

THE TENEBRIONIDAE OF SOUTHERN AFRICA

XXXIII. DESCRIPTIVE NOTES ON THE EARLY STAGES
OF *ONYMACRIS RUGATIPENNIS* HAAG AND
LEPIDOCHORA DISCOIDALIS GEBIEN AND
KEYS TO GENERA AND SPECIES OF
ADESMIINI AND *EURYCHORINI*

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Transvaal Museum

(With 28 Text-figures and 15 Plates)

INTRODUCTION

THE following description of the larvae of two Tenebrionid beetles, which are strictly confined to the dunes of the desert, may serve as a contribution to our knowledge of the manifold life of the Namib Desert. They belong to two different tribes, the *Adesmiini* and *Eurychorini*, and this account, together with the keys of genera and species as so far known—and more especially the illustrations, may assist in their classification and add to the knowledge of Tenebrionid larvae in general. All larvae dealt with in this paper were hitherto unknown.*

This paper is confined to the larvae; pupae will be dealt with in a later publication.

I wish to express my sincere thanks to the S.A. Council for Scientific and Industrial Research for an assistantship grant, to the Transvaal Museum for providing me so generously with all facilities for my work and to Protea Holdings Ltd., Johannesburg, for the loan of a Reichert 'R.C.' microscope for microphotography. Last, but by no means least, I am deeply indebted to Dr C. Koch, at whose instigation the present paper was undertaken and whose suggestions have been of great value to my investigations.

The insectarium of the Transvaal Museum was established by Dr C. Koch towards the end of 1956 for the purpose of experimental ecology and the breeding of the early stages of Tenebrionids. Since then thousands of early stages have been obtained, belonging to 35 genera and 75 species, all of them hitherto unknown to science.

The adults are kept in large terraria, with a layer of desert sand, and stones for petrophilous species, at the bottom. Eggs and all further early stages are transferred into smaller containers with sand and stones, adults of subsequent generations are put back into the large terraria. The containers with the early stages are regularly checked and samples of the different stages preserved in

* The first publication dealing systematically with a larva of the genus *Adesmia* Fisch was written by Skopin (1959).

70% alcohol (Paulian, 1956).* Adults and early stages are fed on bran, bread and vegetables; water is kept in all containers on little trays or in tubes to supply moisture by evaporation; most of the larvae prefer to stay close to the water containers where some moisture oozes out and the sand is slightly damp.

Though the results of breeding are encouraging, it should be mentioned that the housing and rearing of Tenebrionid larvae in our section is still in a provisional state. Many important improvements are necessary to get the best results, and to utilize this culture to the full for research in systematics, biology and ecology.

The parent specimens of the early stages discussed in the present paper were to a great extent collected during the Carp Expedition to the Namib in May-June 1959.

As dead larvae deteriorate rather quickly, it was found advisable to photograph important details of every species, as far as possible in fresh condition, in order to establish a photo-archive for immediate comparison and for studies at a later period. In this connexion about 250 photos have so far been taken. In order to spread out hairs and setae neatly, the larvae are rolled in saw-dust and then treated with a soft brush. Smaller objects, like epipharynx or maxillae, are put on a glass slide with hollowed centre in little water to prevent floating; water is used because alcohol evaporates too quickly.

The photos of larvae (*in toto*) are taken with the Practina FX and Braun Hobby Automatic Flash, all photos of details with the Reichert fixed-length camera 'KAMB' furnished with the photomicrographic objectives, the Zeiss Luminars of 25, 40, 63 and 100 mm. focal length. Photos of the epipharynx and labra are taken with the Reichert 'KAMB' in connexion with the Reichert 'RC' microscope with objective 4/0.08, 6.3/0.16, 10/0.25 and plan ocular 8x. The films used are Agfa Isopan F or Adox R17.

The particulars given in the keys refer to the state of material on 26 September 1960. The measurements are in mm. First figure: length of body; second figure: width of body; third figure: width of head capsule. Owing to the varying turgidity of the not always fresh larvae, the first two figures represent only approximate value.

The separation of Adesmiini and Eurychorini larvae is applicable to the material dealt with in this paper.

Ninth abdominal tergite elongate- to broad-ovate, apex straight; distal third at least with a pattern of slender setae. Ventral surface of mid and hind legs with numerous setae; distance between hind coxae small, from about one-third the width of front coxa to at most half the width. † Distal sclerotized band of epipharynx plain mesially without hooks. **ADESMIINI**

Ninth abdominal tergite either globular with small, stout, hook-like spines, or subtriangular with upcurved apex; if setae not small, hook-like, then confined to margin (on disc only single hairs or very fine setae much narrower than marginal ones). Ventral surface of mid and hind legs bare, except for one to three strong, isolated setae; distance between hind coxae large, as wide as to much wider than width of front coxa. Distal sclerotized band of epipharynx with two strong hooks pointing towards each other. **EURYCHORINI**

* More recent experiments were undertaken with the fixer recommended by Ernden (1942) (formaldehyde-alcohol-glacial acetic acid); this method seems to be preferable as the specimens remain softer and the anal structures turn inside out more completely.

† The distance between coxae naturally depends somewhat on the state of turgidity, so measurements are not always exact; however, the differences are so striking that they will be recognized nevertheless even in material that is not quite fresh.

ADESMIINI

Onymacris rugatipennis Haag

The description is based on a more or less full-grown larva, 40 mm. long, 3.8 mm. broad, head capsule 3 mm. wide. Body almost cylindrical, gradually narrowing towards apex, with distinct, transverse to elongate sclerites and elongate-ovate, scutiform ninth abdominal tergite. Cuticle glabrous of ivory-yellowish colour, setae and hairs reddish brown.

Head

(Pl. XXXb)

Convex above, two and a half times as wide as long; front emarginate anteriorly with a few fine, isolated bristles; sides of cranium rounded with a tuft of brownish, spiniform setae, the inner margination arcuate, the setae gradually becoming longer towards margin, on the average about as long as clypeus, the exterior marginal edge with hairs which are twice as long as latter. Clypeus transverse, trapezoidal, narrowing anteriorly, at base two-and-a-half times narrower than width of head, with a median row of very small, erect, flattened setae becoming more aggregated laterally. Labrum (Pl. XXVIIIa) about as wide as clypeus anteriorly, ivory-opaque in life (brownish in alcohol), bilobed; discal setae stout, flattened, dark brown, one-fifth the length of labrum, adjoining setae on anterior lobes spiniform, more slender and lighter in colour; anterior margin bordered by fine, brown hairs as long as labrum. Epipharynx (Pl. XXVIIIb) terminated posteriorly by a transverse, sinuous, sclerotized band, dilated laterally, and with two triangularly pointed prolongations distally, enclosing mesially a sensory area composed of eight punctures in two transverse rows; a wide band of long, rather broad spines accompanies the bilobed margin anteriorly; in the median, slightly raised portion, scattered setae form a triangle, whose distal point is formed by a pair of shorter spines; inside the angle are six sensory punctures, four in an upper and two in a lower row; underneath them lies a transverse row of four micro-punctures. The remaining middle portion, between setae and the sclerotized band, is occupied by microscopic trichoid processes. Antennae (Text-fig. 26) originating from a broad, granular membranous scapus; first segment elongate, yellowish, base and apex colourless, second about one-third shorter, pear-shaped, the widest periphery demarcated by a band (main sensorium) with a very fine dark outline which is not completely closed dorsally; third segment small, tubiform, one-quarter the length of the second joint, tipped by a single seta of the length of segment. Mandibles (Text-fig. 1) bifid, apical teeth obtusely pointed, not very prominent; on right mandible the second tooth somewhat narrower than the superior one; on left mandible inferior tooth broad, triangular (ventral view); molar parts dorsally triangularly pointed, ventrally more rounded; superior surface feebly convex; exterior margin strongly arcuate; on ventral surface the membranous elevation, set with a bunch of strong brown setae, runs from middle of margin towards excavation, subparallel to the former, thence extending to dorsal surface and forming the outer limit of mandible opposite molar part; condyle very large. Maxillae (Text-fig. 22) fairly large, palpi surmounting mandibles, three segmented, first and third segment of subequal length, the apical one spindle-shaped and narrower, second segment a fourth longer. Stipes fused with mala, on ventrolateral surface with long golden hairs; mala (fused galea and lacinia) slightly longer than first segment of palpus, inner margin armed with a double row of strong, brown, somewhat curved spines, accompanied on ventral surface by a fringe of very fine yellowish hairs; articulating membrane

between cardo and submentum with brown, scaly formation. Submentum subsquare with a stripe of brown scales at the border to articulating membrane; gula wider than submentum, with long hairs on anterior centre; mentum trapezoidal, strongly dilated just before middle, anterior half whitish, posterior half brownish with long hairs; prementum with two tufts of long hairs on each side; ligula bilobed, a fifth length of first segment of labial palpus, tipped by very fine long hairs; palpi in two segments, basal segment cylindrical with long hairs laterally, one-and-a-half times as long as second, conical segment, the apex of which is covered with minute hairs.

Thorax

Thoracic nota more distinctly sclerotized than abdominal tergites. Prothorax, widest part of the body, not quite twice as wide as long; anterior and posterior margin with a broad, brownish band somewhat dilated laterally and finally transitive into the brownish, scaly-spotted integument of the epipleurum, which is densely covered with reddish brown hairs; meso- and metanotum slightly narrower than pronotum, about a seventh shorter. Meso- and metathorax bearing spiracles; the first one large, transverse ovate, about four times as wide as long, the second small, roundish, as long as the first is wide, appearing somewhat reduced. For the characters of the sternal parts of the thoracic and the first abdominal segments see Text-fig. 9, which shows the details better than a laboured description.

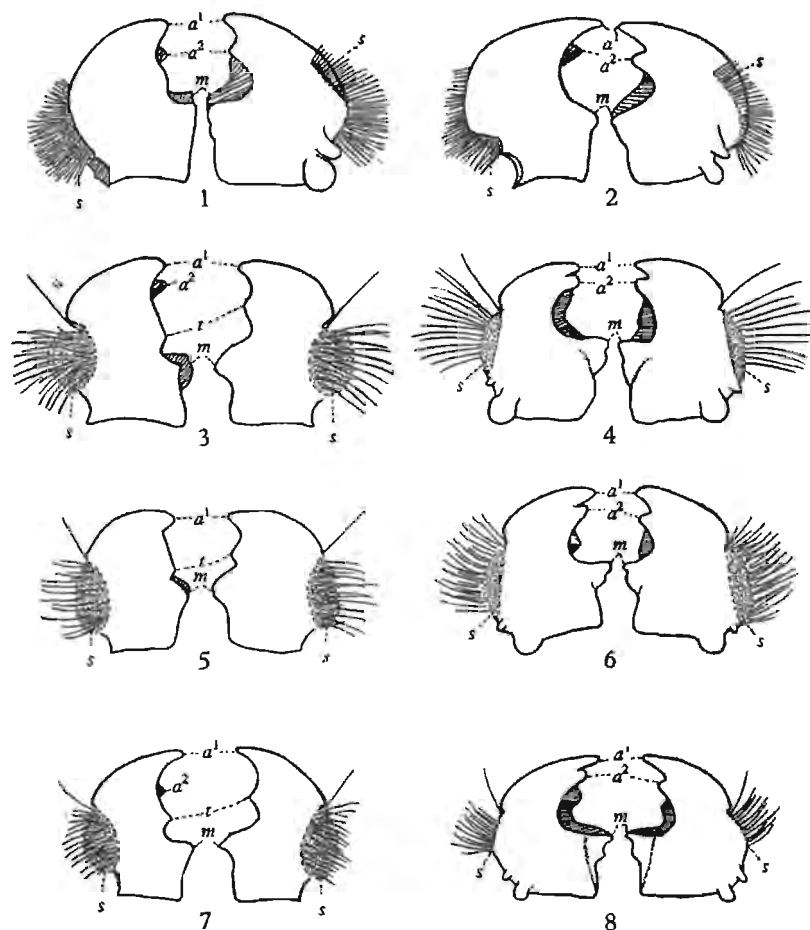
Legs

(Text-fig. 15, Pl. XXXa)

The three pairs of legs increase in size from hind to fore legs and are strongly armatus, dorsally convex, ventrally flattened; first pair wider and about a fifth longer than the second pair; the difference between mid and hind legs is not quite as great. All legs composed of coxa, trochanter, femur, tibiotarsus and claw; front coxae attached very closely to one another and enclosed by a large united articulating membrane; intercoxal space of mesosternum about a quarter of midcoxa and of metasternum a third of hindcoxa; both pair of coxae are enclosed by separated articulating membranes; claw of fore legs large, distinctly more than half the length of tibiotarsus, broad, triangularly pointed, strongly sclerotized; base strongly sinuate ventrally: the soft, barely sclerotized ventral base of claw transversely triangular, on inner margin a strong seta as long as base and a smaller one on ventral surface; tibiotarsus about twice as long as wide, outer half of dorsal surface set with long, fine hairs, inner half bare; ventral surface, next to exterior margin, with a vertical stripe of about three subparallel rows of very short, stout bristles besides the long, sharply pointed, strongly sclerotized spines (about 11) on inner edge, most of them as long as width of tibia; femur with a dense pattern of very short bristles on ventral surface, leaving free only the central anterior portion and a bare strip between the short setae on disc and the double row of longer, pointed setae on exterior margin; the trochanter has a square spot of short bristles on ventral surface next to coxal articulation, and similar bristles along interior margin, anteriorly the outermost edge of the latter with longer pointed setae; coxae and articulating membrane with long golden hairs. Mid and hind legs furnished dorsally with long hairs, ventrally the whole surface of segments is densely set with brown setae of varying length, on femur and tibiotarsus these setae are longer than those on fore legs; unsclerotized base of claw of mid and hind legs ring-shaped, in length a sixth of the length of claw; the latter broad, triangular with constricted apex, base straight.

Abdomen

First abdominal tergite transverse, the three following ones subsquare, the remainder oblong; apart from the first and last tergites they show anteriorly a concavely curved white stripe on disc; sides of all furnished with long, brownish golden hairs. Spiracles on first abdominal segments situated in the anterior quarter of tergites next to epipleurum, oblique transversely placed, ovate, peritrema protruding. The first eight ventrites are bare except for a few bristles



Text-figs. 1-8. Abbreviations: a^1 and a^2 , apical teeth; m , molar part; s , membranous, setose elevation (stippled); t , additional tooth.

Text-fig. 1. *Onymacris rugatipennis*. Left mandible in dorsal and ventral view.

Text-fig. 2. *Epiphysa flavicollis*. Left mandible in dorsal and ventral view.

Text-fig. 3. *Lepidochora discoidalis*. Mandibles, dorsal view.

Text-fig. 4. *L. discoidalis*. Mandibles, ventral view.

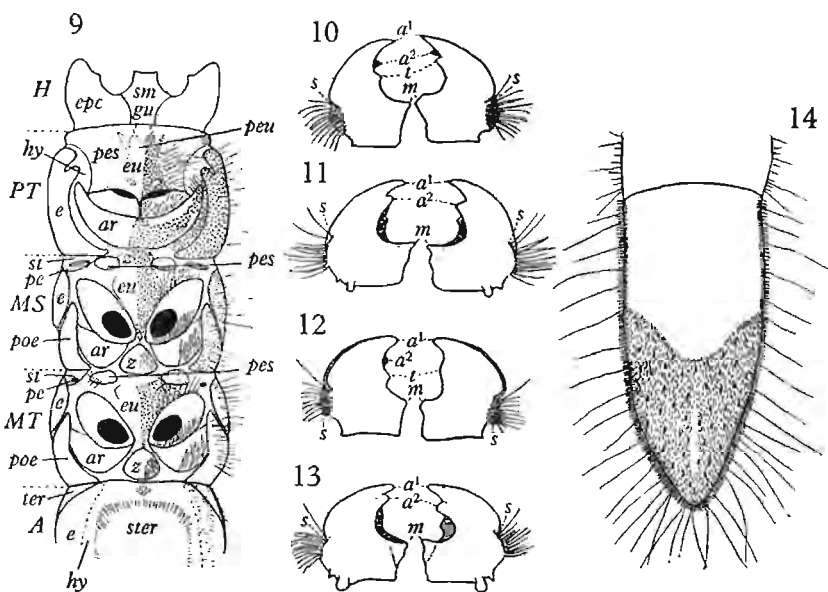
Text-fig. 5. *L. kahani*. Mandibles, dorsal view.

Text-fig. 6. *L. kahani*. Mandibles, ventral view.

Text-fig. 7. *Stips dohrni*. Mandibles, dorsal view.

Text-fig. 8. *S. dohrni*. Mandibles, ventral view.

laterally and a semicircular row of long brown hairs on anterior margin of first ventrite. The ninth abdominal tergite (Pls. XXXI*a*, XXXIII*a*) is slightly longer than the preceding one, about a fifth longer than wide, elongate-ovate, scutiform; dorsum convex throughout, in lateral view forming an evenly convex shield, the ventral part of which is strongly drawn back, thus the tergum projects remarkably beyond ninth sternum; apical third of dorsum with dispersed, small erect setae; intermediate space between setae densely covered by black-tipped microscopic setulae; anteriorly the setae form a somewhat biarcuate line towards lateral margin; marginal setae slightly longer than discal ones; the outermost edge with long, fine hairs, extending to a fourth of the length of segment, decreasing in size towards base of tergum. The ninth sternum (Pls. XXXIII*a*, XXXIV*b*) bears two big coniform pygopodia densely armatus with pointed spines and fine hairs; in caudal view the pygopodia are curved towards each other, next to them are two bare, subtriangular anal lobes which are joined by a narrower, setae-bearing median lobe; between these three anal lobes and the articulating membrane lies the anal slit.



Text-fig. 9. *Onymacris rugatipennis*. Ventral view of part of head, of the thoracic segments and of the anterior portion of first abdominal segment. Abbreviations: *ar*, articulating membrane of leg; *e*, epipleurum; *epc*, epicranium; *eu*, custernum; *gu*, gula; *hy*, hypopleurum; *pe*, pre-epipleurum; *pes*, presternum; *peu*, pre-eusternal subdivision of custernum; *poe*, post-epipleurum; *sm*, submentum; *ster*, first abdominal sternite; *st*, stigma; *ter*, first abdominal tergite; *z*, post-sternellum; *H*, lower part of head; *PT*, prothorax; *MS*, mesothorax; *MT*, metathorax; *A*, abdomen (modified after St. George, 1925).

Text-fig. 10. *Pogonobasis* (s.str.) spec.? Mandibles, dorsal view. Explanation same as in Text-figs. 1-8.

Text-fig. 11. *Pogonobasis* (s.str.) spec.? Mandibles, ventral view. Explanation same as in Text-figs. 1-8.

Text-fig. 12. *Symphochora simoni*. Mandibles dorsal view. Explanation same as in Text-figs. 1-8.

Text-fig. 13. *S. simoni*. Mandibles, ventral view. Explanation same as in Text-figs. 1-8.

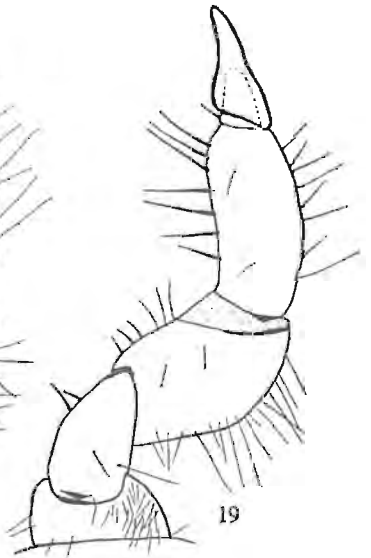
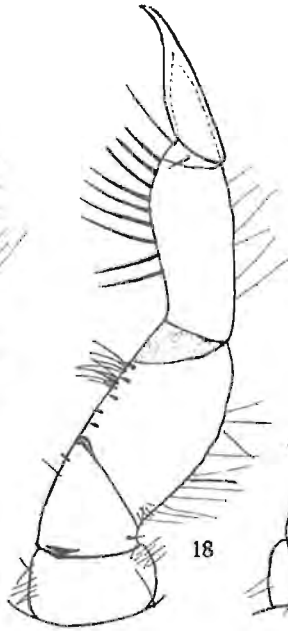
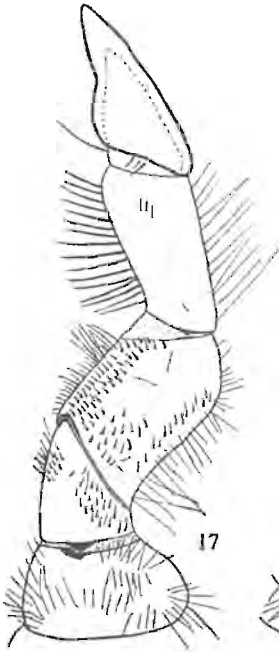
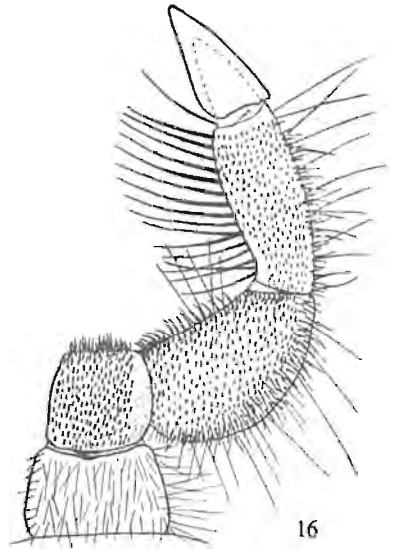
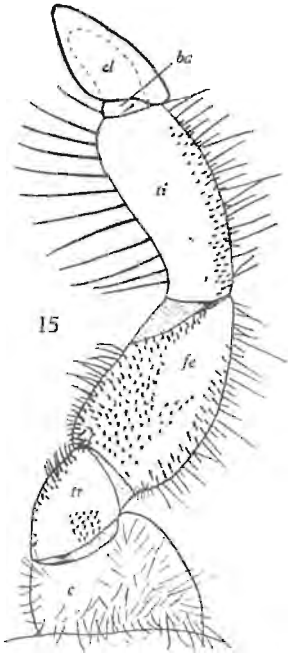
Text-fig. 14. *Onymacris laeviceps*. Ninth abdominal tergite.

Notes on first-stage larva (Text-fig. 24)

The egg of *Onymacris rugatipennis* is on the average 4.5 mm. long and 1.8 mm. wide; the first instar about 6 mm. long, width of head capsule 0.9 mm., shortly before moulting the larva reaches a length of 10 mm., head 1.1 mm. wide; front with very fine hairs; each lobe of labrum bears one strongly sclerotized, large, flat seta with pointed apex, a much smaller seta towards median incision and several very fine hairs along anterior margin; at the base of the incision arise two long, very fine hairs, originating close together and spreading out distally; the mandibles have one strongly sclerotized, flat seta, about four finer ones and several fine hairs on the very turgid dorsolateral membranous elevation. All segments are coated laterally with long fine hairs, in particular the margin of ninth abdominal segment, a few single hairs on disc of ninth tergite. There are no cerci on anal tergite nor spines on disc or on the pseudopodia. The larva has minute, triangular, thoraco-abdominal egg-bursters (Emden, 1946); the three thoracic ones are slightly larger and situated in front of the base of a paramedian, very fine seta near hind margin; the following eight abdominal egg-bursters lie at the outer side of a seta, which is situated more laterally in the posterior third of each segment. The legs already show quite a number of pointed spines on ventral inner edge of all joints and hairs on dorsal surface.

The first instar of the *Adesmiini* dealt with in this paper are in general very much alike; all have in common on each lobe or side of labrum one stout, flat, strongly sclerotized seta, and sometimes a weaker seta and single fine hairs. In *Stenocara gracilipes* and *depressa*, as well as in *Epiphysa flavicollis*, each side of labrum and soft elevation of mandible bear just one strong seta, no other setae or hairs. It seems very likely that these setae play a decisive role in hatching. The ninth tergite is furnished only with isolated, very fine, long hairs on disc; even *Onymacris bicolor marshalli*, with its broad, short setae in following stages, has only a few isolated long hairs on ninth tergite.* The second instar may thus be easily distinguished from the first in showing on labrum a row of equally developed setae, and on ninth abdominal tergite strong setae similar in shape and arrangement to those of older larvae, but relatively longer. Very closely related forms are hardly or not distinguishable, occasionally the shape of the abdomen indicates a particular species, as for example *O. laeviceps*, which has already in the first instar a very prolonged, pointed abdomen, while the abdomen in the other *Onymacris* species are more triangularly rounded. Hafez & Makky (1959) have given a drawing of a first-instar larva of *Adesmia bicarinata* Klug, which does not show any of the characters mentioned above; the labrum and its furniture are not to be seen clearly, the ninth abdominal tergite already shows distinctly the arrangement of strong setae, which I found only in older stages, and tergites and sternites are densely covered with hairs, which is not even the case, for example, in the first instar of the hairy *Stenocara gracilipes*, the ventrites and tergites of which are very sparsely furnished with hairs, only laterally are hairs more dense. I have never found such a big difference between the size of the egg and the newly hatched larva as Hafez & Makky (1959), egg 3.8 mm. long, minimum length of first larva 6.6 mm., average length 7.1 mm.

* The *Stenocara* species examined (*depressa* and *gracilipes*) bear on top of ninth abdominal apex near margin two minute, flat, triangular, pointed spines with base sub-vertical and about 0.015 mm. wide (Pl. XXVIII e). As far as is known it is the first time that such spines have been found on ninth tergite of first-instar larvae in Tenebrionids.



For legends see foot of facing page.

Key to the genera of *Adesmiini*

1. Exterior sclerotized part of mandible opposite molar part, forming dorsally a uniform curve to joint; the soft setae-bearing elevation extending dorsally, limiting mandible externally opposite molar part (Text-fig. 1); mandible, next to joint between clypeus and labrum, much narrower than half of the width of the joint, at the utmost half as wide (Pl. XXX*b*). Epipharynx (respectively labrum) strongly bilobed: lobes set with numerous, scattered setae extending mesially towards base (Pl. XXVIII*b*). Fore legs about one and a half times larger than hind legs. Claw of fore leg a half to two-thirds the length of tibiotarsus (Text-fig. 15, Pl. XXX*a*).
(See key to *Onymacris*, p. 172.) Onymacris Allard
- Exterior, sclerotized part of mandible opposite molar part strongly sub-rectangularly reflected before joint, limiting mandible laterally; the soft setae-bearing elevation only showing basally beneath angle (Text-fig. 2); mandible, next to joint between clypeus and labrum, distinctly wider than half the width of this joint. Epipharynx (respectively labrum) with evenly convex, straight, or slightly concave anterior margin, interior surface of lobes without or with very few setae, mesially only single setae or two vertical rows of setae (Pl. XXVIII*c, d*); if anterior margin slightly bilobed and interior surface with more numerous setae, mandible like above and legs as in the following (*Physosterna globosa*). Fore legs more than one-and-a-half to over twice as large as hind legs. Claw of fore leg about as long or longer than tibiotarsus (Text-figs. 17, 18). 2
2. Surface of epipharynx free of setae except for two pairs in middle of lower third, flanking the sensory punctures (Pl. XXVIII*c*). Dorsolateral margin of mandible raised. Ninth abdominal tergite slender, almost one-and-a-half times as long as wide, gradually narrowing towards the strongly pointed apex; anterior row of setae wing-like arcuate and distinctly separated from the apical setae by a bare transverse region of about a seventh of the length of ninth abdominal tergite (Pl. XXXI*b*).

Epiphysa flavicollis Fabricius

Twenty-two larvae in different stages; two larvae alive: nine beetles alive.

Largest larva: 67:6:4:8. About full-grown. Parents from Southern Kalahari (Mata-Mata).

Epiphysa flavicollis var.?

Twenty-four larvae in different stages. Largest larva: 70:6:5. About full-grown. Parents from Northern Namib (Roessing-Khan-Cape Cross).

- Surface of epipharynx with more than three pairs of setae (Pl. XXVIII*d*). Dorsolateral margin of mandible plain. Ninth abdominal tergite broad-ovate, if apex pointed, strongly narrowing behind the basal third; a third longer than wide; anterior row of setae not distinctly marked nor separated from the apical setae (Pl. XXXII*c*). 3

Text-figs. 15-19. Abbreviations: *ba*, basal, unsclerotized part of claw (broken line, projection of basal tissue); *c*, coxa; *cl*, claw; *fe*, femur; *ti*, tibiotarsus; *tr*, trochanter; intersegmental membrane stippled; segments in all figures the same. Left fore leg in ventral view of:

Text-fig. 15. *Onymacris rugatipennis*.

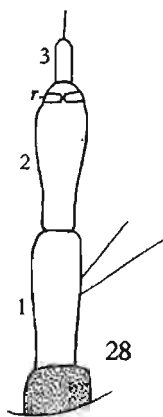
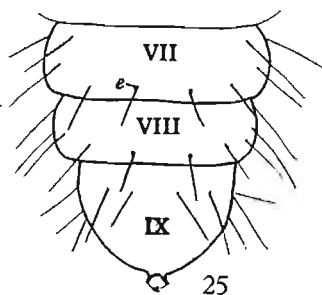
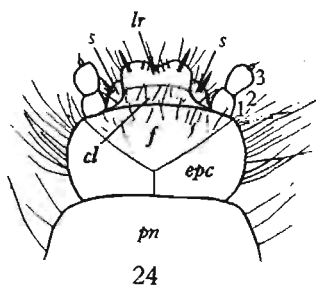
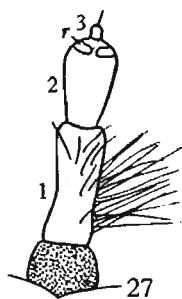
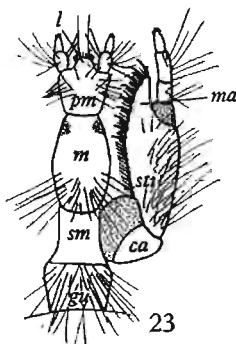
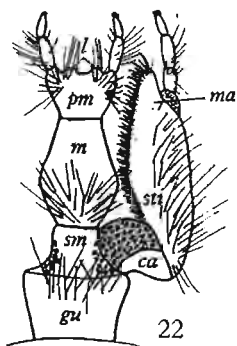
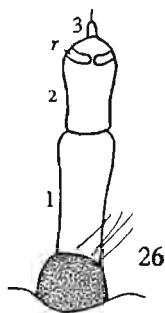
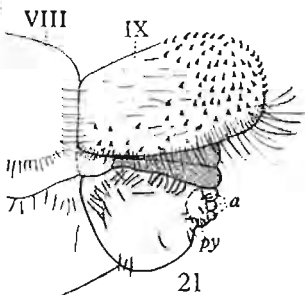
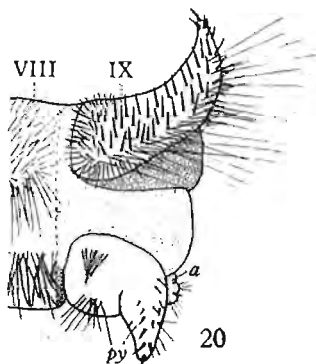
Text-fig. 16. *O. unguicularis*.

Text-fig. 17. *Epiphysa flavicollis*. The leg chosen for illustration was from an older larva than the leg in the photo on Pl. XXX*c*, hence the different numbers of setae on surface of tibiotarsus and base of claw. While the arrangement of setae is fairly constant in a species, the number may vary even on opposite legs of the same specimen.

Text-fig. 18. *Stenocara eburnea*.

Text-fig. 19. *Lepidochora discoidalis*. The leg illustrated did not belong to the specimen described, hence remark about number of setae above.

- 3. Pygopodia bent inwards (ventral or caudal view), apices blunt.
(See key to *Physosterna* p. 171.) Physosterna Allard
- Pygopodia straight perpendicular (ventral or caudal view), apices pointed (Pl. XXXIIIc). 4
- 4. Long pointed setae on inner margin of fore femur. Setae on lateral outer surface of pygopodia forming a compact ovate patch.
Metriopus hoffmannseggi Solier



For legends see foot of facing page.

Four larvae in different stages; 1 pupa; 4 beetles alive. Largest larva: 27:3:2.5. About full-grown. Parents from Northern Namib (Kuiseb area) and Southern Kalahari (Mata-Mata).

- 4 Short, flattened setae on inner margin of fore femur (Text-fig. 18). Setae on lateral outer surface of pygopodia marking only the outline of a bare ovate patch (Pl. XXXIIIc). Stenocara Solier
(See key to *Stenocara*, p. 173.)

Key to species of Adesmiini

Physosterna (see p. 170)

Lobes of epipharynx without setae, mesially two vertical strips of setae (Pl. XXXVIII d). Apical tooth of each mandible (ventral view) sharply pointed, strongly projecting beyond second tooth; second apical tooth on left mandible (ventral view) triangular, strongly pointed. Articulating membranes of middle and hind legs, epipleura and sternal parts of meso- and metathorax smooth, ivory, without inner scaly, brown formation. Outer ventral margin of fore tibiotarsus without setae. Fore claws distinctly longer than tibiotarsus (measured at outer margin).

Physosterna cribripes Haag

Fifteen larvae in different stages. Largest larva: 48.5:4.5:3.7 (larva in not very good condition, therefore measurements not very accurate). Second larva: 43:5.4:3. First about full-grown. Parents from South-West Africa (without exact locality).

Setae on epipharynx scattered on lobes and median part (similar to epipharynx of *Onymacris rugatipennis*, Pl. XXXVIII b). Apical tooth of each mandible (ventral view) obtusely rounded, slightly projecting beyond second tooth; second apical tooth on left mandible (ventral view) roundly dentiform. Articulating membrane of middle and hind legs, epipleura and sternal parts of meso- and metathorax with brown scales in integument (Pl. XXXI c). Outer ventral margin of fore tibiotarsus with a vertical row of setae. Fore claw from shorter than, to as long as, tibiotarsus.

Physosterna globosa Haag, f.t.

Text-fig. 20. *Eurychora* spec. Side view of ninth abdominal segment. VIII and IX, eighth and ninth abdominal segment. *a*, anal lobes; *py*, pygopodium; intersegmental membranes stippled.

Text-fig. 21. *Lepidochora discoidalis*. Side view of ninth abdominal segment. Explanation of letters same as for Text-fig. 20.

Text-fig. 22. *Onymacris rugatipennis*. Left maxilla and labium. Ventral view; *ca*, cardo; *gu*, gula; *l*, ligula; *m*, mentum; *ma*, mala maxillaris; *pm*, prementum; *sti*, stipes maxillaris; articulating membranes stippled, that between stipes and submentum with brownish inner scales.

Text-fig. 23. *Lepidochora discoidalis*. Left maxilla and labium, ventral view. Explanation same as for Text-fig. 22.

Text-fig. 24. *Onymacris rugatipennis*. Head of first-stage larva. *cl*, clypeus; *epc*, epicranium; *f*, frons; *lr*, labrum; *pn*, pronotum; *s*, membranous, setose elevation of mandible; 1, 2, 3, first to third segment of antenna.

Text-fig. 25. *Lepidochora discoidalis*. Hind end of first-stage larva. VII, VIII, IX, seventh to ninth abdominal tergites. *c*, cerci; *e*, left egg-burster of the seventh abdominal segment.

Text-fig. 26. *Onymacris rugatipennis*. Right antenna, dorsal view. *r*, ring-shaped sensorium on apex of second segment. Basal articulating membrane stippled.

Text-fig. 27. *Lepidochora discoidalis*. Right antenna, dorsal view. Explanation same as for Text-fig. 26.

Text-fig. 28. *Symphochora simoni*. Right antenna, dorsal view. Explanation same as for Text-fig. 26.

Seventeen larvae in different stages. Five larvae alive. Largest larva: 60:5:4:2. About full-grown. Parents from Northern and Southern Namib (Kuiseb area).

Physosterna globosa epiphysoides Peringuey

Twenty-one larvae in different stages. Largest larva: 22:3:2:2. Probably not full-grown. Parents from Northern and Southern Namib (Kuiseb area).

Physosterna globosa scherzi Koch

One larva: 39:5:3:7:3. Not full-grown. Parents from Northern and Southern Namib (Kuiseb area).

Onymacris (see p. 169)

1. Trochanter, femur and tibiotarsus of fore legs uniformly and densely covered with setae (Text-fig. 16). Anterior margin of meso- and metanotum and first abdominal segment with a transverse strip of very fine microbristles. 2
 - Trochanter, femur and tibiotarsus with patterns of setae, leaving large bare patches free (Text-fig. 15). Nota of all segments bare. 4
 2. Seventh to ninth abdominal segment strongly elongate, last one strongly pointed, apex with a furry-looking coat of small broadened setae and very dense microsetae (Text-fig. 14). Claws of forelegs slender, elongate, about twice as long as wide (Text-fig. 16). 3
 - Seventh and eighth abdominal segment subrectangular, ninth abdominal segment broad-ovate, apex with slender pointed spines and extremely fine microsetae (Pl. XXXII a). Claws of fore legs broad, about as long as wide. 3
- Onymacris plana* Peringuey
- Nineteen larvae in different stages. Largest larva: 39:4:6:3:8. About full-grown. Parents from Southern Namib (Kuiseb area).
3. Ninth abdominal segment more than twice as long as wide (Text-fig. 14). Labrum three times as wide as long. Clypeus narrowing slightly anteriorly, densely set with setae except for a small half-circular area anteriorly. Left mandible ventrally with the second apical tooth strongly developed and as long as the first one. 3
- Onymacris laeviceps* Gehlen
- Eleven larvae in different stages. Largest larva: 17:1:7:1:6. Certainly not full-grown, but at rather a young stage. Parents from Southern Namib (Tsauchab, Sossus, Gobabeb).
- Ninth abdominal segment about one-and-a-half times as long as wide. Labrum twice as long as wide. Clypeus strongly narrowing anteriorly, only posterior half set with setae. Left mandible ventrally with the second apical tooth very weakly developed, much smaller than apical tooth. 3
- Onymacris unguicularis* Haag
- Three larvae in different stages. Largest larva: 24:2:2:2:1. Probably not full-grown. Parents from Southern Namib (Walvis Bay).
4. Ninth abdominal segment triangular, flattened above, setae short, round (Pl. XXXI b). 3
- Onymacris bicolor marshalli* Koch
- 325 larvae, but mainly only of the very earliest stages. Largest larva (hind body broken off): —:2:6:2. Second larva: 19:2:1:6. Certainly not full-grown. Parents from Northern Namib, Angola (Porto Alexandre).
- Ninth abdominal segment elongate ovate, base constricted, convex above, setae slender, pointed. 5
5. Bare part on ninth abdominal segment (measured at middle) two-and-a-half times as long as portion with setae, the latter small, about twice as long as wide (Pl. XXXI a). 5
- Onymacris rugatipennis* Haag
- Ninety-four larvae in different stages. Two larvae alive. Largest larva: 40:3:8:3. About full-grown. Parents from Southern Namib (Kuiseb area).
- Bare part on ninth abdominal segment less than twice as long as portion with setae, the latter long, slender, about three times as long as wide. 6

6. Setae on ninth abdominal segment very densely and regularly placed. Left mandible ventrally with the second apical tooth elongate, pointed, almost as long as first one.

Onymacris marginipennis palgravei Perringuey

Twelve larvae, mostly first stages. Largest larva: 41.5:42:3.5. About full-grown. Parents from Southern Namib (Walvis Bay).

- Setae on ninth abdominal segment more scattered. Left mandible ventrally with the second apical tooth broad triangular, much smaller than first one.

Onymacris multistriata Haag

Thirty-three larvae in different stages. One beetle alive. Largest larva: 34:32:2.8. Probably not quite full-grown. Parents from Southern Kalahari (Twee Rivieren).

Stenocara (see p. 171)

1. Strong, broad setae on posterior margin of clypeus. Ninth abdominal segment obtusely elongate, almost as wide as long; spines three to four times as long as wide.

Stenocara depressa Haag

Sixty larvae in different stages, mainly very early stages; 1 pupa. Largest larva: 36:32:2.8. About full-grown. Parents from Northern Namib (Swakopmund area).

- Long, fine hairs on posterior margin of clypeus. Ninth abdominal segment strongly pointed, a third longer than wide; spines five to six times as long as wide (Pl. XXXII c).

2

- 2 Exterior margin of labrum with many long, fine, pointed setae. Pronotum with long golden hairs laterally, extending to half of disc on each side, and along posterior margin; long hairs on disc and posterior margin of meso- and metanotum, leaving free a bare median patch. Abdominal segments with long, isolated hairs on anterior and posterior margin. Median anal lobe with about three small spines anteriorly, whole surface set with fine hairs. Claw of fore leg broad, one-and-a-half times as long as wide: ventral surface of trochanter, femur and tibiotarsus with several spines.

Stenocara gracilipes Solier *sensu lato*

Twenty larvae in different, but mainly very early stages. One pupa. Largest larva: 27:3:2. Probably not quite full-grown. Parents from South-West Africa (Sossus Vlei, Kuiseb area, Khan River Mountains).

- Exterior margin of labrum with three to four broad, blunt setae on each side, medium part with a few isolated, fine, pointed setae, the two median ones longest. Thoracic and abdominal nota bare. Median anal lobe with a transverse row of strong spines anteriorly, hairs confined to margins. Claw of fore leg extremely slender and pointed, over three times as long as wide: ventral surface of fore legs without spines (Text-fig. 18).

Stenocara eburnea Pascoe

Eight larvae in different stages. Largest larva: 27:2:1.7. Probably not quite full-grown. Parents from Northern Namib (Swakopmund Area).

Summary on the Adesmiini larvae

The genus of *Onymacris* shows three different groups, in which the respective species are more nearly related. To the first group belong *O. rugatipennis*, *O. marginipennis palgravei* and *O. multistriata*. The second group contains up to now only one species, *O. bicolor marshalli* with its curious, knoblike setae on ninth abdominal tergite. The third group, mainly characterized by the dense furniture of its legs, is made up of *O. plana*, *O. unguicularis* and *O. laeviceps*.

The genus *Physosterna*, with *P. globosa*, is closely related to the first *Onymacris* group, while *Physosterna cribripes* is further removed.

Epiphysa (flavicollis) is not only the largest representative, but also the most

easily distinguishable by its beautifully curved pattern of setae on ninth abdominal tergite.

In the genus *Stenocara*, *S. gracilipes* and *S. eburnea* seem closely related if one considers only the ninth tergite; on the other hand *S. eburnea* is distinguished from *gracilipes* and *depressa* by its bare fore legs and extremely pointed claw, and an epipharynx which shows strangely enough the same distribution of sensory punctures as in most of the Eurychorini, four punctures in centre of disc and two on anterior margin, the latter being rather far apart from each other; the characteristic hooks of the sclerotized posterior band in the Eurychorini are missing.

In the Adesmiini larvae which have been dealt with in this paper, *Stenocara gracilipes* is the only 'hairy' one, with long golden hairs on tergites, especially on meso- and metanotum.

EURYCHORINI

Lepidochora discoidalis Gebien

The description is based on a more or less full-grown larva, measuring 15 mm. in length, 4 mm. in width, head capsule 2 mm. wide. Body gradually narrowing anteriorly and posteriorly, with distinct, strongly transverse sclerites and rounded ninth abdominal segment; transverse-ovate in transverse section; head and ninth abdominal segment about one-third narrower than the following or preceding segments respectively. Cuticle smooth shiny, of ivory colour, hairs and setae brownish.

Head

Convex above, twice as wide as long; sides rounded, with a tuft of brown, spiniform setae becoming longer exteriorly, on the average about as long as the second antennal segment, the extreme marginal edge with a fringe of fine hairs which are longer than the first antennal segment; anterior margin of front strongly emarginate. Clypeus transverse, three times wider than long, slightly narrowing anteriorly, in living specimens transparent to such a degree that the mandibles are clearly visible; posterior margin with fine hairs, leaving free a clear median space. Labrum transverse-ovate, about the width of clypeus, about three-and-a-half times as wide as long, the posterior half brownish, bounded anteriorly by a row of about twenty-four stout, flat setae of unequal length, with the longest setae laterally about three-quarters the length of labrum; the anterior portion less sclerotized, with a series of long, fine setae on front margin not quite as long as the second antennal segment. Epipharynx (Pl. XXIX*b*) transverse-ovate; the posterior sclerotized band mesially with two long, somewhat curved spines, pointing towards each other; below them are two rows of very small sensory punctures, four in each row; the discal surface is free of spines except for two very small ones in the centre just below middle, between them are four minute sensory punctures; above them are six larger sensory punctures, spaced in two vertical rows; the space between them and the anterior margin and the posterior sclerotized band is filled with minute trichoid processes; the anterior margin has on each side laterally two fine, pointed setae, three very broad, flat ones towards middle and in the centre four smaller, very fine, pointed setae. Antennae originating from a broad, granular, basal membrane; three segments; first segment one-and-a-quarter times longer than second with long hairs on the glossy, dorsal, ventral and lateral surface and a fine granular sculpture along anterior margin; second segment bare, pear-shaped, one-third narrower basally than at the swollen apex, around the swelling of which runs the main sensorium as a band of darker outline which is not completely closed dorsally; third segment very small, subsquare, one-seventh the length of second, tipped with a single

seta as long as segment of article (Text-fig. 27). Mandibles very stout (Text-figs. 3, 4); apex bifid; dorsally the apical teeth are rather weakly developed and retracted against molar part; left mandible with an additional, small, obtusely triangular tooth, just in front of molar part; right mandible with a subrectangular, rounded tooth mesially between apex and molar; the external margin arcuate, the anterior sclerotized third portion is separated from the following membranous elevation by an acute angular incision in which arises a strong seta; the membranous elevation extends from within the ventral margin over a considerable area of the dorsolateral surface, densely set with strong, pointed, brown setae; in ventral view the two apical teeth on each mandible form a stout mass, the apices themselves being small; the molar part of right mandible rounded, strongly projecting and separated basally by a ridge from ventral surface; left molar somewhat smaller, its apical part triangular, pointed. Maxillae rather stout, palpi with three segments (Text-fig. 23); first segment subsquare, third as long as first, half as wide; second segment one-and-a-half times as long as the other segments; stipes fused with mala; mala slightly longer than first segment of palpus, inner margin armed with a double row of strong, curved spines; articulating membrane between cardo and submentum large, the latter subsquare, bare; gula slightly wider with long hairs; mentum subcylindrical, slightly broader at base, longer than wide, basal part with long hairs, anterior half glossy with a round, finely granular patch on each side below anterior margin; prementum subsquare, slightly constricted basally, with long hairs on anterior half; ligula rounded, scarcely reaching one-half the length of the first segment of palpus, margin with fine hairs and two longer, pointed setae; palpi with two segments, articles elongate, second segment slightly shorter than first and one-third narrower; apices of last segments of both palpi with minute hairs.

Thorax

Pronotum widest basally, about twice as wide as long, sides rounded, gradually narrowing anteriorly; anterior margin straight, base strongly arcuate, extending medially considerably beyond mesonotum; meso- and metanotum about three times as wide as long. Lateral margins of thoracic segments somewhat granular, furnished with scattered, fine, brown hairs of varying length, of which the longest are about half the length of segment. Sternal parts glossy, bare except for a tuft of long hairs on pre-eusternum of prothorax; pre-epipleurum of mesothorax bearing a transverse-ovate spiracle.

Legs (Text-fig. 19)

The three pairs of legs decrease in size from the anterior to the posterior ones; first pair wider and about a quarter longer than second pair; the difference between mid and hind legs is not quite as great; all legs composed of coxa, trochanter, femur, tibiotalarsus and claw; all segments on dorsal surface with long, yellowish hairs whose length is almost equal to the width of tibiotalarsus, ventrally flattened and armatus with sharp, strongly sclerotized spines on inner margin, reaching on tibiotalarsus of fore legs to a length almost equalizing the width of this segment; the number of spines are, in the almost full-grown larva of the described specimen, one on base of claw, six on tibiotalarsus, five on femur and two on trochanter; on ventral surface of fore legs are two long, fine hairs on trochanter, femur and tibiotalarsus, the latter being twice as long as wide; claw of fore leg somewhat more than half the length of tibiotalarsus, pointed falcate, strongly sclerotized, weakly convex dorsally, flattened ventrally and with somewhat projecting edges; ventral unsclerotized part of claw small, transversely triangular, seta on inner margin of about half the length of tibial ones. Ventral surface of

mid and hind legs with strong, erect spines, one on trochanter and tibiotarsus, three on femur; inner tibial margin with three long and strong setae, inner margins of femur with two, of trochanter and of base of claw with one each. Distance between midcoxae about as broad as width of front coxa, that between hind coxae two-thirds more.

Abdomen

Abdominal tergites almost three-and-a-half times as wide as long, coated laterally with a few fine hairs, one-third the length of tergite; the first eight tergites with a glassy, shiny band on posterior third, which is well demarcated from the more opaque anterior part; the latter with very fine wrinkles, radiating from an elongate oval at centre; eighth tergite with fine, long, golden hairs, inserted on the dividing line between the glassy and opaque zones and extending beyond the base of the ninth tergite. The spiracles on first eight abdominal segments are situated anteriorly next to epipleurum, they are small, oblong, slightly obliquely placed to the longitudinal axis of body, with the anterior edge of peritreme slightly overlapping. The first eight ventrites are glabrous, except for a half circle of very fine, brown, fairly long hairs on anterior margin of first segment, a few bristles laterally and a single bristle on each side of posterior third. The ninth abdominal tergite is about one-and-a-half times wider than long, evenly rounded, base not constricted (Pl. XXXVI a); in lateral view the tergite arises in a gentle convex curve from the base to the semi-globular apex, which projects beyond ventrite for a fifth of its length (Text-fig. 21, Pl. XXXV b); tergite covered on apical half with very short, stout, strongly sclerotized, hook-like spines of an almost black tint, which are less than one-thirtieth the length of segment, rather widely spaced, becoming scattered anteriorly and laterally, where they extend almost to base; these hook-like spines are directed backward on disc, but pointed forward on the sloping portion of apex; hook-free anterior half of disc with sparse, long, golden hairs, about one-third the length of tergite, these hairs are also found along exterior margin; the pygopodia on ninth ventrite are small, triangularly lobiform with two to three small, slender spines and some fine hairs, situated apically not ventrally and far from projecting beyond ventral surface of ventrite; in ventral view the pseudopodia enclose six small anal lobes (Pl. XXIX f); the three ventral lobes are glossy, forming a triangle, the three lobes above them are finely granular, originating from the articulating membrane; between those two groups of anal lobes lies the anal slit.

Notes on first-stage larva (Text-fig. 25)

The egg of *Lepidochora discoidalis* is 3 mm. long and 1.2 mm. wide; the first instar is of about the same length or slightly longer, width of head capsule about 0.3 mm.; second instar about 4.5 mm. long, head capsule 0.7 mm. wide; the oldest observed larva is 17 mm. long; the pupa (1 specimen) is 10 mm. long and the imago 10-11 mm.

The first instar shows such special features that it may be easily distinguished from older larvae. Cuticle glabrous, but on head and labrum very rugose; antennae strongly dilated, especially second segment; labrum with one strongly sclerotized, flat seta with pointed apex on each side of disc; a similar seta is found on the dorsolateral membranous elevation of each mandible; a few fine setae on labrum anteriorly, and a few hairs on clypeus. Femur and tibiotarsus each with one strong seta on ventral inner edge and a few hairs on dorsal surface. Ninth abdominal segment without any sign of spines, but apex with two very small whitish, divergent cerci, at the top slightly brown-sclerotized; four longer setae on anterior half of disc and a few hairs laterally and ventrally. Each tergite, from the

first thoracic to the eighth abdominal one, bears paramedially on each side a very fine seta with a minute pointed egg-burster, besides a fine seta more laterally and about three on lateral margin. Spiracles round.

The second instar already shows all features of the older larva, only the number of setae is less, on labrum for example twelve as against about twenty-six in the oldest observed stages. Hairs and abdominal spines are relatively longer than in older larvae.

The first instar of the other Eurychorini examined (*Stips stali*, *dohrni* and *gebieni*, *Symphochora simoni*, *Eurychora* spec.) all seem to have already the upcurved apex of ninth abdominal segment with two minute spines on top. There appear to be egg-bursters on all segments, but they are mostly very difficult to distinguish, especially on the abdominal segments. In *Eurychora* egg-bursters were found on all segments, while in the other cases only the thoracic ones were certain.

Key to the genera of Eurychorini

1. Ninth abdominal tergite evenly rounded in dorsal and ventral view; disc with short, stout hook-like spines; pygopodia small, situated apically, ventrally not projecting beyond ninth sternite. Lepidochora Gebien
(See key to *Lepidochora*, p. 179.)
- Ninth abdominal tergite heart-shaped in dorsal view, apex constricted, terminating in a setiferous tubercle, in lateral view strongly curved upwards: disc with pointed setae; pygopodia large, situated ventrally, strongly projecting beyond ninth sternite. 2
2. Disc of head and all nota bare. Third article of antenna small, a sixth to a seventh the length of second. Exterior sclerotized margin of mandible ending in front of middle (Text-figs. 7, 8); membranous, setiferous elevation large, dorsally strongly extending on discal surface; median tooth on left mandible situated next to molar part. 3
- Disc of head and all nota with isolated or dense hairs or setae. Third article of antenna large, a third to a fourth the length of second (Text-fig. 28). Exterior sclerotized margin of mandible ending at or behind middle (Text-figs. 10-13); membranous, setiferous elevation small, dorsally not or scarcely projecting on discal surface; median tooth on left mandible situated medianly between apical tooth and molar part. 4
3. Ninth abdominal tergite about as long as wide; apex prolonged, forming an acute angle, slender in ventral view (Pl. XXXIX a). Arthrochora arenicola Gebien
Thirty-two larvae in different stages. One larva alive. Two beetles alive. Largest larva: 16.5:2.5:1.8. About full-grown. Parents from Southern Namib (Tsauchab).
- Ninth abdominal tergite distinctly wider than long; apex short, forming an obtuse to rectangular angle, stout in ventral view (Pl. XXXVIII a, b).
(See key to *Stips*, p. 179.) Stips Koch
4. Frons with numerous short setae, especially on anterior half. Epipharynx with six sensory punctures on centre of disc (Pl. XXIX d). Eurychora spec.
(Text-fig. 20, Pls. XXXVI c, XL a)
Sixty-one larvae in different stages. Thirty-six larvae alive. Two pupae. Thirteen beetles alive. Largest larva: 27.8:3.5:3. About full-grown. Parents from Southern Kalahari (Mata-Mata, Twee Rivieren), Western Transvaal (Frederikstad), Northern Transvaal (Vivo).
- Frons with six setae, two posteriorly in front of the epicranial angle, two slightly more anteriorly and laterally and two next to anterior margin; if a few more setae present, only isolated and very fine, hairlike, long,

- half the length of frons. Epipharynx with four sensory punctures on centre of disc and two beneath anterior margin (similar to *Stips*, Pl. XXIX *c*). 5
5. Head one-and-a-half times as wide as long. Difference in size between fore, mid and hind legs not very great; the width of fore segments about one-and-a-half times more than that of hind segments.
- Geophanus spec. ex aff. pygmaeus** Erichson
- Five larvae in different stages (only two complete). One pupa. Largest larva: 12·8:1·6:1·1. Probably not quite full-grown. Parents from Northern Transvaal (Vivo).
- Head about twice as wide as long. Difference in size between fore, mid and hind legs very marked; segments of fore legs twice and more than twice as wide as segments of hind legs. 6
6. Pleural parts of abdominal segments with a few isolated, fairly short setae, about one-fifth length of segment. **Phytolostoma limpopoana** Koch (Pls. XXIX *e*, XXXV *a*)
- Eight larvae in different stages. Largest larva: 16:2:1·2. About full-grown. Parents from Northern Transvaal (Vivo).
- Pleural parts of abdominal segments furnished with a mass of long setae, longest ones a third to half the length of segment. 7
7. Setae on disc of ninth abdominal tergite in two transverse, subparallel rows; setae very long and fine, a third or less of the length of segment, but much longer than marginal setae (Pl. XL *b*).
- Symphochora simoni** Fairmaire
- Thirty-seven larvae in different stages. Twenty-three larvae alive. Seven pupae. Four beetles alive. Largest larva: 23·5:3:2·1. About full-grown. Parents from Transvaal (Makapan, Ficus Cave).
- Only the basal row of setae on ninth abdominal tergite distinct; between this row and the apex there are no setae at all or two isolated setae in centre; setae on the average less than a third of the length of segment and shorter than or about the same length as marginal setae. 8
8. Inner marginal setae on ninth abdominal tergite very slender, base narrow, about eight times as long as wide (Pl. XXXIX *b*).
- Serrichora spec. ex aff. longantennata** Koch
- Thirteen larvae in different stages. Sixty-seven larvae alive. Sixteen beetles alive. Largest larva: 16·5:2:1·6. About full-grown. Parents from Eastern Transvaal (Punda Maria).
- Inner marginal setae on ninth abdominal tergite fairly stout, base broad, three to four times as long as wide. 9
9. Strong setae on discal margin of ninth abdominal tergite forming a semi-circle, occupying in front of base a quarter of disc on each side; basal margin bordered by a dense row of very fine setae of varying length; median circular space of disc free of setae (Pl. XLI *a*). The whole disc of eighth abdominal tergite with scattered setae. Disc of head and thoracic tergites with brown setae, which are partly prolonged to cobweb-fine, yellowish hairs as long as segments.
- Pogonobasis (Peristoptus) perforatus** Fairmaire
- Seven larvae in different stages. Four beetles alive. Largest larva: 17:2·5:1·8. About full-grown. Parents from Port. East Africa (Luabo).
- Strong setae on discal margin of ninth abdominal tergite extending only two-thirds of distance towards base, limited to margin; basal margin with a few isolated setae; median triangular bare space with two setae in centre (Pl. XLI *b*). Disc of eighth abdominal tergite bare, except for a few long setae indicating an anterior and posterior transverse row. Disc of head and thoracic tergites with brown setae, not prolonged to cobweb-like hairs.
- Prunaspila bicostata** (Fähræus)
- Fifteen larvae in different stages. Two pupae. Second generation. Two beetles alive. Largest larva: 18:2·8:1·7. About full-grown. Parents from Northern Transvaal (Vivo).

Key to species of *Eurychorini**Lepidochora* (see p. 177)

1. Surface of head, nota and sterna (besides the hairs and setae on lateral margin) bare. Ninth abdominal segment much narrower than the preceding segment, globular, base not constricted, about one-and-a-half times as wide as long (Pl. XXXVIa); exterior ventral margin with scattered long hairs (Pl. XXIXf).

Lepidochora discoidalis discoidalis Gebien

Seventy-seven larvae in different stages. One pupa. Largest larva: 17:4:2. About full-grown. Parents from Southern Namib (Kuseb area).

Lepidochora discoidalis argentogrisea Koch

Forty larvae in different stages. Measurements and locality same as in *L. discoidalis* s.str.

- Surface of head, nota and sterna furnished with short, adherent setae. Ninth abdominal segment about as wide as the preceding one, transverse-ovate, strongly narrowing at base, about twice as wide as long; exterior ventral margin with dense furry vestiture. 2

2. Setiferous band on first seven abdominal nota narrow, setae dispersed; the bare area, which separates the anterior band from the posterior row of setae, is a median, broad, subparallel strip much wider than the anterior band.

Lepidochora porti Koch (Pl. XXXVIb)

Ten larvae of about the same stage. Three beetles alive. Largest larva: 8:1.9:1.1. Certainly not full-grown. Parents from Southern Namib (Kuseb area).

- Setiferous band on nota broad, setae densely set; bare strip, which separates the anterior setiferous band from the posterior row of setae, hardly marked on the first abdominal segments, more distinct on distal ones, never in the middle of segment or wider than anterior band, or bare area triangular. 3

3. First seven abdominal nota with a very distinctly marked pattern consisting of a pair of bare median ocular spots, a large triangular patch underneath and several subovate bare patches towards sides. Ninth abdominal segment twice as wide as long; setae small, about a thirtieth or less of the length of the latter (Pl. XXXVIIa).

Lepidochora kahani Koch

Nine larvae in different stages. Five beetles alive. Largest larva: 19:4.5:2.5. Probably nearly full-grown. Parents from Southern Namib (Kuseb area).

- Pattern on nota similar to *kahani* but contours not distinct, broken up, especially on last segments. Ninth abdominal segment more than twice as wide as long; setae larger, about a fifteenth of the length of segment (Pl. XXXVIIb).

Lepidochora eberlanzi parva Koch

Twenty-six larvae in different, but mostly very early stages. Largest larva: 11:3.3:2. Certainly not full-grown. Parents from Southern Namib (Walvis Bay).

Stips (see p. 177)

Setae on ninth abdominal tergite of varying length, the marginal ones slender, about twice as long as the inner ones; the latter small, triangular, on the average three times as long as wide (Pl. XXXVIIIa).

Stips stali (Haag)

Twenty-eight larvae in different stages. Three larvae alive. Sixteen beetles alive. Largest larva: 28.5:3.2:2.5. About full-grown. Parents from Southern Namib (Kuseb area).

Setae on ninth abdominal tergite of about equal length, long and slender, six to ten times as long as wide (Pl. XXXVIIIb).

Stips dohrni (Haag)

Twenty-four larvae in different stages, many first and second instars. Eighty-eight larvae alive. One pupa. Second generation. Fifty-four beetles alive. Largest larva: 23:3:2.2. About full-grown. Parents from Southern Kalahari (Twee Rivieren).

Difficult to distinguish from *Stips dohrni* as only setae on head and ninth abdominal tergite more olive green in contrast to the reddish brown setae in *S. dohrni*.

Stips gebieni (Hesse)

Thirty-seven larvae in different stages. Six larvae alive. One pupa. Second generation. Fourteen beetles alive. Largest larva: 19:2:2:1:7. About full-grown. Parents from Southern Kalahari (Twee Rivieren).

Summary on the Eurychorini larvae

In the Eurychorini we find two completely different types of larvae; the essential difference lies in the shape of ninth abdominal tergite. On the one hand we have the *Lepidochora* group with rounded abdomen, set with small, hook-like spines, disc of apex straight; pygopodia small, ventrally not projecting beyond ninth sternite. On the other hand we have the remaining genera with shape of last abdominal segment more triangular, set with erect, pointed setae; apex produced and strongly curved upwards; pygopodia large, ventrally projecting beyond ninth sternite.

In the genus of *Lepidochora*, *L. discoidalis discoidalis* and *L. discoidalis argento-grisea* are distinguished from the other three species by the different shape of ninth abdominal tergite and the bare body.

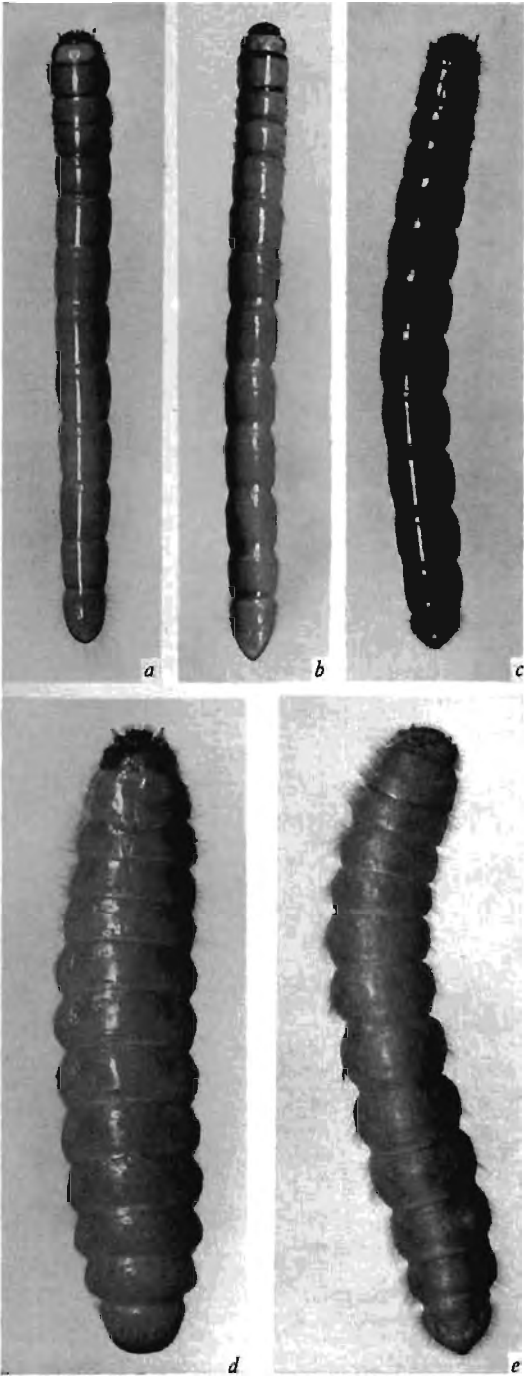
The genera *Stips* and *Arthrochora* seem to be more nearly related to *Lepidochora* (especially *L. discoidalis*) than to the other Eurychorini larvae, with bare head and nota, the small third antennal segment, and the same formation of the exterior margin and membranous elevation of mandibles as in *Lepidochora*; but the shape and furniture of the ninth tergite, already in the first instar, and the epipharynx, link *Stips* and *Arthrochora* to the other genera of Eurychorini.

The genus *Eurychora* is somewhat separated from the other genera by a different distribution of sensory punctures on epipharynx and the numerous setae on frons.

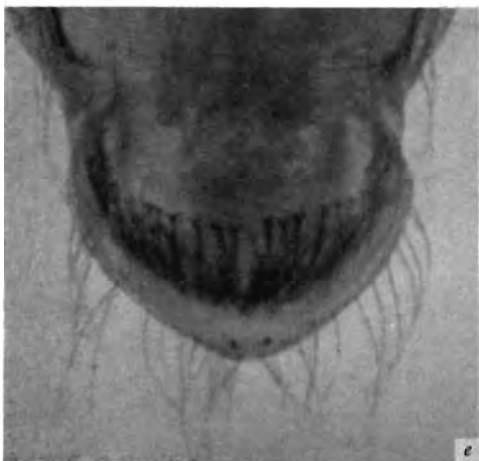
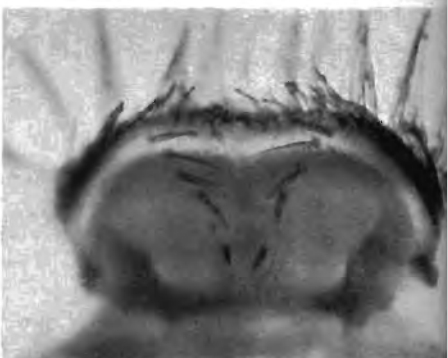
The remaining genera are not very strikingly different from each other, with the possible exception of *Geophanus* of which species we have no good material.

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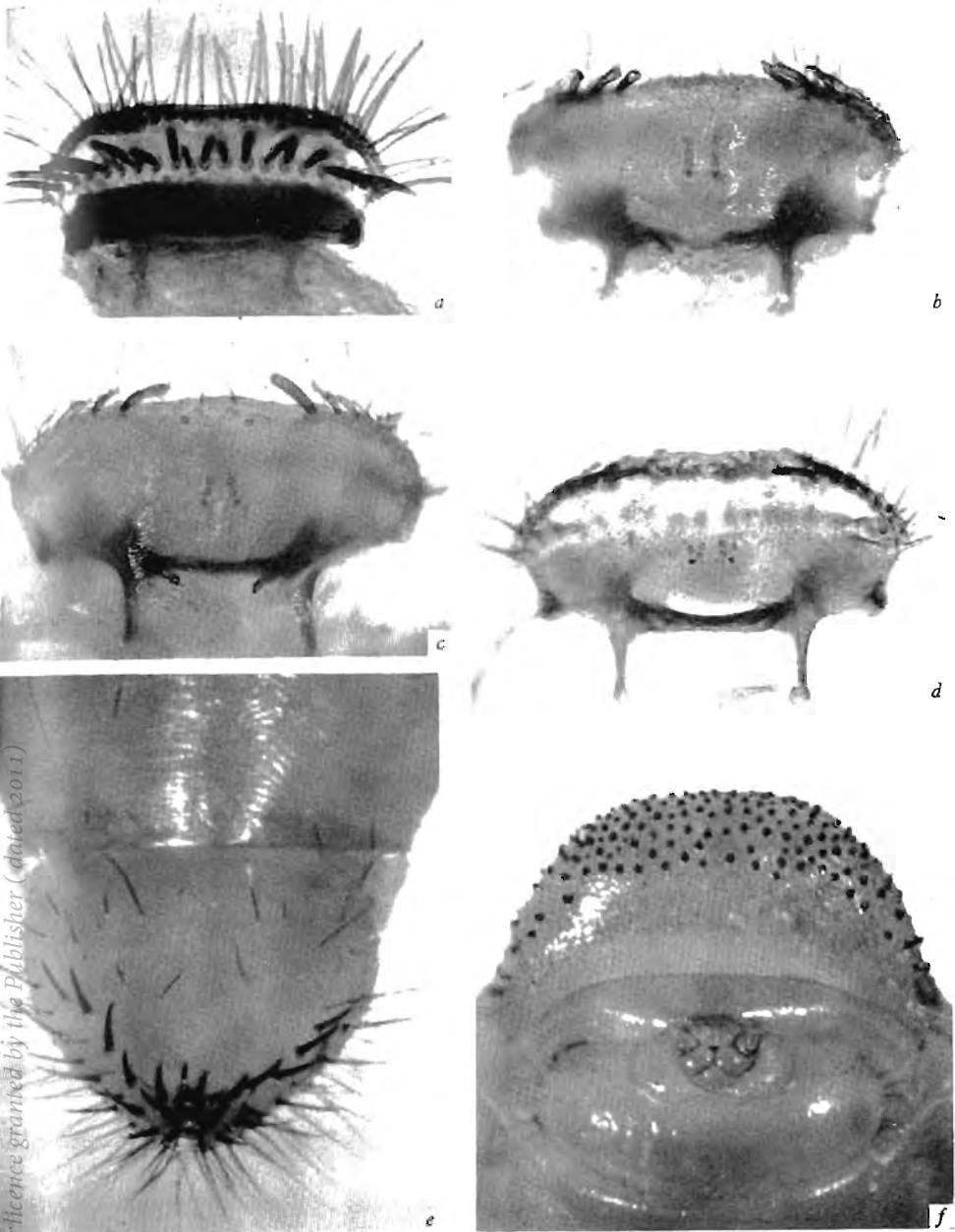
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a, *Onymacris rugatipennis* Haag ($\times 1.9$); b, *Epiphysa flavicollis* Fabricius ($\times 1.3$); c, *Stips dohrni* (Haag) ($\times 3.2$); d, *Lepidochora discoidalis* Gebien ($\times 4.8$); e, *Eurychora* spec. ($\times 3.5$).



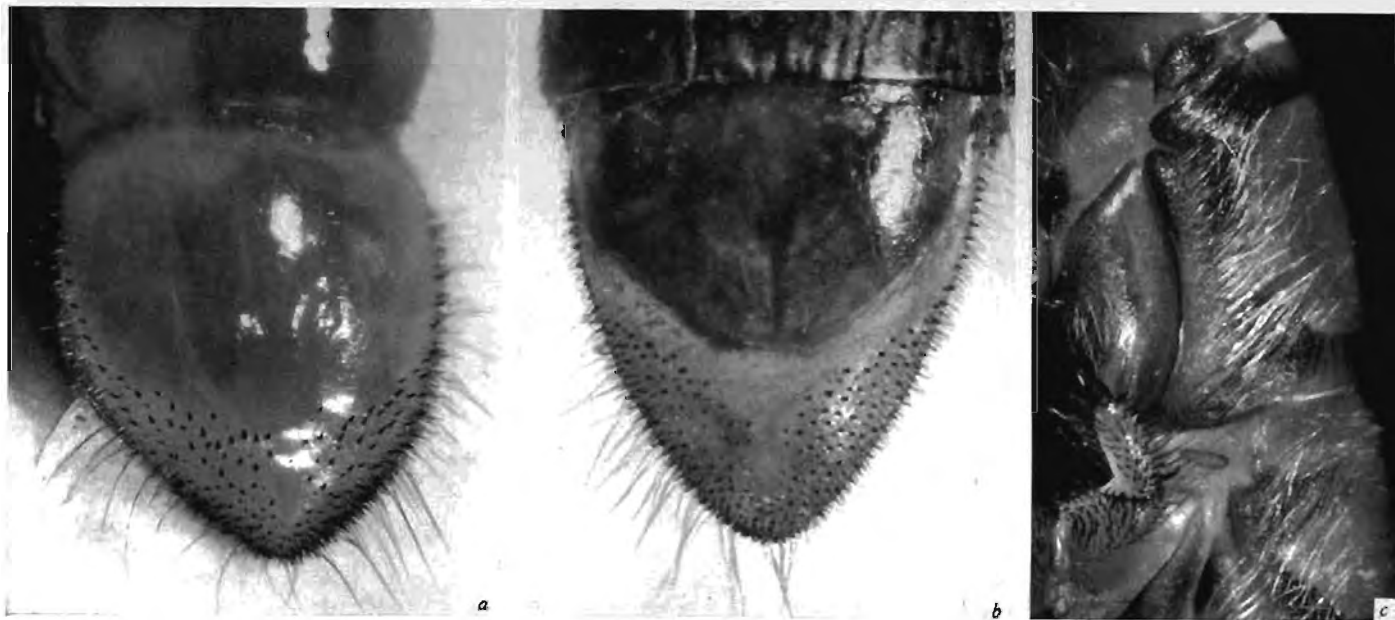
- a, *Onymacris rugatipennis*. Clypeus and labrum ($\times 40$); b, *Onymacris rugatipennis*. Epipharynx ($\times 51$); c, *Epiphysa flavicollis*. Epipharynx ($\times 30$); d, *Stenocara depressa*. Epipharynx ($\times 83$); e, *Stenocara gracilipes*. Part of eighth, and the ninth abdominal tergite of first-stage larva. Visible through the transparent, seta-less cuticle of the first instar is the ninth tergite of the second instar with numerous strong setae. On top of apex of ninth tergite of first instar two flat triangular spines ($\times 60$); f, *Pogonobasis spec.* Maxillae and labium, dorsal view. Mentum somewhat collapsed, in front of it the hypopharyngeal sclerite ($\times 34$).



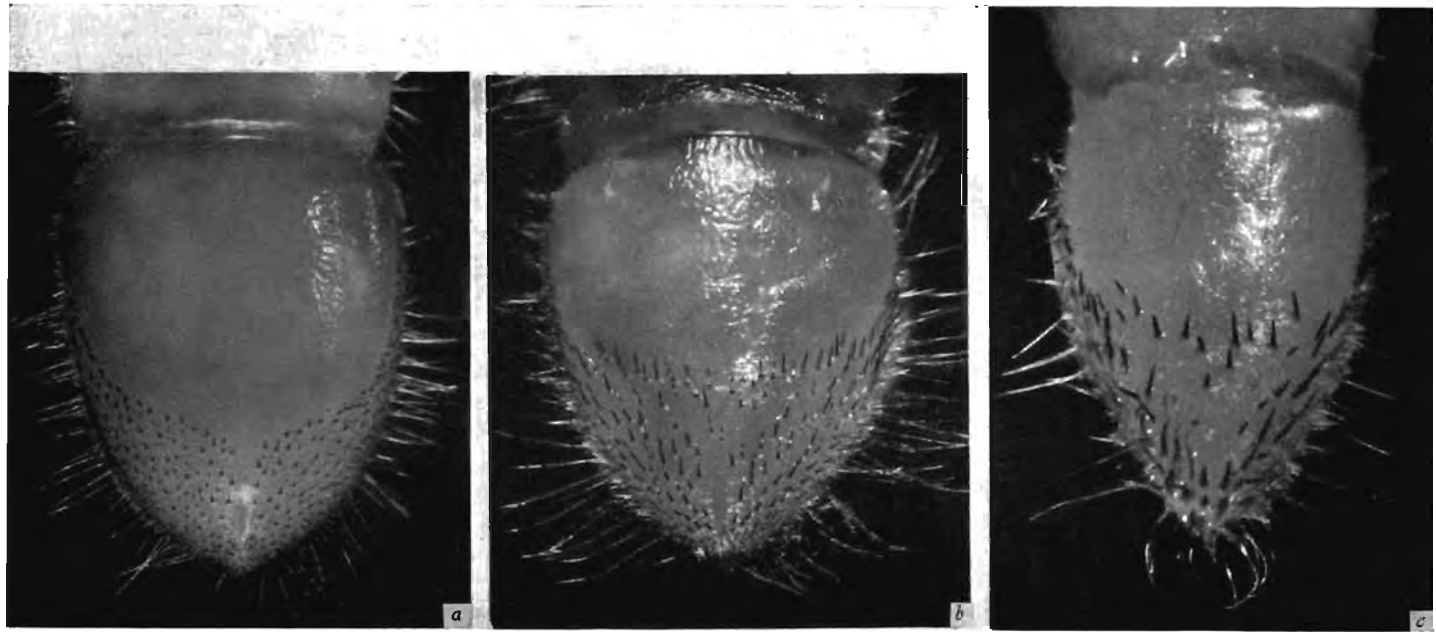
a. *Stips dohrni*. Labrum ($\times 65$); b, *Lepidochora discoidalis*. Epipharynx. Sensory punctures in two vertical rows ($\times 92$); c, *Stips dohrni*. Epipharynx. The two upper sensory punctures shifted to the anterior margin. Median spines on the posterior sclerotized band clearly visible, apices broken off ($\times 75$); d, *Eurychora* spec. Epipharynx. Sensory punctures in triangular formation ($\times 78$); e, *Phytostoma limpopoana*. Part of eighth, and the ninth abdominal tergite ($\times 35$); f, *Lepidochora discoidalis*. Ninth abdominal segment in caudal-ventral view. Pygopodia very small; the tergite can be drawn over the sternite, covering the anal structures completely ($\times 34$).



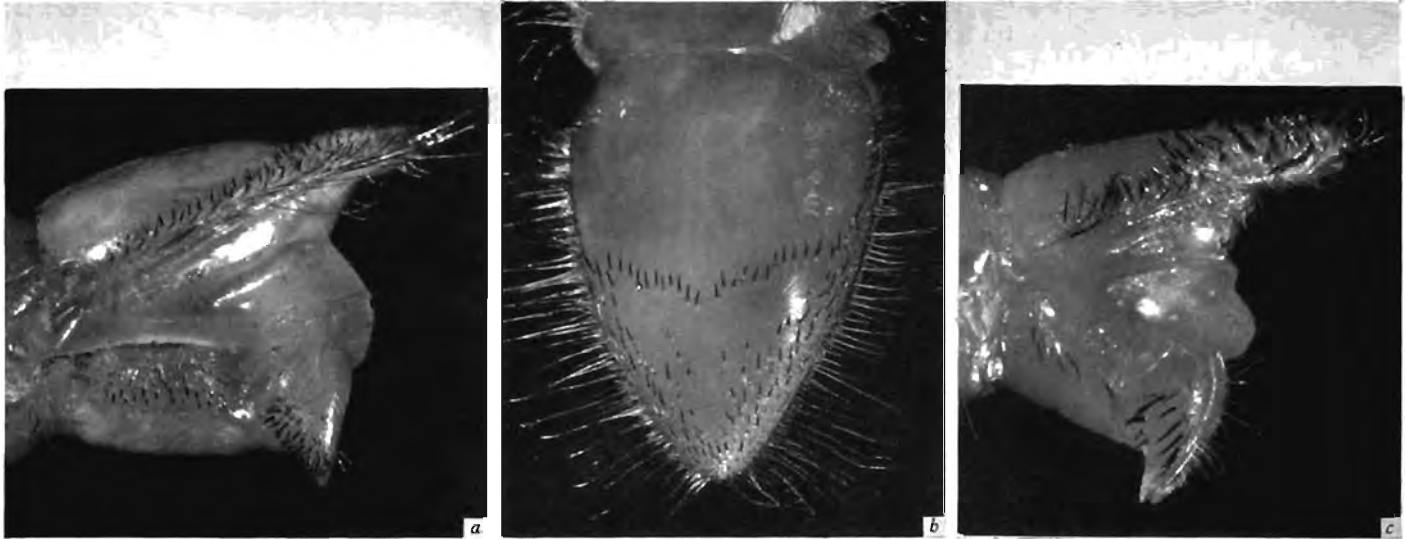
a, *Onymacris rugatipennis*. Fore legs ($\times 20$); *b*, *O. rugatipennis*. Head ($\times 18$); *c*, *Epiplatys flavicollis*. Fore legs ($\times 18$). Notice different shape and size of claws, which occurs fairly often.



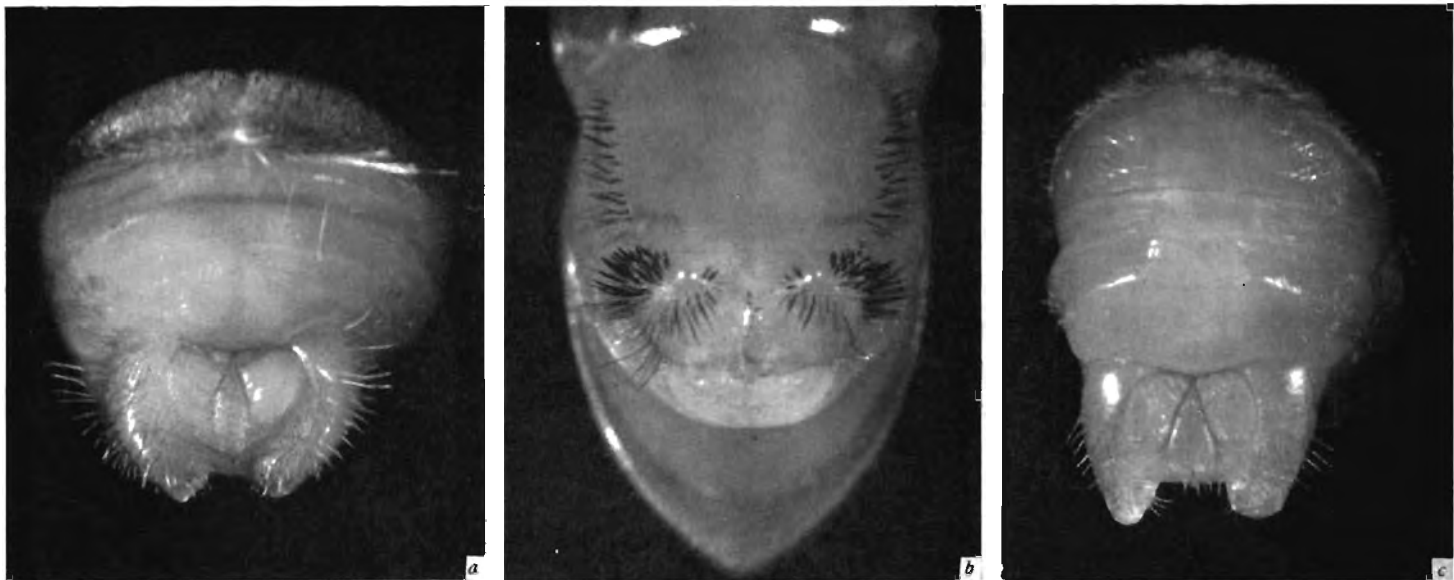
a, *Onymacris rugatipennis*. Ninth abdominal tergite ($\times 17$); b, *O. bicolor marshalli*. Ninth abdominal tergite. Marginal hairs on right side missing ($\times 30$); c, *Physosterna globosa*. Prothorax and part of mesothorax, lateral view. Compare with Text-fig. 9. The formations are very similar to those of *Onymacris rugatipennis* ($\times 20$.)



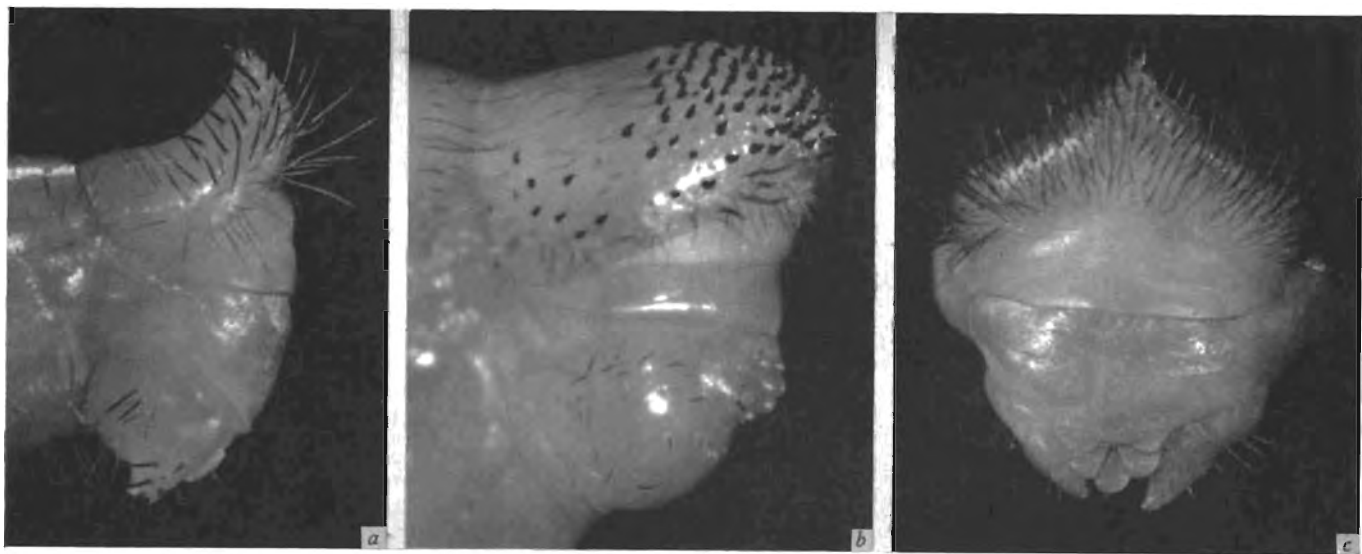
Ninth abdominal tergites of: a, *Onymacris plana* ($\times 15$); b, *Physosterna cribripes* ($\times 13$); c, *Stenocara eburnea* ($\times 29$).



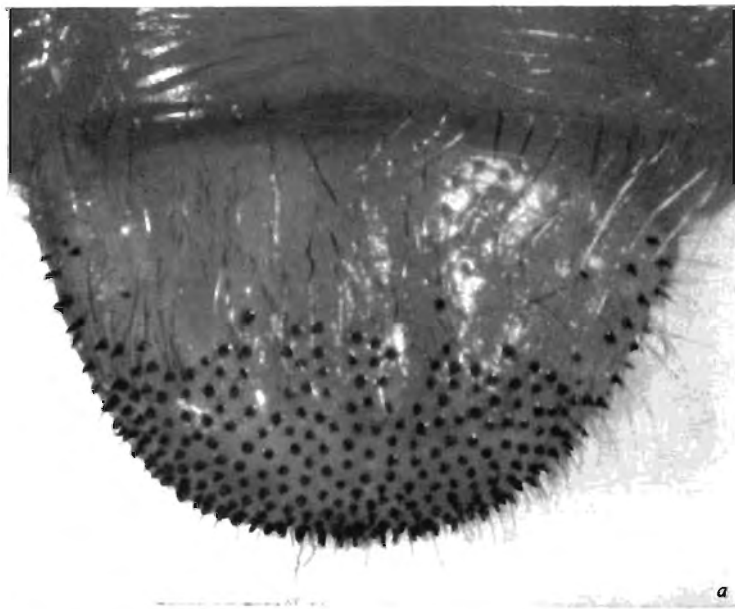
a, *Onymacris rugatipennis*. Ninth abdominal segment, lateral view ($\times 14$); b, *Epiphysa flavicollis*. Ninth abdominal tergite, dorsal view ($\times 12$); c, *Stenocara eburnea*. Ninth abdominal segment, lateral view. Notice the sharply pointed pygopodia and the open oval of setae thereon. ($\times 20$).



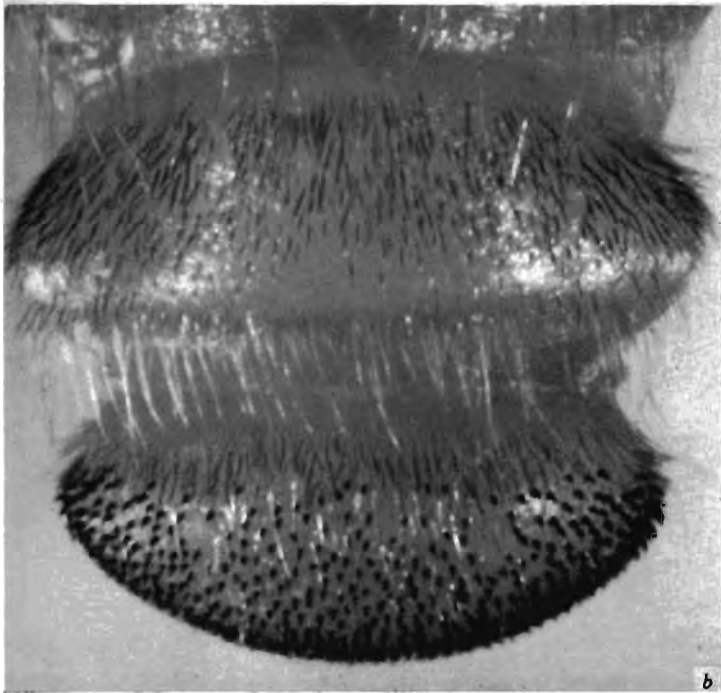
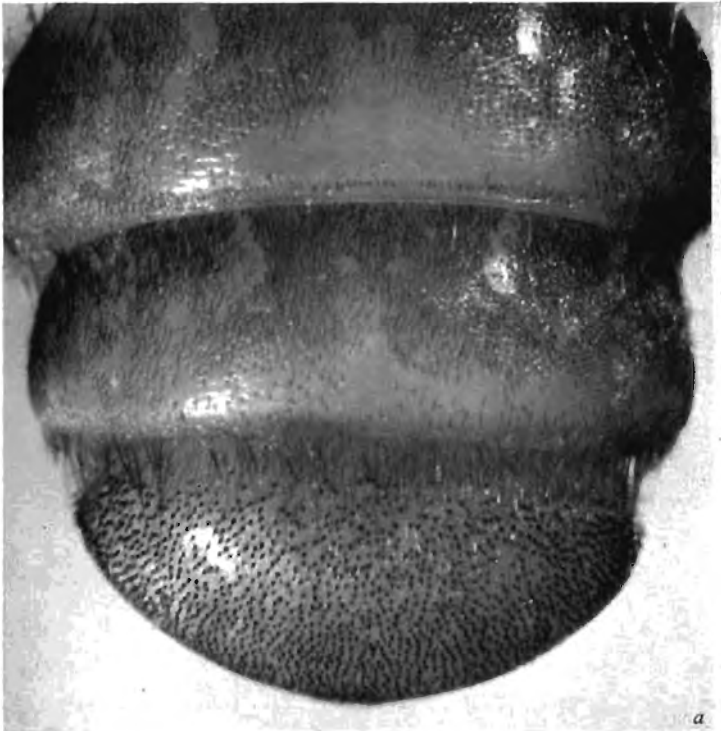
a, *Onymacris plana*. Ninth abdominal segment, caudal view. Pygopodia strongly curved inwards ($\times 20$); *b*, *O. rugatipennis*. Ninth abdominal segment, ventral view. Pygopodia set with a mass of stronger and finer setae ($\times 19$); *c*, *Epiphysa flavicollis*. Ninth abdominal segment, caudal view. Pygopodia fairly perpendicular with broad, blunt apices ($\times 14$).



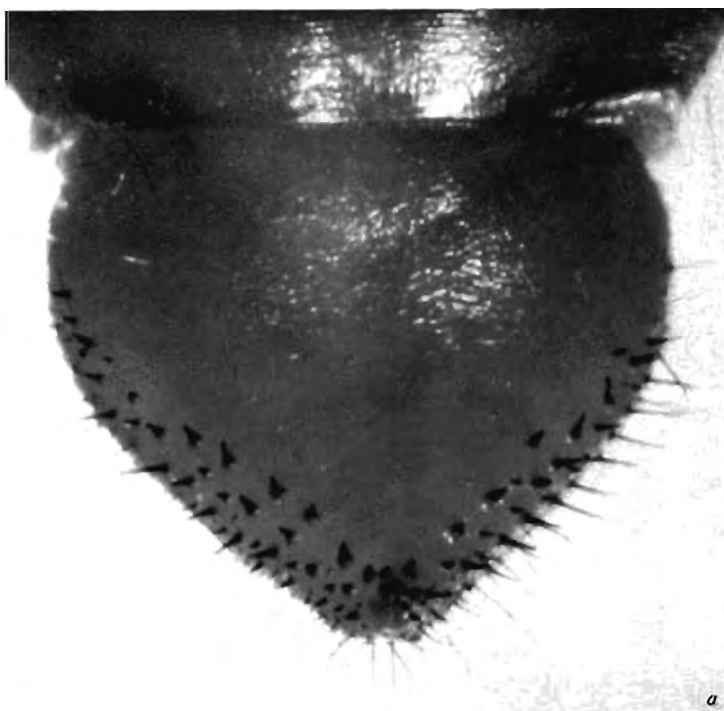
a, *Phytolostoma limpopoana*. Part of eighth, and the ninth abdominal segment, lateral view ($\times 28$); *b*, *Lepidochora discoidalis*. Part of eighth, and the ninth abdominal segment, lateral view (compare with Text-fig. 21). Notice the evenly curved apex and the very small pygopodium in comparison with *Phytolostoma* ($\times 30$); *c*, *Eurychora spec.* Ninth abdominal segment, caudal view. Notice the upcurved apex and compare with Pl. XXIXf, *Lepidochora discoidalis* ($\times 14$).



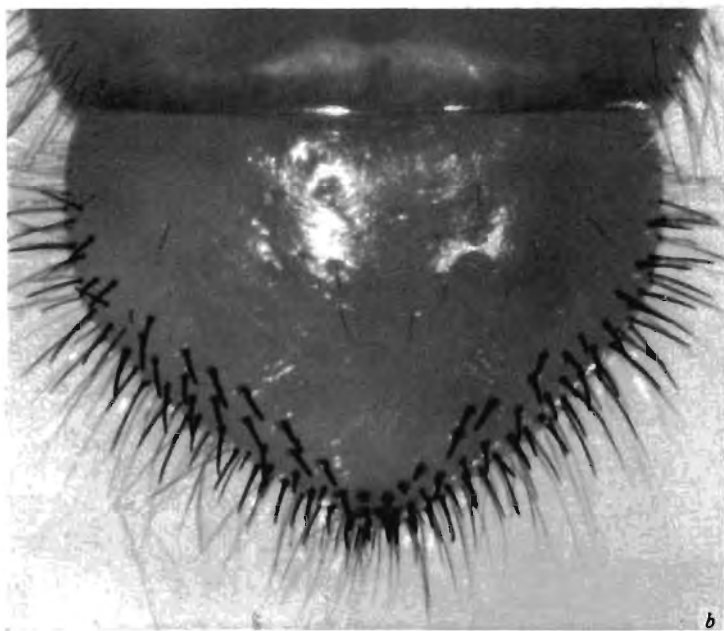
a, *Lepidochora discoidalis*. Part of eighth, and the ninth abdominal tergite ($\times 24$);
b, *L. portii*. Part of seventh, and the eighth and ninth abdominal tergites ($\times 65$).



a, *Lepidochora kahani*. Last three abdominal tergites. Notice the distinct pattern ($\times 23$);
b, *L. eberlanzi parva*. Part of seventh, and the eighth and ninth abdominal tergites ($\times 32$).

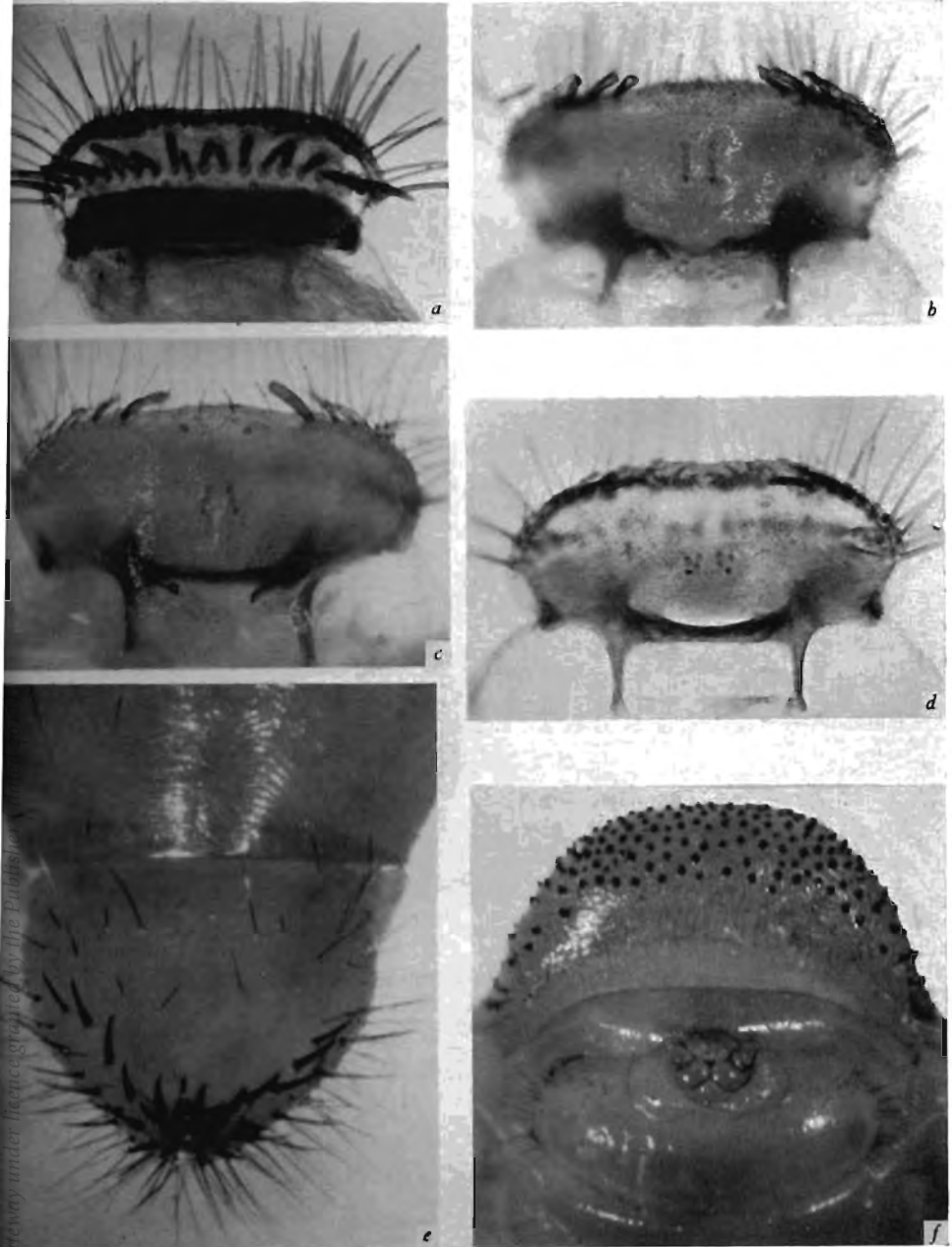


a

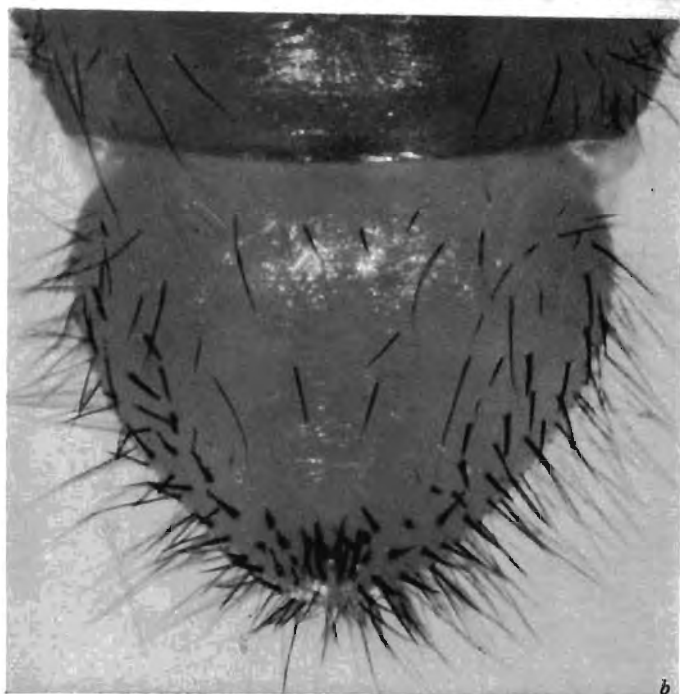


b

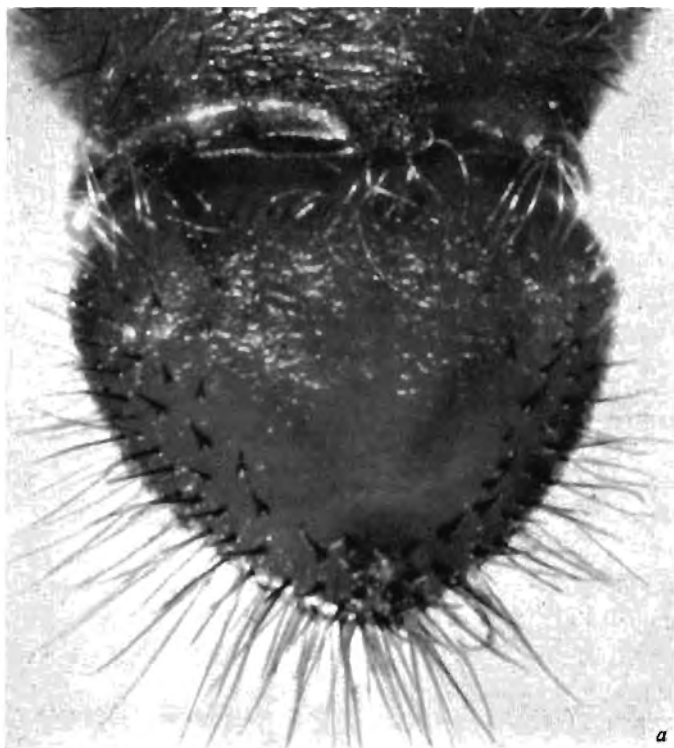
a, *Stips stali*. Part of eighth, and the ninth abdominal tergite ($\times 37$). b, *S. dohrni*. Ninth segment not fully extended ($\times 36$).



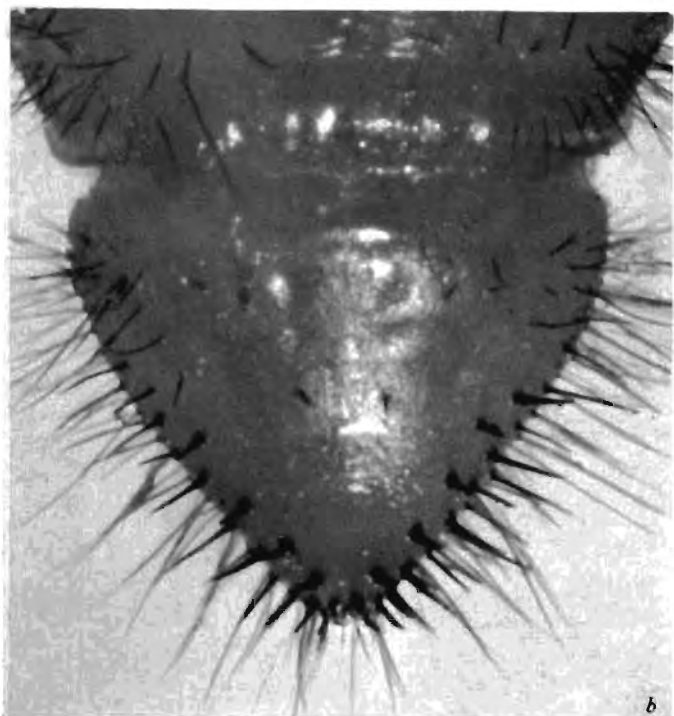
a, *Stips dohrni*. Labrum ($\times 65$); b, *Lepidochora discoidalis*. Epipharynx. Sensory punctures in two vertical rows ($\times 92$); c, *Stips dohrni*. Epipharynx. The two upper sensory punctures shifted to the anterior margin. Median spines on the posterior sclerotized band clearly visible, apices broken off ($\times 75$); d, *Eurychora* spec. Epipharynx. Sensory punctures in triangular formation ($\times 78$); e, *Phytolostoma limpopoana*. Part of eighth, and the ninth abdominal tergite ($\times 35$); f, *Lepidochora discoidalis*. Ninth abdominal segment in caudal-ventral view. Pygopodia very small; the tergite can be drawn over the sternite, covering the anal structures completely ($\times 34$).



Part of eighth, and the ninth abdominal tergite of: *a*, *Eurychora* spec. ($\times 23$);
b, *Symphochora simoni* ($\times 34$).



a



b

Part of eighth, and the ninth abdominal tergite of: *a*, *Pogonobasis perforatus* ($\times 43$);
b, *Prunaspilea bicostata* ($\times 44$).