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The morphology and relationships of the male of *Lecaniodiaspis elytrapappi* Munting and Giliomee (Homoptera: Coccoidea).

by

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INTRODUCTION

The members of the genus *Lecaniodiaspis* Targioni-Tozzetti are generally considered to be a very homogeneous group of insects belonging to the family Asterolecaniidae (Balachowsky, 1948; Ferris, 1955). Borchsenius (1959) separated *Lecaniodiaspis* and six allied genera from the Asterolecaniidae and erected a new family, the Lecaniodiaspididae, to contain these genera. He regarded this family as being more closely related to the Coccidae than the Asterolecaniidae (Borchsenius, 1959, 1961).

The above-mentioned workers all based their conclusions solely on the evidence supplied by female characters, in fact *Lecaniodiaspis elytrapappi* is the only member of the Asterolecaniidae (*sensu lato*) of which the morphology of the male has been studied in any detail. A taxonomic description of the male of *L. elytrapappi* was presented earlier (Munting and Giliomee, 1967) and in the present paper the author wishes to elaborate on the morphology of the male and to discuss its relationships with other male Coccoidea.

The terminology corresponds with that employed by Theron (1958) and Giliomee (1967).

THE HEAD

The median crest (mc) consists of a weakly sclerotized plate which is broad posteriorly, but narrowed anteriorly (fig. 1A). Posteriorly the sclerite is bounded by a transverse ridge, which probably represents the postoccipital ridge (por). This ridge is present in most male Coccoidea, being absent only in the margaroid genus *Steingelia* (Theron, 1958) and the family Coccidae. Behind the postoccipital ridge two small sclerites project posteriorly, one on each side. These sclerites are considered to be vestiges of the postocciput (poc), which is present in *Margarodes* and *Pseudaspidopectus* (Theron, 1958).

The membrane surrounding the median crest is weakly reticulated and it separates the median crest widely from the ocular sclerite (ocs). The latter is

weakly sclerotized and bears a pair of dorsal simple eyes (dse) and a pair of ventral simple eyes (vse). The ocelli are absent. The ocular sclerite is bounded anteriorly by the preocular ridges (procr) and posteriorly by the postocular ridges (pocr). The preocular ridge carries a process for articulation with the antenna and the ventral part extends for about halfway from that point to the median line (fig. 2A). The postocular ridge is well developed and follows the same course as in the Coccidae (Giliomee, 1967). The gena (g) is large, bulging and not sclerotized or reticulated.

The midcranial ridge (mcr) is absent dorsally. Ventrally (fig. 1B) it runs from the antennae, which it supports by means of two short lateral branches (lmcr), to the preoral ridge. The ridge is strong, except for a short distance at the level of the preocular ridges, where it is represented by weak sclerotization. The ridge follows a similar course in the asterolecaniid *Asterodiaspis alba* (Borchsenius, 1960). Except for these cases extensive development of the ventral part of the midcranial ridge has hitherto only been found in the margaroid Coccoidea and this condition is therefore considered to be a primitive feature of *Lecaniodiaspis*. The posterior extremity of the midcranial ridge supports the cranial apophysis (ca). The latter, as in most Coccidae, is a short scoop-like structure with a bifurcate apex. The apex serves for the attachment of the antennal muscles. The preoral ridge (pror) is represented by a few vestiges at the base of the cranial apophysis. The reduction of the preoral ridge in *Lecaniodiaspis* is perhaps due to the fact that the function of supporting the cranial apophysis is here fulfilled by the ventral part of the midcranial ridge, but it should be remembered that in some Coccidae (Giliomee, 1967) and Diaspididae (Ghauri, 1962), where the cranial apophysis lacks the support of the midcranial ridge, the preoral ridge is also reduced or even absent altogether.

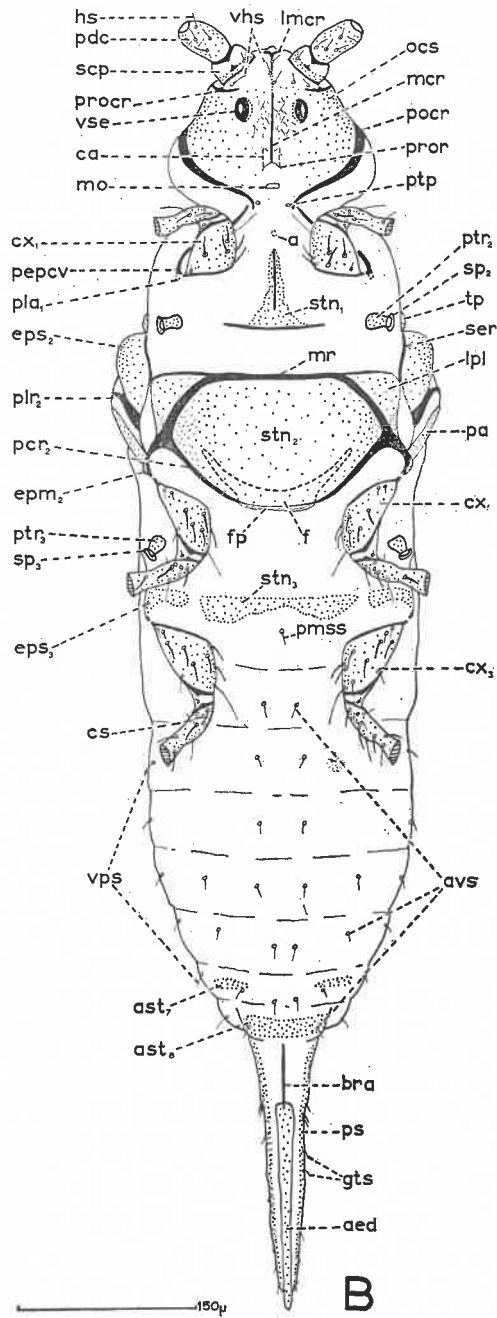
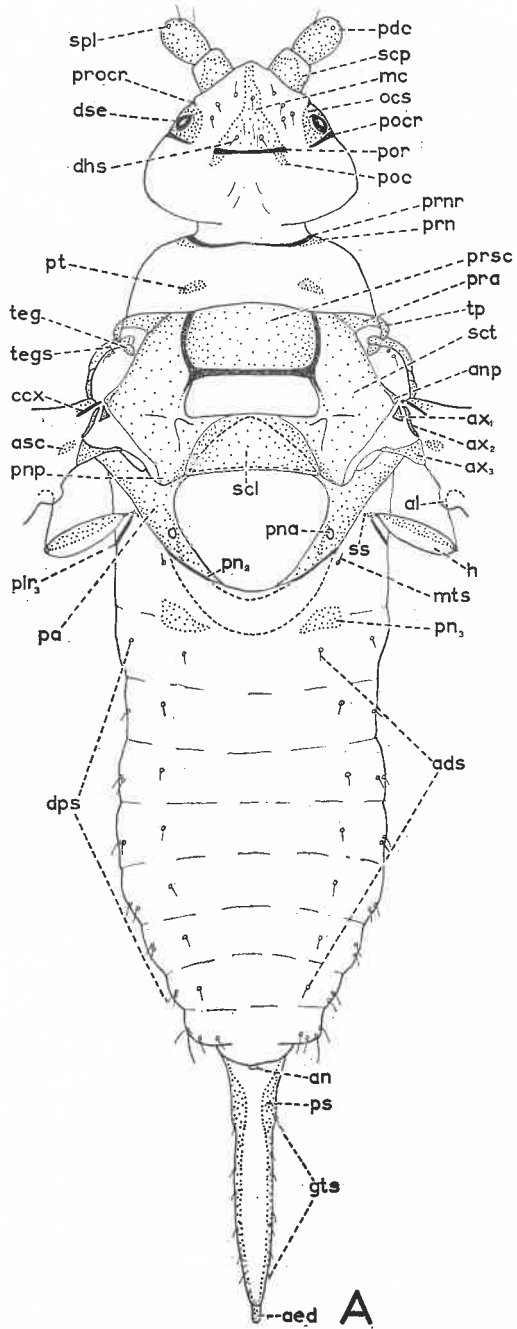
A small mouth opening (mo) is situated in the membrane behind the vestiges of the preoral ridge. On each side, posterolateral to the mouth opening, a small tentorial pit (ptp) is found from which the posterior tentorial arms are invaginated. These are connected internally by a narrow, transverse tentorial bridge. From each side of the bridge an anterior tentorial arm extends forwards to join the cranial apophysis at its base.

The antennae consist of ten segments, as is usual for male Coccoidea. The scape (scp) is short and inserted fairly low down on the front of the head. The distal part is membranous and this probably facilitates articulation with the pedicel; articulation is accomplished by means of two articular processes, one ventrally on the scape and the other directly opposite on the basal ridge of the pedicel. Posteriorly the scape articulates with the preocular ridge by means of a process on its basal ridge. The pedicel (pdc) is subglobular and well sclerotized throughout. The flagellar segments are all cylindrical and sclerotized.

Setae and sensilla: On the head itself only hair-like setae are found.

EXPLANATION OF FIGURES

Fig. 1. Male of *Lecaniodiaspis elytropappi*. A. Dorsal view. B. Ventral view.



They are arranged in two groups, i.e. dorsal head setae (dhs) which occur on and around the median crest, and the ventral head setae (vhs) which are situated anterior to the ventral eyes.

On the antennae four types of setae are present. The ordinary hair-like setae are found on the 1st-3rd segments and the fleshy setae on the 2nd-10th segments. In addition somewhat stouter setae, called antennal bristles (fig. 2D, ab), are found on the 8th-10th segments, and three capitate subapical setae (set. scla) are present near the apex of the 10th segment. The sensilla on the antennae consist of a sensillum placodeum (spl) on the 2nd segment (fig. 1 A) and basiconic type sensilla (bs) on the 3rd and 10th segments (fig. 2 C and D).

THE THORAX

1. **Prothorax:** The prothorax is separated from the head by a deep cervical groove (fig. 1 A), a condition which appears to be typical for the lecanoid Coccoidea. As in other male coccids the prothorax is extensively desclerotized. The anterodorsal part is strengthened by a transverse pronotal ridge (prnr), which is medially interrupted by weak sclerotization and laterally closely approximates the pleural sclerite. On each side a small lateral pronotal sclerite (prn) is closely associated with the ridge. Similar sclerites are present in the Coccidae (Giliomee, 1961) and they are probably homologous with the lateral pronotal sclerites of the Pseudococcidae (Giliomee, 1961) and Diaspididae (Ghauri, 1962). In the posterior part of the prothorax two small, weakly sclerotized posttergites (pt) are found.

The pleural region (fig. 2 A) bears a ridge-like proepisternum + cervical sclerite (pepcv), which extends from the posterior end of the postocular ridge, with which it articulates, to the vestigial propleural ridge. As in the Pseudococcidae and Coccidae the ridge is less strongly sclerotized for a short distance posterior to the level of the pronotal ridge. The propleural ridge (plr₁) is dorsally invaginated to form a small pleural apophysis (pla₁) and ventrally it articulates with the basal process of the coxa.

The prosternum (stn₁) is represented by a weakly sclerotized triangular sclerite which is traversed by a longitudinal median ridge and posteriorly bounded by a transverse ridge (fig. 1 B). In some individuals a small apophysis (a) is situated medially in the membrane anterior to the prosternum. This structure was also found in some Coccidae (Giliomee, 1961), while Theron (1962) described a "mamillate organ" from the same region in the Phenacoleachiidae; its function is obscure.

No setae are found on the prothorax.

2. **Mesothorax:** The mesothorax of *Lecaniodiaspis* closely resembles that of the family Coccidae. As in all male Coccoidea the mesothorax is comparatively well developed; this can be expected in view of its function as the principal wing bearing segment.

The mesotergum is composed of an alinotum and postnotum, the former being subdivided into a prescutum, scutum and scutellum.

The prescutum (fig. 1 A, prsc) has the shape of a large median bulge. Laterally it is bounded by the prescutal ridges (pscr), which extend posteriorly for some distance along the sides of the membranous area of the scutum. Its posterior margin is formed by the prescutal suture (pscs), with which a strong internal ridge corresponds; the latter is also present in the Coccidae (Theron, 1958; Giliomee, 1961) and some Diaspididae (Theron, 1958; Ghauri, 1962). The anterior edge of the prescutum curves sharply downwards and on its anterior margin a simple internal lamina, the prephragma, is borne. The scutum (sct) of *Lecaniodiaspis* is very similar to that of the Coccidae. As in the Coccidae it consists of two lateral halves which are completely separated from each other by a large, subrectangular membranous area. This membranous area is also found in other Coccoidea eg. some Margarodidae (Theron, 1958), the Asterolecaniidae (Russel, 1941) and the Kermococcidae (Borchsenius, 1960). The anterior part of the scutum extends along the sides of the prescutum and the posterior part along the sides of the scutellum. In the anterior region the scutum gives rise to the prealare (pra) whose distal end is differentiated into a heavily sclerotized triangular plate (tp); the latter articulates with the episternum. Laterally the scutum bears an anterior notal wing process (anp), while the posterior notal wing process (pnp) is represented by a posterolateral lobe. The scutellum (scl) is comparatively large and heavily sclerotized. Its anterior and posterior edges curve sharply inwards, but they do not unite internally. A large membranous area behind the scutellum separates it from the following sclerite, the postnotum (pn₂). The latter is arched and extends deeply into the metathoracic cavity, where it is overlapped by the inflexed metanotum. The anterior margin of the postnotum is well sclerotized, irregular and sometimes overlapped medially by the metathoracic fold. The internal posterior margin carries the notched mesopostphragma. Laterally a deep, finger-like apophysis (pra) with an external opening arises from the postnotum, and beyond that the latter is produced into a broad postalare (pa), which extends anteriorly to articulate with the mesopleural ridge. Dorsally the postalare carries a small process to which the axillary cord of the wing is attached. A short distance posterior to that point the postalare is connected to the posterior marginal fold of the alinotum.

In the pleural region (fig. 2 A) the most distinct feature is the strong pleural ridge (plr₂), which follows an oblique course across the pleuron. Ventrally it forms a process for articulation with the coxa, more dorsally a pleural apophysis (pla₂) is invaginated from the ridge and further on it fades out when it reaches the large, rounded, pleural wing process (pwp₂). Anteriorly, at the base of the latter, there is a small tendon-like apodeme (t) to which the tegular muscle is attached. The basalare (bas) is well developed and connects the pleural wing process with the episternum; the subalare (sa) is small and lies in the membrane dorsal to the wing process. The episternum (eps₂) consists of two sclerites which are separated completely by a transverse membranous area. The dorsal part is large and convex and articulates dorsally with the triangular sclerite of the prealare; the ventral part is vestigial. The episternum is bounded anteriorly by the subepisternal ridge (ser) which is strong dorsally, but only indicated by a band of darker sclerotization below the membranous area. This band marks the border

between the lower part of the episternum and the lateropleurite (lpl). The latter is well developed and bounded anteriorly by a lateral extension of the anterior part of the marginal ridge. The epimeron (epm₂) is represented by a small sclerite which is situated behind the pleural ridge, immediately dorsal to the coxal articulation. The mesothoracic spiracle (sp₂), with the peritreme (ptr₂) supporting it, lies in the membrane anterior to the lateropleurite.

The basisternum (fig. 1 B, stn₂) is large and its margins are reinforced by strong secondary ridges. The precoxal ridge (pcr₂) originates on the pleural ridge and stretches posteroventrally along the margin of the basisternum, but it fades out where it reaches the furcal pit (fp). The anterior and posterolateral margins are bounded by the marginal ridge, which unites with the precoxal ridge posteriorly. No trace can be seen of a median ridge, which is a distinct feature of the basisternum of male Coccidae (Theron, 1958; Giliomee, 1967). From the furcal pit a large furca (f) is invaginated.

The pteralia consist of the usual three axillary wing sclerites (ax₁, ax₂, ax₃) and the additional sclerite (asc). With the exception of the first axillary their structure is very similar to that of the Coccidae (see Giliomee, 1961). The first axillary is different in that the elongated anterior arm, which curves round the apex of the second axillary in most male Coccoidea, has disappeared. This phenomenon was also noted in the Pseudococcidae (Theron, 1958). Anterior to the wing base and separated from the latter by a large membranous bulge lies a small, meniscate, tegular sclerite (teg). The membranous bulge carries 2-4 short, hair-like tegular setae (tegs). No setae other than the tegular setae are found on the mesothorax.

3. Metathorax: The notum is represented by a large internal sclerite, and two minute suspensorial sclerites (ss) to which the muscles from the halteres are apparently attached. The internal plate closely overlaps the mesopostnotum and is in turn overlapped by membrane. Further posteriorly a transverse, irregular sclerite on each side represents the postnotum (pn₃).

In the pleural region the pleural ridge (plr₃) can be seen to extend from the coxal articulation to the base of the haltere, where it is slightly expanded to form a small pleural wing process (pwp₃). About halfway between these two extremities a slight depression and weakening of the pleural ridge probably represents a vestigial pleural apophysis (pla₃).

The episternum (eps₃) consists of two separate sclerites viz. one that extends in a ventral direction and a small, triangular one which is situated anterior to the pleural apophysis. The epimeron (epm₃) extends broadly posteriorly. The precoxal ridge (pcr₃) is much reduced; it originates on the pleural ridge and runs

EXPLANATION OF FIGURES

Fig. 2. Male of *Lecaniodiaspis elytropappi*. A. Lateral view. B. Front leg, posterior view. C. 3rd antennal segment, ventral view. D. 10th antennal segment, ventral view. E. Wing.

for a short distance along the ventral margin of the episternum. The metathoracic spiracle (sp_3) with its peritreme (ptr_3) is situated anterior to the episternum.

The metasternum (stn_3) is represented by a weak, irregular plate, which bears no apophyses.

Setae: A small, hair-like metatergal seta (mts) is found on each side anterior to the metapostnotal sclerite. On the metasternum a single, hair-like, posterior metasternal seta ($pmss$) is situated medially.

4. Wings: The fore wings (fig. 2 E) are large and elongated. A small alar lobe (al) is present on the hind margin near the base of the wing.

The two main wing veins, the radius (rad) and media (med), are not visibly connected and in this respect the venation resembles the condition in the Pseudococcidae (Giliomee, 1961) and Coccidae (Giliomee, 1961), but differs from that of the Diaspididae (Ghuri, 1962). The short costal complex of wing veins (ccx) articulates basally with the pronotal wing process by means of a dorsal projection and with the pleural wing process by means of a transverse ventral process.

The hind wings are reduced to halteres (h) which usually carry a simple, hooked seta at the apex; in one specimen two setae were present on one side. The anterior part of the haltere is usually weakly sclerotized.

5. Legs: The legs (fig. 2 B) are rather slender and all very similar in size and shape. A remarkable feature of the leg of this species is that the trochanter and femur ($tr+fm$) are fused completely and there is no trace of the narrow strip of articular membrane that separates these two segments in other Coccoidea; the place of fusion is indicated, however, by a narrow constriction. The tarsus (tar) is one-segmented and it bears a claw (cl) which has a small denticle ventrally near the apex.

Setae and sensilla: Both fleshy (fs) and hair-like (hs) setae are found on the legs. A number of the ventral setae on the tibiae and tarsi are stronger and more spine-like than the other setae. Some of them are bifurcate. They are considered to be modified hair-like setae as they correspond to the latter in being straight, with an acute apex and in having a distinct basal ring. Bifurcate setae were also found on the tarsi of male Diaspididae (Ghuri, 1962), where they were considered as belonging to the fleshy type.

The so-called spur, which is situated ventrally at the apex of tibia, is also bifurcate. For this reason and because it resembles the bifurcate hair-like setae in every respect except for being somewhat larger it is probably not a spur in the sense used by Snodgrass (1935), but merely a modified hair-like seta.

A pair of capitate digitules are present on the tarsi ($tdgt$) and claws ($udgt$) and a row of six oval campaniform sensilla (cs) encircles the basal part of the trochanter + femur. A single campaniform sensillum is situated dorsally near the base of the tarsus. These digitules and specialized sensilla are also found in other male Coccoidea.

THE ABDOMEN

The abdomen is composed of eight pregenital segments and a ninth or genital segment. The first segment is not developed ventrally, as is also the case in all other male Coccoidea.

The pregenital segments are largely desclerotized; terga are completely absent and sternites are found only on the 7th (ast₇) and 8th (ast₈) segments. Small pleural sclerites (pscl) are found on the 4th-7th segments where the dorso-pleural setae are inserted; they are probably of a secondary nature and serve to strengthen the derm around the bases of the setae. The only other Coccoidea in which pleural sclerites have so far been found are in the family Coccidae, and only in the genera *Inglisia* and *Ceroplastes* do they occur anterior to segment VII (Giliomee, 1967).

The general structure of the genital segment is very similar to that of the Coccidae. It consists of a narrow, elongated style, which is curved in lateral view, and a median aedeagus (aed). The penial sheath (ps) is well sclerotized laterally, but membranous ventromedially. The anus (an) opens in the membrane dorsal to the penial sheath near the base of the segment. The aedeagus is long and in mounted specimens it extends beyond the apex of the penial sheath. At its base it is supported by a short median ridge, the basal rod (bra).

Setae and sensilla: All the setae of the abdomen are of the hair-like type. As is the case in the Pseudococcidae and Coccidae they are arranged in dorsal, pleural and ventral groups.

In the dorsal group (ads) there is one seta on each side on the 1st-7th segments.

The pleural setae can be subdivided into a dorsopleural and a ventropleural group. The dorsopleural group (dps) is composed of one seta on each of the 1st and 2nd segments, and two on the 3rd-7th segments. In the ventropleural group (vps) there is usually one seta on each of the 3rd-7th segments and occasionally one on the 2nd. The group of setae on the posterolateral margin of the 8th segment can also be regarded as pleural setae; one of them is about twice as long as the others. These setae occur in the region where the glandular plate and glandular pouch are found in the Pseudococcidae and Coccidae respectively (Giliomee, 1961, 1967). In *Lecaniodiaspis*, however, glandular pores are found neither in this region nor on the body itself and as a result the caudal waxy filaments which are usually so characteristic of the living males in the other two families are also absent. It should be noted that in a few genera of the Coccidae the pouch and filaments are also absent (Giliomee, 1961).

The ventral setae (avs) are arranged in four longitudinal series, two medially and one on each side. In each series there is usually one seta per segment, but individual setae may occasionally be absent. In the two median series setae are found on the 2nd-7th segments and in the lateral series on the 5th-7th.

Along the margins of the genital segments, 14-19 small genital setae are found. Ventrally, at the apex of the penial sheath, a number of small, circular discs are present. They are probably sensilla which play a rôle in the act of copulation.

DISCUSSION

Balachowsky (1937, 1942, 1948) divided the Coccoidea into margaroid lecanoid and diaspidoid types and Theron (1958) made a detailed comparative study to show in what respects the males of these groups differ from one another. The present investigation revealed that the male of *Lecaniodiaspis* exhibits characters which are typical for the lecanoid type. However, a few structures were located whose absence had been listed by Theron as specialisations of the lecanoid type. Thus *Lecaniodiaspis* possesses a distinct postoccipital ridge as well as vestiges of the postocciput; this is however not the first lecanoid male in which a postoccipital ridge was found as a vestigial postoccipital ridge had already been observed in the Pseudococcidae (Giliomee, 1961). *Lecaniodiaspis* furthermore possesses a metasternal plate and a number of abdominal sclerites; these structures have also previously been found in a lecanoid family, i.e. the Coccidae (Giliomee, 1967).

The morphology of the males of only two families of the lecanoid Coccoidea, i.e. the Pseudococcidae and Coccidae has been studied in detail (Theron, 1958; Giliomee, 1961, 1967). When the male of *Lecaniodiaspis* is compared with these forms it is immediately apparent that it is much more closely related to the Coccidae than the Pseudococcidae. Thus *Lecaniodiaspis* agrees with the Coccidae, but differs from the Pseudococcidae, in having (i) the anterior tentorial arms separate, (ii) a large membranous area in the scutum, (iii) a metasternal plate and no metasternal apophyses, (iv) the penial sheath elongated, (v) the pre- and postocular ridges separate, (vi) the prescutal suture distinct, with a corresponding internal ridge, and (vii) the tarsus one-segmented. The only characters shared exclusively by *Lecaniodiaspis* and the Pseudococcidae are (i) the absence of the narrow anterior arm of the 1st axillary wing sclerite, (ii) the absence of sclerotization on the genae, (iii) the absence of a median ridge on the basisternum, and (iv) the presence of a postoccipital ridge; the ridge, however, is vestigial in the Pseudococcidae and well developed in *Lecaniodiaspis*.

In addition to the four differences mentioned above *L. elytropappi* also differs from the Coccidae in the following respects:

- (i) Vestiges of the postocciput are present.
- (ii) The ventral part of the midcranial ridge is well developed and extends far posteriorly.
- (iii) The ocelli are absent.
- (iv) The trochanter and femur are fused.
- (v) The presence of bifurcate setae on the tibia and tarsi.

It will only be possible to determine at what taxonomic levels these characters are significant when genera related to *Lecaniodiaspis* and more species of this genus have been studied; some of the characters may even be peculiarities of this particular species alone.

Lecaniodiaspis and the Coccidae were also considered to be closely related by the workers who studied only female Coccoidea. Both Balachowsky (1948) and Ferris (1957) included *Lecaniodiaspis* in the family Asterolecaniidae, but stated that the latter and the Coccidae were closely related. Borchsenius (1959, 1960)

considered *Lecaniodiaspis* to be particularly closely related to the Coccidae and he therefore separated *Lecaniodiaspis* and six related genera from the Asterolecaniidae and included them in a new family, the Lecaniodiaspididae (Borchsenius, 1959). He considered this new family to be more closely related to the Coccidae than to the Asterolecaniidae. He based this conclusion mainly on the presence in female *Lecaniodiaspis* of an anal cleft, which according to him (Borchsenius, 1960) is very similar to the anal cleft of female Coccidae.

Support for the separation of *Lecaniodiaspis* from the Asterolecaniidae is found in the fact that they each harbour a different kind of symbiont, those of *Lecaniodiaspis* being yeast-like and those of the Asterolecaniidae being bacterium-like. It is also worthy of note that conditions in *Lecaniodiaspis* are rather similar to those in the Coccidae, both as far as the type of symbiont is concerned and the way in which the symbionts enter the oocytes (Buchner, 1953). Unfortunately it is not possible to discuss here the relationships between the males of *Lecaniodiaspis* and those of the other Asterolecaniidae, and to decide whether *Lecaniodiaspis* is more closely related to the Coccidae than to the Asterolecaniidae, as the morphology of the latter is still insufficiently known. The descriptions of male Asterolecaniidae by Green (1909), Russel (1941) and Borchsenius (1960) are too incomplete to make a fruitful discussion possible.

Lecaniodiaspis is probably more primitive than the Coccidae. This is indicated by the presence of a strong postoccipital ridge and vestiges of the post-occiput, as well as the condition of the ventral part of the midcranial ridge. On the other hand a number of specialisations are found in *Lecaniodiaspis* eg. the ocelli are absent and the trochanter and femur are fused.

Finally it should be mentioned that it is becoming clear, as the morphology of more and more male Coccoidea is studied, that the differences among the males of the so-called families of the lecanoid Coccoidea are relatively small. They are more or less comparable with those among the subfamilies of Morrison's (1928) family Margarodidae. From the work of Hughes-Schrader (1948) and Brown (1959) it is furthermore evident that there is a diversity of cytological mechanisms among the various subdivisions of the Margarodidae which is not nearly equalled by the differences among the lecanoid families. Therefore it would seem that for the sake of consistency, the same rank should be given to Morrison's subfamilies of the Margarodidae as to the families of the lecanoid Coccoidea, as these are understood by Balachowsky (1942) and Ferris (1957).

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KEY TO LETTERING OF FIGURES

a	apophysis	hs	hair-like seta	prsc	prescutum
ab	antennal bristle	lmcr	lateral branch of mid-cranial ridge	ps	penial sheath
ads	abdominal dorsal setae	lpl	lateropleurite	pscl	pleural sclerites
al	alar lobe	mc	median crest	pscr	prescutal ridge
an	anus	mcr	midcranial ridge	pscs	prescutal suture
anp	anterior notal wing process	med	media	ptp	posterior tentorial pit
asc	additional sclerite	mo	mouth opening	ptr ₂	peritreme of mesothoracic spiracle
avs	abdominal ventral setae	mr	marginal ridge	ptr ₃	peritreme of metathoracic spiracle
ax ₁	first axillary wing sclerite	mts	metatergal seta	pwp ₂	mesopleural wing process
ax ₂	second axillary wing sclerite	ocs	ocular sclerite	pwp ₃	metapleural wing process
ax ₃	third axillary wing sclerite	pa	postalare	rad	radius
bas	basalare	pcr ₂	precoxal ridge of mesothorax	sa	subalare
bra	basal rod of aedeagus	pcr ₃	precoxal ridge of metathorax	scl	scutellum
bs	sensillum basiconicum	pd	pedicel	scp	scape
ca	cranial apophysis	pepcv	proepisternum + cervical sclerite	sct	scutum
ccx	costal complex of wing veins	pla ₁	propleural apophysis	ser	subepisternal ridge
cl	claw	pla ₂	mesopleural apophysis	set.scla	subapical seta
cs	campaniform sensillum	pla ₃	metapleural apophysis	sp ₂	mesothoracic spiracle
cx	coxa	plr ₁	propleural ridge	sp ₃	metathoracic spiracle
dhs	dorsal head seta	plr ₂	mesopleural ridge	spl	sensillum placodeum
dps	dorsopleural setae	plr ₃	metapleural ridge	ss	suspensorial sclerite
dse	dorsal simple eye	pmss	posterior metasternal seta	stn ₁	prosternum
e _{pm} ₂	mesepimeron	pn ₂	mesopostnotum	stn ₂	basisternum of mesosternum
e _{pm} ₃	metepimeron	pn ₃	metapostnotum	stn ₃	metasternum
e _{ps} ₂	mesepisternum	pna	postnotal apophysis	t	tendon-like apodeme
e _{ps} ₃	metepisternum	pn _p	posterior notal wing process	tar	tarsus
f	furca	poc	postocciput	tdgt	tarsal digitule
fp	furcal pit	pocr	postocular ridge	teg	tegula
fs	fleshy seta	por	postoccipital ridge	tegs	tegular seta
g	gena	pra	prealare	tib	tibia
gts	setae of genital segment	prn	lateral pronotal sclerite	tp	triangular plate
h	halter	prnr	pronotal ridge	tr + fm	trochanter + femur
		procr	preocular ridge	udgt	ungual digitule
		pror	preoral ridge	vhs	ventral head setae
				vps	ventropleural setae
				vse	ventral simple eye

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