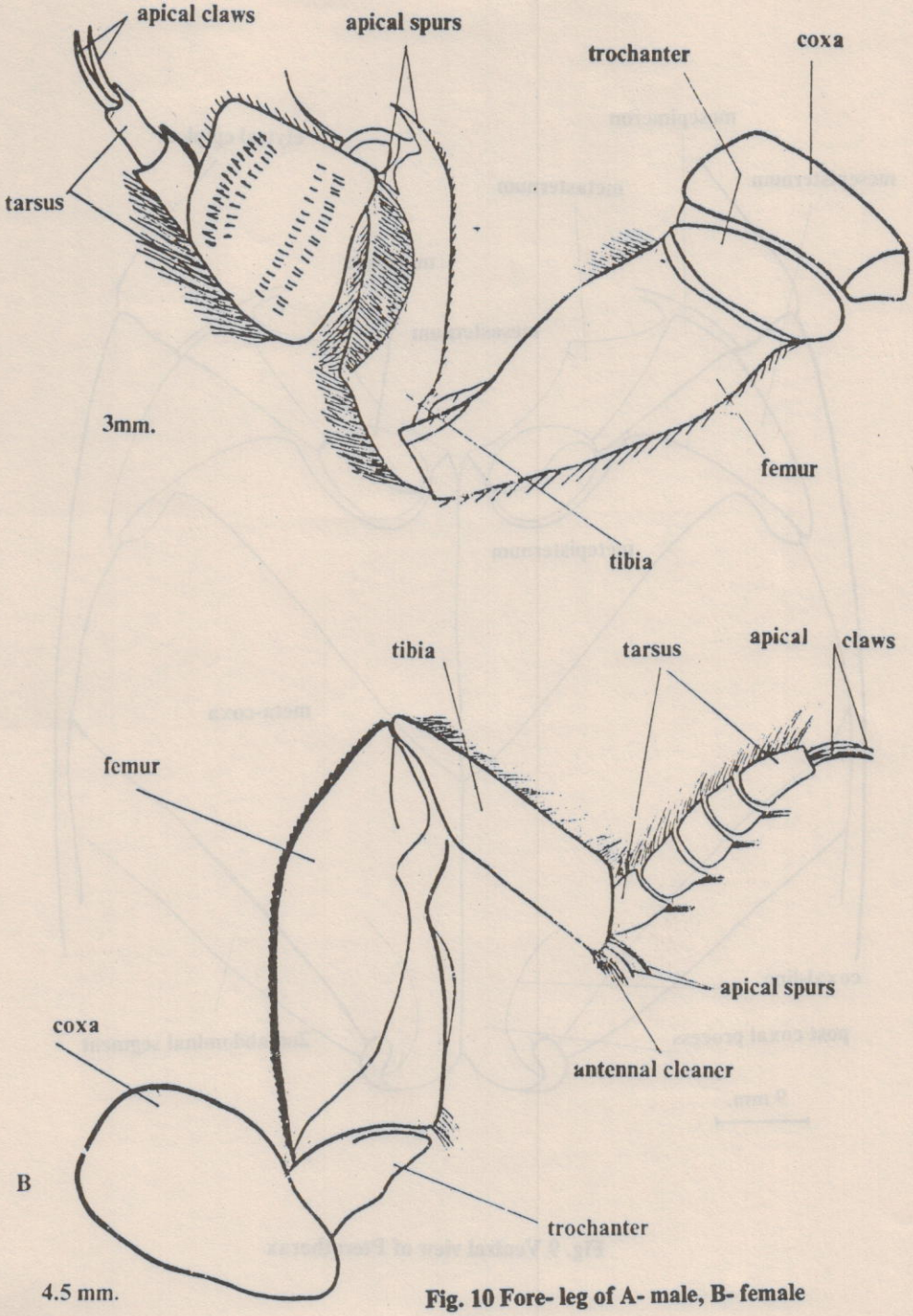


Fig. 10 Fore- leg of A- male, B- female

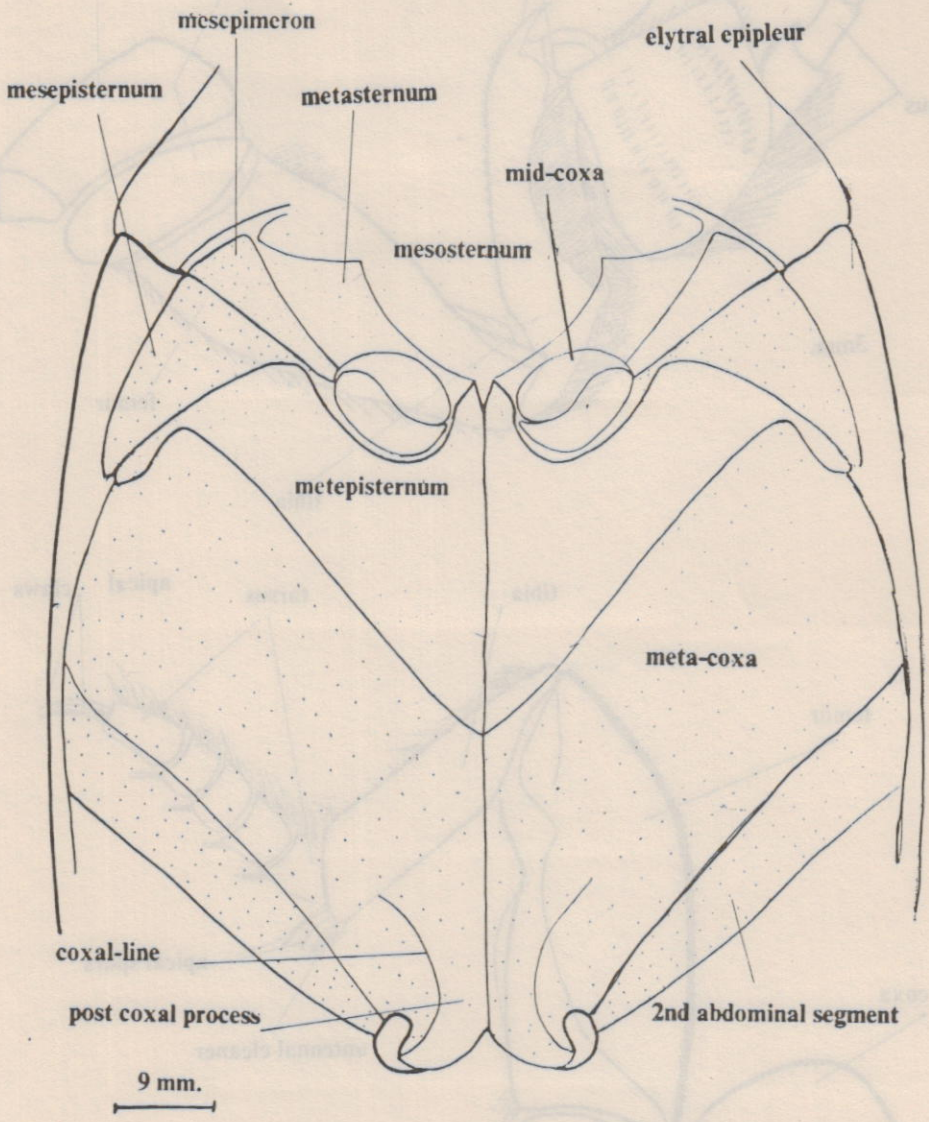


Fig. 9 Ventral view of Pterothorax

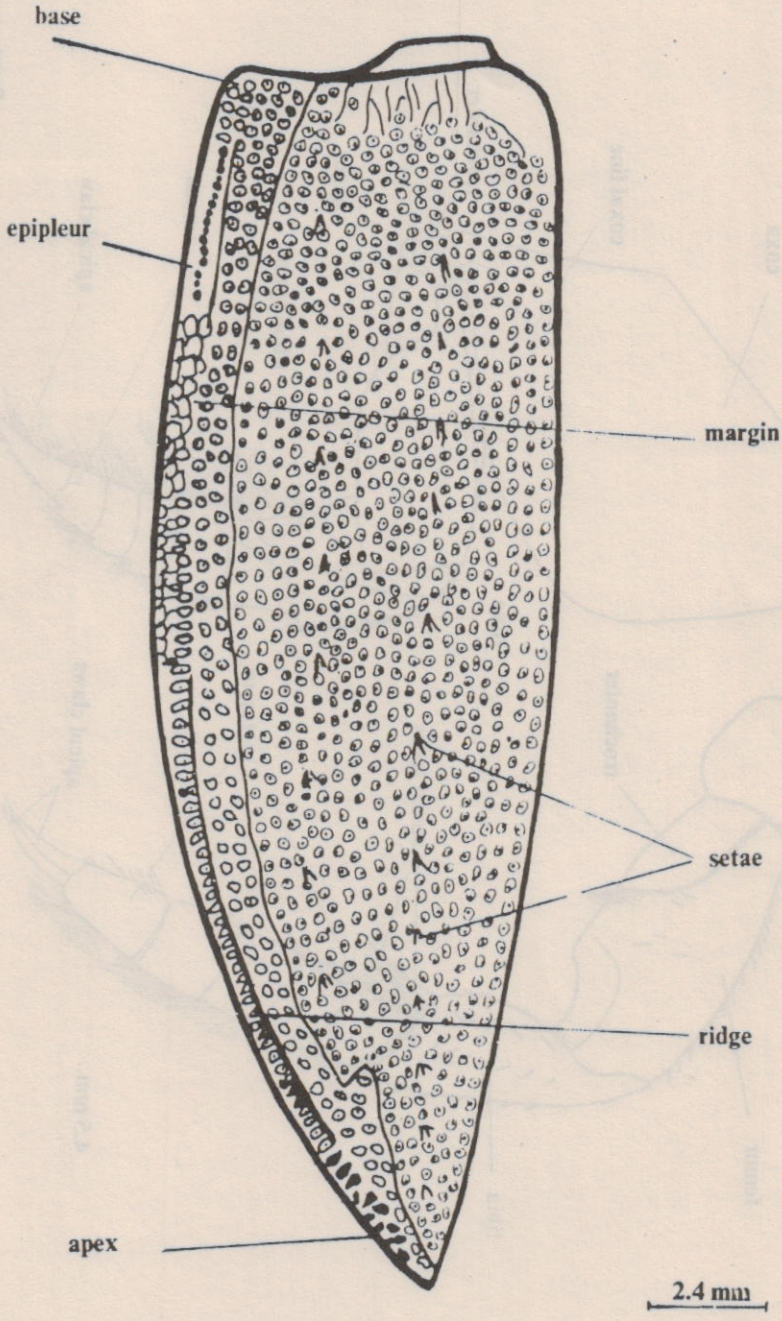


Fig. 12 Dorsal view of elytron

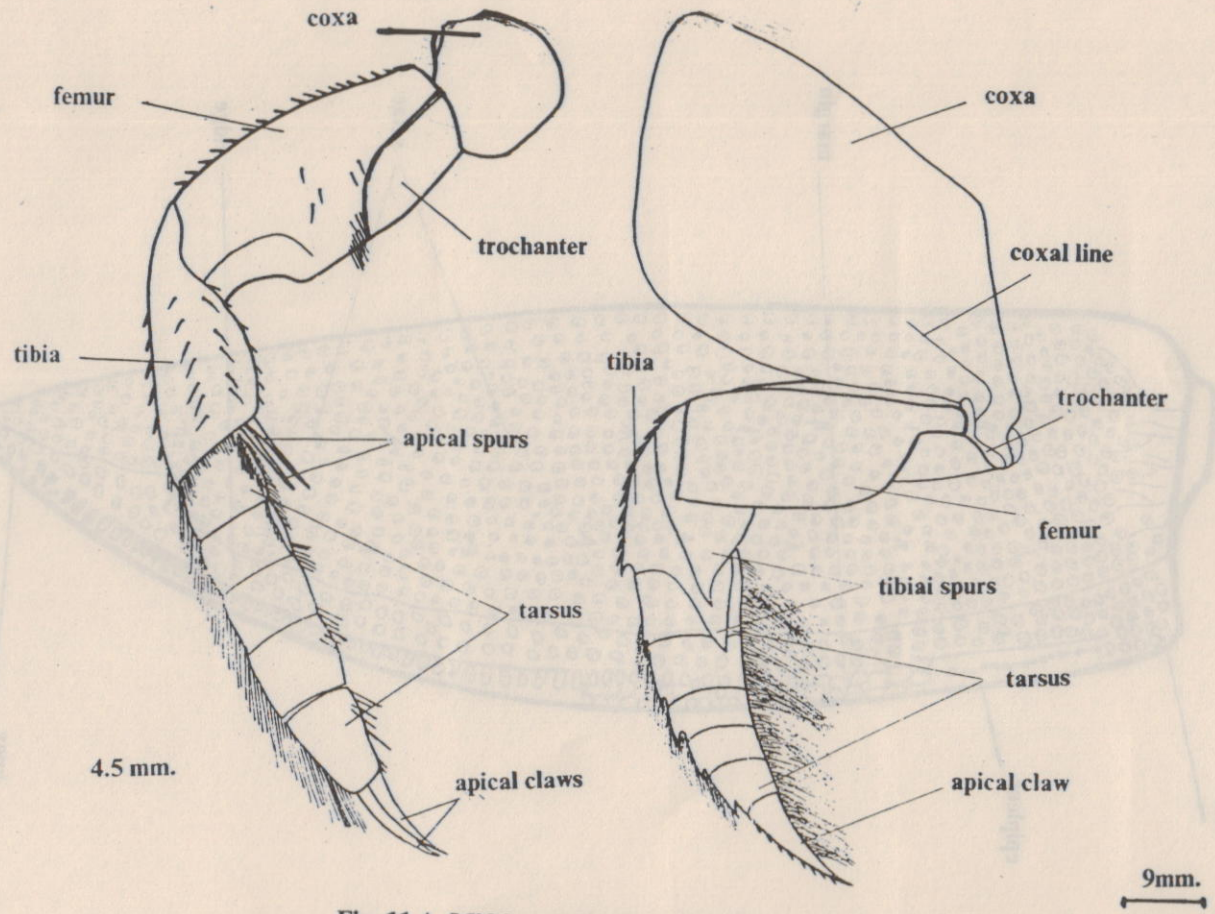


Fig. 11 A. Mid-leg, B Hind-leg of male

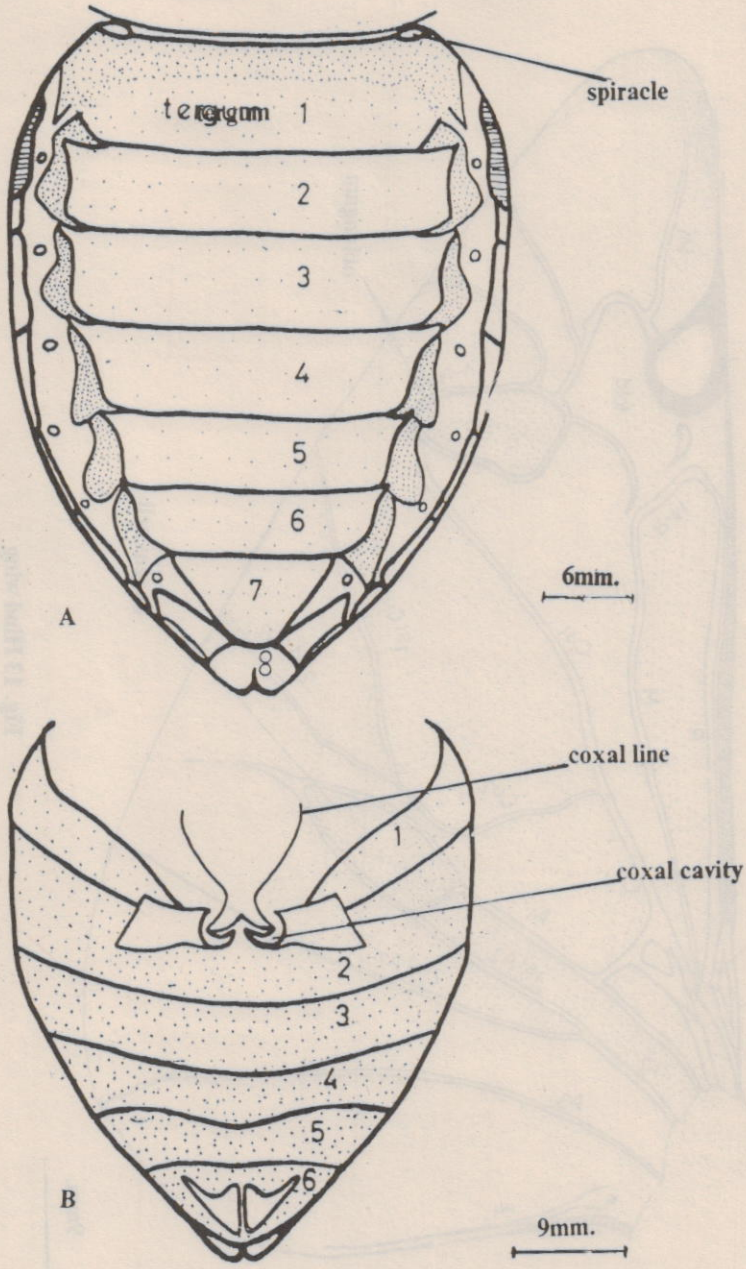


Fig. 14 Dorsal and ventral view of the abdomen

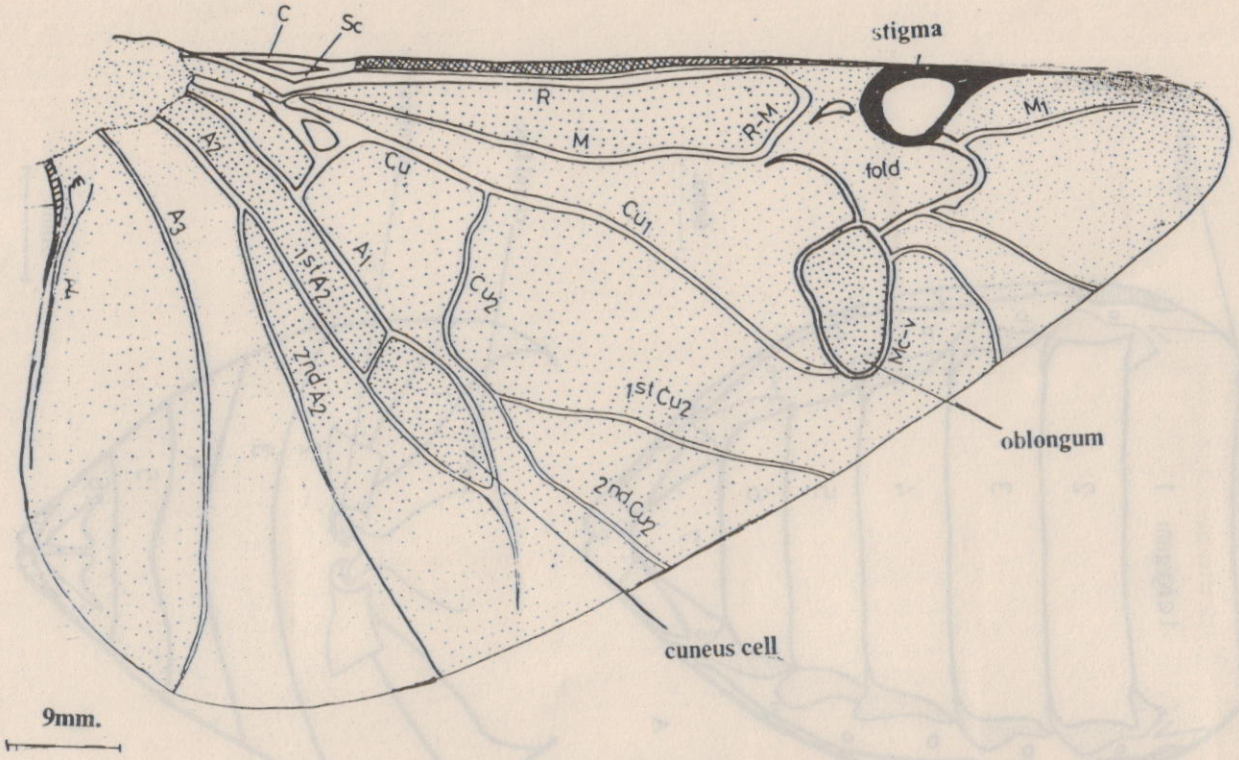


Fig. 13 Hind wing

A1- First Anal, A2- Second anal, A3-Third Anal, A4- Fourth Anal,

C- Costo, Sc- Subcosta, R- Radius, Rs- Radial sector, M- Media, Cu- Cubitus

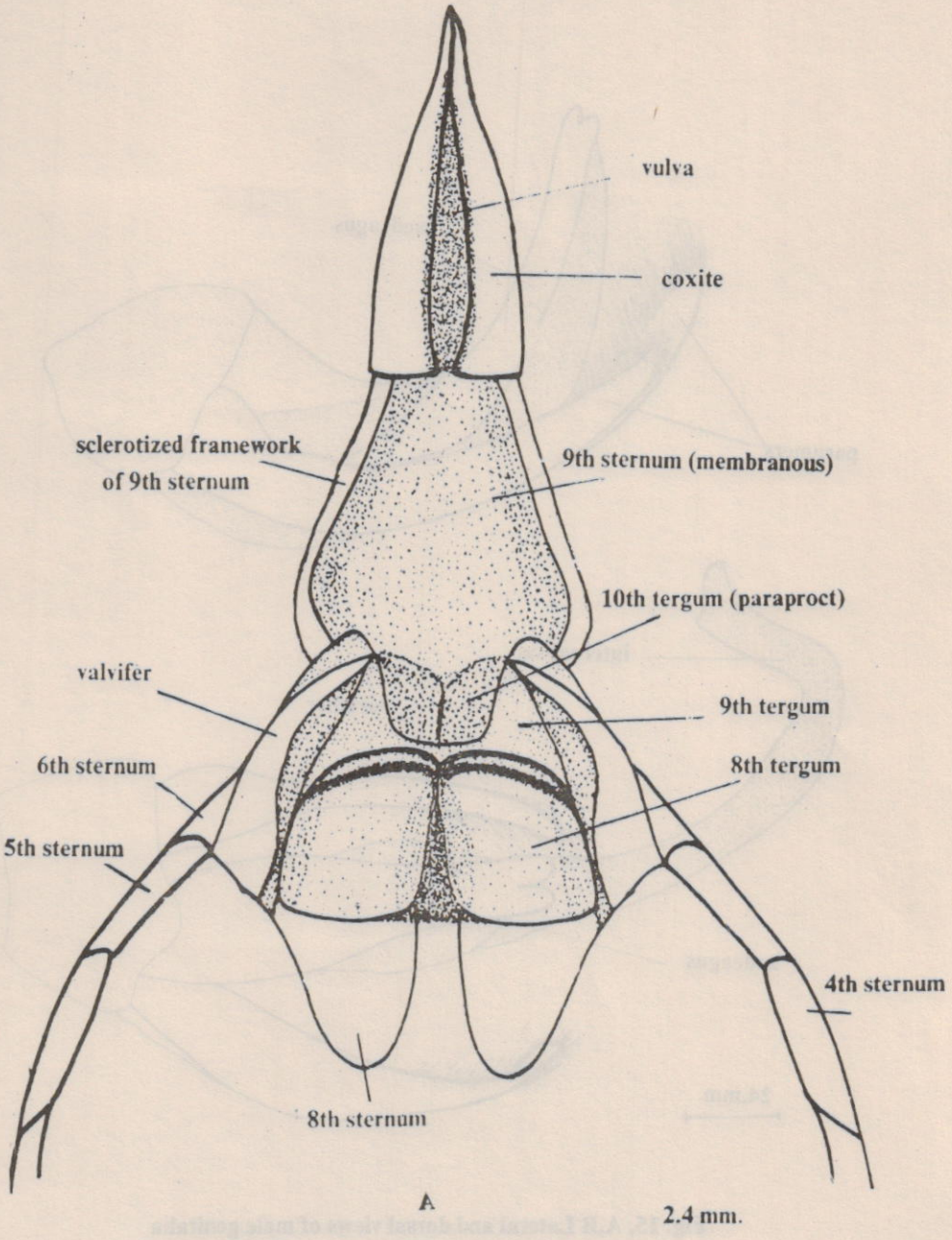


Fig. 16 Dorsal view of female genitalia

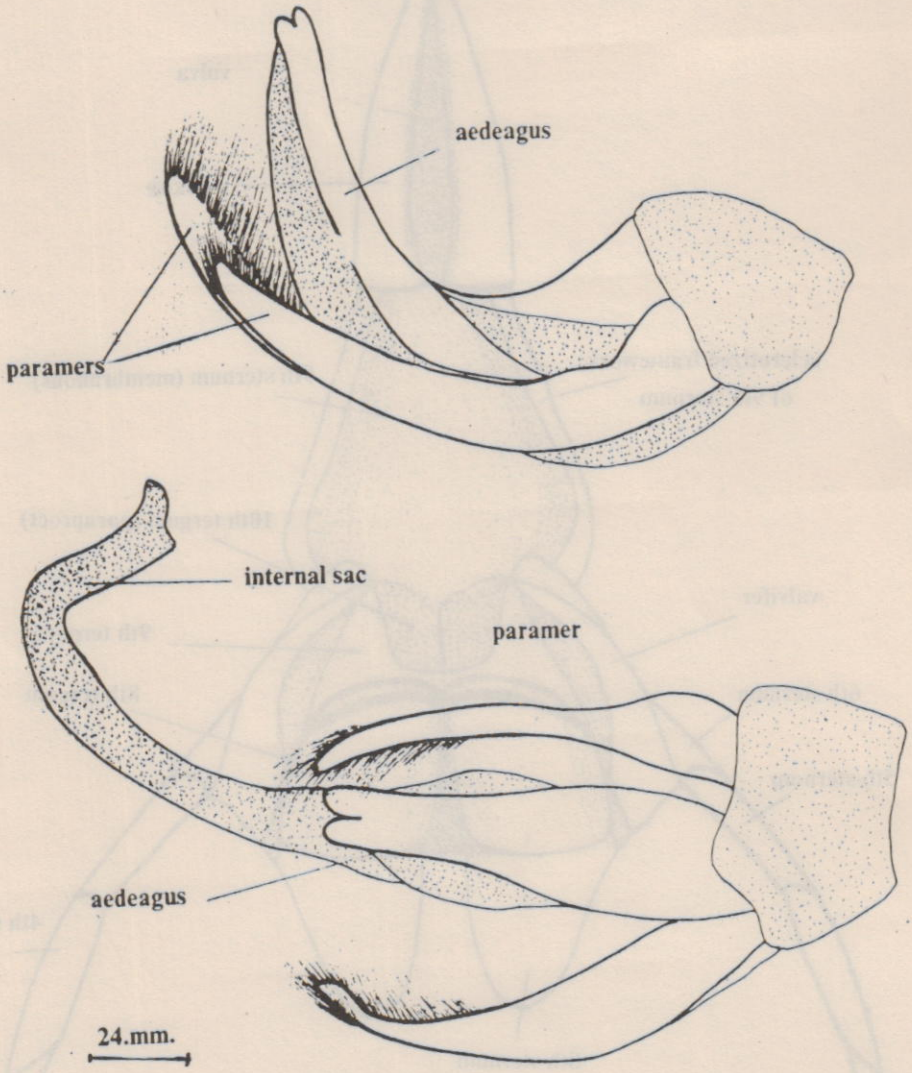


Fig. 15, A,B Lateral and dorsal views of male genitalia

رقم الايداع في دار الكتب والوثائق ببغداد ٤٦٩ لسنة ١٩٩٠

دار الحكمة للطباعة والنشر
بغداد / ١٩٩١

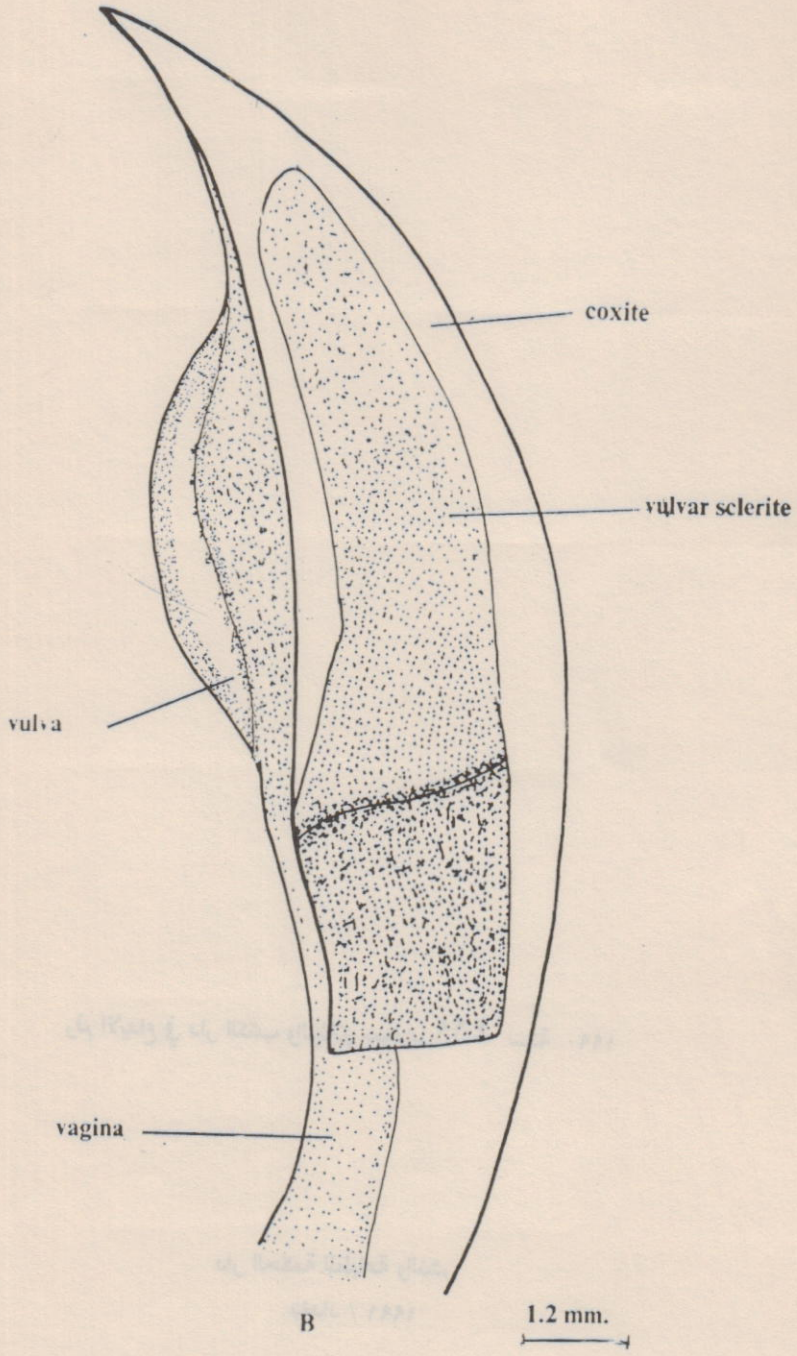


Fig. 16 Lateral view, Apical end of female genitalia

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جـــامعة بـــــغداد
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المظهر الخارجي للخنفساء الغواصة

Cybister tripunctatus Oliv .

عائلة الخنافس الغواصة ـ غمدية الاجنحة

الدكتور حسين عباس العلي والسيدة رجاء محمد عبدالكريم

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